BHUBANESWAR SMART CITY LIMITED

2nd Floor, Block – 1, BMC Bhawani Office Complex, Saheed Nagar,
Bhubaneswar - 751007 | Email: - bbsr.bscl@gmail.com; Tel: - +91 674 2548 228

REQUEST FOR PROPOSAL

for

Selection of Master System Integrator for Implementation of Smart Solutions in Bhubaneswar City

MARCH 2017

REQUEST FOR PROPOSAL

RFP No.: **BSCL/243/16/620**
Date: **4th March 2017**

Project Name: Implementation of Smart City Projects under Smart City Mission in Bhubaneswar City

Name of Assignment: Selection of Master System Integrator for Implementation of Smart Solutions in Bhubaneswar City

Bhubaneswar Smart City Limited,
2nd Floor, Block – 1, BMC Bhawani Office Complex,
Saheed Nagar, Bhubaneswar – 751 007,
Odisha

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DISCLAIMER

The information contained in this Request for Proposal ("RFP") document or any other information subsequently provided to Bidders, whether verbally or in documentary or any other form by or on behalf of the Bhubaneswar Smart City Limited (“Client”) or any of its employees or advisers, is provided to the Bidders on the terms and conditions set out in this RFP and such other terms and conditions subject to which such information is provided.

This RFP is not an agreement and is neither an offer nor invitation by the Client to the prospective Bidders or any other person. The purpose of this RFP is to provide interested Bidders with information that may be useful to them in the formulation of their Proposals pursuant to the RFP. This RFP includes statements, which reflect various assumptions and assessments arrived at by the Client in relation to the Goods and Services. Such assumptions, assessments and statements do not purport to contain all the information that each Bidder may require. This RFP may not be appropriate for all persons, and it is not possible for the Client, its employees or advisers to consider the objectives, technical expertise and particular needs of each party who reads or uses this RFP. The assumptions, assessments, statements and information contained in this RFP may not be complete, accurate, adequate or correct. Each Bidder should, therefore, conduct its own investigations and analysis and should check the accuracy, adequacy, correctness, reliability and completeness of the assumptions, assessments and information contained in this RFP and obtain independent advice from appropriate sources.

Information provided in this RFP to the Bidders is on a wide range of matters, some of which depends upon interpretation of law. The information given is not an exhaustive account of statutory requirements and should not be regarded as a complete or authoritative statement of law. The Client accepts no responsibility for the accuracy or otherwise for any interpretation or opinion on the law expressed herein.

The Client, its employees and advisers make no representation or warranty and shall have no liability to any person including any Bidder under any law, statute, rules or regulations or tort, principles of restitution or unjust enrichment or otherwise for any loss, damages, cost or expense, which may arise from or be incurred or suffered on account of anything contained in this RFP or otherwise, including the accuracy, adequacy, correctness, reliability or completeness of the RFP and any assessment, assumption, statement or information contained therein or deemed to form part of this RFP or arising in any way in this selection process.

The Client also accepts no liability of any nature whether resulting from negligence or otherwise however caused or arising from reliance of any Bidder upon the statements contained in this RFP.

The Client may in its absolute discretion, but without being under any obligation to do so, update, amend or supplement the information, assessment or assumption contained in this RFP.

The issue of this RFP does not imply that the Client is bound to select a Bidder to provide the Goods and Services and the Client reserves the right to reject all or any of the Proposals without assigning any reasons whatsoever.

The Bidder shall bear all its costs associated with or relating to the preparation and submission of its Proposal including but not limited to preparation, copying, postage, delivery fees, expenses associated with any demonstrations or presentations which may be required by the Client or any other costs incurred in connection with or relating to its Proposal. All such costs and expenses will remain with the Bidder and the Client shall not be liable in any manner whatsoever for the same or for any other costs or other expenses incurred by a Bidder in preparation or submission of the Proposal, regardless of the conduct or outcome of the selection process.

Section 1. Instructions to Bidders and Bid Data Sheet

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Section 1. Instructions to Bidders and Bid Data Sheet

A. General Provisions

Definitions

(a) "Affiliate" means, in relation to a Bidder, a person who controls or is controlled by such Bidder, or a person who is under the common control of the same person who controls such Bidder.

(b) "Applicable Law" means the laws and any other instruments having the force of law in the state of Odisha / India, as they may be issued and in force from time to time.

(c) "Bidder" means any person that submits a Proposal pursuant to this RFP.

(d) "Bid Data Sheet" or "BDS" means the data sheet set out in Part F of Section 1 with specific details and information to supplement (and not override) the general provisions set out in Part A of the ITB.

(e) "CEO" means the Chief Executive Officer of the Client.

(f) "Clause" means a clause of the ITB.

(g) "Client" means Bhubaneswar Smart City Limited (BSCL), the implementing agency that will sign the Contract for the Services with the selected Bidder.

(h) "Companies Act" means the (Indian) Companies Act, 1956 or the (Indian) Companies Act, 2013, to the extent applicable.

(i) "Contract" means the legally binding written agreement to be executed between the Client and the successful Bidder. A draft of the Contract is set out in Section 6 and includes all the documents listed in Clause 1 of the draft Contract (i.e., the General Conditions of Contract (GCC), the Special Conditions of Contract (SCC), and the Appendices).

(j) "Control" in relation to a Person, means: (i) the ownership, directly or indirectly, of more than 50% of the voting shares of such Person; or (ii) the power, directly or indirectly, to direct or influence the management and policies of such Person by operation of law, contract or otherwise. The term "Controls" and "Controlled" shall be construed accordingly.

(k) "Day" means a calendar day.

(l) "Eligibility Criteria" means, collectively, the financial eligibility criteria and the technical eligibility criteria

specified in the Bid Data Sheet and the other eligibility criteria specified in Clauses 2, 3, 4 and 5, which a Bidder is required to satisfy to be qualified as an eligible Bidder for award of the Contract.

(m) "EMD" shall have the meaning ascribed to it in Clause 19.

(n) "Financial Proposal" means the financial proposal of the Bidder comprising the documents set out in Clause 18.

(o) "GoI" means the Government of India.

(p) "GoO" means the Government of Odisha.

(q) "ITB" mean the Instructions to Bidders set out in Section 1 of the RFP that provides the Bidders with all the information needed to prepare their Proposals.

(r) "Key Expert" means an individual proposed to be engaged by a Bidder, if selected as the successful Bidder to perform and manage the services as per the requirements mentioned under Section 5: Technical Requirements.

(s) "Local Firm" means a firm having registered office in the state of Odisha and satisfying criteria of qualifying as subcontractor as defined herein below.

(t) "MD" means Managing Director of the Client.

(u) "Module" means a component of the Solutions Project in relation to which the Bidder is required to provide the Solution and Services, as described in greater detail in the RFP.

(v) "MoUD" means the Ministry of Urban Development, GoI.

(w) "MSI" means Master System Integrator as the successful Bidder selected by the Client in accordance with this RFP to enter into the Contract to execute the Work and Services.

(x) "Person" means any individual, company, corporation, firm, and partnership, trust, sole proprietor, limited liability partnership, co-operative society, Government Company or any other legal entity.

(y) "Personnel" means, collectively, Key Experts and any other personnel proposed to be engaged by a Bidder, if selected as the successful Bidder, to provide the Solutions and Services.

(z) "Performance Security" shall have the meaning ascribed to it in Clause 25.

(aa) "Proposal" means the submissions made by a Bidder pursuant to the RFP, which will include the Qualification

Documents, Technical Proposal and the Financial Proposal.

(bb) "Proposal Due Date" means the last date for submission of the Proposals, as specified in the Bid Data Sheet.

(cc) "Qualification Documents" means the documents submitted by the Bidder to demonstrate its eligibility in accordance with Clause 17.

(dd) "RFP" means this, request for proposal along with its schedules, annexures and appendices and includes any subsequent amendment issued by the Client pursuant hereto.

(ee) "Services" means the work to be performed by the Bidder pursuant to the Contract, as described in greater detail in the RFP document.

(ff) "Sub-contractor or subcontractor" means a firm or a company engaged by the bidder in accordance with the ITB and / or Standard form of Contract and satisfying following criteria : -

a. Should be a company incorporated under Companies Act or a firm registered with competent authority;

b. Should have been in existence for last five years ending on proposal due date;

c. Should have minimum annual average turnover during last three years equal to or more than 50% of the value of sub-contract; and

d. Should have experience of having completed similar works during the last five years of value not less than 40% of value of sub-contract.

(gg) "Technical Proposal" means the technical proposal of the Bidder comprising the documents set out in Clause 17.

1. Introduction

1.1 The city of Bhubaneswar has been selected to be developed into a smart city under the first phase of the Smart Cities Mission launched by the MoUD. The Client is the special purpose vehicle incorporated to implement the Smart Cities Mission in Bhubaneswar in accordance with the Smart City Proposals. The Smart City Proposals include the application of certain pan-city smart solutions, which involve the use of technology, information and data to improve infrastructure and services within the city of Bhubaneswar (the Smart Solutions Project).The Client, as named in the Bid Data Sheet intends to invite bids for Selection of Master System Integrator for implementation of Smart Solutions for Bhubaneswar City, as briefly described in the Bid Data Sheet in accordance with the method of selection specified in the Bid Data Sheet. In

providing the Solution and Services, the Bidder is required to comply with the provisions of the RFP.

1.2 The Contract (appended to the RFP at Section 6), which will be signed between the Client and the successful Bidder is for a term as specified in Bid Data Sheet (including implementation, defect liability and maintenance period), which term may be extended on mutually acceptable terms and conditions.

1.3 The Client has adopted a single stage bid process for selection of the successful Bidder. Bidders who are eligible in accordance with Clauses 2, 3, 4 and 5 of the RFP are invited to submit their Proposals for providing the required Solution and Services, which will consist of three parts: (a) Qualification Documents; (b) Technical Proposal; and (c) Financial Proposal, each in the formats specified in Section 2 and 3.

1.4 The evaluation of the Proposals will be carried out in three sub-stages:

(a) The first sub-stage will involve qualification of the Bidders based on evaluation of their Qualification Documents to determine compliance with the Eligibility Criteria. Only those Bidders who are found to meet the Eligibility Criteria will be qualified for the next sub-stage.

(b) In the second sub-stage, the Technical Proposals of the eligible and qualified Bidders will be evaluated to determine compliance with the requirements of this RFP. Only those Bidders who score at least the minimum qualifying technical score, as specified in the Bid Data Sheet, on their Technical Proposals will be eligible for evaluation of their Financial Proposals in the third and final sub-stage.

(c) In the third and final sub-stage, the Financial Proposals of the eligible and qualified Bidders whose Technical Proposals have received at least the minimum qualifying technical score will be opened and evaluated and will be scored in accordance with the formula specified in the Bid Data Sheet. The Proposals of the qualified Bidders will be finally ranked on the basis of Quality and Cost Based Selection (QCBS);

(d) The first ranking Bidder will be invited to participate in negotiations with the Client in accordance with Clause 32. Thereafter, upon completion of the negotiations, the Client will issue a letter of award to the first ranking Bidder, declaring the first ranking Bidder to be the successful Bidder. Following receipt of the letter

of award, the Bidder will furnish the Performance Security in accordance with Clause 25, fulfil any other conditions specified in the letter of award and execute the Contract with the Client.

1.5 The Bidders should familiarize themselves with the local conditions and take them into account in preparing their Proposals. Bidders may attend the pre-bid meeting, which will be held on the date specified in the Bid Data Sheet, during which the Bidders will be free to seek clarifications and make suggestions to the Client on the scope of the Services or otherwise in connection with the RFP. Attending any such pre-bid meeting is optional and is at the Bidders' expense. The maximum number of participants from a Bidder, who choose to attend the pre-bid meeting shall not be more than two (2) per Bidder. The representatives attending the pre-bid meeting shall accompany with an authority letter duly signed by the authorized signatory of his/her organization.

1.6 The statements and explanations contained in the RFP are intended to provide the Bidders with an understanding of the scope of the Supply and Services required. Such statements and explanations should not be construed or interpreted as limiting in any way or manner: (i) the scope of the rights and obligations of the Bidder, as set out in the Contract; or (ii) the Client's right to alter, amend, change, supplement or clarify the rights and obligations of the Bidder or the scope of the Supply and Services or the terms of the Contract.

Consequently, any omissions, conflicts or contradictions in the RFP are to be noted, interpreted and applied appropriately to give effect to this intent. The Client will not entertain any claims on account of such omissions, conflicts or contradictions.

1.7 The Client will endeavor to provide to the Bidders, in a timely manner and at no additional cost, the inputs, relevant project data, responses to queries and reports required for the preparation of the Proposals as specified in the Bid Data Sheet. However, for avoidance of doubt, it is hereby clarified that the aforesaid data/ information provided under RFP or to be provided later, is only indicative and solely for the purposes of rendering assistance to the Bidders towards preparation of their Proposals. The Bidders are hereby advised to undertake their own due diligence (to their complete satisfaction) before placing reliance on any such data/information furnished or to be provided later by the Client and/ or any of his consultants.

1.8 The Client will endeavor to adhere to the timelines set out in the Bid Data Sheet for carrying out the bid process and award of the Contract.

1.9 It will be assumed that Bidders will have accounted for all relevant factors, including technical data, and applicable laws and regulations while submitting the Proposals.

1.10 Bidders shall bear all costs associated with the preparation and submission of their proposals, and their participation in the Selection process, and presentation including but not limited to postage, delivery fees, expenses associated with any demonstrations or presentations which may be required by Client or any other costs incurred in connection with or relating to its Proposal. The Client is not bound to accept any Proposal, and reserves the right to annul the selection process at any time prior to Contract award, without thereby incurring any liability to the Bidders.

1.11 Client requires that the Systems Integrator provides professional, objective, and impartial advice and at all times hold Client's interests' paramount, avoid conflicts with other assignments or its own interests, and act without any consideration for future work. The Systems Integrator shall not accept or engage in any assignment that may place it in a position of not being able to carry out the assignment in the best interests of Client and the Project.

2. Conflict of Interest

2.1 The Bidder has an obligation to disclose to the Client any situation of actual or potential conflict that impacts its capacity to serve the best interest of its Client. Failure to disclose such situations may lead to the disqualification of the Bidder or the termination of its Contract.

2.2 Without limiting the generality of the foregoing, a Bidder shall be deemed to have a conflict of interest and shall not be eligible under the circumstances set forth below:

a. Conflicting activities

Conflict between consulting activities and procurement of goods, works or non-consulting services: a Bidder that has been engaged by the Client to provide goods, works, or non-consulting services for a project, or any of its Affiliates, shall be disqualified from providing consulting services resulting from or directly related to those goods, works, or non-consulting services. Conversely, a Bidder hired to provide consulting services for the preparation or implementation of a project, or any of its Affiliates, shall be disqualified from subsequently providing goods or works or non-consulting services resulting from or directly related to the consulting services for such preparation or implementation.

b. Conflicting relationships

Relationship with the Client's staff: a Bidder (including its Directors, Stakeholders or Management) that has a close business or family relationship with a professional staff of the Client who are directly or indirectly involved in any part of (i) the preparation of the RFP for the assignment, or (ii) the Technical Specifications of the goods, works or services may not be

awarded a Contract, unless the conflict stemming from this relationship has been resolved in a manner acceptable to the Client throughout the selection process and the execution of the Contract.

3. Corrupt and Fraudulent Practices

3.1 The Bidder (including its officers, employees, agents and advisors), its Personnel and Affiliates shall observe the highest standards of ethics during the bid process. Notwithstanding anything to the contrary in this RFP, the Client shall reject a proposal without being liable in any manner whatsoever to the Bidder if it determines that the Bidder has directly or indirectly through an agent engaged in any corrupt practice, fraudulent practice, coercive practice, collusive practice, undesirable practice or restrictive practice, as defined in Section 4. The Client will declare a Bidder ineligible, either indefinitely or for a stated period of time, to be awarded a contract if it at any time determines that the Bidder has engaged in corrupt or fraudulent practices in competing for and in executing the contract.

3.2 To this end, the Bidder shall permit and shall cause its system integrators, contractors and sub-contractors to permit the Client to inspect their accounts, records, and other documents relating to the submission of the Proposal and Contract performance and to have them audited by auditors appointed by the Client.

4. Eligibility

4.1 A company incorporated under the Companies Act 1956 or the (Indian) Companies Act, 2013 or an equivalent law outside India or a firm or limited liability partnership registered in India or in any other jurisdiction, which meets the Eligibility Criteria shall be eligible to submit a Proposal.

4.2 None of the member of a given JV/Consortium can be a member of another JV/Consortium for submitting this same bid otherwise all the bids comprising the same member shall stand disqualified. However, a sub-contractor can be a member of more than one JV/ Consortium.

4.3 A parent company/firm shall be allowed to use the credentials of its subsidiaries/associates provided, the stake of the parent company is more than 50% and satisfactory documentary proofs establishing the relationship and stake are submitted.

4.4 A wholly owned subsidiary may use the technical credentials of its parent company if an undertaking confirming the relationship is provided by the parent company/firm.

4.5 Furthermore, it is the Bidder's responsibility to ensure that it's Personnel, agents (declared or not), service providers, system integrators, contractors, sub-

contractors and/or their employees meet the eligibility requirements specified in the RFP.

4.6 The Bidder, its contractors or sub-contractors, OEMs should not be blacklisted/debarred in last 5 years by any State / Central Government Department or Central /State PSUs as on bid submission date in India. The Bidder shall submit an affidavit declaring and confirming the same.

4.7 The Bidder, its contractors or sub-contractors, during the last 3 (three) years, neither failed to perform on any agreement, as evidenced by imposition of a penalty by an arbitral or judicial authority or a judicial pronouncement or arbitration award against the Bidder or its Contractors or sub-contractors, nor been expelled from any project or agreement nor have had any agreement terminated for breach by such Bidder or its contractors or sub-contractors.

5. Qualifications of the Bidder

5.1 By submission of documentary evidence in its bid, the Bidder must establish to the Client's satisfaction:

(a) that it has the financial, technical, and production capability necessary to perform the Contract, meets the qualification criteria as specified in the Bid Data Sheet, and has a successful performance history.

(b) For the purposes of establishing a Bidder's qualifications, the experience and / or resources of the Sub-contractor will only be allowed for the systems/sub-systems as stated in Bid Data Sheet.

(c) that, in the case of a Bidder offering to supply key goods components of the System, as identified in the Bid Data Sheet, that the Bidder does not itself produce, the Bidder is duly authorized by the producer/OEM to supply and support those components in the Client's country under the Contract that may result from this bidding; (This will be accomplished by including Manufacturer's Authorizations in the bid, based on the sample found in Appendix 12, Section 2); and

(d) that, if a Bidder proposes Subcontractors for services if and as identified in the BDS, these Subcontractors have agreed in writing to serve for the Bidder under the Contract(s) that may result from this bidding; and

(e) that, in the case of a Bidder not doing business within the Client's country, the Bidder is or will be (if awarded the Contract) represented by an Agent in that country who is equipped and able to carry out the Bidder's maintenance, technical support, training, and repair obligations prescribed in the

General and Special Conditions of Contract, and/or Technical Requirements.

5.2 The bids submitted by a Joint Venture/Consortium as partners shall also comply with the following requirements and as indicated in Bid Data Sheet:

5.2.1 the bid shall be signed so as to be legally binding on all partners;

5.2.2 one of the partners shall be nominated as being in charge, and this nomination shall be evidenced by submitting a power of attorney signed by legally authorized signatories of all the partners;

5.2.3 the partner in charge shall be authorized to incur liabilities and receive instructions for and on behalf of any and all partners of the Joint Venture/ Consortium, and the entire execution of the Contract, including payment, shall be done exclusively with the partner in charge;

5.2.4 It is the responsibility of the partner in charge to ensure that all the other Joint Venture/ Consortium members in the bid are compliant to all the clauses as mentioned in the bid, failing which bid can be disqualified;

5.2.5 the partner or combination of partners that is responsible for a specific component of the System supplied under this bid must meet the relevant minimum qualification criteria for that component;

5.2.6 a firm may submit bids either as a single Bidder on its own, or as partner in one, and only one, Joint Venture/Consortium. If, as a result of the bid opening, this requirement is not met, all bids involving the firm as a single Bidder or Joint Venture partner will be disqualified;

5.2.7 all partners of the Joint Venture/Consortium shall be liable jointly and severally for the execution of the Contract in accordance with the Contract terms, and a statement to this effect shall be included in the authorization mentioned under ITB Clause 5.2.2 above, in the bid as well as in the Contract (in case of a successful bid).

5.2.8 the proposal shall include a brief description of the roles and responsibilities of all the partners of the Joint Venture / Consortium.

5.3 In case allowed, if a Bidder intends to subcontract major items of supply or services, it shall include in the bid details of the name and nationality of the proposed Sub-contractor for each of those items and shall be responsible for ensuring that any Sub-contractor proposed complies with the requirements of ITB Clause 4, and that any Goods or Services components of the System to be provided by the Sub-contractor comply with

the requirements of this bid document and the related evidence required by ITB Clause 17 is submitted.

5.4 For the purposes of these Bidding Documents, a Sub-contractor is any vendor or service provider with whom the Bidder contracts for the supply or execution of any part of the System to be provided by the Bidder under the Contract (such as the supply of major hardware, software, or other components of the required Technologies specified, or the performance of related Services, e.g., software development, transportation, installation, customization, integration, commissioning, training, technical support, maintenance, repair, etc.). A firm which is a Bidder, whether as a single Bidder or as a partner in a Joint Venture/Consortium, cannot be a Sub-contractor in other bids, except for the supply of commercially available hardware or software by the firm, as well as purely incidental services such as installation/configuration, routine training, and ongoing maintenance/support. If the Bid Data Sheet for ITB Clause 5.1 (a) allows the qualification of Sub-contractors nominated for certain components to be taken into account in assessing the Bidder's overall qualifications, any Sub-contractor so nominated by any Bidder is automatically disqualified from being a Bidder itself or a partner in a Joint Venture/Consortium. The same will normally apply to firms that have provided Sub-contractor agreements for certain services pursuant to ITB Clause 5.1 (d). Non-compliance may result in the rejection of all bids in which the affected firm participates as Bidder or as partner in a Joint Venture/Consortium. As long as in compliance with these provisions, or as long as unaffected by them due to not participating as Bidder or as partner in a Joint Venture/Consortium, a firm may be proposed as a Sub-contractor in any number of bids.

5.5 The Bidder shall comply to the below requirements:

(i) The Bidder shall quote only one specific make and model from only one specific OEM, for each of the goods. Providing more than one option shall not be allowed. All goods quoted by the Bidder must be associated with item code and names and with printed literature describing configuration and functionality. Any deviation from the printed specifications should be clearly mentioned in the offer document by the Bidder.

(ii) The OEM for each product or technology quoted should be in the business of that product or solution or technology for at least 3 years as on the date of release of the RFP.

(iii) All the OEMs should have authorized presence in India either directly or through channel partner(s) as on the date of release of RFP.

(iv) The OEM for all active components should give a declaration that products or technology quoted are neither end of- sale nor end-of-life as on the date of installation and commissioning and are not end-of-support till the successful completion of O&M period of the project.

(v) OEM proposed by the Bidder shall be in compliance to National Security Policy of Government of India.

6. Site Visit

6.1 The Bidder may wish to visit and examine the project site or sites and obtain for itself, at its own responsibility and risk, all information that may be necessary for preparing the bid and entering into the Contract. The costs of visiting the site or sites shall be at the Bidder's own expense.

6.2 The Client will arrange for the Bidder and any of its personnel or agents to gain access to the relevant site or sites, provided that the Bidder gives the Client adequate notice of a proposed visit of at least seven (7) days. Alternatively, the Client may organize a site visit or visits concurrently with the pre-bid meeting, as specified in the ITB Clause 10.2. Failure of a Bidder to make a site visit will not be a cause for its disqualification.

6.3 No site visits shall be arranged or scheduled after the deadline for the submission of the Bids and prior to the award of Contract.

7. Acknowledge-ment by Bidder

7.1 It shall be deemed that by submitting the Proposal, the Bidder has:

(i) made a complete and careful examination of the RFP and any other information provided by the Client under this RFP;

(ii) accepted the risk of inadequacy, error or mistake in the information provided in the RFP or furnished by or on behalf of the Client;

(iii) satisfied itself about all things, matters and information, necessary and required for submitting an informed Proposal, and performing the Services in accordance with the Contract and this RFP.

(iv) acknowledged and agreed that inadequacy, lack of completeness or incorrectness of information provided in this RFP or ignorance of any matter shall not be a basis for any claim for compensation, damages, extension of time for performance of its obligations or loss of profits or revenue from the Client, or a ground for termination of the Contract; and

(v) agreed to be bound by the undertakings provided by it under and in terms of this RFP and the

Contract.

(vi) acknowledged that The Client and/ or its advisors/ Consultants shall not be liable for any omission, mistake or error on the part of the Bidder in respect of any of the above or on account of any matter or thing arising out of or concerning or relating to this RFP or the Selection Process, including any error or mistake therein or in any information or data given by the Client and/ or its Consultant.

8. Rights of the Client

8.1 The Client, in its sole discretion and without incurring any obligation or liability, reserves the right, at any time, to:

(i) suspend the bid process and/or amend and/or supplement the bid process or modify the dates or other terms and conditions relating thereto prior to the issuance of the letter of award to the successful Bidder;

(ii) consult with any Bidder in order to receive clarification or further information;

(iii) retain any information, documents and/or evidence submitted to the Client by and/or on behalf of any Bidder;

(iv) independently verify, disqualify, reject and/or accept any and all documents, information and/or evidence submitted by or on behalf of any Bidder, provided that any such verification or lack of such verification by the Client shall not relieve the Bidder of its obligations or liabilities, or affect any of the rights of the Client;

(v) reject a Proposal, if: (A) at any time, a material misrepresentation is made or uncovered; or (B) the Bidder in question does not provide, within the time specified by the Client, the supplemental information sought by the Client for evaluation of the Proposal.

(vi) accept or reject a Proposal, annul the bid process and reject all Proposals, at any time prior to the issuance of the letter of award to the successful Bidder, without any liability or any obligation for such acceptance, rejection or annulment and without assigning any reasons whatsoever to any Bidder.

8.2 If the Client exercises its right under this RFP to reject a Proposal and consequently, the first/highest ranked Bidder gets disqualified or rejected, then the Client reserves the right to:

(i) invite the next ranked Bidder to negotiate the Contract, except in the case where the rejection is for the reason mentioned in the clause 32; or

(ii) take any such measure as may be deemed fit in the sole discretion of the Client, including inviting fresh Proposals from the qualified Bidders or annulling the entire bid process.

B. The Bidding Documents

9. Bidding Documents

9.1 The contents of the Bidding Documents are listed below and should be read in conjunction with any addenda issued in accordance with ITB Clause 10:

Section 1: Instructions to Bidders (ITB) and Bid Data Sheet

Section 2: Qualification documents and Technical Proposal – Standard Forms

Section 3: Financial Proposal (Price Schedule) – Standard Forms

Section 4: Corrupt and Fraudulent Practices

Section 5: Technical Requirements

Section 6: Standard Form of Contract

10. Clarification and Amendment of the RFP

10.1 The Bidder may request a clarification of any part of the Bid documents prior to the last date for submission of queries, as indicated in the Bid Data Sheet for ITB 1.8. Any queries or requests for additional information in relation to the bid documents should be submitted in writing or by fax and email. The queries submitted sent via email should be in excel sheet format only, along with name and details of the organisation submitting the queries. The template for bid queries is provided in Annexure 1. The envelope or communication must clearly bear the following subject line – "Selection of Master System Integrator for implementation of Smart Solutions in Bhubaneswar City: Queries or Request for Additional Information" and sent to the address/number/e-mail address as indicated in the Bid Data Sheet for ITB 1.5.

The Client shall make reasonable efforts to respond to the queries or request for clarifications on or before the date specified in the Bid Data Sheet for ITB 1.8. The Client's responses to Bidder queries (including an explanation of the query but without identifying its source) will be made available to all Bidders and shall be uploaded on the Client's website. It shall be the Bidder's responsibility to check the Client's website for the responses to the queries or requests for clarification. The Client may, but shall not be obliged to communicate with the Bidders by e-mail, notice or other means it may deem fit about the issuance of clarifications. The Client reserves the right not to respond to any query or provide any clarification, in its sole discretion, and nothing in this bid document shall be taken to be or read as compelling or requiring the Client to respond to any query or to provide any clarification. Should the Client deem it necessary to amend the bid document as a result of a clarification, it shall do so following the procedure described below:

(a) At any time prior to deadline of bid submission, the Client may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective Bidder, amend the bid documents by issuing an amendment. The amendments shall be uploaded on the Client's website and will be binding on the Client and the Bidders. The Bidders shall update themselves by visiting the Client's website regularly and the Client bears no responsibility for any Bidder's failure to do.

(b) If the amendment is substantial, the Client may extend the Proposal Due Date to give the Bidders reasonable time to take an amendment into account in their Proposals.

(c) Verbal clarifications and information given by the Client or any other Person for or on its behalf shall not in any way or manner be binding on the Client.

10.2 As per dates **specified in the Bid Data Sheet,** the Client will organize and Bidders are welcome to attend a pre-bid meeting at the time and place **indicated in the BDS** for ITB 1.5. The purpose of the meeting will be to clarify issues and answer questions on any matter that may be raised at this stage, with particular attention to issues related to the Technical Requirements. Bidders are requested to submit any questions in writing to reach the Client not later than one week before the meeting. Questions and answers will be transmitted in accordance with ITB Clause 10.1. Minutes of the meeting, including the questions raised and responses given, together with any responses prepared after the meeting, will be transmitted without delay to all those that received the Bidding Documents from the Client.

10.3 The Bidder may substitute, modify or withdraw its Proposal at any time prior to the Proposal Due Date. No Proposal shall be substituted, withdrawn or modified after the time specified in the Bid Data Sheet for ITB 1.8 on the bid submission date.

C. Preparation of Proposals

11. General Considerations

In preparing the Proposal, the Bidder is expected to examine the RFP in detail. The RFP must be read as a whole. If any Bidder finds any ambiguity or lack of clarity in the RFP, the Bidder must inform the Client at the earliest to seek clarity on the interpretation of the RFP. Material deficiencies in providing the information requested in the RFP may result in rejection of the Proposal.

12. Cost of Preparation of Proposal

The Bidder shall bear all costs associated with the preparation and submission of its Proposal, and the Client shall not be responsible or liable for those costs, regardless of the conduct or outcome of the selection process. The Client is not bound to accept any Proposal, and reserves the right to annul the selection process at any time prior to award of the Contract, without assigning any reason and without incurring any liability to the Bidder.

13. Language

The Proposal, as well as all correspondence and documents relating to the Proposal exchanged between the Bidder and the Client shall be written in the language(s) specified in the Bid Data Sheet.

14. Documents Comprising the Proposal

The Proposal shall consist of 3 parts: (a) Qualification Documents; (b) the Technical Proposal; and (c) the Financial Proposal. Each part will comprise the documents and forms listed in Clauses 17 and 18.

15. Only One Proposal

The Bidder shall submit only one Proposal. If a Bidder submits or participates in more than one Proposal, all such Proposals shall be disqualified and rejected.

16. Proposal Validity

(a) Each Proposal must remain valid for the period specified in the Bid Data Sheet.

(b) During the Proposal validity period (as specified in the Bid Data Sheet), the Bidder shall maintain its original Proposal without any change.

Extension of Validity Period

(c) The Client will make its best effort to complete the bid process and select the Bidder within the Proposal's validity period specified in the Bid Data Sheet. However, should the need arise, the Client may request, in writing, all Bidders who submitted Proposals prior to the Proposal Due Date to extend the Proposals' validity.

(d) If the Bidder agrees to extend the validity of its Proposal, it shall be done without any change in the original Proposal.

(e) The Bidder has the right to refuse to extend the validity of its Proposal in which case such Proposal will not be further evaluated, and the EMD of such Bidder will be returned in the manner set out in this RFP.

(f) In the event a Bidder agrees to extend the validity of its Proposal, the validity of the EMD submitted by such Bidder along with the Proposal (where the EMD is submitted in the form of a bank guarantee) will also be extended for an equivalent period.

17. Qualification Documents and Technical

(a) The Qualification Documents and Technical Proposal are un-priced proposals and shall not include any financial information. Qualification Documents and Technical

Proposal Format

Proposal containing material related to financial information shall be declared non-responsive.

(b) The Qualification Documents submitted by a Bidder shall comprise the following:

(i) The Qualification Documents Proposal Submission Form in the form attached at Appendix 1;

(ii) Details of the Bidder in form set out at Appendix 2;

(iii) The bid document processing fee in the form of a demand draft drawn in favour of the Client;

(iv) The EMD/Bid Security: If the Bidder is submitting the EMD in the form of a bank guarantee, it must be in the format set out at Appendix 3;

(v) A power of attorney for signing the Proposal in the format set out in Appendix 4;

(vi) Financial qualification of the Bidder in the format set out in Appendix 5 along with copies of duly audited financial statements for the financial years being considered for the purposes of evaluation of the Bidder's financial capacity;

(vii) Joint Bidding Agreement and Joint Venture/Consortium summary of the Bidder in the format set out in Appendix 6;

(viii) Technical qualification of the Bidder in the format set out in Appendix 7 along with supporting certificates from clients;

(ix) Current Contract commitments of the Bidder in the format set out in Appendix 8;

(x) Affidavit certifying that the Bidder is not blacklisted in the format set out in Appendix 11;

(xi) Copy of service tax and sales tax registration in India; and

(xii) Duly certified copy of the Bidder's certificate of incorporation/certificate of registration issued under its applicable laws.

(xiii) A Power of Attorney for Partner in Charge of Joint Venture / Consortium as per format set out in Appendix 18.

(c) The Technical Proposal submitted by a Bidder shall comprise the following:

(i) Conformity in the form of Bid Compliance Undertaking as per the format as set out in

Appendix 9 to all business, functional and technical requirements as mentioned in Section 5 of the RFP and shall be supported by documentary evidence establishing to the Client's satisfaction, that the Goods and Services to be supplied, installed and/or performed by the Bidder conform to the RFP requirements.

(ii) Detailed Technical Description of the proposed system along with System Architecture, Design, Frontend and Backend applications, Database, Reporting tools, Monitoring and Diagnostics functions of the proposed solution.

(iii) Data Sheets of all hardware which will form part of the solution.

(iv) Statement of Deviation of the Bidder in the format set out in Appendix 10;

(v) Manufacturer Authorization of the Bidder in the format set out in Appendix 12;

(vi) Proposed Sub-Contractor: A list of all sub-contractors that the Bidder proposes to sub-contract any system/sub-system/part/activity to complete the scope as defined in this RFP. List of proposed sub-contractors of the Bidder in the format set out in Appendix 13;

(vii) Software List of the Bidder in the format set out in Appendix 14;

(viii) List of Custom material of the Bidder in the format set out in Appendix 15;

(ix) Description of approach, methodology, and work plan;

(x) Work schedule for Deliverables as per format in Appendix 21;

(xi) Details of Key Expert to be deployed for the implementation, operation and management of the project in accordance with Section 1: ITB. Format for CV is presented in Appendix 16;

Note: Each CV needs to have been recently signed by the key personnel and/or countersigned by the authorized official of the Firm. At the time of submission of bid proposal, the scanned copies of the signature of key personnel will be allowed but at the time of signing of contract, the original signature will be required. However, in both the cases, original counter signature of Authorized signatory shall be required in original. A CV shall be summarily rejected if the

educational qualification of the key personnel proposed does not match with the requirement as given in the RFP. The personnel proposed should possess good working knowledge of English language. No key personnel involved should have attained the age of 70 years at the time of submitting the proposal. The Client reserves the right to ask for proof of age, qualification and experience at any stage of the Project.

(xii) If applicable, undertaking from the Key Experts in the format set out in Appendix 17. In case a Bidder is proposing Key Expert from educational/ research institutions, a 'No Objection Certificate/ Consent Letter' from the concerned institution shall be enclosed with his CV clearly mentioning his/ her availability for the assignment. In the absence of such certificate, his/ her CV will not be evaluated.

(xiii) The Bidder shall make the assessment of support personnel; both technical and administrative to undertake the Project. If required, additional support and administrative staff shall be provided as needed for the timely completion of the Project without any additional cost to the Client. It is stressed that the time period for the Assignment indicated in the Technical Requirements should be strictly adhered to.

(xiv) Technical Proposal Submission Form in the format presented in Appendix 19;

(xv) Team Composition and Task Assignments as per format in Appendix 20;

Failure to comply with the above requirements and documents will make the Proposal non-responsive.

18. Financial Proposal

18.1 All Goods and Services identified in the Supply and Installation Cost Table and the Recurrent Cost Table in Section 3, and all other Goods and Services proposed by the Bidder to fulfil the requirements of the System, must be priced separately in the format of the same tables and summarized in the corresponding Cost Summary Tables in the same Section. Prices must be quoted in accordance with the instructions provided in Section 3 for the various cost tables, in the manner specified below. The Bidder shall quote for the entire scope of contract on an "overall responsibility" basis such that the total bid price covers Bidder's all obligations mentioned in or to be reasonably inferred from the bidding documents in respect of providing the product/services.

18.2 The price of items that the Bidder has left blank or the items omitted altogether from the cost tables provided in

Section 3 shall be assumed to be included in the price of other items.

18.3 Unit prices must be quoted at a level of detail appropriate for calculation of any partial deliveries or partial payments under the contract, in accordance with the Implementation Schedule in Section 5, and with GCC and SCC Clause 40. Bidders may be required to provide a breakdown of any composite or lump-sum items included in the Cost Tables.

18.4 The prices for Goods offered shall be quoted, including all customs duties, levies, fees, sales and other taxes incurred until delivery of the Goods if the Contract is awarded. In principally, it is estimated that following taxes and charges namely, road permit charges, state entry tax, CST, service tax, Works Contract Tax (VAT) etc. will be applicable for the supply, installation, commissioning, operation and maintenance of the project.

18.5 Transportation and Insurance: Inland transportation, insurance and related local costs incidental to the delivery of the Goods to the designated Project Sites must be quoted separately as a Service item in accordance with ITB Clause 18.6, whether the Goods are to be supplied locally or from outside the Client's country.

18.6 The price of Services shall be quoted in total for each service (where appropriate, broken down into unit prices). Prices must include all taxes, duties, levies and fees whatsoever. The prices must include all costs incidental to the performance of the Services.

18.7 Prices for Recurrent Costs beyond the scope of warranty services to be incurred during the Warranty Period, defined in SCC Clause 57.4 and prices for Recurrent Costs to be incurred during the Post-Warranty Period, defined in SCC Clause 1 (rr), shall be quoted as Service prices in accordance with ITB Clause 18.6 on the Recurrent Cost Table in detail, and on the Recurrent Cost Summary Table in currency totals. Recurrent costs are all-inclusive of the costs of necessary Goods such as spare parts, software license renewals, labor, etc., needed for the continued and proper operation of the System.

18.8 Unless otherwise specified in the Bid Data Sheet, prices quoted by the Bidder shall be fixed during the Bidder's performance of the Contract and not subject to increases on any account. Bids submitted that are subject to price adjustment will be rejected.

18.9 In case any assumption or condition is indicated in the Financial Proposal, it shall be considered as non-responsive and shall be liable for rejection.

18.10 The cost indicated in the Financial Proposal shall be deemed as final and reflecting total cost of proposal and should be stated in INR only. Omissions, if any, in costing of any item shall not entitle the Bidder to be compensated and the liability to fulfil the obligations as per the RFP within the total quoted price shall be that of the Bidder.

18.11 The bidder shall submit the financial proposal in the excel sheet format of BOQ items provided in www.tendersodisha.gov.in and shall be uploaded in the *.xls format in the same website. Any submission of financial proposal in part of full in the form of physical or hard copy will lead to rejection of bid.

Currency of Proposal

(a) The Bidder shall submit its Financial Proposal in Indian Rupees only.

Currency of Payment

(b) Payments under the Contract shall be made in Indian Rupees only.

19. Earnest Money Deposit/Bid Security

(a) An Earnest Money Deposit (**EMD**) amount as indicated in the Bid Data Sheet in the form of an irrevocable and unconditional bank guarantee drawn in favour of the Client (as indicated in Bid Data Sheet) and payable at Bhubaneswar must be submitted along with the Proposal.

(b) Proposals not accompanied by EMD shall be rejected as non-responsive.

(c) The EMD submitted along with the Proposal will remain valid for a period of 28 days beyond validity period of the Proposal, including any extensions thereof.

(d) No interest shall be payable by the Client for the sum deposited as EMD.

(e) Unless forfeited in accordance with Clause 20 below, the EMD of the unsuccessful Bidders will be returned within 1 month of signing of the Contract with the successful Bidder. The EMD of the successful Bidder will be returned upon the selected Bidder furnishing the Performance Security in accordance with Clause 25.

(f) The EMD of a Joint Venture/Consortium (if allowed) shall be issued in the name of the Joint Venture submitting the bid provided the Joint Venture has legally been constituted, or else it shall be issued on the name of Partner in charge of the JV/Consortium proposed for the bid.

(g) The EMD in original shall be placed in a separate envelope and marked as “EMD/Bid Security” and shall be attached with the envelope containing the Qualification Documents marked as “RFP – Selection of Master System Integrator (MSI) for Implementation of Smart

Solutions in Bhubaneswar City" and "Not to be opened except in the presence of evaluation committee".

20. Forfeiture of EMD

The EMD shall be forfeited and appropriated by the Client as mutually agreed genuine pre-estimated compensation and damages payable to the Client for the time, cost and effort of the Client, without prejudice to any other right or remedy that may be available to the Client under the RFP or in law under the following conditions:

(a) If a Bidder withdraws or modifies its Proposal during the Proposal validity period or any extension agreed by the Bidder thereof.

(b) If a Bidder is disqualified in accordance with Clause 2;

(c) If the Bidder tries to influence the evaluation process or engages in corrupt, fraudulent, coercive or undesirable practice or restrictive practice as set out in Section 4.

(d) If a Bidder is declared the first ranking Bidder and it:

(i) Withdraws its Proposal during negotiations. However, failure to arrive at a consensus between the Client and the first ranked Bidder shall not be construed as withdrawal of proposal by the first ranked Bidder;

(ii) fails to furnish the Performance Security in accordance with Clause 25 of the RFP;

(iii) fails to sign and return, as acknowledgement, the duplicate copy of the letter of award;

(iv) fails to fulfil any other condition precedent to the execution of the Contract, as specified in the letter of award; or

(v) fails to execute the Contract.

21. Period of Validity of Bids

21.1 Bids shall remain valid, at a minimum, for the period specified in the Bid Data Sheet after the deadline date for bid submission prescribed by the Client, pursuant to ITB Clause 23. A bid valid for a shorter period shall be rejected by the Client as non-responsive. However, Bidders are responsible for adjusting the dates in the Bid Data Sheet in accordance with any extensions to the deadline date of bid submission pursuant to ITB Clause 21.2.

21.2 In exceptional circumstances, prior to expiry of the bid validity period, the Client may request that the Bidders to extend the period of validity for a specified additional period. The request and the responses to the request shall be made in writing. A Bidder may refuse the request without risking forfeiting the EMD, but in this case the bid will be out of the competition for the award. Bidder agreeing to the request will not be required or permitted

to modify its bid, but will be required to ensure that the bid remains secured for a correspondingly longer period, pursuant to ITB Clause 19 (c).

22. Bid documents Processing Fees

22.1 All Bidders are required to pay the amount as indicated in the Bid Data Sheet towards the cost of bid documents processing fees as follows:

a. Bid document processing fee shall be paid through demand draft drawn in favour of the Client.

b. The bid document processing fee is non-refundable.

Please note that the Proposal, which does not include the Bid document processing fees, would be declared as non-responsive and accordingly, rejected.

D. Submission, Opening and Evaluation

23. Submission, Sealing, and Marking of Proposals

23.1 The Bidder shall submit a signed, stamped and complete Proposal comprising the documents specified in Clause 17 and Clause 18, as per the procedure specified in Clause 35 of ITB, no later than time and date as specified in the Bid Data Sheet.

23.2 The Proposal shall be submitted online through http://tendersodisha.gov.in and the Demand Drafts / Bank Guarantee for Bid Security and Bid Document Processing Fee will be hand delivered or sent by registered post, speed post or courier in the manner and to the address specified in the Bid Data Sheet:

The Client will not be responsible for any delays, loss or non-receipt of Proposals. Proposals submitted by fax, telegram or e-mail shall be rejected.

Each Proposal must be typed or written in indelible ink and an authorized representative of the Bidder shall sign the Proposal and physically initial all pages of the Proposal. All the pages of the proposal must be numbered in sequence. The authorization shall be by way of a written power of attorney executed in the format attached as Appendix 4. The name and position held by the person signing the Proposal must be typed or printed below the signature.

23.3 The Proposal shall contain no interlineations or overwriting, except as necessary to correct errors made by the Bidder. Any modifications, revisions, interlineations, erasures, or overwriting shall be valid only

if they are signed or initialled by the authorized signatory/ person signing the Proposal.

23.4 The bidder shall comply with all requirements as per the terms and conditions of bid submission through http://tendersodisha.gov.in. The detailed procedure for submission of tenders online has been provided in clause 35 of the ITB.

23.5 deleted

23.6 deleted

23.7 The Client may, at its discretion, extend this deadline for submission of bids by amending the RFP, in which case all rights and obligations of the Client and Bidders will thereafter be subject to the deadline as extended.

23.8 Any bid received by the Client after the bid submission deadline prescribed by the Client in the Bid Data Sheet for ITB Clause 23.1, will be rejected and returned unopened to the Bidder.

24. Withdrawal, Substitution and Modification of Bids

24.1 The Bidder may withdraw, substitute, or modify its bid after submission, in accordance with ITB Sub-Clause 35.3.

24.2 deleted

24.3 deleted

24.4 Bids requested to be withdrawn in accordance with ITB 24.1 shall not be opened.

24.5 No bid may be withdrawn, substituted, or modified in the interval between the bid submission deadline and the expiration of the bid validity period specified by the Bidder in the Bid Submission Form, or any extension thereof agreed to by the Bidder. Withdrawal of a bid during this interval may result in the forfeiture of the EMD/Bid Security, if any, pursuant to ITB Clause 20.

25. Performance Security

25.1 Upon selection, the Bidder shall furnish to the Client, a performance security of the amount specified in Clause 25.2 below, on or before execution of the Contract to secure the due performance of the obligations of the Bidder under the Contract (the **Performance Security**). The Performance Security will be in the form of an unconditional, irrevocable and on-demand bank guarantee issued in favour of the Client in the format appended to the Contract.

25.2 The Performance Security shall be for an amount equal to **10% (Ten per cent)** of the total value of the Contract.

26. Opening of Proposals

(a) The Client shall open, in accordance with clause 36 of ITB, only those Proposals that are submitted on or before the specified time on the Bid Submission Due Date.

(b) The Client shall open all bids, including withdrawals, substitutions, and modifications, in public, in the presence of Bidder's representatives who choose to attend bid opening.

(c) The modification, substitution or withdrawal of bids shall be dealt in accordance with the procedure specified in clause 35.3 of ITB.

(d) Bids and modifications that are not opened and read out at bid opening shall not be considered for further evaluation, irrespective of the circumstances. These bids, including any bids validly withdrawn in accordance with ITB Clause 24, will promptly be returned, unopened, to their Bidders.

27. Confidentiality

(a) From the time the Proposals are opened to the time the Contract is awarded, the Bidder should not contact the Client on any matter related to its Qualification Documents, Technical Proposal and/or Financial Proposal. Information relating to the evaluation of Proposals and award recommendations shall not be disclosed to the Bidders who submitted the Proposals or to any other party not officially involved with the bid process, until the publication of the Contract award.

(b) Any attempt by a Bidder or anyone on behalf of the Bidder to influence improperly the Client in the evaluation of the Proposals or award of the Contract may result in the rejection of its Proposal.

(c) Notwithstanding the above provisions, from the time of the Proposals' opening to the time of Contract award publication, if a Bidder wishes to contact the Client on any matter related to the selection process, it should do so only in writing.

28. Responsiveness and Eligibility Tests

(a) First, the Client's evaluation committee shall open and evaluate the Qualification Documents for responsiveness and to determine whether the Bidders are eligible to be awarded the Contract. At the opening of the Qualification Documents, the following shall be read out:

- the name and the country of the Bidder;
- the presence or absence of duly sealed envelopes with the Technical Proposal and the Financial Proposal; and

- any modifications, substitutions or withdrawal to the Proposal submitted prior to the Proposal Due Date.
- any other information deemed appropriate.

The Qualification Documents shall be considered responsive only if:

(a) all documents specified in Clause 17 are received in the prescribed format;

(b) the Proposal is received by the Proposal Due Date;

(c) it is signed, sealed and marked as specified in Clause 23;

(d) it contains all the information and documents (complete in all respects) as requested in this RFP; and

(e) it does not contain any condition or qualification.

(b) The Client's evaluation committee shall evaluate and determine whether the Bidders who have submitted responsive Qualification Documents satisfy the Eligibility Criteria.

(c) If any Bidder is found to be disqualified in accordance with the terms of the RFP or the Qualification Documents are found to be non-responsive or the Bidder does not meet the Eligibility Criteria, then the Proposal submitted by such Bidder will be rejected.

(d) Upon completion of evaluation of the Qualification Documents, the Client will notify the Bidders whether they are qualified and eligible for evaluation of their Technical Proposals.

(e) An indicative bid submission checklist is provided in Annexure 2. Bidders should expand and (if appropriate) modify and complete this checklist. The purpose of the table is to provide the Bidder with a detailed summary checklist of items that must be included in the bid as described in ITB Clauses 17 and 18, in order for the bid to be considered responsive.

(f) If envelopes are not sealed and marked as per the instructions, the Client assumes no responsibility for the misplacement or premature opening of the contents of the proposal submitted and consequent losses if any suffered by the Bidder.

29. Evaluation of Technical Proposals

The Client's evaluation committee shall evaluate the Technical Proposals of eligible Bidders for responsiveness. If the Technical Proposal is found:

(a) not to be complete in all respects; or

(b) not duly signed by the authorized signatory of the Bidder;

(c) not to be in the prescribed format; or

(d) to contain alterations, conditions, deviations or omissions,

then such Technical Proposal shall be deemed to be substantially non-responsive and be liable to be rejected.

Each responsive Technical Proposal submitted by an eligible Bidder will be given a technical score on the basis of the evaluation criteria, sub-criteria, and point system as specified in the Bid Data Sheet. The Financial Proposals of only those Bidders who score at least the minimum qualifying technical score, as specified in the Bid Data Sheet, on their Technical Proposals will be opened by the Client.

30. Opening of Financial Proposals

(a) After the evaluation of Technical Proposals of eligible Bidders is completed, the Client shall notify those Bidders whose Technical Proposals were considered non-responsive to the RFP or who do not score the minimum qualifying technical score that their Financial Proposals will not be opened, along with information relating to the Bidder's overall technical score, as well as scores obtained for each criterion and sub-criterion. The Financial Proposals of technically unqualified Bidders will be returned unopened. The Client shall simultaneously notify in writing those Bidders that have achieved the minimum qualifying technical score and inform them of the date, time and location for the opening of their Financial Proposals. The opening date should allow the Bidders sufficient time to make arrangements for attending the opening. The Bidder’s attendance at the opening of the Financial Proposals is optional and is at the Bidder’s choice.

(b) The Financial Proposals of eligible Bidders whose Technical Proposals have scored at least the minimum qualifying technical score shall be opened online by the Client’s Authorised Officials on the date and at the time notified by the Client in the presence of the Bidders whose designated representatives choose to be present. At the opening of the Financial Proposals, the names of the Bidders, and the overall technical scores, including the break-down by criterion, shall be read aloud. The Financial Proposals will then be evaluated to confirm that they are responsive in terms of the RFP. If any Financial Proposal is found:

(i) not to be complete in all respects;

(ii) not duly signed by the authorized signatory of the Bidder, wherever required;

(iii) not to be in the prescribed format; or

(iv) to contain alterations, conditions, deviations or omissions,

then such Financial Proposal shall be deemed to be substantially non-responsive and liable to be rejected.

The Financial Proposals that are found to be responsive will be evaluated, and the total cost quoted by the eligible and technically qualified Bidders will be read aloud and recorded.

31. Correction of Errors

(a) Activities and items described in the Technical Proposal but not priced in the Financial Proposal shall be assumed to be included in the prices of other activities or items, and no corrections will be made to the Financial Proposal.

Prior to evaluation of the Financial Proposals, the Evaluation Committee will determine whether the Financial Proposals are complete in all respects, qualified and unconditional, and submitted in accordance with the terms hereof.

The Client's evaluation committee will correct any computational or arithmetical errors in the Proposals. In case of discrepancy between (a) a partial amount (sub-total) and the total amount; or (b) between the amount derived by multiplication of unit price with quantity and the total price; or (c) between words and figures, the former will prevail in each case. In case of any discrepancy between the Technical Proposal and the Financial Proposal of a Bidder, the Technical Proposal shall prevail and the Client's evaluation committee shall correct the quantities specified in the Financial Proposal so as to make it consistent with the corresponding quantities specified in the Technical Proposal, apply the relevant rate included in the Financial Proposal to the corrected quantity, and correct the total cost stated in the Financial Proposal.

Cost Evaluation

(b) The Client's evaluation of the bid will be made on the basis of prices quoted in accordance with ITB Clause 18

(c) The Evaluated Bid Price (C) for each responsive bid will be determined as the sum of the Adjusted Supply and Installation Costs (P) plus the Recurrent Costs (R);

where the Adjusted Supply and Installation Costs (P) are determined as:

i. The price of the hardware, Software, related equipment, products, Materials and other Goods

offered from within or from outside the Client's Country, in accordance with ITB Clause 18; plus

ii. The total price for all software development, transportation, insurance, installation, customization, integration, Commissioning, testing, training, technical support, repair, and other Services, in accordance with ITB Clause 18;

iii. with adjustments for:

1) Deviations proposed to the Implementation Schedule in the Technical Requirements resulting in delayed completion of the entire Information System, if permitted in the BDS and provided they do not exceed the maximum permissible delay period specified in the BDS. For evaluation purposes, a pro rata increase of the total Supply and Installation Costs will be added using the percentage(s) specified in the BDS for each week of delay. Bids offering deliveries beyond the maximum permissible delay specified may be rejected.

2) Deviations taken to the Contract payment schedule specified in the SCC. If deviations are permitted in the BDS, for evaluation purposes the total Supply and Installation Costs will be increased pro rata by the amount of interest that could otherwise be earned on the amount of any payments that would fall due under the proposed schedule earlier than the schedule stipulated in the SCC, at the interest rate specified in the BDS.

3) Goods and Services that are required for the Information System but have been left out or are necessary to correct minor deviations of the bid will be added to the total Supply and Installation Costs using costs taken from the highest prices from other responsive bids for the same Goods and Services, or in the absence of such information, the cost will be estimated at prevailing list prices. If the missing Goods and Services are a scored technical feature, the relevant score will be set at zero.

4) Corrections to errors in arithmetic, in accordance with ITB Clause 31 (a).

iv. The Recurrent Costs (R) are reduced to Net Present Value and determined using the following formula:

$$R \equiv \sum_{x=1}^{N+M} \frac{R_x}{(1+I)^x}$$

where

N = number of years of the Warranty Period, defined in SCC Clause 57.4

M = number of years of the Post Warranty Services Period as defined in SCC 1 (rr)

x = an index number 1, 2, 3, ... N + M representing each year of the combined Warranty Service and Post-Warranty Service Periods.

Rx = total Recurrent Costs for year "x," as recorded in the Recurrent Cost Sub-Table.

I = discount rate to be used for the Net Present Value calculation, as specified in the BDS.

(d) The lowest evaluated bid price (Fm) will be given a financial score (Sf) of 100 points. The financial scores (Sf) of the other financial proposals will be determined using the following formula:

Sf = 100 x Fm/F;

In which Sf is the financial score, Fm is the lowest evaluated bid price (lowest financial proposal), and F is the Financial Proposal under consideration.

Proposal shall be ranked in accordance with their combined technical (St) and financial (Sf) scores:

S = St x Tw + Sf x Fw;

Where S is the combined score, and Tw and Fw are weights assigned to Technical Proposal and Financial Proposal as specified in Bid Data Sheet.

The bidder achieving the highest combined technical and financial score will be considered the successful Bidder and will be invited for contract signing. Subject to Clause 32, the first/highest ranked Bidder will ordinarily be the selected Bidder.

E. Negotiations and Award

32. Negotiations

(a) The first/highest ranking Bidder may, if necessary, be invited for negotiations with the Client. The negotiations will be held at the date and address as informed by the Client.

(b) The Client shall prepare minutes of negotiations which will be signed by the Client and the Bidder's authorized representative.

(c) If the negotiations fail, the Client shall inform the first/highest ranking Bidder in writing of all pending issues and disagreements and provide a final opportunity to the first/highest ranking Bidder to respond. If disagreement persists, the Client shall terminate the negotiations informing the first/highest ranking Bidder of the reasons for doing so. Upon termination of the negotiations with the first/highest ranking Bidder, the Client may invite the next-ranked Bidder to negotiate the Contract with the Client or annul the bid process, reject all Proposals and invite fresh Proposals. If the Client commences negotiations with the next-ranked Bidder, the Client shall not reopen the earlier negotiations.

33. Client's Right to Vary Quantities at Time of Award

33.1 The Client reserves the right at the time of Contract award to increase or decrease, by the percentage (s) indicated in the BDS any of the following:

a. de-scope or add the systems/sub-systems equivalent to specified percentage (%) of Contract value; or

b. the quantity of substantially identical Sub-systems; or

c. the quantity of individual hardware, Software, related equipment, Materials, products, and other Goods components of the Information System; or

d. the quantity of Installation or other Services to be performed,

from that originally specified in the Technical Requirements (as amended by any Addenda issued pursuant to ITB Clause 10), without any change in unit prices or other terms and conditions.

34. Award of Contract

(a) After completing the negotiations, the Client shall issue a letter of award to the selected Bidder:

(i) accepting the Proposal of the selected Bidder with such modifications as may be negotiated with the Client;

(ii) requesting it to submit the Performance Security in accordance with Clause 25;

(iii) Subject to submission of the Performance Security and satisfaction of all other conditions specified in the letter of award, requesting it to execute the Contract.

Within [15] days of receipt of the letter of award, the selected Bidder shall sign and return a copy of the letter of award.

(b) Upon execution of the Contract, the Client will publish the award information; and promptly notify the other technically qualified Bidders of the conclusion of the selection process or upload the details of the selected Bidder on its website.

(c) If the selected Bidder fails to satisfy the conditions specified in Clause 34 (a) (i) above or fails to execute the Contract on or before the date specified in the letter of award, the Client may, unless it consents to an extension, without prejudice to its other rights under the RFP or in law, disqualify the selected Bidder, revoke the letter of award and forfeit the EMD of the selected Bidder. If the Client elects to disqualify the selected Bidder and revoke the letter of award, it may invite the next ranked Bidder to negotiate the Contract with the Client or take any such measure as it may deem fit, including inviting fresh Proposals from the eligible Bidders or annulling the entire bid process.

(d) The client shall reserve the right to award the contract in full or a part. Any increase in the scope of contract shall be awarded within the limits as specified in Bid Data sheet.

35. Procedure for e-tendering

35.1 Accessing/ Purchasing of BID documents

35.1.1 The Contractor/Bidder intending to participate in the bid is required to register in the Portal using his/her active personal/official e-mail ID as his/her Login ID and attach his/her valid Digital Signature Certificate(DSC) to his/her unique Login ID. He/ She has to submit the relevant information as asked for about the firm/Contractor. The portal registration of the bidder/firm is to be authenticated by the State Procurement Cell after verification of original valid certificates/documents such as (i) Pan Card and (ii) Registration Certificate (RC)/VAT Clearance Certificate (for procurement of goods) of the concerned bidder. The time period of validity in the portal is at par with the validity of RC/VAT Clearance. Any change of information by the bidder is to be re-authenticated by the State Procurement Cell. After successful authentication, bidder can participate in the online bidding process. The DSC used must be of appropriate class (Class II or Class III) issued from a registered Certifying Authority(CA) as stipulated by Controller of Certifying Authorities(CCA),Government of India such as n-Code, Sify, TCS, MTNL, e-Mudhra etc. &

should be in the name of the authorized signatory as authorized in Appendix-III of the RFP Application.

35.1.2 (a) To log on to the portal the Contractor/Bidder is required to type his/her Login ID and password. The system will again ask to select the DSC and confirm it with the password of as a second stage of authentication. For each login, a user's DSC will be validated against its date of validity and also against the Certificate Revocation List (CRL) of respective CAs stored in system database. The system checks the unique ID, password and DSC combination and authenticates the login process for use of portal.

(b) The tender documents uploaded by the Tender Inviting Officer in the website https://.tendersodisha.gov.in will appear in "Latest Active Tender" section of the homepage. Only a small notification will be published in the newspaper specifying the work details along with mention of the specific website for details. The publication of the tender will be for specific period of time till the last date of submission of bids as mentioned in the 'Invitation for Bid' after which the same will be removed from the list of Latest Active tenders. The bidder can down load the RFP document from the web site and save it in his system and undertake the necessary preparatory work off-line and upload the completed documents at his convenience before the closing date and time of submission.

35.1.3 The complete BID document can be viewed / downloaded by the Bidder from e-procurement portal of Government https://tendersodisha.gov.in.

35.1.4 To participate in bidding, bidders have to pay the cost towards tender document in the form of a Demand Draft issued from a Nationalised Bank or Scheduled Bank in India in favour of Chief Executive Officer, Bhubaneswar Smart City Limited payable at Bhubaneswar and a Bid Security is also to be furnished by the bidder for the amount mentioned in the RFP in the form of Bank Guarantee (B.G) as per the format mentioned in Appendix-II, issued from a Nationalised or Scheduled Bank.

35.2 Preparation and Submission of Bids

35.2.1 The Bidder may submit his Bid online following the instruction appearing on the screen.

35.2.2 The documents forming part of the proposal of the bidder (except the financial proposal) shall be prepared and scanned in different files (in PDF or JPEG format) and uploaded during the on-line submission of BID.

35.2.3 Bid must be submitted online only through e-procurement portal of State Government https://tendersodisha.gov.in

using the digital signature of authorized representative of the Bidder on or before the scheduled dates mentioned in the RFP (up to 17.00 hours IST).

35.3 Modification / Substitution / Withdrawal of Bids

35.3.1 In the e-Procurement Portal, it is allowed to modify the Application number of times after necessary modification, before the final date and time of submission. The Applicant shall have to log on to the system and resubmit the documents as asked for by the system. In doing so, the Application already submitted by the Applicant will be removed automatically from the system and the latest Application only will be admitted. But the Applicant should avoid modification of Application at the last moment to avoid system failure or malfunction of internet or traffic jam. If the Applicant fails to submit his modified Application within the designated time of receipt, the Application already in the system shall be taken for evaluation.

In the e-Procurement Portal, withdrawal of bid is allowed. But in such case the bidder has to write a letter containing written notice of the modification, substitution or withdrawal addressed to the Authority and upload the scanned document to portal in the respective Application before the closure of receipt of the Application. The system shall not allow any withdrawal after expiry of the closure time of the Application.

35.3.2 Any alteration/ modification in the Application or additional information supplied subsequent to the Application Due Date, unless the same has been expressly sought for by the Authority, shall be disregarded.

36. Online Opening of Bids

36.1 Opening of BIDs will be done through online process.

36.2 The authorized officials of Client shall on-line open Technical BIDs on scheduled date at 11.30 hours IST, in the presence of the authorized representatives of the Bidders, who choose to attend. Technical BID of only those bidders shall be online opened whose documents as listed at clause 23.2 of the ITB have been physically received. The officials of Authority will subsequently examine and evaluate the BIDs in accordance with the provisions of this RFP.

F. Bid Data Sheet

A. General

ITC Clause Reference	Description
1.1	**Name of the Client*:*** Bhubaneswar Smart City Limited (BSCL) **Description of the Solution for which bids are invited:** Selection of Master System Integrator for implementation of Smart Solutions in Bhubaneswar City. **Method of selection**: Single Stage selection, three envelope system, Quality and Cost Based Selection (QCBS) with the following weights given to technical and financial proposals: Technical = 70% Financial = 30%
1.2	**The Contract term is :** One hundred two (108) months including Implementation period of Twenty Four (24) months
1.4 (b)	**Minimum qualifying technical score:** 70
1.4 (c)	**Please refer Clause 29 of Bid Data Sheet.**
1.5	**A pre-bid meeting will be held:** Yes **Date of pre-bid meeting:** As per 1.8 : Schedule of Bidding Process **Address:** Conference Hall Bhubaneswar Smart City Limited, 2nd Floor, Block – 1, BMC Bhawani Office Complex, Saheed Nagar, Bhubaneswar – 751 007, Odisha Telephone: 0674-2392778 Fax: 0674-2396889 E-mail: pancitysolutionbbsr@gmail.com Contact person: Mr. Simanchal Maharana, General Manager (E&T) All Pre-bid queries shall be addressed to the following in the format prescribed in RFP: **Address:** Mr. Simanchal Maharana, General Manager (E&T) Bhubaneswar Smart City Limited, 2nd Floor, Block – 1, BMC Bhawani Office Complex, Saheed Nagar, Bhubaneswar – 751 007

E-mail:
pancitysolutionbbsr@gmail.com

1.7 **The Bidder may download the RFP for preparing of the bid proposal from the website:**

www.tendersodisha.gov.in

1.8 **SCHEDULE OF BIDDING PROCESS**

The Client shall endeavour to adhere to the following schedule:

Sr. No.	Event Description	Date
1	Issue of Advertisement & Uploading of RFP	4th March 2017
2	Last date of receiving Queries	18th March 2017 by 5:00 PM
3	Pre-bid Meeting	21st March 2017 at 11:00 AM
4	Reply to Pre-bid Queries	Before 31st March 2017
5	Last Date of submission of Proposals Online	29th April 2017 up to 5:00 PM
6	Last date of hard copy submissions as per RFP	05th May 2017 up to 5.00 PM
7	Opening of Proposals (Qualification & Technical Proposals)	06th May 2017 at 11:30 AM
8	Opening of financial proposals	Date of financial opening will be informed to the technically qualified bidders.
9	Validity of Proposal	180 calendar days from the last date of submission of proposal

5.1 (a) **The Bidder must meet the following qualification criteria as on the last date of submission of this bid:**

S. No	Type	Eligibility Criterion	Documentary Evidence
1	**Company Profile**	The Bidder (Partner In charge in case of Consortium) shall be in operations for a period of at least ten (10) years as on published date of RFP. In case of a Consortium, in addition, each member other than Partner In charge shall be in operations for a period of at	• Copy of certificate of Incorporation/Registration under Companies Act 1956 (for Indian companies) • Global companies to provide equivalent proof of incorporation/registration • A written undertaking from each of the consortium

S. No	Type	Eligibility Criterion	Documentary Evidence
		least five (5) years as on published date of RFP.	members, in case of a consortium, duly signed by the authorized signatory, holding a written power of attorney for this bid on a stamp paper, authorizing the lead bidder to incur liabilities and receive instructions for and on behalf of any and all consortium members, and the entire execution of the Contract, including but not limited to the payments.
2	**Company Financials & Profile**	The Bidder/Consortium shall have an average annual turnover of INR 1,000 Crores over the last three (3) Financial Years. In case of Consortium, at least 50% of the turnover criteria shall be met by the Partner In charge and the remaining can be satisfied by the other Consortium partners. Lead member or Consortium members shall be into one of the following specific business areas. Specific Business Areas • ICT Infrastructure • Telecom Infrastructure • IT System Integration Services	• Audited financial statements for last three Financial Years. • Statutory auditor's certificate clearly specifying the annual turnover for the specified years. • MoA/AoA shall be submitted showing the area of business.
3	**Company Financials**	The Bidder (Partner In charge in case of consortium) shall have minimum net-worth of INR 100 Crores as per the last audited Financial Year.	The Sole Bidder or the Partner In charge 1. Certificate from the Statutory Auditor on net worth
4	**Local Presence**	The Bidder (Partner In charge in case of consortium) shall have an office in Bhubaneswar or shall furnish an undertaking at the time of bid submission that the Bidder shall establish an office in Bhubaneswar within sixty days of signing the Contract. The office shall be	• List and address of office in Bhubaneswar OR • Undertaking from authorized signatory to open office with sales tax registration in Bhubaneswar within 60 days from Contract signing.

S. No	Type	Eligibility Criterion	Documentary Evidence
		maintained during the entire duration of the Contract.	
5	**Certifications**	The Bidder (any member of consortium) shall have any one of the following Certifications valid at the time of Bidding: • ISO 9001:2015 • ISO 20000:2011 for IT Service Management or equivalent certification • ISO 27001:2013 for Information Security Management System or equivalent certification	• Copies of the valid certificate in the name of the Bidder.
6	**Company Standing**	As on date of submission of the proposal, the Bidder (all members of the consortium as applicable) shall not be blacklisted by any any State / Central Government Department or Central /State PSUs.	The Sole Bidder or the Partner In charge and all other Members of Consortium: 1. Legal Attorney certified letter of undertaking to this effect on the letter head, co-signed by bidders' authorized signatory. 2. In case of consortium, this needs to be provided by each of the consortium member.
7	**ICOMC**	The Bidder (any member in case of consortium) shall have successfully executed at least two (2) projects related to implementation of Integrated Operations Centre/Command and Control Centre integrating at least three (3) different city/campus-wide applications/sensors at the command and control centre for a city wide / campus wide deployment having a minimum value of INR 10 crores per project (excluding civil works) during last seven (7) years.	Sole Bidder/any Member of Consortium/Sub-Contractor(s): 1. Work order/ Contract clearly highlighting the scope of work, Bill of Material and value of the contract/order. 2. Completion Certificate issued & signed by the competent authority of the client entity on the entity's Letterhead In case of large orders/orders with operations & maintenance phase, the completion may specify successful execution and in-operation status of a part of the order meeting the requirement.
8	**ITMS**	The Bidder (any member in case of consortium) shall have successfully executed at least	Sole Bidder/any Member of Consortium/Sub-Contractor(s):

S. No	Type	Eligibility Criterion	Documentary Evidence
		two (2) projects related to implementation of Integrated Traffic Management System integrating at least three (3) different components from the below list on a single application having a minimum value of INR 7 crores per project (excluding civil works) during last seven (7) years. Components: 1. Red Light Violation Detection Systems 2. Automatic Traffic Counters & Classifiers 3. Dynamic Message Signs 4. Public Address (PA) System	1. Work order/ Contract clearly highlighting the scope of work, Bill of Material and value of the contract/order. 2. Completion Certificate issued & signed by the competent authority of the client entity on the entity's Letterhead In case of large orders/orders with operations & maintenance phase, the completion may specify successful execution and in-operation status of a part of the order meeting the requirement.
9	**Transit ITS**	The bidder shall have experience on at least two AVL projects for intra-city public transit system with a fleet of at least 50 buses wherein the bidder shall have provided AVL system software and hardware to monitor, manage and control transit operations. In addition, the bidder should have integrated the AVL system with the Passenger Information sub-system to provide route and ETA (expected travel arrival) to passengers. The AVL projects should have been commissioned within the past 7 (seven) years from the date of submission of the bid and should have been in commercial operations for at least one year after successful system acceptance.	Sole Bidder/any Member of Consortium/Sub-Contractor(s): 1. Work order/ Contract clearly highlighting the scope of work, Bill of Material and value of the contract/order. 2. Completion Certificate issued & signed by the competent authority of the client entity on the entity's Letterhead In case of large orders/orders with operations & maintenance phase, the completion may specify successful execution and in-operation status of a part of the order meeting the requirement.
10	**ICT - OFC**	The Bidder (any member in case of consortium) shall have successfully executed at least two (2) projects related to implementation of Outside Plant Fibre Optic Passive Infrastructure of at least 200 km	Sole Bidder/any Member of Consortium/Sub-Contractor(s): 1. Work order/ Contract clearly highlighting the scope of work, Bill of Material and value of the contract/order.

S. No	Type	Eligibility Criterion	Documentary Evidence
		or Active infrastructure with at least 100 nodes per project having a minimum value of INR 10 crores per project during last seven (7) years.	2. Completion Certificate issued & signed by the competent authority of the client entity on the entity's Letterhead In case of large orders/orders with operations & maintenance phase, the completion may specify successful execution and in-operation status of a part of the order meeting the requirement.
11	**ICT – Wi-Fi**	The Bidder (any member in case of consortium) shall be a licensed ISP in India and shall have experience of implementation and operations of at least two (2) City wide / campus wide Wi-Fi Projects consisting of over 75 Access Points per project during last seven (7) years.	Sole Bidder/any Member of Consortium/Sub-Contractor(s): 1. Work order/ Contract clearly highlighting the scope of work, Bill of Material and value of the contract/order. 2. Completion Certificate issued & signed by the competent authority of the client entity on the entity's Letterhead 3. Proof of License registration confirming registration as an ISP license holder. In case of large orders/orders with operations & maintenance phase, the completion may specify successful execution and in-operation status of a part of the order meeting the requirement.
12	**ERP**	The Bidder (any member in case of consortium) shall have successfully executed at least two (2) projects related to implementation/integration and support of ERP system including finance, utility billing, and maintenance & asset management modules (with at least 2 of these modules) having a minimum value of INR 10 crores per project during last seven (7) years.	Sole Bidder/any Member of Consortium/Sub-Contractor(s): 1. Work order/ Contract clearly highlighting the scope of work, Bill of Material and value of the contract/order. 2. Completion Certificate issued & signed by the competent authority of the client entity on the entity's Letterhead In case of large orders/orders with operations & maintenance phase, the completion may specify successful execution and in-operation status of a part of the order meeting the requirement.

S. No	Type	Eligibility Criterion	Documentary Evidence
13	**E-Governance**	The Bidder (any member in case of consortium) shall have successfully executed at least two (2) projects related to implementation/integration and support of citizen centric e-Governance applications integrating at least four (4) different municipal services (excluding CCTV system) having a minimum value of INR 5 crores per project during last seven (7) years.	Sole Bidder/any Member of Consortium/Sub-Contractor(s): 1. Work order/ Contract clearly highlighting the scope of work, Bill of Material and value of the contract/order. 2. Completion Certificate issued & signed by the competent authority of the client entity on the entity's Letterhead In case of large orders/orders with operations & maintenance phase, the completion may specify successful execution and in-operation status of a part of the order meeting the requirement.
14	**Parking**	The Bidder (any member in case of consortium) shall have successfully executed at least two (2) projects related to implementation of a parking management platform consisting of three or more parking lots during last seven (7) years.	Sole Bidder/any Member of Consortium/Sub-Contractor(s): 1. Work order/ Contract clearly highlighting the scope of work, Bill of Material and value of the contract/order. 2. Completion Certificate issued & signed by the competent authority of the client entity on the entity's Letterhead In case of large orders/orders with operations & maintenance phase, the completion may specify successful execution and in-operation status of a part of the order meeting the requirement.
15	**Overall**	The sole bidder or the consortium shall meet at least 4 out of 8 project experiences required as part of Criteria 7-14 and remaining criteria in Criteria 7-14 can be met by sub-contractor(s).	

5.1 (c) **Manufacturer's Authorizations** in the form of certificates for Information Technologies are required for the following types/categories:

a) RLVD System with ANPR

b) ATCC

c) DMS

d) Environmental Sensors

e) AVL (on-board units)

f) Parking Sensors

g) ETM

h) Transit Scheduling Software

i) CCTV Cameras

j) VMS

k) ERP Solution

l) Wi-Fi System

m) Smart Poles

5.4 **Sub-contractors:** Allowed for sub-systems/components as defined below:

- Fibre optic network build, other cabling and fixtures work, and all civil work during implementation.
- Civil, Electrical and Cabling works related to MSI solution.
- Infrastructure works at Command and Control Centre.
- As per BDS for ITB 5.1 (a)

If the work is sub-contracted, the sole responsibility of the work shall lie with the partner in charge. The partner in charge shall be held responsible for any delay/error/non-compliance etc. of its sub-contracted vendor. The details of the sub-contracting agreements (if any) between both the parties would be required to be submitted to Client along with bid documents.

Note: The Bidder will not be allowed to change any sub-contractor during any stage of the Contract. If the Bidder changes any sub-contractor, the bid/Contract shall be liable for rejection.

JV/Consortium: Bids from JV/Consortium of up to four members are accepted provided the JV/Consortium as a whole meets all the eligibility/qualification criteria.

B. Preparation of Proposals

13 This RFP has been issued in the English language.

Proposals shall be submitted in English Language.

All correspondence exchange shall be in English Language.

In case any supporting document or printed literature is in another language, it must be accompanied by an accurate translation of all the relevant passages in English by an approved/authorized/licensed translator[1], in which case, for all purposes of interpretation of the Proposal, the translation in English shall prevail.

16 (a) **Proposals must remain valid for** 180 (one hundred eighty) calendar days from the last date of submission of proposal.

18.8 Prices quoted by the Bidder shall be ***fixed.***

19 (a) An EMD of INR 6,00,00,000 (Indian Rupees Six Crores Only) in the form of a unconditional and irrevocable bank guarantee from any Scheduled Commercial Bank in India and drawn in favour of the Bhubaneswar Smart City Limited and payable at Bhubaneswar, must be submitted along with the Proposal.

The EMD must be in the format set out in Appendix 3 and the minimum validity date of the bank guarantee should be for a period of 28 days beyond validity period of the Proposal, including any extensions thereof. In the event of any extension in the Proposal's validity, the EMD will also remain valid for such extended period.

22.1 Bid documents processing fee of INR 10,500 (Indian Rupees Ten Thousand and Five Hundred Only) inclusive of VAT @ INR 500/- shall be paid through a demand draft in favour of Bhubaneswar Smart City Limited and payable at Bhubaneswar.

C. Submission, Opening and Evaluation

23.1 & 23.2 **The hard copy submissions must be delivered in physical form to the following address:**

Bhubaneswar Smart City Limited,
2nd Floor, Block – 1, BMC Bhawani Office Complex,
Saheed Nagar, Bhubaneswar – 751 007,
Odisha

Bid Submission deadline: As per 1.8 Schedule of Bidding Process

Apart from the online submission, the Bidder must also submit following number of physical copies of the Proposal:

[1]Approved/authorized/licensed translator means one who is certified by Government for document translation. The registration/certification number of the translator is mandatory to mention on the translated document along with full address, phone number and mail-id.

(a) **Qualification Documents –** 1 original and 3 copies.

(b) **Technical Proposal –** 1 original and 3 copies.

(c) **Financial Proposal –** Only online as per the terms of ITB.

(d) Soft copy of (a) and (b) above in .pdf format (without any password protection in searchable format) in a CD/DVD for each section in each envelope.

24.2 **The notice for withdrawal, substitution and modification must be delivered in physical form to the following address:**

Bhubaneswar Smart City Limited,
2nd Floor, Block – 1, BMC Bhawani Office Complex,
Saheed Nagar, Bhubaneswar – 751 007,
Odisha

The notice must be submitted no later than bid submission date and time as specified in Bid Data Sheet.

29 The Technical Proposals of eligible and qualified Bidders shall be evaluated as follows:

Technical Proposal (Envelope B)

Criteria, sub-criteria, and point system for the evaluation of the Technical Proposals:

S.N.	Evaluation Criteria	Max. Score	Documents Required
1	**Company Profile**		
1.1	The Bidder/Consortium shall have an average annual turnover of INR 1,000 Crores over the last three (3) Financial Years. In case of Consortium, at least 50% of the turnover criteria shall be met by the Partner In charge and the remaining can be satisfied by the other Consortium partners. Lead member or Consortium members shall be into one of the following specific business areas. Specific Business Areas • ICT Infrastructure • Telecom Infrastructure • IT System Integration Services **Annual Turnover:** 1) >1000 and ≤ 1200 Crores	10	• Audited financial statements for last three Financial Years. • Statutory auditor's certificate clearly specifying the annual turnover for the specified years. • MoA/AoA shall be submitted showing the area of business.

S.N.	Evaluation Criteria	Max. Score	Documents Required
	: 3 Marks 2) >1200 and ≤ 1500 Crores : 7 Marks 3) >1500 Crores : 10 Marks		
1.2	The Bidder (any member in case of consortium) shall have CMMi Certification: Level 3 : 3 marks Level 5 : 5 marks	5	Sole Bidder/any Member of Consortium: • CMMi certificate copy to be attached
2	**Project Experience**		
2.1	The Bidder (any member in case of consortium) shall have successfully executed at least two (2) projects related to implementation of Integrated Operations Centre/Command and Control Centre integrating at least three (3) different city/campus-wide applications/sensors at the command and control centre for a city wide / campus wide deployment having a minimum value of INR 10 crores per project (excluding civil works) during last seven (7) years. **Number of Projects:** 1) 2 Projects : 3 Marks 2) >2 and ≤5 Projects : 7 Marks 3) >5 Projects: 10 Marks	10	Sole Bidder/any Member of Consortium/Sub-Contractor(s): 1. Work order/ Contract clearly highlighting the scope of work, Bill of Material and value of the contract/order. 2. Completion Certificate issued & signed by the competent authority of the client entity on the entity's Letterhead In case of large orders/orders with operations & maintenance phase, the completion may specify successful execution and in-operation status of a part of the order meeting the requirement.
2.2	The Bidder (any member in case of consortium) shall have successfully executed at least two (2) projects related to implementation of Integrated Traffic Management System integrating at least three (3) different components from the below list on a single application having a minimum value of INR 7 crores per project (excluding civil works) during last seven (7) years.	7.5	Sole Bidder/any Member of Consortium/Sub-Contractor(s): 1. Work order/ Contract clearly highlighting the scope of work, Bill of Material and value of the contract/order. 2. Completion Certificate issued & signed by the competent authority of the client entity on the

S.N.	Evaluation Criteria	Max. Score	Documents Required
	Components: 1) Red Light Violation Detection Systems 2) Automatic Traffic Counters & Classifier 3) Dynamic Message Signs 4) Public Address (PA) System **Number of Projects:** 1) 2 Projects : 3 Marks 2) >2 and ≤5 Projects : 5 Marks 3) >5 Projects: 7.5 Marks		entity's Letterhead In case of large orders/orders with operations & maintenance phase, the completion may specify successful execution and in-operation status of a part of the order meeting the requirement.
2.3	The Bidder shall have experience on at least two AVL projects for intra-city public transit system with a fleet of at least 50 buses wherein the bidder shall have provided AVL system software and hardware to monitor, manage and control transit operations. In addition, the bidder should have integrated the AVL system with the Passenger Information sub-system to provide route and ETA (expected travel arrival) to passengers. The AVL projects should have been commissioned within the past 7 (seven) years from the date of submission of the bid and should have been in commercial operations for at least one year after successful system acceptance. **Number of Projects:** 1) 2 Projects : 3 Marks 2) >2 and ≤5 Projects : 5 Marks 3) >5 Projects: 7.5 Marks	7.5	Sole Bidder/any Member of Consortium/Sub-Contractor(s): 1. Work order/ Contract clearly highlighting the scope of work, Bill of Material and value of the contract/order. 2. Completion Certificate issued & signed by the competent authority of the client entity on the entity's Letterhead In case of large orders/orders with operations & maintenance phase, the completion may specify successful execution and in-operation status of a part of the order meeting the requirement.
2.4	The Bidder (any member in case of consortium) shall have successfully executed at least two (2) projects related to implementation of Outside Plant Fibre Optic Passive Infrastructure	5	Sole Bidder/any Member of Consortium/Sub-Contractor(s): 1. Work order/ Contract clearly highlighting the scope of work, Bill of

S.N.	Evaluation Criteria	Max. Score	Documents Required
	of at least 200 km or Active infrastructure with at least 100 nodes per project having a minimum value of INR 10 crores per project during last seven (7) years. **Number of Projects:** 1) 2 Projects : 1 Marks 2) >2 and ≤5 Projects : 3 Marks 3) >5 Projects: 5 Marks		Material and value of the contract/order. 2. Completion Certificate issued & signed by the competent authority of the client entity on the entity's Letterhead In case of large orders/orders with operations & maintenance phase, the completion may specify successful execution and in-operation status of a part of the order meeting the requirement.
2.5	The Bidder (any member in case of consortium) shall be a Licensed ISP in India and shall have experience of implementation and operations of at least two (2) City wide / campus wide Wi-Fi Projects consisting of over 75 Access Points per project during last seven (7) years. **Number of Projects:** 1) 2 Projects : 1 Marks 2) >2 and ≤5 Projects : 3 Marks 3) >5 Projects: 5 Marks	5	Sole Bidder/any Member of Consortium/Sub-Contractor(s): 1. Work order/ Contract clearly highlighting the scope of work, Bill of Material and value of the contract/order. 2. Completion Certificate issued & signed by the competent authority of the client entity on the entity's Letterhead 3. Proof of License registration confirming registration as an ISP license holder. In case of large orders/orders with operations & maintenance phase, the completion may specify successful execution and in-operation status of a part of the order meeting the requirement.
2.6	The Bidder (any member in case of consortium) shall have successfully executed at least two (2) projects related to implementation of a parking management platform consisting	5	Sole Bidder/any Member of Consortium/Sub-Contractor(s): 1. Work order/ Contract clearly highlighting the scope of work, Bill of

S.N.	Evaluation Criteria	Max. Score	Documents Required
	of three or more parking lots during last seven (7) years. **Number of Projects:** 1) 2 Projects : 1 Marks 2) >2 and ≤5 Projects : 3 Marks 3) >5 Projects: 5 Marks		Material and value of the contract/order. 2. Completion Certificate issued & signed by the competent authority of the client entity on the entity's Letterhead In case of large orders/orders with operations & maintenance phase, the completion may specify successful execution and in-operation status of a part of the order meeting the requirement.
2.7	The Bidder (any member in case of consortium) shall have successfully executed at least two (2) projects related to implementation/integration and support of ERP system including finance, utility billing, and maintenance & asset management modules (with at least 2 of these modules) having a minimum value of INR 10 crores per project during last seven (7) years. **Number of Projects:** 1) 2 Projects : 1 Marks 2) >2 and ≤5 Projects : 2 Marks 3) >5 Projects: 2.5 Marks	2.5	Sole Bidder/any Member of Consortium/Sub-Contractor(s): 1. Work order/ Contract clearly highlighting the scope of work, Bill of Material and value of the contract/order. 2. Completion Certificate issued & signed by the competent authority of the client entity on the entity's Letterhead In case of large orders/orders with operations & maintenance phase, the completion may specify successful execution and in-operation status of a part of the order meeting the requirement.
2.8	The Bidder (any member in case of consortium) shall have successfully executed at least two (2) projects related to implementation/integration and support of citizen centric e-Governance applications integrating at least four (4) different municipal services (excluding CCTV system) having a minimum value of INR 5 crores per project during last seven (7)	2.5	Sole Bidder/any Member of Consortium/Sub-Contractor(s): 1. Work order/ Contract clearly highlighting the scope of work, Bill of Material and value of the contract/order. 2. Completion Certificate issued & signed by the competent authority of

S.N.	Evaluation Criteria	Max. Score	Documents Required
	years. **Number of Projects:** 1) 2 Projects : 1 Marks 2) >2 and ≤5 Projects : 2 Marks 3) >5 Projects: 2.5 Marks		the client entity on the entity's Letterhead In case of large orders/orders with operations & maintenance phase, the completion may specify successful execution and in-operation status of a part of the order meeting the requirement.
3	**Approach and Methodology**		
3.1	Proposed Solution and Architecture including compliance to requirements as per RFP	8	
3.2	Overall Approach, Methodology, Implementation and Deployment Plan.	7	
3.3	Technical Presentation in front of Evaluation Committee	10	
4	**Key Expert**		
4.1	Project Director – Bachelor of Engineering degree and MBA/M.Tech/MS having more than 15 years of experience in implementation and management of similar ICT projects involved in complete project lifecycle. Must have at least five (5) relevant projects (e-governance, ERP or command and control center). Project Director shall be a full time employee of the Bidder and in case of consortium shall be a full time employee of the Partner in Charge. Project Director preferably shall have international experience of at least one project.	3 (1 mark reserved if Project Director has international experience)	CV signed by Key Expert and Authorized Representative
4.2	Project Manager – Bachelor of Engineering degree and MBA/M.Tech/MS with PMP having more than 12 years of experience in similar ICT projects and involved in end to end implementation. Must have at least three (3) relevant projects	3	CV signed by Key Expert and Authorized Representative

S.N.	Evaluation Criteria	Max. Score	Documents Required
	(e-governance, ERP or command or control centre).		
4.3	Network Architect – Bachelor of Engineering degree or MCA having more than 8 years of experience in network design and implementation of both active and passive infrastructure supporting outside plant environment. Must have at least three relevant projects (outdoor fibre optic based networks).	2	CV signed by Key Expert and Authorized Representative
4.4	Solution Architect – Bachelor in IT or Engineering having more than 8 years of experience in designing and implementing e-governance applications similar to the project requirements. Must have at least two relevant projects	2	CV signed by Key Expert and Authorized Representative
4.5	ITMS Expert – Bachelor in Electronics or equivalent Engineering having more than 10 years of experience in designing, implementing and integrating various ITMS sub-systems including Traffic Signalling and RLVD/ANPR as minimum. Must have at least two relevant projects responsible for implementation and integration of the system	2	CV signed by Key Expert and Authorized Representative
4.6	Integration Engineer – Bachelor in IT or Engineering having more than 8 years of experience in integrating multiple sensors at the command and control centre at city-wide/campus-wide deployment. Must have at least two relevant projects (Command and Control Centre).	2	CV signed by Key Expert and Authorized Representative
4.7	Security Architect – Bachelor in IT or Engineering having more than 8 years of experience implementing secure networks. Must have industry standard certifications including CISSP. Must have at least two relevant projects (Network Security).	1	CV signed by Key Expert and Authorized Representative

The key experts shall be evaluated based on the below criteria:		
A.	**GENERAL QUALIFICATIONS**	**20%**
A1.	Technical qualifications	10%
A2.	Professional experience	5%
A3.	Industry Certifications	5%
B.	**ADEQUACY FOR THE ASSIGNMENT**	**65%**
B1.	Experience in similar capacity/ broad sector	25%
B2.	Experience relevant to TOR/ Project	40%
C.	**FAMILIARITY WITH THE REGION**	**5%**
C1.	Experience in system integration projects related to similar scope in India.	3%
C2.	Knowledge of local language and culture	2%
D.	**ASSOCIATION WITH THE FIRM**	**10%**
D1.	Full Time permanent staff	6%
D2.	Years of association	4%

S.N	Evaluation Criteria	Max. Marks	Documents Required
5	**Other Staff Requirement (minimum)** **Required on-site (not evaluated but shall be approved by Client)**		
	Maintenance Support Staff: Manpower requirement of Maintenance support staff is covered in Section 6 – Scope of Work (Technical Requirements)		
5.1	ITMS Support Engineer – Bachelor in Electronics with minimum 8 years' experience of deployment and maintenance of ITMS System	N/A	CV signed by Key Personnel and Authorized Representative
5.2	ERP Support Engineer – Bachelor in IT or MCA with	N/A	CV signed by Key Personnel and Authorized Representative

S.N	Evaluation Criteria	Max. Marks	Documents Required
	minimum 8 years' experience of deployment and maintenance of ERP Systems		
5.3	e-Governance Support Engineer – Bachelor in IT or MCA with minimum 8 years' experience of deployment and maintenance of e-Governance Systems	N/A	CV signed by Key Personnel and Authorized Representative
5.4	Fibre optic Support Engineer – Bachelor in Engineering with minimum 8 years' experience of deployment and maintenance of fibre optic infrastructure	N/A	CV signed by Key Personnel and Authorized Representative
5.5	Integration Support Engineer – Bachelor in Engineering with minimum 8 years' experience of deployment and maintenance of integrated command and control centre	N/A	CV signed by Key Personnel and Authorized Representative
	Helpdesk Support Staff: Manpower requirement of Helpdesk support staff is covered in Section 6 – Scope of Work (Technical Requirements)		
5.6	Helpdesk Operations Support Engineer – Bachelor in Engineering with minimum 7 years' experience in deployment, management and maintenance of Contact centres/helpdesks.	N/A	CV signed by Key Personnel and Authorized Representative
	Facility Management Staff: Manpower requirement of Facility Management staff is covered in Section 6 – Scope of Work (Technical Requirements)		
5.7	Facility Management Supervisor – Graduate with minimum 7 years of experience in supervising, managing and support of facility management.	N/A	

31 (c) (iii) (1) Each Technical Proposal will be assigned a technical score out of a maximum of 100 marks. Only the bidders who get an Overall Technical score of minimum 70% or more and more than 50% in each section of the Technical Evaluation framework will qualify for commercial evaluation stage. Failing to secure minimum marks shall lead to technical rejection of the Bid.

The Client will not accept deviations in the schedule of installation and commissioning specified in the Implementation Schedule.

31 (c) (iii) (2) The Client ***will not*** accept deviations in the payment schedule in the SCC.

31 (c) (iv) Discount Rate (I) for Net Present Value (NPV) calculations of recurrent costs = ***10*** percent per annum

33.1 Percentage for increase/decrease: ***20%***

ANNEXURE 1: TEMPLATE FOR PRE-BID QUERIES

Bidder shall submit all pre-bid queries in the following format.

S. No.	RFP Volume, Section	RFP page no	Content in the RFP	Clarification sought

ANNEXURE 2: BID SUBMISSION CHECKLIST

Bidders should expand and (if appropriate) modify and complete the below checklist. The purpose of this table is to provide the Bidder with a detailed summary checklist of items that must be included in the bid as described in ITB Clauses 17 and 18, in order for the bid to be considered responsive.

S. No.	Item		RFP Reference Clause/Page	Provided (Yes/No/ NA)	Page No.
1.	Technical Bid	Joint Venture / Consortium Summary			
2.		Financial Qualification of the Bidder			
3.		JV/Consortium Agreement			
4.		MoU for JV/Consortium			
5.		Sub-Contracting Agreements			
6.		PoA by Partner in charge to Signing Authority (as applicable)			
7.		PoA by Partner 1 to Partner in charge (as applicable)			
8.		PoA by Partner 2 to Partner in charge (as applicable)			
9.		PoA by Partner 3 to Partner in charge (as applicable)			
10.		Certificate of Incorporation - Partner in Charge			
11.		Financials - Partner in Charge			
12.		Certificate of Incorporation - Partner 1			
13.		Financials - Partner 1			
14.		Certificate of Incorporation - Partner 2			
15.		Financials - Partner 2			
16.		Certificate of Incorporation - Partner 3			
17.		Financials - Partner 3			
18.		Bid Submission Form			
19.		Details of the Bidder (Partner in charge)			
20.		Details of the Bidder (Partner 1)			
21.		Details of the Bidder (Partner 2)			
22.		Details of the Bidder (Partner 3)			

S. No.	Item		RFP Reference Clause/Page	Provided (Yes/No/ NA)	Page No.
23.		Details of the Bidder (any Sub contractor if proposed)			
24.		Bid Documents Processing fee			
25.		Technical Qualification – Qualifying Projects			
26.		Client Certificates for qualifying projects			
27.		Current Contract Commitments / Work in Progress			
28.		Bid Compliance Undertaking			
29.		Statement of Deviation			
30.		Affidavit certifying Bidder is not blacklisted			
31.		Manufacturer Authorizations			
32.		List of Proposed Subcontractors			
33.		List of Custom Materials			
34.		Software List			
35.		Bid Security - EMD			
36.		Performance Bank Guarantee Form			
37.		Key Expert CVs			
38.		Undertaking regarding availability of Key Expert			
39.		Team Composition & Task Assignments			
40.		Work Schedule			
41.		Signed & stamped RFP document (by Authorized Signatory)			
42.		One Original + Three copies of bid (Technical proposal & Qualifications)			
43.		Original Price Bid (only original copy)			
44.		Soft copy of technical bid in CD/DVD			
45.		CD of technical presentation showcasing bidders qualifications, solution and innovation			

S. No.	Item		RFP Reference Clause/Page	Provided (Yes/No/ NA)	Page No.
46.	Financial Bid	Grand Summary Cost Table			
47.		Price Schedule			
48.		Supply and Installation Cost Summary Table			
49.		Recurrent Cost Summary Table			
50.		Supply and Installation Cost Sub-Table(s)			
51.		Recurrent Cost Sub-Tables(s)			
52.		Deviation Cost Table			

Section 2. Qualification Documents and Technical Proposal – Standard Forms

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Section 2. Qualification Documents and Technical Proposal – Standard Forms

Qualification Documents

APPENDIX 1: QUALIFICATION DOCUMENTS AND PROPOSAL SUBMISSION FORM

[On the Letter head of the Bidder]

{Location, Date}

To:

Chief Executive Officer
Bhubaneswar Smart City Limited,
2nd Floor, Block – 1, BMC Bhawani Office Complex,
Saheed Nagar, Bhubaneswar – 751 007,
Odisha

Ref: Selection of Master System Integrator for implementation of Bhubaneshwar Smart City Solutions

Dear Sir:

We, the undersigned, offer to provide the Solution, Goods and Services for Master System Integrator for implementation of Smart City Solutions by Bhubaneswar Smart City Limited in Bhubaneswar City of Odisha in accordance with your Request for Proposals dated [Insert Date]. We are hereby submitting our Proposal, which includes the Qualification Documents and our Technical Proposal and Financial Proposal, each in a separate sealed envelope.

If negotiations are held during the period of validity of the Proposal, we undertake to negotiate in accordance with the RFP. Our proposal is binding upon us, subject only to the modifications resulting from negotiations in accordance with the RFP.

We hereby declare that:

(a) All the information and statements made in this Proposal are true, nothing has been omitted which renders such information misleading and we accept that any misinterpretation or misrepresentation contained in this Proposal may lead to our disqualification by the Client.

(b) All documents accompanying our Proposal are true copies of their respective originals. We will make available to the Client any additional information it may find necessary or require to authenticate or evaluate the Proposal.

(c) Our Proposal shall be valid and remain binding upon us for the period of time specified in the Bid Data Sheet, Clause 16(a).

(d) We have no conflict of interest in accordance with Clause 2.

(e) We and our Affiliates are not submitting more than one or separate Proposals.

(f) We or any of our Affiliates have not been charge-sheeted by any agency of the government or convicted by a court of law, indicted or have had adverse orders passed by a regulatory authority which could cast a doubt on our ability to execute the Contract.

(g) No investigation by a regulatory authority is pending either against us or any of our Affiliates or against our chief executive officer or any of our directors/managers/employees.

(h) If due to any change in facts or circumstances during the bid process, we attract the provisions of disqualification in terms of the provisions of this RFP, we shall inform the Client of the same immediately.

(i) We meet the Eligibility Criteria and all other requirements of the RFP and are qualified to submit a Proposal, We have not directly or indirectly through an agent engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, collusive practice, undesirable practice or restrictive practice as defined in Section 5 of the ITB. We undertake to continue to abide by and ensure that our Personnel comply with the Client's policy with regard to corrupt and fraudulent practices as per Clause 5 and Section 5.

(j) We or our Affiliates, Suppliers, or service providers for any part of the Contract, are not subject to any temporary suspension and have not been barred by any government or government instrumentality in India or in any other jurisdiction to which we or our Affiliates belong or in which we or our Affiliates conduct business or by any multilateral funding agency, from participating in any project or being awarded any contract or being given any funding and no such suspension or bar subsists on the Proposal Due Date.

(k) In the last 5(five) years, we or our Affiliates have neither been expelled from any project or contract by any government or government instrumentality nor have had any contract terminated by any government or government instrumentality for breach on our part.

(l) if we are selected as the MSI, we undertake the Contract and provide the Goods and Services on the basis of the requirements as defined in the RFP and our proposed Solution.

(m) Our Proposal is binding upon us and is subject to any modifications resulting from the Contract negotiations.

(n) We have carefully analysed the RFP and all related information. We understand that except to the extent as expressly set forth in the Contract, we shall have no claim, right or title arising out of any documents or information provided to us by the Client or in respect of any matter arising out of or concerning or relating to the bid process including the award of the Contract.

(o) Our Financial Proposal has been quoted by us after taking into consideration all the terms and conditions stated in the RFP, the Technical Requirements,

the draft Contract, our own estimates of costs and after a careful assessment of all the conditions that may affect the Work.

(p) We irrevocably waive any right or remedy which we may have at any stage at law or howsoever arising to challenge the criteria for evaluation or question any decision taken by the Client in connection with the evaluation of the Proposals, selection of the Bidder, or in respect of this Project and the terms and implementation thereof.

(q) We acknowledge the right of the Client to reject our Proposal without assigning any reason and we hereby waive, to the fullest extent permitted by applicable law, our right to challenge the same on any account whatsoever.

(r) We acknowledge the right of the Client to cancel the bid process and not award the Contract, without assigning any reason and without incurring any liability to the Bidders and we hereby waive, to the fullest extent permitted by applicable law, our right to challenge the same on any account whatsoever.

(s) We undertake, if our Proposal is accepted and the Contract is signed, to initiate the Services no later than the date indicated in Clause 34 (c) of the Bid Data Sheet.

We remain,

Yours sincerely,

Authorized Signature {In full and initials}: _____

Name and Title of Signatory: _____

Address: _____

Contact information (phone and e-mail): _____

APPENDIX 2: DETAILS OF THE BIDDER

(To be submitted on the letterhead of the Bidder)

[All individual firms and each partner of a Joint Venture that are bidding must complete the information in this form. Nationality information should be provided for all owners or Bidders that are partnerships or individually owned firms.

Where the Bidder proposes to use named Sub-contractors for components of the Information System, the following information should also be supplied for the Sub-contractor(s), together with the information in Forms in Appendix 5, Appendix 7, and Appendix 8. Joint Ventures must also fill out in Appendix 6.]

1. (a) Name:

   (b) Country of incorporation:

   (c) Date of incorporation and/or commencement of business:

2. Brief description of the company including details of its main lines of business and proposed role and responsibilities in this assignment [*Note: Such description shall not exceed 5 type-written pages.*]:

3. Shareholding of the Bidder, if applicable

4. List of directors

5. Details of individual who will serve as the point of contact/ communication for the Client[2]:

   (a) Name:

   (b) Designation:

   (c) Company:

   (d) Address:

   (e) Telephone Number:

   (f) E-Mail Address:

   (g) Fax Number:

[2] In the event that the authorized signatory and the point of contact are different individuals, the information for both the individuals (i.e., the authorized signatory and the point of contact) are to be furnished. The Client will send communication to both the entities.

6. Particulars of the Authorised Signatory of the Bidder:

(a) Name:

(b) Designation:

(c) Address:

(d) Telephone Number:

(e) E-Mail Address:

(f) Fax Number:

APPENDIX 3: FORMAT OF THE EMD/BID SECURITY

(To be executed on stamp paper of appropriate value)

B.G. No. [___] **Dated:**

1. In consideration of you, Bhubaneswar Smart City Limited (referred to as **BSCL**, which expression will, unless it is repugnant to the subject or context thereof include, its successors and assigns) having agreed to receive the Bid of [***insert name of Bidder***] with its registered office at [***Insert Address***] (referred to as the **Bidder** which expression will unless it be repugnant to the subject or context thereof include its/their executors, administrators, successors and assigns), for Master System Integrator for implementation of Bhubaneshwar Smart City Solutions (the **Project**), as a part of implementation of Smart Cities Mission in Bhubaneswar, pursuant to the Request for Proposal dated [___] (referred to as the **RFP**) and other related documents including without limitation the draft Contract (collectively referred to as **Bid Documents**), we (Name of the Bank) having our registered office at [___] and one of its branches at [___] (referred to as the **Bank**), at the request of the Bidder, do hereby in terms of the RFP, irrevocably, unconditionally and without reservation guarantee the due and faithful fulfilment and compliance of the terms and conditions of the Bid Documents (including the RFP) by the said Bidder and unconditionally and irrevocably undertake to pay forthwith to BSCL an amount of Rs. [___] (referred to as the **Guarantee**) as our primary obligation without any demur, reservation, recourse, contest or protest and without reference to the Bidder, if the Bidder will fail to fulfil or comply with all or any of the terms and conditions contained in the said Bid Documents.

2. Any such written demand made by the CEO of BSCL stating that the Bidder is in default of due and faithful compliance with the terms and conditions contained in the Bid Documents will be final, conclusive and binding on the Bank.

3. We, the Bank, do hereby unconditionally undertake to pay the amounts due and payable under this Guarantee without any demur, reservation, recourse, contest or protest and without any reference to the Bidder or any other person and irrespective of whether the claim of BSCL is disputed by the Bidder or not, merely on the first demand from BSCL stating that the amount claimed is due to BSCL by reason of failure of the Bidder to fulfil and comply with the terms and conditions contained in the Bid Documents, including but not limited to the following events:

   (a) If a Bidder withdraws its Proposal during the Proposal validity period or any extension agreed by the Bidder thereof.

   (b) If a Bidder is disqualified in accordance with Clause 3;

   (c) If the Bidder tries to influence the evaluation process or engages in corrupt, fraudulent, coercive or undesirable practice or restrictive practice as set out in Section 4 of the RFP.

   (d) If a Bidder is declared the first ranking Bidder and it:

(i) withdraws its Proposal during negotiations. However, failure to arrive at a consensus between the Client and the first ranked Bidder shall not be construed as withdrawal of proposal by the first ranked Bidder;

(ii) fails to furnish the Performance Security in accordance with Clause 25 of the RFP;

(iii) fails to sign and return, as acknowledgement, the duplicate copy of the letter of award;

(iv) fails to fulfil any other condition precedent to the execution of the Contract, as specified in the letter of award; or

(v) fails to execute the Contract.

Any such demand made on the Bank shall be conclusive as regards amount due and payable by the Bank under this Guarantee.

4. This Guarantee shall be irrevocable and remain in full force till the validity of the Proposal, including any extensions thereof, and will continue to be enforceable till all amounts under this Guarantee have been paid.
If the Bidder is declared as the MSI, then the validity of the EMD of such Bidder shall be extended until the date on which the MSI submits the Performance Security. The EMD of the MSI will be returned upon the MSI furnishing the Performance Security.

5. We, the Bank, further agree that BSCL will be the sole judge to decide as to whether the Bidder is in default of due and faithful fulfilment and compliance with the terms and conditions contained in the Bid Documents including, those events listed at clause 3 above. The decision of BSCL that the Bidder is in default as aforesaid will be final and binding on us, notwithstanding any differences between BSCL and the Bidder or any dispute pending before any court, tribunal, arbitrator or any other authority.

6. The Guarantee will not be affected by any change in the constitution or winding up of the Bidder or the Bank or any absorption, merger or amalgamation of the Bidder or the Bank with any other person.

7. In order to give full effect to this Guarantee, BSCL will be entitled to treat the Bank as the principal debtor.

8. The obligations of the Bank under this Guarantee are absolute and unconditional, irrespective of the value, genuineness, validity, regularity or enforceability of the Bid Documents or the Bid submitted by the Bidder.

9. The obligations of the Bank under this Guarantee shall not be affected by any act, omission, matter or thing which, but for this provision, would reduce, release or prejudice the Bank from or prejudice or diminish its liability under this Guarantee, including (whether or not known to it, or BSCL):

(a) any time or waiver granted to, or composition with, the Bidder or any other person;

(b) any incapacity or lack of powers, authority or legal personality of or dissolutions; or change in the Bidder, as the case may be;

(c) any variation of the Bid Documents, so that references to the Bid Documents in this Guarantee shall include each such variation;

(d) any unenforceability, illegality or invalidity of any obligation of the Bidder or BSCL under the Bid Documents or any unenforceability, illegality or invalidity of the obligations of the Bank under this Guarantee or the unenforceability, illegality or invalidity of the obligations of any Person under any other document or guarantee or security, to the extent that each obligation under this Guarantee shall remain in full force as a separate, continuing and primary obligation, and its obligations be construed accordingly, as if there were no unenforceability, illegality or invalidity; and

(e) any extension, waiver, or amendment whatsoever which may release a guarantor or surety (other than performance of any of the obligations of the Bidder under the Bid Documents).

10. Any notice by way of request, demand or otherwise will be sufficiently given or made if addressed to the Bank and sent by courier or by registered mail to the Bank at the address set forth herein.

11. We undertake to make the payment on receipt of your notice of claim on us addressed to [***name of Bank along with branch address***] and delivered at our above branch which will be deemed to have been duly authorized to receive the notice of claim.

12. It shall not be necessary for BSCL to proceed against the Bidder before proceeding against the Bank and the Guarantee will be enforceable against the Bank, notwithstanding any other security which BSCL may have obtained from the Bidder or any other person and which will, at the time when proceedings are taken against the Bank, be outstanding or unrealized.

13. We, the Bank, further undertake not to revoke this Guarantee during its currency except with the previous express consent of BSCL in writing.

14. The Bank represents and warrants that it has power to issue this Guarantee and discharge the obligations contemplated herein, and the undersigned is duly authorized and has full power to execute this Guarantee for and on behalf of the Bank.

15. For the avoidance of doubt, the Bank's liability under this Guarantee will be restricted to Rs. [___]. The Bank will be liable to pay the amount or any part of the Guarantee only if BSCL serves a written claim on the Bank in accordance with clause 11 of this Guarantee, on or before …….. (indicate date corresponding to the Proposal validity period and requirement for the period of Bank Guarantee towards EMD).

16. Capitalized terms used but not defined herein shall have the meanings given to them in the RFP.

Signed and Delivered by……Bank

By the hand of Mr./Ms. …….. its …… and authorised official.

(Signature of the Authorised Signatory)

(Official Seal)

APPENDIX 4: FORMAT FOR POWER OF ATTORNEY FOR SIGNING OF PROPOSAL

(On Non – judicial stamp paper of Rs 100/- or such equivalent amount and document duly attested by notary public)

Power of Attorney

Know all men by these presents, we …… (name of the Bidder and address of the registered office) do hereby constitute, appoint and authorize Mr. / Ms…… …… (name and residential address) who is presently employed with us and holding the position of ……. as our true and lawful attorney (hereinafter referred to as the "attorney"), to do in our name and on our behalf, all such acts, deeds and things necessary in connection with or incidental to submission of our Proposal for Master System Integrator for implementation of Bhubaneshwar Smart City Solutions for Bhubaneswar Smart City Limited (BSCL) in Bhubaneswar City of Odisha**"**, including signing and submission of the Proposal and all accompanying documents, attending the pre-bid meeting, providing information/responses to BSCL, representing us in all matters before BSCL, if selected, undertaking negotiations with BSCL prior to the execution of the Contract and generally dealing with BSCL in all matters in connection with our Proposal.

We hereby agree to ratify and confirm and do hereby ratify and confirm all acts, deeds and things done or caused to be done by our said attorney pursuant to and in exercise of the powers conferred by this Power of Attorney and that all acts, deeds and things done by our attorney in exercise of the powers hereby conferred shall and shall always be deemed to have been done by us.

IN WITNESS WHEREOF WE, ……., THE ABOVE NAMED PRINCIPAL HAVE EXECUTED THIS POWER OF ATTORNEY ON THIS …… DAY OF ……., 20.....

For _____

(Signature)

(Name, Title and Address)

Witness:

1.

2.

Accepted

…….. (Signature)

(Name, Title and Address of the Attorney)

- *The mode of execution of the power of attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executants(s) and when it is so required the same should be under common seal affixed in accordance with the required procedure.*
- *In case the Proposal is signed by an authorized director of the Bidder, a certified copy of the appropriate resolution/ document conveying such authority may be enclosed in lieu of the power of attorney.*
- *For a power of attorney executed and issued overseas, the document will also have to be legalised by the Indian Embassy and notarised in the jurisdiction where the power of attorney is being issued. However, the power of attorney provided by Bidders from countries that have signed the Hague Legislation Convention, 1961 are not required to be legalised by the Indian Embassy if it carries a conforming apostille certificate.*

APPENDIX 5: FINANCIAL QUALIFICATION OF THE BIDDER

(Bidders, including each partner of a Joint Venture/Consortium, shall provide financial information to demonstrate that they meet the requirements stated in the BDS for ITB Clause 5.1 (a). Each Bidder or partner of a Joint Venture/Consortium shall complete this form. If necessary, separate sheets shall be used to provide complete banker information. A copy of the audited balance sheets shall be attached. Autonomous subdivisions of parent conglomerate businesses shall submit financial information related only to the particular activities of the subdivision.)

Name of Bidder or partner of a Joint Venture (if allowed):

S. No.	Financial Year (FY)	Annual Turnover (Rs. crore)	Net Profit (Rs. Crore)
1	Financial Year 2011-12 (or FY 2011)		
2	Financial Year 2012-13 (or FY 2012)		
3	Financial Year 2013-14 (or FY 2013)		
4	Financial Year 2014-15 (or FY 2014)		
5	Financial Year 2015-16 (or FY 2015)		

Note:

- *The Bidder shall attach copies of the balance sheets, financial statements and audited annual reports for each of the Financial Years mentioned above. The financial statements shall:*
  - *(a) reflect the turnover of the Bidder;*
  - *(b) be audited by a statutory auditor;*
  - *(c) be complete, including all notes to the financial statements.*
- *The Bidder shall provide a statutory auditor's certificate specifying the annual Turnover of the Bidder in the form set out at Appendix-5.*
- *In case the financial year in the Bidder's country is the calendar year, the Bidder shall submit above financial information for years 2011, 2012, 2013, 2014 and 2015.*
- *In case Bidder is claiming International Turnover, the amount shall be converted to USD and then to INR based on the RBI rates as per 31st January, 2017.*

Date:

APPENDIX 6: FORMAT OF JOINT BIDDING AGREEMENT AND JOINT VENTURE / CONSORTIUM SUMMARY

(To be executed on stamp paper of appropriate value)

THIS JOINT BIDDING AGREEMENT is entered into on this the [date in words] day of [month in words] [year in 'yyyy' format].
AMONGST

1. [Name of company], a company incorporated under the Companies Act, 1956 and having its registered office at [registered address] (hereinafter referred to as the "First Part" which expression shall, unless repugnant to the context include its successors and permitted assigns);

AND,

2. [Name of company], a company incorporated under the Companies Act, 1956 and having its registered office at [registered address] (hereinafter referred to as the "Second Part" which expression shall, unless repugnant to the context include its successors and permitted assigns);

AND,

3. [Name of company], a company incorporated under the Companies Act, 1956 and having its registered office at [registered address] (hereinafter referred to as the "Third Part" which expression shall, unless repugnant to the context include its successors and permitted assigns);

AND,

4. [Name of company], a company incorporated under the Companies Act, 1956 and having its registered office at [registered address] (hereinafter referred to as the "Fourth Part" which expression shall, unless repugnant to the context include its successors and permitted assigns);

The above mentioned parties of the [FIRST, SECOND, THIRD AND FOURTH] PART are collectively referred to as the "Parties" and each is individually referred to as a "Party".

WHEREAS,

a) Bhubaneswar Smart City Limited (BSCL), a SPV Company incorporated under the Companies Act, 1956 and having its principal place of business at 2nd Floor, Block 1, BMC Bhawani Office Complex, Saheed Nagar, Bhubaneswar - (hereinafter referred to as the "Client" which expression shall, unless repugnant to the context or meaning thereof, include its administrators, successors and assigns) has invited proposals ("the Proposal") by its Request for Proposal dated [date] (the "RFP") for appointment of Master System Integrator for [name of assignment] (the "Project").

b) The Parties are interested in jointly bidding for the Project as members of a Consortium and in accordance with the terms and conditions of the RFP document and other bid documents in respect of the Project, and

c) It is a necessary condition under the Project that the members of the Consortium shall enter into a Joint Bidding Agreement and furnish a copy thereof with the Proposal.

NOW IT IS HEREBY AGREED as follows:

1. Definitions and interpretations: In this Agreement, the capitalised terms shall, unless the context otherwise requires, have the meaning ascribed thereto under the RFP.

2. Consortium:

   a) The Parties do hereby irrevocably constitute a consortium (the "Consortium") for the purposes of jointly participating in the selection process for the Project;

   b) The Parties hereby undertake to participate in the Bidding process only through this Consortium and not individually and/ or through any other consortium constituted for this Project, either directly or indirectly or through any of their Affiliates.

3. Covenants: The Parties hereby undertake that in the event the Consortium is declared the selected Master System Integrator and awarded the Project, the Parties shall enter into a contract for Master System Integrator services ("Contract") with the Client and for performing all obligations as the Master System Integrator in terms of the Contract for the Project.

4. Role of the parties: The Parties hereby undertake to perform the roles and responsibilities as described below:

   a) Party of the First Part shall be the Partner in Charge of the Consortium and shall have the power of attorney from all Parties for conducting all business for and on behalf of the Consortium during the selection process for the Project and until the Effective Date under the Contract;

   b) Party of the Second Part (Partner 1) shall be [role];

   c) Party of the Third Part (Partner 2) shall be [role];

   d) Party of the Fourth Part (Partner 3) shall be [role].

5. Joint and Several Liability: The Parties do hereby undertake to be jointly and severally responsible for all obligations and liabilities relating to the Project and in accordance with the terms of the RFP and the Contract, for the performance of the Contract.

6. Partner in-charge: Without prejudice to the joint and severe liability of all the Parties, each Party agrees that it shall exercise all rights and remedies under the Contract through the Partner in Charge and the Client shall be entitled to deal with such Partner in Charge as the representative of all Members. Each Party agrees and acknowledges that:

   a) any decision (including without limitation, any waiver or consent), action, omission, communication or notice of the Partner in Charge on any matters related to the Contract shall be deemed to have been on its behalf and shall be binding on it. The Client shall be entitled to rely upon any such action, decision or communication from the Partner in Charge;

   b) consolidated invoices for the services in relation to the Project performed by all the Partners shall be prepared and submitted by the Partner in Charge and the Client shall have the right to release payments solely to the Partner in Charge and the Client shall not in any manner be responsible or liable for the inter se allocation of payments, works etc. among the Parties;

   c) any notice, communication, information or documents to be provided to the Master System Integrator shall be delivered to the authorized representative of the Project (as designated pursuant to the Contract) and any such notice, communication,

information or documents shall be deemed to have been delivered to all the Parties.

7. Representation of the Parties: Each Party represents to the other Parties as of the date of this Agreement that:

   a) Such Party is duly organised, validly existing and in good standing under the laws of its incorporation and has all requisite power and authority to enter into this Agreement;

   b) The execution, delivery and performance by such Party of this Agreement has been authorised by all necessary and appropriate corporate or governmental action and a copy of the extract of the charter documents and board resolution/ power of attorney in favour of the person executing this Agreement for the delegation of power and authority to execute this Agreement on behalf of the Party is annexed to this Agreement, and will not, to the best of its knowledge:

      (i) require any consent or approval not already obtained;

      (ii) violate any Applicable Law presently in effect and having applicability to it;

      (iii) violate the memorandum and articles of association, by-laws or other applicable organisational documents thereof;

      (iv) violate any clearance, permit, concession, grant, license or other governmental authorisation, approval, judgement, order or decree or any mortgage agreement, indenture or any other instrument to which such Party is a party or by which such Party or any of its properties or assets are bound or that is otherwise applicable to such Party; or

      (v) create or impose any liens, mortgages, pledges, claims, security interests, charges or Encumbrances or obligations to create a lien, charge, pledge, security interest, encumbrances or mortgage in or on the property of such Party, except for encumbrances that would not, individually or in the aggregate, have a material adverse effect on the financial condition or prospects or business of such Party so as to prevent such Party from fulfilling its obligations under this Agreement.

   c) this Agreement is the legal and binding obligation of such Party, enforceable in accordance with its terms against it; and

   d) there is no litigation pending or, to the best of such Party's knowledge, threatened to which it or any of its Affiliates is a party that presently affects or which would have a material adverse effect on the financial condition or prospects or business of such Party in the fulfilment of its obligations under this Agreement.

8. Termination: This Agreement shall be effective from the date hereof and shall continue in full force and effect until the Effective Date under the Contract, in case the Project is awarded to the Consortium. However, in case the Consortium is not selected for award of the Project, the Agreement will stand terminated upon intimation by the Client that it has not been selected and upon return of the EMD by the Client.

9. Miscellaneous:

   a) This Joint Bidding Agreement shall be governed by laws of India;

   b) The Parties acknowledge and accept that this Agreement shall not be amended by the Parties without the prior written consent of the Client.

IN WITNESS WHEREOF THE PARTIES ABOVE NAMED HAVE EXECUTED AND DELIVERED THIS AGREEMENT AS OF THE DATE FIRST ABOVE WRITTEN.

SIGNED, SEALED & DELIVERED
For and on behalf of PARTNER IN-CHARGE by:
[Signature]
[Name]
[Designation]
[Address]

SIGNED, SEALED & DELIVERED
For and on behalf of
SECOND PART (PARTNER 1) by:
[Signature]
[Name]
[Designation]
[Address]

SIGNED, SEALED & DELIVERED
For and on behalf of
THIRD PART (PARTNER 2) by:
[Signature]
[Name]
[Designation]
[Address]

SIGNED, SEALED & DELIVERED
For and on behalf of
FOURTH PART (PARTNER 3) by:
[Signature]
[Name]
[Designation]
[Address]

In presence of:

3. [Signature, name and address of witness]
4. [Signature, name and address of witness]

Notes:

1. *The mode of the execution of the Joint Bidding Agreement should be in accordance with the procedure, if any, laid down by the Applicable Law and the charter documents of the executant(s) and when it is so required, the same should be under common seal or official seal of all partners.*
2. *Each Joint Bidding Agreement should attach a copy of the extract of the charter documents and documents such as resolution / power of attorney in favour of the person executing this Agreement for the delegation of power and authority to execute this Agreement on behalf of the Consortium Member.*
3. *For a Joint Bidding Agreement executed and issued overseas, the document shall be legalised by the Indian Embassy and notarized in the jurisdiction where the Power of Attorney has been executed.*

Joint Venture/Consortium Summary:

Names of all partners of a Joint Venture	
1. Partner in charge	
2. Partner 1	
3. Partner 2	
4. Partner 3	

APPENDIX 7: TECHNICAL QUALIFICATION – QUALIFYING PROJECTS

[Use a separate sheet for each contract]

Name of Bidder or partner of a Joint Venture/Consortium:

1.	Number of contract	
	Name of contract	
	Country	
2.	Name of Client	
3.	Client address	
4.	Nature of Information Systems and special features relevant to the contract for which the Bidding Documents are issued:	
5.	Contract role (check one) ☐ Prime Bidder ☐ Management Contractor ☐ Subcontractor ☐ Partner in a Joint Venture	
6.	Amount of the total contract/subcontract/partner share (in specified currencies at completion, or at date of award for current contracts) Total contract: INR_____; Subcontract: INR_____; Partner share: INR_____;	
8.	Date of award: Date of Commissioning:	
9.	Contract was completed _____ months ahead/behind original schedule (if behind, provide explanation).	
10.	Contract was completed INR _____ equivalent under/over original contract amount (if over, provide explanation).	
11.	Special contractual/technical requirements:	
12.	Indicate the approximate percent of total contract value (in INR) of Information System undertaken by subcontract, if any, and the nature of such Information System.	

(Name and Signature of Authorized Signatory)

- *For each Eligible Assignment, the Bidder should indicate the duration of the assignment, the contract amount, the amount paid to the Bidder) and the Bidder's role/involvement.*

- *Bidders are expected to provide information in respect of each Eligible Assignment in this Appendix. Each Eligible Assignment must comply with the requirements set out in the Bid Data Sheet.*
- *For each completed Eligible Assignment, work order and the completion certificate issued by the client certifying that the assignment has been completed by the Bidder should be furnished.*
- *For each ongoing Eligible Assignment, the work order and certificate issued by the client certifying the percentage of completion of the assignment by the Bidder should be furnished. The client reserves the right to ask for documentary proofs for the claims made with regard to technical eligibility and work experience at any stage of bid process or for the selected Bidder, any time thereafter.*
- *The client reserves all rights to verify the authenticity of experience related certificates or any other certificates submitted by the Bidder, at any stage of bid process or even thereafter. In case of finding any fraudulent practice during verification, the client shall reject the bid or terminate the contract.*
- *In case Bidder is claiming International Experience, the amount shall be converted to USD and then to INR based on the RBI rates as per 31st January, 2017.*

APPENDIX 8: CURRENT CONTRACT COMMITMENTS / WORK IN PROGRESS

(Bidders and each partner to an Joint Venture / Consortium bid should provide information on their current commitments on all contracts that have been awarded, or for which a letter of intent or acceptance has been received, or for contracts approaching completion, but for which an unqualified, full completion certificate has yet to be issued.

Name of Bidder or partner of a Joint Venture (if allowed):

Name of contract	Client, contact address/tel./fax	Value of outstanding Information System (INR)	Estimated completion date	Average monthly invoicing over last six months (INR)
1.				
2.				
3.				
4.				
5.				

APPENDIX 9: BID COMPLIANCE UNDERTAKING

[The Bidder-in-charge shall submit an undertaking (on company letterhead and should be signed and stamped by all members of JV/Consortium) confirming compliance to all business, functional and technical requirements as specified in this RFP.] .

The Bidder shall submit undertaking with following points:

1. We hereby confirm that all implicit and explicit deviations, comments and remarks mentioned elsewhere in our proposal shall be treated as NULL and VOID and stand withdraw with no financial and time implications.
2. We further confirm that unless we include such clauses in the "Statement of Deviation" [as stated in Appendix 10] attached herewith and prices against such clauses in the Price Form 1.7 of Financial Proposal, the comment shall be considered as unconditionally withdrawn with no financial and time implications.
3. We hereby confirm that except for deviations noted in the form of the Statement of Deviation attached herewith, our proposal is fully and truly compliant.

The Bidder shall also note that:

1. Unless Bidder includes such clauses in the Statement of Deviation [as per Appendix 10] and prices against such clauses in the Price Form 1.7 of Financial Proposal, such deviation/non-compliance shall be considered as unconditionally withdrawn with no financial and time implications.
2. Any comment by the Bidder elsewhere in the proposal which indicates no-compliance/deviation and which has not been included in the form of Statement of Deviations shall be treated as "Fully Compliant" with no financial and time implications.
3. The "Statement of Deviation" shall be completed by the Bidder in case of any non-compliance or any observation or alternate solution/design to the tender specifications.
4. This Statement of Deviation is not applicable for any of the conditions mentioned in ITB, BDS, GCC and SCC and in case the Bidder indicates any non-compliance/deviation, the bid will be liable for rejection.
5. The Client reserves the right to accept or reject any deviation proposed by the Bidder at the price quoted by the Bidder. Then the Contract price will be adjusted accordingly.
6. In case of any discrepancy found in compliance of submitted proposal to the standards and specifications as per RFP, the bidder shall be liable to replace such goods and equipment with those in compliance, at their own cost, without any liability to the client.

Proposals received without Bid Compliance Undertaking shall be rejected as non-responsive. Proposals with missing, incomplete, or ambiguous responses regarding compliance may be deemed non-responsive. Bidders must submit fully compliant proposal with all the requirements as defined in the document. Client reserves the right to request more information for any or all responses listed after the bid submission deadline during the technical evaluation stage.

APPENDIX 10: STATEMENT OF DEVIATION

Item No.	Clause Number	Details of Deviations (Original/ Proposal)	Remarks explaining reasons for deviations and why it may be considered by the Client	Check whether priced in the Price Schedule

Note:

1. We hereby confirm that the pricing of unconditional withdrawal of the above deviations has been given in the Price Form 1.7 of Financial Proposal.
2. We hereby confirm that any comment by us which is not mentioned in the Statement of Deviation above shall be treated as NULL and VOID and stand withdraw with no financial and time implications.
3. We hereby confirm that the deviation noted in the form of the Statement of Deviation above but are not priced in the Price Form 1.7 of Financial Proposal; such deviations shall be considered as unconditionally withdrawn with no financial and time implications.

Date: _____ _____

(Signature of Bidder)

APPENDIX 11: FORMAT FOR AFFIDAVIT CERTIFYING THAT BIDDER (OR IT'S CONTRACTOR/SUB-CONTRACTOR) IS NOT BLACKLISTED

(On a Stamp Paper of Rs. 100/- value and duly notarized)

Affidavit

I M/s. …… , (the name of the Bidder/Contractor/Sub-contractor and addresses of the registered office) hereby certify and confirm that we are not barred or blacklisted by any Central / State Government Department or Central / State PSUs globally from participating in any project or being awarded any contract, either individually or as member of a consortium and no such bar or blacklisting subsists as on the Proposal Due Date.

We further confirm that we are aware our Proposal for the Master System Integrator for implementation of Bhubaneshwar Smart City Solutions Project would be liable for rejection in case any material misrepresentation is made or discovered with regard to the requirements of this RFP at any stage of selection and/or thereafter during the term of the Contract.

Dated this ……..Day of …….., 201….

NAME OF THE BIDDER/CONTRACTOR/SUB-CONTRACTOR

…….
SIGNATURE OF THE AUTHORISED PERSON

…….
NAME OF THE AUTHORISED PERSON

- *For an affidavit executed and issued overseas, the document will also have to be legalised by the Indian Embassy and notarised in the jurisdiction where the affidavit is being issued. However, the affidavit provided by Bidders from countries that have signed the Hague Legislation Convention, 1961 are not required to be legalised by the Indian Embassy if it carries a conforming apostille certificate.*

APPENDIX 12: MANUFACTURER'S AUTHORIZATIONS

Invitation for Bids: Selection of Master System Integrator for implementation of Bhubaneshwar Smart City Solutions

To: _____

WHEREAS _____ who are official producers of _____ and having production facilities at _____ do hereby authorize _____ located at _____ (hereinafter, the "Bidder") to submit a bid and subsequently negotiate and sign a Contract with you for resale of the following Products produced by us:

We hereby confirm that, in case the bidding results in a Contract between you and the Bidder, the above-listed products will come with our full standard warranty.

Name In the capacity of

Signed

Duly authorized to sign the authorization for and on behalf of:
_____

Dated on _____ day of _____, _____.

Note: This authorization should be written on the letterhead of the Manufacturer and be signed by a person with the proper authority to sign documents that are binding on the Manufacturer.

APPENDIX 13: LIST OF PROPOSED SUB-CONTRACTOR (IF APPLICABLE)

System/Sub-system/Item/Activity	Proposed Sub-contractor (Full Name & Address)	Place of Registration & Qualifications

APPENDIX 14: SOFTWARE LIST

The following table assigns each item of software supplied and installed under the Contract to one of the three categories: (i) System Software, (ii) General Purpose Software, or (iii) Application Software; and to one of the two categories: (i) Standard Software or (ii) Custom Software.

	(select one per item)			(select one per item)	
Software Item	**System Software**	**General-Purpose Software**	**Application Software**	**Standard Software**	**Custom Software**

APPENDIX 15: LIST OF CUSTOM MATERIAL

Custom Materials

APPENDIX 16: CURRICULUM VITAE (CV)

1.	Proposed position				
2.	Name of firm				
3.	Name of expert	[First] [Middle] [Surname]			
4.	Date of birth				
5.	Nationality				
6.	(a) Educational Qualification (b) Technical / Industry Certifications	[Indicate college/university and other specialized education of staff member, giving names of institutions, degrees obtained, and year of obtainment starting from the latest degree]			
7.	Membership of Professional Organizations				
8.	Training & Publications	[Indicate significant training since education degrees (under 5) were obtained]			
9.	Countries of Work Experience	[List countries where staff has worked in the last ten years]			
10.	Languages	Language	Proficiency (good/ fair/ poor)		
			Speaking	Reading	Writing
		English			
11.	Employment record [Starting with present position, list in reverse order every employment held by staff member since graduation]	Name of Organization	Position held		Duration
			Designation	Permanent / On Contract / Temporary	YYYY to present
12.	Details of tasks assigned				
13.	Work Undertaken that Best Illustrates Capability to Assigned Handle the Tasks Assigned	[Among the assignments in which the Staff has been involved, indicate the following information for those assignments that best illustrate staff capability to handle the tasks assigned. Highlight experience relevant to the project and of similar capacity role as proposed for this project. Also highlight past experience of working in Odisha]			

		Name of assignment or project: Year: Location: Client: Project Cost: Main project features: Positions held: Activities performed:
		Name of assignment or project: Year: Location: Client: Project Cost: Main project features: Positions held: Activities performed:
14.	Certification	I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes me, my qualifications, and my experience. I understand that any wilful misstatement described herein may lead to my disqualification or dismissal, if engaged.

Signature	Signature
Date: [dd/mm/yyyy]	Date: [dd/mm/yyyy]
Name of expert:	Name of Authorized Signatory:

Note:

1. *CVs must be signed in indelible ink by the authorized signatory of the Bidders. In case of Unsigned CVs shall be rejected.*
2. *The CVs shall also contain an undertaking from the authorized signatory of the Bidder specifying the employees of the company and the proposed key experts who are not employees, in the format set out in Appendix 17. In case the proposed Key Expert is not an employee of the Bidder as on the proposal due date, the undertaking must also contain the details about his/her availability for the duration of the Contract, in the format set out in form Appendix 17.*

APPENDIX 17: UNDERTAKING REGARDING AVAILABILITY OF KEY EXPERT

To, Dated:

Chief Executive Officer
Bhubaneswar Smart City Limited,
2nd Floor, Block – 1, BMC Bhawani Office Complex,
Saheed Nagar, Bhubaneswar – 751 007,
Odisha

Dear Sir,

Sub: Selection of Master System Integrator for implementation of Bhubaneshwar Smart City Solutions

We refer to the RFP dated [●] issued by you for Selection of Master System Integrator for implementation of Bhubaneshwar Smart City Solutions in Bhubaneswar.

We, M/s ……. [***Insert name of the Bidder***] confirm that Key Expert named below are the employees of the company on the proposal due date:
1. …….
2. …….
3. …….

Further we, M/s ……. [***Insert name of the Bidder***] confirm that Key Expert named below:
1. ……
2. …….
3. …..
4. …….

have authorized us to use their technical experience and submit their name as a Key Expert for this Proposal and Project.

If selected as the successful Bidder, we undertake that Key Experts mentioned above would be available and will provide their best services for the duration of the Contract, in accordance with the terms of the RFP and the Contract.

Name of the Bidder

…….
Signature of the Authorised Person

…….
Name of the Authorised Person

Date:
Place:

APPENDIX 18: FORMAT FOR POWER OF ATTORNEY FOR PARTNER IN CHARGE OF JOINT VENTURE / CONSORTIUM

(To be executed by all members of the Consortium)

Whereas Bhubaneswar Smart City Limited (the "Client") has invited proposals from Bidders for selection of Master System Integrator for [name of assignment] being developed under Bhubaneswar Smart City Limited (BSCL) Project, (the "Project").

Whereas, [name of Party], [name of Party] and [name of Party] (collectively the "Consortium") being Partners of the Consortium are interested in bidding for the Project in accordance with the terms and conditions of the Request for Proposal and other connected documents in respect of the Project, and

Whereas, it is necessary for the Partners of the Consortium to designate one of them as the Partner in-charge with all necessary power and authority to do for and on behalf of the Consortium, all acts, deeds and things as may be necessary in connection with the Consortium's bid for the Project and its execution.

NOW, THEREFORE, KNOW ALL MEN BY THESE PRESENTS,

We, [name of Party] having our registered office at [registered address], M/s. [name of Party], having our registered office at [registered address],and M/s.[name of Party], having our registered office at [registered address], (hereinafter collectively referred to as the "Principals") do hereby irrevocably designate, nominate, constitute, appoint and authorize M/s [name of Partner In-charge], having its registered office at [registered address], being one of the Partners of the Consortium, as the Partners In-charge and true and lawful attorney of the Consortium (hereinafter referred to as the "Attorney") and hereby irrevocably authorize the Attorney (with power to sub- delegate to any person) to conduct all business for and on behalf of the Consortium and any one of us during the bidding process and, in the event the Consortium is awarded the Contract, during the performance of the services related to the Project, and in this regard, to do on our behalf and on behalf of the Consortium, all or any of such acts, deeds or things as are necessary or required or incidental to the submission of its bid for the Project, including but not limited to signing and submission of all applications, bids and other documents and writings, accept the Letter of Acceptance, participate in bidders' and other conferences, respond to queries, submit information/documents, sign and execute contracts and undertakings consequent to acceptance of the bid of the Consortium and generally to represent the Consortium in all its dealings with the Client, and/ or any other government agency or any person, in all matters in connection with or relating to or arising out of the Consortium's bid for the Assignment and/ or upon award thereof until the Contract is entered into with the Client.

AND hereby agree to ratify and confirm and do hereby ratify and confirm all acts, deeds and things done or caused to be done by our said Attorney pursuant to and in exercise of the powers conferred by this Power of Attorney and that all acts, deeds and things done by our said Attorney in exercise of the powers hereby conferred shall and shall always be deemed to have been done by us/ Consortium.

IN WITNESS WHEREOF WE THE PRINCIPALS ABOVE NAMED HAVE EXECUTED THIS POWER OF ATTORNEY ON THIS [date in words] DAY OF [month] [year in 'yyyy' format].

SIGNED, SEALED & DELIVERED
For and on behalf of
PARTNER IN-CHARGE by:
[Signature]
[Name]
[Designation]
[Address]

SIGNED, SEALED & DELIVERED
For and on behalf of
SECOND PART (PARTNER 1) by:
[Signature]
[Name]
[Designation]
[Address]

SIGNED, SEALED & DELIVERED
For and on behalf of
THIRD PART (PARTNER 2) by:
[Signature]
[Name]
[Designation]
[Address]

SIGNED, SEALED & DELIVERED
For and on behalf of
FOURTH PART (PARTNER 3) by:
[Signature]
[Name]
[Designation]
[Address]

In presence of:

1. [Signature, name and address of witness]
2. [Signature, name and address of witness]

Notes:

1. *The mode of execution of the Power of Attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and when it is so required the same should be under common seal or official seal of all members.*

2. *Wherever required, the Bidder should submit for verification the extract of the charter documents and other documents such as a resolution/power of attorney in favour of the person executing this Power of Attorney for the delegation of power hereunder on behalf of the Bidder.*
3. *For a Power of Attorney executed and issued overseas, the document will also have to be legalised by the Indian Embassy and notarised in the jurisdiction where the Power of Attorney is being issued. However, the Power of Attorney provided by Bidder from countries that have signed The Hague Legislation Convention, 1961 are not required to be legalised by the Indian Embassy if it carries a conforming Appostille certificate.*

APPENDIX 19: TECHNICAL PROPOSAL SUBMISSION FORM

To, Dated:

Chief Executive Officer
Bhubaneswar Smart City Limited,
2nd Floor, Block – 1, BMC Bhawani Office Complex,
Saheed Nagar, Bhubaneswar – 751 007,
Odisha

RFP dated [date] for appointment of Master System Integrator for [name of assignment].

Dear Sir,

With reference to your RFP Document dated [date], we, having examined all relevant documents and understood their contents, hereby submit our Technical Proposal for selection as [name of assignment]. The Proposal is unconditional and unqualified.

We are submitting our Proposal as [Sole Bidder/ JV/Consortium] [with] [insert a list with full name and address of each Joint Venture Bidder].

If negotiations are held during the period of validity of the Proposal, we undertake to negotiate in accordance with the RFP. Our Proposal is binding upon us, subject only to the modifications resulting from negotiations in accordance with the RFP.

We understand you are not bound to accept any Proposal you receive. Further:

1. We acknowledge that Client will be relying on the information provided in the Proposal and the documents accompanying the Proposal for appointment of the Master System Integrator, and we certify that all information provided in the Proposal and in the supporting documents is true and correct, nothing has been omitted which renders such information misleading; and all documents accompanying such Proposal are true copies of their respective originals.

2. This statement is made for the express purpose of appointment as the Master System Integrator for the aforesaid Project.

3. We shall make available to Client any additional information it may deem necessary or require for supplementing or authenticating the Proposal.

4. We acknowledge the right of Client to reject our application without assigning any reason or otherwise and hereby waive our right to challenge the same on any account whatsoever.

5. We certify that in the last 3 (three) years, we have neither failed to perform on any contract, as evidenced by imposition of a penalty by an arbitral or judicial authority or a judicial pronouncement or arbitration award against the Bidder, nor been expelled from any project or contract by any public authority nor have had any contract terminated by any public authority for breach on our part.

6. We declare that:

   a) We have examined and have no reservations to the RFP, including any Addendum issued by the Client;

b) We do not have any conflict of interest in accordance with the terms of the RFQ cum RFP;

c) We have not directly or indirectly or through an agent engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice, as defined in the RFP document, in respect of any tender or request for proposal issued by or any agreement entered into with Client or any other public sector enterprise or any government, Central or State; and

d) We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf will engage in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice.

7. We understand that you may cancel the selection process at any time and that you are neither bound to accept any Proposal that you may receive nor to appoint the Master System Integrator, without incurring any liability to the Bidders.

8. We declare that we are not a member of any other Consortium/Joint Venture applying for appointment as a Master System Integrator.

9. We certify that in regard to matters other than security and integrity of the country, we or any of our affiliates have not been convicted by a court of law or indicted or adverse orders passed by a regulatory authority which would cast a doubt on our ability to undertake the Master System Integrator services for the Project or which relates to a grave offence that outrages the moral sense of the community.

10. We further certify that in regard to matters relating to security and integrity of the country, we have not been charge-sheeted by any agency of the Government or convicted by a court of law for any offence committed by us or by any of our affiliates. We further certify that neither we nor any of our consortium members have been barred by the central government, any state government, a statutory body or any public sector undertaking, as the case may be, from participating in any project or bid, and that any such bar, if any, does not subsist as on the date of this RFP.

11. We further certify that no investigation by a regulatory authority is pending either against us or against our affiliates or against our CEO or any of our Directors/ Managers/ employees.

12. We hereby irrevocably waive any right or remedy which we may have at any stage at law or howsoever otherwise arising to challenge or question any decision taken by Client in connection with the appointment of Master System Integrator or in connection with the selection process itself in respect of the above mentioned Project.

13. We agree and understand that the proposal is subject to the provisions of the RFP document. In no case, shall we have any claim or right of whatsoever nature if the Master System Integration services for the Project is not awarded to us or our proposal is not opened or rejected.

14. In the event of our being selected as the Master System Integrator, we agree to enter into a Contract in accordance with the contract prescribed in the RFP. We agree not to seek any changes in the aforesaid form and agree to abide by the same.

15. We have studied RFP and all other documents carefully. We understand that except to the extent as expressly set forth in the Contract, we shall have no claim, right or

title arising out of any documents or information provided to us by Client or in respect of any matter arising out of or concerning or relating to the selection process including the award of assignment.

16. The Financial Proposal is being submitted in a separate cover. This Technical Proposal read with the Financial Proposal shall be binding on us.

17. We agree and undertake to abide by all the terms and conditions of the RFP Document.

We remain,

Yours sincerely,

Authorized Signature [In full and initials]:

Name and Title of Signatory:

Name of Firm:

Address:

(Name and seal of the Bidder/Partner in Charge)

APPENDIX 20: TEAM COMPOSITION AND TASK ASSIGNMENTS

1. Key Experts[3]				
Name of staff	**Firm**	**Area of expertise**	**Position assigned**	**Tasks assigned**

2. Support staff				
Name of staff	**Firm**	**Area of expertise**	**Position assigned**	**Tasks assigned**

[3] Bidders, who are executing ongoing mandates with the Client, must propose a separate team of Key Experts while bidding for this project. The Key Experts proposed above should be available for presentations/ discussions /meetings with the Client, State Government etc.

APPENDIX 21: WORK SCHEDULE

A. Supply, Implementation, Integration, Testing, Commissioning and Operational Acceptance

S. No.	Activity	Months (in the form of a bar chart)							Total
		M1	M2	M3	M4	M5	M6	n	(months)
	Total								

B. Operations and Maintenance

S. No.	Activity	Months (in the form of a bar chart)							Total
		M1	M2	M3	M4	M5	M6	n	(months)
	Total								

C. Completion and submission of Reports

S. No.	Reports	Date

APPENDIX 22: UNDERTAKING FROM SUB-CONTRACTOR

{on the letter head of the subcontractor firm}

Letter No. _____ Date __/___/____

To,

Chief Executive Officer,

Bhubaneswar Smart City Limited,

Block – 1, 2nd Floor,

BMC Bhawani Office Complex,

Saheed Nagar, Bhubaneswar – 751 007

Ref: - Request for Proposal for selection of Master System Integrator (MSI) for implementation of Smart Solutions in Bhubaneswar City

Sub: - Consent of association with _____ as sub-contractor for the referred RFP

Dear Sir,

1. I, the undersigned, confirm my agreement to associate with M/s …… (hereinafter referred to as "lead bidder") as the "sub-contractor" to submit the proposal and work for the above-captioned project.
2. I authorize the lead bidder to include my company's resume in the above referenced Project Proposal and / or forward my profile to the client for the proposal and represent me on all contractual aspects of this proposal.
3. I confirm my interest and availability to work on the projects awarded, should the lead bidder be successful in the RFP.
4. I confirm that to the best of my belief and knowledge, I have not been blacklisted by any government / semi government body or donor agency.

Yours sincerely,

Authorised Signatory of the subcontractor

Section 3. Financial Proposal (Price Schedule) - Standard Forms

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Preamble

General

1. The Price Schedules are divided into separate Schedules as follows:

    1.1 Financial Proposal Submission Form

    1.2 Grand Summary Cost Table

    1.3 Supply and Installation Cost Summary Table

    1.4 Recurrent Cost Summary Table

    1.5 Supply and Installation Cost Sub-Table(s)

    1.6 Recurrent Cost Sub-Tables(s)

    1.7 Deviation Cost Table

2. The Schedules do not generally give a full description of the information technologies to be supplied, installed, and operationally accepted, or the Services to be performed under each item. However, it is assumed that Bidders shall have read the Technical Requirements and other sections of these RFP Documents to ascertain the full scope of the requirements associated with each item prior to filling in the rates and prices. The quoted rates and prices shall be deemed to cover the full scope of these Technical Requirements, as well as overhead and profit.

3. If Bidders are unclear or uncertain as to the scope of any item, they shall seek clarification in accordance with the Instructions to Bidders in the RFP Documents prior to submitting their bid.

Pricing

4. Prices shall be filled in indelible ink, and any alterations necessary due to errors, etc., shall be initialled by the Bidder. As specified in the Bid Data Sheet, prices shall be fixed and firm for the duration of the Contract.

5. Bid prices shall be quoted in the manner indicated and in the currencies specified in ITB Clause 18. Prices must correspond to items of the scope and quality defined in the Technical Requirements or elsewhere in these RFP Documents.

6. The Bidder must exercise great care in preparing its calculations, since there is no opportunity to correct errors once the deadline for submission of bids has passed. A single error in specifying a unit price can therefore change a Bidder's overall total bid price substantially, make the bid non-competitive, or subject the Bidder to possible loss. The Client will correct any arithmetic error in accordance with the provisions of ITB Clause 31.

7. Payments will be made to the Bidder in the currency or currencies indicated under each respective item. The price of an item should be unique regardless of installation site.

1.1 Financial Proposal Submission Form

[Location]

[Date]

To

Chief Executive Officer
Bhubaneswar Smart City Limited,
2nd Floor, Block – 1, BMC Bhawani Office Complex,
Saheed Nagar, Bhubaneswar – 751 007,
Odisha

Dear Sir,

Subject: Master System Integration Services for [name of assignment].

We, the undersigned, offer to provide the Master System Integration services for [name of assignment] in accordance with your Request for Proposal dated [date] and our Proposal. Our attached Financial Proposal is for the sum of [amount(s) in words and figures].

Our Financial Proposal shall be binding upon us subject to the modifications resulting from arithmetic correction, if any, up to expiration of the validity period of the Proposal, i.e. [date].

We undertake that, in competing for (and, if the award is made to us, in executing) the above contract, we will strictly observe the laws against fraud and corruption in force in India namely “Prevention of Corruption Act 1988”.

We understand you are not bound to accept any Proposal you receive.

We remain,

Yours sincerely,

Authorized Signature [In full and initials]:

Name and Title of Signatory:

Name of Firm:

Address:

1.2 Grand Summary Cost Table

S. No	Description	Price (INR)
1.	Supply and Installation Costs (from Supply and Installation Cost Summary Table)	
2.	Recurrent Costs (from Recurrent Cost Summary Table)	
3.	Grand Totals (to Bid Submission Form)	

Name of Bidder:	
Authorized Signature of Bidder:	

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1.3 Supply and Installation Cost Summary Table

System or Subsystem number ***"Entire System procurement" [as necessary for supply, installation, and achieving Operational Acceptance of the System, specify items in the Table below, modifying, deleting, or expanding the sample line items and sample table entries as needed.]***

S. No	Subsystems / Items	Description	Supply & Installation Prices	
			Locally supplied items	Items supplied from outside the Client's Country
			INR Price	***INR*** Price
1.	Smart Traffic Management System	From Supply and Installation Cost Sub-Table 1		
2.	Smart Tracking System	From Supply and Installation Cost Sub-Table 1		
3.	Smart Parking Management System	From Supply and Installation Cost Sub-Table 1		
4.	Smart Response and Incident Management System	From Supply and Installation Cost Sub-Table 1		
5.	Smart Governance and Smart Connect	From Supply and Installation Cost Sub-Table 1		
6.	Communications Network	From Supply and Installation Cost Sub-Table 1		
7.	ICOMC	From Supply and Installation Cost Sub-Table 1		
8.	Other Items	From Supply and Installation Cost Sub-Table 1		

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S. No	Subsystems / Items	Description	Supply & Installation Prices	
			Locally supplied items	Items supplied from outside the Client's Country
			INR Price	***INR*** Price
9.	Deviation Cost	From Deviation Cost Table		
Grand Total				

Name of Bidder:	
Authorized Signature of Bidder:	

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1.4 Recurrent Cost Summary Table

System or Subsystem number: **"*Entire System procurement*"** *[as necessary for the operation of the System, specify items in the Table below, modifying the sample line items and sample table entries as needed.]*

S. No.	Subsystems / Items	Recurrent Cost Sub-Table No.	Price (INR)
1	Smart Traffic Management System		
2	Smart Tracking System		
3	Smart Parking Management System		
4	Smart Response and Incident Management System		
5	Smart Governance and Smart Connect		
6	Communications Network		
7	ICOMC		
8	Connectivity Cost from various Sub-Systems		
9	Manpower Requirement		
10	Other Items		
Sub-Total (A)			
Revenue from Wi-Fi Monetization (B)			
Revenue from Fibre Monetization (C)			
Grand Total (A – (B + C))			

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Note: Refer to the relevant Recurrent Cost Sub-Tables for the specific components that constitute the Subsystem or line item in this summary table.

Name of Bidder:	
Authorized Signature of Bidder:	

1.5 Supply and Installation Cost Sub-Table 1

System or Subsystem number: ***"Entire System procurement"***

Line item number: ***[specify: relevant line item number from the Supply and Installation Cost Summary Table (e.g., 1.1)]***

[as necessary for supply, installation, and achieving Operational Acceptance of the System, specify: the detailed components and quantities in the Sub-Table below for the line item specified above, modifying the sample components and sample table entries as needed. Repeat the Sub-Table as needed to cover each and every line item in the Supply and Installation Cost Summary Table that requires elaboration.]

Unit prices for the same item appearing several times in the table must be identical in amount and currency.

S. No.	Subsystems / Items	Unit of Measurement	Make & Model	Quantity exclusive of spares/ consumables	Unit Price		Total Price		Taxes and Duties				Total Supply + Installation Prices (including all taxes & duties)
					Supply	Installation / services	Supply	Installation / Services	Customs/ Excise Duty	VAT	Service Tax	Any other taxes/ duties	
					INR	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*
					Price	Price	Price	Price	Price	Price	Price	Price	Price
Smart Traffic Management System													
A	**Traffic Violation Detection System**												
1	TVDS Camera System including ANPR - Type 1	Per Set (one traffic lanes)		12									
2	TVDS Camera System including ANPR - Type 2	Per Set (two traffic lanes)		33									
3	TVDS Camera System including ANPR - Type 3	Per Set (three traffic lanes)		40									
4	TVDS Camera System including ANPR - Type 4	Per Set (four traffic lanes)		8									
5	Overview Camera	Per Approach		93									

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S. No.	Subsystems / Items	Unit of Measurement	Make & Model	Quantity exclusive of spares/ consumables	Unit Price		Total Price		Taxes and Duties				Total Supply + Installation Prices (including all taxes & duties)
					Supply	Installation / services	Supply	Installation / Services	Customs/ Excise Duty	VAT	Service Tax	Any other taxes/ duties	
					INR	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*
					Price	Price	Price	Price	Price	Price	Price	Price	Price
6	TVDS Local Processing Unit	Per Intersection		25									
7	Red Light Violation Detection (RLVD) Sensor	Per Leg		93									
8	TVDS Workstation	Nos.		2									
9	TVDS Server (As per Bidder's Solution)	Set											
10	TVDS Mounting Structure (As per Bidder's Solution)	Set											
11	TVDS Software	Nos.		1									
12	UPS for TVDS (As per Bidder's Solution)	Set											
B	**Automatic Traffic Counter and Classifier (ATCC)**												
1	ATCC Sensor-Type 1	Per Set (One traffic lanes)		12									
2	ATCC Sensor-Type 2	Per Set (two traffic lanes)		33									
3	ATCC Sensor-Type 3	Per Set (three traffic lanes)		40									

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S. No.	Subsystems / Items	Unit of Measurement	Make & Model	Quantity exclusive of spares/ consumables	Unit Price		Total Price		Taxes and Duties				Total Supply + Installation Prices (including all taxes & duties)
					Supply	Installation / services	Supply	Installation / Services	Customs/ Excise Duty	VAT	Service Tax	Any other taxes/ duties	
					INR	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*
					Price	Price	Price	Price	Price	Price	Price	Price	Price
4	ATCC Sensor-Type 4	Per Set (four traffic lanes)		8									
5	ATCC Workstation	Nos.		1									
6	ATCC Server (As per Bidder's Solution)	Set											
7	ATCC Mounting Structure (As per Bidder's Solution)	Set											
8	ATCC Software	Nos.		1									
9	UPS for ATCC (As per Bidder's Solution)	Set											
C	**Public Address System (PAS)**												
1	PAS Speakers	Nos.		414									
2	Ambient Noise Sensor	Nos.		207									
3	VoIP/Amplifier with Built-in DSP	Nos.		58									
4	PAS Operator Console	Nos.		1									
5	PAS Workstation	Nos.		1									
6	PAS Server	Set											
7	PAS Software	Nos.		1									
8	UPS for PAS (As per Bidder's Solution)	Set											

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S. No.	Subsystems / Items	Unit of Measurement	Make & Model	Quantity exclusive of spares/ consumables	Unit Price		Total Price		Taxes and Duties				Total Supply + Installation Prices (including all taxes & duties)
					Supply	Installation / services	Supply	Installation / Services	Customs/ Excise Duty	VAT	Service Tax	Any other taxes/ duties	
					INR	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*
					Price	Price	Price	Price	Price	Price	Price	Price	Price
D	**Dynamic Message Sign (DMS)**												
1	Dynamic Message Sign (DMS) with Controller	Nos.		20									
2	DMS Workstation	Nos.		1									
3	DMS Mounting Structure	Nos.		20									
4	UPS for DMS (As per Bidder's Solution)	Set											
E	**e-Challan System**												
1	e-Challan Application with Server, Database and Other Accessories	Nos.		1									
2	Field Device for e-Challan System	Nos.		30									
F	**Traffic Accident Recording System (TARS)**												
1	TARS Application with Server, Database and Other Accessories	Nos.		1									
2	Field Device for Recording Accident	Nos.		10									
F	**Other Hardware**												
1	Cabinets (As per Bidder's Solution)	Set											
2	Any other Hardware or Software required to meet the RFP requirements of Smart Traffic Management System (Bidder to list individual items and provide costing).	Set											

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S. No.	Subsystems / Items	Unit of Measurement	Make & Model	Quantity exclusive of spares/ consumables	Unit Price		Total Price		Taxes and Duties				Total Supply + Installation Prices (including all taxes & duties)
					Supply	Installation / services	Supply	Installation / Services	Customs/ Excise Duty	VAT	Service Tax	Any other taxes/ duties	
					INR	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*
					Price	Price	Price	Price	Price	Price	Price	Price	Price
Smart Tracking System													
A	**Automatic Vehicle Location (AVL) System**												
1	Smart Tracking Application with servers and database as per Bidder's Solution	Nos.		1									
2	Type I Workstation	Nos.		10									
3	Additional Workstation Monitor	Nos.		10									
B	**OBITS Hardware**												
1	OBU-1 for BPTSL Buses	Nos.		200									
2	OBU-2 for Emergency Vehicles												
2.1	Police Vehicles	Nos.		40									
2.2	PCR Vans	Nos.		33									
2.3	Fire Trucks	Nos.		20									
2.4	Government Ambulances	Nos.		15									
3	OBU-3 for Municipal Vehicles												
3.1	Solid Waste Vehicles	Nos.		150									
3.2	Government Water Tankers	Nos.		20									
3.3	Private Water Tankers Under Govt. Contract	Nos.		10									
4	3G/GPRS enabled SIM Cards	Nos.		488									

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S. No.	Subsystems / Items	Unit of Measurement	Make & Model	Quantity exclusive of spares/ consumables	Unit Price		Total Price		Taxes and Duties				Total Supply + Installation Prices (including all taxes & duties)
					Supply	Installation / services	Supply	Installation / Services	Customs/ Excise Duty	VAT	Service Tax	Any other taxes/ duties	
					INR	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*
					Price	Price	Price	Price	Price	Price	Price	Price	Price
C	**Passenger Information System (PIS)**												
1	PIS Application	Nos.		1									
2	19" size of Passenger Information Display at Bus Stations + UPS	Nos.		30									
3	55" size of Passenger Information Display at Terminal/Interchange + UPS	Nos.		5									
4	UPS-PIS (As per Bidder's Solution)	Nos.		35									
D	**Electronic Ticketing**												
1	ETM Application with Servers and Database	Nos.		1									
2	Handheld ticketing machine compliant with Common Payment System (CPS) requirements and inclusive of all related accessories, software to meet the requirements	Nos.		440									
3	3G/GPRS enabled SIM Cards	Nos.		440									
4	Workstation Type-I - ICOMC	Nos.		3									
5	Workstation Type-III - ETM Cashup	Nos.		2									
6	Printer - Cashup	Nos.		2									
E	**Transit Management System**												
1	Scheduling software inclusive of Servers, Database and Other Accessories	Nos.		1									

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S. No.	Subsystems / Items	Unit of Measurement	Make & Model	Quantity exclusive of spares/ consumables	Unit Price		Total Price		Taxes and Duties				Total Supply + Installation Prices (including all taxes & duties)
					Supply	Installation / services	Supply	Installation / Services	Customs/ Excise Duty	VAT	Service Tax	Any other taxes/ duties	
					INR	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*
					Price	Price	Price	Price	Price	Price	Price	Price	Price
F	**Other Requirements**												
1	Any other Hardware or Software required to meet the RFP requirements of Smart Tracking System (Bidder to list individual items and provide costing).	Set											
Smart Parking Management System													
A	**Off-street PMS Components**												
1	Entry/Exit Boom Barrier Gate	Nos.		18									
2	Entry Ticket Dispenser/Smart Card Reader/QR Code Unit	Nos.		9									
3	Entry/Exit Fixed CCTV Cameras	Nos.		18									
4	Exit Ticket Swallow/Smart Card Reader/QR Code Unit	Nos.		9									
5	Payment Workstation	Nos.		9									
6	Thermal Receipt Printer	Nos.		9									
7	Barcode Reader	Nos.		9									
8	Parking Occupancy Sensors	Nos.		1500									
9	Parking Guidance Signal	Nos.		120									
10	Parking Controller	Nos.		6									
11	Parking Availability Display Board Per Floor - Type A	Nos.		3									

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S. No.	Subsystems / Items	Unit of Measurement	Make & Model	Quantity exclusive of spares/ consumables	Unit Price		Total Price		Taxes and Duties				Total Supply + Installation Prices (including all taxes & duties)
					Supply	Installation / services	Supply	Installation / Services	Customs/ Excise Duty	VAT	Service Tax	Any other taxes/ duties	
					INR	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*
					Price	Price	Price	Price	Price	Price	Price	Price	Price
12	Parking Availability Display Board at Entry - Type B	Nos.		24									
13	MLCP Local Server and accessories	Nos.		3									
14	Server Racks	Nos.		3									
15	UPS-MLCP (As per Bidder's Solution)	Set											
B	**On-street PMS Components**												
1	Camera Based Sensors	Nos.		500									
2	Handheld Terminal (POS)	Nos.		250									
3	GSM/GPRS connectivity from Handheld to ICOMC	Nos.		250									
4	UPS-PMS (As per Bidder's Solution)	Set											
C	**Parking Management System (Central)**												
1	PMS Application Software for MLCP and On-Street	Nos.		1									
2	PMS Workstation	Nos.		1									
3	Parking Mobile Application	Nos.		1									
4	Commuter Portal Integration with Bhubaneswar One	Nos.		1									
5	e-Challan and RTO integration	Nos.		1									
6	PMS Server (As per Bidder's Solution)	Set											

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S. No.	Subsystems / Items	Unit of Measurement	Make & Model	Quantity exclusive of spares/ consumables	Unit Price		Total Price		Taxes and Duties				Total Supply + Installation Prices (including all taxes & duties)
					Supply	Installation / services	Supply	Installation / Services	Customs/ Excise Duty	VAT	Service Tax	Any other taxes/ duties	
					INR	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*
					Price	Price	Price	Price	Price	Price	Price	Price	Price
D	**Other Requirements**												
1	Any other Hardware or Software required to meet the RFP requirements of Smart Parking Management System (Bidder to list individual items and provide costing).	Set											
Smart Response and Incident Management System													
A	**Surveillance System**												
1	CCTV - Fixed	Nos.		850									
2	CCTV - PTZ	Nos.		150									
3	Network Video Recorder (As Per Bidder Solution)	Set											
4	Video Management System (VMS) including Central Application	Nos.		1									
5	PTZ Keyboard with joystick	Nos.		10									
B	**Other Requirements**												
1	Any other Hardware or Software required to meet the RFP requirements of Smart Response and Incident Management System (Bidder to list individual items and provide costing).	Set											

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S. No.	Subsystems / Items	Unit of Measurement	Make & Model	Quantity exclusive of spares/ consumables	Unit Price		Total Price		Taxes and Duties				Total Supply + Installation Prices (including all taxes & duties)
					Supply	Installation / services	Supply	Installation / Services	Customs/ Excise Duty	VAT	Service Tax	Any other taxes/ duties	
					INR	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*
					Price	Price	Price	Price	Price	Price	Price	Price	Price
Smart Governance and Smart Connect													
A	**e-Governance**												
1	Website	Set											
2	Citizen Facilitation Centre (CFC)-Hardware	Set											
3	Citizen Portal	Set											
4	Birth and Death Certificate	Set											
5	Trade Licensing	Set											
6	Right to Information (RTI)	Set											
7	Legal	Set											
8	Welfare Schemes	Set											
9	Building Plan Approval	Set											
10	Property and Holding Tax	Set											
11	Grievance/Complaint Redressal	Set											
12	Mobile Application	Set											
13	Web Based GIS	Set											
14	ArcGIS Desktop License 10.5 or Higher	Nos.		2									
15	ArcGIS online license	Nos.		1									
16	KPIs and Dashboard	Set											
17	Data Migration	Set											

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S. No.	Subsystems / Items	Unit of Measurement	Make & Model	Quantity exclusive of spares/ consumables	Unit Price		Total Price		Taxes and Duties				Total Supply + Installation Prices (including all taxes & duties)
					Supply	Installation / services	Supply	Installation / Services	Customs/ Excise Duty	VAT	Service Tax	Any other taxes/ duties	
					INR	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*
					Price	Price	Price	Price	Price	Price	Price	Price	Price
18	Any other Hardware or Software required to meet the RFP requirements of e-Governance Modules (Bidder to list individual items and provide costing).	Set											
B	**ERP**												
1	Revenue from Property Taxes, Land Leases & Other services	Set											
2	Finance and Management Accounting	Set											
3	Purchasing & Inventory Management	Set											
4	e-Procurement	Set											
5	Contracts Management	Set											
6	Operations, Maintenance and Asset Lifecycle Management	Set											
7	Projects and Works Management	Set											
8	HR and Payroll System	Set											
9	Water Utility Management and Billing	Set											
10	Electrical Utility Management and Billing	Set											
11	Foundation Layer (Including Middleware, SOA,BPM, single sign	Set											

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S. No.	Subsystems / Items	Unit of Measurement	Make & Model	Quantity exclusive of spares/ consumables	Unit Price		Total Price		Taxes and Duties				Total Supply + Installation Prices (including all taxes & duties)
					Supply	Installation / services	Supply	Installation / Services	Customs/ Excise Duty	VAT	Service Tax	Any other taxes/ duties	
					INR	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*
					Price	Price	Price	Price	Price	Price	Price	Price	Price
	on and integration with LDAP)												
12	Enterprise Content Management (ECM) System/ Document Management System	Set											
13	Integration and Interfaces	Set											
14	Data Migration	Set											
15	Any other Hardware or Software required to meet the RFP requirements of ERP Modules (Bidder to list individual items and provide costing).	Set											
C	**Solid Waste Management System**												
1	RFID Reader	Nos.		152									
2	RFID Tag	Nos.		350									
3	Bin Volume Sensors	Nos.		350									
4	Sensor Processing Unit	Nos.		350									
5	Static Weigh Bridge (SWB)	Nos.		2									
6	Barrier Gate	Nos.		2									
7	ANPR Cameras	Nos.		2									
8	CCTV - Fixed	Nos.		2									
9	CCTV - PTZ	Nos.		2									
10	SWM Workstation	Nos.		2									

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S. No.	Subsystems / Items	Unit of Measurement	Make & Model	Quantity exclusive of spares/ consumables	Unit Price		Total Price		Taxes and Duties				Total Supply + Installation Prices (including all taxes & duties)
					Supply	Installation / services	Supply	Installation / Services	Customs/ Excise Duty	VAT	Service Tax	Any other taxes/ duties	
					INR	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*
					Price	Price	Price	Price	Price	Price	Price	Price	Price
12	Any other Hardware or Software required to meet the RFP requirements of Solid Waste Management System (Bidder to list individual items and provide costing).	Set											
D	**Multi-Services Digital Kiosks**												
1	Integrated Multi-Services Digital Kiosks	Nos.		150									
2	Stand-alone Multi-Services Digital Kiosks	Nos.		50									
3	Any other Hardware or Software required to meet the RFP requirements of Multi-Services Digital Kiosks (Bidder to list individual items and provide costing).	Set											
E	**Education and Healthcare Management**												
1	Smart Classroom Solution including all Hardware and Software	Set											
2	Early Childhood Care Centres (E3C) including all Hardware and Software	Set											
3	e-Primary Healthcare System including all Hardware and Software	Set											
4	Upgradation of existing Auxiliary Nurse Midwife (ANM) sub-centre	Set											

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S. No.	Subsystems / Items	Unit of Measurement	Make & Model	Quantity exclusive of spares/ consumables	Unit Price		Total Price		Taxes and Duties				Total Supply + Installation Prices (including all taxes & duties)
					Supply	Installation / services	Supply	Installation / Services	Customs/ Excise Duty	VAT	Service Tax	Any other taxes/ duties	
					INR	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*
					Price	Price	Price	Price	Price	Price	Price	Price	Price
F	Any other Hardware or Software required to meet the RFP requirements of Multi-Services Digital Kiosks (Bidder to list individual items and provide costing).												
1	Any other Hardware or Software required to meet the RFP requirements of Smart Governance and Smart Connect (Bidder to list individual items and provide costing).	Set											
Communications Network													
A	**Fibre Optic Infrastructure including Network Electronics**												
1	HDPE Duct												
1.1	Set of 4x40mm inside one HDPE outersleeve	Mtrs.		480,000									
1.2	1x20mm	Mtrs.		200,000									
2	Trenching	Mtrs.		680,000									
3	Handhole with Cover	Nos.		2,267									
4	Manhole	Nos.		340									
5	Fibre Optic Cable (FOC)												
5.1	48 Count FOC	Mtrs.		480,000									
5.2	12 Count FOC	Mtrs.		200,000									
6	UTP Cat 6 Armoured Cable (As per Bidder's Solution)	Set											
7	Fibre Optic Splice Closure (FOSC)	Nos.		340									
8	Optical Connectors (As per Bidder's	Set											

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S. No.	Subsystems / Items	Unit of Measurement	Make & Model	Quantity exclusive of spares/ consumables	Unit Price		Total Price		Taxes and Duties				Total Supply + Installation Prices (including all taxes & duties)
					Supply	Installation / services	Supply	Installation / Services	Customs/ Excise Duty	VAT	Service Tax	Any other taxes/ duties	
					INR	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*
					Price	Price	Price	Price	Price	Price	Price	Price	Price
	Solution)												
9	Fibre Optic Patch Cords (As per Bidder's Solution)	Set											
10	Fibre Distribution Management System (FDMS)	Nos.		7									
11	Fibre Termination Panel (FTP)												
11.1	48 Count FTP	Nos.		7									
11.2	12 Count FTP	Nos.		2,000									
12	Intelligent Patch Panel Management Hardware with Software (As per Bidder's Solution)	Set											
13	Communication Cabinets with Racks	Nos.		25									
14	Junction Boxes	Nos.		2,000									
15	Ethernet Switch and Router												
15.1	Layer 2 - Type I: Industrial Grade Field Switch	Nos.		2,000									
15.2	Layer 3 - Type I: Backbone Ethernet Switch/Router	Nos.		35									
15.3	Layer 3 - Type II: Core Router and Internet Router	Nos.		4									
15.4	Layer 3 - Type III: Server/Workstation Connectivity Ethernet Switch	Nos.		7									

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S. No.	Subsystems / Items	Unit of Measurement	Make & Model	Quantity exclusive of spares/ consumables	Unit Price		Total Price		Taxes and Duties				Total Supply + Installation Prices (including all taxes & duties)
					Supply	Installation / services	Supply	Installation / Services	Customs/ Excise Duty	VAT	Service Tax	Any other taxes/ duties	
					INR	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*
					Price	Price	Price	Price	Price	Price	Price	Price	Price
16	Media Converter (As per Bidder's Solution)	Set											
17	Wireless Gateway	Nos.		5									
18	Fibre Asset Management System	Set											
19	Network Management System (NMS)	Nos.		1									
20	Enterprise Management System (EMS) including Helpdesk	Set											
21	Rodent Repellent System	Set											
22	Any other Hardware or Software required to meet the RFP requirements of Fibre Optic Infrastructure including Network Electronics (Bidder to list individual items and provide costing).	Set											
B	**City Wide Wi-Fi System**												
1	Wi-Fi Access Point with Controller	Nos.		1800									
2	Wi-Fi Management System	Nos.		1									
3	Wi-Fi Server	Set											
4	Any other Hardware or Software required to meet the RFP requirements of City Wi-Fi System (Bidder to list individual items and	Set											

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S. No.	Subsystems / Items	Unit of Measurement	Make & Model	Quantity exclusive of spares/ consumables	Unit Price		Total Price		Taxes and Duties				Total Supply + Installation Prices (including all taxes & duties)
					Supply	Installation / services	Supply	Installation / Services	Customs/ Excise Duty	VAT	Service Tax	Any other taxes/ duties	
					INR	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*
					Price	Price	Price	Price	Price	Price	Price	Price	Price
	provide costing).												
C	**Environmental Monitoring System**												
1	Environmental Sensors-Hardware and Software	Nos.		4									
2	Digital Display Screen (DDS)	Nos.		2									
3	Any other Hardware or Software required to meet the RFP requirements of Environmental Monitoring System (Bidder to list individual items and provide costing).	Set											
D	**Smart Poles**												
1	Smart Poles	Nos.		20									
2	Any other Hardware or Software required to meet the RFP requirements of Smart Poles (Bidder to list individual items and provide costing).	Set											
E	**Other Requirements**												
1	Any other Hardware or Software required to meet the RFP requirements of Communication Network (Bidder to list individual items and provide costing).	Set											

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S. No.	Subsystems / Items	Unit of Measurement	Make & Model	Quantity exclusive of spares/ consumables	Unit Price		Total Price		Taxes and Duties				Total Supply + Installation Prices (including all taxes & duties)
					Supply	Installation / services	Supply	Installation / Services	Customs/ Excise Duty	VAT	Service Tax	Any other taxes/ duties	
					INR	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*
					Price	Price	Price	Price	Price	Price	Price	Price	Price
ICOMC													
A	**Command and Control Centre**												
1	16 x 4 Video Wall Cubes with Controller (70" each)	Nos.		1									
2	3 x 2 Video Wall Cubes with Controller (70" each)	Nos.		3									
3	Display Content Management System (DCMS) or Video Wall Management System	Nos.		1									
4	70" Monitor Display	Nos.		12									
5	Collaboration System	Nos.		5									
6	Teleconference Phone with Speakers	Nos.		17									
7	Video Conferencing System	Nos.		5									
8	Other Monitors (24")	Nos.		40									
9	Ceiling Speakers	Nos.		120									
10	Room Control System including Panel	Nos.		9									
11	Operator Console	Nos.		40									
12	Operator Workstations	Nos.		20									
13	Task Lights	Nos.		138									
14	Multi-Functional Printers including	Nos.		2									

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S. No.	Subsystems / Items	Unit of Measurement	Make & Model	Quantity exclusive of spares/ consumables	Unit Price		Total Price		Taxes and Duties				Total Supply + Installation Prices (including all taxes & duties)
					Supply	Installation / services	Supply	Installation / Services	Customs/ Excise Duty	VAT	Service Tax	Any other taxes/ duties	
					INR	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*
					Price	Price	Price	Price	Price	Price	Price	Price	Price
	Scanner												
15	Contact Centre Solution (For Helpdesk)	Set											
16	Network Time Protocol based Digital Clock	Nos.		2									
17	Matrix Switcher	Nos.		5									
18	Wireless Microphone System	Nos.		2									
19	Audio Processor (As per Bidder's Solution)	Set											
20	Audio Distribution Amplifier (As per Bidder's Solution)	Set											
21	Audio Extractor (As per Bidder's Solution)	Set											
22	Distribution Amplifier (As per Bidder's Solution)	Set											
23	AV Auto Switcher	Nos.		5									
24	USB KVM Extender	Nos.		20									
25	Communication Cabinets with Racks (As per Bidder's Solution)	Set											
26	Local On-Site Server (As per Bidder's Solution)	Set											
27	Smart City Platform	Set											
28	ICOMC Civil Works including	Sqft.		50,000									

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S. No.	Subsystems / Items	Unit of Measurement	Make & Model	Quantity exclusive of spares/ consumables	Unit Price		Total Price		Taxes and Duties				Total Supply + Installation Prices (including all taxes & duties)
					Supply	Installation / services	Supply	Installation / Services	Customs/ Excise Duty	VAT	Service Tax	Any other taxes/ duties	
					INR	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*
					Price	Price	Price	Price	Price	Price	Price	Price	Price
	interiors, electrical, mechanical, structural, communications, fire, etc.												
29	Fire Detection and Suppression System (In ICOMC, Operations Rooms & Rach Room)	Set											
30	CCTV System (In ICOMC, Operations Rooms & Rack Room)	Set											
31	Access Control System (In ICOMC, Operations Rooms & Rack Room)	Set											
32	Water Leak Detection System (In ICOMC, Operations Rooms & Rack Room)	Set											
33	Rodent Repellent System(In ICOMC, Operations Rooms & Rack Room)	Set											
34	Operation Area: Operator Desk, Chair and Storage	Nos.		115									
35	Large Board Room - 20 seater	Nos.		1									
36	Board Room - 12 Seater	Nos.		4									
37	Cabins - 3 Seater	Nos.		18									
38	Setting up of temporary command & control centre	Set											
39	Dismantling and relocation of temporary command & control centre	Set											

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S. No.	Subsystems / Items	Unit of Measurement	Make & Model	Quantity exclusive of spares/ consumables	Unit Price		Total Price		Taxes and Duties				Total Supply + Installation Prices (including all taxes & duties)
					Supply	Installation / services	Supply	Installation / Services	Customs/ Excise Duty	VAT	Service Tax	Any other taxes/ duties	
					INR	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*
					Price	Price	Price	Price	Price	Price	Price	Price	Price
	to permanent location												
40	Any other Hardware or Software required to meet the RFP requirements of Command and Control Centre (Bidder to list individual items and provide costing).	Set											
B	**Building Management System (BMS)**												
1	Building Management System (BMS)	Set											
2	Any other Hardware or Software required to meet the RFP requirements of BMS (Bidder to list individual items and provide costing).	Set											
C	**GIS Platform**												
1	GIS Platform	Set											
2	Any other Hardware or Software required to meet the RFP requirements of GIS Platform (Bidder to list individual items and provide costing).	Set											
D	**Data Hosting**												
1	WAN/Internet Router (As per Bidder's Solution)	Set											
2	Data Centre TOR (Top of the Rack)	Set											

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S. No.	Subsystems / Items	Unit of Measurement	Make & Model	Quantity exclusive of spares/ consumables	Unit Price		Total Price		Taxes and Duties				Total Supply + Installation Prices (including all taxes & duties)
					Supply	Installation / services	Supply	Installation / Services	Customs/ Excise Duty	VAT	Service Tax	Any other taxes/ duties	
					INR	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*
					Price	Price	Price	Price	Price	Price	Price	Price	Price
	Switch (As per Bidder's Solution)												
3	Servers (As per Bidder's Solution)	Set											
4	Blade Chassis (As per Bidder's Solution)	Set											
5	Primary Storage (As per Bidder's Solution)	Set											
6	Secondary Storage (As per Bidder's Solution)	Set											
7	KVM Switch (As per Bidder's Solution)	Set											
8	Server Load Balancer (As per Bidder's Solution)	Set											
9	Tape Library (As per Bidder's Solution)	Set											
10	Fire Proof Enclosure (As per Bidder's Solution)	Set											
11	Any other Hardware or Software required to meet the RFP requirements of Data Hosting (Bidder to list individual items and provide costing).	Set											
E	**IT Infrastructure**												
1	Antivirus	Set											

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S. No.	Subsystems / Items	Unit of Measurement	Make & Model	Quantity exclusive of spares/ consumables	Unit Price		Total Price		Taxes and Duties				Total Supply + Installation Prices (including all taxes & duties)
					Supply	Installation / services	Supply	Installation / Services	Customs/ Excise Duty	VAT	Service Tax	Any other taxes/ duties	
					INR	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*	*INR*
					Price	Price	Price	Price	Price	Price	Price	Price	Price
2	Firewall, Web Application, UTM, DDOS, Advanced Persistent Threat Solution	Set											
3	Databases	Set											
4	Link Load Balancer	Set											
5	Server Load Balancer	Set											
6	Any other Hardware or Software required to meet the RFP requirements of IT Infrastructure (Bidder to list individual items and provide costing).	Set											
F	**Other Requirements**												
1	Any other Hardware or Software required to meet the RFP requirements of ICOMC (Bidder to list individual items and provide costing).	Set											
								TOTAL CAPEX					

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Notes:

1. *No variation shall be provided for items which are identified as LS, Set, As per Bidder's Solution.*
2. *The Bidder shall optimize the servers, storage, UPS, Cabinets and Poles required for various sub-systems as per their Solution without affecting the performance and service levels.*

3. *Any item/ material either hardware or software required to meet the functionality specified in the tender document whose related component is missing in the above table has to be accounted by the Bidder and the cost of the same is assumed to be reflected and taken care in the cost specified to the Client by the Bidder in the financial bid. The Client is liable only to pay the Contract costs as per the payment terms mentioned to the Bidder to meet all the requirements as specified in the bidding documents.*
4. *The Bidder has to modify the above indicative table and make a comprehensive list of System inventory table by including the components which the Bidder might think are relevant based on the Bidders design to meet all the bid requirements indicating the costs of the same in the financial bid.*
5. *The Bidder shall assess the quantity of spares/ consumables to meet the SLA clause mentioned in the bidding documents and shall quote the cost and quantity of spares/consumables. The evaluation will take the total cost incurred for the Client inclusive of spares/ consumables while evaluating the bids. Any item not quoted by the Bidder, shall be provided free of cost if it is found necessary to fulfil the bidding requirements during the currency of the contract.*
6. *The evaluation will take the total cost incurred for the Client inclusive of spares/ consumables while evaluating the bids which is to be included by the Bidder in the Contract cost itself.*
7. *The Contract Cost shall be inclusive of all the installation, commissioning, testing and any other costs that might be incurred by the Bidder during the duration of the contract.*
8. *The Client has the right to increase decrease the quantities and the Supply & Installation costs will be adjusted as per the unit costs indicated above.*

Name of Bidder:	
Authorized Signature of Bidder:	

1.6 Recurrent Cost Sub-Table 2

Lot number: ***"Single lot procurement"***

Line item number: ***[specify: relevant line item number from the Recurrent Cost Summary Table (e.g., z.1)]***

Currency: ***[specify: the currency of the Recurrent Costs in which the costs expressed in this Sub-Table are expressed]***

[as necessary for operation of the System, specify: the detailed components and quantities in the Sub-Table below for the line item specified above, modifying the sample components and sample table entries as needed. Repeat the Sub-Table as needed to cover each and every line item in the Recurrent Cost Summary Table that requires elaboration.]

Unit prices for the same item appearing several times in the table must be identical in amount and currency.

S. No.	Subsystems / Items	Year 1 (INR)	Year 2 (INR)	Year 3 (INR)	Year 4 (INR)	Year 5 (INR)	Year 6 (INR)	Year 7 (INR)	Sub-Total (INR)
1	Smart Traffic Management System								
2	Smart Tracking System								
3	Smart Parking Management System								
4	Smart Response and Incident Management System								
5	Smart Governance and Smart Connect								
6	Communications Network								
7	ICOMC								
8	Connectivity cost from various Sub-Systems								
8.1	Bandwidth Requirements								
a	Wi-Fi Bandwidth Requirement								
b	Bandwidth Requirement at ICOMC								
c	Other Bandwidth Requirements								
8.2	GSM/GPRS connectivity for AVL System								

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S. No.	Subsystems / Items	Year 1 (INR)	Year 2 (INR)	Year 3 (INR)	Year 4 (INR)	Year 5 (INR)	Year 6 (INR)	Year 7 (INR)	Sub-Total (INR)
9	Manpower Requirement								
10	Any Other Items								
Grand Total (INR)									

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Notes:

1. *Bidders to refer Indicative System Inventory Table (Recurrent Cost Items) for accessing the quantities in the Recurrent Cost Sub-table 2 above.*
2. *The financial evaluation would however be done basing on the Net Present Value (NPV) concept for the entire contract period at a discount rate mentioned in bid data sheet.*

   Only as an Example,

Bidders	CAPEX	OPEX Cost							Total Bid Price
		Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr. 6	Yr. 7	
Bidder 'X'	355	30	31	32	32	32	33	45	**590**
Bidder 'Y'	325	30	34	35	37	39	40	50	**590**

Bid Evaluation (NPV Method): - (Discounting Rate = 10%)

$$\text{Bidder 'X'} = 355 + \frac{30}{(1+0.1)^1} + \frac{31}{(1+0.1)^2} + \frac{32}{(1+0.1)^3} + \frac{32}{(1+0.1)^4} + \frac{32}{(1+0.1)^5} + \frac{33}{(1+0.1)^6} + \frac{45}{(1+0.1)^7}$$

= **Rs. 515.4 Cr.**

$$\text{Bidder 'Y'} = 325 + \frac{30}{(1+0.1)^1} + \frac{34}{(1+0.1)^2} + \frac{35}{(1+0.1)^3} + \frac{37}{(1+0.1)^4} + \frac{39}{(1+0.1)^5} + \frac{40}{(1+0.1)^6} + \frac{50}{(1+0.1)^7}$$

= **Rs. 504.4 Cr.**

3. *The above costs should be inclusive of all expenses, over-heads, GPRS communication, etc. and covering the entire scope as per the tender document during the Maintenance Period.*

4. *The recurrent costs shall also be calculated to meet the SLA's specified in the Section 5 – Technical Requirements for the Contract Period.*
5. *The Bidder is not allowed to quote a Unit Rate for an Operations Item for a subsequent year to be lower than the Unit Rate of the current year; it can utmost be equal if not higher than the current year.*
6. *The Bidder should indicate supply and installation/ services cost separately wherever applicable for each line item of the "1.6 Recurrent Cost Sub-Table 2" in the same table.*
7. *The Client has the right to increase decrease the quantities and the recurrent cost will be adjusted as per the unit costs indicated above.*

Name of Bidder:	
Authorized Signature of Bidder:	

1.7 Deviation Cost Table

Item Nos	RFP Clause No.	Details of Deviation	Cost for Increase or Decrease for Unconditional Withdrawal of each Deviation	
			Locally supplied items	Items supplied from outside the Client's Country
			INR	*INR*
Total for Prices Quoted for Unconditional Withdrawal of the deviation Given in Appendix 10				

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Notes:

1. *The Bidder shall quote the price for unconditional withdrawal of each deviation given in Appendix 10.*
2. *The deviation mentioned in the form of the Statement of Deviation (Appendix 10), but not quoted the price in Price Schedule No. 1.7 above for unconditional withdrawal of such deviation, shall be considered as unconditionally withdraw with no financial and time implications.*
3. *The Client reserves the right to accept or reject any deviation proposed by the Bidder at the price quoted by the Bidder above. Then the Contract price will be adjusted accordingly.*

Name of Bidder:	
Authorized Signature of Bidder:	

Section 4. Corrupt and Fraudulent Practices

4.1 The Bidders and their respective officers, employees, agents and advisers shall observe the highest standard of ethics during the selection process. Notwithstanding anything to the contrary contained in this RFP, the Client shall reject a Proposal without being liable in any manner whatsoever to the Bidder, if it determines that the Bidder has, directly or indirectly or through an agent, engaged in corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice (collectively the "Prohibited Practices") in the selection process. In such an event, the Client shall, without prejudice to its any other rights or remedies, forfeit and appropriate the Performance Security, if available, as mutually agreed genuine pre-estimated compensation and damages payable to the Client for, *inter alia,* time, cost and effort of the Client, in regard to the RFP, including consideration and evaluation of such Bidder's Proposal.

4.2 Without prejudice to the rights of the Client under Clause 4.1 hereinabove and the rights and remedies which the Client may have under the LOA or the Contract, if a Bidder is found by the Client to have directly or indirectly or through an agent, engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice during the selection process, or after the issue of the LOA or the execution of the Contract, such Bidder shall not be eligible to participate in any tender or RFP issued by the Client during a period of 2 (two) years from the date such Bidder is found by the Client to have directly or through an agent, engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice, as the case may be.

4.3 For the purposes of this Clause 4.3, the following terms shall have the meaning hereinafter respectively assigned to them:

(a) "corrupt practice" means (i) the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence the action of any person connected with the selection process (for avoidance of doubt, offering of employment to or employing or engaging in any manner whatsoever, directly or indirectly, any official of the Client who is or has been associated in any manner, directly or indirectly with the selection process or the LOA or has dealt with matters concerning the Contract or arising therefrom, before or after the execution thereof, at any time prior to the expiry of 1 year from the date such official resigns or retires from or otherwise ceases to be in the service of the Client, shall be deemed to constitute influencing the actions of a person connected with the selection process; or (ii) save as provided herein, engaging in any manner whatsoever, whether during the selection process or after the issuance of the LOA or after the execution of the Contract, as the case may be, any person in respect of any matter relating to the Project or the LOA or the Contract, who at any time has been or is a legal, financial or technical consultant/adviser of the Client in relation to any matter concerning the Contract;

(b) "fraudulent practice" means a misrepresentation or omission of facts or disclosure of incomplete facts, in order to influence the selection process;

(c) "coercive practice" means impairing or harming or threatening to impair or

harm, directly or indirectly, any persons or property to influence any person's participation or action in the selection process;

(d) "collusive practices" is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party[4];

(e) "undesirable practice" means (i) establishing contact with any person connected with or employed or engaged by the Client with the objective of canvassing, lobbying or in any manner influencing or attempting to influence the selection process; or (ii) having a conflict of interest; and

(f) "restrictive practice" means forming a cartel or arriving at any understanding or arrangement among Bidders with the objective of restricting or manipulating a full and fair competition in the selection process.

[4] For the purpose of this sub-paragraph, "parties" refers to participants in the procurement or selection process (including public officials) attempting either themselves, or through another person or entity not participating in the procurement or selection process, to simulate competition or to establish prices at artificial, non-competitive levels, or are privy to each other's bid prices or other conditions.

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Abbreviations

Terms	Definition
AAA	Authentication, Authorization, and Accounting
ACD	Automatic Call Distributor
ADF	Automatic Document Feeder
ADS	Active Directory Services
AFCS	Automatic Fare Collection System
AGC	Automatic Gain Control
AHU	Air Handling Units
AIDS	Acquired Immune Deficiency Syndrome
AMC	Annual Maintenance Contract
AMD	Advanced Micro Devices
AMI	Advanced Meter Infrastructure
AMR	Automatic Meter Reading
ANI	Automatic Number Identification
ANPR	Automatic Number Plate Recognition
ANSI	American National Standards Institute
AOC	ADSL Overhead Charge
API	Application Program Interface
ARP	Address Resolution Protocol
ARV	After Repaired Value
ASC	Auto Signal Compensation
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASTM	American Society for Testing and Materials
ATCC	Automatic Traffic Counting & Classification System
ATP	Acceptance Test Procedures
ATR	Action Taken Reports
ATSC	Adaptive Traffic Signal Control
AVC	Advance Video Coding
AVI	Audio Video Interleave
AVL	Automatic Vehicle Locater
AVLS	Automatic Vehicle Location System
AWG	American Wire Gauge
BBSR	Bhubaneswar
BDA	Bhubaneswar Development Authority
BDC	Bus Display Console
BGP	Border Gateway Protocol
BIFMA	Business and Institutional Furniture Manufacturers Association
BIS	Bureau Of Indian Standard
BMC	Bhubaneswar Municipal Corporation
BMP	Bitmap

Terms	Definition
BMS	Building Management System
BOOTP	Bootstrap Protocol
BOQ	Bill of Quantities
BPEL	Business Process Execution Language
BPM	Business Process Management
BPR	Business Process Reengineering
BPSK	Binary Phase Shift Keying
BPTSL	Bhubaneswar Puri Transport Services Ltd.
BSCL	Bhubaneswar Smart City Limited
BTC	Bhubaneswar Town Centre
BTCD	Bhubaneswar Town Centre District
BTP	Bhubaneswar Traffic Police
BTU	British Thermal Unit
CAD	Computer Aided Dispatch
CAT 6	Category 6
CATV	Cable Television
CBR	Constant Bit-Rate
CCD	Charge Coupled Device
CCITT	Consultative Committee on International Telephone & Telegraph
CCK	Complementary Code Keying
CCTV	Closed Circuit Television
CDMA	Code Division Multiple Access
CDP	Comprehensive Development Plan
CDRW	Compact Disc Re-Writable
CEO	Chief Executive Officer
CERT	Computer Emergency Response Team
CFC	Citizen Facilitation Centre
CFS	Call For Service
CHO	City Health Officer
CIF	Common Intermediate Format
CIFS	Common Internet File System
CIP	Construction In Progress
CLI	Caller line identification
CLID	Caller Identification
CLIR	Connected Line Identification Restriction
CMDB	Configuration Management Database
CMOS	Complementary Metal-Oxide Semiconductor
CNIP	Calling Number Identification Presentation
CNIR	Calling Number Identification Restriction
COLP	Connected Line Identification Presentation
COTS	Commercial Off The Shelf

Terms	Definition
CPC	Common Payment Card
CPS	Common Payment System
CPU	Central Processing Unit
CRCA	Cold Rolled Close Annealed
CRI	Colour Rendering Index
CRM	Customer Relationship Management
CSA	Canadian Standards Association
CSV	Comma Separated Values
CTI	Computer Telephony Integration
CTRL	Control
CTS	Combined Tactical Systems
DBMS	Database Management System
DC	Data Centre
DCMS	Display Content Management System
DDC	Digital Direct Controller
DEO	Data Entry Operator
DFDL	Data Format Description Language
DHCP	Dynamic Host Configuration Protocol
DIMM	Dual In-Line Memory Module
DIY	Do-it-Yourself
DLP	Defect Liability Period
DLPTM	Digital Light Processing Technology
DMS	Dynamic Message Sign
DNIS	Dialled Number Identification Service
DNS	Domain Name Service
DOB	Date Of Birth
DOS	Days of Services
DRC	Disaster Recovery Centre
DRP	Disaster Recovery Plan
DRS	Disaster Recovery Site
DSCP	Differentiated Services Code Point
DSP	Digital Signal Processor
DSSS	Direct-sequence spread-spectrum
DTS	Dream Team Sahara
DVD	Digital Video Disc
DVI	Digital Visual Interface
DWG	AutoCAD drawings
EAI	Enterprise Application Integration
EAL	Evaluation assurance level
ECB	Emergency Call Box
ECC	Error Connecting Code

Terms	Definition
ECM	Enterprise Content Management
ECMA	European Computer Manufacturers Association
ECMS	Enterprise Content Management System
EGOV	e-Governance
EIA	Electronic Industries Alliance
EIRP	Effective Isotropic Radiated Power
EMAIL	Electronic Mail
EMS	Enterprise Management System
EMV	Europay, MasterCard and Visa
EPABX	Electronic Private Automatic Branch Exchange
EPC	Evolved Packet Core
EPR	Ethylene Propylene Rubber
ERP	Enterprise Resource Planning
ESB	Enterprise Service Bus
ESD	Electrostatic Discharge
ESI	Employee's State Insurance
ESQL	Extended Structured Query Language
ESRI	Economic And Social Research Institute
ETA	Estimated Time of Arrival
ETD	Estimated Time of Departure
ETM	Electronic Ticketing Machine
ETS	Educational Testing And Assessment
ETSI	European Telecommunications Standards Institute
FAT	Factory Acceptance Test
FCC	File Client Cache
FCR	Field Call Report
FCU	Fan Coil Unit
FDMS	Fibre Distribution and Management System
FIFO	First In, First Out
FOB	Freight on Board
FPMPMI	Flat Panel Monitor Physical Mounting Interface
FPS	Frames Per Second
FSB	Front side Bus
FTP	File Transfer Protocol
GAAP	Generally Accepted Accounting Principles
GIF	Graphics Interchange Format
GIS	Geographic Information System
GOI	Government of India
GPI	General Purpose Interface
GPRS	General Packet Radio Service
GPS	Global Positioning System

Terms	Definition
GRE	Generic Routing Encapsulation
GRN	Goods Received Note
GSM	Global System for Mobile Communications
GST	Goods and Services Tax
GTFS	General Transit Feed Specification
GUI	Graphical user interface
HBA	host bus adapter
HDCP	High-bandwidth Digital Content Protection
HDD	hard disk drive
HDLC	High-Level Data Link Control
HDMI	High-Definition Multimedia Interface
HDTV	High Definition Television
HHC	Hand Held Computers
HRM	Human resource management
HRMS	Human Resource Management System
HSD	High Speed Diesel
HTML	Hypertext Markup Language
HTTP	Hyper Text Transfer Protocol
HTTPS	Hyper Text Transfer Protocol Secure
HVAC	Heating, ventilation and air conditioning
IAT	Installation Acceptance Tests
ICDS	Integrated Child Development Services
ICMP	Internet Control Message Protocol
ICOMC	Intelligent City Operations and Management Centre
ICT	information and communications technology
IEC	International Electrotechnical Committee
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
IGMP	Internet Group Management Protocol
IMAP	Internet Message Access Protocol
INR	Indian Rupee
IOS	iPhone Operating System
IPFIX	Internet Protocol Flow Information Export
IPS	Intrusion Prevention System
IPT	Intermediate Para Transit
IPTS	Integrated Public Transport System
IRE	Institute of Radio Engineers
IRIG	Inter-Range Instrumentation Group
ISDN	Integrated Services Digital Network
ISI	Indian Standard Institute
ISO	International Organization for Standardization

Terms	Definition
ISP	Internet Service Provider
ITIL	Information Technology Infrastructure Library
ITMS	Integrated Transport Management System
ITS	Intelligent Transportation System
IVD	Infraction Vehicle Data
IVR	Interactive Voice Response
IVRS	Interactive Voice Response System
JBB	JAVA Business Benchmark
JDBC	Java Database Connectivity
JMS	Java Message Service
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
JPEG	Joint Photographic Experts Group
JSON	JavaScript Object Notation
JSR	Java Specification Request
KML	Keyhole Markup Language
KMPL	Kilometers Per Litre
KPI	key performance indicator
KVA	Kilo Volt Ampere
KVM	keyboard, video and mouse
LACP	Link Aggregation Control Protocol
LAN	local area network
LCD	Liquid Crystal Display
LCV	Light Commercial Vehicle
LDAP	Lightweight Directory Access Protocol
LED	Light Emitting Diode
LIFO	Last In First Out
LLDP	Link Layer Discovery Protocol
LMS	Land Management System
LNA	Low Noise Amplifier
LPM	Litre Per Minute
LPU	Local processing unit
LTO	Linear Tape-Open
MAC	Media Access Control
MAF	Manufacturers Authorization Form
MAV	Multi Axle vehicle
MCB	Miniature Circuit Breaker
MCBF	Mean Cycle between Failure
MCH	Maternal and Child Health
MCTS	Mother Child Tracking System
MDT	Mobile Data Terminal
MED	Media Endpoint Discovery

Terms	Definition
MHZ	Megahertz
MIB	Management Information Bases
MIME	Multipurpose Internet Mail Extensions
MIMO	Multiple Input, Multiple Output
MIS	Management information system
MJPEG	Motion joint photographic Experts group
MLCP	Multilevel Car Parking
MLP	Mobile Location Protocol
MMS	Multimedia Messaging Service
MOV	Metallic Oxide Varistor
MPEG	Moving Picture Experts Group
MRI	Meter Reading Instruments
MRP	Material requirements planning
MSI	Master System Integrator
MSL	Moisture Sensitivity Level
MSW	Municipal Solid Waste
MTBF	Mean Time Between Failure
MTTR	Mean Time to Repair
NABL	National Accreditation Board for Testing and Calibration Laboratories
NAT	Network address translation
NEMA	National Electrical Manufacturers Association
NFC	Near Field Communication
NFPA	National Fire Prevention Association
NFS	Network File System
NIC	network interface card
NIST	National Institute of Standards and Technology
NMAM	national municipal accounting manual
NMMP	National Mission Mode Project
NMS	Network Management System
NOC	Network Operation Centre
NPCI	National Payments Corporation of India
NREGA	National Rural Employment Guarantee Act
NTCIP	National Transportation Communications for Intelligent Transportation
NTP	Network Time Protocol
NTS	Network Time Server
NVR	Network Video Recorder
OBITS	ON-BOARD ITS
OBU	On-Board Unit
OCEF	Optical Cable Entrance Facility
OCR	Optical Character Recognition
ODBC	Open Database Connectivity

Terms	Definition
ODMS	Odisha Disaster Management System
OEM	Original Equipment Manufacturer
OFC	Optical Fibre Cable
OFDM	Orthogonal frequency-division multiplexing
ONVIF	Open Network Video Interface Forum
OPS	Open Pluggable Specification
ORSAC	Odisha Space Application Centre
OSD	On Screen Display
OSDC	Open Science Data Cloud
OSPF	Open Shortest Path First
OSRTC	Orissa State Road Transport Corporation
OTA	Over The Air
OTP	One Time Password
PAS	Public Announcement System
PAT	Prototype Acceptance T
PCC	Power Control Centre
PCI	Peripheral Component Interconnect
PCM	Pulse Code Modulation
PCP	Phencyclidine
PCR	Police Control Room
PCV	Police Control Vans
PDF	Portable Document Format
PEAP	Protected Extensible Authentication Protocol
PHP	Personal Home Page
PIO	Public Information Officer
PIS	Public Information System
PIT	Pre-Installation Testing
PKDA	Puri Konark Development Authority
PKI	Public Key Infrastructure
PLC	Programmable Logic Controller
PMC	Puri Municipal Corporation
PMS	Parking Management System
PNG	Portable Network Graphics
POE	Power over Ethernet
POI	Point of Interest
POP	Point of Presence
POS	Point of Sale
PPB	Parts per Billion
PPM	Parts per Million
PPP	Public Private Partnership
PRA	Probabilistic Risk Assessment

Terms	Definition
PRI	Primary Rate Interface
PSD	Photoshop Image
PSTN	Public Switch Telephone Network
PTS	Public Transport Solution
PTZ	Pan-Tilt-Zoom
PVC	Polyvinyl Chloride
QAM	Quadrature Amplitude Modulation
QIP	Qualified Institutional Placement
QOS	Quality of Service
QPI	Quick Path Interconnect
QPSK	Quadrature Phase Shift Keying
QSIG	Q Signalling
RADIUS	Remote Authentication Dial-In User Service
RAID	Redundant Array of Inexpensive Disks
RAM	Random Access Memory
RCA	Root Cause Analysis
RCC	Reinforced Cement Concrete
RCH	Residential Care Homes
REST	Representational State Transfer
REXEC	Remote Execution
RFC	Request For Comments (Standard)
RFID	Radio Frequency Identification
RFP	Request For Proposal
RFQ	Request for Quotation
RGB	Red Blue Green
RHEL	Red Hat Enterprise LINUX
RIP	Routing Information Protocol
RLVD	Red Light Violation Detection
RMON	Remote Monitoring
RMS	Root Mean Square
ROM	Read Only Memory
RPM	Revolutions per Minute
RSH	Remote Shell
RSS	Really Simple Syndication
RSTP	Rapid Spanning Tree Protocol
RTA	Regional Transportation Agency
RTC	Real Time Clock
RTF	Rich Text Format
RTI	Right to Information
RTO	Regional Transport Office
RTP	Real-time Transport Protocol

Terms	Definition
RTSP	Real Time Streaming Protocol
RTU	Remote Terminal Unit
RTV	Real Time Video
S/PDIF	Sony/Philips Digital Interconnect Format
SAN	Storage Area Network
SAS	Statistical Analysis System
SAT	System Acceptance Test
SATA	Serial Advanced Technology Attachment
SCADA	Supervisory Control And Data Acquisition
SCN	Security camera network
SCP	Security Certified Program
SCR	Smart Card Reader
SCSI	Small Computer System Interface
SCU	Single Control Unit
SDHC	Secure Digital High Capacity
SDK	software development kit
SDLC	Software Development Life Cycle
SFP	Small Form-factor Pluggable
SFTP	Secure File Transfer Protocol
SIF	Source Input Format
SIM	Subscriber Identity Module
SIP	Session Initiation Protocol
SIT	System Integration Testing
SLA	Service Level Agreement
SLB	Security Loader Block
SMA	Service Maintenance Agreement
SMPS	Switched-Mode Power Supply
SMS	Short Message Service
SMTP	Simple Mail Transfer Protocol
SNMP	Simple Network Management Protocol
SNTP	Simple Network Time Protocol
SOA	Service-Oriented Architecture
SOAP	Simple Object Access Protocol
SPL	Sound Pressure Level
SPV	Special Purpose Vehicle
SQL	Software Queueing Language
SRS	Software Requirement Specifications
SSD	Solid-State Drive
SSH	Secure Shell
SSID	Service Set Identifier
SSL	Secure Sockets Layer

Terms	Definition
SSO	Single Sign-On
STI	Speech Transmission Index
STPI	Software Technology Parks of India
SVC	Scalable Video Coding
SVGA	Super Video Graphics Array
SWG	Standard Wire Gauge
TACACS	Terminal Access Controller Access Control System
TAT	Turn Around Time
TCP	Transmission Control Protocol
TDM	Time-Division Multiplexing
TDS	Tax Deducted at Source
TELNET	Telecommunications Network Protocol
TFA	Treated Fresh Air
TFT	Thin-Film Transistor
TFTP	Trivial File Transfer Protocol
THD	Total Harmonic Distortion
TIA	Telecommunications Industry Association
TIFF	Tagged Image File Format
TLS	Transport Layer Security
TMC	Traffic Management Centre
TOR	Terms Of Reference
TOS	Traffic Operation System
TPC	Transaction Processing Council (Benchmarking)
TPM	Trusted Platform Module
TRAI	Telecom Regulatory Authority of India
TRD	Test Results Documentation
TSN	Time Since New
TSO	Time Since Overhaul
TSP	Telecom Service Provider
TTR	Transaction Trailer
TTS	Temporary Transit Station
TVDS	Traffic Violation Detection System
TVL	TV Lines
UAT	User Acceptance Testing
UBS	Urban Bus Specification
UDP	User Datagram Protocol
UHF	Ultra-High Frequency
UID	Unique Identification Number
ULB	Urban Local Bodies
ULC	Underwriters Laboratories of Canada
UPC	Ultra-Physical Contact

Terms	Definition
UPS	Uninterrupted Power Supply
URL	Uniform Resource Locator
USB	Universal Serial Bus
USSD	Unstructured Supplementary Service Data
UTC	Universal Time Coordinated
UTP	Unshielded Twisted Pair
VAT	Value Added Tax
VBR	Variable Bit-Rate
VCR	Video Cassette Recorder
VDW	Voice Directed Warehousing
VESA	Video Electronics Standards Association
VFD	Variable Frequency Drive
VGA	Video Graphics Array
VHMD	Vehicle Health Monitoring and Diagnostic
VIP	Very Important Person
VLAN	Virtual Local Area Network
VMS	Video Management System
VOC	Volatile Organic Compounds
VPN	Virtual Private Network
WAN	Wide Area Network
WAV	Waveform Audio File Format
WBS	Work Breakdown Structure
WDR	Wide Dynamic Range
WEEE	The Waste Electrical and Electronic Equipment (Directive)
WIN	Windows
WIP	Work in Progress
WRIS	Water Resource Information System
WSDL	Web Services Description Language
WSRP	Web Services for Remote Portals
WTP	Wireless Transaction Protocol
WYSIWYG	What You See What You Get
XAUTH	Extended Authentication
XLPE	Cross Linked Polyethylene insulation
XLS	Excel Spreadsheet (Microsoft file Extension)
XML	Extensible Markup Language

1. Introduction

1.1. Overview

The city of Bhubaneswar has been selected to be developed into a smart city under 1st phase of the Smart Cities Mission launched by MoUD. For the Smart City, the Intelligent City Operation and Management Centre (ICOMC) will provide the digital platform for integration and delivery of citizen-centric functions spanning across mobility, common payment system, utilities and services. Bhubaneswar Smart City Limited (BSCL) is soliciting a Proposal to supply, install, commission, operate and maintain solutions integrated at ICOMC to support the smart city initiative of Bhubaneswar (henceforth referred to as “Smart Solutions” project). BSCL intends to engage a System Integrator to provide a total package solution that includes system software and hardware, required field and central equipment/hardware, installation, integration, communication technology, operations and comprehensive maintenance as described herein for a complete, turnkey deployment of the Smart Solutions project in Bhubaneswar. The system shall be integrated with other external modules at a central command centre and provide real-time decision support for achieving the smart city vision.

While “Smart City” is a ubiquitous term found everywhere nowadays, there is no single unambiguous definition of Smart City Concept. The definition that City of Bhubaneswar is adopting is: “A smart city is characterized by the integration of technology into a strategic approach to sustainability, citizen well-being, and economic development” by Navigant Research.

1.2. Project Background

Bhubaneswar is the capital city of the Orissa and also familiar as the “Temple City”, it has a unique position by virtue of the ability to seamlessly integrate its rich cultural heritage with a strong regional economic base. Designed by German architect Otto Königsberger, Bhubaneswar became the capital city of Odisha in 1949 by replacing Cuttack. Bhubaneswar also plays an important role as a regional gateway to the Golden Tourist Triangle of Puri, Konark, and Chilika Lake. The city is currently acting as a hub for technical education & healthcare hub with the presence of national level institutes like KIIT, KISS, AIIMS, Apollo, etc. Steel Hub (Kalinga Nagar), Petro Chemical Hub (Paradeep) and the Golden Tourism Triangle (Puri, Konark, Chilika) form the chief regional economic drivers for the city of Bhubaneswar. Bhubaneshwar is also one of the IT investment region with population just around 1 million shows the potential of growth for the employment in this region.

The Bhubaneswar-Cuttack metropolitan area has a population of around 1.7 million in 2011 of which Bhubaneswar Municipal Corporation area has around 0.84 million population in 2011. As per projections, there are around 9.7 lakh population in BMC area in 2015. The below exhibit shows the demographics and boundaries of BMC (Bhubaneswar Municipal

Corporation) and BDA (Bhubaneswar Development Authority) of the Bhubaneswar City. The core city of Bhubaneswar is in BMC area and is well connected with the other parts of the country through National Highways, Railway Line and through air.

Exhibit 1: Map showing the boundary of BDA and BMC

The population of Bhubaneswar city has grown from 6.47 lakh to 8.4 lakh population in 2011 with a decadal growth rate of 29.4% according to the census. While the BDP area has a population of 1.3 million. The city is connected with national Highways NH-5, NH-9 and NH-42.

1.3. Client

Odisha state government formed the Special Purpose Vehicle (SPV), Bhubaneswar Smart City Limited (BSCL), to initiate the implementation of projects under the Smart City Mission in the city. The SPV is a registered under the Companies Act 2013 as a limited enterprise. SPV is headed by the Chief Executive Officer (CEO). It has 10 government directors and 5 independent directors who are known experts.

Exhibit 2: BSCL Structure

1.4. Project Context

The India Smart Cities Challenge saw Bhubaneswar finishing first among 98 Indian cities. In a first of its kind competition among cities where people were put at the centre of the planning process, Bhubaneswar came out with flying colours because of its extensive public participation, detailed area-centric plans and robust pan-city proposal. The vision identified through citizen participatory process for Bhubaneswar is as follows:

VISION

Bhubaneswar, through participatory decision-making, responsible governance and open access to information and technology, to be a:

1. **Transit oriented city** with a compact urban form that promotes active, connected and sustainable mobility choices
2. **Liveable city** providing diverse range of housing, educational and recreational opportunities; while enhancing its heritage, arts and traditional communities
3. **Child-friendly city** providing accessible, safe, inclusive and vibrant public places
4. **Eco-city** co-existing in harmony with nature for nurturing a resilient, clean, green, and healthy environment
5. **Regional economic centre** attracting knowledge based enterprises and sustainable tourism activities by leveraging and empowering its institutions, local businesses and informal workforce

The Smart city proposal for Bhubaneswar has two components in which one is the pan city proposal and the other is the area based development (ABD) proposal. The six modules/components that formed the city's Pan City Proposal are illustrated in Exhibit 3.

Exhibit 3: Pan City Proposal Components.

The Central Control Centre is planned to be an Intelligent City Operations and Management Centre (ICOMC) that will integrate all the pan city components and city services, including the seamless integration of ABD, Bhubaneswar Town Centre District's (BTCD's), utility operations requirements. ICOMC shall serve as a strategic location/tool for converging multiple ICT and IoT led initiatives by different agencies for ensuring efficient delivery of citizen services by:

- Providing digital platform for integration and delivery of citizen-centric functions spanning across mobility, parking, incident & emergency management, common payment system, E-Governance & ERP Services, etc.
- Provide evidence based decision making and responsive operational controls facilitated by this centre resulting in better G2C services and inter-sectoral collaboration.
- Managing and presenting the right data to the right stakeholders at the right time, ICOMC shall act as a catalyst to deliver transformative efficiency gains and innovation that will benefit residents.

1.5. Project Objectives

The Smart Solutions Project shall provide efficiencies and decision support analytics to the Client in support of making Bhubaneswar into a Smart City by:

- Supporting the concept of integrated transportation management by delivering a high quality, sustainable and integrated transportation system for Bhubaneswar.

- Providing quick access to information to travellers, operators and decision makers to identify alternatives and deal with incidents & emergencies.
- Establishing transit as an alternate to ownership model through tracking, schedule adherence, traveller information, maintenance management, common payment systems and data analytics.
- Enhancing transparency, accessibility and efficiency of municipal functions through E-Governance, ERP and other smart solutions providing integrated operations and operator management.
- Developing effective solutions to city operations problems and providing a means of delivering opportunity for all through smart use of technology across the city.
- Supporting high quality communication networks for reducing the digital divide and enhancing resident's quality of life.
- Ushering the era of cashless society through city-wide common payment system.
- Implementing open data policies and standard operating procedures (SOPs) for empowering citizens, changing how Bhubaneswar city government works, creating an innovation culture in the city, and improving the delivery of public services.

1.6. Bid Purpose

The purpose of this tender is for the Bhubaneswar Smart City Limited (BSCL) to enter into a contract with a qualified firm for the Supply, Installation, Integration, Commissioning, Operations and Maintenance of integrated solutions to support the smart city initiative of Bhubaneswar (henceforth referred to as "Smart Solutions" project).

BSCL is looking to engage a Proponent:

- Who brings strong implementation experience in smart city integration and operations through integrated, multi-agency coordination platform
- Who can develop Standard Operating Procedures for the various components of the project
- Who brings forth expertise for traffic management, incident and emergency management
- Who has experience in deploying CAD-AVL systems for transit operations, emergency response systems and supporting pre-emption & TSP at signals
- Who has deployed citizen interfaces (E-government & ERP) for streamlining and municipal functions from citizen perspective
- Who has experience implementing city-wide ICT and surveillance system coupled with using the said systems efficiently through data analytics
- Who can provide smart education and smart health-care systems for residents of Bhubaneswar
- Who has a quality control plan in place to demonstrate that all equipment is tested and passed prior to shipping
- Who is capable of providing high quality installations of the project equipment

- Who is capable of maintaining and operating the complex smart city systems to provide maximum decision making support and performance of the systems
- Who will provide strong capacity building for the government and other staff and end-to-end support for the smart city solutions

This tender is designed to provide interested Bidder's with sufficient basic information to submit proposals meeting minimum requirements, but is not intended to limit a proposal's content or exclude any relevant or essential data. Bidders are at liberty and are encouraged to expand upon the specifications to evidence superior bid understanding and service capability.

2. Existing Conditions

The Pan City Proposal of Bhubaneswar Smart City consists of six components which is illustrated in Exhibit 4. The six components are namely: Two of the main components of the Pan City Proposal, namely, (1) Traffic Management, (2) Transit Operations, (3) Parking Management, (4) Common Payment Cards, (5) Emergency Response & Incident Management, and (6) Central Control Centre. As per the Pan City Proposal, the Central Control Centre is planned to be an Intelligent City Operations and Management Centre (ICOMC) that will integrate all the pan city components and city services, including the seamless integration of Bhubaneswar Town Centre District's (BTCD's) utility operations requirements.

Traffic Signal System from the Traffic Management Component was procured separately. Similarly, the Common Payment Card is being procured as separate project.

Exhibit 4: Bhubaneswar Smart CITY Proposal – PAN City Components

2.1. Smart Traffic Management System

A brief description of the current situation for Traffic Management, which shall be referred as Smart Traffic, is as follows:

2.1.1. Traffic Signals

In January 2017, contract was issued to Envoys Pvt Ltd. for installation of a CoSiCoSt based Adaptive Traffic Signal Control (ATSC) system based on WiTrac controller and solar based power for 58 signalized intersections, 14 pelican signals and 5 blinkers. A map of these intersections is provided in Exhibit 5, while a listing of the junctions is provided in Exhibit 6.

At present, signals are present at 23 junctions which will all be replaced by the ATSC system. The ATSC project is a nine month project.

Exhibit 5: Location of Signals

List of Intersections			
1	Hanspal Chowk ***	39	Siripur Chowk
2	Puri NH By-Pass ***	40	Governor House Chowk
3	Palasuni Chowk ***	41	Power House Chowk
4	Priya Hotel Chowk Rasulgarh	42	120 Battalion Chowk
5	Rasulgarh Chowk	43	Shastri Nagar Chowk
6	Satya Nagar flyover Junction In Cuttack Road	44	The World / Behera Sahi Chowk
7	Laxmi Sagar Chowk	45	Jaydev Vihar
8	Railway Station Road Chowk	46	XIMB Chowk
9	Chintamani Chowk	47	Nalco / Kalinga Hospital Chowk
10	Badagada Junction/Chowk	48	Damana Chowk
11	Kalpana/Fire Station Chowk	49	Press Club Chowk
12	Museum / BMC Chowk	50	Patia Chowk
13	BJB Nagar Chowk	51	KIIT Chowk
14	Ravi Talkies Chowk	52	Infocity Chowk
15	Garage Square	53	Near Iscon Temple Underpass ***
16	Daya River Chowk	54	CRP Chowk
17	Mausima Chowk	55	DAV School Chowk
18	VaniVihar Chowk	56	Fire Station / Baramunda Chowk
19	Rupali Chowk	57	Delta Chowk
20	Maharishi College Chowk	58	City Womens College Chowk
21	Ram Mandir Junction / Satya Nagar	59	Khandagiri Chowk
22	Shriya Talkies Chowk	60	Jagamara Chowk
23	Master Canteen Chowk	61	Kalinga Studio Chowk
24	Rajmahal Chowk	62	Info Valley Junction ***
25	Sishu Bhaban Chowk	63	Sai Temple Chowk
26	Forest Park / EkamraChowk	***Note: *** Blinkers Locations***	
27	Acharya Vihar Chowk		
28	Ananda Bazar Chowk		
29	IPICOL Road Chowk		
30	Nicco Park Chowk		
31	Red Cross / Patel Nagar Chowk		
32	Housing Board Chowk		
33	Rabindra Mandap Chowk		
34	PMG Chowk		
35	AG Chowk		
36	Capital Hospital Chowk		
37	Airport Chowk / Soor Company Chowk		
38	Ganga Nagar Chowk		

Exhibit 6: List of Intersections for Signalization, Pelicans & Blinkers

2.1.2. Surveillance:

Currently, 28 intersections in the city are monitored using 133 CCTV cameras.

- CCTV command and Control Centre monitors these cameras 24 x 7.
- 8 staff work per shift and 3 shifts a day.
- Daily recordings are written in CD and sent to the office of ACP traffic for records and further action.

CCTV command and Control Centre.

- Traffic Police staff manually record the vehicle number of the traffic violators.
- Manual violation detection (replaying video) is being carried out by a team of three traffic police staff working in two shifts.
- Vehicle numbers are cross checked in the RTO database to get the owners details.
- On an average, around 150 challans are sent via snail mail, of which only 60% of the violators are paying fines.
- On ground, 8 to 10 officers monitor traffic movement and around 500-600 challans are issued to the violators on a daily basis.

2.1.3. Automatic Number Plate Recognition (ANPR)

- Only at one location, AG Chowk, Automatic Number Plate Recognition (ANPR) system has been installed. On an average, 60 red light violations are detected daily using ANPR system.

2.1.4. Chalan

- Currently Traffic Police are using manual chalans for enforcement

2.1.5. Accident Database

- Accident information is obtained through FIR forms.

2.2. Smart Tracking System

This component now envisions to incorporate all tracking needs of the city in a single user interface with connections to respective applications for detailed operations management. The systems requiring tracking to achieve the needs of the Smart Solutions project were identified as: (1) Public Transit Vehicles (BPTSL buses); (2) Emergency Vehicles consisting of Police Cars, Police Control Vans, Ambulances and Fire Trucks; (3) Municipal Vehicles consisting of Solid Waste vehicles, Water Tankers, Cess Pool Vehicles, etc. The existing conditions for these systems are briefly described here. The Public Transit System is described in greater detail since a complete operations management system for transit shall be provided by the bidder as part of this component.

2.2.1. Public Transit

Bhubaneswar-Puri Transport Services Limited (BPTSL) is the Special Purpose Vehicle (SPV) responsible for planning, contracting, and monitoring & enforcing the public bus transport operations for the city of Bhubaneswar and to the neighbouring cities of Puri, Cuttack and Khodra. BPTSL is under the Housing and Urban Development department of Government of Odisha. The SPV is under joint partnership of stakeholders: BDA (40%),

BMC (40%), OSRTC (10%), PKDA (5%), and PMC (5%). The entire operations of the public bus transport is being managed by Dream Team Sahara (DTS) under the Net cost model of PPP contract with BPTSL since August 2010. The contract was made for 7 years. BPTSL is planning on staying with the operator model, but most likely will move to a Gross Cost or a Hybrid model. A parallel effort to develop a City Bus Modernization Plan (CBMP) is underway from BPTSL which will provide the direction that BPTSL will be taking for its growth.

The infrastructure for city bus service include buses, bus queue shelters, bus depots, bus terminals, etc. BPTSL service covers important places such as Master Canteen, NandanKanan, airport, Kalinga Vihar, SUM hospital etc. with a fleet size of 165 buses. The various types of buses in the fleet are shown below:

Bus Type	Number of Buses	Make	Intended Capacity of Each Bus (Seating + Standing)
Standard Non AC Bus	55	TATA	44+11 = 55
Standard AC Buses	12	TATA	44+11 = 55
Midi Non AC	70	SWARAJ MAZDA	32+8 = 40
Midi Non AC	28	TATA	28+8 = 36
Total	**165**	**-**	

DTS operates 70 buses within Bhubaneswar city and remaining buses are operated to neighbouring cities of Cuttack, Puri, Khorda and Jada. Among the currently available fleet, the operator for 20 buses is yet to be selected. Hence, the operating fleet size is 145 buses currently. Out of total 165 buses, 125 buses were procured in 2010-11 (about 6 years old) and remaining buses were procured in 2014-15 (1-2 years old).

Exhibit 7: Bus stops where bus queue shelters are present (in green points) in BMC area.

There are around 483 bus stops present in on the bus routes of BPTSL in which only 98 stops (including left and right side bus stops at each location) have bus queue shelters. These bus shelters are developed by BMC on PPP mode and these are being maintained by private parties.

BPTSL has limited staff of five to oversee the operations and all other activities are being managed by DTS. The DTS has staff for conductors, drivers and maintenance personnel. DTS is also performing some of the activities such as bus washing through outsourcing mode.

Currently BPTSL has only one bus depot at Pokhariput with around 5 acres. A review of the current operations is as follows:

- Not all the buses park at bus depot after the end of trips. Some of the buses parks on open lands and also on sides of roads.
- Minor repairs are carried out at Master Canteen and Major repair activities are undertaken at Pokhariput depot. Major repairs and overhauls are outsourced to contractors identified by DTS due to lack of proper facilities and tools at depots.
- Currently, bus cleaning facilities are available at Pokhariput depot and Master Canteen bus terminal. Cleaning activities are outsourced.
- DTS has identified seven (7) High Speed Diesel (HSD) vendors in the city for fuel filling. Fuel filling takes place at the end of the day's trip or during lunch break when no passengers are on-board.

There are three bus terminals present in Bhubaneshwar from where the city bus service operate the routes. They are,

- Master Canteen
- Chandrashekharpur
- Ghatikia

Last two are majorly used as night shelter. The operations administrations and scheduling, dispatching of vehicles on to routes, tickets issue, cash depositing from trip, traffic operations statistics keeping happens at terminals. The privately owned city buses also uses these terminals

There are not much penetration of ITS into the transit operations in Bhubaneshwar. The digital passenger information display boards are present in buses procured in 2014. Currently, DTS holds the following the digital infrastructure.

- ETM machines: There are around 300 ETM machines with DTS which are used for ticketing. This helps in tracking the tickets issued, trip timings and origins and destinations of the passengers.
- GPS was installed and buses used to be tracked for about a year. But, now the system is not working.

2.2.2. Emergency Services

Police Vehicles, Police Control Room Vans, Ambulances and Fire Trucks provide the emergency services in Bhubaneswar. A more detailed description of the agencies and the services are provided in the Smart Response section. The vehicles requiring location information that shall be integrated with the Smart Tracking System are as follows:

Types of Vehicles	Total Number
Police Vehicles	40
PCR Vans	33
Fire Trucks	20
Government Ambulances Servicing Bhubaneswar and Suburbs	12

2.2.3. Municipal Services

Bhubaneswar Municipal Corporation (BMC) oversees the civic functions consisting of solid waste management, water supply, cess pool services, etc. In January, an elementary tracking system was introduced for the Solid Waste Vehicles. The system shall be replaced by the requirements set forth in this RFP. A more detailed description of the solid waste system is provided in the Smart Governance and Smart Connect section of the bid document.

Oversight of these services where vehicle and resources are involved is being sought by BMC. The Smart Tracking application shall provide visibility into monitoring of process and SLAs for the various municipal vehicles.

2.3. Smart Parking Management System

Bhubaneswar Municipal Corporation (BMC) is the nodal agency responsible for providing designated parking spaces to the vehicle user. BMC has the statutory power to collect parking fee through user charges notification applied through a two Level decision making structure, namely:

- Municipal Corporation Level:

➢ Final approval authority for parking spaces within the city limit.

➢ A Section Officer maintains the parking database of the three zone offices

- Zone Level :

➢ Responsible for identifying the designated parking spots/ locations.

➢ Two ward supervisors (in each zone) have the responsibility to identify parking locations

➢ Currently there are three zones within BMC area: South East, South West and North.

BMC approved locations are bid out to selected private partners who can manage those location through competitive bidding. Currently, BMC is selecting partners for each parking location on an annual basis.

The Private partner role includes:

- Managing the parking area as per the timeline mentioned in the contract agreement. Generally, it has been for one year.
- Allowed to collect parking fees from the users as per the rates prescribed in the contract agreement.
- Keep parking area properly illuminated.
- Engage proper staff wearing BMC logo on their vest/ shirts to maintain the area.
- Take approval of parking tickets with serial number from BMC.
- Ensure not to encroach vehicular movement area for parking.

In addition, the private partner is not allowed to:

- Modify parking fees and timings.
- Construct any permanent structure within parking area.
- Use parking area for any kind of advertisement purpose or hoarding.

Lastly, Commissionerate of Police (Bhubaneswar – Cuttack) - Traffic Division, is responsible for regulating parking through imposing penalty for violation. The statutory power to collect fines for parking violation is through the Odisha Urban Police Act, 2003 & Motor Vehicle Act, 1988.

The current parking infrastructure is as follows:

- BMC has identified 78 designated on-street parking locations, including both on-street within carriageway and on-street off carriageway, within ROW.
- 14 locations are already handed over to private entity for management.
- 29 locations are going through competitive bidding process and soon those will be handed over to private entity.
- 35 designated locations are still vacant and available as free parking.
- BMC has two off street parking spaces: Bhawani Mall & Keshri Mall (Roof-top parking facilities) both are currently not opened for public.
- Currently no institutional parking area (both Govt. And Private) is used as shared parking area.

For Operation and Management of Parking Spaces:

- Currently no parking infrastructure is there except few parking board along Janpath road.
- Paper tickets are used for collecting parking fees.
- Manpower is deployed in every parking areas (approx. two people for every 100 m. area), although it varies depending upon the demand.

For Regulating Parking Spaces:

- No special person is deployed to look after parking violation.
- PCR van looks after the parking violation along with other traffic violation, while patrolling.
- Two special purpose vehicle is in operational for towing illegally parked vehicle.

As per existing studies, 90% of the Parking demand in Bhubaneswar is on-street in nature. Out of existing parking stretches, the following locations have the maximum parking occurring:

- Janpath road (Shriya Talkies to Sishu Bhawan Sq.),
- NH-5 (Acharya Vihar to Jayadev Vihar),

- Shachivalaya Marg Road (Nicco Park to Rabindra Mandap sq.), and
- Old Cuttack-Puri road (Rasulgarh to Rabi Talkies)

2.4. Smart Response and Incident Management System

Police, Fire and Ambulance service deal with the emergency management and incident response. A new common (Dial 112) number is planned as an integrated number for all these three services. These services shall be supported from the ICOMC, and the response shall be integrated from the ICOMC. Individual dispatching would occur from the respective agencies.

2.4.1. Police

Bhubaneswar-Cuttack Police Commissionerate (BCPC) is the responsible agency for VIP movements, traffic and non-traffic incident response. Currently, VIP movements are conducted through radio communication where Traffic Police manually control each major intersection. As for incident response, Traffic Police have a Dial 100 Control Centre at Police Commissionerate, Bhubaneswar-Cuttack from where dispatch functions occur. There are 33 Police Control Room (PCR) Vans dedicated to respond to distress calls received at dial 100 control centre. PCR vans are fitted with GPS-enabled Automatic Vehicle Location System (AVLS) for tracking, quick dispatch of nearest vehicle. The Control Centre solution and AVLS devices are currently provided by InterAct Public Safety Solutions.

2.4.2. Fire

The 101 Service is for Fire emergencies which is under Directorate General of Fire Service, Home Guards & Civil Defence. The department provides the response for any fire in Bhubaneswar and adjoining areas. There are total of 335 Fire Stations present across Odisha. Of which, six fire stations are present across Bhubaneswar which are located at Kalpana Square, Chandrashekaharpur, Secretariat, Balianta, Jatani and Khorda. These six fire stations consists of around 30 fire tenders. The administrative setup for Fire Services is as follows:

- Director General (DG) acts as an administrative head for the fire services.
- Inspector (IG) assists in administration to DG.
- Chief Fire Officer (CFO) looks after entire operational activities of the firefighting & rescue of the state
- Fire officer (FO) looks after administration of the fire stations under the respective jurisdiction & supervises the operational activities
- Deputy Fire Officer (DFO) supervises the operational activities & fire protection & fire preventive measures undertaken.

- Assistant Fire Officer (AFO) supervises the fire fighting protections & prevention measures at the district level.
- Station officer (SO) considered to be the first responder to all types of emergencies.

2.4.3. Ambulance

National Health Mission (NHM), Odisha is the governing body for the operation of the Emergency Medical Ambulance Service in Bhubaneswar. Dial 108 and Dial 102 Control Rooms for Ambulance Service are operated from IDCO tower, Bhubaneswar. Entire infrastructure for control room including system are owned by NHM, Bhubaneswar and operated by Ziqitza Health Care Limited. Ziqitza Health Care Limited is undertaking the operations & maintenance of the ambulance service on fixed cost on monthly basis for the period of 5 years started from March, 2013.

There are total of 420 government ambulance services operating for the entire Odisha. Out of 420, around 8 ambulances are covering BBSR urban area (BMC), 4 for BBSR rural area, 5 for Cuttack area and 8 covering Puri region.

2.5. Smart Governance and Smart Connect

2.5.1. E-Governance and ERP System

BMC has undertaken various e-governance initiatives over the past few years. The vision of the e-governance program remains:

- Implementation of technologies and processes which will ensure efficient management of resources and assets of the city
- Monitoring system to ensure timely execution of projects.
- Ensure that citizens have a good experience living in the city and interacting with BMC

To this end, a range of initiatives have been undertaken toward citizen centric services with the following agencies involved:

- OESL (OESL is the SPV of the IT department (OCAC) & ILFS technologies)
- WIPRO
- TCS
- ILFS

A list of initiatives is given in Appendix B.

Currently, another effort to track solid waste vehicles is also underway. ORSAC is undertaking a survey to Geo tag property data. This will be available from the property tax and building plan module. Other GIS surveys such as Asset mapping are not part of this RFP, but all modules have to be GIS enabled.

An analysis of the initiatives showed the following gaps:

- Multiplicity of initiatives
- Duplication of effort
- No single version of the truth
- Lack of interaction and integration between agencies
- Confusion for the citizen
- Information is not a corporate resource
- Standalone systems
- Integration points not defined
- Too many developers
- No coordination
- No integrated back office automation.
- No acceptance or usage from customer
- Mostly is automation of as-is processes.
- Some modules may be overlooked and slip thru the gaps

The MSI should assess these initiatives and reuse content.

2.5.2. Solid Waste Management System

There are about 1,300 BIN Points located in the entire BMC area. At present, the lifting of these BIN Points is being monitored through information given by Sanitary Supervisors of concerned area. Apart from the above points, monitoring of unregistered garbage points does not have a mechanism. TTS (Temporary Transit Station) Monitoring is currently done through the information given by concern officer deployed at the site. Citizen complaints on city sanitation does not having a proper mechanism to monitor the complaint redressed

status along with evidence. The above manual reporting, consolidation, analysis and taking appropriate action is time consuming thus hindering regular sanitation review / monitoring.

Authority intends to implement a GIS/GPS enabled Solid Waste Management System to automate the entire process including online tracking of waste collection vehicles, their routes, and temporary transit stations (TTS) and attendance of public health workers. Web Based Monitoring System should address monitoring of each type of waste disposal separately. MSI is required to validate the requirements given in business, functional and technical requirements with the user departments and propose a system based on the specifications provided in the RFP.

2.6. Intelligent City Operations and Management Centre (ICOMC)

Currently, there are three control centres operational in Bhubaneswar for CCTV, Dial 100 and Dial 108.

The CCTV Control room currently manages the 133 cameras that are installed in 28 traffic junctions. Each of the 133 cameras are connected with an internet bandwidth of 4 mbps. Recordings form the cameras are stored in 600 TB DVRs for a period of 1 month. After 1 month, the older recordings are overwritten. CCTV Command Centre is designed to house 35 operators per shift. Command Centre is headed by the nodal officer – ADCP. Currently, 8 operators work per shift and 1 supervisor of SI grade will monitor the operations during the 8 hour shift. Each operator is assigned set of cameras to monitor and report incidents. 24/7 operations are managed in 3 shifts of 8 hours each. Shift timings are 07:00 to 14:00; 14:00 to 22:00 and 22:00 to 07:00 hours.

Dial 108 (Ambulance) control room is operated from IDCO tower, Bhubaneswar. Entire infrastructure for control room including system are owned by NHM, Bhubaneswar and operated by Ziqitza Health Care Limited. Average response time of the ambulance is currently estimated at 20 minutes for urban areas (cities & towns), 25 minutes for semi-urban areas (BBSR rural & outer periphery of urban) and 30 minutes for Rural areas (Block & Tahseel). Response time is calculated from the time of the call received till the ambulance reaches the incident location

Dial 100 (Police) Control Centre is maintained by trained police staff located at Police Commissionerate Bhubaneswar-Cuttack There are 33 Police Control Room (PCR) Vans are dedicated to respond to distress calls received at dial 100 control centre. A team of 24 staff headed by ADCP manages the Control Centre. 24/7 operations are carried out. Peak call traffic hours are between 14:00 and 22:00, during which maximum staff are deployed to handle the calls. Operations between 22:00 and 06:00 are handled by minimum staff. Twenty one Police stations in the Bhubaneswar city limits are managed from the centre. On an average, 2,200 daily calls are handled by the staff addressing various issues and required assistance are provided.

The PCR vans are fitted with GPS-enabled Automatic Vehicle Location System (AVLS) for tracking, quick dispatch of nearest vehicle. The Control Centre solution and AVLS devices are provided by InterAct Public Safety Solutions.

All these control centres act as a standalone control centres. There is no integration anywhere between these control centres in either data or for the systems and no common platform is available to provided integrated response. Agency coordination is limited.

2.6.1. GIS Platform

One of the goals of the smart city initiative is to create a single citizen interface (similar to OneMap of Singapore) where data is available on a GIS platform. An initial effort was conducted, referred as Phase 1 effort during the Smart City Proposal development. Phase-I development is implemented by ESRI-India which basically serves the purpose of a Citizen Interface with the following Modules

- Home page
- Maps
- Themes
- Query
- Measurement
- Map Link
- Know your Ward
- Legend
- Around me
- Events
- Announcement
- Feedback
- Draw
- Heritage
- Know Your Plot
- Help

The Layers of GIS Data integrated are:

Maps Data	Source
Satellite Imagery	From ESRI Server
Street Maps	
Topographic Maps	
Bhubaneswar CDP 2030	From different Government Departments of BBSR
Revenue	
Police Jurisdiction	
Health Jurisdiction	
City Map	

Point Data	Source
Community Services	From different Government Departments of BBSR
Culture	
Education	
Emergency	
Govt Office	
Health	
Sports & Recreation	
Tourism	
Transportation	
Utility	

The hardware & Software system was setup at Odisha State Data Centre facility. While the GIS software is available through a Portal for ArcGIS with two numbers of four core License and database is SQL Server 2014 64 bit R2.

2.7. Communications Network

A Detailed Project Report (DPR) for City Wi-Fi for the city of Bhubaneswar was prepared by STPI. As per the Wi-Fi DPR, there will be 3500-5000 access points. Street light poles situated at a distance of 70m to be used as the point for access points. These access points will terminate at aggregator switch, which will be connected to Data Centre. Data Centre will comprise of core switch, network management switch, WLL and distributor switch.

Proof of Concept (PoC) was carried out at seven locations of Bhubaneswar namely Utkal university, BMC bhawan, IMFA park, SP Mukherjee Park, Biju Patnaik Park & Airport Terminal Building.

It was determined to include this component in the Smart Solutions project and include it as part of the MSI scope of services.

The city does not own any fibre-optic network. It leases lines from network service providers like everyone else.

3. Project Overview and Components

The Master System Integrator (MSI) shall be responsible for the implementing the Smart Solutions Project consisting as described in this section. The Key components of the Smart Solutions Project that the MSI shall implement that builds from the Pan City proposal are shown in Exhibit 9. Description of these components follows the illustration. The Bhubaneswar Command and Control Centre shall be an Intelligent City Operations and Management Centre (ICOMC) and shall provide a central platform for integration.

3.1. Key Stakeholders in the System

The key stakeholders that shall be the direct/indirect users of the system are:

Exhibit 8: Agencies & Stakeholders of ICOMC

Exhibit 9: Smart Solutions - Key Components

3.2. General

The bidder scope shall include the following services that shall apply across all components:

The bidder shall review and be familiar with the complete Bhubaneswar Smart City Proposal including the targets for each Pan City component. The bidder solution shall reflect ability to achieve the Smart Solutions requirements if the RFP specifications fall short in any respect.

The bidder's architecture shall provide:

- Expandability: Open ended; allows upgrading to take advantage of continued evolution in information and control systems.
- Interoperability: Machine independent; allows the largest-possible markets for deployment.
- Compatibility: Non-interference; various devices within the same system must be able to operate without interfering with the operation of other devices.
- Interchangeability: Vendor independent; devices from different vendors that perform the same functions may be interchanged.
- Open: Non-proprietary; promotes rapid development of new technologies and acceptance by consumers.
- Saleable: Flexible; standards recognize local conditions with a wide range of ITS devices and communication channel capabilities. Legacy systems are accommodated to the extent possible.
- State-of-the-art: Use of the latest & best available standards to avoid locking in obsolescent technologies.
- Comply with the published e-Governance standards, frameworks, policies and guidelines available on http://egovstandards.gov.in (updated from time-to-time)
- Bidder's solution shall adhere to the model framework of cyber security requirements set for Smart City (K-15016/61/2016-SC-1, Government of India, Ministry of Urban Development).
- Bidder shall provide integrated ICOMC Platform that shall:

➢ Integrate various agencies and smart solutions components at the ICOMC to provide efficient and integrated response to not only emergencies and incidents, but also for regular efficient functioning of the city government.

➢ Provide analytic tools build into the system that shall support automatic detection of anomalies and their quick mitigation.

➢ Support data to be published on Citizen Portal by various agencies as per the Open Data Policy.

- Shall develop Standard Operating Procedures and Open Data Policies for the Smart Solutions project to become truly functional.
- Shall support transformation of BSCL, BMC, BDA and BPTSL into digital organizations and entire process shall be IT enabled.
- Provide citizens services that shall be made available through multi channels.

3.3. Smart Traffic Management System (also called Integrated Traffic Management System)

The Smart Traffic component looks at integrated traffic management. BSCL intends to achieve the following business requirements through this component implementation:

- Enhance transportation mobility and efficiency by providing transportation facilities and services in the city that improve mobility, circulation, connectivity and reduce congestion.
- Support automated enforcement systems to enhance discipline and improve safety of road users including pedestrians and cyclists (vulnerable road users).
- Provide centrally controlled traffic management and tools for multi-agency integration for decision making and incident response in achieving the goals of the component.
- Support multi-modal transportation in the city through better understanding of network flows and transfer requirements.
- Help the city authorities understand the traffic patterns prevailing across the city helping make informed decisions for better infrastructure planning and transportation improvements
- Provide a transportation system that protects and enhances air quality by reducing GHG emissions.
- Plan and manage events in Bhubaneswar based on historical data and data analytics.
- Enable stakeholders and citizens to be abreast with all latest traffic updates in real-time including regular and critical travel advisories.
- Support integrations with other technology components for enhanced efficiency and realization of Smart City objectives/goals, including the Adaptive Traffic Signal Control System (ATSC). Integration shall support Integration shall support emergency & incident services management, transit signal priority, emergency pre-emption at signals and coordinated management.

3.3.1. Overview

The Smart Traffic Management System or Integrated Traffic Management System (ITMS) comprises of the core central software that runs on the central server computers which are physically hosted in the ICOMC. Further, the Integrated Traffic Management System has various sub-systems which have their own software which runs on the individual sub-systems and the system operator workstations. Operator workstations are located at ICOMC.

The principal function of the Central software is to identify, manage, and disseminate information about traffic and other roadway related events. To accomplish this goal, the Integrated Traffic Management System shall interface with the following field level devices deployed at strategic locations across the city:

The physical architecture of Traffic Management shall consist of the following components:

- **Field devices and sub-systems shall include:**

- Traffic Violations and Detection System (based on ANPR)
- Automatic Traffic Counting and Classification System (ATCC)
- Public Address System (PAS) System
- Dynamic Message Sign (DMS)
- E-Challan Handheld Device
- Accident Recording Device

- **Central System:**

The central system will be located at the Command and Control Centre at ICOMC in which Servers will be located to run the central software related applications and database.

Major Sub Systems of Smart Traffic System

The Integrated Traffic Management System solution shall consist of the following sub-systems:

- **Traffic Violation Detection System (TVDS):**

The TVDS System shall help the client and other stakeholders especially the Police department to manage the traffic. The TVDS shall enforce the violations by the road users which shall ultimately help in enhanced safety and traffic discipline on the roads.

TVDS which are deployed at intersection shall detect and enforce the following violations:

- Red Light Violation Detection system (RLVD)
- Zebra Crossing
- Speed Violation
- Free Left Violation
- Wrong direction movement of vehicle

TVDS which are deployed at identified mid blocks shall detect and enforce the following violations:

- Speed Violation
- Wrong direction movement of vehicle

- **Automatic Number Plate Recognition (ANPR):**

Mounted at the traffic intersections and on identified mid blocks, the system shall help in identifying the vehicles that violate traffic regulations and helps in enforcement and maintenance of traffic discipline amongst the citizens. There are several violations like Red Light Violation, speed violation, free left turn violation, zebra crossing , wrong direction violation that shall be detected and vehicles can be identified using ANPR System. The e-challan system is also integrated with the ANPR System which shall help in generating challans to errant vehicle owners.

- **Automatic Traffic Counting & Classification (ATCC):**

These devices shall provide volume, occupancy, speed, classification, headway, gap, queue length and other parameters (as defined elsewhere in this RFP) which

is archived and used for planning and traffic management. ATCC shall be installed at the identified mid blocks on road.

- **Public Address System (PAS):**

This system shall be used to announce informatory and emergency messages to the road users and will be connected to the ICOMC system application. The PAS System shall be capable of playing pre-defined audible messages from the ICOMC.

- **Dynamic Message Sign (DMS):**

DMS shall use Industry standard NTCIP communications and messages can be set and cleared or scheduled through the GIS based map interface. The operator shall view the current message in the field and status of the equipment. Through the dedicated communications system, the signs should frequently polled for status. DMS shall be installed at various locations along the city for guiding the motorists by disseminating general purpose information from ICOMC or providing real time information generated as an event response to road users from the Central application.

- **E-Challan System**

The E-Challan System shall provide a simple, digital process for giving tickets/challans to violators. Traffic and Parking violations shall be processed in the field with handheld machines, while TLVD violations will be processed in the Control Room. The E-Challan system shall provide the process to digitally and seamless send out tickets/challans and process payments through a highly user-friendly application. The front-end and back-end applications shall integrate the ICOMC platform. Users shall be able to make payments through the various options available through the Common Payment Card System (coming through a separate bidding process) like smart card, mobile, online, neighbourhood payment centres, etc.

The E-Challan system shall provide citizens with their pending tickets/challans and history online and on mobile apps in the Bhubaneswar One Citizen Interface Environment.

- **Traffic Accident Recording System (TARS)**

Traffic Accident Recording System (TARS) shall provide the accident investigator with advanced techniques in accident data storage and analysis with tools to identify blackspots, analyse root causes, and for isolating common features in accidents. A visualization package that combines advanced accident analysis with location mapping through Geographical Information Systems (GIS) shall be provided. The bidder shall provide field units (tablets or similar) for collecting the accident data (First Information Reports - FIRs), the data from which shall be transferred to ICOMC platform through 3G network or Wi-Fi. The data shall be integrated with other city-wide information on the ICOMC platform. It shall consist of:

- Accident reporting system
- Accident recording system
- Analysis of accidents

- Dissemination of data

- **ITMS Platform of ICOMC:**

The ITMS Sub platform of the ICOMC Platform shall support all the Smart Traffic Functions. It shall integrate with the external Traffic Signal Project and provide the Smart Solutions components the necessary integration to achieve the objectives and business requirements of the project. It shall provide support for the 24 hour operations and will house all the central equipment and staff. Specifically, it would be used for monitoring the Traffic Management sub-systems and providing response to road users.

A preliminary list of locations where TVDS /RLVD & PA System are to be deployed is provided in Appendix B.

3.3.2. Architecture & Data Flow

The Smart Traffic solution architecture shall be based on open protocols, interoperable and be scalable. The overall Smart Traffic System Architecture is as given below in Exhibit 10:

Exhibit 10: Smart Traffic (ITMS) Architecture

3.4. Smart Tracking System

This service application envisions a detailed Computer Aided Dispatch / Automated Vehicle Location System (CAD/AVL) that will provide the tracking, monitoring & dispatch functions for selected vehicles and resources (staff) in the various Smart Solutions components. The broad objective of the Smart Tracking system is to enhance operational efficiency, provide real-time information and support decision making. The specific business requirements intended to be achieved by the Smart Tracking System are:

Improve organizational efficiencies by:

- Process oversight by tracking of vehicles and reporting non-compliant actions;
- providing a comprehensive and tightly integrated solution to managing the organization's business functions; and
- Streamlining business processes through automation, integration and workflows.
- Improve emergency response times by integrating vehicle locations with local traffic conditions.
- Enhance decision making by

➢ Enhancing reporting capabilities;

➢ Incorporating processes based on best practices;

- Support penetration of technology by providing a user friendly and intuitive user interface to promote system use, productivity and to minimize the need for training;
- Some additional business requirements, specific to transit agency, include:

➢ Reduce leakages and enhance multi-modal transportation by supporting EMV based common payment system and mobile payments.

➢ Enhance efficiencies of BPTSL staff by:

➢ Eliminating the need for "offline shadow systems" including spreadsheets and custom databases to support financial activities;

➢ Reducing the need for redundant data entry;

➢ Improve and provide necessary reports and access to data through inquiry or drill down capabilities and auditing; and

➢ Provide interface capabilities with Microsoft Office, Share Point, etc.

- Providing centre-level (ASRTU or similar organization) reporting requirement compliance (reporting requirement to be provided at design stage);
- For the depot/transit management subsystem for BPTSL buses that shall be implemented, the requirements include:
- Improve Vehicle Maintenance: By providing systematic planning for vehicle maintenance will cut down the vehicle idle time for non-operational buses, vehicle routine maintenance, breakdown ratio shall come down, automated alert for maintenance, vehicle on time departure from depot, easy to check vehicle in/out status according to schedule time, vehicle transfer between depots/divisions in the future.
- Improve Scheduling and Planning: Having vehicle allotment for the

scheduling will be easy, crew and vehicle assignment shall be once in the system, if any changes required system shall allow them to update the changes, schedule cancellation or new schedule allocation. This reduces frequent manual intervention and error free operation.

- Improve Data Management and Reporting: Data warehousing will help BPTSL to run the hassle free operation, for example looking at the data will provide idea of cut down the schedule/trip, dead kilometres, vehicle wise KMPL or manufacture wise KMPL or driver wise KMPL, utilization of tyre and life cycle of tyre retreading, battery life, repeated issues by fleet wise of manufacture wise, vehicle utilization, accident and breakdown data, master data of crew, vehicle and other staffs, over time hours, warranty details necessary items, fuel consumption, etc.
- Facilitate Effective Management: The entire movement of the vehicle shall be recorded on the system to manage effectively. Depends on priority system shall send alerts to concerned department or staff. Each vehicle history provides usage and lifetime of the fleet to decide for scrap. Fitness certificate, road permit, insurance shall be maintained in system to track and manage smoothly, to track history of tyre lifetime to do tyre treading to minimize operational cost.
- Improve Information Accuracy: Stores module shall have history of stock, material forecasting, accurate information of spare parts, warranty details, spare tracking provides accurate information.
- Facilitate Easier Processing: System helps BPTSL to track and pay staff's salary, incentive, ESI, PF and IT in short time.
- Develop Centralized System: HR and Depot management shall use same database to maintain employee records. This is to avoid manual duplication at various places.

3.4.1. Overview

Key Agencies, Vehicles & Resources

The key agencies for which Smart Tracking is being proposed are:

- Bhubaneswar-Puri Transport Services Limited (BPTSL): Is the Special Purpose Vehicle (SPV) responsible for planning, contracting, and monitoring & enforcing the public bus transport operations for the city of Bhubaneswar and to the neighbouring cities of Puri, Cuttack and Khodra.
- Bhubaneswar Municipal Corporation (BMC): Oversees the civic functions consisting of solid waste management, water supply, cess pool services, etc. Oversight of these services where vehicle and resources are involved is being sought by BMC. The Smart Tracking application shall provide visibility into monitoring of process and SLAs for the various municipal vehicles.
- Bhubaneswar-Cuttack Police Commiserate (BCPC): Is the responsible agency for traffic and non-traffic incidents, VIP movement and emergency response.
- 108 Service: While under the Department of Health & Family Welfare, Government of Odisha; the 108 service is responsible for dispatching ambulances for emergencies.
- 101 Service: Fire department under Directorate General of Fire Service, Home Guards & Civil Defence provides the response for any fire in

Bhubaneswar and adjoining areas. Dispatch and monitoring of response times are sought by the department through smart tracking application.

The vehicle and resource categories to be covered under this package are:

- BPTSL Buses: As is well known, a good transit system will reduce the number of private vehicles on the road; especially if the transit system is coupled with a parking fees that aims at reflecting the true value of land for parking. Providing tracking and operations control for buses will provide passenger's information on next bus time of arrival leading to increase in ridership. The analytics from bus tracking data will support better decision making and increase efficiency of service. Tracking can also be used to provide conditional priority (transit signal priority) to buses at traffic signals. The depot/transit management module in the Smart Tracking service application shall support end-to-end transit operations management
- Fire & Ambulance Vehicles: Fire and ambulances shall be provided pre-emption at traffic signals to efficiently manoeuvre the city streets during emergencies. Informing the nearest emergency vehicle based on location of emergency, providing pre-emption, routing choices and green waves when required to make emergency management more efficient shall be part of the project. The Smart Tracking system shall integrate with the respective dispatch systems from these agencies.
- Police Vehicles: Providing green waves to VIP vehicles based on the Police escort vehicle travel will lead to lower manpower requirement to facilitate a green wave. It will also lower delays for other vehicles standing at the signals reducing emissions. In addition, tracking Police vehicles shall support control room staff in addressing emergency situations with greater knowledge and better understanding of the situation. Providing pre-emption, routing choices and green waves shall be part of the project.
- Municipal Vehicles: Is solid waste collected properly from the bins? Is the weight of the waste correct? Tracking of solid waste with necessary checks-and-balances can support building efficiencies into the solid waste system. Similarly, water and other municipal vehicles shall be tracked to enhance efficiencies and improve decision making. Process management of people, vehicles and other components involved shall be monitored. Decision support system that monitor process compliance, efficiencies and SLA monitoring shall be part of the project.

In addition, to support city-wide mobility platform, the following systems also may be including in the tracking system (at the cost of the operator):

- Private buses that operate like city buses
- Intermediate Para Transit (IPT) vehicles (mainly autos & e-rickshaws)
- Taxis
- Ola & Uber autos & cabs (integration on the mobility application platform)

Finally, the Smart Tracking application shall support tracking and reporting platform for vehicles like school buses. This will help parents (in the case of school buses) track the location of the bus and get to the drop-off/pickup point at the correct time instead of waiting without knowledge of the bus location. The cost of the tracking units to be borne by the School or similar agency that wishes the service.

The MSI shall be responsible only for storing and sharing the data (not required to develop the application). Servers and equipment for components not included in this bid shall be procured outside of this project. The MSI Smart Tracking application shall be able to show all the vehicles (up to fifty thousand (50,000) vehicles).

The specific elements of the system to be included in this component include:

- The On-Board ITS (OBITS) equipment

- OBU-1 for BPTSL buses shall confirm to the Urban Bus Specification II (with latest amendments) standard. IT shall consist of:
  - Single Control Unit (SCU): The SCU is at the heart of AVL equipment, the BDC and other equipment (in-bus display, cameras, etc., - if available on bus) shall be connected to the SCU. Two way voice communication between crew at bus to dispatcher at ICOMC, waypoint data transfer through GPRS connectivity to central system at data centre, events like harsh breaking, over speeding, etc., It has GPS and GPRS receiver in it with GPS & GPRS antenna exposed outside to sky to get good signal. In case of dark zone areas all the data will be stored in SCU for certain amount of period. Diagnostic logs and other files shall be stored in SCU will transfer to AVL central system at data centre.
  - Bus Driver Console (BDC): On board electronic information exchange peripheral interface to the SCU that allow crew to view and exchange information with dispatchers using the AVL central software. The BDC shall be shown the current location of the vehicle on map, next stop and distance, live stream of on board camera, emergency messages sent by dispatchers from AVL central system.
- On-Board Unit 2 (OBU-2): OBU-2 shall satisfy UBS-II requirement, but shall support form factors (size) that will fit in the emergency vehicles (Police Cars, PCR Vans, Ambulances and Fire Trucks). The Display Console with UBS-II shall allow visualization of the incident on the map along with travel time to the incident for alternate route choices. Two-way communication shall be provided.
- On-Board Unit 3 (OBU-3): OBU-3 shall provide the tracking of municipal vehicles which will mainly provide location tracking.
  - Central Smart Tracking Application shall support project and non-project vehicles of up to 50,000 on the map. The application shall consist of:
- City map with tracking of all vehicles and resources with filters to show each vehicle/resource type
- User interface supporting
  - all functionalities of transit operations management as specified in the requirements
  - Quick mapping and dispatch functions for all emergency vehicles
  - Location tracking along with route choice recommendations for emergency vehicles to reach the destinations at the earliest.
  - Alerts (route deviation, breakdowns, SOS, harsh braking, etc.) and alert management based on vehicle category
  - MIS reports by agency and requirements
  - SLA reports by agency and requirements
  - Filters and menus

- Passenger Information System for BPTSL buses providing next bus information on:

➢ Display boards
➢ Smart bus stops
➢ Other Bus stops;
➢ web,
➢ mobile (sms);
➢ mobile applications;
➢ call centre through IVRS;

- Ticketing for BPTSL buses using ETM machines as part of Transit Management System.
- Open data and data integration support in-line with the Bhubaneswar's smart city vision.

3.4.2. Architecture & Data Flow

The Smart Tracking solution architecture shall be based on open protocols, interoperable and be scalable. The smart tracking system shall enable City of Bhubaneswar to optimize scheduling, improve operation efficiency, real-time information for vehicle arrivals to users, systematized vehicle maintenance, and crew rostering. The architecture proposed for the project based on the needs, objectives and goals of the project is shown in Exhibit 11 below, a schematic of the solution is provided in Exhibit 12.

Exhibit 11: Smart Tracking Architecture

Exhibit 12: Smart Tracking Schematic with Passenger Information System

3.5. Smart Parking Management System

Goal of Smart Parking is to provide a seamless, efficient, customer-friendly, cost-effective parking operation for the Bhubaneswar City and have the capability to expand and integrate the latest technology which would include smart parking/navigational capability.

The Smart Parking business requirements are to ensure:

- Reduced Congestion through improved capacity of arterial & collector streets through regulated parking that does not block smooth movement of through traffic.
- Integrated off-street and on-street parking with advanced real-time parking availability information on-demand either through portal or mobile application to its users in order to enable them to reserve the parking spaces and make the payment for the same.
- Reduce leakages in parking through implementation of Common Payment System for paying parking charges.
- Support future parking policies and bylaws of the city through strong oversight and challaning.
- Smart Parking Management Plans shall account for event based sudden increase in demand.

To this end, the Smart Parking System shall satisfy the following objectives:

- Provide users with advanced information and guidance on portal or mobile handsets as regards availability of parking spaces in and around their destinations
- Support common payment system (CPS) being planned as a separate project in the Smart Solutions project.

- Optimise parking space usage
- Improve the efficiency of parking operations
- Enable time and location specific parking tariff to be implemented to facilitate demand management.
- Allow advance booking of a parking spot at a premium rate.
- Facilitate regulation of parking tariffs and overall strategic city parking policy
- Enable enforcement of penalties on parking violations

3.5.1. Overview

The smart parking solution is envisaged for both off-street as well as on-street facilities

- Off-street Parking Spaces include those on ground with boundary walls or multilevel car parks with a defined entry and exit points
- On-street Parking Spaces include those spaces adjoining the road or other facilities and do not have a boundary wall and defined entry and exit points. These kind of parking spaces have specified number of slots available, typically on an open ground or road.

The Smart Parking shall consist of on street/off-street parking detection sub-system, access control sub-system, information/guidance sub-system, payment management sub-system and Administration, Reporting/MIS sub-system. It enables on-line monitoring of parking areas occupancy that can serve for drivers' navigation to free/available parking spaces.

Appendix B provides the parking locations including the three Multi-level parking locations.

3.5.2. Architecture & Data Flow

The Smart Parking solution architecture shall be based on open protocols, interoperable and be scalable. Smart Parking architecture is illustrated in Exhibit 13.

Exhibit 13: Smart Parking Architecture

3.6. Smart Response and Incident Management System

The Smart Response System will be designed to support monitoring of day to day operations of the city and supplement citizen safety. The business requirements of the Smart Response system include:

- Coordinated ICOMC response to any incident or event that impacts Bhubaneswar's multimodal transportation system.
- Support Homeland Security through edge surveillance of video data.
- Provide a secure and safe environment for the residents of Bhubaneswar by using intelligent analytics and integrated platform over the surveillance system.
- Support active coordination with meteorology department to proactively react to natural disasters and emergencies.

To this end, the specific objectives of the system include:

- The objective of the Incident Management System is to generate "optimal" recommendations for the city's pro-active security and safety. The broad objectives of the system are:
- Pro-active monitoring and Surveillance;
- Citizen security and safety;
- Information dissemination;
- Incident Management.
- The incidents can be with a conditional workflow for tracking and resolution. The definition of external incidents is any disruption to the traffic, road accidents & investigations, citizen complaints, traffic escalations, court or regulatory directions etc.,. In addition to base analytics the Incident Management System shall be able to perform the following operations in providing the public services to the citizens:
- Identification of Lost, Missing, Suspect, Impounded or Hot listed objects while the vehicle is mobile or immobile (stationary or on-move);
- Identification of abandoned objects /No movement from a place for a certain period;
- Road conditions such as water log, road carpet, any obstructions such as encroachments, illegal constructions etc.,;
- Vehicle counts and Vehicular traffic patterns at critical junctions or street junctions or main roads.

The Incident Management System shall leverage the Smart Tracking System and shall be integrated with the CAD/AVL System. The system shall generate the vehicle unique identification number to search into the intra/inter departmental systems or regulatory database / information systems to identify the hot list and provide the location coordinates (long/lat coordinates) and able to generate alerts and send it to the nearest interceptors, police station, hospital and fire stations as desired by the department. The system shall store the details as tracking history for further analysis and reporting. The system shall have the capability of managing the incidents.

3.6.1. Overview

Emergency & Incident Management System shall broadly consists of the following components:

- Surveillance System: Fixed and PTZ CCTVs throughout the city for monitoring city operations;
- Emergency Call Box (ECB): To trigger the response to the emergency services such as ambulance, police, fire, etc. ECB shall be integrated with multi-services digital kiosks.
- Emergency Contact Centre System: Central System at the ICOMC to response to the emergency services.

The goal of deploying Emergency Management and Incident Response System is to allow for pro-active security rather than reactive security. Therefore, security systems must be designed and deployed in an intelligent way with a prime focus that they can curtail any security related incidents prior to its occurrence. CCTV city surveillance system is considered as an integral part of the emergency and incident management system. The CCTV surveillance system includes both fixed and PTZ cameras and will be deployed as part of the project. The surveillance system shall be provided at all strategic locations including roads, intersections, near public spaces/buildings, and other critical facilities like ICOMC, etc. MSI shall conduct a survey and prepare detailed report which shall indicate, validate and provide finalized locations, positions, mounting arrangements, height, and orientation/field of view of the CCTV cameras. It shall also be responsibility of MSI to make proper adjustments to capture best possible video/image. MSI to ensure cameras are protected from on-field challenges of weather, physical damage and theft. Integration of each CCTV cameras with central application server by providing unique ID, IP addresses etc. shall also be under MSI scope along with data encryption and data security of the videos recorded.

Emergency response intake can be done through call, mobile app or Emergency Call Box (ECB) button being deployed as part of the multi-services digital kiosks. ECBs installed in the city shall inform the relevant authority on emergency situations or any incidents for immediate response. The ECB is an integral part of the Emergency Responsive System at ICOMC. The ECB as a part of multi-services digital kiosks shall be installed at the strategic locations like malls, parks, other public places.

The Emergency Contact Centre System shall be established as part of the ICOMC in the city to empower people to connect to police and get police assistance anytime, anywhere at very short “response time”. This system shall empower people to connect to the emergency services such as Police, Fire, Ambulance service, etc. and get assistance anytime, anywhere at very short response time. The objective of the system is to receive and respond immediately to emergency calls made by the public seeking assistance by directing the emergency vehicles available for the purpose. The central application at the ICOMC shall be equipped with latest technological tools like GIS MAP, CAD (Computer aided dispatch) and GPS enabled PCR VANs, Ambulance and Fire engines to attend to handle public distress calls for services.

3.6.2. Architecture & Data Flow

The Emergency and Incident Management system shall leverage city’s fibre optic network as means of communication. For connectivity, the CCTVs and ECBs will be connected to the nearest node/POP room through a dedicated switch and fibre optic infrastructure. At the node, there will be dedicated infrastructure like Network Video Recorder (NVR) that will be connected to the CCTV surveillance system for recording purposes. From this node, the

city information in the form of live video, images and call from the citizens through the ECBs shall be backhauled and handled by the operators at the ICOMC.

The Integrated Software Platform of the Emergency Contact Centre System shall support all features required for efficiently handling all stages of a call made in emergency situation. The Computer aided dispatch (CAD) software platform integrates various modules:

- CAD framework;
- Call Reception System;
- Call Recording and Logging;
- GIS (Geographical Information System);
- AVLS (Automatic Vehicle Location System);
- Responder Systems (Mobile Data Terminals);
- Incident Reporting System;
- Video Interface (CCTV Video Integration to GIS);
- Converged Communication Platforms [PSTN, Wireless (Cell Phone), SMS, e-mail].

The following Exhibit 14 illustrates the high level architecture of the Emergency and Incident Management System:

Exhibit 14: Illustration of Emergency Management and Incident Response System

3.7. Smart Governance and Smart Connect

3.7.1. E-Governance and ERP System

The business requirements of the E-Governance & ERP system envisaged as part of the Smart Solutions project, include:

- Bhubaneswar shall have a comprehensive, adaptable, state of the art ERP system which shall automate and digitize functions of BMC, BSCL, BDA and BPTSL.

- Bhubaneswar shall have a comprehensive suite of e-Governance applications which shall provide convenient, anytime, anywhere citizen and employee services.
- Along with ERP and e-Governance system, Enterprise Content Management System, citizen engagement systems (including redressal and collaboration, contact centre), ICOMC, KPI and dashboard system and integration of all existing systems and ready framework for integration of any future system shall be implemented. All these systems shall have a tightly integrated application architecture which shall play a vital role in not only just enhancing efficiencies for city operations but also when integrated with the citizen facing e-governance applications, shall provide the benefits of a holistic solution.
- ERP and e-Governance system shall provide significant improvement in Government to Customer (G2C), Government to Employee (G2E), Government to Business (G2B) & Government-to-Government (G2G) interfaces.
- ERP and e-Governance system shall streamline, standardize electronic information gathering and access, and in-turn increase transparency, accessibility and efficiency of the stakeholder agencies.
- ERP and e-Governance system shall facilitate information reuse, across and within various departments of the stakeholder agencies.
- ERP and e-Governance system shall reduce system maintenance and training requirements by adopting standard systems and processes for the stakeholder agencies.
- ERP and e-Governance system shall provide electronic delivery of services to meet citizen expectations and requirements. Intent is to create efficiencies in the internal working of the stakeholder agencies and provide user friendly interfaces, so that the citizens shall have a trouble free experience in dealing with the city.
- ERP and e-Governance system shall support e-commerce initiatives (e.g., online filing, payments etc.).
- E-Governance and ERP system shall have continued compliance with Government frameworks including NeGP and Government of Odisha e-Governance policy, legal regulations and standards.
- E-Governance solution shall comply with the published e-Governance standards, frameworks, policies and guidelines available on http://egovstandards.gov.in (updated from time-to-time).
- E-Governance and ERP system solution shall be modular and customizable to meet the requirements of the Project.
- E-Governance and ERP system shall be scalable to accommodate future growth and support hardware and software additions and upgrades.
- E-Governance and ERP system shall have the capability for printing of all bills generated by any module.
- E-Governance and ERP system shall support integration with Aadhar card as well as digital and electronic signature for applicable services.
- E-Governance and ERP system shall support future integration with any digital government initiatives.

- Some of the functionality defined in the E-Governance and ERP system and Smart City Platform may overlap. It is the MSI's responsibility to optimize the functionality as part of his overall solution for the Project.

Estimates of data migration and transactions are given in Appendix B.

3.7.1.1. E-Governance System

Overview

Bhubaneswar Municipal Corporation (BMC) has a historic tradition of strong civic activism dedicated to the cause of a better life for all its citizens. BMC has undertaken pioneering work in various fields and perceives its role as principal provider of Health & Sanitation, Slum Development, Disaster Management, City Beautification, Citizen Services, Efficient Solid Waste Management, Underground Sewerage System, Efficient Urban Planning and Development, Online Services, Vending Zones & Parking Zones.

BMC is managing BHUBANESWAR as a mixed use area & has municipal powers and functions in this area. The municipal functions envisaged are:

- Local level governance
- Primary Collection of Solid Waste
- Maintenance of Storm Water Drains
- Maintenance of municipal roads
- Maintenance of parks, gardens and play grounds
- Primary education and medical needs
- Governance of markets, cremation grounds and slaughterhouses
- Regulating advertisements
- Allotment of Trade Licenses
- O&M of internal sewers and community toilets
- Street lighting
- Operation and Maintenance of Heritage points in the city.
- Assessment of taxes: Property tax
- Utility Payment: Payments relating to electricity, water bills
- Interaction with:

➢ Fire service

➢ Police

The revenue the BMC generates stems from the assets it manages. Illustrative examples of **assets** which exist under BMC jurisdiction are as follows:

- Properties & buildings
- Advertisement hoarding sites
- Parking lots
- Yatri niwas
- Kalyan mandap

- Water pumping stations, storage tanks, purification plants, water mains, valves and other water network assets necessary for supply of clean water to BMC users.
- Waste water drains, man-holes other waste-water network assets necessary for providing sewage facilities to BMC users.
- Storm water drains and rain harvesting pipes and equipment
- Street lights, traffic lights and other traffic management/road management equipment
- Solid waste bins and Temporary transit stations
- Sewage treatment equipment and plant.
- Vehicles and other fixed assets like furniture, buildings, office equipment

The vision of BMC is to have an efficient and citizen friendly organization. To achieve this vision, it is proposed that the MSI have a strong back-end IT application such as a COTS or reputed ERP system. The operation & maintenance functions are of prime importance to the BMC. The core ERP with work flow enabled operation and maintenance functions is essential. In addition, customized or productized modules will be required for E-municipality modules.

To optimally manage its assets and discharge its civic and municipal duty, it is proposed that an integrated IT solution be with the following logical components are implemented:

1	**Civic functions**
1.1	Solid waste
1.2	Street lighting
1.3	Storm water drains
1.4	Water & Sewerage
2	**Back office Systems: ERP system**
2.1	Revenue management modules
2.2	Finance, Accounts and budgeting
2.3	Purchasing and Inventory management
2.4	Contract management
2.5	Operation & Maintenance & Asset life cycle Management
2.6	Works & Projects
2.7	HR including personnel information system and Payroll.
2.8	Water connection
2.9	Electricity
3	**Customer Facing Systems:**
3.1	Multi-Channel Communication Centre for customers
3.2	BMC Citizen portal
3.3	E-governance functions
a	Birth & Death
b	Trade Licences

c	RTI
d	Legal
e	Welfare schemes
3.4	Property and holding tax
3.5	Building plan approval & common application form
3.6	Citizen grievance & complaints redressal
3.7	Mobile Applications
3.8	Web based GIS layer
3.9	Management Information System: KPI Dashboard
4	**Foundation Layer:**
4.1	A SOA based integration solution
4.2	Document management system including file tracking
4.3	Backup Software
5	**Integration Interfaces**
5.1	Integrated Operations Centre
5.2	Legacy modules – as specified
5.3	GIS integration
5.4	Mobile Applications
5.5	Payment gateway
5.6	E-mail &SMS
5.7	Digital Certificate
5.8	Various state systems as per implementation requirements
5.9	More systems for integration can be added during implementation

All these functions shall be addressed by a combination of the ERP system and the be-spoke e-government modules.

It is envisaged that the citizen shall interact with BMC via the portal which shall direct the query / grievance to the relevant department using work flows. Most of these services will be covered by modules of the proposed ERP. In addition, specific e-government functions will be as follows but not limited to:

- Birth & Death Certificates
- Trade Licenses
- RTI: Online filing and receipt of information relating to the Right to Information Act
- Grievance / Complaints regarding Sewerage, Garbage, Horticulture, Road Maintenance etc.
- Legal case monitoring
- Welfare schemes

BMC corporate web site and the portal through which interaction of all stakeholders and transactions will take place is the responsibility of the MSI.

There are several stand-alone IT systems created over time under the JNNURM & NMMP programs. Some of them are:

- Birth & Death
- Trade Licenses
- RTI
- Legal
- Welfare schemes
- Building plan approval & common application form
- Property tax
- Solid waste management
- Grievance redressal modules

The MSI may examine these initiatives and where possible integrate them seamlessly with the proposed solution. The specifications given in this RFP are the functional requirements of BMC and the MSI should study the same, see the efficacy of current systems and then utilize, modify or replace existing systems. The MSI has to study the working of the BMC, suggest and discuss BPR and then come to the to-be processes.

System Architecture

Proposed System Architecture for the e-governance is indicated in exhibit 15 below

Exhibit 15: System Architecture for E-Governance

3.7.1.2. ERP System

Overview

BMC recognizes the importance of IT to enhance the efficiency and effectiveness of service delivery to its citizens and stakeholders. BMC along with BSCL has set up vision to convert their organisations into a digital organisation by comprehensive deployment IT across its departments to conduct of its business. As part of the same it envisages to

- Implement technologies and processes for efficient management of resources and assets of the city
- Implement systems for electronic delivery of services to meet citizen expectations and requirements and to monitor projects for timely completion.
- Streamline and standardize electronic information gathering and access.
- Facilitate information reuse, across and within various departments of BMC and BSCL
- Reduce system maintenance and training requirements by adopting standard systems and processes for BMC and BSCL.
- Support for e-commerce initiatives (e.g., online filing, payments etc.)
- Deploy system to ensure continued compliance with Government and legal regulations and standards
- Achieve significant improvement in Government to Customer (G2C), Government to Employee (G2E), Government to Business (G2B) & Government-to-Government (G2G) interfaces.

The ERP package will drive the operational excellence at BMC, through the implementation of state of art best business practices. The salient ERP functionality requirements would include:

- Mapping the city of the Bhubaneswar, to support property tax business processes. Subsequently ensure prompt collection of annual taxes, required to fund the city operations.
- Logically representing the assets as mentioned above, as and when they are currently existing, created or acquired and ensure that the preventive, reactive and break down maintenance activities are efficiently processed. The quality of life will be dependent on service delivery for, regular sewage collection/disposal, working street lights, unclogged drains, stable power supply, adequate quality water supply, uninterrupted Internet services and well-kept parks/ playground promoting leisure activities & physical exercise.
- Electricity and Water: Customer services which are in action round the clock at the click of a mouse, addressing no current, power outage or other grievances and providing a customer statement of bills due, payments made and outstanding amounts. The businesses and cities should be able to benefit from the electronic payment means.
- Projects/Capex Expenditure: Infrastructure development will be an ongoing process and the city needs to cater for the growth in economic activity and population. The system should ensure achievement of objectives in terms of both cost and schedule management by facilitating monitoring and control of projects.
- BMC Corporate Functions: best practice implementation for Budgeting, Finance, Procurement & Stores, HR & Payroll Management.
- Outsourced Services: BMC has outsourced some areas of the city for sanitation functions. The system should ensure transparency of vendor invoices for services. Work order details for work performed and costs incurred should be available. Full traceability is required, starting from notification generated from and employee or customer, linked to a

resulting work order outsourced to the Vendor to the final closure of the call when the job is completed.

System Architecture

In order to achieve the vision, the stakeholder organizations intends to implement a comprehensive state of the art ERP application, Citizen engaging systems including Grievance Redressal, Intelligent City Operations and Management Centre (ICOMC), KPI and dashboard system, including integration with all the current systems and a ready/open framework for integration of any future systems at these organizations. System architecture for the same is illustrated below:

A tightly integrated application architecture with above applications will play a vital role in not only just enhancing efficiencies for city operations but also when integrated with the citizen facing e-governance applications, will provide the benefits of a holistic solution.

ERP system shall meet the requirements of Budgeting, Finance, Contract Management, Projects, Procurement including e-procurement, Maintenance of all equipment and customer complaints on BMC assets, Billing, HRMS and Payroll functions BMC employees. Each of these functions is elaborated further in detailed functional requirements section of this report.

ERP at Bhubaneswar is envisaged to be the system of record, and a core component of a majority of the business processes. All the master data like Customers, Properties, Vendors, Equipment, Service Tax Rates, Electric and Water supply rates, Employees & Associates, Materials, Spares, G/L accounts, Banks, Cost Centres etc. would be maintained in this system. As a part of the backbone of the systems, it is planned to have a world class commercially-off-the shelf (COTS) or widely used software package comprising of modules to address the following business functions:

- Finance, Accounts, Management Accounting and Budgeting: General Ledger, Accounts Payable, Accounts Receivable, Asset Management,

Depreciation Calculation, Over Head Costing, Work Order Costing, Investment Planning, Funds and Grants Management

- Revenue Management: Properties & buildings, Advertisement hoarding sites, Parking lots, Yatri niwas, Kalyan mandap and Vehicles amongst others
- HR and Payroll: HR Management, Payroll Management, Payroll Processing, Employee Self Service, Time and Attendance Management
- Purchasing and Inventory Management: E-Tendering, E-Procurement, Purchase Requisitions, Purchase Orders and Contracts, Receipt of Goods and Services, Invoice Receipt, Inventory and Spares Management, Vendor Master, Approval Hierarchies and MIS
- Contract Management: Contract Lifecycle from Contract drafting, review from multiple perspective, and creating a final Contract document
- Operations, Maintenance & Asset Life Cycle Management: Properties, Roads, Pipeline, Fibre Network Records, Asset/Equipment Master, Resource Master, Preventive, Predictive and Breakdown Maintenance, Notifications, Work Orders, Maintenance History Management and MIS
- Project and Works Management: Capital Investment Planning, Managing Project Schedules and Costs, Project Execution, Project Accounting
- Water Utility: Customer Service Management, New Connections, Temporary Water Connections, Automated Meter Reading, Service Management, Water Billing
- Electric Utility: Customer Service Management, New Connections, Temporary Electricity Connections, Automated Meter Reading, Service Management, Electricity Billing

The ERP modules would provide out of the box integration amongst themselves and further the ERP would be integrated with Document Management System, Payment Systems, Banks, GIS, Portal, SCADA systems, Customer Facilitation Centre, Kiosks and E-Governance system.

3.7.2. Solid Waste Management System

Following business requirements shall be met by solid waste management system:

- The smart solid waste management system shall enable the level of solid waste, recycled waste, to be remotely monitored using wireless sensors installed inside the waste bin.
- The waste collection shall then be managed via a web portal from ICOMC.
- RFID based system shall allow real-time tracking of waste collection system.

3.7.2.1. Overview

Authority is responsible for collection, segregation, transportation, dumping and processing of the city waste from door to door. Authority deals with multiple types of solid waste i.e. solid waste, construction waste, bio-medical and animal waste.

Authority or its Agency deploys vehicles for collection of door to door waste and dumping into the bins/collection points at strategic locations. From these bins/collection points separate 4 wheelers (loaders) shall carry the waste to Temporary Transit Stations (TTS) and thereafter to Solid Waste Treatment Centres. Authority and/or the Agency shall deploy field staff for street sweeping and collection of street waste and dumping to the nearest bins/collection points.

Current Scenario - There are about 1,300 BIN Points located in the entire BMC area. At present, the lifting of these BIN Points is being monitored through information given by Sanitary Supervisors of concerned area. Apart from the above points, monitoring of unregistered garbage points does not have a mechanism. TTS (Temporary Transit Station) Monitoring is currently done through the information given by concern officer deployed at the site. Citizen complaints on city sanitation does not having a proper mechanism to monitor the complaint redressed status along with evidence. The above manual reporting, consolidation, analysis and taking appropriate action is time consuming thus hindering regular sanitation review / monitoring.

Authority intends to implement a GIS/GPS enabled Solid Waste Management System to automate the entire process including online tracking of waste collection vehicles, their routes, Temporary Transit Stations (TTS) and attendance of public health workers.

Web Based Monitoring System should address monitoring of each type of waste disposal separately. MSI is required to validate the requirements given below with the user departments and propose a system based on the specifications given below.

3.7.2.2. System Architecture

3.7.3. Multi-Services Digital Kiosk

BSCL intends to achieve the following business requirements through multi-services digital kiosks:

- Multi-Services Digital Kiosk shall provide various services and information to citizens, visitors, as well as BSCL staff, integrated using one common platform.
- Multi-Services Digital Kiosk shall also be the contact point for citizens who are not connected to smart phones or e-mail.
- Multi-Services Digital Kiosk shall be deployed at strategic locations.
- Using the Multi-Services Digital Kiosk, citizens shall be able to avail multiple city services integrated via the e-governance platform plus shall provide the capability for bill payments.
- Multi-Services Digital Kiosks shall be of two types – Integrated Multi-Services Digital Kiosks and Standalone Multi-Services Digital Kiosks.
- Integrated Multi-Services Digital Kiosk shall include the following in one integrated structure – emergency call button, touch screen for citizen services with payment options (integrated with Common Payment Platform, e-wallets, debit and credit card), CPC reader (with additional security features such as PIN), bill/ticket printer, integrated CCTV, Wi-Fi and Solar Panel with batteries, plus additional space for static advertising/promotions.
- Standalone Multi-Services Digital Kiosk shall be a standalone structure with following components: touch screen for citizen services with payment options (integrated with Common Payment Platform, e-wallets, debit and credit cards), CPC reader (with additional security features such as PIN), bill/ticket printer etc.
- Multi-Services Digital Kiosk shall also include capabilities for providing services to differently abled users.

3.7.3.1. Overview

Multi-Services Digital Kiosks will be deployed across Bhubaneswar to give the citizens access to various services via one integrated platform. Two types of kiosks will be installed in Bhubaneswar – Integrated multi-services digital kiosks and Stand-alone multi-services digital kiosks.

Integrated multi-services digital kiosks will be dedicated and fixed structure which will include Wi-Fi access point, emergency call button, charging points, solar panels, access to citizen services including capabilities to make payments for citizen services and bills using touch screen and Common Payment Card (CPC) interface, CPC reader, static advertising around three (3) faces, and CCTV. Multi Services Digital Kiosks shall be installed at strategic locations such as malls, public parks, near government offices etc.

Stand-alone kiosks will be a dedicated kiosks for citizens to enable various citizen services, digital payments for citizen services using touch screens, CPC interface, capability of printing tickets/bills, CPC reader, bill/ticket printer. Stand-alone kiosks will be installed at various strategic locations such as inside government offices, malls, other important buildings etc.

3.7.3.2. Architecture

Multi-Services Digital Kiosk shall be connected with the ICOMC using the fibre optic infrastructure. A switch shall be housed inside each multi-services digital kiosk from where the data will be backhauled to the nearest POP over the fibre optic infrastructure. A

conceptual architecture for the integrated multi-services digital kiosks has been presented in Exhibit 16 below.

Exhibit 156: Multi-Services Digital Kiosk

3.7.4. Education and Healthcare Management

Project Kusum (E3C), Smart Classrooms and e-Primary Healthcare System

Bhubaneswar Smart City envisages an area based development named as Bhubaneswar Town Centre District (BTCD) spread over 985 acres in the core area of Bhubaneswar. It is planned that the pan city technological solution i.e. Intelligent City Operations and Management Centre (ICOMC) will provide certain services specifically for this area.

The aim is to provide enhanced services to residents, better monitoring and control over schools, anganwadis and Auxiliary Nurse and Midwife (ANM) Centres through IT enabled attendance, camera based surveillance, equipment based monitoring, multimedia based learning etc.

At present, there are 9 ANM centres functionally manually under the control of Bhubaneswar Municipal Corporation. Also, it planned to develop a total of 11 (eleven) Model Anganwadis in the area and develop & improve multimedia based learning in approximately 13 government schools (except Kendriya Vidyalaya) coming under the area.

Objectives

The interventions in the field of education and primary health has been categorised in the RFP as:

- e-Primary Healthcare System

- Smart Classrooms
- Project Kusum – Early Childhood Care Centres (E3C)

The business requirements under the above three interventions are as following:

- Establish 13 Smart Classrooms in Government schools.
- Establish 40 Early Childhood Care Centres (E3C) as model anganwadi centres with IT based learning and day to day regular monitoring of the centres through Intelligent City Operations and Management Centre.
- Upgradation of 9 Nos. of existing Auxiliary Nurse and Midwife (ANM) sub-centres into single point for preventive healthcare provisioning.
- e – Primary Health System: Robust IT platform for integrating citizen's record available in various public offices to their unique ID for providing health, social welfare and care.
- Integration of child's health information with e – Primary Health Initiative.
- 100% of the citizens of the BTCD area to be covered under e-Primary Healthcare system.
- Technical support in implementation of e-Primary healthcare system and strengthening of Mother Child Tracking System (MCTS).

3.8. Communications Network

The communications network for Bhubaneswar has the following business requirements:

- Reduction of the digital divide by introducing a highly accessible communication network that also supports the Smart City functions.
- Provide common high speed communications network for various government agencies in the city.
- City-wide Wi-Fi as a key offering with free access to e-Governance services for citizens and municipal workforce, enabling broadband services to be affordable and accessible.
- Robust communications network as the underlying enabler for the success of the smart solutions project.
- Generate revenue during operations for communications network to be self-sustainable.

3.8.1. Fibre Optic Infrastructure including Network Electronics

3.8.1.1. Overview

With technology being a key driver for implementation of smart city initiatives across Bhubaneshwar, a robust network is one of the key foundational requirements on which future 'Smart' initiatives shall be designed and built. Hence, an end-to-end fibre optic connectivity is envisaged as a part of this project. The planned fibre optic network infrastructure shall be capable to carry all the key services that will be implemented in due course under smart city initiatives. This dedicated fibre optic infrastructure shall be used for both BSCL and non-BSCL services (other government services and tenants). Ultimately, the BSCL fibre optic network shall be used as the underlying enabler for realizing all connectivity needs (both citizens, smart city components and sensors) to enable a digitally connected Bhubaneswar

Key business requirements of the BSCL owned fibre optic network (BSCL Network) are:

- Reliability and availability: BSCL network shall have a high degree of reliability and availability, even in the event of failed links, equipment failure, and overloaded conditions. In addition, the failure of a single link or piece of equipment should not impact the overall network performance.
- Scalability: The network shall be scalable that can grow to include new user groups and can support new applications without impacting the level of service delivered to existing users.
- Manageability and Sustainability: Once designed and developed, the BSCL available network staff must be able to manage and support the network in such a way that it functions effectively and efficiently.
- Affordability and Accessibility: The services utilizing the BSCL network shall be priced in such a way that it is affordable and within reach of the target consumers.
- Publically Available: BSCL network shall be publically available to encourage digital India and enhance broadband penetration.
- Generate Revenue: BSCL network shall be able to generate revenue for BSCL so that it is sustainable and profitable. This may be achieved by leasing dark fibre or bandwidth (of BSCL network) to other agencies.
- Ownership: BSCL Network shall become an asset to the City with all ownership under the control of BSCL.
- It is envisaged that the end-to-end fibre optic based network shall be owned by BSCL. The MSI shall build this network during the course of the Contract. However, as an interim connectivity, the MSI may leverage telecom connectivity from different ISPs to meet the overall project communications and implementation timeline requirements.
- Fibre optic infrastructure shall fulfil connectivity needs of all the smart city components envisaged as part of the Project.

The end-to-end fibre optic infrastructure shall be provided as per the following:

- The Data Centre becomes Primary POP with six (6) additional Secondary POP rooms (including 1 at ICOMC) that will be the aggregation facilities for an integrated high-speed network backbone for both BSCL and non-BSCL needs;
- These POP rooms shall also be the hosting spaces for BSCL network electronics (provided by MSI);
- A dedicated fibre optic infrastructure shall be provided in a partial-mesh architecture for backbone communications of the Project connecting all the POPs;
- From each of these POP facilities, there will be a dedicated fibre optic infrastructure required for distribution layer serving a particular 'zone'. This distribution communications will be used to provide the connectivity to BSCL field cabinets / future mini-POPs (if required to meet the project connectivity requirements). This shall be provided in a ring configuration;
- The last layer for communications will be the access layer i.e. connectivity to every field device that will be provided from the distribution network.

3.8.1.2. Architecture

Backbone Architecture

The backbone will be designed between Primary POP at ICOMC and all the six (6) secondary POPs in a partial mesh where all of the data that is transmitted between the POPs will take the shortest path (or least costly path). Each POP shall be connected to at least two (2) additional POPs for high availability, reliability and survivability of the overall backbone network. The backbone network will be sized to be at 40GE and scalable in the future. In the case of a failure or break in one of the links, the data takes an alternative path to the destination. The overall backbone network connectivity will be such that each link

shall be able to meet its individual zone requirement and in addition account for redundant network switching capacity required in case of any other link failure. It should also have the provision for future growth in terms of bandwidth requirements of the network.

The proposed backbone network connectivity between each Point of Presence and ICOMC shall be through dedicated fibre strands. The cable for backbone connectivity shall be 48 strands single mode fibre cable. This cable will have redundant building entrances at each POP site and will terminate on redundant network switching electronics to eliminate any common points of failure for the backbone communications. All backbone electronics will be sized with sufficient capacity to support the redundant and future network traffic in order to allow complete traffic rerouting on the backbone, in the event of a fibre or switch failure without impacting network performance.

Distribution Architecture

The distribution architecture will be Layer 2 based and is designed for 10GE ring configuration for the fibre optic network. This ring will be created using a combination of redundant POPs and geographically diverse paths wherever available. The cable for distribution connectivity shall be 48 strands single mode fibre cable. The distribution fibre will be used to connect a particular 'zone' from a respective POP. This zone will include mini POPs, Street Cabinets, and/or BSCL buildings.

Access Distribution for City-wide BSCL Services

Using the distribution network, the access network will provide end-to-end connectivity to the field devices and any buildings. The access network shall provide connectivity using dedicated 12 strands single mode fibre.

Exhibit below presents the preliminary architecture for the fibre optic communications.

Exhibit 16: Preliminary Architecture for the Fibre Optic Communications

3.8.2. City Wide Wi-Fi

City Wide Wi-Fi has the following business requirements:

- City-Wide Wi-Fi shall be one of the key service offerings by BSCL to its citizens.
- City-wide Wi-Fi is an initiative aimed to enable the broadband to be affordable, accessible and available for the citizens and workforce.
- City-wide Wi-Fi shall be used for offering e-Governance services for the citizens, m-governance services to BSCL workforce and smart city services. For municipal functions and e-Governance services, the Wi-Fi services shall be free of charge.
- City-Wide Wi-Fi shall be offered at anywhere between 400 to 700 locations across Bhubaneswar.
- Wi-Fi shall be provided at no cost to the user for 30 minutes or 50 MB (whichever happens earlier) at 2 Mbps download per user per session. Post this, the MSI may create custom plans for the user based on consultations with the Client. The target contention ratio for the Wi-Fi services shall be 1:200.
- Wi-Fi services shall be provided using a neutral operator i.e. an operator who supports multiple ISPs (tenant based model) to offer their services through the BSCL infrastructure. Further, 3G/4G offload can also be supported using city Wi-Fi network.
- Beyond the free Wi-Fi services for citizens, the MSI may monetize the Wi-Fi services without impacting the overall user experience and in

consultation with the Client. The MSI will retain all monetization derived from the city Wi-Fi services.

- MSI at his own cost may offer Wi-Fi as a service to any building after getting consensus with the Client.
- Wi-Fi services shall be offered in compliance with the regulations and policies from both TRAI and DOT.
- Wi-Fi Operator shall be a Licensed ISP in India who shall be able to meet all requirements for operations of network as per RFP.
- Wi-Fi network shall also support coupon based plans at strategic locations across Bhubaneswar.

3.8.2.1. Overview

City-Wide Wi-Fi is one of the key service offerings by BSCL to its citizens; an initiative aimed to enable broadband to be affordable, accessible and available for citizens. The Wi-Fi infrastructure includes a combination of Wi-Fi Access Points (APs), mounting infrastructure, and associated active and passive infrastructure including fibre/copper based network.

Since Bhubaneswar has a considerable number of workforce and population, there is a requirement to provide city Wi-Fi services across public spaces and other strategic locations for enabling the broadband to be affordable, accessible and available for its citizens. Through this approach, BSCL will be able to offer Wi-Fi as a service to its citizens across Bhubaneswar.

In addition to citizen benefits, the presence of a city Wi-Fi network creates many benefits for the BSCL workforce. BSCL employees will also utilize the benefits of mobile connectivity for m-governance applications throughout the City, allowing efficient access to mobile applications that support their individual work processes, from building inspections to solid waste removal, and municipal services. Any municipal function that requires employees to be mobile will benefit from the Wi-Fi connectivity. Financially, this will reduce the costs for cellular data (3G/ LTE) that BSCL will be paying as almost all mobile data will flow across the city Wi-Fi network. Moreover, Wi-Fi will be used for offering e-governance services for the citizens.

For the implementation of a city Wi-Fi network, the following are the types of infrastructure being proposed for Wi-Fi Access Points:

- Outdoor Rated Access Points (AP) on Smart Poles (Smart Strip);
- Outdoor Rated Access Point (AP) co-located on Street Light Poles;
- Integrated with Multi-Services Digital Kiosk: Wi-Fi access points will be integrated at the Integrated Multi-Services Digital Kiosk that will be installed at the strategic locations such as bus stations, parks, etc.

3.8.2.2. Architecture

The approach for Wi-Fi is that BSCL will invest in building the Wi-Fi infrastructure including access points and associated hardware and software, and will provide fibre to each of the access points for backhaul purposes. However, the MSI will have a neutral operator responsible for operating the Wi-Fi network and will also be responsible for providing the raw bandwidth for the Wi-Fi network. This neutral operator will act as an operator of operators i.e. tenant based model who in-turn will offer Wi-Fi services from various telecom

service providers. The MSI can offer additional value-add services such as music, videos, games etc. over this Wi-Fi LAN network and can also use this network for 3G/4G offloading.

The Wi-Fi APs and Multi-Services Digital Kiosk will be connected using dedicated fibre optic infrastructure. Each of the Wi-Fi APs will have dedicated fibre counts that will connect back to the POP. For redundancy, the AP shall use wireless frequency for creating a mesh to ensure continuous communications in case of a fibre link not being available.

Wi-Fi network shall also include a Wi-Fi management software and application with a secure login procedure. The city Wi-Fi network shall also support mobility i.e. people driving or walking within Bhubaneswar will be able to access the Wi-Fi network on the move.

The overall concept of operations for city Wi-Fi is such that BSCL will provide Wi-Fi as a service to its citizens. It will allow citizens to use Wi-Fi for various e-governance applications, use Wi-Fi with a one-time login, coupon based login or premium plan. The summary of the overall concept of operations in terms of different services being offered via the city Wi-Fi network are:

- One-time login – each session will last for 30 minutes or 50 MB (whichever happens first) post which the user will have to go through the login process again;
- Bhubaneshwar city services i.e. e-governance and m-governance – all e-governance and m-governance services to be offered to citizens and BSCL employees using the Wi-Fi LAN at no cost to the citizens for any amount of time;
- Plans – various coupons will be available for using the city Wi-Fi services. These coupons will be made available at strategic locations across Bhubaneswar including Multi-Services Digital Kiosk. Further, they can also be available via SMS service. In addition, there will be premium plans available to the citizens for:

Purchasing a premium plan session at one time that lasts more than 30 minutes or 50 MB and/or at a faster speed.

3.8.3. Environmental Monitoring System

Environmental parameters, specifically air and noise pollution, are a major concern for the citizens and administrators of any city. As Bhubaneswar aspires to also be an environmentally sustainable smart city, integrated environmental monitoring stations comprising of various sensors shall be implemented in Bhubaneswar. The business requirements of environmental monitoring system is given below:

- Integrated ambient air and noise pollution monitoring stations comprising of various environmental sensors shall be implemented in Bhubaneswar for monitoring and trending of various ambient air and noise parameters.
- Environment monitoring shall be done for tracking that the pollution and noise levels are within the acceptable limits.
- Display of parameters to citizens to create awareness and support ‘open data’ initiatives.
- Establish frameworks for regulating these parameters in terms of any supporting initiatives for maintaining acceptable levels.
- Central monitoring at ICOMC, city application, website and digital display screen in an integrated manner.

The Environmental monitoring system installations shall be provided on streetlight poles or

dedicated tripod stands; A Digital Display Screen (DDS) shall also be installed at strategic locations across the City to display environmental parameters to the public.

3.8.4. Smart Poles

3.8.4.1. Overview

Smart Poles shall include space for LED based streetlight, space for Cellular Antenna Wi-Fi Access points and networking equipment, integrated Surveillance camera as a single integrated unit. The Smart poles shall be deployed across smart strip (Janpath) in Bhubaneswar.

MSI shall install smart poles at strategic locations as approved by the Client. MSI shall coordinate with respective agencies for all necessary RoWs, approvals, permits, civil works, sanctions associated with smart poles; All electrical, civil and mechanical works associated with implementing smart poles shall be under the scope of the MSI.

Dismantling of old streetlight poles (if applicable) for replacement with smart poles shall be under the scope of the MSI. If any equipment is dismantled, MSI shall hand over the equipment to BSCL in working condition.

3.9. Intelligent City Operations and Management Centre (ICOMC)

3.9.1. Overview

The Command Control Centre will house an Intelligent City Operations and Management Centre (ICOMC) and Command Centre for other agencies. The individual Command Centres would be used by respective agencies to monitor their functions and responsibilities. In addition to ICOMC there will be 15 agency specific Command Control Centre – the initial list of agencies is as follows:

- Police including Traffic Police
- BMC
- Electricity Department
- Fire Department
- Ambulance
- BPTSL

Below is approximate space that would be available for the ICOMC and the other Command Centres.

S. No.	Space Description	No.	Requirements (tentative)
1	ICOMC	1	Approx. 10,000 sq. ft. double height area consisting of: • Video Wall – 16X4 Cubes of 70 inch each • Central Operations Area • Large Board Room (War Room) -1 • Cabin – 3 • Board Room – 1 • Visitors' Gallery – 1 • Rack Room • No of Operators (in a shift): 30

S. No.	Space Description	No.	Requirements (tentative)
2	Command Control Centre – Type 1	3	Approx. 5,000 sq. ft. overseeing the ICOMC video wall; consisting of: • Video Wall – 3X2 Cubes of 70 inch each • Operations Area • Cabin – 1 • Board Room – 1 • No of Operators (in a shift): 10
3	Command Control Centre – Type 2	12	Approx. 2,000 sq. ft.; consisting of: • Large Display – 70 inch screen • Operations Area • Cabin – 1 • No of Operators (in a shift): 5

3.9.2. ICOMC

ICOMC shall be the 'nerve centre' of Bhubaneswar that assists in enhancing efficiencies of city operations and management. It provides a holistic view of all city operations allowing monitoring, control and automation of various functionalities at an individual system level along with enabling cross-system analytics. The ICOMC shall be deployed in Bhubaneswar as part of this project, to make the city operations intelligent, integrated and efficient. The business requirements that the ICOMC & ICOMC Platform shall achieve are:

- Shall enable cross-system and cross-agency coordination to monitor, operate and manage the city in an integrated manner.
- The smart city (ICOMC) platform shall enable different agencies and departments of Bhubaneswar to monitor and utilize information of other departments for delivering services in an integrated and more efficient manner.
- The smart city platform shall be able to normalize the data coming from different devices of various OEMs. It shall support integration with multiple vendors.
- All systems being provided as part of this RFP and by Others (mentioned in this RFP) shall be integrated at the ICOMC as per the requirements of the Project.
- The data store function shall acquire data both automatically and manually. Automatic data acquisition shall be met through industry-standard data transports. Data Acquisition via Dynamic Data Exchange (DDE) and OLE for Process Control (OPC) along with other proprietary transports shall also be supported.
- The smart city platform shall enable various visualization and analytics of city operations to improve decision making. These analytics shall be achieved via cross-system integration of various systems and as per the standard operating procedure discussed and agreed upon with the Client. Analytics shall include both prescriptive and predictive analytics.
- ICOMC shall provide reporting capabilities for city administrators to keep record of city operations.

- The systems at ICOMC shall ensure that integrity and confidentiality of all information gained is secure at all times.
- The smart city platform shall be the integration point at which data from across the city converges for processing. This shall allow all information to be managed within the same network, eliminating many communication problems that are faced by working in siloes.
- The ICOMC shall be rated for 24x7 operations and shall provide shift based operations for an overall 24x7 support.
- The ICOMC Platform shall integrate all components mentioned in the Bhubaneswar Smart City Proposal and this bid. It shall be include the SCADA/IoT systems that shall be implemented in ABD area.
- Integrate all systems from ICOMC to a central GIS platform being provided as part of this RFP.
- Smart city platform may not necessarily duplicate all functionality derived out of individual system specific applications but will monitor and integrate various features using which an intelligent city operations can be achieved.
- The system shall be scalable to accommodate future growth and support hardware and software additions and upgrades.
- The overall work shall be in reference to standards published as per ISO 37120 and World Council of City Data (WCCD).

ICOMC shall leverage information provided by multiple city systems to support an integrated, seamless, proactive and comprehensive response mechanism for day-to-day city operations and challenges. The smart city platform (referred as ICOMC platform) of ICOMC shall provide a combination of system layers that when combined shall make use of Big Data, ICT and ITS infrastructure, advanced computing, analytics, and visualization to enhance the city's intelligence. In addition, it shall provide the tools for the city decision makers to better manage the services they provide to its citizens.

There are a number of functions and systems that shall be managed out of the ICOMC. Depending on the type of systems and functions, they shall be monitored and/or controlled from the ICOMC, and will have the option of sharing a feed to another agency as required via the ICOMC. ICOMC shall integrate all the City Systems procured under the Smart City Mission, which include systems procured through this project and system which are/will be procured as other projects. In addition to systems identified in this RFP, the ICOMC shall seamlessly integrate the following system being procured separately:

- Existing City Surveillance project implemented by Traffic Police
- Existing Street Lighting project
- Existing ERP & E-Governance Initiatives
- Traffic Signalling
- Common Payment Card
- Public Bike Sharing System
- E-rickshaw
- Electricity & Water SCADA Systems
- Online GIS Platform – Bhubaneswar One

The integration requirements with above projects is identified below:

System	Monitor	Control	Feed sharing (external)	Remarks
Existing City Surveillance project implemented by Traffic Police	✓		✓	Feed shall be taken from existing Police Control Room
Existing LED based Street Lighting project	✓		✓	Integration with lighting system
Existing ERP & E-Governance initiatives	✓	✓		Complete integration/upgrade of existing ERP/E-Gov Systems for seamless service delivery to citizens
Advanced Traffic Signal Control System (ATSC)	✓	✓	✓	Complete integration of ATSC with Traffic Management, Transit Management and Emergency Management.
Common Payment Card	✓		✓	Complete Integration with all relevant modules involving payments, citizen services.
Public Bike Sharing System	✓	✓		Integration with Citizen Portal and City Mobile application
E-rickshaw	✓	✓		Integration with Citizen Portal and City Mobile application
Electricity & Water SCADA System	✓	✓	✓	Complete Integration of systems for integrated response and billings.
Online GIS Platform Server – Bhubaneswar One	✓	✓	✓	Online GIS Platform Server shall be completely integrated for all City Applications and Services. The GIS Platform shall act as the single unified data map for Bhubaneswar. The Data collected/generated for the maps shall be available to all application/agencies as per City's Open Data Policy from time to time.

3.9.2.1. Architecture

A schematic representation of ICOMC envisioned for this project has been presented in the info graphic below.

Exhibit 178: Schematic of ICOMC

The following is a functional diagram of the logical connections between various components at the ICOMC. A brief description of each component is detailed below.

Exhibit 18: Functional diagram of the ICOMC

ICOMC shall consist of:

- Applications and Web Browsers – Software applications of other modules (sub-systems) shall be a content input into the ICOMC Systems.
- Audio System and Speakers – A system of audio components to provide sound in the operations and boardroom spaces.
- Boardroom Display – Large format LCD/LED monitor shall be provided in the boardroom.
- Call Centre – A 24 x 7 call centre shall be setup to support city operations. The call centre shall have the capability of expansion as required to support City Services
- CATV – Cable TV shall be an input source into the ICOMC Systems. This content source shall be managed by the DCMS and be available anywhere in the ICOMC. Inputs such as weather, news, etc. can be obtained via this CATV feed.
- City CCTV Cameras – These are the primary video inputs into the Video Systems.
- City Managed Systems – Content for a number of systems (part of Smart City project) to be managed and monitored at the ICOMC.
- Data Centre and Disaster Recovery Site – Data Centre shall be co-located at STPI Data Centre in Bhubaneswar. STPI shall provide air-conditioned space for hosting infrastructure. The Disaster Recovery (DR) Site will be of STPI in a different seismic zone and STPI will provide managed services for DR.

- DCMS – The Display Content Management System shall manage all networked visual content throughout the facility, including the video display wall and the boardroom display. This system will manage a dashboard for City Management Systems to be displayed and monitored on the video wall.
- Helpdesk - Helpdesk services shall be able to support activities like reporting technical incidents / issues / problems with the system, escalate the calls to the respective departments, analyse the incident and generate reports.
- Monitors – Consist of operator monitors, cabin monitor, and other displays that are connected to the ICOMC network.
- Network Video Recorder (NVR) – A network video recorder shall be dedicated for recording and archiving of camera video.
- Operator Workstation– These workstations shall be dedicated for ICOMC System use at the operator consoles. They are the point of control for the various systems at the ICOMC.
- ICOMC Smart City Platform – Various smart city dashboards, Key Performance Indicators (KPI's), and analytics that are available as display visuals to aid city operations and better manage the City. This platform will also input and output feeds from other agencies such as fire, education, healthcare, etc. The Platform shall:

➢ Integrate any type of sensor used for urban services irrespective of the technology used for the Smart Solutions components.

➢ Support seamless integration of data sources from the various components and sub-components, as well as external applications specified in this bid for initiating automated response

➢ Support cross-functional, vendor agnostic APIs for data sharing

➢ Support 24x7 public facing web interface for data sharing with external developers.

➢ Support data security specifications specified later in the bid document.

➢ Support different tiers of user categorization, authentication, authorization, and services based on the project requirements.

- Video Display Wall – The Video Display Wall shall be located in the Operations Room and shall be the primary visual display for operators at the ICOMC.
- Video Management System – The Video Management System shall manage CCTV streaming video, PTZ control, and video archiving.

Command Control Centre – Type – I

Command Control Centre – Type I shall consist of:

- Applications and Web Browsers – Software applications of modules (sub-systems) relevant to the agency.
- Audio System and Speakers – A system of audio components to provide sound in the operations and boardroom spaces.
- Boardroom Display – Large format LCD/LED monitor shall be provided in the boardroom.

- Monitors – Consist of operator monitors, cabin monitor, and other displays that are connected to the ICOMC network.
- Operators – These workstations shall be dedicated for ICOMC System use at the operator consoles. They are the point of control for the various systems at the ICOMC.
- Smart City Platform – Agency relevant smart city dashboards, Key Performance Indicators (KPI's), and analytics that are available as display visuals to aid Agency operations and better manage the City. APIs for data sharing.
- Video Display Wall – The Video Display Wall shall be located in the Operations Room and shall be the primary visual display for operators at the ICOMC.

Command Control Centre – Type – II

Command Control Centre – Type II shall consist of:

- Applications and Web Browsers – Software applications of modules (sub-systems) relevant to the agency.
- Audio System and Speakers – A system of audio components to provide sound in the operations and boardroom spaces.
- Boardroom Display – Large format LCD/LED monitor shall be provided in the operations room.
- Monitors – Consist of operator monitors, cabin monitor, and other displays that are connected to the ICOMC network.
- Operators – These workstations shall be dedicated for ICOMC System use at the operator consoles. They are the point of control for the various systems at the ICOMC.
- Smart City Platform – Agency relevant smart city dashboards, Key Performance Indicators (KPI's), and analytics that are available as display visuals to aid Agency operations and better manage the City. APIs for data sharing.

Temporary Control Room

The ICOMC is being planned in the upcoming Municipal Corporation Building, which is still in design stage. The bidder shall establish a temporary control centre in BMC-Bhawani Mall Building. Details are provided in the next section.

3.9.3. GIS Platform

The business requirements for GIS integration include:

- Implementation of Web Portal as user friendly interface of BBSR Smart city features
- Citizen engagement (G2C) to disseminate Smart city benefits
- Support efficient operation & maintenance of Government & Business Functions (G2G and G2B)
- Centralized Repository of information of BBSR which are complete, up-to-date and accurate
- Disseminate the information 24/7 with good decision support system

- Continuous improvement to meeting growing demands of community and agencies
- Provide an integrated map system for government agencies to deliver location-based services and information.
- Support multi-agency collaboration on a GIS platform with many government agencies participating and contributing information.

Bidder shall develop Bhubaneswar-One (B-One) GIS as a web based application to facilitate the citizens of Bhubaneswar with various services. The portal shall support public to easily discover and search for geospatial and textual data. It shall enable users to view multiple data layers on a map and perform various functions like search, query and data analysis. The advanced search and query tools shall enable users to search for specified features like Landmarks, Heritage sites, Museum etc., based on the map layers.

3.10. System Diagram

Exhibit below illustrates the complete system for the project:

Exhibit 20: System Diagram for Smart Solutions Project

4. MSI Scope of Services - Overview

The project requires turnkey services wherein the successful bidder i.e. MSI shall broadly cover the following main scope of services:

- Design
- Supply
- Install
- Test
- Integrate,
- Commission
- Train & Build Capacity
- Operations and maintenance

➢ One (1) year DLP/warranty of the system and subsequently comprehensive maintenance for additional six (6) years. Warranty shall start from the date of Operational Acceptance.

➢ Ensure performance, functional and technical requirements of the system are maintained during this phase.

➢ Supporting monitoring & evaluation the performance of the Smart Solutions system on a continuous basis to get the maximum efficiency and decision making support out of the system.

➢ Supporting facility management for both the temporary control centre and final ICOMC.

MSI shall be responsible to carry out any detailed survey prior to submission of bid for the complete solution components required to finalize infrastructure requirement, network bandwidth requirement, implementation, operational & administrative challenges etc.

MSI shall suggest the sizing of the required hardware necessary for meeting the required performance related SLAs starting from ”Complete Deployment” till the first seven years of productive use of the system. The MSI is responsible for sizing the proposed hardware for all the modules of BMC in future and performance requirements of the solution. The MSI is to supply and install the hardware and systems software as part of the scope of work. The bidder shall ensure that the LAN / WAN, servers and storage are sized adequately with built in redundancy into the architecture to meet a 10 second response time in terms of performance. The MSI has to size and propose and procure hardware requirements for the DR site including back up software as well.

The subsequent sections detail out the scope with respect to each of the solution component. The MSI shall note that the activities defined within scope of work mentioned are indicative and may not be exhaustive. MSI is expected to perform independent analysis of any additional work that may be required to be carried out to fulfil the requirements as mentioned in this RFP and factor the same in its response.

The following Exhibit presents the detailed scope of services that have to be carried out as a part of the contract.

Exhibit 19: Detailed Scope of Work

4.1. Project Management

MSI shall be responsible for end to end project management for the implementation and maintenance of the smart city ICT components. MSI shall deploy a competent team of experts for project management which shall include a Project Manager along with a deputy.

The Project Manager shall be the single point of contact that shall assume overall responsibility of the Project and ensure end to end working of the Project. He shall function as the primary channel of communication for all Client requirements to the implementation team. In case of any absence of the project manager (sickness or vacation), the MSI shall ensure that an alternate project manager (as approved by the client or its representative) shall be provided during the absence period.

MSI shall be responsible for preparing a master schedule of work which shall highlight implementation plan for all the Project milestones. The schedule shall identify the manufacture, delivery, installation, integration of equipment (Software and Hardware), training programs, test procedures, delivery of documentation and the respective solutions. The schedule shall also show Client and any third party responsibilities along with the activities in the timeline. MSI shall conduct bi-weekly meetings between the Client (and/or its representative) and the 'key personnel' to discuss project progress and implementation in Bhubaneswar. All key personnel associated with the project shall also be available for meetings whenever asked by the Client or its representative.

MSI shall also be responsible for effective risk and issue management and escalation procedures along with matrix as part of project management. MSI shall identify, analyse, and evaluate the project risks and shall develop cost effective strategies and action plan for mitigation of risks. As part of the Project MSI shall monitor, report and update risk management plans and shall be discussed during project meetings.

MSI shall prepare minutes of every meeting which takes place and submit to Client or its representative for tracking of the Project. MSI shall propose a suitable progress reporting mechanism for the project duration.

All the tools required by MSI for project management, configuration management, issue and risk management, escalation procedure and matrix document repository etc. shall be factored in the proposal submitted by MSI.

Based on progress reports, MSI shall also accordingly update the master schedule of work on a continuous basis during the period of the contract.

All deliverables shall be submitted in at least two (2) formats i.e. draft and final. The Client's representative will have at least 30 days to review and comment on every deliverable. The practice of submissions for all deliverables will be that three (3) hard copies and CDs of every deliverable shall be submitted. Two of these copies will be submitted to the ICT consultant and one will be submitted to the client. The submissions will include both hard and soft copies.

4.2. Survey and Detailed Design of all smart solutions component

MSI shall survey the site to validate the conditions provided as part of the Bid document. MSI shall conduct end-to-end survey of the site area and based on the observations asses and validate the present conditions, implementation approach and methodology, project challenges and mitigations and other project critical information. During the survey stage itself, MSI shall mobilize its entire staff and fully acquaint them with the site conditions. It is MSI's responsibilities to periodically survey the site and be updated on the conditions during the course of the contract. During the design stage, MSI is also expected to:

- Workshops with different stakeholders for capturing business requirements, creating awareness of best practices, communicating the changes, building consensus on process design etc. These needs to be organized at different intervals and in different places throughout the duration of the projects as needed.
- Stake holder consultation other than workshops, with those stake holders who will be identified by BSCL, for critical inputs, review, suggestions, process description etc.
- Review sessions with different stake holders for signing off the deliverables, walking through the deliverables for facilitating quick understanding.

The MSI shall be responsible for the detailed design of the Bhubaneswar smart city solutions. MSI shall discuss in detail with the Client or its representatives the detailed design of the smart Bhubaneswar smart city solutions and fine tune any requirements. It is the MSI's responsibility to satisfy the operational requirements of the Client and adopt industry best practices for implementation during the design stage itself. Based on the survey observation, analysis and discussion with the Client, the MSI shall submit a Detailed Design Report. The detailed design report shall include end-to-end design validation for the project including any project understanding, analysis, detailed design, integration plan, and for-construction drawings. Complete set of design and construction drawing including method of installation as applicable shall also be included in the Detailed Project Report. Construction details shall accurately reflect actual job conditions.

All technical data sheets of the products may be submitted ahead of time by the MSI. It is MSI's responsibility to get all technical data sheets approved by the Client or its representative to meet the overall project schedule.

Design and construction drawings shall include the following at a minimum:

- All system device locations as required for installation, operation and maintenance;
- Cable requirements, routing and location (as applicable);
- Typical mounting details;
- Single Line Diagrams (SLDs);
- Splicing diagrams;
- Wiring diagrams;
- 3D layouts and renderings;
- Any other layouts;
- Any other requirement to meet the requirements of the RFP.

All drawings shall be updated/revised to “as-built” conditions when installation is complete.

Design submissions shall be based on project requirements and shall include as applicable, but not limited to, the following:

- Complete listing of specifications to be used along with detailed technical data sheet;
- Detailed engineering drawings;
- Shop drawings including product data sheets;
- Revisions to original design submissions.

No work requiring shop drawing submission shall commence until final review has been obtained by Client. However, review of the shop drawings by the Client shall not relive the MSI of his responsibility for detailed design inherent to shop drawings.

For the software components like ERP, E-Governance applications, MSI will create requirement analysis documents for various components of the solution. This includes System Requirements Specification (SRS) and Functional Requirements Specification (FRS) documentation. The MSI shall be responsible for documenting any existing/planned ‘processes’ of the Client as part of these deliverables.

4.3. Prototype Acceptance and Factory Acceptance Testing

After the approvals of the technical data sheets by the Client or its representative, MSI shall submit the prototype of all the material presented in the Detailed Design Report to the Client for its review and approval. Note that it shall be MSI’s responsibility to get the prototypes approved in due course of time without affecting the overall schedule of completion of works.

Material provided as part of the Project shall undergo Prototype Acceptance Test (PAT) and Factory Acceptance Test (FAT). Details regarding the PAT and FAT are presented in Testing Section of the Scope of Work. MSI shall also present to the Client and its representatives the test results for PAT and FAT in the form of Test Result Documentation presented in the Testing section. The client at its own discretion shall visit any FAT site. MSI shall be responsible for organizing all logistics required for this site visit.

For all the software components like ERP and e-Governance, MSI shall also propose prototype of solution components in this phase and get the required approvals.

4.4. Hardware Supply and Installation Stage

MSI shall be responsible for the supply and installation of all components as part of the Bhubaneswar smart city solutions to meet the technical, functional, business and performance requirements of this RFP. No deviations from these requirements shall be acceptable by the client. Any additional hardware or software component required to meet the technical and performance requirement of the project and not specified as part of this document but required to meet the overall requirements of the project shall be factored in as part of the Bid, and provided by the MSI. MSI shall deliver the project and install and handle the equipment in accordance with manufacturer's requirements. Installation process of the MSI shall be flexible and shall accommodate Client's requirements without affecting the schedule as specified in the RFP.

MSI shall be responsible for all supply, storage and handling of the material provided as part of the bid document. The OEM proposed for the IT infrastructure shall be in line with the national security policy (as applicable).

If there is removal/change of any existing material during installation process and belongs to the Client, the material shall be handed-over to the Client. MSI shall also be responsible for reinstating any site in the project limits at no additional cost to the client. It shall be the MSI's responsibility to supply and install all hardware in compliance with the requirements of the RFP. Since this is a turnkey contract, MSI shall be responsible for all implementation works on the project including any civil, structural, electrical, etc. works required to meet the requirements of the project. All power conversions necessary to operate the equipment shall be under the scope of MSI. The Client shall only provide raw power for all the equipment.

4.5. Software Development

MSI shall be responsible for development and deployment of all software required to meet the requirements of the project. It is preferred that majority of the software shall is time tested and pre-configured. However, some of the modules may require bespoke development. MSI shall be fully responsible for developing and implementing all software required for the project. This software shall be developed based on the approved software and functional requirements specifications. The technology platform chosen for all software shall be based on industry standards based and shall be secure. Migration of data shall be the responsibility of the MSI. MSI is required to take the source data in the format which is available. Subsequently, MSI is required to take complete ownership of data migration and also develop a detailed plan for data migration.

All licenses for the software shall be perpetual and the client may purchase any additional licenses at the stated cost (as per financial proposal of the Bidder) during this course of the contract. The MSI shall ensure that full support from the OEM's is provided during the course of the contract. MSI shall be responsible to provide any upgrades, patches, fixes to the software during the course of the contract at no additional cost to the client.

4.6. System Integration

MSI shall be responsible for the integration of all hardware and software supplied as part of this Project as per the technical and performance requirements of this bid document. The system integration scope also includes integration of the Project components with the components provided by Others as per the details of the RFP.

In case the integration of any of the systems is not as per the requirements specified in the bid document, MSI shall be responsible to provide any upgrades required to meet the

integration requirements at no additional cost to the Client unless otherwise agreed by the Client.

It shall be the responsibility of MSI to take approval of the Client for the Integration of the overall system as per the bid document. Post systems integration, the Client shall review and approve the overall performance of the integrated system as per the requirements of the bid document. MSI shall be responsible for fixing any requirements that are not found in compliance with the original bid requirements and approved detailed design at no additional cost to the client.

4.7. Testing

All materials, equipment, systems, manufacturing or configuration processes, or other items to be provided under the Contract shall be inspected and tested in accordance with the requirements specified in this document and will be subject to Client or its representative's approval. The testing shall include any existing civil infrastructure equipment or materials to be taken over by the MSI. Approvals or passing of any inspection by the Client shall not, however, prejudice the right of the Client or its representative to reject the material if it does not comply with the specification or requirements of the RFP when erected or give complete satisfaction in service.

The MSI shall design and successfully complete tests to demonstrate that all equipment, materials and systems furnished and installed function in the manner intended and in full compliance with the requirements outlined in the RFP and the approved detailed design of the MSI.

All tests shall be subject to inspection or witnessing of tests by the Client or its representative. Inspection or witnessing of tests may be waived at the sole discretion of the Client or their representative, subject to the MSI furnishing the Client or their representative with properly completed test certificates in accordance with the requirements of the RFP. Failure of the Client or their representative to witness any test shall not relieve the MSI of the obligation to meet the requirements of the Contract.

MSI shall submit an Acceptance Test Procedures document (ATP), for Client's approval prior to undertaking any testing. The ATP shall clearly address:

- Type of testing and device to be tested;
- How each testable specification requirement will be demonstrated, including the test environment and set-up, specific functionality to be tested, method for performing the test and quality assurance procedures;
- The results that will constitute success for each test;
- Timing of test within the overall Contract schedule;
- The location for testing;
- Personnel required to conduct the test;
- Approximate time required to execute the test or set of tests;
- Responsibilities of both the MSI and Client's representatives during each test; and
- A cross-reference to which Contract requirements from the Compliance Matrix (to be developed by the MSI) are being addressed by each test procedure.

The ATP shall include an updated Compliance Matrix to include the test relevant stage at which each contract requirement will be demonstrated; and a cross-reference to the test procedure(s) that serve to address each contract requirement. The Compliance Matrix shall be used as a “punch list” to track which requirements have not yet been demonstrated at each stage of testing. A requirement classified as having been “demonstrated” during a certain ATP stage can be subsequently redefined as having been “not demonstrated” if compliance issues emerge prior to System Acceptance. ATP shall be submitted to Client at least three (3) weeks in advance of any intended testing.

All measuring instruments required to measure test parameters shall be calibrated by an approved testing authority. The equipment shall be inspected for standards of construction and electrical and mechanical safety.

Test results shall be recorded for all tests conducted under this Contract. The MSI shall make test results available to Client or their designate for review immediately after completion of the tests.

ATP for each test shall be collated, bound and delivered as part of the close-out documentation requirements specified herein.

ATP submission shall include a hard copy of the originally marked test results and a neatly typed summary. Two (2) hard copies and one (1) electronic copy shall be provided.

ATP shall incorporate the following distinct stages for each deployed stage:

- **Prototype Acceptance Tests (PAT)**: Prototype Approval Test shall be conducted only on the customized equipment for their design and compliance to functional specifications. PAT shall be completed before conducting FAT and only after approval of PAT by Client’s representative, the equipment shall go in production. PAT shall be witnessed by Client’s representatives;
- **Factory Acceptance Tests (FAT)**: FAT shall be conducted before the equipment and software is shipped to Client for installation, and deficiencies shall be rectified before shipping to Client for installation. All devices furnished by the MSI shall be tested and subjected to a nominal 72-hours burin-in period at the factory. FAT shall be witnessed by Client’s representatives at their discretion. Factory acceptance tests shall be conducted on randomly selected final assemblies of all equipment to be supplied. In case any of the selected samples fail, the failed sampled is rejected and additional 20% samples shall be selected randomly and tested. In case any sample from the additional 20% also fails the entire batch may be rejected;
- **Pre-Installation Testing (PIT):** All equipment supplied under this Contract shall undergo pre-installation testing in accordance with the ATP. This shall include existing equipment, any spare parts, any new equipment provided by Client or their designate and new equipment provided by the MSI.

If the equipment is considered a standard production item, the MSI may, with the prior consent of the Client or their designate, supply a copy of the equipment manufacturer’s quality control test results in place of a MSI performed test.

All PIT testing shall be carried out prior to installation of the equipment. After satisfactory completion of the MSI’s PIT tests, the MSI shall supply all test

measurements and results to the Client or their designate, together with a Test Certificate.

- **Installation Acceptance Tests (IAT)**: IAT shall be conducted after each installation of each equipment type, and deficiencies shall be rectified before the initiation of SAT. IAT may be witnessed by Client's representatives;
- **Proof of Performance Testing (POP):** The MSI shall implement a structured proof of performance testing, which will progressively place all components in service. Site tests shall be performed on individual components, subsystem sites, and the complete subsystems, as necessary to confirm that each element of the system functions satisfactorily and fulfils the requirements of this specification.

Completion, submission, and approval of all relevant PIT and IAT tests and results must be completed prior to carrying out any POP tests.

All subsystem equipment and components shall be tested by the MSI regardless of whether or not it is a standard item.

After satisfactory completion of the MSI's POP tests, the MSI shall supply all test measurements and results to the Client or their designate, together with a Test Certificate.

- **System Integration Testing (SIT):** The MSI is responsible for the proper and harmonious operation of all subsystems installed under this Contract. Where connections of the new systems to existing subsystems or equipment supplied by others are required, the MSI is responsible for connection of equipment specified in the Contract and for initial system integration tests. Such a test will verify the full functionality of each subsystem as they are interconnected. This will require testing to be coordinated by the MSI with the Client or their designate. This work will be carried out under the direction of the Client or their designate.

Completion, submission and approval of all relevant PAT, FAT, PIT IAT and POP tests and results must be complete prior to carrying out any SIT tests.

The MSI shall:

- Complete all equipment and subsystem tests required in the Contract;
- Test each subsystem independently on the communications subsystem;
- Add subsystems one at a time and monitor the overall performance;
- Fail safe testing of all subsystems one at the time while monitoring overall systems performance.

A SIT certificate will be issued when all system tests have been completed satisfactorily, and the MSI has supplied a full set of Test Certificates and a Test Certificate for the complete system, together with final copies of all Operating and Maintenance Documentation for the System.

- **Stress and Load Testing:** Comprehensive stress and load testing of Smart Governance and Smart Connect modules shall be conducted to demonstrate robustness and reliability of the system.
- **Security Testing (including penetration and vulnerability test):** Security test shall be conducted to demonstrate security requirements at network layer and software applications. Components shall pass

vulnerability and penetration testing for rollout of each phase. Components shall also pass web application security testing for portal, mobile app, and other systems. Security testing shall be carried out for exact same environment/architecture that shall be set up for go-live. Penetration test shall be carried out periodically and vulnerability analysis shall be carried half-yearly during maintenance phase. For all applications hosted on-cloud or hosted on premises, the security testing shall be a mandatory requirement.

- **Pilot Test:** Requirements for Pilot Test is explained in the Pilot Deployment Section of the Scope of Work.
- **System Acceptance Tests (SAT)**: SAT shall be conducted after the entire system has been installed, integrated and commissioned. Deficiencies, if any shall be rectified before the initiation of Burn-in Test. SAT shall be conducted on full system completion only to determine if the system functional and technical requirements as specified in the bidding documents are meet. SAT shall be witnessed by Client's representatives. Data migration, if any will be carried out by MST prior to commencement of this stage. SAT shall also include any performance and load testing for the software applications.
- **Burn-in Tests (BT)**: Following successful completion of the SIT and SAT, the approved System will be put into service and its performance monitored for a period of thirty (30) consecutive calendar days for the purpose of verifying system reliability in an operating environment. Any failures and defects occurring in this time will be documented. Any serious defects which affect the availability of the system will be a basis for restarting the test. Upon the satisfactory completion of this performance testing a Completion Certificate will be issued.

The MSI shall not commence BT until SIT and SAT have been performed and successfully completed and all documentation of the successful completion of PAT, FAT, PIT, IAT, POP, SIT and SIT, along with notification of the schedule date of the BT is provided to the Client or their designate in accordance with the Requirements. Commencement of BT will be conditional on the Client or their designate providing written notification of Client's readiness to proceed to BT.

The MSI shall be suitably prepared for the BT prior to the start date. Repeated failure of the BT may result in the MSI having to reimburse the Client or their designate for costs incurred. No compensation to the MSI will be made for repeat testing.

Where equipment supplied by the MSI fails during the burn-in period, the MSI shall restart the test at day zero (0) following appropriate corrective measures.

If a utility failure is proved to be the cause of testing failure, then the MSI shall restart the fourteen (14) day burn-in test at the day the failure occurred. If a subsystem failure is proved to be the cause of testing failure, then the MSI shall start the test over at day 0 (zero).

Where tests or burn-in indicate that an existing subsystem or component, not provided by the MSI, is defective, the MSI shall immediately report the deficiency to the Client or their designate. The Client or their designate may assign corrective repairs, retesting and repeat of BT to the MSI, in accordance with change provisions of the Agreement.

The MSI shall provide the Client or their designate with a contact name and phone number(s) for a designated emergency contact person during BT. The emergency contact person shall be accessible twenty-four (24) hour a day, for each day of testing.

Issuance of the Completion Certificate is a basis for the start of the Warranty period for the Systems.

- **Operational Acceptance Test:** Shall be conducted after successful SAT and Burn-in tests. Continuous fault free running of the System shall be tested. Post the completion of Operational Acceptance Test, System shall be considered for Operational System Acceptance and Defect Liability Period (DLP) shall commence. Operational Acceptance Test shall include the following as a minimum:

- Completion of all activities and fulfilment of all business, functional and technical requirements listed in RFQ cum RFP;
- Scrutiny of all inspection reports, audit findings, Contracts, licensing agreements etc.;

Client may authorize the MSI to proceed to the next testing stage with certain deficiencies not yet resolved.

The MSI shall provide written notice to Client at least five days in advance of any testing, indicating the specific tests to be completed as well as the date, time and location. The MSI shall be required to reschedule testing if Client witnessing representatives cannot be present or if other circumstances prevent testing from taking place.

MSI shall provide written Test Results Documentation (TRD) within one week of completing each stage of testing. The TRD shall document the results of each ATP procedure and provide an updated Compliance Matrix that indicates which contract requirements have been demonstrated. The TRD must be approved before Client will grant System Acceptance. A sample format for the TRD is provided below:

<table>
<tr><td colspan="2">Item #:
Item Description:
Test:</td><td colspan="2">Tester:
Date:</td></tr>
<tr><td colspan="4">Test Set-up:</td></tr>
<tr><td>Clause</td><td>Test Procedure</td><td>Expected Results</td><td>Actual Results</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="4">Witnessed:
(This Does Not Constitute Approval)
Reviewed and Approved:</td></tr>
</table>

MSI shall be responsible to carry out all the testing as per the satisfaction of the Client and its representatives. All the costs those are associated with any testing are to be borne by the MSI including the costs of travel and accommodation of the Client or its representatives from their home locations in their cost bid. In the interest of the MSI maximum of three (3) people shall be nominated by the Client to attend any such testing wherever it is carried out.

In case of failure of any testing, the failure component shall be repaired and the test shall be rerun. If a component has been modified as a result of failure, that component shall be replaced in all like units and the test shall be rerun for each unit.

MSI shall provide the Client with a copy of the manufacturer's quality assurance procedures for information. Documentation certifying the showing that each item supplied has passed factory inspection shall also be submitted by the MSI.

4.7.1. Pilot Deployment

The MSI shall conduct Pilot deployment and testing for meeting Client's business requirements before rolling out the complete system. The pilot will be run for four weeks to study any issues arising out of the implementation. MSI shall also review health, usage and performance of the system till it is stabilized during pilot deployment. Based on Client's feedback for incorporating changes as required and appropriate, MSI shall train staff involved in the Pilot implementation.

The Pilot shall be demonstrated to the Client's representatives. If for any reason the pilot is found to be incomplete, these will be communicated to the MSI in writing on the lapses that need to be made good. A one-time extension will be provided to the MSI for making good on the lapses pointed out before offering the system to Client for review. Failure to successfully demonstrate the Pilot may lead to termination of the contract with no liability to Client.

4.8. Training & Change Management

Post the system integration, MSI shall train Client representatives to operate the equipment installed and to conduct any routine diagnostics and routine maintenance work. Training shall be done during Pilot Deployment and before Final Deployment. The period of training shall be mutually agreed upon by Client and MSI.

The MSI shall provide training courses for at least:

- Decision Makers/ Management;
- Client's operations personnel;
- Users of Various Systems/Applications developed as part of the project;

The actual number of each of above categories of trainees will be provided at Design Stage.

MSI shall provide all training materials in both Microsoft Office and Adobe PDF formats, consisting of graphics, video and animations on Compact Disc (CD) and Digital VideoDisc (DVD) with a permission to reproduce copies later on.

The Training Plan (TP) shall be developed for each component/module and shall include the training schedule and course outlines. Bidder must be provided to Client the TP for review at least three weeks in advance of the start of training. The TP must be approved by Client before the start of training.

MSI shall also be responsible for full capacity building of BSCL staff. Training and capacity building shall be provided for all individual modules along with their respective integrations. All training materials shall be developed by the MSI.

MSI shall furnish all special tools, training videos, self-learning tools, equipment, training aids, and any other materials required to train course participants, for use during training courses. Training shall include, as a minimum, a four (4) hour session on system maintenance and configuration, and a four (4) hour session on system operation.

The instructors shall demonstrate a thorough knowledge of the material covered in the courses, familiarity with the training materials used in the courses, and the ability to effectively lead the staff in a classroom setting. If at any stage of training, the Client feels

that on-field sessions are required, the same shall be conducted by the MSI. The language of training shall be in English/Hindi and Oriya as indicated by the Client during this stage.

If any instructor is considered unsuitable by Client, either before or during the training, the MSI shall provide a suitable replacement within one week of receiving such notice from Client.

The MSI shall provide brief refresher versions of each training course to the original trainees and new inductees between three to six months after System Acceptance for each deployment stage at no additional cost. A team of trainers shall be deployed fulltime for six months around the Go-Live period for each component for training the staff and stakeholders.

In addition to the training to the operations staff during system deployment stage, the MSI shall conduct half-yearly training refreshment sessions to train the new staff inducted by the Client and to enhance the knowledge of the Client's staff operating the Bhubaneswar smart city solutions by adopting "train the trainer" approach.

MSI has to ensure that training sessions are effective and the attendees shall be able to carry on with their work efficiently. For this purpose, it is necessary that effectiveness of the training session is measured through a comprehensive online feedback mechanism.

MSI shall also deploy a team of Change Management experts to support the stakeholders in assimilating the technology in the BBSR region.

MSI shall help the agencies with complete Change Management exercise needed to make this project a success. In fact Change Management will have to subsume 'training' as a key enabler for change. Following outlines the responsibilities of MSI with respect to designing and implementation of change management plan for the Project.

- Change Management initiative, to be designed & implemented by MSI, shall focus on addressing key aspects of Project including building awareness in personnel on benefits of new system, changes (if any) to their current roles & responsibilities, addressing the employee's concerns & apprehensions w.r.t. implementation of new system and benefits that are planned for the employees.
- It is required that if MSI doesn't operate in the Change Management, Communication and Training domain then he collaborates with/ hires services of a specialist agency who will be responsible for complete Change Management, Awareness and Communication implementation and monitoring, on the lines suggested below:
- The agencies requiring change management as part of the project shall form various stakeholder groups to address the Change Management Initiative. Stakeholders are all those who need to be considered in achieving the project goals and whose participation and support are crucial to its success. A key individual stakeholder or stakeholder group is a person or group of people with significant involvement and/or interest in the success of the project.
- Stakeholder analysis identifies all primary and secondary stakeholders who have an interest in the issues with which the The ICOMC project is concerned. The stakeholder groups will be the set of core users (Change Agents) who will directly participate in the awareness and communication initiatives, workshops, and provide feedback to the governance Committee.

- Stakeholder groups can be categorized into below categories, based on their influence and role in managing the change and making it successful:

4.8.1. Capacity Building for E-Governance & ERP

Capacity Building is a highly critical component of the project and specifically for E-Governance & ERP implementation. The objective of the Capacity Building (CB) initiatives is to empower the direct users and other stakeholders of BMC to optimally use the system and enhance outcomes in customer facing and other core municipal functions; and also ensure a smooth functioning of BMC.

The System Integrator would render CB services in both areas, as per the “bundling” approach. The SI holds the responsibility for creation of training material, designing the training programs and their delivery to the target group.

Building capacities at various levels is critical to the successful implementation of the recommended IT initiatives. Also, the training programs would cover at minimum general/basic computer awareness programs in addition to project-specific programs in order to ensure adoption of the system at the BMC.

The main challenges to be addressed effectively by the MSI are the diverse trainee base, wide variability in education and computer proficiency and minimal availability of time. The MSI holds the responsibility for creation of a detailed and effective training strategy, user groups and classifications, training plan and guidelines, detailed training material, training program designed their delivery to the target groups.

It has been envisaged to train approximate 50% of BMC personnel staff as a part of capacity building during the ICOMS implementation phase. The MSI holds the responsibility for creation of training material, designing the training programs and their delivery to the target group. Following is the indicative list of the training programs that needs to be administered to the group of officials as identified above. The overall responsibility of administering the training program lies with the MSI.

- Awareness and sensitization of benefits of IT
- Basic Computer Awareness & Role based training for application users
- Trainers Training
- System Administration & Support Training

The MSI shall be responsible for the following activities as part of the End User and Train the Trainer Training:

Develop Overall Training Plan

MSI shall be responsible for finalizing a detailed Training Plan for the program in consultation with BMC covering the training strategy, environment, training need analysis and role based training curriculum. MSI shall own the overall Training plan working closely with the BMC Training team. MSI shall coordinate overall training effort.

Develop Training Schedule and Curriculum

System Integrator shall develop and manage the training schedule in consultation with BMC, aligned with the overall implementation roadmap of the project and coordinate the same with all parties involved. Training schedule shall be developed by solution and shall be optimized to reduce business impact and effective utilization of Training infrastructure

and capacities. The training curriculum for the BMC training program should be organized by modules and these should be used to develop the training materials. The training curriculum outlines the mode of delivery, module structure and outline, duration and target audience. These sessions should be conducted such that the users of the application/modules are trained by the time the application "goes-live" with possibly no more than a week's gap between completion of training and going live of modules. Continuous reporting (MIS) and assessment should be an integral function of training. MSI shall also identify the languages to be used by the end-user for entering data and ensuring multi- language training to the end users as per requirement.

Learning Management System and Training Portal

Developing a Learning Management System and Training Portal for providing access to all training content online including documents, demo, audio, video, simulation and practice, assessment, self-learning and context sensitive help and monitoring, support and reporting

Develop Training Material

Based on the specific needs and the objectives of BMC, training programs should be organized by the MSI. The training program must include training on each of the ICOMC modules.

Following is the indicative list of the training programs that needs to be administered to the group of officials as identified above. The overall responsibility of administering the training program lies with the MSI.

- Basic IT skills and use of computers to creating awareness about the benefits of ICT and basic computer skills
- Role-based training on the BMC application – Basic and Advanced. This training should be in a role based, benchmarked and standardized format, multi-lingual and lead to learning completion and assessment. It should also allow for self-learning and retraining. Training would include mechanism for demonstration using audio / video / simulated / demo practice exercises and evaluation of trainees. The training should be module based.
- "Train the Trainer" programs, where members of the BMC staff would be trained to enable them to conduct further training programs, thus helping build up scalability in the training program and also reducing the dependency on external vendors for training.
- System Administrator training: a few members of the BMC staff with high aptitude would be trained to act as system administrators and troubleshooters for the system.
- Customization of the Training Manuals, User Manuals, Operational and Maintenance Manuals provided along with the Software

PLEASE NOTE: The number of training groups will depend on the number of user groups and has to be mutually decided between Client and MSI.

The minimum indicative level content for the training programs under capacity building and is listed as below:

Training #	Type of Training	Training Content	Number of Days /group
1	Awareness and	This module shall cover Principles of e-	**2**

Training #	Type of Training	Training Content	Number of Days /group
	sensitization of benefits of ICT	governance, NeGP & ERP- e-gov. It shall also cover the advantages of use of ICT in BMC. It shall briefly cover the technology trends and how it can be put to use by use of live examples of ICT use across the world	
2	Basic computer awareness	This module shall cover the fundamental concepts of Computer, Internet, Peripherals, System software and Application software It shall also cover the use of MS- Office suite in detail. It can also touch upon use of office tools such as printers, fax machine, copiers and scanners as well as basics in use of computers (checking network connections, etc.).	**5**
3	Role based system training on The ICOMC Application Software	This module is required to train the at various levels in operating the application. The training is to be provided to the staff depending upon their role and responsibilities in the workflow. During this training, the trainees could also be asked to carry out the routine functions using the software. The training should be module based and cover all modules of ICOMC.	**5**
4	Trainer's training	This training is provided to a select audience across groups who can act as Master trainers and those who can train their colleagues	**3**
5	Network Administration support and Trouble Shooting	Skills in Troubleshooting *vis-à-vis* application, standard software and networking (for those with the aptitude and/or prior training)	**3**

In cases where the training material may be made available by the OEM, it is the MSI's responsibility to ensure the relevance of the material to BMC, customize if necessary and own up the delivery and effectiveness. MSI shall ensure that the training content meets all the objectives of the training course. The material shall be developed in Hindi and English language. MSI shall also develop the training material for delivery through Computer Based Training, Instructor Led Training, Online User Material/Help Manuals and Job Aids. MSI shall provide detailed training material providing step-by-step approach in soft and hard copies to all offices for reference.

Deliver Training to End Users

MSI shall deliver training to the end users utilizing the infrastructure at the designated Training Centres. Role-based training for the Senior Officers will be carried out for a suitable location by the System Integrator.

MSI shall also impart simulated training on the actual application with some real life like database. The MSI should create case studies and simulation modules that would be as close to the real life scenario as possible. The objective of conducting such trainings would be to give first hand view of benefits of using the system. Such specialized training should

also be able to provide the participant a clear comparison between the old ways of operation against the post ERP-e-gov scenario. This training needs to be conducted by the MSI at the very end when all the other trainings are successfully completed.

Most of the training would be an Instructor-Led Training (ILT) conducted by trained and qualified instructors in a classroom setting. To maintain consistency across trainings, standard templates should be used for each component of a module.

An IL course will have the following components:

- Course Presentation (PowerPoint)
- Instructor Demonstrations (The ICOMC - Application training environment)
- Hands-on Exercises (The ICOMC - Application training environment)
- Application Simulations: Miniature version of The ICOMC Application with dummy data providing exposure to the officers to a real life scenario post implementation of The ICOMC
- Job Aids (if required)
- Course Evaluations (Inquisition)

In addition to the ILT, for the modules that may be more appropriate to be conducted through a Computer Based Training (CBT), a CBT should be developed for them. CBT should involve training delivered through computers with self-instructions, screenshots, simulated process walk-through and self-assessment modules.

Select set of staff with high aptitude group and/or relevant prior training, are to be imparted with the training/skills to act as system administrators and also as troubleshooters with basic systems maintenance tasks including hardware and network.

Deliver Training to Trainers (Internal & external – if specified by BMC)

MSI shall help BMC in assessing and selecting the internal trainers as well as external trainers who can conduct the end user training subsequent to the training by the MSI. MSI shall coordinate the ‘Train the Trainer’ session for the identified trainers to ensure that they have the capability to deliver efficient training.

In addition to the training delivered to the end-users, the trainers should also be trained on effectively facilitate and deliver training to end users. Also, it is advisable to always run pilots for any training program before deployment. This training will hence serve as the pilot and as a training session for trainers as well. In addition the end-user training sessions,

Training of Trainers training will consist of three segments:

- The first segment will be set of workshops covering effective presentation skills and coaching techniques and discussing the benefits and structure of the trainer model.
- The second segment will be the formal The ICOMC training which will consist of all modules relevant for their role.
- The third segment will be a teach-back session where trained trainers will present course content and receive feedback regarding content, flow, and presentation techniques. This will also include a feedback session where trainers can provide feedback on the training materials, flow, comprehension level, and accuracy.

Training Effectiveness Evaluation

MSI shall evaluate the effectiveness of all end users trainings using electronic or manual surveys. MSI shall be responsible for analysing the feedback and arrange for conducting refresher training, wherever needed.

State will periodically monitor the training effectiveness through the performance metrics and Service levels and the MSI shall comply with the same.

4.9. Final Deployment and Documentation

After addressing the Client feedback and any deficiency observed during the Pilot deployment and upon completion of System Acceptance Tests (SAT), final deployment of the Bhubaneswar smart city solutions shall be considered by the MSI. For achievement of final deployment, MSI shall also be responsible for development of a cutover strategy which shall include initial data take on, sequence of data take on, set up of support mechanisms to minimize business impact due to any cutover activities.

Post the final deployment, MSI shall handover detailed documentation that describes the site conditions, system design, configuration, training, as-built conditions, operation and maintenance. All documentation shall be in English and Oriya (as agreed with the client), shall utilize metric measurements, and shall be submitted directly to Client in paper hardcopy and electronically in Word/AutoCAD/Excel/Project and Adobe Acrobat.

All installation drawings shall be prepared in AutoCAD, GIS and Adobe Acrobat and provided on CD-ROM as well as hard copies. . The drawings shall contain sufficient detail including but not limited to equipment dimensions, interfaces, cable details, equipment mounting and fire protection.

Electrical and electronic drawings shall be supplied to show engineering changes made to any component or module any time during the contract period.

‘As-built’ Documents delivered by the MSI shall include:

- An inventory of all components supplied including model name, model number, serial number and installation location;
- An inventory of all spare parts supplied including brand, model number, and serial number and storage location;
- All reference and user manuals for system components, including those components supplied by third parties;
- All warranties documentation, including that for components supplied by third parties;
- As-builts in CAD and GIS;
- A diagram indicating the as-built inter-connections between components;
- Software documentation which also includes the version number of all software, including that supplied by third parties.
- Cable run lists and schedules;
- All network and equipment details such as IP addresses, user names, and passwords;
- Data communication protocols; and
- ‘As-Built’ drawings for all components installed.

MSI shall submit to the Client copies of comprehensive operating and maintenance manuals, and log sheets for all systems and hardware supplied as part of this RFP. These shall be supported with the manufacturer's operating and maintenance manuals. The manuals shall be complete, accurate, up-to-date, and shall contain only that information that pertains to the system installed. Maintenance documents shall include:

- Equipment installation and operating documentation, manuals, and software for all installed equipment;
- System Installation and setup guides, with data forms to plan and record options and configuration information;
- The schedule/procedures for preventative maintenance, inspection, fault diagnosis, component replacement and on-site warranty support administration on each system component;
- Hard copies of manufacturer's product specification sheets, operating specifications, design guides, user's guides for software and hardware, and PDF files on CD-ROM or non-volatile memory stick of the hard-copy submittal;
- Complete list of replaceable parts including names of vendors for parts not identified by universal part numbers (such as EIA codes);
- Manufacturer's product specification sheets, operating specifications, design guides, user's guides;
- Permits; and
- Contractor names and telephone number lists for all project trades.

MSI shall provide Systems Manuals (SM), documentation including:

- The configuration and topology of central systems hardware and software;
- Central systems software functions and operations;
- Scheduled maintenance required for the central systems; and
- Database structure and data dictionary.

MSI shall also provide following documents for any be-spoke software development:

- Business process guides;
- Program flow descriptions;
- Data model descriptions;
- Sample reports;
- Screen formats;
- Frequently Asked Questions (FAQ) guides;
- User Manuals and technical manuals;
- Any other documentation required for usage of implemented solution.

Documentation of processes shall be done using standard flow charting software. An intuitive online learning tool depicting standard operating procedures of system usage are

required to be deployed. There shall be a provision of training system in the deployment architecture so as new employees can be inducted easily.

All pages of the documentation shall carry a title, version number, page number and issue date, and shall contain a complete subject index. MSI shall be responsible for fully coordinating and cross referencing all interfaces and areas associated with interconnecting equipment and systems.

Documentation shall require re-issues if any change or modification is made to the equipment proposed to be supplied. MSI may re-issue individual sheets or portions of the documentation that are affected by the change or modification. Each re-issue or revision shall carry the same title as the original, with a change in version number and issue date.

Each volume shall have a binder (stiff cover and spine), and drawings shall be protected by clear plastic to withstand frequent handling. The binding arrangement shall permit the manual to be laid flat when opened.

The paper used shall be of good quality and adequate thickness for frequent handling.

4.10. Operational System Acceptance

At the completion of operational acceptance test, the system shall be considered for operational system acceptance. At the close of the work and before issue of final certificate of completion by the Client, the MSI shall furnish a written guarantee indemnifying Client against defective materials and workmanship for a period of one (1) year after completion which is referred to as Defect Liability Period. The MSI shall hold himself fully responsible for reinstallation or replace free of cost to Client during the Defect Liability period. MSI shall provide approved temporary replacement equipment and material such that the system remains fully functional as designed and commissioned during repair or replacement activities at no cost to the Client.

4.11. Comprehensive Maintenance for System and Services

MSI shall be responsible for comprehensive maintenance of both hardware and software, up-gradations in the system, expansion of the system, technical manpower, spares management and replenishment, performance monitoring and enhancements of the Bhubaneswar smart city solutions deployed as part of this project and shall maintain service levels as defined in the RFP. All equipment and material supplied by the MSI shall be provided with standard warranty against defects of design and manufacturing and against faults and failures associated with workmanship of MSI and its sub-contractors commencing from operation acceptance of the system. All equipment found to be defective during comprehensive maintenance shall be repaired or replaced by the MSI at no cost to the Client.

MSI shall provide all the technical, managerial, and other staffing required to manage day-to-day maintenance of the Bhubaneswar smart city solutions during the Contract period. MSI shall deploy project manager stationed at Bhubaneshwar who shall be the single point of contact to the client and shall be responsible for operation and maintenance of the system.

All spares required for the smooth operation of the Bhubaneswar smart city solutions shall be maintained by the MSI for the entire duration of the contract to meet SLA requirements. The cost of the spares, repairs, and replacement shall all be deemed to be included in the

price quoted by the MSI. MSI shall also institutionalize structures, processes and reports for management of SLA. Root cause analysis and long term problem solutions shall also be part of MSI scope.

MSI shall maintain all data regarding entitlement for any upgrade, enhancement, refreshes, replacement, bug fixing and maintenance for all project components during Warranty. MSI shall be responsible for updates/upgrades and implementation of new versions for software and operating systems when released by the respective OEM at no extra cost to the Client during entire duration of contract. Requisite adjustments / changes in the configuration for implementing different versions of system solution and/or its components shall also be done by MSI. The MSI shall also ensure application of patches to the licensed software covering the appropriate system component software, operating system, databases and other applications. Software License management and control services shall also be conducted by the MSI during this phase. Any changes/upgrades to the software during comprehensive maintenance shall be subjected to comprehensive and integrated testing by MSI to ensure that changes implemented in system meets the specified requirements and doesn't impact any other function of the system. Issue log for errors and bugs identified in the solution and any change done in solution (vis-à-vis the FRS, BRS and SRS signed off) shall be periodically submitted to the Client. MSI shall also be responsible for operating City website, city portal, and city application including all support, content updates and upgrades throughout the duration of contract.

MSI shall ensure OEM support during Comprehensive Maintenance stage for system performance, performance tuning, upgrades etc. MSI shall provide all support for formulation of all policies and procedures related to System Administration, Data Base Management, applications, archives, network management & security, back up and data recovery and archive, data synchronization after crash. Assistance to Client shall be provided as needed in management of legacy data interfaced, print spools, batch jobs, printer configuration etc.

MSI shall prepare a detailed System administration manual, Data administration manual, operational manual, User manual which shall be used by Client's employees to run Bhubaneswar smart city system's production environment. This shall also include how the various parameters shall be monitored/ tuned in a live system. Preparation of requisite system configuration for disaster recovery management and fail over system plan shall also be under the supervision of MSI. The MSI shall also maintain the following minimum documents with respect to ICT components:

- High level design of system;
- Module level design of system;
- System Requirement Specifications (SRS);
- Any other explanatory notes about system;
- Traceability matrix;
- Compilation environment.

MSI shall also ensure updation of following documentation of software system:

- Documentation of source code;
- Documentation of functional specifications;

- Application documentation is updated to reflect on-going maintenance an enhancement including FRS and SRS, in accordance with the defined standards;
- User manuals and training manuals are updated to reflect on-going changes/enhancements;
- Adoption of standard practices in regards to version control and management.

The communication costs (Internet charges, telephone charges, 3G/GPRS connectivity charges) and any other incidental charges related to maintenance period shall be in the scope of the MSI and considered to be included in the proposal submitted by the MSI for the entire contract duration.

Any planned and emergency changes to any component during maintenance period shall be through a change management process. For any change, MSI shall ensure:

- Detailed impact analysis;
- Change plan with roll back plan;
- Appropriate communication on change required has taken place;
- Approvals on change;
- Schedules have been adjusted to minimum impact on production environment;
- All associated documentation are updated post stabilization of the change;
- Version control maintained for software.

Any software changes required due to problems/bugs in the developed software/application will not be considered under change control. The MSI will have to modify the software/application free of cost. This may lead to enhancements/customizations and the same needs to be implemented by the MSI at no extra cost.

If the Operating System or additional copies of Operating System are required to be installed / reinstalled / de-installed, the same should be done as part of the post implementation support.

Support Staff Required

Three (3) types of support staff shall be provided by MSI during maintenance phase:

- Maintenance Support Staff
- Helpdesk Support staff
- Facility Management Staff

Maintenance Support Staff

Well trained, efficient and effective Maintenance Support Staff shall be provided by the MSI during the maintenance phase of the project to support Client's operational and technical requirements in day to day operations of the smart city solutions provided by MSI. Any fault originating for the Bhubaneswar smart city components shall be addressed by the MSI Maintenance Support staff in the least time possible. The staff assigned shall be well qualified to attend to the emergency situations and shall be able to communicate in an effective and efficient manner. The supports staff shall provide 24*7 services, work in a shift

based system and provide full support coverage of the Bhubaneswar smart city solution and maintain the system as per the SLA's defined. At a minimum, 70 maintenance personnel shall be deputed during Maintenance phase in the following shifts:

- Two (2) shifts comprising of 30 personnel each;
- One (1) shift comprising of 10 personnel.

The ICOMC Operators shall be well trained on all the smart city components to understand and take necessary action in any kind of situation.

Helpdesk Support Staff

MSI shall also depute support staff at Helpdesk. The support staff at Helpdesk shall provide 24*7 services, work in a shift based system and provide full support coverage of Helpdesk and maintain the system as per SLAs defined. At a minimum, 24 support personnel shall be deputed at Helpdesk during maintenance phase in following shifts:

- Two (2) shifts comprising of 10 personnel each;
- One (1) shift comprising of 4 personnel each.

Facility Management Staff

Facilities management which include but not limited to building and grounds maintenance, cleaning, catering and vending, security, space management, utilities management etc. and associated manpower shall also be under the scope of the MSI during maintenance phase. At a minimum, MSI shall depute Facility Management staff of 25 personnel which shall work in a shift based system to provide 24*7 services. Staff requirement per each shift is as per below:

- Two (2) shifts comprising of 10 personnel each;
- One (1) shift comprising of 4 personnel each.

Any additional staff required for management, HR, payroll etc. of Maintenance staff, Helpdesk and Facility Management staff, if required by MSI, shall also be under the scope of the MSI.

4.12. Specific Scope of Services

In addition to the scope of services specified in the RFP, this section details system specific requirements for some of the Smart Solutions components. Note that this section should be read in-conjunction with other sections in the bid including functional and technical specifications:

4.12.1. E-Governance & ERP System

For the purpose of this RFP, the solution must cater to multi company functionality. The users will be from BMC, BSCL, BDA and BPTSL organisations, while work flows shall be aligned to BMC and BSCL working. Hence this RFP shall address BMC and BSCL as the primary users and each of the modules have to be customised to the operational needs of both. The bidder shall propose an enterprise license for the ERP.

It is estimated that the number of users would be about 1000.Along with E-Governance and ERP system, Enterprise Content Management System, citizen engagement systems (including redressal and collaboration, contact centre), ICOMC, KPI and dashboard system and integration of all existing systems and ready framework for integration of any future

system shall be implemented. All these systems shall have a tightly integrated application architecture which shall play a vital role in not only just enhancing efficiencies for city operations but also when integrated with the citizen facing e-governance applications, shall provide the benefits of a holistic solution.

There are several stand-alone IT systems created over time under the JNNURM & NMMP programs. The MSI may examine these initiatives and where possible integrate them seamlessly with the proposed solution. The specifications given in this RFP are the functional requirements of BMC and the MSI should study the same, see the efficacy of current systems and then utilize, modify or replace existing systems. The MSI has to study the working of the BMC, suggest and discuss BPR and then come to the to-be processes.

To this end, the MSI shall be responsible for complete 'As-Is' analysis of the existing systems with the Client. The MSI shall review the business operations of these existing systems and recommend the 'To-Be' scenario to the Client. The Client at its discretion may decide to continue using the existing systems or procure a new system from the MSI as part of this contract. All 'change management' from the as-is to the to-be scenario shall be a part of this project.

The system integrator is required to assess the requirements of the stakeholder agencies as listed in the RFP and validate with a conference with the BMC stakeholders and propose proven solutions from reputed OEMs for back office requirements, to meet the requirements of BMC. For other requirements proven solutions shall be proposed and will need to be customized to meet stakeholder agencies specific requirements. It is required that the MSI will enclose the Manufacturers Authorization Form (MAF) for the respective Component.

The MSI shall suggest the sizing of the required hardware necessary for meeting the required performance related SLAs starting from "Complete Deployment" till the first seven years of productive use of the system. The MSI is responsible for sizing the proposed hardware for all the modules of stakeholder agencies in future and performance requirements of the solution. The MSI is to quote, procure, supply and install the hardware and systems software as part of the scope of work. The bidder shall ensure that the LAN / WAN, servers and storage are sized adequately with built in redundancy into the architecture to meet a 10 second response time in terms of performance. The MSI has to size hardware requirements for the DR site.

The MSI is also required to have a comprehensive change management & training methodology together with institutionalize the mechanisms and transfer the knowledge so that stakeholder agencies will be able to manage the incremental improvements and future expansions of the solution, on its own.

The MSI is required to supply licenses and hardware, configure, customize, develop and commission various components of the system as indicated above. Besides, the MSI is also required to carry out the deployment as per a phased plan of deployment for various components of the solution. After complete deployment, post implementation support for 7 years is required to be provided by the MSI. The MSI is to submit a deployment plan in his proposal.

The complete deployment is to be undertaken in 18 months. MSI may suggest a phased deployment; however, all modules are to go live by 18 months.

MSI deployment design document shall include a comprehensive methodology for implementation of the solution at the stakeholder agencies to ensure that the organization

can achieve the objectives of the project and harness the capabilities of the solution components and the embedded best practices. The implementation methodology should provide early visibility to the BMC users, streamline implementations and deliver faster results to all the stakeholders of the project. The project methodology section in the RFP response should be precise and concise and should at least cover:

- Governance and Project Management
- Project plan
- Team composition and structure
- Scope Management
- Data Migration Strategy
- Training, Testing and Acceptance
- Issues and Risk Management
- Escalation procedures and matrix
- Methodology:

➢ Specific methodologies for implementation (if required) of each component starting from project initiation through Requirements gathering, system design, build, integration testing, acceptance testing, deployment preparation and Go Live.

➢ In certain work packages, especially the Corporate Web Site and Portal the MSI may prefer to use Agile Methods. The proposed methodology must ensure integration of all elements.

- Post implementation support and Help Desk Setup
- Project Deliverables

This being a brown field implementation the MSI is expected to deploy senior and experienced consultants with deep domain knowledge in Maintenance, Utilities, application integration, e-Government and/or Smart City Operations. These experts are to act as coaches and prescribe what best practices are to be adopted by stakeholder agencies for each component of the solution. Following shall be taken care of while defining the implementation methodology for the project.

- Adoption of best practices: Process Improvement shall be done to enable stakeholder agencies to adopt some of the best practices embedded in the components of the Solution. The areas that can bring maximum benefits will be identified by MSI in close coordination with stakeholder agency's process owners. MSI will also bring in knowledge of the best practices adopted by other customers to the stakeholder agencies implementation.
- Plan for customization/development – The MSI should plan for following developments as a part of the normal effort for implementing the Solution:

➢ Seamless integration across systems

➢ Documents outputs in pdf, word, excel, .rtf formats

➢ All the reports required by BMC and BSCL

➢ Development of various components where MSI proposal is to develop the solutions instead of COTS solution

- Any other customization/ development required to complete the scope of the solution and meet the requirements of RFP
    - Documentation: The MSI shall ensure preparation of complete documentation of all software development, configuration settings, customized applications, other activities, steps / stages involved in the implementation including the source code for the customized product developed for BMC and BSCL. Integrator will provide detailed final system documentation for reference of BMC and BSCL. System Integrator shall prepare the final user manual incorporating all details of all menus and functionality provided by the system. The source code of customizations will be property of BMC and BSCL.
    - Tools –As part of the proposal, MSI is required to propose the set of tools required for project management, configuration management, issue tracking, document repository etc. along with cost for the same to be included in the commercial proposal.

The implementation Methodology Definition in Proposal

- The methodology to be deployed by the MSI to implement the solution will have different work elements and activities. All these activities and the work elements should be clearly defined in the proposal.
- Critical activities of Implementation: While there are different techniques and tools available as a part of the methodology, the following are expected to be part of the implementation methodology to be adopted by the MSI

- Workshops with different stake holders for capturing business requirements, creating awareness of best practices, communicating the changes, building consensus on process design, for signing off the deliverables etc. These needs to be organized at different intervals and in different places throughout the duration of the projects as demanded by the context.
- Stake holder consultation other than workshops, with those stake holders who will be identified by BMC, for critical inputs, review, suggestions, process description etc.
- Review sessions with different stake holders for signing off the deliverables, walking through the deliverables for facilitating quick understanding
    - Documentation of proceeding – recording the developments, discussions, deliverables, using standard methodology and native tools available with the solution components
    - Work standards/practices for documentation, configuration, testing, data migration etc.
    - Training the different stake holders, on a continuous basis

Project Deliverables

- As per the implementation methodology proposed, the MSI must document the phase wise deliverables for each component for approval by BMC. A detailed list of deliverables by system and by project phase shall be provided by MSI.
- MSI shall provide a detailed project plan as part of proposal submission. The project plan shall highlight each of the phases of the project in line with RFP requirement, milestones in the projects and deliverables

associated with each milestone. MSI can propose its proven methodology for such projects and shall provide valid references where in such a methodology has been used to deliver a project of similar size and scale.

- Issue and Risk Management: An issue is a formally identified matter that may hinder progress on a project or program and about which no agreement has yet been reached. Often it can be difficult to determine which questions should be documented as issues and which can be resolved directly without impeding the project flow. Those items that require documentation, formal investigation and approval should be managed as issues and risks and risk management methodology must be proposed by the MSI.
- Scope Management: Scope of the project will be managed through a formal scope change management process. Project management is essential to ensure that changes to the scope of the program do not adversely affect the program/project objectives. Change management documentation of project scope and approval procedures provide a visible decision-making process for the project and provide a clear audit trail of scope changes and the corresponding cost benefit appraisal and must be proposed by the MSI in the Project Management Methodology.
- Testing & Acceptance: The MSI shall provide standard functionality test suites for testing the components. For software, the MSI shall prepare the test plan and shall get it approved by BMC. Test Data for different scenario (Test Cases) will be prepared in consultation with the users concerned for testing the modules. The pre-commissioning tests shall be carried out to assess the following but not limited to:

➢ Conformance to the functional requirements,

➢ Performance of the system with reference to response time and accuracy,

➢ User friendliness.

➢ Simultaneously, the documentation will also be reviewed by the user to ensure its accuracy and clarity.

- System Testing: The system Integrator is required to prepare procedures detailing the steps for conducting System Tests, which are accepted by BMC. The system Integrator shall after development and customization/configuration of the Components, conduct tests to demonstrate that the system meets all the requirements (functional and technical) specifications as brought out in this RFP.
- On the basis of these tests, a report would be submitted by the system Integrator for review and approval by BMC. The test results and response times should be demonstrated by the MSI during the testing phases (System, integration & Stress and Load testing) at each BMC location in an environment/infrastructure as mutually agreed upon by BMC and the MSI.
- Developing a Test Plan to support Function Testing and System/ Integration Testing and ensuring that the testing of the software is comprehensive and auditable and preparing test cases for User Acceptance Testing (UAT).
- Testing of the entire system, as part of system integration testing. And testing of the data conversion and migration to the new system, as part

of system integration testing. Integration testing shall be carried out across components to ensure end to end business processes are delivering the desired results.

- Develop acceptance test procedures to ensure conformance to the required process as per the functional specifications, response time, and the integrity of components after installation, and to eliminate any operational bugs. This will include:
- Fine tuning of the software, ensuring all required related component software are installed and any debugging, if required.
- At the satisfactory conclusion of these Acceptance Tests to the duly signed off by BMC, a Business Readiness check would be conducted by the Project Governance team, which would give the GO AHEAD for starting the Deployment Phase Activities.
- Data Migration: Migration of data in the new system is responsibility of MSI. BMC along with MSI will jointly decide on what data will be migrated. The expected sources of data which would require migration are:

➢ Property data from the Property tax System which is currently in development and would Go Live before this solution.

➢ Financial data

➢ Data in excel sheets from the desk tops.

➢ GIS data for commissioned assets at the time of system deployment

However, data migration scope will be defined as per project plan to be submitted by MSI. The MSI is required to take the source data in the format which is available. The MSI is required to take complete ownership of this activity and develop a detailed plan for data migration.

- End-User Training – The MSI is expected to conduct role based training to facilitate user adoption of the system. The training material shall be prepared accordingly by the MSI, with training data and business scenarios which the end users can relate to. Successful completion of end user training is necessary prior to granting Go Live clearance by BMC to the MSI. It is necessary that the end user training is conducted by trainer with expertise in the business domain and the person who is part of functional team of MSI.
- Cut Over Strategy: The MSI must evolve & detail a comprehensive cut over strategy including initial data take on, sequence of data take on, set up of support helpdesk, helpdesk procedure to minimize business impact of cut over activities. This deliverable would require a formal sign off by BMC. The MSI is required to undertake the following to review readiness for “Usage Ready” of the solution, by completing and reviewing the following tasks and activities:

➢ Facilitate in setting up central help desk for any queries

➢ Review the health, usage and performance of the system till it stabilizes

➢ Ensuring resolution / Documentation of all issues raised during implementation

➢ Final configuration/ integration, volume and stress testing

➢ Switch over to production environment.

- Declaration of “usage ready” – the system will be declared “Usage Ready” by BMC when the following tasks/activities are accomplished satisfactorily
- Acceptance testing of each phase
- Hardware and software configuration
- Data migration of each phase
- Training of each phase
- User creation / role identification for each phase
- Help desk setup
- Usage Ready Definition: “Usage Ready” means commissioning and integration of all the hardware including Data Centre, Disaster Recovery Centre-if applicable, and all the components of the solution as per the RFP, configured, customized and used successfully by all the intended users of BMC for successfully executing all the intended transactions as in this RFP and as per the SLAs and / or mutually agreeable levels. The “Usage Ready” shall come into effect only on approval by BMC.
    - Acceptance of “Complete deployment”: The solution is accepted as “complete Deployment” only after successfully generating at least one balance sheet for the complete operations, for one financial quarter or successfully using the system for three months after usage ready, whichever is longer.
    - The Project Managers from the BMC and MSI will jointly initiate the notice for declaring “Complete Deployment” after satisfactory completion of all the following:
- All the activities as listed in this RFP
- After scrutinizing all the inspection reports, audit findings, Contracts, licensing agreements etc.
- Satisfactory completion of closing of accounts and generation of complete balance sheet for one financial quarter, with the ERP solution and approved by the head of finance and accounts of BMC

Support services

- After go live of all the solution components, the MSI will provide three months of system stabilization services.
- During this phase, the MSI will take up the following
- Tasks related to bug fixing (if any) in customization made in the system
- Maintaining back-ups of the implemented system
- Coordinating with OEM’s of the respective component for resolving any product related issues.
- Minor developments, improvements in the output and input formats
- Hand holding the users
- Formulation of Post “Complete deployment” Support Strategy
- Formulating the mechanisms for Post “Complete deployment” Monitoring

- Carrying out the Review of issues and activities carried out during user adoption and system stabilization period
- Monitoring and fine tuning system response
- After completion of system stabilization support phase and system acceptance, the project will enter support phase. The support phase will be 5 years after system stabilization support.
- The support services shall be designed to achieve the following broad objectives
- Facilitating user adoption
- Continuous improvement and refinement of the processes, reports
- Operations of help desk and refresher training.
- Institutionalizing structures and processes for management of SLA, strategic control
- Root cause analysis of recurrent problems and permanent fix with prior permission of BMC at no extra cost is part of support scope.
- Liaison with respective OEMs in case of product related issues and provision of workaround solutions in case of delays in providing resolution.

The support services shall include below activities.

- Help desk operations - Initial Response, Immediate telephonic response and support for usage related and other minor problems. Dial-in support for handling, minor bug fix.
- SLA based support – The MSI is required to detail out their support process. The industry standard Service level agreements shall be proposed by the system integrator.
- Periodic reporting on SLA management needs to be provided by the MSI. Root cause analysis and long term solutions to fix the problems shall be part of the reporting mechanisms. There will be no additional cost for fixing the problems through root cause analysis.
- System Improvements – Minor system improvements shall be identified by the MSI and carried out as per priority set by BMC.
- Onsite support - On-site support for hand holding the users, database recovery and data synchronization after crash, performance tuning, bug fix, update for all critical functions.
- Updates/Upgrades/New releases/New versions. The MSI shall provide and implement from time to time the Updates/Upgrades/New releases/New versions of the software and operating systems as required at no extra cost. The MSI should ensure upgrades, updates & patches of the Solution Components are applied as and when released by the respective OEM's.
- If the Operating System or additional copies of Operating System are required to be installed / reinstalled / de-installed, the same should be done as part of the post implementation support.
- MSI should carry out any requisite adjustments / changes in the configuration for implementing different versions of solution and/or its components

- MSI shall ensure application of patches to the licensed software covering the appropriate solution component software, operating system, databases and other applications.
- Software License Management. The MSI shall provide services for solution component license management and control.
- Operational Support – On-site operational support after implementation
- Component support – the MSI must ensure the support from the relevant OEM for services relating to system functionality, technical functionality, performance tuning, upgrades etc.
- Documentation - upgrade the Documentation system on any new releases and provide any updates of technical and functional manuals
- End training environment - establishment of centre of excellence (CoE) having an integrated environment with all the components for the following purposes:

➢ Processes and structures for continuous improvement

➢ Processes and structures for solution roll out

➢ Skills and expertise to maintain support and continuously improve the end to end business processes and solution.

➢ Train new and existing users

- The MSI is expected to provide the mandatory support services for a period of five years, after the declaration of “Complete Deployment” and system stabilization support period.
- BMC will have the options to extend the post implementation support services beyond the five years’ period stipulated in the RFP. The support extension will be discussed and will be agreed on mutually agreeable terms and conditions.
- Technical Support

➢ The technical support for the solution components is meant to ensure OEM support –for system performance, performance tuning, upgrades etc.

➢ Formulation of all policies and procedures related to System Administration, Data Base Management, applications, archives, network management & security, back up etc.

➢ Prepare requisite system landscape and procedures for smoothly implementing the solution component. This shall also take into consideration the phased implementation as required as per this RFP.

➢ The MSI shall prepare and submit an authorization matrix for approval for various processes to be used in the deployed systems and processes. Upon approval by BMC the MSI shall implement the approved authorizations in the system authorizations and perform any related activity or task as and when required by BMC.

➢ Assist BMC to manage the legacy data interfaces, print spools, batch Jobs, printer configuration etc.

➢ Prepare a detailed System administration manual, Data administration manual, operational manual, User manual which shall be used by BMC employees to run the solution in production environment. This shall also include how the various parameters shall be monitored/ tuned in a live system.

- Finalize the back up and data archival policies for all the Components. All necessary configurations shall be done and tested.
- Prepare requisite system configuration for disaster recovery management and Fail Over system plan.

4.12.2. Solid Waste/Municipal Vehicle Management

Solid Waste/Municipal Vehicle (water tankers, cess-pool vehicles, etc.) Management scope shall include the following:

- End-to-end process oversight of vehicles and resources which shall consist of:

- Tracking of resources (sweepers for solid waste, etc.) for process oversight as per the SLAs of the agency/operator responsible for the work from household garbage collection to bins.
- Tracking of bins on a sample basis.
- Tracking, monitoring & reporting of vehicles through the Smart Tracking System, which shall connect to the Solid Waste and Municipal Vehicle management systems
  - Solid waste vehicle tracking from bins to TTS.
  - Solid waste vehicle tracking from TTS to Waste Treatment Centre
- Operations & Management Application that shall support
  - Process oversight and reporting on compliance
  - Billing & collection recording
  - MIS reports & dashboards for decision support
  - SLA monitoring & reporting
    - Integration with Smart Tracking, Grievance redressal system, GIS portal and ERP-E-Governance services

The Solid Waste Management system shall support operations management as per local requirements for disposal of:

- Solid waste
- Construction waste
- Bio-medical waste
- Animal waste

4.12.3. Multi-Services Digital Kiosks

The specific scope for Multi-Services Digital Kiosks include:

- MSI shall install integrated and stand-alone multi-services digital kiosks at strategic locations and approved by the Client.
- MSI shall be responsible for creating the required software platform to support the functionalities of the Multi-Services Digital Kiosk;
- MSI shall be responsible for integrating the VoIP features at the ICOMC for transferring the call to the respective departments;
- MSI shall be responsible for integrating the each kiosk with the central application server by providing the unique ID, IP addresses, etc.;

- MSI shall be responsible for upgrading the OS, firmware and other related platform of the Kiosk periodically;
- MSI shall be responsible for replenishment of consumables including paper for printing receipts and tickets;
- MSI shall be responsible for carrying out the turnkey works for implementing the kiosks;
- MSI shall coordinate with the plot developers for installation and Right of Way (RoW).

4.12.4. Fibre Optic Infrastructure

The following are the overall responsibilities that need to be undertaken by the MSI as part of the Project for the fibre optic infrastructure. Note that this should be read in-conjunction with other sections in the RFP including functional and technical specifications:

- MSI shall undertake a detailed and comprehensive network architecture design of smart city components and existing physical infrastructure in line with the overall objective and requirements of the project. MSI shall identify the space required for setting up the network infrastructure at each of the location in consultation with BSCL;
- MSI shall be required to undertake the GIS based survey to design the OFC route planning and network topology and share the same with the BSCL. MSI can make use of the publicly available data and tools such as Google Maps, ArcGIS, NIC developed maps etc. However, the ownership of the accuracy and validation of the data map information shall be with the MSI;
- The network architecture design exercise shall involve:

➢ Existing Conditions Survey;

➢ Detailed Network architecture covering all locations;

➢ Detailed Fibre layout including for construction drawings;

➢ Detailed Network solution and deployment architecture covering the central infrastructure at ICOMC, POPs and Data Centre.

➢ Solution required for managing / monitoring the complete Network Backbone, Distribution and Access Layers.

➢ Detailed information security architecture to ensure data privacy as well as security.

- MSI shall validate Network architecture that includes all of the above along with other design elements like data standards, technology standards, interoperability standards, security architecture and other such guidelines / standards. This shall be prepared in active consultation with Client or its representative;
- MSI shall factor inclusion of various BSCL and Govt. offices and their location, bandwidth requirements, security, LAN/WAN protocols, network topology for each of the Smart City components during design stage;
- MSI shall provide end-to-end fibre optic infrastructure across Bhubaneswar including conduits, manholes, handholes, fibre optic cable, FOSCs, network switches, and accessories for the backbone,

distribution and access network. This includes end-to-end connectivity for all buildings and field devices;

- MSI shall provide end-to-end trench for laying of the backbone and distribution fibre optic infrastructure throughout the project area;
- MSI to provide trench for connectivity to every end device from the backbone trench;
- MSI to provide manholes and handholes at strategic locations for connectivity to field devices across backbone, distribution and access network. MSI to provide handholes for within buildings and to meet future additional requirements;
- MSI shall be responsible for all the splicing works;
- MSI to assess and incorporate in the implementation the type of soil, long cuttings, new embankments, water logged areas, types of major bridges, major yards etc.;
- MSI to work out the requirements of heavy tools and plants depending upon nature of the territory, availability of roads alongside etc.;
- Before carrying out laying and installation of ducts and fibre, MSI shall prepare an installation report (approved by the Client or its representative) which shall constitute the following:

➢ Closely examining the proposed cable route and prepared cable route plans prepared in AutoCAD;

➢ Implementation works at POP buildings and preparation of site plans;

➢ Siting of areas for loading/unloading of cable drums and siding facilities for the for the project;

➢ Preparation of the material schedule required for different protective works;

- MSI is expected to incorporate best practices for precaution against damage by Termites & Rodents;
- Cable laying is proposed either by traditional Cable pulling method or by Cable blowing method (preferably);
- The Network Architecture once approved shall be base lined either in part or in whole and the Client shall institutionalize the processes for Architecture Change management to undertake any change in the respective location, as required during the contract phase;
- Designing IP Address Schema:

➢ The MSI shall design suitable IP Schema for the entire Network Backbone including ICOMC, POP, smart city components and interfaces to external systems/ network. The MSI shall ensure efficient traffic routing irrespective of link medium;

➢ The MSI shall maintain the IP Schema with required modifications from time to time within the scope of the project.

- MSI shall coordinate and validate with the Client the detailed cable routing along with locations of joints, terminations etc.;
- MSI shall compute and implement all the storage infrastructure required as part of the fibre optic infrastructure. All networking and firewall requirements for the fibre optic infrastructure will also need to be undertaken by MSI;

- MSI shall be responsible for data encryption and data security;
- Provide details on connection type, speed and bandwidth required at the ICOMC and POP (as applicable) for connectivity to outside world;
- Assist consultant and Client in registering BSCL as an IP-1 with DoT;
- Maintain the fibre asset management system during the course of the contract;
- Proper earthing, grounding and lighting suppression for all applicable equipment under the scope of MSI.
- MSI shall build the fibre optic network over the duration of the contract. The MSI will be responsible for evaluating the exact timelines for the end-to-end construction of the fibre optic network. However, at the end of the contract, it is expected that BSCL owns end-to-end fibre optic infrastructure. For interim project connectivity requirements and to meet the overall project timelines, MSI may obtain connectivity using different ISPs via wired and wireless techniques. MSI shall factor in all such connectivity costs as part of the bid.
- MSI shall be given RoW for the entire project area. Using this RoW, the MSI may lease out additional capacity (beyond project needs) and may also install additional infrastructure based on requirements of various agencies (all additional costs to be borne by the MSI) upon discussions with Client. However, the ownership of the project's fibre optic network at any given point shall remain with BSCL.
- The POP rooms shall be provided at the Data Centre, ICOMC and five (5) additional buildings of BMC/BSCL. All works associated with installation of equipment and cabling until and within the POP rooms shall be under the scope of the MSI. The MSI shall also be responsible for coordination and approvals with the concerned building owners and shall also be responsible for reinstatement of the works.

4.12.5. City-Wide Wi-Fi

The scope of services for city-wide Wi-Fi includes:

- The MSI shall validate through a coverage modelling and/or detailed survey in Bhubaneswar the number of hotspots required;
- Wi-Fi Operator shall be a Licensed ISP in India who shall be able to meet all requirements for operations of network as per RFP. The Wi-Fi network operator shall be a neutral operator i.e. a tenant based model where any licensed service provider may offer Wi-Fi services using this network;
- The MSI shall be responsible for monetization of City Wi-Fi services in compliance with the requirements of the RFP. The MSI shall retain all revenues realized from monetization;
- The APs shall be installed at street light poles, smart poles and kiosks.
- Raw bandwidth required for the city Wi-Fi network shall be provided at no additional cost by the MSI;
- Testing of Wi-Fi network for penetration, security and coverage post deployment of the network;

- The MSI shall comply with all the standards and best practices. MSI shall also ensure that DoT and TRAI guidelines issued from time to time including but not limited to operations, security, user registration, equipment EIRP, etc. At no point Client or its authorized entities shall be responsible for any non-compliance on account of non-adherence by the MSI;
- The MSI shall develop and implement a billing and accounting software for e-recharge, enabling Wi-Fi usage and accounting for the service revenue as per the requirements stated in this RFP;
- MSI shall also be responsible for:

➢ Providing adequate security mechanisms in City Wi-Fi service equipment to prevent unauthorized access or interfaces to services, calls, protocols and data;

➢ The MSI shall provide all the usage data/log/analysis for further usage like usage prediction, planning towards additional resource deployment.

4.12.6. GIS Platform

The GIS System with the B-One Portal shall provide efficient decision support system by enabling the following facilities, but not limited to:

- Enable the public to easily discover and search for geospatial and textual data.
- Enable the public to view different representations of Bhubaneswar on a map.
- Enable the public to view the heritage points in Bhubaneswar.
- Enable the public to provide feedback.
- Query tools enables users to search for specified features like Health facilities, educational institutions etc.
- Enable the administrator to publish announcements and events for public.
- Enable the public to view information related to a ward in Bhubaneswar.
- Enable the public to view bus routes.
- Enable the public to locate facilities available in their vicinity.

The scope of services shall include:

- Implementation of

➢ B-One citizen portal

➢ Enterprise GIS Database

➢ Setup of Enterprise Integrations

➢ Mobile Solutions

➢ Open Data System

Figure 1: Overall system architecture proposed

- Bidder shall carry out Design, Development and Maintenance with regard to Data Services, Integration of Data and Application Development services for B-One.
- Data Services for B-One - Revamp existing data & Build additional data as per the business and operational requirements. Integrate ICOMC data and other systems data with B-One.
- Application services for B-One - Carry out application development to Revamp existing and build new functions & tools as per requirement. Development of web-services for Integration with other systems.
- Review ESRI's Phase 1 work on the B-One Portal
- Identifying data and agencies that shall populate the B-One Portal that will build upon the Phase 1 work.
- Development of Standard Operating Procedures (SOPs) for agency updates on data – frequency, responsibility, etc.
- Develop design document and hold workshop for the city and state agency stakeholders of the Portal.
- Once approval is received from the Stakeholder team, develop a full-fledged B-One portal that shall form the single point of access for location based needs of the city and potentially all citizen services.
- Develop test plans & procedures, use-case analysis, etc.
- Support system testing and acceptance before deployment of the system.
- Provide maintenance and updates for the period of the project.
- Centralised Enterprise GIS Database will implemented which can get integrated with external systems. The database shall be highly scalable and designed for larger-scale use and enterprise-wide implementations.
- Required Mobile Apps shall be developed for all G2C, G2G & G2B users.

- Bidder shall provide following licenses in the name of the Client:

- Two (2) number of ArcGIS Desktop 10.5 or latest for data digitisation and updation.
- One (1) number ArcGIS online license for Publishing GIS services, Authoring maps and administering ArcGIS Online groups and organizing content.

- Open Data System shall be developed & implemented with the following conditions with consideration to best practices:

- Setup Open Data Framework - Identification of Data, Security concerns, Stake-holders, Sustainability, Investments, Design of entire Implementation
- Identification & finalization of data formats, setup necessary data conversion systems & procedures. Data in formats such as Shape file, CSV, Excel, etc. shall be generated periodically through automated routines and through web services these data will be transferred to data repository of Open Data System
- Identify/develop open data policies for sharing of data by the Government Agencies that will be contributing to the B-One Portal
- Policies and Approvals. Data Maintenance, Ownership & Workflows
- Develop Public Engagement plans & procedures
- Setup of Data Centre and system Maintenance
- Development and Enablement of Web Services for integration with external systems and access by external systems
- Implementation of Portal consisting of:
  - Data catalog, search, view metadata & download
  - Developers Access registrations,
  - Web service registrations,
  - Mobile Apps download process & data,
  - Links to websites that are using Bhubaneswar Open Data
  - Policy documents, data maintenance work flows
  - Citizen forum, Citizen data usage stories, Links to citizen organizations
  - Data analysis & reports
- Recommendation for Governance body and sustenance plans

4.12.7. Intelligent City Operations and Management Centre (ICOMC)

As part of the Project, three types of Command and Control Centre shall be implemented which are as follows:

- **Temporary Command and Control Centre at BMC-Bhawani Mall – 8000 Sq. Ft**

- A temporary Command and Control Centre shall be implemented at BMC-Bhawani Mall for monitoring and management of all Bhubaneswar smart solutions till the permanent ICOMC is not ready for operations.
- MSI shall be responsible for complete installation of temporary command and control centre which also includes all civil, mechanical, electrical and interior works.

- MSI shall also be responsible for Facility Management at temporary command and control centre which includes but not limited to building and grounds maintenance, cleaning, catering and vending, security, space management, utilities management etc.
- MSI shall also be responsible for dismantling temporary command and control centre when ICOMC is implemented. Shifting of existing equipment from temporary to ICOMC shall also be under the scope of MSI.
    - **ICOMC – 40,000 Sq. Ft.**
- MSI shall be responsible for complete implementation of ICOMC. Implementation scope shall also include all civil, mechanical, electrical and interior works. Scope of implementation is explained in sections below.
- MSI shall be responsible for shifting the equipment placed in temporary command and control centre to ICOMC.
- MSI shall also be responsible for Facility Management at ICOMC which include but not limited to building and grounds maintenance, cleaning, catering and vending, security, space management, utilities management etc.
    - **ICOMC at Police Headquarters**
- ICOMC – satellite command centre, shall also be installed at Police Headquarters with all the required systems to operate the City command centre.

4.12.7.1.ICOMC: Data Security

The smart city network architecture shall adopt an end-to-end security model that protects data and infrastructure from malicious attacks, thefts, natural disasters, etc. The architecture shall be implemented in such a way that the system is protected from hackers and other threats. The data security system shall address security policies, hardware and software, along with the connectivity between the field device and the respective application.

Note that the client at its discretion may have the authority to carry a security audit of the entire system during the course of the project or post implementation at regular intervals.

4.12.7.2.ICOMC: Data Hosting

The hosting requirements of the project shall be met via a hybrid architecture that includes:

- On-premises; and
- Data Centre (located at STPI).

Overall, the objective of this architecture is to optimize the number of on-site servers without compromising the overall performance of the system. BSCL through STPI shall provide the hosting space only. All the servers, storage and other IT infrastructure at the STPI data centre have to be provided by the Bidder. The Disaster Recovery (DR) Site shall be provided through STPI. The required servers at the DR site shall be provided by BSCL through the managed services contract.

MSI is required to provide an overall solution meeting the below mentioned minimum requirements for various applications. It is expected that all applications for on-cloud hosting shall support cloud ready architecture.

Application	High Availability/ Clustering	Single sign on	Back up	DR (minimum production capacity)	RTO	RPO	Expected Response Time in Seconds
Smart Traffic	No	Yes	Yes	Yes (Min 50%)	60 Mins	15 Mins	3
Smart Tracking	No	No	Yes	Yes (Min 50%)	60 Mins	15 Mins	3
Smart Parking	No	No	Yes	No			
Smart Response	Yes	Yes	Yes	Yes (Min 50%)	60 Mins	15 Mins	3
Smart Governance and Smart Connect	Yes	Yes	Yes	Yes (Min 50%)	60 Mins	15 Mins	3
Smart City Platform	Yes	Yes	Yes	Yes (Min 50%)	60 Mins	15 Mins	2

4.12.7.3.ICOMC: Other Requirements

- MSI shall be responsible for compliance with all local standards and certifications, including building, electrical and occupational requirements;
- MSI shall integrate ICOMC with various other City systems and infrastructures. MSI shall coordinate with all the stakeholders of these city systems for integration purposes;
- MSI shall be responsible for setting up the required software platform and interfacing ICOMC with other city components;
- Define SOPs with the Client or its representative for the operations to ensure that ICOMC systems are configured to support the operational procedures;
- Creation of KPIs and dashboards as per the requirement of the Client;
- Mobile version for the smart city platform for the Client;
- Build and certify ICOMC as per ISO 27001:2011 standards.

4.12.7.4.ICOMC: Interiors

Norms

The ICOMC interiors shall be state of the art adhering to the various best practices norms for control centres, including:

- Development of ergonomic reports for the ICOMC covering Human Factors Engineering (HFE), ISO9241 (Ergonomic requirements for office work with visual display terminals - VDTs) and ISO11064 (Ergonomic Design of Control Centres)
- The proposed interior material should meet to basic control room norms, including but not limited to:

  - ASTM E84 or equivalent fire norms,
  - high scratch resistant surfaces,
  - Bhubaneswar seismic zone (Zone 3) compliance, and
  - Green Guard passed Desk for ensuring safe environment for operators.

Site Preparation for ICOMC including Operation Area, Large Board Room, Board Room, Cabins and Rack Room.

The detailed design in all aspects for the design-build (including but not limited to civil, mechanical, structural, electrical, communications, fire, fit-outs, furniture, etc.) of the ICOMC shall be the responsibility of the MSI and be approved by the Client or its representative. All interior works of ICOMC shall be modular in nature allowing expansions. The MSI shall have the required personnel on the team including architect, structural engineer, MEP (Mechanical, Electrical, Plumbing) etc. as needed for this design-build. At least two (2) options for the design-build shall be proposed for the ICOMC. Interior layouts and material to be procured for the ICOMC shall be approved by the Client or its representative.

The MSI shall be required for complete site preparation, installation and commissioning for ICOMC which includes Operation Area with operator consoles and video wall, Large Board Room, Board Room, Cabins and Rack Room on turnkey basis as per the requirement in consultation with the Client and its representative but not limited to the following:

Civil and Architectural work

The scope for civil work in this RFP is to furnish the Command Control Centre in all aspects. The furnishing includes but not limited to the following:

- Cutting and chipping of existing floors
- Trench works
- Masonry works
- Hardware and metals
- Glazing
- Paint work
- False flooring
- False ceiling
- Storage

- Portioning
- Doors and locks
- Painting
- Fire proofing all surfaces
- Cement concrete works
- Insulation
- Plumbing

All material to be used shall be of fine quality ISI marked unless otherwise specified

False Ceiling

The MSI shall install the top false ceiling at ICOMC. This false ceiling shall house A/C ducts (if required) and cables of electrical lighting, firefighting, and CCTV. Appropriate pest control measures shall be taken to keep pests at bay.

Raised flooring

The MSI shall be responsible for raised flooring and provide for suitable pedestal and under structure designed to withstand various static and rolling loads subjected to it in server racks. The entire raised floor shall have laminated floor covering and beadings on all sides of the panel.

Electrical Distribution System

The MSI shall be responsible for installation of electrical distribution system. MSI shall be responsible for proper and uninterrupted working and shall ensure this by having the IT equipment and server room power distribution system with redundancy:

- Two incoming HT feeder supply from different sub-stations. Even if one feeder is down, the other one keeps power available.
- Emergency Diesel- Generator backup on failure of both main feeders
- UPS system with battery bank for critical loads
- Connection between UPS system and the IT equipment shall be redundant. No single point of failure shall exist in the power connectivity between network racks and UPS system.

Air Conditioning and Natural Convection

- Since ICOMC is a critical area, precision air conditioning system shall be exclusively installed to maintain the required temperature. The A/C shall be capable of providing sensible cooling capacities at ambient temperature and humidity with adequate air flow. The task of the MSI shall include (but not limited to):

  - Connecting the indoor unit with the mains electrical point
  - Connecting indoor and outdoor units mechanically (with insulated copper piping)
  - Connecting indoor and outdoor unit electrically
    - The air conditioner shall be linked to secondary power supply as well to prevent them from shutting down in case of power outage.

UPS requirements and features

- UPS system shall provide a redundant power supply to the following needs:

➢ Servers and important network and storage equipment

➢ Access control, Fire Detection & suppression system and surveillance system

- The system shall be automatic with power supply from the mains and automatic switchover to DG set as secondary source for the Data centre. The specifications of UPS are provided in this RFP.

Electrical work

- MSI shall do complete electrical cabling work for ICOMC and IT equipment which shall include but not limited to:

➢ Main electrical panel in ICOMC

➢ Power cabling

➢ UPS distribution board

➢ UPS point wiring

➢ Power cabling for utility component and utility points etc.

➢ Online UPS

➢ Separate Earth pits for the component

➢ Metering for different loads

- The MSI shall use fire retardant cables of rated capacity exceeding the power requirements of existing and proposed components to be used at maximum capacity.
- All materials to conform to ISI standards as per industry practice

Lighting Works

MSI shall be responsible for the lighting works in the facility. Following items need to be undertaken by MSI for lighting:

- Supply of all equipment associated with implementation of lighting including fixtures, lamps, wiring etc.;
- Wiring for lighting system in the building;
- Installation of lighting fixtures;
- Warranty for the lighting equipment;
- Critical lights shall be connected to UPS for uninterrupted lighting;
- Post the installation, MSI shall ensure that lux levels of the building are as per IES-HB-10-11 and requirements of this RFP.

Fire Detection and Suppression System

- The facility shall be equipped with adequate and advanced Fire Detection and Suppression system. The system shall raise an alarm in the event of smoke detection. The system shall have proper signage, response indicators and hooters in case of an emergency. The system shall be based as per NFPA standards.

Building Management System

- Building Management System shall be implemented for effective monitoring, management, control and integration of various building systems such as HVAC, lighting, electrical, fire detection and suppression system, CCTV system, Access Control System etc. over a single platform. BMS shall perform various functions such as data collection and archival, alarm and event management, trending, reports and MIS generation, preventive maintenance etc.
- Design-Build of the BMS shall be under the scope of MSI. IO summary and other BMS related provisions shall fall under the scope of the MSI.

CCTV System

- The MSI shall provide CCTV system within the ICOMC on 24X7 basis. All important areas of the ICOMC along with the non-critical areas like locations for DG sets, entry exit of ICOMC, Entry and Exit of building premises need to be under constant video surveillance. Monitoring cameras shall be installed strategically to cover all the critical areas of all the respective locations. The MSI shall also provide the ICOMC operations room to be Wi-Fi enabled;

Access control system

- The Biometric/Access card based Access Control System shall be deployed with the objective of allowing entry and exit to and from the premises to authorized personnel only with appropriate door locks and controller assemble connected with BMS system. The system deployed shall be based on proximity as well as biometric technology for critical areas and proximity technology for non-critical areas.

Rodent Repellent System

- The entry of rodents and other unwanted pests shall be controlled at the ICOMC using non-chemical, non-toxic devices. Ultrasonic pest repellents shall be provided in the false flooring and ceiling to repel the pests without killing them. However the MSI shall conduct periodic pest control using chemical spray once in a quarter as a contingency measure to effectively fight pests.

Water leak detection system

- The Water Leak Detection System shall be installed to detect any seepage of water into the critical area and alert the security control room for such leakage. It shall consist of water leak detection cable and alarm module. The cable shall be installed in the ceiling and floor areas around the periphery.

5. Functional Requirements

5.1. Smart Traffic Management System

FR - 1 Functional Requirements

Traffic Violation Detection System (TVDS)	
FR 1.1	The TVDS System shall help the BSCL and other stakeholders especially the Police department to monitor the traffic movement. The TVDS shall also help in enforcing the various violations by the road users which shall ultimately help in enhanced safety and traffic discipline on the roads.
FR 1.2	The TVDS system shall be deployed at several major signalized intersections in Bhubaneswar as a part of the project that shall be used by Traffic Police to monitor and enforce traffic violations.
FR 1.3	The TVDS sub-system shall help traffic police in generating challans which can help Police to legally challenge the traffic violator/ offender.
FR 1.4	The TVDS sub-system shall help in initiating public education and awareness program on automated enforcement of red light violations by media & motor driving learning schools by performing data processing on sample/ stored and simulated violations.
FR 1.5	The software and solution of TVDS shall comply with all functional and business requirement as specified in this RFP, elsewhere.
FR 1.6	TVDS will be operational and detect violations on 24X7 basis.
FR 1.7	The TVDS sub-system shall have an ANPR based on non-intrusive type of enforcement for detecting various traffic violations.
FR 1.8	The TVDS shall automatically detect the license plate in the captured video feed in real-time.
FR 1.9	TVDS including ANPR cameras at sites/locations shortlisted, Video Image Processor with embedded software application for violation detection (like Traffic Limited Zone Infraction and Speed Limit Infraction etc.), video compression with integration to Command and Control Centre applications like violation booking and challan generation shall be provided by the Bidder.
FR 1.10	The system should work seamlessly with the ANPR sub-system to perform OCR (Optical Character Recognition) of the license plate characters (English alpha-numeric characters in standard fonts) and convert into machine readable format for further processing.
FR 1.11	The system shall be capable of storing JPEG image of the violating vehicle along with its license plate and enter the license plate number into the database along with date, time-stamp and site location details.
FR 1.12	The TVDS system should instantaneously (within 4 seconds) receive the processed ANPR of the violating vehicle from the ANPR sub-system.
FR 1.13	The system should store a continuous unaltered video clip of the vehicle approaching and leaving the violation location in the database.

FR 1.14	Secured connectivity for real-time data transfer between the TVDS sensors locations in the field with the central control room shall be provided along with complete hardware and networking required for the solution.
FR 1.15	The TVDS sub-system should work in both day and night conditions with the defined minimum accuracy levels.
FR 1.16	The TVDS sub-system should work with minimum intervention and maximum accuracy levels in all weather conditions
FR 1.17	The system should at least have 95% of violation detection accuracy as the minimum accuracy level irrespective of the type of violation, time and condition of the violation in the field.
FR 1.18	The system should be able to provide Unique Case number for each of the Violation Detected.
FR 1.19	The system should be capable of providing a search and filter option to find specific cases at any point of time
FR 1.20	There shall be an operator at central control room to operate the TVDS application on TVDS workstation.
FR 1.21	Type of Violations – The following type of traffic violations should be automatically detected using the appropriate non-intrusive technology in each case as applicable. All the traffic violations should be seamlessly integrated with the ANPR sub-system and maintain the status of each violation till closure in the database. • Red Light Violation & Detection (RLVD) • Zebra Crossing Violation/ Stop Line Violation • Speed Violation • Free Left lane blocking Violation • Wrong Direction Vehicle Movement
FR 1.22	Red Light Violation Detection (RLVD) – The non-intrusive RLVD sub-system should be capable of capturing multiple Infraction Vehicle Data (IVD) simultaneously on each arm of the junction at any point of time.

FR 1.23	Zebra Crossing / Stop Line Violation at Junctions – The non-intrusive system should be capable of detecting the violations and capturing multiple IVD simultaneously on each arm of the junction at any point of time.

FR 1.24	Speed Violations – The nonintrusive system shall be capable of measuring speed of vehicles and capture over speed vehicles The Speed measurement should support multiple methods for calculation of speed – either Average or Instantaneous Speed Measurement methods.
FR 1.25	The system shall have the provision of setting different speed thresholds for different class of vehicles.

FR 1.26	The speed violations system should be installed on mid-blocks or designated areas as identified during design stage.

FR 1.27	Free Left Violation – The non-intrusive system should identify the violation where either the Free Left is blocked by other vehicles or violation occurred when no free left is allowed. • The system should be capable to mark the free left junctions (through exceptions in case fewer number exists) • In case of blocking the “Free Left”, the system should capture multiple IVD for the vehicles in the front area of the free left blocking the road. • In case of “No Free Left”, the system should be able to capture multiple IVD’s.

FR 1.28	Wrong Direction Vehicle Movement – The non-intrusive system should be installed at critical junctions to capture the wrong direction vehicle movement. The system should identify and capture multiple IVD. The E-Challan standard procedure should be triggered.

FR 1.29	The TVDS should also seamlessly integrate with e-challan sub-system which is capable of providing a legally binding court evidence following a proven and a robust procedure.
FR 1.30	The TVDS system shall have an operations monitoring dashboard, located at the central control centre & monitored by the Control Centre operator.

FR 1.31	On this dashboard there shall be a schematic layout of the TVDS showing all the connected nodes on the GUI.
FR 1.32	The various nodes when connected & disconnected shall be represented in different colour schema on the GUI of the Control Centre operator.
FR 1.33	If any particular node is disconnected from the control room, the same shall raise an alarm to the Control Centre operator GUI & appropriate action shall be taken to rectify the same.
FR 1.34	The monitoring dashboard shall allow the Centre operator to click on any node & view the details of “operator” logged in, time duration since logged in, summary of operations performed.
FR 1.35	If Centre operator or any other user form control centre disable/enable/operate any active device remotely, the same shall be captured in Control Centre activity report with all details including but not limited to date , time, device, action performed etc.
FR 1.36	The monitoring dashboard shall show the status (connected/disconnected, faulty/working) of all logical devices (ANPR Camera, Overview camera, RLVD Sensor, other units etc.) connected to a particular node when clicking on a node from the monitoring dashboard GUI.
FR 1.37	In case of any fault in the devices connected to a node, or connectivity failure with a node, a pop-up message shall appear on the monitoring dashboard workstation. The operator has to acknowledge the pop-up message & report the type of fault to the maintenance team & shall record the details to the assigned team/individual into the system.
FR 1.38	Fault assignment to the maintenance team shall be managed and controlled by the system software only. Once a fault is assigned by the ICOMC operator or authorized user to the maintenance team, the same shall be displayed in the maintenance module and once fault is closed/resolved by the maintenance team it shall be updated automatically (in case of active devices) or else updated manually in the software application/maintenance module.
FR 1.39	The access to monitoring dashboard shall be specific to the privilege of the user which can be defined in the system & shall be specific to a group/part of node locations.
Automatic Number Plate Recognition (ANPR) System	
FR 1.40	ANPR System is the core to identify the infracting vehicle from the traffic violation perspective. The ANPR System identifies the number plates of these vehicles which is then passed on to various other sub-systems for further processing. The following are the Functional Requirements related to the ANPR System.

FR 1.41	The ANPR System shall be core to identifying the exact violating vehicle which is detected using the TVDS sub-system.
FR 1.42	The software and solution of ANPR shall comply with all functional and business requirement as specified in this RFP, elsewhere.
FR 1.43	The ANPR system shall capture vehicle license plate from front of from rear depending on the proposed solution and ensuring the performance parameters are met.
FR 1.44	The ANPR sub-system is also used for identifying hot-listed vehicles for ensuring law & order in the city of Bhubaneswar by the police department.
FR 1.45	The TVDS along with the ANPR system when seamlessly integrated with the e-challan system shall generate challans (tickets) to various traffic violators.
FR 1.46	The ANPR sub-system shall be used for satisfying various add-on use-cases such as travel time estimations, estimating O-D patterns in the city, stolen vehicle identification etc.
FR 1.47	ANPR system is used to identify vehicles by their registered number plates.
FR 1.48	The ANPR shall be deployed at various potential locations across the city of Bhubaneswar viz. strategic intersections, mid-blocks, sensitive zones etc.
FR 1.49	ANPR system at junctions should capture and read each and every vehicle number plate that passes through its field of view in multiple lanes and stores the number in the database.
FR 1.50	The ANPR system should continuously record all footage in its field of view which is to be stored at a local base station (with an upload facility to central database at ICOMC).

FR 1.51	The ANPR system should be able to detect and recognize the English alpha numeric License plates in all standard fonts and formats of all vehicle classes irrespective of the type and size of the vehicle.
FR 1.52	Apart from standard printed and High Security license plates, the system should be able to recognize hand painted straight font alpha numeric number plates in standard formats found on Indian license plates
FR 1.53	The system processing should be in real time i.e. the recognition of license plate number should happen instantaneously (within three seconds of capture)
FR 1.54	The system should be able to process and read number plates of vehicles with speeds up to 120 km/h with the minimum accuracy requirement specified in this sub-section.
FR 1.55	The system should be very robust to variation in License Plates in terms of font, size, contrast and colour and work with good accuracy but should always be well above the minimum accuracy defined in this sub-section.
FR 1.56	The ANPR should be able to process and read the number plates at any time of the day and night, in all weather conditions
FR 1.57	The ANPR sub-system shall have the following minimum accuracy levels irrespective of any other reason at the installed location for each of the vehicles in the field of view during any time of the day or night: • at a minimum of 95% vehicle detection accuracy. • the system should have a conversion accuracy of more than 85% for the detected vehicles for ANPR for standard format license plates • the system should have a conversion accuracy of more than 70% for the detected vehicles for ANPR for non-standard format license plates
FR 1.58 \	The following are the minimum details of the infracting vehicle to be captured: • Location Name and ID along with Latitude and Longitude • Date & Time of the instance • Vehicle Number plate (Captured & Processed) • Headway • Image of the vehicle • Direction of Travel • Speed of the vehicle
FR 1.59	ANPR system should be integrated with the RTA and VAHAN database to extract the registered details of the vehicles based on the captured number plate and the details should be stored in a repository including the following details as applicable: • Vehicle Registration Plate Number • Date of Registration • Name of the Person of which the Vehicle is registered to • DOB of the Person of which the vehicle is registered to • Date of Renewal

	• Location of Issuing Registration Authority Office • Class of Vehicle • Vehicle Colour • Vehicle Insurance No. (historic and Active) • Insurance Validity Date • Vehicle Fitness No. • Fitness Validity Date • Vehicle Permit No. • Permit Validity Date • Load permit • History of Violations
FR 1.60	ANPR should work with various analytics as defined in this section for identifying and capturing traffic violations.
FR 1.61	ANPR system should be integrated with the E-Challan sub-system to enable E-Challan generation and payment process.
FR 1.62	Hot Listed Vehicle Detection System – The ANPR system should detect the hotlist vehicles and notify to the appropriate authority.
FR 1.63	The ANPR sub-system shall be able to connect to external sources/ 3rd party databases and check each captured ANPR vehicle numbers against these sources to detect any hot-listed vehicle.
FR 1.64	The ANPR system should immediately send a configurable high-alert to the pre-designated people with details of the hot-listed vehicle and all other captured details.
FR 1.65	The ANPR system should automatically send the high alert to the ICOMC for next course of action.
FR 1.66	The ICOMC internally alerts the traffic junction subsystem to continuously track the infracting vehicle at every junction, notifying the nearest patrolling vehicle and other intercepting teams.
FR 1.67	Court Evidence Standard Procedure – The ANPR system should provide the Colour video & image evidences of infracting vehicles to be submitted in the court.
FR 1.68	The tamper-proof video extract shall be provided as a supporting evidence (for submission in a court of law) to each infracting vehicle and the video length shall be t-5 to t+5 seconds where t being the instant at which the infraction occurred. The video output should be in colour in any industry standard format such as MJPEG, MP4, AVI etc.,) with visually readable license plate number.
Automatic Traffic Counting & Classification System (ATCC)	
FR 1.69	The ATCC System shall primarily be installed at important junctions and mid-blocks in the city. The ATCC System shall help in continuous monitoring of the traffic conditions in the city. The following are the Functional Requirements related to the ATCC System.

***FOV:** Required Field of View of Equipment
Note: This ANPR System is for illustration purpose only. The bidders are free to modify the System as per the solution to meet all RFP Requirements

FR 1.70	The ATCC system shall be deployed on city road primarily on city's entry, exit and at major points of intersection in Bhubaneswar, the objective of the sub-system is to collect traffic data at major points.
FR 1.71	The data from ATCC shall be used by various Government and private organizations (as per BSCL discretion) to understand the existing traffic volume trends & patterns
FR 1.72	The ATCC data collected shall be used by various stake-holders for extensive planning and traffic engineering exercises across the road stretches
FR 1.73	The real-time traffic data can be shared with 3rd party map solution providers and online navigation systems as per the discretion of BSCL
FR 1.74	The software and solution of ATCC shall comply with all functional and business requirement as specified in this RFP, elsewhere.
FR 1.75	The ATCC Sub-system shall support the following four use-cases with other Sub-systems provided by 3rd parties as a minimum and shall support development and deployment of any other use-case for up to 18 months from the go-live date. • Use case 1: Signal Timing Optimization using ATCC Data in Real-time • Use case 2: Changes in Signal timing based on Maximum Queue Alert from ATCC • Use case 3: Passing Congestion Information to DMS • Use case 4: Using Traffic Data Archive for future planning/Design/Analysis purposes

USE CASE 1 : Signal Timing Optimization using ATCC Data in Real-time

USE CASE 2 : Changes in Signal timing based on Maximum Queue Alert from ATCC

USE CASE 3 : Passing Congestion Information to VMB

USE CASE 4 : Using Traffic Data Archive for future Planning/Design/Analysis purposes

FR 1.76	The ATCC System shall use any proven non-intrusive technology for counting and classifying the vehicles in a real-time under live traffic conditions.
FR 1.77	The field of view of ATCC on a road stretch shall be able to cover from end to end of the traffic lane irrespective of the number of lanes on the particular road stretch.
FR 1.78	The number of ATCC sensors required to achieve a multi-lane road stretch shall be arrived at by the MSI based on the technology being provided and other criteria.

FR 1.79	The ATCC System at any point of time, shall provide a minimum of 5 classification levels viz. 2-wheeler, 3 Wheeler/Auto Rickshaws, Car/ Jeep, LCV, Bus/Truck/MAV at any given point in time.
FR 1.80	The ATCC system shall meet the following accuracy levels when compared with actual data collected using other means at each location of all the installed locations (minimum accuracy requirements): • Counting of vehicles: > 92% • Classification of vehicles (w.r.t. each class): > 85%
FR 1.81	The ATCC shall have built in algorithms to distinguish and classify non-linear traffic patterns and occlusion of traffic.
FR 1.82	ATCC sensors shall capture the traffic data 24X7 lane wise, leg wise and transfer the traffic data to Command and Control Centre (ICOMC) through fibre backbone in real time.
FR 1.83	There shall be an operator at central control room to operate the ATCC application on ATCC workstation.
FR 1.84	The data of ATCC shall also be available in open data source which can further be used in other applications.
FR 1.85	The overall system shall work in an integrated fashion whereby data from the ATCC shall be continuously recorded, processed and transferred to ICOMC.
FR 1.86	The algorithm (software) shall be capable of adding configuration parameters for each of the vehicle classes based on the RTA standards and field conditions to achieve maximum accuracy
FR 1.87	Video Camera (if required): Colour video camera with IR flash capable of capturing video during night/dark. Captured video should enable client to identify and classify vehicles visually for comparative analysis purposes.
FR 1.88	ATCC shall be able to process simultaneous and parallel passages of the vehicles at that location at a given point of time.
FR 1.89	Even though multiple sensors are required based on the number of actual lanes, the ATCC should provide processed data at each location lane wise and leg wise.
FR 1.90	The ATCC shall count and classify vehicles travelling in any or both the directions at a given location as per the requirement based on the field conditions.
FR 1.91	The ATCC should be able to count and classify the vehicles with minimum accuracy requirements for vehicles travelling between 20 kmph to 120 kmph speeds.
FR 1.92	The ATCC sub-system should be capable of capturing at a minimum the following primary data points for each vehicle at any point of time: • Unique ID • Vehicle Count • Start Time • End Time • Leg/ road Location • Classification

	• Gap Time • Density • Headway • Occupancy • Queue Length • Vehicle Length • Speed
FR 1.93	The ATCC sub-system shall be capable of computing unlimited Derived fields/ data sets based on several mathematical computations on the primary data points collected. In general all computations required for deriving several Traffic Engineering measures shall be supported by the ATCC reporting module.
FR 1.94	The ATCC sub-system provider shall work closely with client for modifying/ configuring standard existing reports and data formats to suit client requirements. The vendor shall support client in developing any/ all reports and formats required by the agency for a period of at least 18 months from the system go-live date.
FR 1.95	The ATCC Sub-system shall be capable of sharing the data with any other sub-system in a real-time as per the requirement
FR 1.96	The ATCC provider shall work closely with various other sub-system providers to share the required data in acceptable format to the other sub-system providers. As a minimum data exchange in XML, HTML and JSON formats shall be supported
FR 1.97	The ATCC system shall have an operations monitoring dashboard, located at the ICOMC & monitored by the ICOMC operator.
FR 1.98	On this dashboard there shall be a schematic layout of the ATCC showing all the connected nodes on the GUI.
FR 1.99	The various nodes when connected & disconnected shall be represented in different colour schema on the GUI of the ICOMC operator.
FR 1.100	If any particular node is disconnected from the control room, the same shall raise an alarm to the ICOMC operator GUI & appropriate action shall be taken to rectify the same.
FR 1.101	The monitoring dashboard shall allow the ICOMC operator to click on any node & view the details of “operator” logged in, time duration since logged in, summary of operations performed, disable/enable ATCC.
FR 1.102	If ICOMC operator or any other user form ICOMC disable/enable/operate any active device remotely, the same shall be captured in Control Centre activity report with all details including but not limited to date , time, device, action performed etc.
FR 1.103	The monitoring dashboard shall show the status (connected/disconnected, faulty/working) of all logical devices (ATCC system) connected to a particular node when clicking on a node from the monitoring dashboard GUI.
FR 1.104	In case of any fault in the devices connected to a node, or connectivity failure with a node, a pop-up message shall appear on the monitoring dashboard workstation. The operator has to acknowledge the pop-up

	message & report the type of fault to the maintenance team & shall record the details to the assigned team/individual into the system.
FR 1.105	Fault assignment to the maintenance team shall be managed and controlled by the system software only. Once a fault is assigned by the Control Centre operator or authorized user to the maintenance team, the same shall be displayed in the maintenance module and once fault is closed/resolved by the maintenance team it shall be updated automatically (in case of active devices) or else updated manually in the software application/maintenance module.
FR 1.106	The access to monitoring dashboard shall be specific to the privilege of the user which can be defined in the system & shall be specific to a group/part of node locations.
Public Address System (PAS)	
FR 1.107	The PA Systems shall primarily be installed at important junctions and mid-blocks in the city. The PA systems shall help client and other stake-holders to announce real-time advisories and notifications to the road users, tourists and general public from the ICOMC. The following are the Functional Requirements related to the PA System.

FR 1.108	The PAS can be used by BSCL, Police and other stake-holders of the project to disseminate information to road users/public.
FR 1.109	The objective of the voice based sub-system is to disseminate the information to the citizens particularly during emergencies for the messages to reach quickly
FR 1.110	The system should have the capability of designing the messages based on the situation or context for broadcasting across PAS
FR 1.111	The software and solution of PAS shall comply with all functional and business requirement as specified in this RFP, elsewhere.

FR 1.112	The PA system shall provide provision for emergency announcements to be made on per-location, selection of locations, or a system wide basis.
FR 1.113	The PA system shall have provision for announcements to be made from two central locations.
FR 1.114	The Integrated Traffic Management system shall provide for the ability to produce and play-out either pre-recorded messages or make live announcements through PA software
FR 1.115	The PA system shall be integrated with the Integrated Traffic Management & Emergency Response Management System for making automated, system generated, or manual announcements as per the SOPs
FR 1.116	The system should have ability to integrate with CCTV systems, other main/sub systems at ICOMC for configuring and broadcasting the messages
FR 1.117	The system should have ability to configure the messages with the static or dynamic text from various applications/systems to form a complete message as and when required
FR 1.118	The system should recognize and broadcast messages based on some of the analytics such as sound alerts, system alerts, incident alerts and various other alerts
FR 1.119	The system should be able to integrate other network's PA systems or third party application systems where the alerts are generated to broadcast messages.
FR 1.120	There shall be an operator at central control room to operate the PAS application on PAS console.
FR 1.121	The system should be able to generate various statistics, reports & MIS from time to time
FR 1.122	The system shall be designed and installed so that it automatically minimizes community sound pollution
FR 1.123	The requirements of local noise level standards & by-laws shall be respected by this system.
FR 1.124	The system should have the ability to schedule category wise system messages or overall messages in advance for a period of time to selective or all PAS locations
FR 1.125	The PAS message quality shall be such that it is clearly audible from its location to a distance of more than 100 m without any distortion and loss in quality of the sound during the prevailing traffic conditions in site that are typical to Bhubaneswar city.
FR 1.126	Ability to integrate with CCTV systems, DMSs and other main/sub systems at Command and Control Centres for configuring and broadcasting the messages to the road users
FR 1.127	Ability to configure the messages with the static or dynamic text from various applications/systems to form a complete message as and when required
FR 1.128	Ability to categorize the messages as per the business need and able to configure as per category

FR 1.129	The PAS should provide the status indicators on the system and as well at various command centres
FR 1.130	The PA system shall have an operations monitoring dashboard, located at the control centre & monitored by the Centre operator.
FR 1.131	On this dashboard there shall be a schematic layout of the PA system showing all the connected nodes on the GUI.
FR 1.132	The various nodes when connected & disconnected shall be represented in different colour schema on the GUI of the Control Centre operator.
FR 1.133	If any particular node is disconnected from the control room, the same shall raise an alarm to the ICOMC operator GUI & appropriate action shall be taken to rectify the same.
FR 1.134	The monitoring dashboard shall allow the ICOMC operator to click on any node & view the details of “operator” logged in, time duration since logged in, summary of operations performed, disable/enable PA system.
FR 1.135	If ICOMC operator or any other user form ICOMC disable/enable/operate any active device remotely, the same shall be captured in ICOMC activity report with all details including but not limited to date , time, device, action performed etc.
FR 1.136	The monitoring dashboard shall show the status (connected/disconnected, faulty/working) of all logical devices (PA system) connected to a particular node when clicking on a node from the monitoring dashboard GUI.
FR 1.137	In case of any fault in the devices connected to a node, or connectivity failure with a node, a pop-up message shall appear on the monitoring dashboard workstation. The operator has to acknowledge the pop-up message & report the type of fault to the maintenance team & shall record the details to the assigned team/individual into the system.
FR 1.138	Fault assignment to the maintenance team shall be managed and controlled by the system software only. Once a fault is assigned by the ICOMC operator or authorized user to the maintenance team, the same shall be displayed in the maintenance module and once fault is closed/resolved by the maintenance team it shall be updated automatically (in case of active devices) or else updated manually in the software application/maintenance module.
FR 1.139	The access to monitoring dashboard shall be specific to the privilege of the user which can be defined in the system & shall be specific to a group/part of node locations.
Dynamic Message Sign (DMS)	
FR 1.140	The DMS Systems shall primarily be installed prior to important junctions and at strategic mid-blocks in the city which shall help road users to make decisions based on the messages displayed on the DMS signs. The DMS system shall help client and other stake-holders to display real-time information/ advisories and notifications to the road users, tourists and general public from the ICOMC. The information from various sub-systems can be displayed on DMS which helps motorists to take timely decisions. The following are the Functional Requirements related to the DMS System.

FR 1.141	The DMS can be used by client, Police and other stake-holders of the project.
FR 1.142	The software and solution of DMS shall comply with all functional and business requirement as specified in this RFP, elsewhere.
FR 1.143	The objective of the sub-system is to disseminate the standard / customized / dynamic mode of information, messages, and alerts to the citizens in a digital text formats per the situational requirement. • Standard – Pre-defined static messages • Customized – Ability to create new / modify the messages during execution time prior to sending the messages. • Dynamic – Ability to generate the Dynamic Message structure interfacing with the data points that is dynamically picked from the system to incorporate in the messages.
FR 1.144	DMS Type: Permanent DMS Installed on permanent supports or structures (either on T or on L shape gantry)
FR 1.145	Each sub-system should be integrated to DMS as required to support dissemination of any type of message
FR 1.146	DMS shall have the ability to build the static, customized or dynamic content (messages) as per the situations, driven by data, alerts, alarms, scheduled, duration, daily and seasonal occurrences, manual or automatic broadcasting of messages to selective or all DMS's with a validity date-time. The data based messages should be possible to dynamically display the messages on DMSs.
FR 1.147	There shall be an operator at central control room to operate the DMS application on DMS workstation.
FR 1.148	The DMS shall have message acknowledgement functionality.

FR 1.149	The bidder should design and propose message templates which shall be approved by BSCL and/or a set of generic messages as defined by BSCL shall be provided initially.
FR 1.150	Default message should be setup for DMS when the system is restarted or for a particular DMS after a scheduled message period expires
FR 1.151	The ITMS software shall automatically setting blank DMS messages during pre-defined time of day periods
FR 1.152	The central software shall have following diagnostic and reporting features: • Software diagnostics report • System availability status report, for a selectable time period • System status report, including the message currently displayed by each DMS • System fault status report, indicating diagnostics codes received from the DMS over a selectable time period
E-Challan System	
FR 1.153	The e-challan System should facilitate real time revision of violation fees and should enable real time communication of rules to all remote terminals from Central facility/Control Centre
FR 1.154	The e-challan System should enable client or any other appointed third party to facilitate generation of reports based on business rules to be amended from time to time.
FR 1.155	The e-challan System should track each and every revenue source and should ensure no leakages due to manual intervention.
FR 1.156	The e-challan System should • report all validated violations to a central software application deployed at the command centre using the network laid out as a part of this tender document. • include central reporting system at the centralized Command and Control Centre. • include reporting dashboards with location specific thresholds to be set for generating customized reports • be capable of monitoring the number of vehicles based on violation type during any given time • generate reports for any location, for each of the violations capturing challan and revenue details, and details of vehicles, repetition of violation etc. These reports should be available in all standard acceptable formats like .csv, .pdf, .txt, etc.
FR 1.157	The e-challan System Software should consists of the following modules • Photo Collection • Violation booking • e-challan Generation • Postal dispatches • Postal Statement

	• Postal returns and return info feeding • Data entry in vehicle Regn. remarks database • Provision to enter comment Sold out vehicles/Fake vehicles /Fake addressed • Vehicles/Theft Vehicles/Authorized complaints/Multiple owners) • Identification of Police Stations, Junctions, Courts, Police Staff for the Traffic dept. • MV Act cases • ID, Address & contact details fields addition. • Action dropouts as per Court decisions • Report Generation • Online Pending Challan Verification • Online Violation photo view facilities • Upgrading the E-challan Software • Online Uploading photos by the Police in Control room • Online handheld machine tracking System • Server database and crash recovery of data. • Regular Backup System • Performance tuning of the Application, Database tuning, Network tuning, Web Service tuning. • Traffic violators History (for suspension of driving license) • APIs for sharing e-Challan information for online payment and updation of payment status in e-Challan application server. • Generating hash value for each challan • Digital signing of – challan
FR 1.158	The MSI shall provide the dedicated API for sharing information of e-Challans for online payment gateway interface and updating payment status of e-Challans
FR 1.159	E-challan software shall work in client – server mode, where 1000 handheld devices units will act as clients connected to server through cellular network for data transfer. The system should be scalable for 2000 devices (server sizing will be revisited when scaling up devices from 1000 to 2000), which may be added later on. Suitable number of IP Addresses for e-challan system server shall be acquired in the name of client by the MSI.
FR 1.160	E-challan system shall be able to retrieve vehicle owners Details and vehicle data from RTO database to minimize data entry.
FR 1.161	E-challan system shall be able to retrieve vehicle Registration Details by reading Vehicle Number Plate and driving license details by reading DL Smart card to minimize data entry.
FR 1.162	The login authentication of the user using the handheld devices should be done locally, so that device is usable even when there is no cellular network connectivity. Login/password should be saved in hand held device/mobile phone till connectivity is restored with the server. Server should maintain

	log of all current. Any access to the system must be recorded along with date, time, user ID and IP Address
FR 1.163	Whenever any traffic police officer is suspended, dismissed or for any other reason is disqualified or when blocked from server, there has to be a provision in e-challan software to disqualify his/her access the device or system.
FR 1.164	While filling challans in handheld device it should be possible to go back to previous screen any time, edit the data and come back to present screen.
FR 1.165	Certain fields such as name of driver, registration number of vehicle, offence type, date, time and location should be mandatory. In case of notice files information such as Registration number of vehicle, offence type, date, time, location, makes and colour should also be mandatory fields. No notice or challan should be generated without filling these mandatory fields.
FR 1.166	Input data validation as per defined rules, must take place in the handheld device itself through client software to eliminate errors prior to transfer into the database.
FR 1.167	A unique challan number should be generated through client software for each challan. (Example device code/circle code/year/unique serial number). The server must assign a separate primary key for each challan uploaded on the server.
FR 1.168	Traffic officers should be able to issue challans only for Violation they are authorized to register.
FR 1.169	As soon as a vehicle registration number is entered, the handheld device should automatically check from the server if the vehicle is stolen, wanted in any criminal case or it is in the list of suspicious vehicles
FR 1.170	The most frequent traffic offences should be kept at the top in the drop down menu and offence ingredients should be available if required by officer.
FR 1.171	Date, time and GPS coordinates of place of challan should be automatically populated in the relevant fields of client software.
FR 1.172	Compounding amount must populate in the field automatically from master table.
FR 1.173	Compounding amount must appropriately increase as per Motor Vehicle Act for Repeat offenders. This field should not be editable by the traffic officer.
FR 1.174	After a challan has been printed, the officer should not be able to change or delete any challan data even when there is no connectivity and the data has not been pushed to central server
FR 1.175	Hand Held device users, other users who are connected with server and Administrator should have full rights to change their password. Passwords must Travel to server in encrypted form.
FR 1.176	User forms and GUI of client and server software must be intuitive and easy to use and require minimal training. GUI should have menu driven combo boxes, radio buttons etc. to minimize number of keystrokes.
FR 1.177	At any stage, context based help should be available to the user using the device. General help files should also be available in device.

FR 1.178	The client application should be capable of storing data locally for at least 500 challans when off line. Data synchronization with server should take place automatically whenever network is available
FR 1.179	There should be administration module where in different users or group users, having various rights and privileges as defined by administrator under IT policy, could be created.
FR 1.180	Only role based access to data base and server should be permitted.
FR 1.181	Software should have facility to add and manage e-challans. It should be Compatible and connected with mobile e-challan upload application installed in handheld machine.
FR 1.182	e-challan software shall have specific input fields like location (GPS/GPRS based) with provision of entry, Officers detail who is making challan, Vehicle number, drivers detail /License number in case of in person SPOT challan, date and time of challan, Picture upload, Violation type with dynamic challan amount and Act.
FR 1.183	Separate manageable/ configurable masters for Challan type (Violation type) with amount and Act shall be present.
FR 1.184	Provision to open transport Headquarters website for searching and entering names and address details of owner of vehicle shall be present.
FR 1.185	Software shall be scalable or made compatible to retrieve data from transport website NIC SARATHI /NCRB automatically using API / Web services etc. (Integration with other Headquarters will be facilitated to the bidder)
FR 1.186	Software shall have facility to generate various reports related to challans within a date range, ability to filter by Offense type, map on Google for digital mapped analysis, number of Challans Made for a particular person/ driving license number, number of paid / unpaid
FR 1.187	Software shall have facility to generate various reports related to Traffic e-challans, challans made by particular officer or all by showing Respective numbers of challans
FR 1.188	With provision of vehicle type like commercial or private, either entry can be made in challan form or same can be retrieved from transport website for Reporting, verification and action about wrong permit, consecutive challans for a Particular vehicle etc.
FR 1.189	While making challan of any Vehicle, Software may be able to POP UP and report in detail about previous challans, if any, for the same person / vehicle.
FR 1.190	The data transmitted using the GSM/ GPRS or any other technology from the device to the server should be using the HTTPS (Hyper Text Transfer Protocol secure).
FR 1.191	Software should be able to customized as per user requirement as and when required
FR 1.192	MSI shall provide all updates and upgrades and software bug fixing free of cost during warranty and subsequent AMC (if given to same vendor). Warranty shall be Comprehensive onsite for whole e-challan system including Hardware software and accessories as defined in RFP.

FR 1.193	The system shall be able to monitor the functioning of all handheld machine and its critical parts. A report of faulty handheld machines or its part shall be auto generated and same may be rectified by the MSI within required time.
FR 1.194	The e challan system shall be able to integrate with TVDS (Traffic violation detection) system. All challan generated through TVDS shall be recorded in to the e challan system.
FR 1.195	The "e-challan system" shall generate the hash value of the each e-challan (files including image, video, transection detail, data entry) generated by the system, Print on the slip and store in the system also.
FR 1.196	The e-challan system shall be able to generate e challan signed digitally by Digital signature of the responsible authority.
FR 1.197	The e-challan system shall be available online for the officer sitting at the control room. It shall be possible to generate e-challan for the violations observed through the Camera footage being streamed from City surveillance system or TVD system. Any integration if required shall be the responsibility of the MSI. The e-challan system shall be able to record the selected evidence for the e-challan
FR 1.198	Daily backup facility the e-challans shall be present. Facility to export and store the same to external device shall be present.

Traffic Accident Reporting System (TARS)	
FR 1.199	TARS shall provide: • Accident reporting system • Accident recording system • Analysis of accidents • Dissemination of data

FR 1.200	The Bidder shall provide accident database that will support collecting high quality information on all aspects of road traffic collisions and incorporate best practices of Road Accident Investigation.
FR 1.201	The accident reporting system should have been used in at least two cities
FR 1.202	The system shall support for Client to quickly and accurately reconstruct collisions and analyse the data, to inform road and vehicle safety research policy and to develop standards to prevent future collisions or mitigate injuries.
FR 1.203	The system shall support information gathering and dissemination as per various stakeholder requirements for accident data, namely, Police, Safety Engineers, Insurance Agencies, Safety Researchers and Decision Makers.
FR 1.204	Information to be captured shall include, but not limited to: • how the accident happened, • detailed information about the vehicle(s) involved, • type and extent of human impact. • human factors involved (inebriation, etc.) • nature of any injuries, • type and extent of property damage, • socio-economic data of the people involved, • primary & secondary causes of the accident • incident photos • drawing of accident analysis • information on analysing agency and personnel
FR 1.205	Bidder shall provide appropriate field devices to support TARS gather the information in the field
FR 1.206	The field device shall satisfy the following requirements: • Device shall have similar form factor and should be easy to use and carry in the field. • Device should be touch-based and rugged for long term field use. • Device battery shall last for a 12 hour period based on regular usage. • Device shall be preloaded with the user forms needed to be filled by the Police. • The location accuracy of the field device shall be within three meters. • It shall provide ability to save photos of the incident in its database
FR 1.207	The Accident database shall be appropriately integrated with the rest of the ICOMC platform.
FR 1.208	The raw and analysed accident information shall be made available to decision makers through efficient dashboard.
FR 1.209	Accident information shall be integrated with other traffic management and ICOMC modules.

TMS Central System Application (Central Software)	
FR 1.210	The Central software application is a browser-based software application that allows operators and other users who have access to perform all of their Traffic Management related functions.
FR 1.211	The system integrates key operational functions such as event entry, addressing, sign control, traffic data, travel times and reporting in one simple solution that allows users to identify and respond to incidents on the roadway network.
FR 1.212	Central software GUI shall be fully browser-based, allowing authorized users of the software to access the system without the need for any client side software
FR 1.213	The GUI shall allow each user to open multiple instances, including any number of map views, lists and dialogs.
FR 1.214	The GUI shall be scalable and should be handled by a large number of concurrent users viewing the map.
FR 1.215	The Central software shall have the map which should be central to all system actions by efficiently and effectively using screen real-estate. The map shall include several collapsible panels (i.e. top panel and enhanced search) that are hidden when not in use.
FR 1.216	The central software interface shall provide -mouse-click functionality on icons, graphics and map areas to access to additional information on any map and user feature through the “Action Panel”.
FR 1.217	Uploaded data shall not be deleted from individual field devices/ systems until the central system has provided confirmation that the transactions have been successfully received.
FR 1.218	The central software shall have response plan/ Standard Operation Procedures (SOPs) feature in which the system shall generate an automated Response Plan for every event created in the system
FR 1.219	The central software shall have the ability of notifications that will provide alerts when devices are in a failure state. Any faults detected shall be communicated by the system to certain users via a GUI alarm or notification and/or E-mail. Alert subscriptions and recipients should be configured through the broadcast or user groups configuration portals
FR 1.220	The Central software shall have travel time module. These travel times shall then be published as part of E-mail response, kept for historic tracking of route performance, or published to DMS. This module shall utilize ATCC as the source of traffic information in the Integrated Traffic Management System.
FR 1.221	The central software shall be able to update its date and time applying time synchronization to servers using the internet and using this to in turn update the date and time on all system devices and workstations.
FR 1.222	All active equipment shall have an internally maintained date and time clock synchronized at a time interval via the communications controller with the Central System date and time clock.
FR 1.223	The time synchronization application in the device shall have the capability to adjust the minimum time interval for updating itself with the central

	system time and date, and shall be capable to update time as often as every minute (configurable) with the central system.
FR 1.224	The central software shall manage all device activity and maintain their logs including at a minimum: • Data storage and processing systems • Financial systems • Customer databases • Sales and transaction systems
FR 1.225	All devices/ equipment shall operate with a real-time data connection to the central system via the communications network for that equipment.
FR 1.226	If the data connection to the central system is temporarily lost, all equipment shall seamlessly switch to an offline mode in which all data is temporarily stored in internal memory and transmitted to the central system as soon as the data connection is re-established.
FR 1.227	All equipment shall have sufficient memory to operate in offline mode, with no loss of data, for no less than 168 hours.
FR 1.228	It shall be possible to “future-date” challan value so that they can be uploaded ahead-of-time and automatically activated at the planned date and time.
FR 1.229	The MSI should provide an automated Fault Monitoring Module to generate reports identifying the faults of the equipment if any on a daily basis. The fault monitoring system shall have as a minimum the following capabilities: • Setting up of automatic and manual alerts • Automatic fault detection & reporting • Fault Status reports • Fault Closure reports
FR 1.230	The reports shall be non-editable and client and/or its representatives shall have real time access to the Fault Monitoring Module with user privileges of the highest level.
FR 1.231	Automatic Backup/Archiving Software shall provide automatic back-up of the entire database. The software shall allow taking complete back up or incremental back as per the desired archival policy.
DMS Control Room Application	
FR 1.232	The DMS system should be capable of displaying content with various fonts, static, scrolling, flash & other features.
FR 1.233	Ability to configure priorities for each message, and selective/all DMSs. It should provide the option of selective DMSs dedicated to certain requirements based on the need.
FR 1.234	Ability to integrate it to Traffic/Other Command Centres and 3rd Party DMSs.
FR 1.235	Ability to manage the conflict of message schedules intelligently in stand-alone mode or by using a 3rd Party integration with DMS’s
FR 1.236	The system should provide feedback to the Command and Control Centre (ICOMC) on the DMSs status if the DMSs are Active / Inactive.

FR 1.237	New messages shall be created and approved by suitable users having administrative rights.
FR 1.238	Feature of storage for each displayed message in an archive, indicating the approving user for future reference and analysis.
FR 1.239	The TMS software provided as part of the solution shall be compliant to NTCIP protocols for communicating and controlling DMS. All the functionalities a specified in NTCIP v03 shall be available in DMS and shall be complied with for any diagnostics or functional requirements
FR 1.240	The TMS software shall be capable of scheduling a message to be displayed at pre-set date/time both of pre-stored messages as well as live streaming
FR 1.241	The TMS software shall have feature of Multi DMS messaging to control the display of same message on all DMS.
FR 1.242	The TMS software shall have the feature of Remote system restart and pixel status check
FR 1.243	The TMS software shall have GUI with corridor highlighted with DMS icons
FR 1.244	The software shall display the current messages in the GUI of the selected DMS icons.
FR 1.245	Offline or non-functional DMSs shall have appropriate recognizable icons in the GUI
Monitoring & Control Dashboard	
FR 1.246	The ITMS control centre operator shall be provided with a dashboard and monitoring system that is completely independent from the field/ challan transaction system and shall be displayed and monitored at the ICOMC. This system shall record the following information, the total number of vehicles violating based on violation type including all details such as date, time, location etc.
FR 1.247	On this dashboard there shall be a schematic layout showing all the violation detection nodes on the GUI.
FR 1.248	The various nodes when connected & disconnected shall be represented in different colour schema on the GUI of the control centre operator.
FR 1.249	If any particular node is disconnected from the control room, the same shall raise an alarm to the ICOMC operator GUI & appropriate action shall be taken to rectify the same.
FR 1.250	The monitoring dashboard shall show the status (connected/disconnected, faulty/working) of all logical devices connected to a particular node when clicking on a node from the monitoring dashboard GUI.
FR 1.251	In case of any fault in the devices connected to a node, or connectivity failure with a node, a pop-up message shall appear on the monitoring dashboard workstation. The operator has to acknowledge the pop-up message & report the type of fault to the maintenance team & shall record the details to the assigned team/individual into the system.
FR 1.252	Fault assignment to the maintenance team shall be managed and controlled by the system software only. Once a fault is assigned by the ICOMC operator or authorized user to the maintenance team, the same

	shall be displayed in the maintenance module and once fault is closed/resolved by the maintenance team it shall be updated automatically (in case of active devices) or else updated manually in the software application/maintenance module promptly.
System Data Requirements	
FR 1.253	Client shall own all system data and be able to use the central system to export transactions data for processing/analysis using other software.
FR 1.254	Data shall be retained in the database for at least the financial year previous to the current financial year.
FR 1.255	The MSI shall support Client's data release policy.
FR 1.256	Data received from system devices shall be maintained at the original level of transactions and not be aggregated, consolidated, or combined within the database.
FR 1.257	Sufficient data storage capacity shall be provided in the central system to store online a minimum of two years of data.
FR 1.258	All data shall be automatically backed-up daily without human intervention, using the backup devices and media.
FR 1.259	Means shall be provided to automatically archive data older than two years along with the archiving media to store the data.
FR 1.260	The functional capability shall be provided to use such archived data to process comparative type reports, such as but not limited to reports utilizing and comparing data from non-consecutive month periods in two different years, or day-of-week comparisons over multiple month or annual periods.
FR 1.261	The transactional database shall store the date/ time stamped details of each transaction including all information transmitted to the central system from the system devices.
FR 1.262	Client shall own all system data and be able to use the central system to export transactions data for processing/analysis using other software.
FR 1.263	Data shall be retained in the database for at least the financial year previous to the current financial year.
Integration with other Systems	
FR 1.264	Integration with Smart City Platform and Mobile Applications - Integration of various components provides seamless access of various data across the departments which helps in operation. So the MSI shall provide complete support for any third party integration required to integrate ITMS with Smart City Platform of Client and mobile applications to get real time data.
FR 1.265	Integration with Common Payment Card - A Common Payment Card (CPC) is being envisaged as part of Smart City Initiatives which shall be used for making payments at multiple merchandises across Bhubaneswar and this shall also be used to pay the violation penalty. The CPC shall be issued by Banks and will be accepted at most of the facilities in Bhubaneswar including utility payments, transit, parking etc. The MSI shall work in close coordination with the CPC and other related agencies to make it workable.

FR 1.266	Integration with “Vahan and Sarathi” – Smart Traffic Management System or ITMS shall integrate with “Vahan and Sarathi”, the scheme of Government of India, for identification and channelization of any transit or traffic related penalties.
Graphical User Interface Requirements	
FR 1.267	The central system shall be delivered with a fully functioning Graphical User Interface (GUI).
FR 1.268	The GUI shall be based on standard windows controls or an equivalent operating system.
FR 1.269	All screens with non-paging data shall open and populate with data within 3 seconds.
FR 1.270	All screens with paging data shall open and populate with the initial data within 3 seconds and thereafter page updates shall be retrieved within 1 second.
FR 1.271	Dragging the cursor bar for a scrollable list shall cause instantaneous redisplay of the list in time with the movement of the cursor bar.
System Security Requirement	
FR 1.272	The system shall only be accessible by authorized persons, controlled using login and password protection.
FR 1.273	It shall be possible to create different user groups with different privileges.
FR 1.274	The system shall maintain a transaction log that records all users that access reports, the reports accessed, edits and changes to the database and the system logon and logoff times.
FR 1.275	The transaction log shall maintain this information for a minimum of one year. Editing of data in the log shall not be possible for any user.
FR 1.276	Further non editable, non-tamper able, mirror copies of logs should be sent to the Client periodically.
FR 1.277	The system security shall provide features to maintain data integrity, including error checking, error monitoring, error handling and encryption.
FR 1.278	Verification features shall be provided to ensure that all system-created files are uniquely identified, and that no files are lost or missed during data transfer.
FR 1.279	All systems, sub-systems and devices shall only allow access to authorized user group.
FR 1.280	All security breach detections shall be confidential, and accessible only to users of the appropriate group.
FR 1.281	For all data transactions, the system security shall include authentication features to verify that all claimed source, recipient or user identities are correct and valid.
FR 1.282	All data transactions shall include non-repudiation features to verify message content that data was not correctly originated or received by a certain user.

TR - 1 Technical Requirements

Traffic Violation Detection System (TVDS) including ANPR	
TR 1.1	This specification covers the requirements for the supply, installation and testing of Traffic Violation Detection sub-system (TVDS). This sub-system shall provide proven non-intrusive camera with the required software to cover the various types of violations to be detected, ANPR camera (bundled or separate as per the bidder design - cost to be included), overview camera for manual check (as per bidders design), and all required software which shall be useful for submitting a legally valid evidence.
TR 1.2	TVDS shall be able to be integrated with centralized E-challan system, wherein it continuously send the violation details to ICOMC. ICOMC will fetch the vehicle data from RTO/ VAHAN database and the challan will be generated and will be sent to the mentioned postal address.
TR 1.3	The data of TVDS will be stored in Local processing unit (LPU) and LPU should have the storage capacity of minimum 7 days.
TR 1.4	The TVDS system should instantaneously receive the processed ANPR of the violating vehicle from the ANPR Sub-system in Meta file format and Images & video is required only in case of violation.
TR 1.5	The TVDS system shall have option to save custom reports for subsequent use. The system shall have option to export report being viewed to common format for use outside of the ANPR or exporting into other systems
TR 1.6	The TVDS should have at least 90% violation detection accuracy as the minimum accuracy level irrespective of the type of violation, time and condition of the violation in the field.
TR 1.7	Automatic Number Plate Recognition (ANPR) cameras shall be designed to capture consistent, high-quality images & video of vehicle license plates.
TR 1.8	The camera shall be IP66 rated.
TR 1.9	The ANPR Camera shall support a resolution of 1920 x 1080 with a frame rate of at least 25 fps.
TR 1.10	The ANPR Camera shall have a 2/3” CCD progressive sensor and a varifocal lens of 5-50mm.
TR 1.11	ANPR cameras shall support night Capture imaging system to ensures 24/7 performance and eliminates headlight glare.
TR 1.12	It shall support adjustable imaging modes to allow configuration for regional plate characteristics.
TR 1.13	It shall be able to capture clear plate images from vehicles moving at a speed of up to 120 km/h in all weather and light conditions.
TR 1.14	ANPR camera wiring shall utilize outdoor rated UTP CAT6 cable. If due to any on-site conditions, the distance between the camera and the nearest switch is greater than 90 m, outdoor rated multi-mode fibre optic drop cable shall be used with environmentally rugged media converters or using passive Ethernet extenders.

TR 1.15	It shall have operational capture/recognition range of 3m to 20m.
TR 1.16	It shall have automated adaptive settings to keep tracking environment changes.
TR 1.17	It shall be able to produce JPEG and MJPEG stream output and shall have multiple image display facility.
TR 1.18	The camera shall support time synchronization via the SNTP protocol.
TR 1.19	Only outdoor rated UTP CAT6 cable shall be used to connect the device to the respective switch port. If for any case, the distance between the switch port and device exceeds 90m, use outdoor rated multi-mode fibre cable with environmentally rugged media converters.
TR 1.20	The ANPR system shall include the central application and the recording hardware/software system to store the video at 25 fps, 4 CIF resolution and up to a period of 30 days for the number of ANPR cameras listed in the bid document.
TR 1.21	The following types of ANPR are required based on number of lanes on a particular approach/ leg: ANPR Type 1: for one traffic lane approach ANPR Type 2: for two traffic lanes approach ANPR Type 3: for three traffic lanes approach ANPR Type 4: for four traffic lanes approach
Overview Camera	
TR 1.22	The overview camera shall capture the infracting vehicle including the status of Traffic Signal. These videos shall be available in the incident review system.
TR 1.23	The overview camera shall be supported by illumination devices to ensure images captured with a minimum illumination of 0.05 Lux are readable/viewable when viewed through a standard computer monitor.
TR 1.24	The overview camera shall have IR illumination. IR Illuminator can be Internal or external & visibility should be at least 100 m.
TR 1.25	The overview camera shall be provided with necessary cabling, enclosure and mounting equipment.
TR 1.26	The overview camera shall provide a minimum frame rate of 25 fps. The camera shall use a 1/3" or 1/2" colour, inter-line transfer, solid state CCD image sensor with a minimum of 1920 x 1080 resolution.
TR 1.27	The lens of overview camera shall be designed to prevent bright light “flare” caused by indirect sunlight outside the angle of view of the lens affecting the viewed scene.
TR 1.28	The overview camera shall be IP66.
TR 1.29	The overview camera shall be compliant to operating voltage of 230V, 50 Hz AC power, or alternatively have power transformers that are compliant to operating voltage.
TVDS Local Processing Unit	
TR 1.30	The LPU shall be of minimum i3, 2.4 GHZ processor or latest version of processor

TR 1.31	The LPU shall have enough storage for storing the data of minimum one month.
TR 1.32	The LPU shall be supplied with required software and operating system.
TR 1.33	The operating temperature of the LPU shall be between 0 - 60° C
TR 1.34	The enclosure of LPU shall comply with IP 65.
RLVD Sensor	
TR 1.35	The triggering of RLVD shall be done either by virtual camera sensor or video analytics or by using a sensor placed on Red LED aspect to detect the signal head status in real-time.
TR 1.36	The RLVD sensor shall be outdoor rated and protected against corrosion.
TVDS Workstation	
TR 1.37	For TVDS Workstation, refer to Type 2 Workstation specification in Section 5.7.4.1.
TVDS Server	
TR 1.38	For TVDS Server, refer to Server specification in Section 5.7.4.3.
TR 1.39	The Server storage should be designed to accommodate raw data (detailed transaction data) of at least 2 years and summary data of at least 5 years.
TVDS Pole	
TR 1.40	RLVD system shall be installed on a pole above the road (at a minimum clearance height of 6 meters) to cover the entire road stretch.
TR 1.41	The MSI shall make all design considerations during design of pole to withstand wind speeds of at least 150 kmph and shall be designed and approved by structural engineers and following appropriate guidelines.
TR 1.42	Any cable entering into the RLVD system shall be properly protected and should not be visible outside.
TR 1.43	RLVD Pole shall be hot dip galvanized after fabrication with silver coating of 86 micron as per IS:2629; Fabrication in accordance with IS-2713 (1980)
TR 1.44	Height of pole shall be minimum 6 meters above the ground.
TR 1.45	Casting of Civil Foundation with foundation bolts, to ensure vibration free erection (basic aim is to ensure that video feed quality is not impacted due to winds in different climatic conditions). Expected foundation depth of min. 100 cms
TR 1.46	The pole shall be equipped with Lightning arrester at selected sites as per the requirements
TR 1.47	A sign board describing words such as “This area is under surveillance” shall be hanged on the pole.
UPS for TVDS	
TR 1.48	For TVDS UPS, refer to UPS specification in Section 5.7.4.5

General - TVDS/ ANPR/ ATCC Sub-system Hardware	
TR 1.49	The devices shall be powered by 220-240VAC/50 HZ or 12/24/48VDC input as per the design requirements.
TR 1.50	The devices shall have the following communication ports as a minimum: Ethernet/ Serial communication (EIA standards RS 232 C/RS 485).
TR 1.51	The devices shall have health diagnostic sensor to check and transmit any faults related with the device/ electric power which shall be visible clearly to the operator in ICOMC while the system is operational.
TR 1.52	The devices shall be operating without any loss in the functional capability at a relative humidity of 95% condensing or better
TR 1.53	The devices shall be operating without any loss in the functional capability within an operating temperature of 0°C to 60°C
TR 1.54	All components as a part of the procurement shall be confirming to IP 66 or better for outdoor units.
TR 1.55	The cabinets of all the devices shall be electrically and mechanically robust and shall have a degree of protection of IP66 or higher specified in IEC60529
TR 1.56	The anti-lightning and surge protection complying with the IEC 61643-1 shall be provided for all devices.
TR 1.57	Rugged locking mechanism should be provided for the onsite enclosures and cabinets.
Automatic Traffic Counter and Classifier (ATCC)	
ATCC Sensor	
TR 1.58	The ATCC Sensor shall be of any proven non-intrusive technology for counting and classifying the vehicles in a real-time under live traffic conditions.
TR 1.59	The number of ATCC sensors required to achieve a multi-lane road stretch shall be arrived at by the MSI based on the technology being provided and other criteria.
TR 1.60	The ATCC should be able to count and classify the vehicles with minimum accuracy requirements for vehicles travelling between 20 kmph to 120 kmph speeds.
TR 1.61	The ATCC shall have built in algorithms to distinguish and classify non-linear traffic patterns and occlusion of traffic.
TR 1.62	The following types of ATCC are required based on number of lanes on a particular approach/ leg: ATCC Type 1: for one traffic lane ATCC Type 2: for two traffic lanes ATCC Type 3: for three traffic lanes ATCC Type 4: for four traffic lanes
ATCC Workstation	
TR 1.63	For ATCC Workstation, refer to the Type 2 Workstation specification in section 5.7.4.1.

ATCC Server	
TR 1.64	For ATCC Server, refer to the Server specification in section 5.7.4.3.
TR 1.65	The Server storage should be designed to accommodate raw data (detailed transaction data) of at least 2 years and summary data of at least 5 years.
ATCC Gantry /Pole	
TR 1.66	Non-intrusive sensors shall be installed on gantry/pole either on the road side or above the road to cover the entire road stretch.
TR 1.67	The MSI shall make all design considerations during design of gantry/pole to withstand wind speeds of at least 150 kmph and shall be designed and approved by structural engineers and following appropriate guidelines
TR 1.68	Any cable entering into the ATCC sensor shall be properly protected and should not be visible outside.
UPS for ATCC	
TR 1.69	For UPS for ATCC System, please refer to the UPS specification in Section 5.7.4.5.
Public Address System (PAS)- General	
TR 1.70	PA system shall be integrated with the ICOMC. Necessary hardware and software for the PA system shall be provided at the control centre and in the field as needed.
TR 1.71	The PA system shall be IP based and shall provide a VoIP interface (preferred SIP based).
TR 1.72	The completed system shall demonstrate through testing a speech transmission index (STI) of 0.5 or better under all operational ambient noise conditions. STI will be demonstrated at heights of 1.5 meters above the road level at all locations using the PA-STI testing criterion.
TR 1.73	PA announcements at each location shall be a uniformly distributed sound level on a plane 1.5 m above finished road level in all public areas that has sound pressure level (SPL) which is greater of: • 78 dB • 10 dB above ambient sound level to a maximum of 96 dB
TR 1.74	The PA system shall have the capability of playing live and pre-recorded (i.e. .WAV) messages.
TR 1.75	The PA system shall include capabilities for monitoring audio paths and automatic testing supervision to ensure that the systems are working as per the requirements.
TR 1.76	All components of the PA system shall have an operating temperature range of at least +5ºC to +60ºC and shall have a storage temperature range of 0ºC to +80ºC.
TR 1.77	Operating and storage relative humidity of up to 95%, non-condensing shall be accommodated.
TR 1.78	The PA system shall have a MTBF of at least 100,000 hours.

TR 1.79	PA System shall be powered by 230 VAC, 50Hz. The power supply units shall be provided as part of the MSI. The power supply units shall be industrial grade for field devices. Wherever required, the power conversions shall be done by the MSI.
TR 1.80	The PA System shall provide audio processing capabilities including paging management, audio routing, equalization, digital signal processing, ambient analysis control and digital gain management.
PA Speakers	
TR 1.81	The PA system speakers shall be of high impedance matching the line level input.
TR 1.82	Speakers shall be wired in such a way so that the failure of one speaker does not affect other speakers (home run only).
TR 1.83	Speakers shall be outdoor rated and protected against corrosion.
TR 1.84	MSI shall be responsible to finalize the detailed design of the locations in such a way that the overall SPL and STI requirements of the project can be achieved.
TR 1.85	Speakers shall be aesthetically pleasing.
TR 1.86	Speakers may have in-built amplifiers or have external amplifiers to ensure that required sound pressure levels can be achieved.
Ambient Noise Sensor	
TR 1.87	The PA system shall provide dynamic level control and shall be fitted with ambient noise level monitoring capability to compensate for changes in noise level automatically.
TR 1.88	The ambient noise sensor shall ensure that the output of the speakers can be automatically adjusted based on ambient noise conditions.
TR 1.89	The Ambient noise sensors shall be connected to the Amplifier/VoIP interface to manage and optimize PA system at individual locations.
TR 1.90	Noise sensors shall be outdoor rated and protected against corrosion.
Amplifier/VoIP Interface with built-in DSP	
TR 1.91	The PA system shall include amplifiers/VoIP interface capable of driving the speakers to a sound pressure level to ensure the minimum target STI of 0.5 is achieved under all conditions.
TR 1.92	The Amplifier/VoIP interface shall be installed at the intersections or locations as per the detailed design requirements.
TR 1.93	The VoIP should have an output power of minimum 60W (RMS).
TR 1.94	The VoIP interface should have an input for noise sensor to monitor ambient noise.
TR 1.95	The device shall convert analog audio to standard IP format for transmission over the Ethernet based fibre optic network.
TR 1.96	The device shall support browser based configuration to allow control and monitoring from any network-based PC.
TR 1.97	The device shall provide at least 4 inputs and 6 relay outputs to interface with external systems.

TR 1.98	The device should have LED status indications for faults including but not limited to power, short circuit etc.
Public Address System operator consoles	
TR 1.99	The operator console shall be located in the control centre and shall be IP based system.
TR 1.100	The console shall have hot keys for all call, individual call and group functions call for selecting multiple locations.
TR 1.101	The operator console shall have control desk functions.
PAS Workstation	
TR 1.102	For PA System Workstation, refer to Type 2 Workstation specification in Section 5.7.4.1.
PA System Server	
TR 1.103	For PA System Server, refer to Server specification in Section 5.7.4.3.
UPS for PA System	
TR 1.104	For UPS for PA System, please refer to the UPS specification in Section 5.7.4.5.
Dynamic Message Sign (DMS)	
TR 1.105	The DMS's shall be: • Fully programmable • Display in single colour (amber) for text and graphics/pictogram • Full matrix with controller in-built • Display area of 3000(H) x 1800mm (V)
TR 1.106	The DMS shall be capable of creating, managing and displaying messages in at least three languages (Hindi, English, Local language). The DMS shall be capable of displaying languages that is predominant in all the adjacent states.
TR 1.107	The DMS should be clearly visible from a minimum distance of 300 meters under all light conditions.
TR 1.108	Displayed Text/ Image shall not appear to flicker to the normal human eye.
TR 1.109	The DMS LEDs shall be of Amber colour.
TR 1.110	The DMS shall have maximum Pixel pitch of 15mm.
TR 1.111	It shall be compliant to EN 12966 Optical Classes L3, R2, B6, C2.
TR 1.112	The DMS shall be NTCIP 1203 v03 (or latest) compliant.
TR 1.113	The DMS shall be equipped with photoelectric sensor for automatic luminance control to adjust in steps with ambient light conditions. The sensor should not be installed on the front facial of DMS to avoid setting up false luminance levels due to vehicle headlights during night time.
TR 1.114	The DMS shall have door sensor which indicates the open/close position of DMS doors in Control Centre.
TR 1.115	The DMS should have in-built temperature sensor.

TR 1.116	The DMS shall have health diagnostic functionality. Each pixel can be monitored and feedback can be provided for the healthy status of the DMS which includes but not limited to : • Power failure at DMS • LED controller failure • Communication failure • LED failure • Pixel failure.
TR 1.117	The failure of one LED should not affect the functionality of any other LED cluster or pixel.
TR 1.118	The DMS unit shall have in-built protection for : • Lightning protection • Surge protection
TR 1.119	The device shall be powered by 220-240VAC/50 HZ input as per the design requirements.
TR 1.120	The DMS shall be connected to OFC backbone and shall have the RJ45 connection for network connectivity over IEEE 802.3 compliant TCP/IP over Ethernet connectivity. If any media converter is required, the same shall be provided.
TR 1.121	Only outdoor rated UTP CAT6 cable shall be used to connect the device to the respective switch port. If for any case, the distance between the switch port and device exceeds 90 m, the contractor shall use multi-mode fibre cable with respective media converters.
TR 1.122	DMS shall comply to following environmental conditions: • DMS operating relative humidity shall be 95% condensing • DMS shall have extended operating temperature of 0°C to 60°C DMS shall be IP 65 or NEMA 4X or better rated
TR 1.123	The DMS shall have an MTBF of 100,000 hrs.
TR 1.124	The DMS shall have functionality of controlling Brightness & Contrast Controlled through control Centre software.
TR 1.125	The DMS housing material shall be of mild steel and rust proof.
TR 1.126	The DMS housing shall have a border/bezel of minimum 50mm.
TR 1.127	The DMS shall have conventional diagonal air circulation and thermostat control for automatic temperature control.
DMS Workstation	
TR 1.128	For DMS Workstation, refer to Type 2 Workstation Specification in Section 5.7.4.1.
Mounting Structure for DMS	
TR 1.129	The DMS shall be installed either on T shape or inverted L shape cantilever structure.

TR 1.130	The MSI shall make all design considerations during design of gantry to withstand wind speeds of at least 150 kmph and shall be designed and approved by structural engineers and following appropriate guidelines.
TR 1.131	The DMS structure should have minimum height of 6.5 meters above road level.
TR 1.132	Any cable entering into the DMS shall be properly protected and should not be visible outside. Preferably it should be routed through the structure columns.
TR 1.133	The Structure should have walkway for maintenance staff to easily access and maintain DMS.
TR 1.134	The walk-way should have wire mesh on the bottom side to avoid any tool/equipment from accidentally falling on the roadway.
TR 1.135	The passage from structure to DMS should have locking provisions to avoid any unauthorized access.
UPS for DMS	
TR 1.136	For UPS for DMS, refer to UPS specification in Section 5.7.4.5.
e-Challan Systems	
TR 1.137	The e-challan handheld shall have latest mobile operating system (Windows or Android)
TR 1.138	The hand held shall have latest and high speed processor with minimum frequency of 800 MHz that suits the operating system
TR 1.139	The device should have a minimum of 512MB RAM for smoother functioning
TR 1.140	The handheld should have 1 GB Flash or higher, with an expandable micro SD card which supports capacity of at least 32 GB
TR 1.141	The device shall have colour display of minimum 4 inch, with minimum resolution of 640 x 480 (with Trans reflective screen VGA/QVGA)
TR 1.142	The handheld device shall have capacitive Touch Screen feature for easy navigation and usage
TR 1.143	The device should have a sim card slot to support 4G networks
TR 1.144	The handheld device shall have any form factor which shall be of Lightweight (preferably less than 800 gm including battery & print media) and should be easy to hold in the palm. The device shall have rugged structure with multiple drop resistance of 5 feet
TR 1.145	The handheld must last for minimum 8 hours of use in the field and be capable to hold 168 hours of transaction data. The device shall have suitable mechanism for charging from 220V standard AC power supply through standard power jack. The device standby time shall be for 5 days without intermittent charging. Suitable Vehicle charger shall also to be provided
TR 1.146	The handheld shall support communications through all of the following • USB 2.0 or higher • RS232 Port

	• Bluetooth 2.0 or higher • WLAN (IEEE 802.11 b/g/n) • GSM/GPRS/EDGE/CDMA/3G/4G
TR 1.147	The handheld shall have in-built thermal printer and should be able to print on a paper with minimum width of 3 inch. It shall support print speeds of at least 200 dpi, 60 mm per second or better with easy paper loading mechanism. The media type shall be Thermal Paper.
TR 1.148	The handheld shall be able to scan 1D and 2D barcodes (QR Codes)
TR 1.149	The device shall have a minimum of 5 MP camera with flash that can support still images and videos in all lighting conditions
TR 1.150	The device shall have QWERTY keypad as mode of input
TR 1.151	The handheld should be equipped with a speaker emitting output of at least 10 watt and a 3.5mm audio jack
TR 1.152	The handheld device shall have indicators on device for power, charging, low battery, connectivity, Read/write status, etc.
TR 1.153	The device shall have a rechargeable type Li-ion battery with minimum capacity of 3000 mAh
TR 1.154	The handheld shall pass Ingress protection class/rating IP54
TR 1.155	The handheld device shall meet the following Operating Conditions • Temperature: 0 – 55 degree Centigrade • Operating Humidity: 5 – 95% RH (Non condensing)
TR 1.156	The device shall have all the following features • Login through unique ID • Password or biometric authentication E-challan software shall be installed on the handheld machines to process challans in online and offline modes per user requirement
TR 1.157	The device should have PCI , EMV certified as per RBI guidelines for accepting payment through Credit/Debit card and smart card
TR 1.158	Each of the handheld device shall come with the following Accessories • User manual • Additional battery • Disc for device driver software • Charging Adapter • Car Charger • Device cover casing
TR 1.159	The handheld shall have a minimum life of 3 years under normal operational conditions.

5.2. Smart Tracking System

FR - 2 Functional Requirements

Smart Tracking Central System	
Design & Documentation	
FR 2.1	The MSI shall conduct a detailed study of the ground situation and understand all aspects of rolling stock, infrastructure, operations and management required for the various components of AVL for each of the Smart Solutions agencies. One or more site survey reports shall be developed for the project.
FR 2.2	The Bidder shall develop hardware and software design documents as per the project requirements.
FR 2.3	The Bidder shall develop a detailed System Requirement Specification (SRS) and a RFP mapping document that maps the RFP requirements to the SRS.
FR 2.4	The Bidder shall develop Test Plans consisting of test procedures for each requirement and share it with the Client prior to the testing of the systems.
FR 2.5	The Bidder shall develop design for Mobile application, SMS, IVRS and Commuter website and get approval of the Client before proceeding with the development.
FR 2.6	The Bidder shall develop detailed documents on approach for Pilot Testing, System Acceptance and Operational Acceptance and get approvals of Client before going for the acceptance testing.
FR 2.7	The Bidder shall submit monthly progress reports consisting of overall progress, progress in the last month, challenges faced, risk mitigation measures undertaken and activities for the next month.
FR 2.8	All the required commercial off the shelf (COTS) software, customised software, firmware, etc. shall all be supplied by the Bidder for each and every component supplied, as per the solution to be provided by the Bidder.
FR 2.9	All COTS components used as part of the deployment, including and not limited to the operating system and the database applications, shall be latest as on date of supply to Client.
FR 2.10	System shall allow role based access and provide filters for each smart tracking vehicle category and type.
FR 2.11	System shall have read and write access to dispatcher to view and edit information
FR 2.12	All related networking requirements including network switches, LAN cabling within the terminals, stations etc. to make the AVL System operationally functional shall be in the scope of the Bidder.
FR 2.13	All active devices supplied as a part of the AVL System shall have self-diagnostic capabilities which can be initiated from the equipment and also remotely from the central server at a pre-defined time each day (configurable) to know and generate the status and health of the equipment.

Smart Tracking (AVL) Central Software	
FR 2.14	The Bidder shall provide all software and hardware that comprise the overall central system, including the servers, database, etc., along with the required number of licenses for all users. The AVL software shall be provided outright with perpetual, royalty free license.
FR 2.15	The AVL application software shall be well established and currently deployed in a minimum of two transit projects.
FR 2.16	All data shall be the property of the Client and shall be immediately available to the Client.
FR 2.17	Transit AVL Application shall be the base application in the Smart Tracking Application.
FR 2.18	The Smart Tracking Application should connect with the respective applications for dispatch (Police dispatch application, Solid Waste Application, etc.) where available. If no application is available, the needed application shall be developed by the bidder (Water Tankers, Ambulance, Fire, Cess-Pool, etc.).
FR 2.19	System shall allow dispatcher to send message to multiple fleet at a single time for the On Board Unit (OBU) that are capable of receiving messages.
FR 2.20	System shall allow dispatcher to select one vehicle, multiple vehicle, all vehicle, depot wise, service wise or by a category predefined by the Client.
FR 2.21	All workstation application software shall have the latest available operating system platform.
FR 2.22	For transit and emergency Vehicles, three years data shall be retained in a historical database for use by management and other the Client staff to plan and assess system performance, and to address inquiries, conflicts and related issues. For other vehicles, the data shall be stored for at least one year.
FR 2.23	In case fleet is not sending the positional data for specified time then dispatcher has access to send request command to OBU.
FR 2.24	The AVL software shall be installed on ICOMC workstations and at required off-site locations for managerial staff to review the operations.
FR 2.25	The AVL Application software shall be LAN based at the ICOMC and web-based versions shall be available for offsite usage. If the Bidder proposes web-based Software for the ICOMC, the Bidder shall show that the access speeds are satisfactory for the system requirements.
FR 2.26	All communications and AVL data shall be stored in a manner that allows direct access by the software for at least 180 days. Utilities shall be provided to support archive and restore functions for older data.
FR 2.27	On-Board ITS (OBITS)/On-Board Unit (OBU) will send the location data every 10 seconds or at a user configurable value which central system software has to capture and process it. Various alerts, to be finalized in the design stage, shall be shown to the dispatcher in real-time to help support operations.
FR 2.28	GPS location data shall be updated through 3G/GPRS connection to the central system software within 1 minute for all the vehicles.

FR 2.29	When GPRS service is not available or dropped then OBU shall send the positional packets through SMS.
FR 2.30	During project implementation or maintenance, If the Client find the cellular service used by the Bidder is not satisfactory; the bidder shall migrate the SIMS to a better service provider, approved by the Client, at no additional cost.
FR 2.31	The AVL system shall integrate with Transit Management System to maintain and update crew and fleet information.
FR 2.32	If crew is on vacation, system shall be able to identify his/her vacation and notify to operator to change the crew.
FR 2.33	Vehicle maintenance shall seamlessly integrate with Transit Management system so that no redundancy of master data exists between the systems.
FR 2.34	The displayed vehicle status list (e.g., headway adherence) shall be capable of being sorted on any data field by the individual dispatcher.
FR 2.35	Two way voice communication from ICOMC to Vehicle: Central system software shall be allowed the through software. Dispatchers at ICOMC shall use headphones to talk to the crew.
FR 2.36	Two way voice communication from Vehicle to ICOMC: All the calls shall land in EPABX/VoIP or similar client approved system so that multiple calls at ICOMC can be handled by the dispatchers.
FR 2.37	All the two way communication cost shall be borne by the bidder for the period of the project including Maintenance period.
FR 2.38	AVL system shall have System Audit trail feature.
FR 2.39	AVL system shall interface with other Smart Solutions mentioned in the document.
FR 2.40	AVL system shall provide centre-to-centre communications through the ICOMC Platform to the ATSC (Signal) system when vehicles (buses & emergency vehicles) traverse preset geo-fences. The AVL system shall provide information for the signal system to initiate Transit Signal Priority or Emergency Pre-emption (depending on the vehicle) in a timely manner.
FR 2.41	Early green, green extension and phase insertion shall be the minimum TSP strategies that shall be supported by the system.
FR 2.42	AVL system shall share data with various ICOMC systems through the ICOMC central platform.
Maps	
FR 2.43	The central software shall incorporate maps to support the functionality, comprised of a selection of individually selectable theme layers (e.g., stations, streets, names, water features, parks, major buildings). The base map shall be Google maps or similar quality.
FR 2.44	Central system software shall have smart search feature to filter the data on the software.
FR 2.45	The Bidder shall use the same base map for the AVL system as the one developed as per the Bhubaneswar One GIS map requirements.

FR 2.46	The system shall include mechanisms to allow for periodic independent updates by the Client to the central software maps.
FR 2.47	Fleet icon on the Map shall provide the direction of travel of the vehicle in real-time.
FR 2.48	The Client shall be able to develop additional overlay map layers to the external source map that shall include polygons (e.g., municipal boundaries, fare zones), lines (e.g., route traces) and points (e.g., landmarks, transfer locations, time-points, stops), with the colour, shape and thickness being selectable.
FR 2.49	Map shall have a tool to measure the distance through mouse clicks.
FR 2.50	Application shall allow authorized staff of Client to create, modify and delete the POI and Geo Fencing on the Map.
FR 2.51	Client shall help identifying the locations of bus stops, bus stations, terminals, depots, etc. to the bidder. Bidder is responsible for carrying out the necessary surveys and bear the cost of equipment, persons, transportation, etc.
FR 2.52	Application shall have features to Geo-fence particular areas and provide SMS and Email alerts to authorized staff if vehicles cross the geo-fenced boundary.
FR 2.53	The application shall allow users to view the map, including a selectable combination of the source map layers and new layers, at various user-defined zoom levels.
FR 2.54	Application shall allow dispatcher to get a Printout of the Map what he/she can see on the screen. The print option shall support A4, A3 and A2 size printouts.
FR 2.55	The system shall receive location reports from each vehicle. The system shall use the time stamped location reports in combination with schedule data to derive the current schedule adherence status.
FR 2.56	Application shall have reasonable filters to track the vehicle movement in real time
FR 2.57	Application shall integrate with ICOMC platform to quickly pinpoint incident location on the map.
FR 2.58	Application shall provide travel times from the incident location to all the emergency vehicles in the vicinity.
FR 2.59	Application shall allow state-of-the-art features for quick dispatch of vehicles and personnel to the incident location
FR 2.60	Application shall allow trip planning with shortest route and other options for emergency vehicles to reach destination quickly.
FR 2.61	The system shall provide accurate real time travel time information of the road network in Bhubaneswar for determining the quickest route.
FR 2.62	Application shall allow dispatcher to select multiple vehicles through mouse clicks. Dispatcher shall be able to send group messages or conduct voice call to the selected vehicles in one shot.

FR 2.63	Application shall be capable to figure out where vehicle had deviated from the route vis-à-vis the defined route and show it on the map.
FR 2.64	The system shall receive and store latitude and longitude information together with the associated schedule adherence, stamped with date, time, vehicle, block, route, and store this data.
FR 2.65	Information shown along with the vehicle on the map shall be user selectable. The User shall have the option of selecting vehicle number, route, schedule, speed, delay time, etc. on the vehicle. The actual parameters to be defined during design stage by Bidder through discussion with Client.
FR 2.66	The display icon of the vehicle on the map shall provide an indication if the latest reported location being displayed is older than the reporting interval or not, to identify packet losses and delay in communication transfer.
FR 2.67	The display icon of the vehicle on the map shall provide an indication in different colour based on current vehicle status • On time • Late • Early • Over speeding • Route deviation • Positional packet delay for configurable time • SOS Alert The details to be defined during design stage by Bidder through discussion with Client.
FR 2.68	The system shall track headways at corridor stations for each individual route serving the station, all routes serving the station, and for any user-specified combination of routes serving the station.
FR 2.69	Based on configurable thresholds, the system shall use the observed headways to report/real-time alert when headways are shorter or longer than desired range of headway, at a given station.
FR 2.70	The system shall highlight the vehicle IDs of those vehicles that are operating with incorrect headway, using tabular and map displays to indicate their current headway adherence status.
FR 2.71	The tabular display entries and the map display symbols for these vehicles shall use distinct and configurable colour codes for short headways and long headways status.
FR 2.72	Map should refresh the Vehicle location on every 30 seconds interval. The application shall allow Client to configurable at any time without code or program change.
FR 2.73	The system shall provide a real-time output of the current location and schedule adherence for all fleet vehicles.
FR 2.74	ETA: More than 70% of the predictions accuracy for Estimated Time of Arrival between -2 to 7 minutes, 30 minutes before the bus arrival. The thresholds shall be reassessed during operations for better passenger confidence on the predictions.

FR 2.75	Estimated Time of Departure shall be calculated and displayed on the PIS display board located at terminals and interchanges in real time.
FR 2.76	In case of vehicle breakdown, the system shall record the event and send SMS to the concerned persons.
FR 2.77	The Bidder shall document and provide to the Client the communications protocols, command sets and message formats used in this interface.
FR 2.78	On right click of the mouse, the following vehicle information, at a minimum, shall show on the Map: • Vehicle Number • Contact no of Crew • Current Trip/Schedule no • Current Delay • ETA for the next 3 stops • Last stop • Next approaching stop • Last GPS time stamp • Current Vehicle status • Current Speed
FR 2.79	All the alerts shall meet BPTSL and other relevant agencies (BMC, etc.) business requirements. Various alert types explained below, shall be discussed and finalized during design stage.
FR 2.80	Alerts shall be configurable by authorized staff for each dispatcher.
FR 2.81	Dispatchers shall have ability to filter or sort the various alerts of given alert type.
FR 2.82	By double clicking the vehicle reg.no AVL application shall provide history of all the alerts for the entire day for that particular vehicle.
FR 2.83	Alert window shall have option to show recent alert for specified time, entire day or for last 3 months.
FR 2.84	The AVL Application GUI and the map should interface to provide extensive alerts required for real-time operational support. If required following few alerts shall send by Email and SMS to the registered staffs of Client at the configured period in advance (ex: Service and Maintenance Alerts). For critical alerts system will generate audio alert too. Following are tentative list, this may be updated/added during design and implementation period: • Critical Alerts (SOS) ➢ Ambulance Required ➢ Accident ➢ Breakdown ➢ Fire ➢ Security ➢ Bus stopped idle for x minutes during the Trip (Time must be configurable by the Client) • Major Alerts

	➢ Bus running without Schedule/Trip on the Road ➢ Route Deviation Alerts ➢ Schedule Adherence Alerts – colour coded by gap time ➢ Bus Bunching Alerts ➢ Speed Violation ➢ OBU switched off/ communication lost for configurable time ➢ SCN/Camera switched off/ communication lost ➢ In bus Sign switched off/ communication lost • VHMD switched off/ communication lost Minor Alerts ➢ Over Speeding ➢ Tamper Alert ➢ Harsh Acceleration ➢ Harsh Break • Service and Maintenance Alerts ➢ Fuel level alert when it is below the expected limit ➢ Engine Oil pressure ➢ Crew license expiry ➢ Vehicle FC renewal ➢ Vehicle routine maintenance ➢ Vehicle insurance and road permit
FR 2.85	The AVL Central Software shall display the following information, at a minimum, for a selected stop(s): • Stop ID; • ETA/ETD for the next 'x' number of buses, where x is configurable through the application. • Routes servicing the stop; and • Number of buses that shall arrive as per Schedule in the next x minutes, where x is configurable through the application.
FR 2.86	The Alerts shall be easily identified on the map through double-clicking of the alert. Location playback features shall be available on clicking of Alerts.
FR 2.87	In case dispatcher wants to escalate the alert to next level, system shall allow them to enable without any screen switch over or too many manual inputs on the system.
Location Playback	
FR 2.88	The dispatcher shall be able to review on the map display the chronological sequence of reported locations for specified location or specified vehicles over a specified time period.
FR 2.89	The software shall provide controls to view the entire sequence of reported locations from the beginning of the time period or to step through the sequence incrementally forwards or backwards.
FR 2.90	The system shall allow replay for a single vehicle, selected set of vehicles or all vehicles on the selected map view for selected time period. Selection

	can be time period, or area in which vehicles arrive or a combination of both.
FR 2.91	System shall consist of multiple features for location playback to allow variable speeds and time period selections for ease of replaying.
FR 2.92	The system shall allow selection of any time period for the historical data.
FR 2.93	Replay functionality shall have necessary filters for dispatcher to find the vehicles
FR 2.94	The replay data shall include location and schedule adherence data for vehicles and staff being tracked.
FR 2.95	All users accessing the AVL software shall be able to access the playback function.
FR 2.96	Replay functionality to support Vehicle having schedule/trip and without schedule/trip to do the replay by dispatcher. Route deviation should be clearly marked while the replay
FR 2.97	Replay functionality to support replay of one/group/all resources/staff as desired by dispatcher.
FR 2.98	The system shall allow the ability to use playback without exiting from the current AVL operational view.
FR 2.99	The system shall be able to store a playback in a format that can be exported for viewing on any computer.
Data Logging and Retrieval	
FR 2.100	All incoming and outgoing data shall be stored for retrieval, analysis, display and printing.
FR 2.101	The system shall allow all such data to be retrieved, even if it has been archived.
FR 2.102	This historical information shall include all reported and derived data for vehicles (including at minimum the date/time, vehicle, schedule, route, trip, location data, schedule adherence data, headway adherence data, station/stop arrival predictions); and all central software user logons and logoffs.
FR 2.103	The system shall include a means of archiving transaction data, or restoring data from an archive, while the system is in operation.
FR 2.104	It shall not be necessary to shut down the database to perform a successful back-up operation.
FR 2.105	The stored data shall enable accessing the historical data from both the online and archived storage, and selective sorting and retrieval based on user-specified criteria for any of the fields.
FR 2.106	Historical data shall be read-only with modification only permitted to individual pre-defined fields, with prior approval from the Client
AVL GUI Requirements	
FR 2.107	The central system shall be delivered with a fully functioning Graphical User Interface (GUI).
FR 2.108	The GUI shall be based on standard windows controls or equivalent.

FR 2.109	Scheduling and Rescheduling shall be very convenient for day to day operations for the dispatcher.
FR 2.110	Dashboard: Multiple dashboards shall be created based on dispatcher category. At minimum last month, last week, previous day, current day. The dashboards shall be made available as soon as dispatcher login and there should be option to get the dashboard under the menu.
FR 2.111	All screens with paging data shall open and populate with the initial data in 3 seconds and thereafter page updates shall be retrieved within 1 second.
FR 2.112	Dragging the cursor bar for a scrollable list shall cause instantaneous redisplay of the list in time with the movement of the cursor bar.
FR 2.113	There should be one screen to show all the vehicle no, vehicle status, last stop, last GPS timestamp received
FR 2.114	All the buses shall be shown concurrently in the GUI with both static and real-time data as parameters. Additional flexibility shall be present to select groups of buses based on criteria defined by the Client.
FR 2.115	Multiple configurable views of the GUI shall be available for the dispatcher that shall be available for retrieval through a dropdown list.
FR 2.116	The hover features should be present giving an indication of the main vehicle movement characteristics in real-time which shall include at a minimum current speed, distance travelled, next nearest stop, delay if any, trip number etc. These parameters should be also configurable easily to display system features as required by the Client.
FR 2.117	AVL GUI shall have line diagram to show dynamic status of the vehicle by selecting the route.
FR 2.118	Various master data files should be available through the AVI Application GUI. These include but not limited to: • Schedule Master • Route Master • Bus Stop Master • Depot Master (for future requirements) • Crew Master • OBITS/OBU Master • PIS Master • Landmark Master
Prediction Software Requirements	
FR 2.119	The system shall use the real time location and schedule adherence data to create a continuously updated table ,XML data feed and GTFS data stream of the last reported location for all vehicles and the next arrival predictions within the Client's configurable upcoming time window for all stations/stops
FR 2.120	The system shall provide this data table and XML data feed and GTFS data feed that the Client and designated third parties have the right to perpetual and royalty-free access, for the purposes for integration with future Passenger Information System (PIS) or other public information methods and importing data into the long term database.

FR 2.121	The Bidder shall also provide a data dictionary and Entity Relationship Diagram for the data tables and XML schema documentation.
FR 2.122	The information required by the algorithm(s) shall be manually entered into a prediction support database by the Bidder.
FR 2.123	The system shall allow the user to configure the prediction support database values.
FR 2.124	A system report providing accuracy predictions stratified by minutes in advance of the arrival, filtered on a stop and time period basis, is a desirable alternative since it would enable accuracy assessment during and after the implementation with less need for field data collection. With such a report, the Bidder shall still be required to assist with sufficient field data collection to validate the system prediction accuracy report, as well as with efforts to use the report data to maximize the accuracy of the arrival predictions.
Operations Monitoring Dashboard/ Console Requirements	
FR 2.125	The AVL system shall include an operations monitoring dashboard located at the ICOMC & monitored by the ICOMC dispatcher.
FR 2.126	On this dashboard shall be relevant schematic layouts with all nodes OBITS/OBU connected & shown on the GUI with real-time status.
FR 2.127	The various nodes when online & offline shall be represented in different colour schema on the GUI of the ICOMC dispatcher workstation as shown few below: • All the AVL related servers at data centre • All the network devices at data centre • OBITS/OBU equipment of all the AVL vehicle. • PIS board at Bus station, Terminal/Interchange and Depot • All the workstation at ICOMC, Bus station, Terminal/Interchange, Depot and Workshop • All the proposed AVL and related software • Proposed infotainment/ advertisement management software • Website (Commuter Portal) • SMS Systems • IVR System In addition to the above if any requirement may require to add in the interest of the project bidder shall provide reasonable support to integrate with third party tool or software
FR 2.128	If any particular node becomes disconnected from the control room, the same shall raise an alarm to the ICOMC dispatcher GUI & appropriate action shall be taken for rectification of the same.
FR 2.129	The monitoring dashboard shall show the status (connected/ disconnected, faulty/ working) of all logical devices (AVL System, PIS modules, etc.) connected to a particular node, when clicked on a node from the monitoring dashboard GUI.

FR 2.130	System shall send Email by attaching all the fault information and sending it to concerned person automatically
FR 2.131	System shall generate alerts/events instantly on the screen to attract dispatcher
FR 2.132	System shall assign a ticket automatically to the concerned team or person.
FR 2.133	System shall have facility to create tickets (for issue tracking) manually.
FR 2.134	Details of created, open, close ticket details shall able to generate in report format.
FR 2.135	In case of any fault in the devices connected to a node, or connectivity failure with a node, a pop-up message shall appear on the monitoring dashboard workstation. The dispatcher has to acknowledge the pop-up message & report the type of fault to the maintenance team & shall record the details to the assigned team /individual into the system.
FR 2.136	Access to the monitoring dashboard shall be specific to the privilege of the user, which can be defined in the central system & shall be specific to a group of node locations (e.g., a set of OBITS/OBU and/or combination of node types).
System Security Requirements	
FR 2.137	The central system & AVL Work-stations shall only be accessible by authorized persons, controlled using login and password protection.
FR 2.138	It shall be possible to create multiple user classes with different privileges.
FR 2.139	The system shall maintain a transaction log that records all users that access reports, the reports accessed, edits and changes to the database and the system logon and log-off times.
FR 2.140	The transaction log shall maintain this information for a minimum of one year. Editing data in the log shall be possible only to the highest class of system user and shall be flagged in the reports generated.
FR 2.141	The system security shall provide features to maintain data integrity, including error checking, error monitoring, error handling and encryption.
FR 2.142	Verification features shall be provided to ensure that all system-created files are uniquely identified, and that no files are lost or missed during data transfer.
FR 2.143	Verification features shall be provided to confirm that there has been no data loss at any point in the transfers.
FR 2.144	Features shall be provided to automatically detect, correct and prevent the propagation of invalid or erroneous data throughout the system.
FR 2.145	All systems, sub-systems and devices shall only allow access to authorized user classes.
FR 2.146	All security breach detections shall be confidential, and accessible only to users of the appropriate class.
FR 2.147	The Central System shall be capable of data communication with all system components in real-time.

FR 2.148	The central system shall update its date and time by applying time synchronisation to servers using the internet and using this to in turn update the date and time on all OBITS/OBU and PIS Displays.
FR 2.149	The central computer system shall manage all device activity including data storage and processing.
FR 2.150	All active equipment shall have an internally maintained date and time clock synchronized at a time interval via the communications controller with the Central System date and time clock.
FR 2.151	The time synchronization application in the device shall have the capability to adjust the minimum time interval to update itself with the central system time and date, and shall be able to update time every minute (configurable) with the central system.
FR 2.152	All mobile equipment (OBITS/OBU) shall operate with a real-time data connection to the central system via the communications (GPRS) network
FR 2.153	All mobile equipment (OBITS/OBU) shall communicate with central system using standard protocols specified in UBS-II specification.
FR 2.154	If the data connection to the central system is temporarily lost, all equipment shall seamlessly switch to an offline mode in which all data is temporarily stored in internal memory and transmitted to the central system as soon as the data connection is re-established.
FR 2.155	All equipment shall have sufficient memory to operate in offline mode, with no loss of data, for not less than 168 hours.
FR 2.156	It shall be possible to “future-date” messages to PIS systems so that they can be uploaded ahead-of-time and automatically displayed during the planned date and time.
FR 2.157	The central software shall provide over-the-air updates & firmware updates to all devices, separate from other immediate critical updates.
FR 2.158	The systems shall be driven by configurable parameters and shall provide the flexibility for maximum configuration. The configurations shall consist of, but not limited to: • Time based messages • User Groups and users privileges • Addition & deletion of OBITS/OBU, PIS nodes, user groups, users • Configurable messages in English, Hindi and Oriya languages • Reports access
FR 2.159	The system shall handle all exceptions. Exceptions can be, but not limited to: • Message not being displayed on the PIS • Triggers for panel opening of any equipment • Default message shall be configurable in case of the lost central connectivity
FR 2.160	The system shall handle all degraded conditions, including but not limited to:

	• Any supplied equipment not functional • Power failures • Data Connection lost • Central Server down • Bus-Station communications non-functional
FR 2.161	Bidder shall provide an automated Fault Monitoring Mechanism to generate reports identifying the faults of the equipment if any on a daily basis. The Fault Monitoring System shall have as a minimum the following capabilities: • Setting up of automatic and manual alerts • Automatic fault detection & Reporting • Fault Status reports • Fault Closure reports These reports shall be non-editable and the Client and/ or its representatives shall have real time access to the Fault Monitoring Mechanism with user privileges of the highest level.
Maintenance Mode – Operational Requirements	
FR 2.162	The Central system and all the equipment (on-board ITS equipment, PIS displays in stations, etc.) shall support a maintenance mode during repair, replacement and testing of equipment.
FR 2.163	The maintenance mode shall be able to be activated for a particular node/ equipment item individually.
FR 2.164	The maintenance mode shall have feature to be activated by only one person having the highest user privilege in terms of system operations.
FR 2.165	Logins and log outs shall be transmitted to the central system, along with associated Date/Time, employee ID, equipment ID etc.
FR 2.166	It shall be possible to upgrade the firmware/ software at the station level, OBITS/OBU from the central server using the communication network.
FR 2.167	System shall allow to update configuration changes at multiple fleets OBITS/OBU over the air.
FR 2.168	Client shall be the owner of all system data and able to use the central system to export transactions data for processing/ analysis using other software.
FR 2.169	Data shall be retained in the database for at least the prior financial year.
FR 2.170	The Bidder shall support Client's data release policy.
FR 2.171	Data received from system devices shall be maintained at the original level of transactions and not be aggregated, consolidated, or combined within the database.
FR 2.172	Sufficient data storage capacity shall be provided in the central system to store online a minimum of two years activity data.
FR 2.173	All data shall be automatically backed-up daily without human intervention, using the backup devices and media. Bidder shall arrange data cartridges, clean cartridges, as required during O & M period.

FR 2.174	Means shall be provided to automatically archive data older than two years using the archiving media.
FR 2.175	The system shall use archived data to process comparative type reports, such as but not limited to reports utilizing and comparing data from non-consecutive month periods in two different years, or day-of-week comparisons over multiple month or annual periods.
FR 2.176	The transactional database shall store the date/ time stamped details of all information transmitted to the central system from system devices.
FR 2.177	In addition to transaction records, the database shall incorporate additional tables to record information of interest, including but not limited to: • Device locations (e.g. PIS Displays etc.) • Diagnostic/ maintenance data (such as error records) • Exception data (such as alarms, memory clears etc.)
Scalability/ Future Operational Requirements	
FR 2.178	The central software shall be scalable to accommodate 800 buses, 500 routes, 300 bus-station PIS, without any modifications to the central software except minor configuration changes, with the details of how scalable the system is provided in the proposal by the Bidder.
FR 2.179	The Bidder under the present scope of work shall be able to generate all reports separately for different routes under operation.
FR 2.180	Bidder shall provide support to integrate with other AVL system in the future during the contract period.
MIS Reports Requirements	
FR 2.181	The software shall provide standard reports based on the AVL data. The reports below are mainly for bus system, bidder shall work with the Client during the design phase to identify reports for each type of tracking requirement. Bidders shall provide details in their proposal related to reports offered and the degree to which they can be configured (at minimum all reports shall be configurable for a specified date/time range and route). Summary reports for different levels of management staff shall be designed by Bidder during the design stage. Automated graphs/plots for commonly used data shall be provided in discussion with Client. Following are tentative list, this may be updated/added during design and implementation period: • Schedule adherence at depot, terminal and various selected bus stops/stations • Headway adherence/Bus bunching report • Active fleet (weekday and weekend) • Service hours and mileage • Speed violation reports • Alerts reports • Missed/Cancelled Trip • Route Deviation • Dead KMs report

	• Vehicle Distance Travelled as per schedule/ trip/ charted trip • Bus stop skipped • Improper stop report • Daily bus out shedding report • Bus breakdown report • Depot IN/OUT report • Monthly summary reports broken down by system, division, depot, route, bus type, driver, conductor, bus make, etc. • Bus Location by date/time, location, and other parameters • Driver performance report consisting of bus stop skipping, harsh acceleration, harsh deceleration, over speeding, etc. • Fraudulent activity reports with the hardware (Tampering reports) • Faults and errors • Bus trip reports; • System exceptions reports • System performance and activity reports • Financial reports SLA violation report based on the business rules specified in bus operations tender. • Travel time reports between stops. • Reports on events that hinder movement of buses. • Consolidated GPS analysis report – service provider wise • Consolidated GPS analysis report – vehicle wise, depot wise, service wise • Historical reports ➢ Employee detail ➢ Vehicle detail ➢ Bus stops ➢ Bus stop names by route
FR 2.182	The Bidder shall be able to collect all the required data from the OBITS/OBU to generate the required PIS display data and MIS reports.
FR 2.183	The software shall have the capability to generate reports based on exceptions as per thresholds set by the Client staff for various AVL components.
FR 2.184	Reports shall have summary and detail information based on the Client need.
FR 2.185	The Bidder shall provide tools to generate ad-hoc reports on stored AVL data.
FR 2.186	All reports must use standard reporting tools (e.g., Crystal Reports or MS Access) and have the ability to export data into file formats that can be

	exported to and edited with standard office software (e.g., Microsoft Word, Adobe Acrobat and Excel)
FR 2.187	Any portion of the transactional database shall be exportable in standard formats (such as .csv, xls, xlsx, xml, etc.) for analysis in third party programs.
FR 2.188	It shall be possible for users to build custom reports from the data in the transactional database with support tools such as Crystal Reports and MS Excel. The reports should be customizable for various time periods through the dashboard of the reporting system.
FR 2.189	A data dictionary shall be provided to Client to facilitate development of custom reports.
FR 2.190	The Central System shall provide sufficient summarized and detailed data, including features to generate standard report based on pre-established criteria, as well as as-required reports based on a user-definable set of search criteria.
FR 2.191	All reports shall be generated using a query language and standard query engine (to be approved by Client) that provides flexibility for future updates, and for creation of new reports.
FR 2.192	Reporting software shall include the ability to generate graphs and charts based on criteria and format defined by the user
FR 2.193	All reports shall be generated with configurable time parameters, including as a minimum annual, monthly, weekly, daily, hourly and with user defined start-end date and time ranges
FR 2.194	As a minimum, the Central System shall generate required standard System reports daily, weekly, monthly, quarterly and annually. These reports shall be available through the AVL Application Software.
FR 2.195	The Bidder shall provide an ad-hoc reporting function and interface into the data and reports server to allow Client personnel to create, execute and receive custom reports without Bidder assistance. An Internet-based interface shall be provided for this function, accessible by Client personnel with appropriate permissions. Client users shall be able to generate ad-hoc reports and do additional analysis of ridership, revenue and other System data. The Bidder shall enable Client's staff to generate reports and use the system. Examples of the types of reports include: • Transaction-level reports by stop and for user-defined start and end points; • Statistical and research reports using user-defined criteria.
FR 2.196	It shall be possible to aggregate data (filter) for reporting, at a minimum, by: • Date/Time • Origin • Destination • Location • Equipment Serial Number • Vehicle number

	• Crew Name It shall not be necessary that values be consecutive for the purposes of aggregation (e.g. non-consecutive months).
FR 2.197	The actual bus operational business rules will keep varying and the Client shall share the same with the selected Bidder from periodically, which the Bidder has to reflect in the AVL application for generating any additional reports during the project period.
FR 2.198	The Software shall be capable of establishing automatic periodic (monthly/quarterly/yearly/ routines to automatically produce and email standard reports to defined user groups.
FR 2.199	The Software shall provide a web-based reporting tool to allow for access from anywhere. The access and views of the reports will be based on Role based access control.
FR 2.200	Software shall allow Client to generate Summary and Detail reports as applicable.
Performance Requirements	
FR 2.201	Server hardware and licenses shall be sufficient for up to 50 dispatcher work-stations to access the central software concurrently, with no loss of performance.
FR 2.202	Bidder to arrange and provide application, software and antivirus licenses as per numbers mentioned in system inventory table. If any additional licenses are required as per the system design approached by the bidder then bidder to provide necessary licenses without any additional cost.
FR 2.203	The central software shall be scalable to accommodate 800 buses, 500 routes, 300 bus-station PIS, without any modifications to the central software except minor configuration changes, the details of how scalable the system is shall be provided in the proposal by the Bidder.
FR 2.204	The servers shall have capacity to process 300,000 service transactions/hour
On-Board Its (OBITS)/On-Board Unit (OBU) Interface with AVL	
On-Board Unit (OBU): OBU-1 (for Bus), OBU-2 (for emergency vehicles) & OBU-3 (for municipal vehicles)	
FR 2.205	Both OBU-1 & OBU-2 shall comply with UBS-II specifications or equivalent standards that are acceptable to the Client. OBU-2 shall be provided at a form factor that can easily be installed in the smaller emergency vehicles. OBU-3 shall a simpler GPS device with no display requirement. **Bidder shall refer to UBS-II specification and its amendments at jnnurm.nic.in.**
FR 2.206	A two-way communication (audio interface) system shall be provided for buses and emergency vehicles.
FR 2.207	At the onset of the project, the Bidder shall study the power surges on cold cranking of buses using OCR and design the OBU to withstand these surges. A report on the surges in various types of buses shall be provided to the Client before OBU installation.
FR 2.208	The Bidder shall provide for the IPTS equipment:

	• Communication protocols: The OBU communications shall be based on open protocols. The protocols for all AVL units (OBU) for the smart tracking vehicles shall be the same. The Bidder shall provide the protocols, API and interface documents to the Client. • Installation: The installation of the AVL equipment shall be done professionally. The Driver Console for OBU-1 & OBU-2 shall be installed such that it is visible and accessible to the Driver. • GUI Customization: Driver Console GUI shall be customized for the Client requirements. Customization is for making the Driver Console shall support the respective operations of the agencies involved, including showing some of the information in the local language. • A timer shall be provided with OBU so that the OBU can be switched off after a variable set period after the vehicle ignition is switched off.
FR 2.209	The OBITS firmware shall be able to update over the air (OTA) from AVL central system software at ICOMC.
FR 2.210	Bidder shall understand the respective agency (BPTSL, Police, Ambulance, Fire, Solid Waste, Water Tankers, Cess-Pool Vehicles, etc.) requirement and develop the interface for BDC as mentioned below at a minimum: • Display Console (DC) interface shall mainly in graphical and it shall support Hindi, Oriya and English selected by crew at their convenience. • Login for driver through pin number or Smart Card to be provided on DC • Route selection function is to be provided for buses on DC • All driver related route information to be displayed on DC • Alerts of harsh break, harsh speed, harsh acceleration, route deviation, speed violation, shall be provided on DC from central system software. • Bidder shall provide basic map of Bhubaneswar & Surrounding areas on DC. Using that crew shall be able to see the vehicle location. • The map shall provide incident location and route choices to incident with travel time on the map for emergency vehicle OBU. • Next stop name with distance shall be provided for buses. • Application shall able to send route and its related information to DC. Route selection could be automated or manual selection based on BPTSL business requirement, this would be discussed and finalized during design.

	• SOS: Multiple SOS messages shall be provided to crew to send to ICOMC. • Depends on SOS type dispatcher shall be able to acknowledge the SOS received from the vehicle. • SOS interface developed by bidder shall support that if required SOS messages shall be passed to multiple staff from central system software. • Two way voice communication: interface shall support making two way voice communications from vehicle to ICOMC or ICOMC to vehicle for OBUs 1 & 2. • Two way voice communication: Interface shall support that only registered number can make outgoing and incoming call to the vehicle.
FR 2.211	The OBITS, where relevant shall be able to automatically pull the route information from the central system software depending on the operations schedule associated with a particular bus.
FR 2.212	The OBITS shall send the current location report as determined by the GPS receiver over the 3G/GPRS network to the Central System, at an interval specified by the Client. The Client shall be able to choose a location report interval between a minimum of 10 seconds and a maximum of at least 2 minutes.
FR 2.213	The OBITS shall detect if the vehicle stops for more than x minutes (configurable) at a location other than a station or a traffic signal or any other pre-defined location and send a time stamped report of this occurrence to the central system. If this occurs when the vehicle is not in cellular data coverage, this report shall be sent as soon as cellular coverage is acquired.
FR 2.214	In case of reported vehicular stoppage, the interface shall be able to allow the reasons for such delay and exclude such delays due to unforeseen conditions to be excluded by impacting the penalties of the bus operator. However such exclusions shall be possible only to be included by the Client.
FR 2.215	OBU is capable to store waypoint data in it. AVL central software shall be able to pull the bulk data from multiple OBU.
FR 2.216	The proposed OBU-2 hardware shall be fit into Ambulances and Police Vehicles in India. Size of the hardware shall be fit into safely within vehicle inside.
FR 2.217	The Emergency vehicles are expected to have following functionality in Vehicle: • Two way communication between ICOMC and vehicle. • Dispatcher at ICOMC able to add vehicle to conference call with other people or vehicles. • Emergency vehicle OBU shall display incident location on Map and nearest landmark name on OBU, quickest route, alternate routes, etc.
FR 2.218	The Emergency vehicles are expected to have following functionality AVL Software:

	• The vehicles shall be tracked on Map. • System shall generate the alert while emergency vehicles bounce beyond a pre-defined boundary. Geo fencing to be done for such case when it crosses the boundary. • Dispatcher at ICOMC shall have ability to make conference call with crew in emergency vehicles with other people or vehicles (vehicles equipped with OBU, etc.). • AVL application (on Map) shall able to track and find the nearest emergency vehicles quickly. • AVL application shall record vehicle movement and same shall be available for playback • Emergency vehicles used for rescue and incident operation shall be recorded in system for reference.
FR 2.219	System shall capable to record incident reported by emergency vehicles such as: • Accident • Breakdown • Riots, • Heavy rain, Flooding, High Wind
FR 2.220	At minimum following MIS Reports to be provided for Emergency vehicles: • Kilometer run • Incident involvement • Response Time • Vehicle usage and utilization
FR 2.221	The Bidder shall indicate which commercial cellular data carrier network(s) are compatible and provide coverage throughout the Client service area.
FR 2.222	Central system software shall store messages sent from MDC for a limited time. Duration of stage is for 2 years maximum.
FR 2.223	Interface shall develop by the bidder to integrate the OBU and BDC with central system software to display information in Oriya or in simple enough graphical form that the Crew can comprehend it with minimal training.
Inner Sign Board	
FR 2.224	Next stop name to be displayed on the sign board inside the bus, if a sign board is available.
FR 2.225	Central system software shall support display format in fixed, scroll and flash
FR 2.226	It shall support both language Hindi, Oriya and English
FR 2.227	Fonts to be used for sign board shall be standard fonts.
FR 2.228	During non-availability of 3G/GPRS connection OBU will send the next stop name based on current GPS location
FR 2.229	Dispatcher shall able to create and send ad-hoc message to sign board from central system software

FR 2.230	GPS timestamp shall be displayed on the sign board in the configured interval
Front, Side and Rear Sign Board	
FR 2.231	Route no and route name shall be displayed on the Front, Side and Rear board
FR 2.232	Depends on the size of the board font size shall be adjustable
In bus Automatic Voice Announcement	
FR 2.233	The OBU-1 shall store next stop announcement voice files of all the schedules/routes run by BPTSL in which central system software has to support.
FR 2.234	Bidder to provide high quality voice files for in bus announcement for all the bus stops.
FR 2.235	It shall first announce the current stop name and then announce the next stop name.
FR 2.236	It shall announce bus destination name at configured interval or distance based. It shall also have the ability to announce public messages as required by BPTSL
FR 2.237	During non-availability of 3G/GPRS connection OBU shall will send the previous stop name and next stop name based on current GPS location
FR 2.238	The Bidder shall indicate which commercial cellular data carrier network(s) are compatible and provide coverage throughout the Client service area (in and around Bhubaneswar).
FR 2.239	The proposed OBU-2 hardware shall be fit into Ambulances and Police Vehicles in India. Size of the hardware shall be fit into safely within vehicle inside.
FR 2.240	The Emergency vehicles are expected to have following functionality in Vehicle: • Two way communication between ICOMC and vehicle. • Dispatcher to be able to add vehicle to conference call with other people or vehicles. • Emergency vehicle OBU shall display incident location on Map and nearest landmark name on OBU, quickest route, alternate routes, etc. sent from ICOMC.
FR 2.241	The Emergency vehicles are expected to have following functionality AVL Software: • The vehicles shall be tracked on Map. This does not have schedule or route. • System shall generate the alert while emergency vehicles bounce beyond a pre-defined boundary. Geo fencing to be done for such case when it crosses the boundary. • Dispatcher at ICOMC shall have ability to make conference call with crew in emergency vehicles with other people or vehicles (buses equipped with OBU, etc.).

	• AVL application (on Map) shall able to track and find the nearest emergency vehicles quickly. • AVL application shall record vehicle movement and same shall be available for playback • Emergency vehicles used for rescue and incident operation shall be recorded in system for reference.
FR 2.242	System shall capable to record incident reported by emergency vehicles such as: • Accident • Breakdown • Riots, • Heavy rain, Flooding, High Wind
FR 2.243	At minimum following MIS Reports to be provided for Emergency vehicles: • Kilometer run • Incident involvement • Vehicle usage and utilization
Transit Management System (TMS)	
General Requirements	
FR 2.244	The Bidder shall conduct a detailed study of the existing BPTSL processes during the planning stage of the project.
FR 2.245	The Bidder shall provide required number of licenses for all users. A minimum of 50 licenses shall be provided.
FR 2.246	TMS application shall consist of: • Ticketing • Scheduling ➢ Network Modelling ➢ Timetable Modelling ➢ Optimization for Bus Scheduling ➢ Optimization for Crew Scheduling ➢ Service & Transfer Synchronization ➢ Daily Operations Management of Buses & Crew • Maintenance & Workforce Management ➢ Depot Management ➢ Workshop Management • ERP Solution or Similar System for Transit Consisting of: ➢ Asset/Inventory Management ➢ Financial & Accounting Management o General Ledger o Accounts Payable o Accounts Receivable o Bank Account Management and Reconciliation o Budgeting

	○ Requisitions / Purchasing ○ Loans/Grants Management ○ Travel expense re-imbursement ➢ Audit Management ➢ Human Resources & Payroll ○ Recruitment Management ○ Performance Management ○ Document Management ○ Time Reporting and Tracking ○ Leave Management ○ Automated Salary & Benefits Payment ➢ Contract Management
FR 2.247	All components of TMS application shall be windows or web based. If windows based, it shall provide a web interface.
FR 2.248	Entire TMS related data shall be available for a minimum period of 7 years.
FR 2.249	All terminology in the TMS application shall be consistent with the current operational terminology used by the Client and BPTSL.
FR 2.250	Application shall have ability to have a separate database instance for testing purposes
User Interface Requirements	
FR 2.251	The TMS software user interface shall have a standard windows user interface look and feel, including standard windows keyboard shortcuts (i.e. CTRL+C, CTRL+V, etc.)
FR 2.252	All its major features shall be available through toolbar icons and all features shall be accessible with point-and-click dialog boxes.
FR 2.253	All data shall only need to be entered once with no retyping of data necessary.
FR 2.254	It shall also have Microsoft Excel import capabilities for data entry.
FR 2.255	System shall provide ability to export reports to Excel, pdf, csv, xml formats
FR 2.256	User shall be able to resize, hide or show table columns any time and modify displayed font. The software shall have capability to save screen preferences on a user-by-user basis
FR 2.257	User shall be able to create and modify report templates from within the user interface.
FR 2.258	Software shall have auto-save & auto-recovery, versioning and file archiving features.
FR 2.259	Basic and advanced search capabilities shall be available in the system
FR 2.260	Application shall have role based access with read and write level access.
FR 2.261	Flexibility in access of individual screens of the application shall be provided so that each user shall have different (no access/read/write) privileges based on the screen.

FR 2.262	Interface shall be consistent across screens and shall create clear user expectancy. Similar consistency in Interface shall be provided across the components of the Project
FR 2.263	Every user shall have option to change his/her password on their own.
FR 2.264	TMS System shall be able to send SMS and Email alerts to one or more persons or user defined groups.
FR 2.265	Admin shall have access to enable or disable the SMS or the Email alerts. It shall be configurable on the application by Admin.
FR 2.266	TMS application shall provide configurable features like how many days before each alert shall be sent, which staff will have access to see what alert, what is the mode for each alert, etc. All these configurations shall be available for each user with a defaults set at the start.
FR 2.267	TMS shall be centralized, but shall be able to run in standalone mode when connectivity is not available.
FR 2.268	Both local database at depot/workshops, etc. and centralized database at ICOMC shall sync regularly at configurable frequency. It shall update only the new/edited information and not the entire database.
FR 2.269	All components of TMS shall be integrated with other Smart Solutions components so that data entry shall be done only once between the subsystems.
FR 2.270	The system shall be modular so that improvements in one sub system/component do not make other subsystems/components to fail.
FR 2.271	A Pilot shall be conducted to ensure all aspects of TMS are working as per the requirements of the Client.
FR 2.272	The Bidder shall identify steps to ensure migration to the Bidder's TMS from the current system with least operational challenges for BPTSL. Bidder shall submit a system migration document to the Client and get the approval.
FR 2.273	Workstations for TMS shall be made available at ICOMC, Depots, Terminals, Workshops, etc. Entrance/Exit points of these locations shall require necessary modules of the TMS. All the networking of Workstations, servers and such required for TMS shall be provided by the bidder.
FR 2.274	Specific modules of the TMS shall be available based on the user responsibility. For example only HR & Payroll module shall be made available to HR Department when they login into TMS.
FR 2.275	All the documents like vehicle registration, FC, Road permit, Staff ID proof, License, purchase order copy, etc. shall be scanned and uploaded into corresponding sub systems like Fleet & Workforce Management, HR & Payroll, Financial systems, etc. Duplication in uploads shall be minimized between the systems.
FR 2.276	TMS system shall have System Audit trail feature.
FR 2.277	Leave information shall be available through web based portal for all employees
FR 2.278	The system shall provide necessary reports and access to data through inquiry, drill down capabilities and auditing;

FR 2.279	Depot manager shall be provided real-time information and reports on various depot events/alerts such as attendance, vehicle in/out alerts, breakdowns, accidents, maintenance alerts, accounts, etc. The specific information to be shared shall be decided during design stage.
FR 2.280	The TMS system shall include an operations monitoring dashboard that shall be available on the application and also on the web/mobile for decision maker access
Scheduling	
FR 2.281	Data by division, depot, operation, route, schedule, bus type, employee type, employee, bus, etc. should be available
FR 2.282	The system shall be able to support operations for a minimum of 1000 buses.
FR 2.283	Ability to optimize the complete service delivery by developing the route and publish final timetables & rosters.
FR 2.284	Ability to Generate informative statistical summaries and MIS from the system
FR 2.285	Proposed System shall have following integrated functionalities/tools: • Route Plan & Timetables • Trips & Vehicle Planning • Crew Schedules • Roster and Dispatch (Operations) • Crew Kiosks (optional) • Performance monitoring • Bus travel time data from AVL system
FR 2.286	The application shall provide feature for creating vehicles in one depot and process for transferring vehicles to other depots.
FR 2.287	Application shall have feature to capture trip/schedule wise revenue kilometre
FR 2.288	Capability to capture dead kilometres in the System.
FR 2.289	Ability to define and create Charter trips into the system. Solution shall provide the entire process – Quote, Booking, Allocation, Invoicing, etc.
FR 2.290	The charter trips should be reflected into the operation module for rostering and dispatch functions.
FR 2.291	Ability to capture requirements from customer for chartered trips into the system.
FR 2.292	Ability to make quick changes in routes and bus stop locations due to traffic management (traffic police) changes (one way streets, construction, etc.)
FR 2.293	Ability to create users in the system
FR 2.294	Ability to assign roles, access and user permission in the system
FR 2.295	System should support user defined event definition for sending alerts and message

FR 2.296	System should be able to send alerts and email based on certain conditions/events/transaction.
FR 2.297	Ability to produces printouts of crew schedules, duty rosters, route timetables, bus stop timetables etc.
FR 2.298	Ability to generate On-demand statistical reports and summaries
FR 2.299	The system shall ability to generate following reports, but not limited to, • Route • Timetable • Crew Rostering • Statistics Report - Headway, Running times for each trips. • Despatch report • Schedule cancellation report • Crew allocation • Schedule allocation • Crew utilization report • Fleet departure at depot • Fleet dead KM per route/ fleet wise • Revenue kilometre • Schedule or trip cancellation • Crew license renewal history • Over time details per staff wise
FR 2.300	The Ability to import and export master data such as nodes details with its respective GIS data to the Map, Crew, Vehicle, Schedule, Routes with stop, etc.
FR 2.301	System shall provide facility to export data/reports into pdf, excel /.csv and /XML formats
FR 2.302	Proposed System should be able to perform trip time deviation analysis to find where the critical trips
FR 2.303	System shall provide Route Creation and Timetabling features
Fare Collection System (FCS)	
Handheld Electronic Ticketing Machines (Referred As Handheld Or ETM)	
FR 2.304	The Handheld on the Transit Vehicle shall allow payments via cash and Common Payment System (CPS) being introduced in the city as a separate effort.
FR 2.305	The Handheld EMV compliant and shall support all forms of payment supported by the CPS including smart card, mobile app, and mobile QR code payment.
Graphical User Interface Requirements	
FR 2.306	The central system shall be delivered with a fully functioning Graphical User Interface (GUI).

FR 2.307	The GUI shall be based on standard windows controls or an equivalent operating system.
FR 2.308	All screens with non-paging data shall open and populate with data within 3 seconds.
FR 2.309	All screens with paging data shall open and populate with the initial data within 3 seconds and thereafter page updates shall be retrieved within 1 second.
FR 2.310	Dragging the cursor bar for a scrollable list shall cause instantaneous redisplay of the list in time with the movement of the cursor bar.
Operations Monitoring Dashboard/ Console Requirements	
FR 2.311	The FCS system shall have an operations monitoring dashboard, located at the City Mobility Centre & monitored by the ICOMC FCS operator.
FR 2.312	The monitoring dashboard shall allow the ICOMC FCS operator to click on Handheld & view the details of “operator” logged in, time duration since logged in, summary of transaction performed, etc.
FR 2.313	In case of any fault in handheld, an alert message shall appear on the monitoring dashboard workstation. The operator has to acknowledge the alert message & report the type of fault to the maintenance team & shall record the details to the assigned team/individual into the system.
FR 2.314	Fault assignment to the maintenance team shall be managed and controlled by the system software itself. Once a fault is assigned by the ICOMC FCS operator or authorized user to the maintenance team, the same shall be displayed in the maintenance module and once fault is closed/resolved by the maintenance team it shall be updated automatically (in case of active devices) or else updated manually in the software application/maintenance module.
FR 2.315	The access to monitoring dashboard shall be specific to the privilege of the user.
Inventory/ Consumable Management Requirements	
FR 2.316	The FCS system shall have an inventory /consumables management module wherein the details of spare inventory & consumables shall be entered into the system.
FR 2.317	This module shall have a minimum level criterion wherein the details of a minimum level for required inventory/ consumables shall be set in the system. This “minimum level” shall be user configurable.
FR 2.318	If inventory/ consumables for any item falls below this defined minimum level, the system shall generate an alert for the appropriate user level for further replenishment/ action.
FR 2.319	Any inventory/ consumables purchased/ damaged/ issued/ lost shall be registered into this module & shall be controlled through this module only.
System Security Requirements	
FR 2.320	The system shall only be accessible by authorized persons, controlled using login and password protection.
FR 2.321	It shall be possible to create different user groups with different privileges.

FR 2.322	The system shall maintain a transaction log that records all users that access reports, the reports accessed, edits and changes to the database and the system logon and logoff times.
FR 2.323	The transaction log shall maintain this information for a minimum of one year. Editing of data in the log shall not be possible for any user.
FR 2.324	Further non editable, non-tamperable, mirror copies of logs should be sent to the Client periodically.
FR 2.325	The system security shall provide features to maintain data integrity, including error checking, error monitoring, error handling and encryption.
FR 2.326	Verification features shall be provided to ensure that all system-created files are uniquely identified, and that no files are lost or missed during data transfer.
FR 2.327	All systems, sub-systems and devices shall only allow access to authorized user group.
FR 2.328	All security breach detections shall be confidential, and accessible only to users of the appropriate group.
FR 2.329	For all data transactions, the system security shall include authentication features to verify that all claimed source, recipient or user identities are correct and valid.
FR 2.330	All data transactions shall include non-repudiation features to verify message content that data was not correctly originated or received by a certain user.
FCS Transaction Requirements	
FR 2.331	Common Payment System (CPS) shall be recharged at the terminals and remote point of sale terminals.
FR 2.332	Bar-coded tickets can be purchased on the buses with on board conductors (using ETM).
FR 2.333	The source destination shall be taken by the ETM based on the bus location as provided by GPS and the destination station shall be entered by the on-board conductor. In case the source station/location is not available due to GPS non-availability, the same shall be entered in by the on-board conductor. At the time of entering destination station the CPS balance shall be checked by the system and if the account does not have sufficient balance, the commuter is required to pay cash and purchase paper ticket.
FR 2.334	All journey types shall be time stamped which shall be configurable from central application GUI.
FR 2.335	The business rules related to time stamping and telescopic fare benefit shall be user configurable and the same shall be finalized and developed based on approval from Client after award of Contract.
FR 2.336	The FCS system shall support all business rules presently in existence. In addition if Client wants to add additional business rules into the system the same shall be provided to the Bidder during system design stage.
FR 2.337	Transaction data shall have the ability to be updated in real time (within 5 seconds) to/ from Central System from/to the handhelds. The system shall

	provide the capability of updating the data (individual or bulk transactions) back to the data centre at user configurable periods.
Central System & Other Equipment - Operational Requirements	
FR 2.338	Uploaded data shall not be deleted from system readers or workstations until the central system has provided confirmation that the transactions have been successfully received.
FR 2.339	The central system shall be able to update its date and time applying time synchronisation to servers using the internet and using this to in turn update the date and time on all system devices and workstations.
FR 2.340	All active equipment shall have an internally maintained date and time clock synchronized at a time interval via the communications controller with the Central System date and time clock.
FR 2.341	The time synchronisation application in the device shall have the capability to adjust the minimum time interval for updating itself with the central system time and date, and shall be capable to update time as often as every minute (configurable) with the central system.
FR 2.342	The central computer system shall manage all device activity and maintain their logs including at a minimum: • Data storage and processing systems • Financial systems • Customer databases • Sales and transaction systems
FR 2.343	All equipment shall have sufficient memory to operate in offline mode, with no loss of data, for no less than 168 hours.
FR 2.344	The central software shall support managing fare tables.
FR 2.345	It shall be possible to “future-date” pending fare tables so that they can be uploaded ahead-of-time and automatically activated at the planned date and time.
FR 2.346	All handheld ticketing machines shall store the current valid fare-set as well as a future “pending” fare-set with activation date and time in order to allow downloads to the device to occur in advance.
FR 2.347	When the activation date and time passes, the handheld ticketing device shall automatically replace the existing fare table with the “pending” fare table.
FR 2.348	Updated fare-sets shall be downloaded as soon as the central system publishes notice that they have become available.
FR 2.349	The central software shall be capable of providing over-the-air fare table updates & firmware updates to the handheld ticketing devices apart from other immediate critical updates.
FR 2.350	The systems should be driven by configurable parameters and should provide the flexibility for maximum configuration. The configurations shall be for, but not limited to: • Time based Fare table, Schedule, Routes, etc. • User Groups and users privileges • Time validity of ticket

	• Penalties associated with the CPS misuse • Penalties associated with the short ticket • Administration fee for issuance of CPS, replenishment, replacement under defect, lost card replacement, CPS card return. • Minimum balance required in CPS to make a trip • CPS policies • Addition & deletion of equipment, nodes, stations, routes, handhelds, user groups, users • Reports access
FR 2.351	The system shall handle all exceptions. Exceptions can be, but not limited to: • CPS not being read • Bar-coded paper ticket not being read • Short ticket • Low balance on CPS • Bar-coded paper ticket lost • Bar-coded paper ticket not readable after entry
FR 2.352	Any exception in the normal process shall be flagged separately for auditing and reports should reflect this condition. Mechanisms should be provided to help audit such exceptions.
FR 2.353	The system shall handle all degraded conditions which can be, but are not limited to, the following: • Handheld Power failures • Data Connection lost • Central Server down
FR 2.354	Alterative mechanisms and all required systems shall be provided for the FCS in case system is in degraded state as specified but not limited to the above by the Bidder.
FR 2.355	There should be provision in the system to enter degraded transactions, in case they are not registered because of degraded operations.
FR 2.356	The Bidders should provide an automated Fault Monitoring Module to generate reports identifying the faults of the equipment if any on a daily basis. The fault monitoring system shall have as a minimum the following capabilities: • Setting up of automatic and manual alerts • Automatic fault detection & reporting • Fault Status reports • Fault Closure reports These reports shall be non-editable and the Client and/or its representatives shall have real time access to the Fault Monitoring Module with user privileges of the highest level.
FR 2.357	The FCS Central System shall be provided in a hot-standby mode at a Disaster recovery site.

FR 2.358	Automatic Backup/Archiving Software shall provide automatic back-up for the entire database shall be provided. The software shall allow taking complete back up or incremental back as per the desired archival policy.
Cash-Up and Deposit – Operational Requirements	
FR 2.359	The FCS system shall determine the system expected amount at the end of each shift of the FCS operations personnel.
FR 2.360	The FCS system shall have cash-up features to facilitate conductor deposits.
FR 2.361	During the cash-ups, the conductors shall do an independent system deposit using the individual login ID and passwords in the deposits module of the FCS system.
FR 2.362	The system shall not reveal the expected amount the operator or a conductor has to deposit to the depositing personnel in any case and shall only record it as a deposit.
FR 2.363	The FCS system shall have deposit audit capabilities which shall determine the shortage or excess of deposit made by the operator/ conductor to the accounts manager.
FR 2.364	There shall be a module to report the excess or shortage after the deposit is made on a daily basis and the reasons for this shall be registered in the system.
FR 2.365	The FCS reports and the exception reports shall be useful in reconciling the operator/ conductor deposits.
FR 2.366	The FCS system shall have module for declaration & deposit of shortage amount into the system in the similar way as cash up is done. Once deposited the system should reconcile it against the shortage amount for that user. The system shall have provision to enter & specify as against which accounting period, the shortage amount is deposited.
FR 2.367	While reconciling shortage & excess, any excess amount which is deposited by the operator/ conductor shall not be reconciled/ balanced against any shortages. Any excess amount declared by the conductor shall be reported separately.
FR 2.368	The dedicated cash-up and deposit workstations in the Depot, Bus Terminal or Divisional office (wherever it is installed) shall be used to carry out these functions.
Maintenance Mode – Operational Requirements	
FR 2.369	The central system and all the equipment shall support maintenance mode during repair, replacement and testing of equipment.
FR 2.370	All transactions done during the maintenance mode on a handheld ticketing machine shall be possible only using a special maintenance CPS card issued specifically for the purpose.
FR 2.371	All such maintenance fare media shall be deposited with the Client and written requests shall be raised by the Bidder if they have to be issued to them.
FR 2.372	All transactions carried out in the maintenance mode shall be reported separately similar to exception transactions.

FR 2.373	The maintenance mode shall be possible only by using a dedicated maintenance "user privilege login" specially created for this purpose.
FCS Data Requirements	
FR 2.374	*Transactional Database*
FR 2.375	Client shall own all system data and be able to use the central system to export transactions data for processing/analysis using other software.
FR 2.376	Data shall be retained in the database for at least the financial year previous to the current financial year.
FR 2.377	The Bidder shall support Client's data release policy.
FR 2.378	Data received from system devices shall be maintained at the original level of transactions and not be aggregated, consolidated, or combined within the database.
FR 2.379	Sufficient data storage capacity shall be provided in the central system to store online a minimum of two years of activity with full transactional data.
FR 2.380	All data shall be automatically backed-up daily without human intervention, using the backup devices and media.
FR 2.381	Means shall be provided to automatically archive data older than two years along with the archiving media to store the data.
FR 2.382	The functional capability shall be provided to use such archived data to process comparative type reports, such as but not limited to reports utilizing and comparing data from non-consecutive month periods in two different years, or day-of-week comparisons over multiple month or annual periods.
FR 2.383	The transactional database shall store the date/ time stamped details of each transaction including all information transmitted to the central system from the system devices.
FR 2.384	In addition to transaction records, the database shall incorporate additional tables to record information of interest, including but not limited to: • Device locations • Conductor logins and logouts (including auto-logouts, after long periods of inactivity) • Diagnostic/ maintenance data (such as error records) Exception data (such as alarms, memory clears, CPS stored balances/passes not matching system expectations based on the transaction records)
FCS integration requirements	
FR 2.385	The Client intends to utilise the FCS data for integration with other sub-systems. The data from FCS system may be required to be shared with other sub-system (like user wise cash collected, cash deposited etc. to AVL/Transit ERP System or other sub-systems) and the data from other sub-systems may need to be automatically updated into FCS (like new user login, route details, fare details, bus-stops addition, etc. from AVL/Transit ERP System or other sub-systems).
FR 2.386	If any requirements specified in this bid conflict with the CPS requirements, the CPS requirements shall override.

FR 2.387	Predefined and agreed data shall be shared between the ITS sub-systems and can be exchanged using XML files.
FR 2.388	The structure of the XML file can be agreed upon in a pre-defined format; one system (where data is getting generated) can pull data from its resources then create an XML file and push it to receiving system (where data needs to be imported) in an encrypted format directly or can place the XML data file in a folder from where other system can read the XML file and use the same information.
FR 2.389	The encryption details shall be provided to the Client for data integration requirements under this project. Similarly the Bidder shall be provided with decryption details for the data which is required to import from other system/sub-systems.
FR 2.390	The process of data sharing can be scheduled to run at pre-defined intervals.
FR 2.391	The required data exchange formats, data fields and inter-linkages shall be discussed in detail with Client during design stage and shall be incorporated accordingly.
FCS Reports	
System Reports	
FR 2.392	Any portion of the transactional database shall be exportable in standard formats (such as .csv, .xls, .xlsx files, etc.) for analysis in third party programs.
FR 2.393	It shall be possible for users to build custom reports from the data in the transactional database with support tools such as Crystal Reports and MS Excel
FR 2.394	The reports shall be exportable to pdf, .xls, .xlsx formats easily.
FR 2.395	A data dictionary shall be provided to Client to facilitate development of custom reports.
FR 2.396	The Central System shall provide sufficient summarized and detailed data including features to generate standard report based on pre-established criteria, as well as as-required reports based on a user-definable set of search criteria.
FR 2.397	All reports shall be generated using a query language and standard query engine (to be approved by Client) that provides flexibility for future updates, and for creation of new reports.
FR 2.398	Reporting software shall include the ability to generate graphs and charts based on criteria and format defined by the user.
FR 2.399	The FCS system shall be capable of generating detailed reports as desired by the Client, for any/ all the transactions (city bus operations including cash and CPS) with multiple filtering capabilities w.r.t route number, ETM ID, Conductor ID, Bus registration number, Operator name, time duration, shift id etc. These reports shall enable the Client to pay the bus operators for the transactions made using smart-cards and to segregate revenue related to each operating agency. The revenue shall be tracked and segregated for transactions involving fare integration and telescopic fare benefits as per the business rules agreed with the Client. The formats for

	these reports shall be finalized and confirmed by BPTSL within 1 (one) year of start of operations of ITS System.
FR 2.400	All reports shall be generated with configurable time parameters, including as a minimum annual, monthly, weekly, daily, hourly and with user defined start-end date and time ranges
FR 2.401	As a minimum, the Central System shall generate the following standard System reports daily, weekly, monthly, quarterly and annually. The details of report contents shall be determined in conjunction with Client during the Design phase after contract award. • Passenger trip reports; • Passenger fare reports; • Daily ridership reports; • Monthly summary ridership reports broken down by passenger type (Adult, Child, Senior); • Fare media in use summaries; • General daily, weekly, monthly, and year to date revenue reports; • Pass sale and reload summaries; • Monthly fare underpayment summaries; • Accounts payable; • General ledger; • Accounting data by Client-specified revenue accounts; • Sales by date/time, fare media type, amount, location, and other parameters • Use by date/time, fare media type, location, and other parameters • Inventory reports by fare media type • Fraudulent activity reports by fare media type • Financial reconciliation and settlement reports • Non-sufficient-funds and other financial reports • Transaction reports by location by fare media type • Fare media replacements, adjustments, or refunds by fare media type • Unused/remaining smart card value • Faults and errors • System exceptions reports; and • System performance and activity reports • ICOMC FCS Operator activity report
FR 2.402	The Bidder shall provide an ad-hoc reporting function, and interface into the data and reports server, to allow Client personnel to create, execute and receive custom reports without Bidder assistance. An Internet-based interface shall be provided for this function, accessible by Client's personnel with appropriate permissions. Client users shall be able to generate ad-hoc reports and do additional analysis of ridership, revenue and other system data. Examples of the types of reports include:

	• Transaction-level reports by stop and for user-defined start and end points; • Statistical and research reports using user-defined criteria.
FR 2.403	It shall be possible to aggregate data (filter) for reporting, at a minimum, by: • Date/Time • Ticket Origin • Ticket Destination • Fare Media Type • Location • CPS Serial Number It shall not be necessary that values be consecutive for the purposes of aggregation (e.g. non-consecutive months).
FR 2.404	It shall be possible to configure in the system such that certain report types to be pushed automatically to a given e-mail address after regular intervals (configurable few minutes to few days).
Stand-Alone Mode Requirements	
FR 2.405	The system at all levels shall be able to run in stand-alone mode without any effect on performance at the individual node locations (POS, Workstations, ETM Machines, etc.)
FR 2.406	The FCS system shall provide for manually copying the data /transactions /configuration files from individual node (POS, ETMs) levels to the FCS Central System Server in case of connectivity failure between nodes & server.
FR 2.407	The transactions/data copied manually from nodes shall be reflected & flagged separately in detailed reports using appropriate filtering options from report filter options.
FR 2.408	The system shall also have a mechanism to manually copy & update data /configuration files/ recharge list/ blacklist, etc. from server to the individual node locations in case of connectivity failure for a longer time to avoid affecting bus operations.
FR 2.409	The mechanism to manually copy data to & from the server & node locations shall be simple, menu driven & performed only by administrator level staff.
Performance Requirements	
FR 2.410	CPS that is in readable condition should be accurately read at least 99.9% of the time.
FR 2.411	Data accuracy at all levels of software & during data transfer - 100%
FR 2.412	The application server shall have capacity to process 20,000 service transactions/hour
FCS Scalability Requirements	
FR 2.413	The central software shall be scalable to at least 1000 ETM machines without any modifications to the central software except minor

	configuration changes, the details of how scalable the FCS system shall be provided in the proposal by the Bidder.
FR 2.414	Server hardware and licenses shall be sufficient for up to 25 operator work-stations to access the central software concurrently, with no loss of performance.

TR - 2 Technical Requirements

Automatic Vehicle Location System (AVL)	
AVL Servers	
TR 2.1	For Central System Servers, refer to Server Specification in Section 5.7.4.3.
AVL Dispatcher Workstation	
TR 2.2	The ICOMC dispatcher workstation shall be loaded with all the required software, GUI interface, antivirus, etc. to enable the dispatcher to perform the duties such as data analysis and report extraction.
TR 2.3	For AVL Dispatcher Workstation, refer to Type 1 Workstation specification in Section 5.7.4.1. Two monitors, as specified in the Type-I Workstation, shall be provided with each AVL workstation.
EPABX	
TR 2.4	For EPABX system, refer to EPABX Specification in Section 5.7.4.6
AVL On-Board Unit (OBU)	
TR 2.5	Bidder shall provide 3G enabled SIM cards to transfer positional data from OBU for buses, emergency vehicles and municipal vehicles to Central AVL system located at Data centre. Bidder to make sure the seamless data transfer with network service provider.
TR 2.6	Bidder shall supply OBU with necessary accessories for the AVL system requirements.
TR 2.7	Bidder shall provide OBU-1 & OBU-2 as per UBS II standard for BPTSL AVL operations & emergency services, respectively. OBU-2 shall be supplied with a form factor that can fit in the emergency vehicles.
TR 2.8	Bidder shall provide OBU-3 for municipal vehicles. IT shall satisfy the following minimum specifications: • GSM network: 850/900/1800/1900MHz • GPRS standard: Class 12 TCP/IP • GPS locating time: 30sec with cold boot (open sky) 5sec with hot boot (open sky) • GPS Positioning accuracy: 10-15m • Working temperature: -20 ~ +70 • Working humidity: 5% ~ 95% RH • Function: GSM quad-band network • SOS Button • Two way communication (Hands-free) Button • Alerts: Tamper, Low Battery
TR 2.9	Bidder shall arrange and conduct the testing as mentioned in specifications for OBU along with Client and project management consultant.
TR 2.10	Bidder shall closely monitor equipment performance during pilot stage to fix any external issues like power fluctuations, high vibration level, if require

	Bidder shall provide all the relevant design specification of this equipment's to Client.
TR 2.11	Bidder shall share the protocol, API, interface document, interface support, etc. with Client for the equipment.
TR 2.12	Bidder shall develop the solution, and integrate OBITS with AVL, PIS, TMS, as mentioned elsewhere in this document.
TR 2.13	The Bidder shall ensure that equipment shall be installed professionally, and they do not cause injury or obstruction to passengers or crew.
TR 2.14	Bus Driver Console GUI shall be customized to support operations as per Client requirements. GUI shall provide graphical representation of data and text in Hindi, English and Oriya as required by the Client.
TR 2.15	A timer shall be provided with Bus OBU so that the OBU can be switched off after a variable set period after the bus ignition is switched off. The timer shall help protect the life of the bus battery, while ensuring file transfers happening in the depot after the bus ignition is switched off.
TR 2.16	Training: The Bidder shall provide training to personnel identified by the Client on maintenance and operations of the equipment. The complete training manual and brochure with instructions on operations and maintenance shall be provided to the Client.
TR 2.17	Routine Maintenance: Bidder is expected to provide one resource at each depot/route origin to maintain the equipment and routine maintenance.
TR 2.18	Bidder shall provide end to end support for the equipment during the contract period.
AVL Disaster Recovery	
TR 2.19	Bidder shall provide disaster recovery for: • AVL & PIS related system • Ticketing • Control Centre Operations
TR 2.20	Bidder shall restore full functionality of the system within one week or shall provide provisions for running control centre operations from the DRS site.
Real-Time PIS Display Boards	
TR 2.21	PIS shall be used to display information to passengers at each station along the corridor and inside buses as well to provide on-board route for locations.
TR 2.22	The signs shall support a variety of information display schemes, including multi-phase messages and the ability to display scrolling text. Related parameters (e.g. Multi-phase Message Transition Time, Display Line Scroll Speed and List Sorted By) shall be configurable.
TR 2.23	Content can include –Transportation Information (Bus schedules, alerts, etc.), safety information, localized community information, GPS driven localized data, advertising (still images, animation, video), tourist information.
TR 2.24	The PIS shall have the capacity to store static information in the display controller (including schedules), which shall be shown if the communication link is lost and after real-time information expires.

TR 2.25	The static information shall be stored in non-volatile memory, with memory capacity at least double that required for the initial data.
TR 2.26	The total weight of the signs, including all internal and external components, shall be such that it doesn't cause any structural or any other damage to the structure to which the sign is mounted.
TR 2.27	The sign enclosures shall be vandal proof, and the housing shall be black for effective message contrast and legibility.
TR 2.28	The sign assemblies shall be secured to sustain the shock and vibration that exists in outdoor environment.
TR 2.29	The signs shall not contain controls accessible to the public.
TR 2.30	The signs shall be legible when sunlight is shining directly on the display face or when the sun is directly behind the display.
TR 2.31	PIS software that can upload Hindi, Oriya and English text as per business and operational needs of Client shall be provided.
TR 2.32	The PIS display board shall be industrial grade flat panels that can withstand the environmental and working conditions found in Bhubaneswar. The panels shall allow for 16/7 operations. 55" and 32" panels shall be provided as per the BOQ.
TR 2.33	The signs shall be capable of receiving the following as inputs from the central system, on an as-required basis: • System management commands (e.g. system status requests) • Static display information (e.g. bus schedules, hours of operation and bus routes) • Real-time display information (e.g. current time and time until arrival of next bus(es)) • Ad-hoc information (e.g. traveller warnings, current weather conditions and advertisements) • PIS shall support text, video, image, audio, animations and graphics.
TR 2.34	It shall provide for modular layout enabling parallel display of content on different areas of the screen – Transit information, Time/Date, Weather, Public announcements, Commercial advertising.
TR 2.35	The display systems shall have in-built test facility, able to carry out self-check at periodic intervals as well as exchange of diagnostic information from the central control stations including power availability, and its current status.
TR 2.36	The display system shall support remote settings such as display intensity, time synchronization.
TR 2.37	The display units shall support multi-lingual fonts in English, Hindi and Oriya in appropriate colours for easy reading, and as per as per business and operational needs of Client.
TR 2.38	The signs shall support a variety of information display schemes, including multi-phase messages and the ability to display scrolling text. Related

	parameters (e.g. Multi-phase Message Transition Time, Display Line Scroll Speed and List Sorted By) shall be configurable.
TR 2.39	Content can include –Transportation Information (Bus schedules, alerts, etc.), safety information, localized community information, GPS driven localized data, advertising (still images, animation, video), tourist information.
TR 2.40	The PIS shall have the capacity to store static information in the display controller (including schedules), which shall be shown if the communication link is lost and after real-time information expires.
TR 2.41	The static information shall be stored in non-volatile memory, with memory capacity at least double that required for the initial data.
TR 2.42	The sign enclosures shall be vandal proof, and the housing shall be black for effective message contrast and legibility.
TR 2.43	The sign assemblies shall be secured to sustain the shock and vibration that exists in outdoor environment.
TR 2.44	The PIS controller shall have a time of day clock and calendar. The time and date shall be synchronized at least every 15 minutes (configurable) with the central software time.
TR 2.45	PIS display shall be refreshed automatically every 30 seconds to show updated information.
TR 2.46	The signs shall include on-going self-diagnostics and shall send an alarm message to the central system in the event that a diagnostic fault is detected.
TR 2.47	Characters shall be at least 12 cm high to allow for a viewing distance of 30 metres.
TR 2.48	The PIS shall be able to display a message composed of any combination of alphanumeric character fonts, punctuation symbols and full graphics.
TR 2.49	When an entire message cannot fit on the PIS, it shall be possible to display the entire message by displaying the message using multiple frames by pagination or scrolling through the messages.
TR 2.50	The choice of display method will be selectable by the Client and the time each frame is shown for and message scroll speed shall be fully configurable by the Client.
TR 2.51	When messages are displayed in multiple languages, each language shall be rotated through in turn.
TR 2.52	Time for which information is displayed in each language shall be configurable by the Client.
TR 2.53	PIS displays shall be managed locally without workstation or server.
TR 2.54	PIS shall also allow English, Hindi and Oriya fonts to be displayed simultaneously.
TR 2.55	Bidders shall arrange all the switches, network items and cables, etc.
TR 2.56	Bidder shall be responsible for all communication costs.
TR 2.57	Bidder shall provide battery backup for all PIS sign and related hardware for 4 hours.

TR 2.58	PIS shall have provisions to support both field and automated centralized testing to ensure units in the field are connected and fully functional.
TR 2.59	Only outdoor rated UTP CAT6 cable shall be used to connect the device to the respective switch port. If for any case, the distance between the switch port and device exceeds 90 m, use outdoor rated multi-mode fibre cable with environmentally rugged media converters.
Commuter Information / Service Website	
TR 2.60	The Bidder shall develop the Smart Tracking website as part of the Bhubaneswar One portal.
TR 2.61	The user shall be able to enter the route, direction, and station/stop ID, or select these from a sequence of drill down lists or from a map.
TR 2.62	The system shall default to display the predicted number of minutes until arrival of the next bus.
TR 2.63	The number of bus predictions displayed in the customer screen should be configurable by the Client.
TR 2.64	The website GUI shall allow for graphical presentation of vehicle locations on GIS-based maps.
TR 2.65	Website shall be designed to show the information in English and Oriya language.
TR 2.66	Website shall allow commuter to plan their complete trips including multiple modes of travel (walk, bus trip using direct routes and transfers of the city wide bus system including suburban buses).
TR 2.67	Information requested by commuter on map line diagram or table shall be updated automatically without manual page refresh.
TR 2.68	Basic information like ETA, ETD, Line diagram, etc. to be provided on the website.
TR 2.69	The Bidder shall build the new website pages with the Client input (branding, graphics and colours).
TR 2.70	Screen layouts, menu and screen information shall be provided to BPTSL for review, comment and approval during the implementation process.
TR 2.71	Bidder shall maintain the commuter portal providing the required updates, both bus operations updates and software updates, during the project period.
IVR System	
TR 2.72	IVR System shall support Hindi, Oriya and English languages.
TR 2.73	IVR System shall be integrated with AVL database to get the live update of the Vehicles to announce real time information to the commuter.
TR 2.74	IVR system shall allow handling minimum of 5 calls at a time.
TR 2.75	The system shall able to record all the incoming call number, duration of the call, total calls per day and it shall be available to generate as report when required.
TR 2.76	Bidder to provide the report with the detail of how many calls are received from commuter, duration of each call, average call hours per day,

Mobile Application	
TR 2.77	Bidder shall develop the Mobile application which shall be integrated with the Bhubaneswar One Mobile App.
TR 2.78	Bidder is responsible to upload the software to online mobile stores on behalf of BSCL and smart tracking agencies.
TR 2.79	The AVL mobile application shall have at least following features: • Smart card recharge • Vehicle location finder • Real time bus arrival on the selected bus station • Commuter to find the nearest bus station from his/her location along with distance • Display ETA for the selected bus station, buses arrive in next 15 minutes • Find nearest landmark (this will be shared by Client) • Provide Fare, Stop name, Stop code, Bus Pass, other major places, feedback, • Provide option for commuter to share the photos taken in case of any problem they found on the bus service limited to project jurisdiction (Bhubaneswar and adjoining areas)
TR 2.80	BPTSL shall able to view, respond and generate the feedback, concerns sent by commuters
Commuter IVR and SMS System	
TR 2.81	Commuter IVRS and SMS systems shall be implemented as toll free systems for the commuter and all the proposed equipment hardware/ software setup that is needed for the proper functioning of these systems shall be provided by the bidder as per the bidders design in co-ordination with BPTSL as per prevailing industry standards.
SMS	
TR 2.82	Bidder shall develop SMS for commuter for those does not have GPRS connection with their mobile. This is to provide ETA, Stop code, fare, pass, route no, etc., through SMS.
TR 2.83	The SMS gateway shall be provided by the bidder. The SMS provider shall be proposed by the successful bidder to the Client for approval. The recurring cost of the SMS shall be borne by the Client.
TR 2.84	The supplied system shall provide response to commuter query within 15 seconds after the query is received by the system.
TR 2.85	All the sent and received SMS information shall be stored in the system to generate report by the dispatcher.
TR 2.86	Bidder shall provide complete support If any third party integration is required to integrate SMS for Smart Tracking agencies
TR 2.87	Bidder to develop the SMS system to provide both instant response and preconfigured response.

TR 2.88	Bidder to provide the report with the detail of how many SMS were sent from system, how many were received, unique numbers, etc.
TR 2.89	Bidder shall develop SMS for commuter for those does not have GPRS connection with their mobile. This is to provide ETA, Stop code, fare, pass, route no, etc., through SMS.
IVRS	
TR 2.90	The proposed IVRS shall support multiple calls at a time, minimum of 5 calls shall be supported.
TR 2.91	All the necessary hardware, software shall be arranged by the bidder.
TR 2.92	IVR System shall support Hindi, Oriya and English languages.
TR 2.93	IVR System shall be integrated with AVL database to get the live update of the Vehicles to announce real time information to the commuter.
TR 2.94	The system shall able to record all the incoming call number, duration of the call, total calls per day and it shall be available to generate as report when required.
TR 2.95	Bidder shall provide reports with the detail of how many calls are received from commuter, duration of each call, average call hours per day, etc.
TR 2.96	Bidder to provide solution for handling calls at ICOMC, either through landline phone or hands free using the software.
Fare Collection System (FCS)	
Handheld Electronic Ticketing Machines (Referred as Handheld or ETM)	
TR 2.97	The handheld shall be capable of reading and issuing Bar-coded Paper Tickets and reading EMV based common payment system (CPS) cards, mobile payment modes including reading QR code.
TR 2.98	The handheld shall have an arrangement to hang over the neck of the conductor and also a fastening arrangement to the palm for prolonged usage. Both the arrangements shall ensure that the conductor doesn't feel uncomfortable under long duration usage.
TR 2.99	The handheld shall have a standard serial communications ports, and a USB for external connectivity.
TR 2.100	The handheld machine shall be appropriately ruggedized so as to provide a service life of at least five years (excluding batteries) under continuous use in a bus environment typical to that experienced in Bhubaneswar region.
TR 2.101	The handheld machine shall be preferably of a one-piece unit or maximum two-piece configuration (e.g. with separate printing unit).
TR 2.102	The weight of each piece (including battery) shall not exceed 0.5 kg.
User Interface	
TR 2.103	The handheld machine shall utilize (1) a touch screen, or (2) physical buttons, or (3) a combination thereof.
TR 2.104	The handheld machine shall provide distinct audible and visual feedback for actions such as validating existing smart cards, detection of blocked

	smart cards, occurrence of card reading error, and successful/unsuccessful reading of smart cards.
On-board Storage	
TR 2.105	The handheld machine shall have sufficient memory to store a minimum of one week worth of transaction records (at least 10,000 records) apart from mandatory firmware etc.
TR 2.106	The handheld should be able to store information for at least 100,000 blocked smart cards.
TR 2.107	The handheld shall have internal and external (SD Card) memory.
TR 2.108	The external memory card shall back-up the internal memory for every 8 hours of operation and be capable to hold 168 hrs of transaction data.
Battery	
TR 2.109	The handheld machines shall be designed to operate from an internal, battery source which can be charged and re-charged.
TR 2.110	The handheld machine battery shall utilize “no memory” battery technology which is state-of-the-art, commercially available and common for use with such equipment.
TR 2.111	The handheld shall operate continuously for minimum 8 (eight) hours without any disruption to the operations at any given instance during the shifts. The bidder shall ensure that appropriate back-up arrangements are made for the handhelds to cover the entire operating shift without disrupting normal operations.
TR 2.112	The battery shall be field replaceable without any loss of data, with field replacement time (from end of operation with previous battery to beginning of operation with new battery) not to exceed three minutes.
TR 2.113	A specialized tool shall be provided to prevent unauthorized persons from removing the battery.
TR 2.114	The battery shall be recharged to a full charge from a completely discharged state in less than four hours.
TR 2.115	The handheld shall have a battery stand-by time of at least 5 days without the requirement of intermittent charging.
TR 2.116	The battery shall have a life of at least 500 recharging cycles with not more than 20% loss of efficiency over that lifetime of the battery.
Smart Card usage on the ETM	
TR 2.117	Upon successful completion of the transaction the handheld machine shall transmit transaction data to the central system, including: • Date and Time of Transaction • Device Identification Number • Smart Card Serial Number • Smart Card Origin • Smart Card Destination • Smart Card Serial Number

TR 2.118	Upon successful completion of the transaction the handheld machine shall indicate the successful completion via the interface, using both the display and a distinct configurable audio message.
Handheld Electronic Ticketing Machines For The Client Audit Personnel - Hardware Requirements	
TR 2.119	Shall be supplied to the Client's audit staff to facilitate random auditing of the tickets issued to the passengers
TR 2.120	Should meet all the applicable and relevant specifications laid out for Common Payment System payment requirements.
TR 2.121	Should meet the operational requirements of the audit personnel of BPTSL, which shall be finalised during the design and deployment stage with the selected Bidder
ICOMC Operator Workstation For FCS	
TR 2.122	The ICOMC operator workstation shall be loaded with all the required software, GUI interface, antivirus, etc. to enable the operator to perform the duties such as data analysis and report extraction.
TR 2.123	The Workstation Type II specified in IT Infra section shall be used.
FCS Cash-Up Workstation	
TR 2.124	The cash-up workstation shall be loaded with all the required software, GUI interface, antivirus, etc. to enable the POS operators, conductors to perform cash-up functions.
TR 2.125	The Workstation Type II specified in IT Infra section shall be used.
Cash-Up Printer	
TR 2.126	The cash-up printer shall be a compact thermal printer able to print, as a minimum, tickets (text and graphics), barcodes, and system status information.
TR 2.127	The print speed shall not be less than 150 mm/s for both text and graphic and at a minimum resolution of 203 dpi (8 dots/mm).
TR 2.128	The printer shall use readily available paper rolls of standard size.
TR 2.129	The printer shall provide low paper and out of paper indication.
TR 2.130	The printer shall have an automatic cutter with a self-sharpening ceramic rotary knife.
TR 2.131	The auto-cutter shall have a reliability of at least 1.5 million cuts.
TR 2.132	The printer head shall have a Mean Cycle between Failure (MCBF) of at least 50 million print lines.
TR 2.133	The printer shall have a Mean Time between Failure (MTBF) of at least 360,000 hours.
FCS Central System - Hardware Requirements	
TR 2.134	The Central System Servers shall follow the specification of Servers in IT Infra Section.

5.3. Smart Parking Management System

FR - 3 Functional Requirements

Parking Management System	
Parking Location	
FR 3.1	Parking Management System must geo-reference all the parking lots and shall have the ability to add more locations in future. Smart parking solution should enable accounting and mapping of individual parking spots to different operators/agencies and monitor the parking space utilisation and revenue from those facilities.
FR 3.2	All parking lots (both off-street and on-street) must have one-to-one mapping of all the sensors and POS/Payment systems in that location.
FR 3.3	Each off-street parking lot can have a local server for storage and hosting the local parking management application while on-street parking lot payment system can connect via City Wi-Fi or other Communication network to central server for exchange of data/information.
Parking Information/Guidance	
FR 3.4	Parking Management System should enable stakeholders/users to obtain real time information about the availability of the parking lot by location based on the occupancy of parking lot. Also, shall have facility to user to be able to view availability by proximity and cost.
FR 3.5	The total number of slots and free slots for parking must be displayed on a digital signboard near the entrance of the parking lots. The Parking Management System's integration with other elements within the tender scope must facilitate display of parking information at variable messaging displays deployed at key points of interest in the city.
FR 3.6	Entry to any parking space should have outdoor displays/screens showing overall availability of parking slots in that particular parking space
FR 3.7	Every parking space shall be fitted with an occupancy sensors for vehicle detection. Sensor should be intelligent and accurately detect if the car space is vacant or occupied. • Appropriate sensors should be chosen based on the type of the parking spot and its external conditions. The preferred sensors would be geo-magnetic sensors for on-street parking, but the MSI can propose innovative, advanced but reliable implementation approaches using other sensors. • The sensor should be able to detect a vehicle irrespective of the depth or height of sensor installation. • For on-street parking, each sensor shall be able to detect a minimum of 10 parking spots. • Each sensor should have its own unique identification in order to be accurately tracked by the Parking Guidance System.

	• Each sensor should have an accurate and real time feedback mechanism to be detected automatically by the system in case of faults.
FR 3.8	Each of the off-street / MLCP Parking shall be fitted with an aisle light indicators for informing users on their availability on-site: • Light indicators should be installed for all indoor parking lots for motorist to see the available and occupied spaces from the parking lane easily • Once a parking spot is occupied the total parking slots should automatically get updated. • The fixation of the light indicators to the ceiling should be easy and fast, and should use a quick fastening clips to easy the installation. • The MSI may suggest any similar innovative solution for Open Parking and Street Parking.
FR 3.9	Informative Display Panels should be installed at all entry points (every floor in case of multilevel car park) of the parking lot indicating available spaces for each parking aisle, bay/zone/level, total parking and should be able to be customized by software. The display panel should be easy to understand and must have graphical directional and zone status indication (as red crosses for zone full or green directional arrows to guide drivers to zones with available spaces).
FR 3.10	Entry to any parking space should have outdoor displays/screens showing overall availability of parking slots in that particular parking space.
FR 3.11	All the Parking Information/guidance system hardware like Sensors, display will be integrated with Parking Guidance Controller which monitors the status of occupancy and controls guidance signs appropriately.
Parking Access Control / Management	
FR 3.12	Each multi-level/off-street car parking shall have parking ticket dispenser machine at the entrance where the ticket can be issued by the machine on pressing the button by the user/ operator. Further, the on-street parking shall have handheld devices through which parking receipts can be generated on payment of fees through card or cash.
FR 3.13	Each entry lane should be equipped with one Entry Device with the following capabilities: • Ticket Dispenser • Touch screen for motorist to enter Unique Booking Number • EMV compliant CPC reader
FR 3.14	The ticket, QR Code and CPC or any other technology used by MSI should be capable of capturing data that is easily retrievable at the exit.
FR 3.15	Every vehicle entering the parking space should be stopped by barrier. The barrier is raised when the motorist is issued a ticket or has been identified as a legitimate user.
FR 3.16	In case the parking lot is already occupied to its capacity, the ticket issuing should automatically be blocked and therefore, the barrier should not open.

	A message should also be displayed on the outdoor screen stating the same.
FR 3.17	The Entry Device should be able to detect and report: • Anti-pass back • Back-out ticket • Low ticket stock
FR 3.18	The display on Entry Device should have capability to display messages in English, Hindi and other Regional languages
FR 3.19	Any vehicle, before leaving the parking area, should be stopped by a barrier system at the point of exit from the parking.
FR 3.20	The solution should also include provision to capture the image of the vehicle including license plate view exiting any of the parking spaces and the all the information related to the same should be stored at a central server.
FR 3.21	Exit of every parking should be equipped with a manned Pay station (booth). • Exit booth should have appropriate space for keeping devices such as a computer in case of an off-street facility / Handheld in case of on-street facility with internet connectivity, QR code reader, CPC Reader, Thermal Receipt Printer etc. • For motorists who enter the parking lot using CPC, the same shall be recorded in the system and while exiting, the payment shall be deducted from that card. If the user fails to show up same CPC which was used while entering, the system should not allow the exit and the user must pay the amount asper business rules as specified by Client. • If any discounting is allowed for parking, the business rules for the same shall be handled by CPC Central Clearing House (CCH) and any discounting as applicable shall be applied by CPC CCH. • The personnel monitoring the exit Pay Station is also required to manually enter the License number details in the system so that the license number, along with date and time of exit, is stored in the database. • The payment for parking should be collected based on entry time stamp by any personnel stationed at the Pay Station. • The system will calculate the fee automatically and indicate this on the screen clearly visible to the motorist. No manual intervention should be necessary to compute the fee. • The Pay Station should be capable of charging devices.
FR 3.22	Once the vehicle exits a parking slot, the total parking slots available in that parking space should automatically get updated.
FR 3.23	Only after completing the full cycle correctly the transaction will be considered as valid within the car park. However, audit trail of each

	complete, incomplete and cancelled transaction should be available in the system.
FR 3.24	The solution should be equipped with Anti-pass back technology and be able to detect and report any instance pass back.
FR 3.25	The barrier should remain in closed position for optimal period of time for the vehicle to pass at entrance and exit.
FR 3.26	The solution should also include provision to capture image of vehicle including license plate number of every vehicle entering and leaving any of the parking spaces and the all the information related to the same should be stored at a central server.
FR 3.27	Barrier Arms should have the following options: • In closed position the full arm should be illuminated red. • During movement the full arm should be illuminated yellow. • Once reached open position the full arm should be illuminated Green.
FR 3.28	Upon horizontal impact by a vehicle, the barrier arm should get detached from the barrier unit with minimal damage to the vehicle and the barrier motor mechanism. An alarm should also be raised and sent to the server and monitoring console, when the barrier is detached.
FR 3.29	Upon impact during closure, the arm will stop and stay in the same position. Under no circumstances should the arm re-open upon impact. This is to prevent keeping the arm open for illegal entries or exits. • The barrier arm should be easy to refit with barrier unit in a short duration (within one minute). • If for any reason and external override (fire system) needs to be connected, then this should only be possible over the Entry/exit Device and the switch should be permanently monitored by the Parking Management System.
FR 3.30	The solution should have capability to capture image of the license plates of the vehicles at every entry and exit of each parking lot. The image should be clicked at the entry point when the ticket is issued and at the exit point during payment. The image of the license plate should be linked to the details of the corresponding ticket issued in real- time and stored in the database for one month. This information will be stored in the ICOMC.
FR 3.31	Parking Management System shall track vehicles entering and exiting parking lots. The Parking Management System should do so at each floor, in case of multilevel parking and communicate the data.
FR 3.32	The Parking Management System should retain videos of car entering /exiting the parking zone as per the security parameters defined in the RFP.
Parking Pricing and Payment	
FR 3.33	The Parking Management System should facilitate real time revision of parking fees and should enable real time communication of rules to handheld terminal and parking booths/kiosks from Central facility/Control Centre.

FR 3.34	Payment sub system shall have the capability of processing and reporting separately numerous transactions including, but not limited to, the following: • Normal transaction • Lost ticket transaction • Insufficient funds transaction • Mutilated or unreadable ticket transaction • Non-revenue (no charge) transaction • Blank or used ticket transaction • Validation transaction
FR 3.35	Parking Management System should enable BSCL/BMC or any other appointed third party to facilitate generation of parking receipts and tickets based on occupancy of parking lots and business rules to be amended from time to time.
FR 3.36	User shall have the multiple payment options as given below. • Primary mode of payment for parking will be by cash at the Pay Station • Common Payment Card (CPC) • For bookings through Citizen App or Smart Web portal application, payment will be made using e-Wallet, net banking, credit card, debit card etc. • Additionally, the MSI can implement innovative and cost effective payment methods (such as e-vouchers) for customers opting for monthly reserved parking passes.
Audit, Performance MIS Reports and Alerts	
FR 3.37	PMS should track each and every revenue source and should ensure no leakages due to manual intervention.
FR 3.38	All vehicular passages during the time that the barrier is not functional/down should be recorded and displayed in the reports separately in order to audit the necessary revenue transactions during that time.
FR 3.39	System shall daily check whether the vehicles that have entered the premises and are yet to leave. Thereby it should be able to generate alert if any vehicle is overstaying in the parking lot over 24 hrs.
FR 3.40	In case of any senor or barrier non-functional, an alert should be sent to the console and server to ensure that the administrator is informed that the device is not working.
FR 3.41	Parking Management System should: • report occupancy of parking lots to a central software application deployed at the ICOMC using the network laid out as a part of this project. • include central reporting system establishing the connection between the devices and sensors, and the centralized ICOMC. • include reporting dashboards with location specific thresholds to be set for generating customized reports

	• be capable of monitoring the number of vehicles that entered or exited the parking premises during any given time • generate reports for each parking spot, in each of the parking lots capturing utilization, cost, and revenue details, and details of assets, people and etc. These reports should be available in all standard acceptable formats like .csv, .pdf, .txt, etc.
Standby or Breakdown/ Off-Line / Manual mode	
FR 3.42	PMS should include the use of wireless handheld device for on-street and off-street parking. This device shall be used in case of street parking or indoor parking or open parking during peak hours or as a fallback mechanism. However, this device must track every transaction limiting any manual transaction to zero.
FR 3.43	Street Parking Mode: It should be possible to use wireless handheld devices in on-street parking mode • On arrival of motorist, it should be able to dispense a ticket • The same device should also be able to function as cash register • The transactions should get uploaded instantly and automatically to the central parking management system using online connectivity.
FR 3.44	Indoor or Open Parking Mode: In case of high traffic at any of the parking lots or during peak hours, it should be possible for the wireless handheld device to be used as central cashiering device (i.e. it should be possible to scan the QR Code on tickets issued by the entry device and issue receipts post payment, so that the motorists could pay for the parking and then drive out quickly), without any time consumed for payment transactions at the exit. • The device should have capability to print parking receipts and bar coded tickets in real time. • Both the functionality of ticket dispensing & cash register should be possible to be combined in one device. • This wireless handheld device should be an online unit, connected in real-time with ICOMC using either Wi-Fi or 3G/4G. However, in case of network failure, the device should have capability to transact offline and sync with the server as and when connection is restored. • The wireless device to have batteries and power supply along with cradle for charging.
Maintenance Mode	
FR 3.45	The central system and all the equipment (barrier gates, ticket dispenser, POS units etc.) shall support maintenance mode during repair, replacement and testing of equipment.
FR 3.46	All transactions done during the maintenance mode on a ticket dispenser or a handheld ticketing machine shall be possible only using a special maintenance smart card issued specifically for the purpose.

FR 3.47	All such maintenance media shall be deposited with the Client and written requests shall be raised by the MSI if they have to be issued to them.
FR 3.48	All transactions carried out in the maintenance mode shall be reported separately similar to exception transactions.
FR 3.49	The maintenance mode shall be possible only by using a dedicated maintenance "user privilege login" specially created for this purpose.
Central System	
FR 3.50	Uploaded data shall not be deleted from system readers or workstations until the central system has provided confirmation that the transactions have been successfully received.
FR 3.51	The central system shall be able to update its date and time applying time synchronization to servers and using this to in turn update the date and time on all system devices and workstations.
FR 3.52	All active equipment shall have an internally maintained date and time clock synchronized at a time interval via the communications controller with the Central System date and time clock.
FR 3.53	The time synchronization application in the device shall have the capability to adjust the minimum time interval for updating itself with the central system time and date, and shall be capable to update time as often as every minute (configurable) with the central system.
FR 3.54	The central system shall manage all device activity and maintain their logs including at a minimum: • Data storage and processing systems • Financial systems • Customer databases • Sales and transaction systems
FR 3.55	All equipment shall operate with a real-time data connection to the central system via the communications network for that equipment.
FR 3.56	If the data connection to the central system is temporarily lost, all equipment shall seamlessly switch to an offline mode in which all data is temporarily stored in internal memory and transmitted to the central system as soon as the data connection is re-established.
FR 3.57	All equipment shall have sufficient memory to operate in offline mode, with no loss of data, for no less than 168 hours.
FR 3.58	The central software shall support managing parking fare tables.
FR 3.59	It shall be possible to "future-date" pending fare tables so that they can be uploaded ahead-of-time and automatically activated at the planned date and time.
FR 3.60	All ticket dispensers and handheld ticketing machines shall store the current valid fare-set as well as a future "pending" fare-set with activation date and time in order to allow downloads to the device to occur in advance.
FR 3.61	When the activation date and time passes, the ticket dispenser and the handheld ticketing device shall automatically replace the existing fare table with the "pending" fare table.

FR 3.62	Updated fare-sets shall be downloaded as soon as the central system publishes notice that they have become available.
FR 3.63	The central software shall be capable of providing over-the-air fare table updates & firmware updates to the handheld ticketing devices apart from other immediate critical updates.
FR 3.64	The systems should be driven by configurable parameters and should provide the flexibility for maximum configuration. The configurations shall be for, but not limited to: • Time based Fare table etc. • User Groups and users privileges • Time validity of ticket • Time validity of CPC • Penalties associated with the CPC misuse • Pass back time on CPC use • Addition & deletion of equipment, nodes, parking lots, handhelds, user groups, users etc. • Reports access
FR 3.65	The system shall handle all exceptions. Exceptions can be, but not limited to: • CPC not being read • QR coded ticket not being read • Low balance on CPC • Manual opening of the barrier gate • Paper ticket lost • QR coded paper ticket not readable after entry • CPC lost after entry • CPC damaged after entry
FR 3.66	Any exception in the normal process shall be flagged separately for auditing and reports should reflect this condition. Mechanisms should be provided to help audit such exceptions.
FR 3.67	The system shall handle all degraded conditions which can be, but are not limited to, the following: • Ticket Dispenser is not functional • Power failures • Data Connection lost • Particular node down • Central Server down
FR 3.68	Alterative mechanisms and all required systems shall be provided for the system in case system is in degraded state as specified but not limited to the above by the MSI.
FR 3.69	There should be provision in the system to enter degraded transactions, in case they are not registered because of degraded operations.
FR 3.70	There shall be back-up handheld machines capable of performing all the functions of the Parking Station if ever the system is down for some reason.

FR 3.71	The back-up handhelds shall be a miniature of the capabilities of the Ticket Dispenser and POS units in all respects such as transaction times, issuing of various fare media etc.
FR 3.72	There shall be provision for data transfer from the back-up hand-held machines to the central system once the system is “UP” and running, preferably using wired transfer authenticated by a registered user. In no case there should be any duplicity and missing transactions/data in the central database.
FR 3.73	The MSI should provide an automated Fault Monitoring Module to generate reports identifying the faults of the equipment if any on a daily basis. The fault monitoring system shall have as a minimum the following capabilities: • Setting up of automatic and manual alerts • Automatic fault detection & reporting • Fault Status reports • Fault Closure reports
FR 3.74	The reports shall be non-editable and the Client and/or its representatives shall have real time access to the Fault Monitoring Module with user privileges of the highest level.
FR 3.75	Automatic Backup/Archiving Software shall provide automatic back-up of the entire database. The software shall allow taking complete back up or incremental back as per the desired archival policy.
Monitoring & Control Dashboard	
FR 3.76	The MLP control centre operator shall be provided with a dashboard and monitoring system that is completely independent from the revenue transaction system and shall be displayed and monitored at the parking facility control room. This system shall record the following information: • The total number of vehicles crossing the gate loop in each controlled entrance and exit lane (count to be obtained regardless of status of equipment components e.g., gate arm raised). • The total numbers of valid card access vehicles for each controlled entrance and exit lane. • The total numbers of valid daily vehicles for each controlled entrance and exit lane. • The number of violation vehicles for each controlled access lane. A violation vehicle is defined as a forced or un-authorized passage of vehicle over the detection area.
FR 3.77	On this dashboard there shall be a schematic layout showing all the connected parking nodes on the GUI.
FR 3.78	The various nodes when connected & disconnected shall be represented in different colour schema on the GUI of the control centre operator.
FR 3.79	If any particular node is disconnected from the control room, the same shall raise an alarm to the ICOMC operator GUI & appropriate action shall be taken to rectify the same.

FR 3.80	The monitoring dashboard shall allow the ICOMC operator to click on any node & view the details of the “operator” logged in, time duration since logged in, summary of transaction performed, disable/enable Entry/Exit Station or POS terminal, other components of parking system.
FR 3.81	If ICOMC operator or any other user from ICOMC disables/enables/operates any active device remotely, the same shall be captured in the ICOMC activity report with all details including but not limited to date , time, device, action performed etc.
FR 3.82	The monitoring dashboard shall show the status (connected/disconnected, faulty/working) of all logical devices (barrier gate, ticket dispenser, camera, CPC reader, receipt printer, QR code reader and other equipment) connected to a particular node when clicking on a node from the monitoring dashboard GUI.
FR 3.83	In case of any fault in the devices connected to a node, or connectivity failure with a node, a pop-up message shall appear on the monitoring dashboard workstation. The operator has to acknowledge the pop-up message & report the type of fault to the maintenance team & shall record the details to the assigned team/individual into the system.
FR 3.84	Fault assignment to the maintenance team shall be managed and controlled by the system software only. Once a fault is assigned by the ICOMC operator or authorized user to the maintenance team, the same shall be displayed in the maintenance module and once fault is closed/resolved by the maintenance team it shall be updated automatically (in case of active devices) or else updated manually in the software application/maintenance module promptly.
System Data Requirements	
FR 3.85	Client shall own all system data and be able to use the central system to export transactions data for processing/analysis using other software.
FR 3.86	Data shall be retained in the database for at least the financial year previous to the current financial year.
FR 3.87	The MSI shall support Client’s data release policy.
FR 3.88	Data received from system devices shall be maintained at the original level of transactions and not be aggregated, consolidated, or combined within the database.
FR 3.89	Sufficient data storage capacity shall be provided in the central system to store online a minimum of two years of activity with full transactional data. The expected daily transactions on the system is around 5,000 per day in the base year.
FR 3.90	All data shall be automatically backed-up daily without human intervention, using the backup devices and media.
FR 3.91	Means shall be provided to automatically archive data older than two years along with the archiving media to store the data.
FR 3.92	The functional capability shall be provided to use such archived data to process comparative type reports, such as but not limited to reports utilizing and comparing data from non-consecutive month periods in two different years, or day-of-week comparisons over multiple month or annual periods.

FR 3.93	The transactional database shall store the date/ time stamped details of each transaction including all information transmitted to the central system from the system devices.
FR 3.94	Client shall own all system data and be able to use the central system to export transactions data for processing/analysis using other software.
FR 3.95	Data shall be retained in the database for at least the financial year previous to the current financial year.
Citizen/ Operator / Authority Interface	
FR 3.96	The Parking Management System should have a mobile and a web delivery channel for citizens to get real time parking availability and pre book parking lots using online payment of parking charges facilitated through a payment gateway.
FR 3.97	A mobile application and web based user interface should be provided with the following features: • The application should have citizen module and officer module. • Through the citizen module, the user should be able to locate nearest parking lot and also pre-book based on his geographical coordinates. The same information must be made available on map with routing information. • The citizen should be able to see all the parking lots with exact available space in a real time mode. • While locating nearest parking lot, the latest parking slot availability should be given to the user. • The application should have an Authority/Operator module where PMC designated inspector / operator will be able to check compliance of slot occupancy against the fees paid by the citizen. • The citizens should be able to generate MIS report to view occupancy of parking lots over a defined time period. • The administrators should be able to generate MIS report to view occupancy, collection and other usage statistics over a defined time period.
Integration with other Systems	
FR 3.98	Integration with Smart City Platform and Mobile Applications - Integration of various components provides seamless access of various data across the departments which helps in operation. So the MSI shall provide complete support for any third party integration required to integrate MLP with Smart City Platform of BSCL and mobile applications to get real time data.
FR 3.99	Integration with Common Payment Card - A Common Payment Card (CPC) is being envisaged as part of Smart City Initiatives which shall be used for making payments at multiple merchandises across Bhubaneswar. The CPC shall be issued by Banks and will be accepted at most of the facilities in Bhubaneswar including utility payments, transit, parking etc.

	The MSI shall work in close coordination with the CPC and other related agencies to make it workable.
FR 3.100	The system shall integrate with 3rd Party / Private parking Systems deployed across the City and provide the information to Citizens

TR - 3 Technical Requirements

Ticket Dispenser	
TR 3.1	The Ticket Dispenser shall have functionality of issuing/reading a QR coded parking ticket with entry record at entrance.
TR 3.2	Dispenser shall be intelligent controller that can run in stand-alone or on-line mode.
TR 3.3	Dispenser shall have LCD display to give guidance to driver during transaction time. Display shall be LCD colour graphics user definable display 320 x 240 pixels type with damage resistant lens capable of displaying graphics and images.
TR 3.4	Dispenser paper roll capacity shall be at least 5,000 tickets per roll.
TR 3.5	Dispenser shall have built-in photo sensor to give paper roll low level indication.
TR 3.6	The Dispenser shall have built-in high speed ticket printer based on thermal technology.
TR 3.7	The built-in printer shall be a compact thermal printer able to print, as a minimum, tickets (text and graphics), QR ode and system status information.
TR 3.8	The print speed shall not be less than 150 mm/s for both text and graphic and at a minimum resolution of 203 dpi (8 dots/mm).
TR 3.9	The Dispenser shall have built-in Common Payment Card (CPC) reader to read/write information from CPC. • The Common Payment Card (CPC) reader shall be EMV compliant. • The CPC reader shall have operating temperature range of 0 to +70 °C.
TR 3.10	Dispenser controller device shall communicate with Ethernet and a minimum CAT5e to the system. No proprietary RS485 cabling or other proprietary system allowed for communication to lane devices.
TR 3.11	Dispenser controller shall support USB, Serial, and RS-232 communication mediums to add on devices.
TR 3.12	Dispenser controller shall have additional inputs and outputs assignable to functions like open/closed sign relays for barrier gates and indication lights operation.
TR 3.13	Front/Rear door shall provide easy access for ticket loading and logic board access.
TR 3.14	The Control unit shall include CPU, input/output terminals, and power supply and logic board for display.

TR 3.15	Lower cabinet shall come complete with pedestal, floor stand, column door low ticket sensors, and power supply board.
TR 3.16	Tickets issued shall be cut with a self-sharpening ticket cutter.
TR 3.17	The Dispenser shall have an easy jam removal mechanism that requires no tools, takes minimal time and training for the operator to clear.
TR 3.18	It shall generate appropriate jam error and alarm codes to the system.
TR 3.19	All dispensers shall come with standard equipment such as heater and cooling fan using a thermostatic controller to ensure a reasonable operating temperature for components in various weather conditions. Humidity range is up to 90% non-condensing.
TR 3.20	The Dispenser housing shall be at least IP54.
TR 3.21	Dispensers shall have the capability to be remotely monitored by LAN, WAN, or remote web access.
TR 3.22	Dispensers shall have an on-board perpetual calendar clock device to maintain time & date with network (LAN) for updating and configuration.
TR 3.23	Dispensers shall have the functionality of stolen ticket detection on-line, that polls ticket validation from the system. System alarm code shall be generated to the log file.
TR 3.24	Dispensers shall have feature to read tickets inserted in any direction i.e. backwards, forwards, and right side up and upside down.
Parking Controller	
TR 3.25	All occupancy sensors shall be integrated to the Parking Controller to give real time status of parking lot occupancy.
TR 3.26	The parking controller shall be rugged and shall have sufficient no. of I/O terminals to take feed from occupancy sensors. If multiple controllers are required to cater to occupancy sensors, the same shall be provided.
TR 3.27	Based on the feedback from the occupancy sensors and Parking System, the controller shall be able to control the parking guidance signals based on their location to guide users accordingly to nearest vacant slot.
TR 3.28	The Parking Controller shall have operating temperature range of 0 to +70 °C.
Barrier Gate	
TR 3.29	The Barrier gate shall have the access control mechanism to enable entry to the passengers with a valid fare media to enter the Parking slots.
TR 3.30	The height of the Barrier gate shall be not less than 1000 mm form the floor.
TR 3.31	The Barrier gate shall have barrier arm with the width of maximum 3 meters in length with collapsible arm mechanism.
TR 3.32	The Barrier gate Cabinet shall have fully lockable doors to the front of the cabinet for ease of access.
TR 3.33	The access controllers for each gate should be independent.
TR 3.34	The Barrier gate shall be capable for working in an off-line mode in case of communication network failure.

TR 3.35	The natural position of the Barrier gate should be the closed position and the drive mechanism will open/close the gate.
TR 3.36	The Barrier gate Arm will be able to operate in auto-reverse mode when hitting an obstacle during closing.
TR 3.37	The Barrier gate Arm should have functionality of self-locked in any position to avoid unauthorized person to manually open/close arm.
TR 3.38	All mechanism parts of the gate shall have a MTBF of at least 10 million cycles.
TR 3.39	The Barrier gate opening time should not be more than 1.5 secs at 90° opening angle.
TR 3.40	The Barrier Gate housing shall be at least IP44.
TR 3.41	The mounting of the gates and its assembly shall be firm with the floor of the Parking stations as to resist possible vibration due to the operation of the motor.
TR 3.42	The operations of the gate will not make noise beyond 55 decibel (daytime commercial noise limit as per BIS standards) under closed housing condition measured as a time weighted average.
TR 3.43	The Drive mechanism shall be electric and adequate to actuate the barrier and meet all opening parameters.
TR 3.44	The Barrier gate steel cabinet should have shot blasted, primed and powder coated. Barrier gate Arms shall be of rectangular extruded aluminium 76 x 38mm white powder coated.
TR 3.45	The Barrier Cabinet and Boom should have finished with an anti-corrosion paint system.
TR 3.46	The Barrier gate control system will be located inside the main Barrier Cabinet and should give easy access to all electrical components for connection, maintenance and programming, including the power isolation switches.
TR 3.47	When a Barrier gate is not working properly and is in out of servicing mode, a visual indication shall be displayed preferably with colour distinction using LED symbols.
TR 3.48	The Barrier gate should have infrared sensors to detect the presence of human, vehicle and other object for extra safety.
Parking Occupancy Sensors	
TR 3.49	The ultrasonic sensor shall be used to detect occupancy status of the parking lot/bay.
TR 3.50	The sensor should transmit this signal in real time to the Parking System to evaluate occupancy and count.
TR 3.51	The Ultrasonic sensor shall have 2-colour built-in LED indicator, wherein Red colour LED indicates parking bay is occupied and Green colour indicates vacant.
TR 3.52	The sensor have feature of control LED indicator which should be clearly visible under all light conditions and from a minimum distance of 100 meters.

TR 3.53	The sensor shall have self-diagnostic functionality to identify any defects and report it to the parking system.
TR 3.54	The detection range of the sensor should be at least 3 meters.
TR 3.55	The sensors shall be housed in an aesthetically good casing and should have mounting provisions suitable for roof mounting and pipe mounting.
TR 3.56	The Ultrasonic sensor shall have built-in auto temperature compensation mechanism.
TR 3.57	The sensor shall work in the frequency range in between 40KHZ to 50KHZ.
TR 3.58	The sensor Protection shall be IP 65.
Sensors for On-street Parking	
TR 3.59	The on-street parking sensor shall be based on non-intrusive technology, preferably geo-magnetic/camera based sensors.
TR 3.60	Each parking sensor shall be able to monitor a minimum of 10 parking spots.
TR 3.61	The parking sensor shall be able to communicate to the parking system locally and shall update occupancy status in real time.
TR 3.62	It shall have operating temperature range of 0 to 70 degrees C.
TR 3.63	The sensor shall be IP65 rated for environmental protection.
Public Information Signs (PIS)	
TR 3.64	The PIS shall be used to display information to users at each multi-level parking station for the vacant slots.
TR 3.65	The PIS display board shall be industrial grade flat panels that can withstand the environmental and working conditions found in Odisha. The panels shall allow for 24x7 operations.
TR 3.66	The PIS shall be of two types: • Type A: Multi-line (equal to or more than no of floors in MLP) – Mounted outside MLP area and on entrance of each floor to indicate vacant parking lots on each floor to the users. • Type B: Single line – Mounted at designated locations on each floor to indicate vacant lots for a particular floor.
TR 3.67	The display systems shall have built-in test facility, able to carry out self-check at periodic intervals as well as exchange of diagnostic information from the parking management central system including power availability, and its current status.
TR 3.68	The display units shall support multi-lingual fonts in English, Hindi and Odiya for easy reading.
TR 3.69	The signs shall include on-going self-diagnostics and shall send an alarm message to the central system in the event that a diagnostic fault is detected.
TR 3.70	The signs shall be based on LED technology with wide viewing angle suitable for viewing from varied angles and should have been of Amber colour.

TR 3.71	The PIS shall be able to display a message composed of any combination of alphanumeric character fonts, punctuation symbols and full graphics.
TR 3.72	When messages are displayed in multiple languages, each language shall be rotated through in turn.
TR 3.73	Time for which information is displayed in each language shall be configurable.
TR 3.74	Only outdoor rated UTP CAT6 cable shall be used to connect the device to the respective switch port. If for any case, the distance between the switch port and device exceeds 90 m, use outdoor rated multi-mode fibre cable with environmentally rugged media converters.
Parking Guidance Signal	
TR 3.75	The Parking Guidance Signal shall be used to display information to users at each multi-level parking station for the vacant slots.
TR 3.76	The Parking Guidance Signal display board shall be industrial grade flat panels that can withstand the environmental and working conditions found in Odisha. The panels shall allow for 24x7 operations.
TR 3.77	The Parking Guidance Signal shall be of full matrix type with provisions to show Parking availability (in numeric format) and guided with arrow.
TR 3.78	The Parking Guidance Signal systems shall have built-in test facility, able to carry out self-check at periodic intervals as well as exchange of diagnostic information from the parking management central system including power availability, and its current status.
TR 3.79	The display units shall support multi-lingual fonts in English, Hindi and Odiya for easy reading.
TR 3.80	The signs shall include on-going self-diagnostics and shall send an alarm message to the central system in the event that a diagnostic fault is detected.
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TR 3.84	Time for which information is displayed in each language shall be configurable.
TR 3.85	Only outdoor rated UTP CAT6 cable shall be used to connect the device to the respective switch port. If for any case, the distance between the switch port and device exceeds 90 m, use outdoor rated multi-mode fibre cable with environmentally rugged media converters.
QR Code Reader	
TR 3.86	The QR Code reader shall be of omnidirectional type which shall be used to scan & process the tickets with QR Codes printed on them.

TR 3.87	The QR Code reader shall be able to read thermal, laser and colour barcodes and decode all standard bar codes, including at least Code 128 and QR codes.
TR 3.88	The QR Code reader shall be equipped with easily visible LEDs that indicate the scanner's state and the status (e.g. "Good Read") of the current scan when the unit is in operation.
TR 3.89	The QR Code reader shall have an audible beep that indicates the status of the current scan when the unit is in operation.
TR 3.90	The reader required for POS terminals shall be provided with fixed mount stand for hands-free operations.
TR 3.91	The reader shall support print contrast with minimum 35% reflective difference.
TR 3.92	The reader shall have at minimum 20 scan-line in 2D omnidirectional pattern
TR 3.93	The QR Code reader scan rate shall be at least 1100 scans per second.
TR 3.94	The QR Code reader at minimum shall have ambient light immunity of 4,842 lux.
TR 3.95	The QR Code reader Mean Time between Failure (MTBF) shall not be less than 100,000 hours.
TR 3.96	The QR Code reader Mean Time to Replace shall not be more than 15 minutes
POS Workstation	
TR 3.97.	Refer to Type 3 Workstation Specification in Section IT and other common Infrastructure.
MLCP Local Server	
TR 3.98	For MLP Application Server, refer to Server specification in Section IT and other common Infrastructure.
Server Rack	
TR 3.99	For Server Rack, Refer to Communication Cabinet with Racks Specification in Section IT and other common Infrastructure.
Fixed CCTV Camera	
TR 3.100	For Fixed CCTV Camera, refer to Fixed CCTV camera specification in Section IT and other common Infrastructure.
Thermal Receipt Printer	
TR 3.101	The ticket printer shall be a compact thermal printer able to print, as a minimum, tickets (text and graphics), barcodes, and system status information.
TR 3.102	The print speed shall not be less than 150 mm/s for both text and graphic and at a minimum resolution of 203 dpi (8 dots/mm).
TR 3.103	The ticket printer shall use readily available paper rolls of standard size.
TR 3.104	The ticket printer shall provide low paper and out of paper indication.

TR 3.105	The ticket printer shall have an automatic cutter with a self-sharpening ceramic rotary knife.
TR 3.106	The auto-cutter shall have a reliability of at least 1.5 million cuts.
TR 3.107	The ticket printer head shall have a Mean Cycle between Failure (MCBF) of at least 50 million print lines.
TR 3.108	The ticket printer shall have a Mean Time between Failure (MTBF) of at least 360,000 hours.
Handheld Terminal (POS)	
TR 3.109	The handheld machine shall have an integrated display and thermal printer that can be easily read under all conditions of ambient light throughout the day and night.
TR 3.110	It shall be possible to upgrade the firmware/software from the central server, configuration list such as routes along with fare and other related details, etc., data from and to the ICOMC using the 3G/4G technology of the cellular operator installed on the device remotely or using wired communication.
TR 3.111	If for any reason the fare media cannot be read automatically using the readers on the handheld, there shall be an arrangement to manually enter the CPC ID and validate it.
TR 3.112	The handheld machine shall store all required transaction data on-board, including: • Parking Location • Parking Operator Name and ID • Date and time of transaction • Device ID • Employee ID Operator • Tariff Tables • Ticket serial number • Period of Parking / Applicable Slab • Transaction Value • Method of Payment – CASH/CPC/Mobile Wallet/Pre-Paid • Action taken (e.g. ticket sold/adjusted/checked) • CPC serial number (if applicable) • Transmission Status (i.e. successfully transmitted/not successfully transmitted)
TR 3.113	The handheld machine shall have sufficient memory to store a minimum of one week worth of transaction records apart from mandatory software/ firmware etc.
TR 3.114	Only successfully transmitted transaction data records shall be overwritten by new transaction data records.
TR 3.115	The handheld machine shall provide a warning when the amount of on-board storage occupied by “not successfully transmitted” transaction data records exceeds a Client specified threshold.

TR 3.116	The handheld machine shall store the current valid fare-set as well as a future “pending” fare-set with activation date and time (if applicable), to allow downloads to the handheld machine to occur in advance.
TR 3.117	Upon successful completion of the transaction the handheld machine shall indicate successful completion via the interface, using both the display and a distinct configurable audio message.
TR 3.118	Upon successful completion of the transaction the handheld machine shall transmit transaction data to the central system, including: • Date and Time of Transaction • Device Identification Number • Ticket Serial Number • Ticket Origin • Ticket Destination • CPC Serial Number
TR 3.119	The device shall have balance check functionality whereby when a CPC is tapped to the reader, the balance is displayed (if applicable) on the handheld machine display.
TR 3.120	Handheld shall be capable of reading and issuing QR-coded Paper Tickets and EMV compliant CPC.
TR 3.121	Handheld shall have an arrangement to hang over the neck of the operator and also a fastening arrangement to the palm for prolonged usage. Both the arrangements shall ensure that the operator doesn’t feel uncomfortable under long duration usage.
TR 3.122	Handheld shall have a standard serial communications ports, and a USB for external connectivity.
TR 3.123	The handheld machine shall be appropriately ruggedized so as to provide a service life of at least five years (excluding batteries)
TR 3.124	The handheld machine shall be preferably of a one-piece unit or maximum two-piece configuration (e.g. with separate printing unit).
TR 3.125	The weight of each unit (including battery) shall not exceed 0.5 kg.
TR 3.126	User Interface • The handheld machine shall utilize (1) a touch screen, or (2) physical buttons, or (3) a combination thereof. • The handheld machine shall provide distinct audible and visual feedback for actions such as validating existing CPC, detection of blocked CPC, occurrence of card reading error, and successful/unsuccessful reading of CPC.
TR 3.127	On-board Storage • The handheld machine shall have sufficient memory to store a minimum of one week worth of transaction records (at least 10,000 records) apart from mandatory firmware etc. • The handheld should be able to store information for at least 100,000 blocked CPC.

	• The handheld shall have internal and external (SD Card) memory. • The external memory card shall back-up the internal memory for every 8 hours of operation and be capable to hold 168 hrs of transaction data.
TR 3.128	Battery • The handheld machines shall be designed to operate from an internal, battery source which can be charged and re-charged. • The handheld machine battery shall utilize “no memory” battery technology which is state-of-the-art, commercially available and common for use with such equipment. • The handheld shall operate continuously for minimum 8 (eight) hours without any disruption to the operations at any given instance during the shifts. The MSI shall ensure that appropriate back-up arrangements are made for the handhelds to cover the entire operating shift without disrupting normal operations. • The battery shall be field replaceable without any loss of data, with field replacement time (from end of operation with previous battery to beginning of operation with new battery) not to exceed three minutes. • A specialized tool shall be provided to prevent unauthorized persons from removing the battery. • The battery shall be recharged to a full charge from a completely discharged state in less than four hours. • The handheld shall have a battery stand-by time of at least 5 days without the requirement of intermittent charging.

5.4. Smart Response and Incident Management System

5.4.1. City Surveillance System

FR - 4 Functional Requirements

FR 4.1	BSCL's Emergency and Incident Response system shall consist of: • Fixed Cameras; • PTZ Cameras; • Network Video Recorder (NVR); • Video Management System (VMS) including central software application; • Camera Accessories i.e. Power Supplies, Cable, Connectors and associated accessories for an integrated system; • Emergency Call Button (Integrated with Multi-Services Digital Kiosks); • Emergency Contact Centre (At ICOMC).
FR 4.2	The cameras implemented as part of this Project shall be rated for operations in outdoor environment (for outdoor installations) and depending on the objective/application, shall be of different configurations including PTZ or fixed cameras.
FR 4.3	All the Cameras shall be IP based.
FR 4.4	The CCTV surveillance system shall be ONVIF compliant.
FR 4.5	Cameras shall have an integral receiver/driver that shall be capable of controlling pan-tilt, zoom and focus locally and also remotely from the ICOMC.
FR 4.6	All cameras shall support real-time video content analysis.
FR 4.7	All CCTV cameras shall be installed on streetlight poles except for multi-services digital kiosks where they shall be integrated.
FR 4.8	Indicative list of capabilities that BSCL Emergency Response and Incident Management system are as follows: • Real-time monitoring of City; • Event based monitoring of City; • Providing secured access to video at any time from any network location; • Situation/Rule based alerts based on user inputs; • Automated response based on events including communication of alerts to relevant authorities like Fire, Hospitals, etc. for swift response in case of emergencies; • Access to historic video data for investigative purposes.
Cameras with Built-in Video Analytics	
FR 4.9	The surveillance system shall support following Built-in-Analytics for the Cameras:

	• AutoTracker: To detect and track movement in the field of view. • Adaptive Motion Detection: To detect and track object that enter a scene and then triggers an alarm when the object enter a user-defined zone. • Abandoned Object: To detect objects placed within a defined zone and triggers an alarm if the object remains in the zone longer than the user-defined time allows. • Camera Sabotage: Triggers an alarm if the lens is obstructed by spray paint, a cloth or a lens cap. • Directional Motion: Generates an alarm in a high traffic area when a person or object moves in a specified direction. • Object Removal: To triggers an alarm if the object is removed from a user-defined zone. • Stopped Vehicle: To detect vehicles stopped near a sensitive area longer than the user-defined time allows. • Intrusion Detection – Detect intrusion
FR 4.10	Event (alarm) Handling: • The camera shall be capable of recording an event as pre and post event images to on-board SD Media Card and on NVR. Events may be triggered using camera motion detection or from an external device input such as a relay. • When triggered from an external input or the camera's motion detector, the camera shall be capable of sending JPEG images via e-mail and/or sequences of images to an FTP server or on-board compact flash and NVR. • A relay output shall be available upon the activation of the camera's motion detector or external relay input. The relay output may also be manually activated from the live view screen.
Network Video Recorder (NVR)	
FR 4.11	NVRs shall be sized to provide minimum 30 days storage assuming recording of 24hrs a day, 7 days a week and 30 days a month at 4 CIF resolution. All NVRs shall be provided in an N+N configuration.
FR 4.12	NVRs shall have in-built capabilities of recording video and audio streams directly from IP based cameras installed at field.
FR 4.13	NVRs shall be ONVIF compliant.
FR 4.14	NVRs shall be capable of reviewing video and audio streams on-demand using the supplied central software.
FR 4.15	NVRs shall be capable of storing all alarms generated as part of the CCTV surveillance system.
FR 4.16	NVRs shall be capable of supporting all recording of camera analytics.
FR 4.17	NVRs shall be network enabled for remote access, viewing, management and status monitoring. User Name and Password protection is required for

	access. The system must provide for remote administrator management of user names, passwords and management of definable end user rights.
FR 4.18	A network user/client interface software shall be supplied at no cost to BSCL. The functional requirements of this client interface software will be reviewed and approved by BSCL or their designate.
FR 4.19	NVR Unit(s) shall provide fully configurable recording options to include, but not limited to: • Full record • Record on motion only • Variable frame rate • Variable resolution • Change of recording configurations on receipt of an alarm globally and/or per camera • Enable audio recording on receipt of an alarm
Recording and Storage	
FR 4.20	The storage solution proposed is that the video feeds would be available for 30 days. After 30 days, the video feeds would be overwritten or archived unless it is flagged or marked by the Police or BSCL for investigation or any other purpose. The video feeds of all relevant cameras capturing the incident in question would be stored until the Police or BSCL deem it good for deletion.
FR 4.21	For incidents that are flagged by the Police, BSCL or any court order, the video of the relevant portion from all relevant cameras should be stored/archived separately for investigation purposes and a committee at Authority can decide when this video feed can be deleted.
FR 4.22	The Recording Servers / System, once configured, shall run independently of the Video Management system and continue to operate in the event that the Management system is off-line.
FR 4.23	The system shall support the use of separate networks, VLANs or switches for connecting the cameras to the recording servers to provide physical network separation from the clients and facilitate the use of static IP addresses for the devices.
FR 4.24	The system shall support H.264 or better, MPEG-4 and MJPEG compression formats for all IP cameras connected to the system.
FR 4.25	The system should not limit amount of storage to be allocated for each connected device.
FR 4.26	The system shall allow for the frame rate, bit rate and resolution of each camera to be configured independently for recording. The system shall allow the user to configure groups of cameras with the same frame rate, bit rate and resolution for efficient set-up of multiple cameras simultaneously. The system shall support archiving or the automatic transfer of recordings from a camera's default database to another location on a time-programmable basis without the need for user action or initiation of the archiving process. Archiving shall allow the duration of the camera's recordings to exceed the camera's default database capacity. Archives shall be located on either the recording server or on a connected network drive. If the storage area on a network drive becomes unavailable for

	recording the system should have the ability to trigger actions such as the automatic sending of email alerts to necessary personnel.
FR 4.27	Bandwidth optimization - The Recording Server / System shall offer different codec (H.264, MJPEG, MPEG-4, etc.) and frame rate (CIF, 4CIF, QCIF) options for managing the bandwidth utilization for live viewing on the Client systems.
FR 4.28	From the Client systems, the user shall have the option of having video images continually streamed or only updated on motion to conserve bandwidth between the Client systems and the Recording Server.
FR 4.29	The Recording Server / System shall support Camera devices from various manufacturers.
FR 4.30	The Recording Server / System shall support the PTZ protocols of the supported devices listed by the camera OEMs.
FR 4.31	The system shall support full two-way audio between Client systems and remote devices i.e. CCTV.
FR 4.32	Failover Support - The system shall support automatic failover for Recording Servers. This functionality shall be accomplished by Failover Server as a standby unit that shall take over in the event that one of a group of designated Recording Servers fails. Recordings shall be synchronized back to the original Recording Server once it is back online. The system shall support multiple Failover Servers for a group of Recording Servers.
FR 4.33	SNMP Support - The system shall support Simple Network Management Protocol (SNMP) in order for third-party software systems to monitor and configure the system. The system shall act as an SNMP agent which can generate an SNMP trap as a result of rule activation in addition to other existing rule actions.
Video Management System (VMS)	
FR 4.34	Central software application to be installed at the ICOMC shall be able to run on any PC based on standard operating systems and shall be license free.
FR 4.35	Video Management System (VMS) shall be non-proprietary and open-ended to support integration with ICOMC platform.
FR 4.36	Central Application Server shall allow user to view live video stream.
FR 4.37	Software shall consist of a single client application and the client software shall not be dependent on, nor require any connection to, a central management or configuration server.
FR 4.38	The client software shall be installable without any need for software or hardware license.
FR 4.39	Dockable windows shall include: • Site Explorer • Alarms/Events window • PTZ and advanced telemetry functions • Monitors window • Maps window

FR 4.40	The system shall support a distributed architecture with no single point of failure.
FR 4.41	Video shall normally stream direct from camera to client; streaming via a proxy, or intermediate server shall not be the normal function of the system but may be selected as an option.
FR 4.42	A client need not ask “permission” to connect to a camera. The handshake between client and camera shall be done directly.
FR 4.43	There shall be no single management server. System management shall be distributed throughout the system.
FR 4.44	Recording failover shall be standard without need for additional license and/or hardware.
FR 4.45	BSCL’s workstations must remain “connected” to all recording devices simultaneously.
FR 4.46	Video shall normally stream direct from camera to client; streaming via a proxy, or intermediate server shall not be the normal function of the system but may be selected as an option.
FR 4.47	Recording failover shall be standard without need for additional license and/or hardware.
FR 4.48	VMS shall allow the overlay of time and date and site information on live video panes, either on all panes, or selected pane only. In addition, the overlay may consist of a user-provided transparent PNG or JPEG file.
FR 4.49	VMS shall allow users to view live video and review recorded video at the same time.
FR 4.50	VMS shall be ONVIF compliant.
FR 4.51	Users shall be able to display any camera view (virtual preset).
FR 4.52	VMS shall allow users to reveal the hidden zone in live video if the user has the appropriate permission.
FR 4.53	Users shall be able to save the current zoom/scroll position as a camera view (virtual preset).
FR 4.54	Administrators shall be able to configure hidden zones on fixed cameras.
FR 4.55	VMS shall allow the display of analytics levels on video.
FR 4.56	Users shall be able to take a snapshot of one image or all images currently displayed and save as a bitmap or JPEG image to a configurable location. This should include zoomed images.
FR 4.57	Users shall be able to print a snapshot of an image displayed in a video pane direct on a printer (colour or grayscale, depending on printer).
FR 4.58	Users shall be able to replay currently viewed live video by a single mouse click for replays from 10, 15 or 30 seconds before current time or from alarm time.
FR 4.59	Users shall be able to configure the size for text and icons displayed on video panes. Text and icons can be fixed size or adjust automatically when video pane size changes.

FR 4.60	In the event of the video connection failing, the Video Management System shall display a clear error message with the option to also display the last video frame received.
FR 4.61	Event Counting: The Video Management System shall allow users to view a count of analytics events on the video pane while video is being displayed. The Video Management System shall allow users to reset the event count for a camera.
FR 4.62	Live Video on Analog or Digital Monitors: • The Video Management System shall be able to display camera information in the On Screen Display (OSD): ➢ Camera name ➢ Date and time • The Video Management System shall support point to point connections for the following data: ➢ Video (SD only) ➢ Audio transmit and receive ➢ Serial
FR 4.63	Audio in Live Video: • Users shall be able to listen to audio from multiple cameras through PC speakers. • Users shall be able to speak to one or more cameras through a PC microphone. • Users shall be able to listen to audio from a camera through monitor's speakers. • Users shall be able to speak to a camera displayed on monitor through a microphone connected to a decoder. • Users shall be able to mute a client speaker. • The Video Management System shall have an option to allow or prevent simultaneous listen and speak (full duplex audio). If full duplex audio is off, the direction of audio will be switched automatically when the user listens or speaks. • Users shall be able to listen to audio streams that do not have associated video.
FR 4.64	PTZ Control: • All PTZ control shall be user-restricted. • Users shall be able to configure named preset positions with optional "tool tip" text. • Users shall be able to configure named custom commands with optional "tool tip" text. Commands can be per PTZ type or per camera, as required. • Users shall be able to copy custom PTZ commands from one camera to another. • Users shall be able to simultaneously pan and tilt a PTZ camera displayed in a video pane in any direction and at varying speed by moving the PC mouse on the video

	pane. • Users shall be able to zoom a PTZ camera in or out using the PC mouse. • Users shall be able to simultaneously pan, tilt and zoom a PTZ camera displayed in a video pane or monitor using a joy stick on one of the supported CCTV keyboards. • Users shall be able to adjust the focus of a PTZ camera using the on screen PTZ controls or a CCTV keyboard: ➢ Focus near ➢ Focus far ➢ Auto-focus • Users shall be able to adjust the iris of a PTZ camera using the on screen PTZ controls or a CCTV keyboard: Open iris-Close-Auto-iris. • Users shall be able to move a PTZ camera to a preset position using the on screen PTZ controls or a CCTV keyboard. • Users shall be able to perform a custom command on a PTZ camera using the on screen PTZ controls (e.g. operate wipers.). • Users shall be able to enter the menu on a PTZ camera using the on screen PTZ controls or a CCTV keyboard (menu options navigated using pan and tilt.). • The Video Management System shall automatically drop the connection to a PTZ camera if not moved for 5 seconds to allow other users to control it. • Users shall be able to hold onto connections to PTZ cameras to prevent other users taking control if not moved (overrides the 5 second timeout.). • Users shall be able to take control of a PTZ camera if user has a higher priority than the user currently moving it (overrides PTZ hold.). • Inform user when can't take control of a PTZ camera because another user with a higher priority is controlling it. • Users shall be able to show or hide the on screen PTZ controls. • The Video Management System shall support the following for cameras using the ONVIF interface or Camera Gateway: ➢ Pan, tilt and zoom control with mouse and joystick ➢ Go to preset ➢ Set preset
FR 4.65	Timeline and Calendar: • Users shall be able to view the recorded video footage for a camera along a timeline. They shall be able to expand and contract the timeline to show a larger or

	smaller time range and to scroll the timeline backwards and forwards to show different time periods. • For a camera, users shall be able to see summary information about how much recording footage is available from which NVR. • Users shall be able to change the playback NVR associated with a camera. • The Video Management System shall provide one-button click controls to go to the beginning or the end of available recording footage. • The Video Management System shall provide a calendar control to allow navigation to any year / month /day in the recording library. • The Video Management System shall provide a go to “hour / minute / second” control. • The Video Management System shall display alarms related to the selected camera along the timeline including summary counts of the number of alarms in each time period. • The Video Management System shall display video bookmarks along the timeline. Bookmarks can either be those from a selected camera or from current bookmark query as displayed in the bookmark list.
FR 4.66	Playback on PC Screen or Video Wall: • The Video Management System shall play back video recorded in MJPEG, MPEG4 and H.264 formats. • The Video Management System shall replay footage in same video pane, or navigate to recorded video panes. • The Video Management System shall play back video from up to 25 cameras at once in a single video window. • The Video Management System shall play back each camera separately or synchronize to playback from the same time. • The Video Management System shall play back synchronized recorded audio in each video pane. • The Video Management System shall display time and date information on recorded video panes, either on all video panes, or on the selected pane only. This should be able to be set independently of the settings for live video panes. • The Video Management System shall play back video using the following standard VCR operations: ➢ Play-pause-fast forward at different speeds. ➢ Rewind at different speeds. ➢ Single frame forward-single frame back. • The Video Management System shall provide a jog shuttle speed control for fast forward and rewind.

	• Users shall be able to move playback to a different time either using the timeline or entering a specific date and time. • Users shall be able to move playback to the time of the next alarm, bookmark or motion over threshold. • Users shall be able to move playback to the time of the previous alarm, bookmark or motion over threshold. • Users shall be able to digitally zoom up to 1000% and scroll replayed video. • Users shall be able to reveal the hidden zone in recorded video if user has the appropriate permission. • Users shall be able to remove interlacing artefacts from 4CIF video. • Users shall be able to display analytics levels on video. • Users shall be able to take a snapshot of one image or all images currently displayed and save as a bitmap or JPEG image to a configurable location. This should include zoomed images. • Users shall be able to print a snapshot of an image displayed in a video pane direct to a printer (colour or grayscale, depending on printer.).
FR 4.67	Motion Search: • Users shall be able to find motion in recorded footage from a selected time and display a motion profile on the timeline. • Users shall be able to adjust the motion threshold used for thumbnails and for moving playback to next/previous motion. ➢ . • It shall be possible to combine motion search modes to further refine the search. • Users shall be able to adjust the speed and granularity of the motion search.
FR 4.68	Audio Search: • Users shall be able to search for sounds in recorded footage from a selected time and display an audio level profile on the timeline. • Users shall be able to adjust the audio threshold used for thumbnails and for moving playback to next/previous sound.
FR 4.69	Thumbnails: • The Video Management System shall be able to display thumbnail images taken from the video footage in the current time line period. Thumbnails can be displayed by: ➢ Time: At equal intervals across the timeline period depending on the number of thumbnails set for the user.

	➢ Alarms: One image for each alarm in the period. ➢ Bookmark: One image for each bookmark in the period ➢ Motion: One image for each time motion goes above a configurable threshold ➢ Audio: One image for each time the audio goes above a configurable threshold ➢ Users shall be able to play back a recording from a selected thumbnail
FR 4.70	Bookmarks: • Users shall be able to add a bookmark to a recording for a camera at a specified time. • Users shall be able to find bookmarks by: ➢ Site name ➢ Camera name ➢ Time range ➢ A text string within the bookmark • Users shall be able to produce reports of bookmarks and export to RTF or CSV formats. • Users shall be able to delete one or more bookmarks (if created by the same user). • Users shall be able to delete bookmarks created by any user. • The Video Management System shall ensure that bookmarks are held alongside recordings on the NVR, not on a user's PC. • Users shall be able to view recorded video associated with a bookmark. • It shall be possible for text information to be automatically fed into the IP Video System as Bookmarks via an SDK. • The Video Management System shall ensure that the text information is displayed in a scrolling bookmark comments window beside the playback window. • Detailed search options shall allow for filtering of bookmarks e.g. by time, by user. • Within the bookmark comments window the highlighted bookmark shall correspond to the current playback position. • Next and previous incident buttons shall automatically scroll the bookmark comments window keeping the highlighted text and associated video in synch. • In a live view pane, users shall be able to add a bookmark to the recording of that camera. • Users shall be able to view bookmarks as a transparent overlay on a live pane. • The Video Management System shall support permissions for bookmarks so that only those users with

	the appropriate security level can view bookmarks created by users at the same level as them or below.
FR 4.71	Incident Export: • Users shall be able to export video clips from a selected camera or cameras within a site to a named incident. • Users shall be able to select the start and end times of the export by clicking and dragging on the timeline. • Time to export shall be no more than 30 seconds per hour of video recorded. • Users shall be able to queue video exports to be performed as a background process. • The Video Management System shall show progress and estimated time to completion in an export status window. • Users shall be able to add additional clips to existing incidents. • The Video Management System shall automatically digitally sign video clips on export. • Users shall be able to protect the original recordings to preserve the evidence. • Users shall be able to review incidents in a standalone incident player application, directly from CD. • Users shall be able to play back incidents with all the playback operations provided by the full Video Management System application. • Users shall be able to check and authenticate digital watermarks embedded within exported clips. • The Incident Player application shall be able to be run at the same time as the main Video Management System application so that users can easily verify the success of an export. • The Video Management System shall support the following ONVIF cameras and cameras streamed via Camera Gateway: ➢ Export of video recorded in MJPEG, MPEG4 and H.264 ➢ Playback of exported video in exported player • The Video Management System shall provide the option to include date and time on each frame of the recording when it is exported. • Administrators shall have the ability to restrict the location that users may export video files to.
FR 4.72	• Users shall have the ability to produce a simple easy to view video summary of an incident. • Users shall have the ability to export all video associated with this summary. • All video in this export should be fully watermarked.

	• The GUI shall allow addition, removal and edit of clips involved in the summary. This editing should be done via GUI.
FR 4.73	Playback on Monitors: • Users shall be able to play back recorded video on monitor from a selected time. • The Video Management System shall support basic play back operations on monitor: ➢ Play ➢ Pause
FR 4.74	Audio in Playback: • Users shall be able to listen to audio recorded with video from all cameras being played back or selected cameras only. • Users shall be able to listen to audio streams without the need to display anything in the video pane. • The Video Management System shall support the following for 3rd Party cameras through ONVIF: ➢ Listen to recorded audio
FR 4.75	Users shall be able to start an instant recording from live video viewed in a video pane. They shall have the option to start recording video only or both video and audio.
FR 4.76	Users shall be able to configure the recording schedule for cameras on NVRs. Recording can be configured to be: • 24/7 • Timed (from minute to weekly schedules) • On alarm or event
FR 4.77	Users shall be able to specify the transport protocol to be used for recording (TCP, UDP, and Multicast.).
FR 4.78	Users shall be able to specify whether audio should be recorded with the video.
FR 4.79	Users shall be able to specify whether the recording should be protected when an alarm or event occurs (from a specified time before the alarm / event.).
FR 4.80	Users with appropriate permissions shall be able to enable or disable recordings temporarily.
FR 4.81	Users shall be able to delete recording schedules.
FR 4.82	Users shall be able to copy recording schedules from one camera to other cameras on the same or another NVR.
FR 4.83	Users shall be able to specify an alternative NVR to record to during a video “lockout” for either a camera or a site. Lockout permission can be used to prevent all other users from viewing and recording from a selected camera or all cameras in a selected site.
FR 4.84	The Video Management System shall support digital signing (watermarking) of recordings as they are recorded on the NVR.

FR 4.85	Users shall be able to find recordings within a specified time period.
FR 4.86	Users shall be able to protect/unprotect recordings.
FR 4.87	The Video Management System shall display a warning message if an NVR is unable to retain the number of days recording for which it was configured.
FR 4.88	The Video Management System shall support the configuration of failover NVRs for each primary NVR with the following options: • 1 to N: 1 primary NVR can have one or more failover NVRs • N to 1: multiple primary NVRs can have the same failover NVR • Continuous recording to primary and failover NVRs • Recording to failover NVR only when primary NVR fails
FR 4.89	The Video Management System shall automatically failover when a primary NVR is down.
FR 4.90	In addition, users shall have the option to manually failover, for example to allow for routine maintenance of a primary NVR.
FR 4.91	Users shall have the option to manually fail back to a primary NVR, with the option to restore the recording configuration from the failover NVR to the primary.
FR 4.92	The Video Management System shall support binary inputs on IP Cameras, encoders, decoders and alarm panels.
FR 4.93	The Video Management System shall support video loss alarm inputs.
FR 4.94	The Video Management System shall support network loss alarm inputs.
FR 4.95	The Video Management System shall support NVR fault alarm inputs, including: • Raid degraded • License failure • Recording failure • Redundant power failure • Redundant network failure
FR 4.96	The Video Management System shall support analytics alarm inputs, with separate events for each analytics filter.
FR 4.97	The Video Management System shall support alarm inputs from 3rd party systems.
FR 4.98	The Video Management System shall enable multiple alarm inputs (detectors) to be grouped into an alarm zone.
FR 4.99	The Video Management System shall support inputs (detectors) that do not cause an alarm to be generated.
FR 4.100	The Video Management System shall support ‘AND’ logic between detectors so that the alarm input is activated only when both detectors are activated with a defined time period.

FR 4.101	The Video Management System shall support detectors that are activated and deactivated by different inputs e.g. activate on a binary input from one device and deactivate on a binary input from another device.
FR 4.102	Users shall be able to dock the alarm viewing window below the Live View or Playback View windows.
FR 4.103	Users shall be able to sort the alarm information in various ways by clicking on column headings.
FR 4.104	The Video Management System shall support set and unset of alarm zones such that alarms are only generated when the alarm zone is set.
FR 4.105	Users shall be able to configure the time schedule for each alarm zone – different start and end times for each day and multiple time periods per day.
FR 4.106	Users shall be able to define specific dates and times within time schedules so that exceptions for holidays etc. can be specified.
FR 4.107	The Video Management System shall enable the same time schedule to be applied to multiple zones.
FR 4.108	Users shall have the option of restoring the previous view after an alarm has been cleared.
FR 4.109	Users shall be able to manually set and unset zones.
FR 4.110	Users shall be able isolate faulty alarm inputs (detectors) such that they do not cause false alarms. Users shall be able to easily identify which alarm inputs are isolated and the reason for isolation.
FR 4.111	The Video Management System shall enable zones to be set and unset on an event.
FR 4.112	The Video Management System shall enable detectors to be isolated and restored on an event.
FR 4.113	Users shall be able to specify a priority for each alarm zone (1-10.).
FR 4.114	Users shall be able to configure the alarm sound for all alarm zones in a site or for each alarm zone individually. Sound can be from any .wav file and can be sounded once or repeated while the alarm is active.
FR 4.115	The Video Management System shall allow alarms to be configured to require text from a user at the point of acknowledging and at the point of clearing.
FR 4.116	The Video Management System shall allow an alarm procedure document (.html, text or URL) to be associated with a site or to an individual alarm zone. This procedure document shall be displayed when an alarm happens.
FR 4.117	Users shall be able to configure the actions that should be performed when an alarm occurs: • Show video from camera, camera view or salvo in specified monitors • Stop video when alarm cleared • Move camera to preset position

	• Send email to multiple recipients, with option to include snapshots • Perform a relay action automatically • Start recording one or more camera – records for specified duration • Auto-protect recording from a specified duration before the alarm
FR 4.118	Users shall be able to configure a second authorizing user for alarm clearing and relay actions – second user has to enter a password to authorize these functions.
FR 4.119	The Video Management System shall support the following for 3rd Party cameras through native protocols and / or ONVIF: • Motion detection events • Record on motion • Video loss • Network loss • Change video quality on event, including frame rate, resolution and bitrate
FR 4.120	Users shall be able to configure an unlimited number of alarm groups each containing a set of alarm zones and/or detectors.
FR 4.121	For each user or user group, it shall be possible to associate one or more video panes with each alarm group. This should also include analog monitors.
FR 4.122	Users shall be able to choose a display mode for alarm video. As multiple alarms come in, the video can either be “cascaded” across the chosen viewing panes or “queued” behind the chosen viewing panes. As alarms are cleared, the associated video is cleared from the chosen viewing panes. Cascaded video can either remain in the same video pane until cleared, or can move to the first available pane as earlier alarms are cleared.
FR 4.123	When all alarm video is cleared from a viewing pane the Video Management System shall display video and layout being viewed before any alarm was displayed.
FR 4.124	The Video Management System shall clearly mark black screen monitoring viewing windows as being distinct from normal live view windows through background colour and icon.
FR 4.125	The Video Management System shall remove any black screen monitoring analog monitors from the normal site hierarchy.
FR 4.126	The Video Management System shall have permissions to determine which users or user groups get access to which alarm groups and which windows are used to display alarm video.
FR 4.127	Users shall be able to configure any of the available viewing panes or analog monitors as a spot monitor for viewing significant live footage.
FR 4.128	The Video Management System shall provide a toolbar option on all live viewing panes to copy the current video stream into the spot monitor.

FR 4.129	The Video Management System shall keep an audit record of what video was started and stopped in the spot monitor, by which user and what times.
FR 4.130	The Video Management System shall allow the video sequence that was viewed in the spot monitor by a selected user in a selected time period to be exported as a single incident.
FR 4.131	Users shall be able to review all video watched by a selected user in a selected time period in an incident player. The video should be played back as one sequence in a single video pane.
FR 4.132	The Video Management System shall generate an alarm if any of the detectors within an alarm zone are activated.
FR 4.133	The Video Management System shall not generate new alarms for subsequent detector activations within the same zone so that the user only has one alarm to handle.
FR 4.134	The Video Management System shall alert new alarms with flashing icon and optionally a sound.
FR 4.135	The Video Management System shall automatically perform the actions configured for the alarm zone or detector: • Show video from camera, camera view or salvo in specified video panes or monitors • Move camera to preset position • Stop video when alarm cleared • Send email to multiple recipients • Perform a relay action • Start recording one or more cameras • Auto-protect recording from a specified duration before the alarm
FR 4.136	When an alarm happens, the Video Management System shall be able to show live video from a camera on one pane and beside it show a looped replay from just before the alarm to just after.
FR 4.137	From a looped replay, users shall be able to quickly jump to continuous replay from the alarm time.
FR 4.138	The users shall be able to display a map showing the location of the alarm.
FR 4.139	Users shall be able to view pending alarms in a list ordered by priority and time.
FR 4.140	Users shall be able to filter the alarm list to show alarms only from specific areas (sites and zones.).
FR 4.141	The Video Management System shall be able to display alarm procedure document for the alarm.
FR 4.142	The Video Management System shall allow users to acknowledge alarms, entering alarm response text as required.
FR 4.143	The Video Management System shall allow users to edit the alarm response text at any time before the alarm is cleared.
FR 4.144	The Video Management System shall allow users to clear alarms, entering alarm response text as required.

FR 4.145	Users shall be able to find historical alarms matching specified criteria: • Alarm type • Alarm state (new, acknowledged, cleared) • From site(s) • From alarm zones(s) • User(s) who acknowledged or cleared • Time range
FR 4.146	The Video Management System shall be able to escalate alarms to other user groups if the alarm is not acknowledged within a pre-defined time period.
FR 4.147	The Video Management System shall be able to escalate alarms to other user groups if the alarm is not cleared within a pre-defined time period.
FR 4.148	The Video Management System shall support different escalation time periods for different alarm priorities.
FR 4.149	The Video Management System shall be able to propagate an alarm to other areas (zones) if the alarm is not acknowledged within a pre-defined time period.
FR 4.150	Users shall be able to produce reports of historical alarms and events and export to RTF or CSV formats.
FR 4.151	Users shall be able to authorize an alarm to be cleared, by a second user entering a password.
FR 4.152	Users shall be able to view live or recorded video associated with the alarm.
FR 4.153	The Video Management System shall ensure that alarms are held on an alarm server, not on a user's PC.
FR 4.154	The Video Management System (VMS) shall support integration with external data sources. An external Data Source shall be defined as any text string up to 320 characters.
FR 4.155	The VMS shall support up to 1 external data record every second.
FR 4.156	The VMS shall support up to 2 million data records.
FR 4.157	The VMS shall support the ability to search and filter data records using the following: • A partial text string to search data record • Source IP address of data • Name of Data source
FR 4.158	The VMS shall allow for the association of data records with video data.
FR 4.159	Integration shall be available via a freely available open interface. The interface shall be via a software development kit.
FR 4.160	Users shall be able to configure relay actions using binary outputs on IP Cameras, encoders and decoders.
FR 4.161	Users shall be able to configure relay actions using external outputs to 3rd party systems.
FR 4.162	The relay activation shall be pulsed with a configurable pulse time period.

FR 4.163	The Video Management System shall support latched relay outputs.
FR 4.164	Users shall be able to associate relay actions with specific cameras so that the actions are readily available when video is displayed from that camera.
FR 4.165	The Video Management System shall perform relay actions on alarm and event.
FR 4.166	The Video Management System shall be able to perform relay actions on a time-schedule.
FR 4.167	The Video Management System shall automatically check for devices not on the network and notify users when not available.
FR 4.168	It shall be possible to define the users who get notified if devices become unavailable.
FR 4.169	Users shall be able to manage the bandwidth used for network scans by configuration of: • Monitor period (mins) • Minimum check interval (msec) • Perform fast check on log in • Perform fast check on refresh
FR 4.170	The Video Management System shall scan for devices using any combination of IP broadcast addresses, individual IP addresses or ranges of IP addresses.
FR 4.171	Users shall be able to turn off scanning of devices.
FR 4.172	Users shall be able to set sites to offline mode. In this mode, all automatic communication with the site will be halted, while still allowing requested traffic.
FR 4.173	Users shall be able to manually refresh any diagnostics view.
FR 4.174	The Video Management System shall notify users when device times are not synchronized with the viewing PC (more than 60 seconds out).
FR 4.175	The Video Management System shall notify users of problems with NVRs. The notifications will be those supported by each NVR.
FR 4.176	Users shall be able to view the current status of an NVR with visual indicators showing whether each item is OK or indicates problems: • Total disk space • Minimum free disk space • Used disk space (total – free) • Percentage space used (used disk space / total disk space) • License expiry date • Maximum streams • Maximum third party streams • Number of cameras recording • Number of cameras not recording • Number of recordings • Maximum recordings

	• Age of last deleted recording (indicates storage being achieved for each camera) • NVR time • Any additional features supported by the NVR.
FR 4.177	Users shall be able to view per camera disk utilization for an NVR. Display a list of cameras being recorded by an NVR, showing the cameras with the highest disk usage at the top. Display the following info. For each camera: • Start time of first recording • End time of last recording • Total size of all recording • Total duration of all recordings • Recording rate (total size / total duration), in kbps
FR 4.178	The Video Management System shall provide a support information tool, which gathers together log files and site database into a zip file.
FR 4.179	Users shall be able to configure named user groups. A group can be granted administrator rights: • Full (can configure everything) • Restricted (can configure everything except users and groups) • No configuration rights (limited user functions only)
FR 4.180	The Video Management System shall be able to hide administration options from normal users. The user interface shall be cleanly split into administrative functions and operational functions. Users who do not have administrative rights shall get a much simpler interface so that they are not confused by visible but disabled features.
FR 4.181	Users shall be able to configure named user accounts and allocate them to user groups.
FR 4.182	Users shall be able to enable and disable user accounts.
FR 4.183	Users shall be able to set-up a user to use either machine OS standard authentication or a password when he logs into the Video Management System.
FR 4.184	Users shall be able to limit the total number of video streams (live or recorded) that a user or member of a user group can display at once.
FR 4.185	Users shall be able to limit the number of time-based thumbnail images that a user or member of a user group will display at once.
FR 4.186	Users shall be able to allocate each user group or user a priority that is used when controlling PTZ cameras.
FR 4.187	Users shall be able to grant global permissions to user groups or users (global permissions do not apply to specific objects such as cameras): • PTZ hold (allows a user to keep control of a PTZ camera when not moving it) • Video lockout (allows a user to perform a video lockout on any site of camera)
FR 4.188	Users shall be able to grant permission for user groups and/or users to access any object in the system (sites, cameras, monitors, salvos, alarm

	zones, detectors and relays.) For each object access can be limited by function: • List – see object in the user interface • View – view video from cameras, sequences, salvos and guard tours • Transmit audio (speak) to a camera • Playback recording from a camera or salvo • Record – make an instant recording of a camera • Export video clips or take snapshots from a camera • Control a PTZ camera • Display video on a monitor or video wall or activate a relay • Respond to alarms from an alarm zone • Hidden zone (live or playback) – access video behind a hidden zone • Audio (live or playback) – receive audio from a device • Set and unset an alarm zone • Isolate and restore a detector • Work offline • Configure presets and access the camera menus
FR 4.189	Users shall be able to reset access permissions on individual objects to use the access permissions of their parent site.
FR 4.190	Users shall be able to configure application settings specific to each PC, including: • Enable or disable scheduled tasks • Enable or disable the application as the topmost window • Location for snapshot images • Format of snapshot image (bitmap or JPEG) • Folder for snapshot image • Replay incident in live or Playback view • Use software or hardware assisted video renderer • Use de-interlace filtering on live view by default • Use de-interlace filtering on playback by default • Set video de-interlacing • Enable or disable use of a CCTV keyboard • Serial port for CCTV keyboard • CCTV keyboard type • Video pane text scale factor (% of the default text size) • Resize text on video panes in proportion to video pane size • Video pane icon size (normal, medium, large) • Select icon size on video panes in proportion to video pane size • Date / time display on video panes (none, all, selected)

	• Load bookmarks on startup • Spot monitor (external monitor or specified video pane) • Protect recordings by default when exporting • Write date and time on exported recordings
FR 4.191	Users shall be able to prevent simultaneous listen and speak (full duplex audio).
FR 4.192	Users shall be able to configure the use of buffered playback when reviewing recordings.
FR 4.193	Users shall be able to enable or disable alert messages.
FR 4.194	Users shall be able to log into the Video Management System manually.
FR 4.195	It shall be possible to start the Video Management System from the command line with the following options: • Username and password • Normal, full screen or video-only modes • Site database
FR 4.196	The Video Management System shall allow users to log out and log in without closing the application.
FR 4.197	The Video Management System shall have an option to require all users to re-enter their password when logging out.
FR 4.198	The Video Management System shall remember display settings on a PC for each user at log off and restore settings at log in: • Which cameras are displayed in which video panes • PTZ controls displayed • Map window position • Alarm window position • Video window positions (default hidden) • Main window size and position and site explorer width • Recording calendar displayed
FR 4.199	Users shall be able to change their own password (if given write permission to the site database).
FR 4.200	Users shall be able to change their default location on the tree hierarchy.
FR 4.201	Users shall be able to lockout all other users preventing them from viewing or recording video from a selected camera or all cameras in a selected site.
FR 4.202	The Video Management System shall support an audit trail that can log user actions to an industry standard database e.g. SQL Server.
FR 4.203	Users shall be able to specify the authentication method to be used between the client application and the audit trail database: • Local user password • Windows user password
FR 4.204	The audit trail shall log the following user actions to the audit trail database: • User logged on • User attempted to log on and was denied access

	• User logged off • User changed "home" site • User acknowledged an alarm • User cleared an alarm • User received an alert message (e.g. device not available) • User starting playing back a recording (forward) • User started playing back a recording (backwards) • User stopped playing back a recording • User denied playing back a recording or playback failed • User took control of a PTZ camera • User released control of a PTZ camera • Second user authorized relay action • Second user authorized alarm to be cleared • Second user denied authorizing a relay or alarm to be cleared • Export recordings • Protect recordings • Manual start or stop recording • User log out denied • User starts playing live video from a specific camera • User stops playing live video from a specific camera • Creation, deletion or editing items stored in the Video Management System configuration database • User created a bookmark
FR 4.205	The audit trail shall log the following information for each entry in the audit log: • Date and time that the user performed the action • Name of the user performing the action • DNS name of computer running in ICOMC • The name of the application writing to the log • A string naming the type of action performed e.g. Log on • Name and matrix number of the object that the action applies to e.g. camera name and number • Further information about the action, in a structured form e.g.: “Alarm Time: 16-Feb-06 10:11:41, Alarm Response: False alarm” • Severity (applies to error message received log entry only)
FR 4.206	The user shall be able to export a report from the audit trail database into a standard reporting tool, e.g. Excel.
FR 4.207	The Video Management System shall discover IP Video devices on a network either by broadcast address or unicast addresses for each device.

FR 4.208	The Video Management System shall allow configuration of IP Video System devices via their web configuration interface.
FR 4.209	The Video Management System shall enable mass configuration of devices, in particular encoder settings on IP cameras and encoders.
FR 4.210	Administrators shall be able to view video from each stream at the same time as making changes to the media parameters on an encoder to aid configuration.
FR 4.211	Administrators shall be able to upgrade the firmware on IP Video System devices - multiple devices can be upgraded in one go.
FR 4.212	Administrators shall be able to create a hierarchy of sites and sub-sites for organizing cameras and other items by location.
FR 4.213	Administrators shall be able to set the time-zone on a site - different sites can each have their own time zone.
FR 4.214	Users shall be able to reorder sites under their parent site (sites are ordered by number).
FR 4.215	The Video Management System shall be able to automatically create a site hierarchy within a site database containing IP Video System devices visible on the network.
FR 4.216	Users shall be able to create sequences and salvos within the sites, set up 24/7 recording for each camera and enable video loss and network loss alarms.
FR 4.217	Users shall be able to add cameras, monitors, alarm panels, alarm servers and NVRs to sites by dragging and dropping, selecting from a list or manually entering the IP Address and name.
FR 4.218	Users shall be able to remove devices from sites.
FR 4.219	Users shall be able to move devices, and other items such as sequences, salvos, and sub sites from one site to another by dragging and dropping.
FR 4.220	Users shall be able to enter a localized display name for cameras, monitors, alarm panels, alarm servers and NVRs which overrides the name stored on the device.
FR 4.221	The Video Management System shall enable a copy of the configuration database to be cached locally on each user workstation to ensure continuity of operation when a connection to the central database is not available.
FR 4.222	The Video Management System shall support a configuration database that is divided into multiple ‘segments’, e.g. one segment for each site. The Video Management System shall allow each segment to be configured and accessed independently.
FR 4.223	The Video Management System shall support user access permissions so that only authorized users can access specific segments.
FR 4.224	When the configuration database is divided into segments, the Video Management System shall allow all sites to monitored e.g. from a central monitoring facility.

FR 4.225	Users shall be able to create one or more maps for each site by importing an image for the background. The following image formats shall be supported: • Bitmap (BMP) • JPEG (JPG) • Portable Network Graphics (PNG) • AutoCAD drawings (DWG) • GIS
FR 4.226	Users shall be able to add links to other maps.
FR 4.227	Users shall be able to reposition items by drag and drop or entering specific coordinates.
FR 4.228	Users shall be able to add cameras to map via drag and drop.
FR 4.229	Users shall be able to specify the field of view for each camera.
FR 4.230	Users shall be able to add alarm zones and detectors to map.
FR 4.231	For alarm zones, users shall be able to have options to not display the alarm icon and/or name unless the alarm is active.
FR 4.232	For zones and detectors, users should be able to configure a detector/zone area on the map.
FR 4.233	Users shall be able to specify the amount of detail displayed for each object including icons, matrix numbers and labels.
FR 4.234	Colour schemes shall be configurable to make text and fields-of-view more visible.
FR 4.235	The map shall be fully scalable with zoom and pan supported under mouse control.
FR 4.236	Users shall be able to displays the previous maps viewed (back, forward).
FR 4.237	Users shall be able to link to any map from any map.
FR 4.238	Users shall have the option of scaling icons to a fixed zoom level.
FR 4.239	The map should be viewable on a separate monitor from the main video(s).
FR 4.240	Users shall be able to display live and recorded video from any camera on a map (drag and drop).
FR 4.241	Users shall be able to view video from some or all of the cameras on a map via drag-select.
FR 4.242	Users should be able to click on the field-of-view of any camera to view the video.
FR 4.243	Where fields-of-view overlap, clicking on the convergent area should result in all cameras being displayed.
FR 4.244	Activated alarms shall be visually represented on the map.
FR 4.245	Where detector/zones areas have been configured, these should be visually represented as being in an alarmed state.

FR 4.246	Where detector/zones areas have been configured and in an alarmed state, the user should be able to start video from all cameras associated with that zone by clicking on it.
FR 4.247	Users shall be able to: • Manage alarms from a map • Clear alarms • Acknowledge alarms • View Video associated with an alarm • Isolate/restore alarms • Set/unset detectors
FR 4.248	Users shall be able to trigger events to binary outputs on cameras or encoders.
FR 4.249	The Video Management System shall include a restricted access version of the video viewing and replay application that prevents all users from accessing the setup screens even if they have an administrator login.
FR 4.250	The Video Management System shall provide a restricted access site database management utility, which prevents creation of new site databases.
FR 4.251	The Video Management System shall provide a restricted access version of the video viewing and replay application, which prevents all users from modifying the audit log configuration even if they have an administrator login.

TR - 4 Technical Requirements

Fixed and PTZ Camera, Lenses and Mounts	
TR 4.1	The camera control shall comply with the latest release of Open Network Video Interface Forum (ONVIF) standards.
TR 4.2	The camera shall include an integral receiver/driver. The receiver/driver shall be capable of controlling pan-tilt, zoom and focus locally and remotely from the ICOMC.
TR 4.3	The camera shall incorporate AGC circuitry to provide for compensation at low light levels.
TR 4.4	The lens shall be integrated with the camera.
TR 4.5	Video output resolution shall not be less than 1920x1080 pixels.
TR 4.6	The camera shall be capable to produce minimum 30 frames per second (fps).
TR 4.7	The camera shall provide automatic white balance, automatic exposure, automatic gain control, electronic shutter, and backlight compensation.
TR 4.8	The camera shall be a true day/night cameras with mechanical IR cut filter.
TR 4.9	The camera shall be capable of providing a high contrast colour picture with a full video output at a minimum illumination as mentioned in the specifications.

TR 4.10	Automatic light range circuits shall be included to provide compensation for variations in scene brightness. The circuits shall provide pictures over a light range of 1 million to 1.
TR 4.11	All cameras shall capture high definition video, compress the video using H.264 technique and transmit real-time using fibre optic based communications system.
TR 4.12	The cameras shall capture audio and compress using G.711 technique and transmit real-time using fibre optic based communications system.
TR 4.13	All cameras shall support on-board real-time video content analysis.
TR 4.14	All cameras shall support both Constant Bit-Rate (CBR) and Variable Bit-Rate (VBR) options.
TR 4.15	The camera shall support up to 2 video profiles, each providing independent configuration of bitrate, framerate and resolution.
TR 4.16	The camera shall support video compression from 64kbps up to 10Mbps.
TR 4.17	The camera shall support audio compression using the G.711 compression algorithm, streaming @ 32Kbps per channel sampled at 8KHz or 16KHz with a 16bit resolution.
TR 4.18	The camera shall support on-board storage via micro SDHC slot and card with a minimum capacity of 64 GB.
TR 4.19	All cameras shall have integral in-built adaptive IR technology. For fixed cameras, the IR shall support a range of at least 50m and for PTZ it shall support a range of at least 200m moving with zoom (adaptive).
TR 4.20	For Fixed Cameras: • The fixed camera shall provide a minimum focal length range of 2.8-10 mm compensated with a minimum 12x digital zoom and shall be remotely controllable from the camera control transmitter at ICOMC. • The fixed camera shall capture video using 1/3” progressive scan CMOS or better. • Fixed Camera resolution shall be 2048 x 1536 or better.
TR 4.21	For PTZ Cameras: • Camera shall have capabilities of PAN of 360° continuous. • Camera shall have capabilities of Tilt of 180°. • Lens of 4.3mm-129mm with minimum 35X optical and 12X digital zoom. • PTZ camera shall capture video using minimum 1/3” type CMOS sensor or better. • It shall support resolution of 1920x1080 or better. • Camera shall support tilt of 100° either side. The tilt capability shall include both the horizontal (level view) and vertical (downward view) position. If the camera travels beyond straight down, automatic image flip circuitry shall prevent the display of an inverted image. • The pan and tilt mechanism shall be an integral part of the camera.

	• Pan speed shall be between 0.1-350°/s and Tilt speed shall be 0.1-350°s.
TR 4.22	There shall be a minimum of 100 assignable automatic preset positions.
TR 4.23	There shall be a minimum of 8 definable privacy zones.
TR 4.24	All cameras shall provide effective 24/7 imaging performance for CCTV surveillance applications.
TR 4.25	All cameras shall provide user control, with remote configuration for functions including streaming and compression settings, exposure, white balance, flicker control, picture size, cropping/privacy, brightness, sharpness, saturation, day-night switching point, frame rate, image rotation, snapshot, dynamic bandwidth allocation and motion detection.
Network Video Recorder (NVR)	
TR 4.26	The Network Video Recorder (NVR) will be connected via a Gigabit Ethernet network.
TR 4.27	NVR shall be of N+N configuration with RAID 6 configuration.
TR 4.28	All equipment shall be designed to provide a usable life of not less than 15 years.
TR 4.29	The NVRs shall have a self-diagnostic feature including disk status, CPU usage, motherboard temperature, network status and fan status.
TR 4.30	The NVRs shall be support interface using 10/100/1000BaseTX. It shall support a total throughput of at least 700 Mbps.
TR 4.31	The NVR shall be powered using 100-240VAC/50Hz.
TR 4.32	Each NVR unit shall be maximum of 2U height.
TR 4.33	The NVR shall support both Linux and Windows platform.
TR 4.34	The NVR shall be capable of digitally signing stored video and digitally sign exported video to ensure chain of trust.
TR 4.35	The NVR shall have failover and redundancy built in with seamless playback without manual intervention.
TR 4.36	The NVR shall support a minimum of 200 recorded video streams and 20 playback streams with minimum playback of 400 Mbps.
TR 4.37	All equipment shall be modularly upgradeable so that it does not need to be replaced in its entirety to increase memory capacity, to upgrade processing performance, or to reconfigure I/O options.
TR 4.38	Normal state (non-alarm) recording configuration to provide for “Detection” as defined by ULC-317-1997 and as follows: • Resolution HD • Normal Frame rate of 25 FPS
TR 4.39	Alarm state recording configuration to provide for “Recognition” as defined by ULC-317-1997 and as follows: • Resolution of HD • Frame rate of 25 FPS • Alarm state recording of one track of audio at 32 Kbit

Central Application	
TR 4.40	The software shall be able to run on any PC based on industry standard OS.
TR 4.41	The software shall support ONVIF compliant cameras and devices.
TR 4.42	The software shall show live video from IP Cameras and Video Transmitters in MJPEG, MPEG4 and H.264 formats.
TR 4.43	The software shall support cameras with resolutions ranging from Standard Definition, High Definition (HD) and up to 5 Megapixel.
TR 4.44	The software shall show video across 4 displays per workstation - each display can have up to 25 viewing panes.
TR 4.45	The software shall allow configuration of the video and audio stream settings for each user, depending on the support hardware.
TR 4.46	Users shall be able to change the video pane layout in each of the 4 screens independently: • Grid layouts: 1x1, 2x2, 3x3, 4x4, 5x5 • Widescreen layouts: 2x3, 3x4, 4x6 • Hotspot layouts based on 3x3, 4x3, 4x4, 5x5 larger pane in top, left • Hotspot layouts based on 4x3, 4x4, 5x5 larger panes in centre
TR 4.47	Users shall be able to change the aspect ratio in each of the 4 video windows independently in order to display Standard Definition or High Definition video. Choose between: • Widescreen (16:9) • Standard (4:3)
TR 4.48	Users shall be able to move any image from one display screen to another via drag-and-drop.
TR 4.49	Users shall be able to digitally zoom up to 1000% and also digitally scroll live video from any camera using the mouse wheel.
TR 4.50	The software shall allow the removal of interlacing artefacts from 4SIF video using the following criteria: • Best performance • Best image quality • Smoothest rendering
TR 4.51	The software shall allow the display of objects detected via analytics on the video (up to 10 at once).
TR 4.52	Users shall be able to view stream statistics on all current video streams, including the following information: • Frame rate • Resolution (SIF, 2SIF, 4SIF,720p, 1080p, 5MP) • Current bit-rate • Audio bit-rate
General	

TR 4.53	The camera shall use an Ethernet 10/100Base-TX network interface with RJ45 connector.
TR 4.54	The camera and the associated equipment shall support communication protocols IPv4, IPv6, TCP, UDP, HTTP, HTTPS, DHCP, IGMP, ICMP, ARP, SNMP, Telnet, FTP, NTP, RTSP, and RTP as a minimum.
TR 4.55	The camera shall incorporate a built-in web server, built-in FTP server, and a built-in FTP client.
TR 4.56	The cameras shall have, at a minimum, the following configurable features: • Image resolution • Frame rate • Image quality adjustments (brightness and contrast) • Source and destination IP address settings • UDP port number • Bandwidth limits • Unicast and multicast settings, and • Support for two (2) simultaneous unicast streams
TR 4.57	The cameras shall support at the minimum three individually configured video streams. The cameras shall be capable of three or more simultaneous streams with one of the streams being in H.264 format.
TR 4.58	All cameras shall have an operating temperature range of 0°C to +60°C (14°F-40°F to 122°F) at humidity: 5% -95% RH.
TR 4.59	The environmental housing shall be of suitable size and provide a temperature controlled atmosphere for the camera, lens and receiver-driver.
TR 4.60	The housing shall allow for easy disconnect of all external cables.
TR 4.61	The housing, mounting arm and the dome camera installed assembly shall be suited to withstand wind gusts of 150 km/h.
TR 4.62	The housing shall meet the IP67, IK10 for protection.
TR 4.63	Operating Temperature for NVR shall be 10°C to +35°C.
TR 4.64	The cameras shall have a Mean Time Between Failure (MTBF) of at least 150,000 hours.
Emergency Call Button (ECB)	
TR 4.65	Emergency Call Button shall be integrated with the Multi-Services Digital Kiosks. Refer to the ECB technical specifications under Multi-Services Digital Kiosks specifications.
Emergency Contact Centre Solution	
TR 4.66	Emergency Contact Centre shall be installed as part of the ICOMC. Please refer to Contact Centre Solution as mentioned under ICOMC specifications.

5.5. Smart Governance and Smart Connect

5.5.1. E-Governance System

FR - 5 Functional Requirements

Civic Functions	
FR 5.1	BMC is responsible for the solid waste management, maintenance of street lights, storm water drains, supplying water and maintaining the sewer system. In keeping with smart city objectives, these functions shall be performed with the use of technology to minimize environmental impact.
FR 5.2	The solid waste solution shall use RFID chips for the bins and GPS devices for the evacuation vehicles. The Temporary transit stations shall be fitted with electronic weigh bridges, cameras, boom barriers and integrated for real time monitoring. The detailed specifications are given in further sections.
FR 5.3	The street lighting system shall be activated with motion sensors and ambient light sensors. The automatic alerts generated have to trigger events in the ERP system for maintenance purposes.
FR 5.4	The storm water drains will be fitted with level gauges and flow meters which shall be integrated into the control centre. The automatic alerts generated have to trigger events in the ERP system for maintenance purposes.
FR 5.5	Power, Water and Sewerage connections are to be handled by the electricity and water module of the ERP. The operation and maintenance of this system shall be on the basis of complaints registered in the grievance module which in turn shall trigger events in the ERP module.
Website	
FR 5.6	Bidder is expected to revamp and maintain the web sites of BMC, BSCL, BPTCL and BDA for the contract period. The following details are given for BMC. Bidder to extrapolate to all four.
FR 5.7	Home Page: A clean, visually compelling home page that quickly conveys to the visitor Bhubaneswar and what the BMC does.
FR 5.8	It would include (not limited to): • About Bhubaneswar • Message from the CEO • Investment opportunities • Information for tourists • Places of tourist interest • Transportation information • Weather information • Link to the portal • Tenders • Key statistics • City Information

	• GIS map • Links to Facebook, twitter etc. with integration of social governance. • Photo Gallery • Online Services listing • FAQs • Feedback • Contact Us • Log in • Search • News & Updates
FR 5.9	Corporate Branding: Clearly communicates a sense of 'identity' at first glance.
FR 5.10	Visual appeal: The site must have an attractive mix of text, images, audio and video.
FR 5.11	Fast Loading Pages: Optimization of web pages for a faster browsing experience with compatibility with key industry browsers and platforms.
FR 5.12	Responsive Design: The site must be mobile-optimized through responsive design methods. Therefore, it should detect that a mobile device is being used and present the user with the mobile version first. The user should be able to switch to the desktop version.
FR 5.13	Simple and clear navigation: The site should be easy to navigate. Information should be grouped and presented in a logical manner and require no more than three levels of "drill down" for the user to find the desired information thus creating a clean, clear, easy and satisfying user experience. This should include drop down menus, so that the visitor can easily find what they are looking for with a few clicks of the mouse.
FR 5.14	Search Tools: Provide search capabilities using key words or phrasing that will provide access to content from throughout the site. Additionally, make it possible to download historical and recent data whereby the user can define his/her preference. Select a platform that allows users to search content of the website easily and quickly without the need for extremely high speed devices (desktop, laptop and mobile) and high speed internet access.
FR 5.15	Links: Links should be placed within the website to allow individuals to contact institutions affiliated with the BMC and access to the portal as well the respective Ministries *(can be called Useful Links)*.
FR 5.16	Easy access to Key performance indicators: Seamless integration with BMC's dashboard data to provide continuously updated graphs and charts. This will be decided with BMC input & consent.
FR 5.17	News/Update feed: Constant and dynamic update feed on site home page. Displays announcements and notifications for new content additions on front page of site.
FR 5.18	Calendar: A dynamic calendar that displays events as well as filters for searching/sorting events.

FR 5.19	Contact Form: Provides a web-based contact form with anti-spam controls.
FR 5.20	Automated e-mails: automatically send follow-up emails to our stakeholders (subscribers) if they visited a specific web page, or completed some specific task (e.g. survey) on the website.
FR 5.21	Social Media Engagement Tools: New tools to improve interaction with social media
FR 5.22	Blog: The site should have a Blog section to facilitate discussions on various topics.
FR 5.23	Career: The site should have a career section which should accept online job application that would be fed directly into the HRM system.
FR 5.24	Language Options: The website ought to be easily translated into other languages – English, Hindi & Oriya.
FR 5.25	BMC Website app: The site should allow for the download of a BMC website app. The app should be compatible with Android and iPhones.
FR 5.26	Compatibility: Site must be compatible with Google Chrome, Microsoft® Internet Explorer 8.0 or higher, Microsoft Edge, Mozilla Firefox, and Safari 5.0 or higher.
FR 5.27	Mobile Access: Site must be “responsively designed” to accommodate mobile users. This must include accommodations for slower, cellular internet connections. This includes compatibility with iOS, Android and other industry standard platforms.
FR 5.28	Settings: Website must not require plug-ins as a default.
FR 5.29	Performance: Site must be able to handle multimedia (video) with high performance.
FR 5.30	HTML Compliance: Full compliance with HTML 5.0 or higher.
FR 5.31	Parallel sites: After ‘Go Live’ there should be two (2) sites running parallel, one for testing purposes and the other for production. All maintenance should be carried out in the test environment and be approved before migrating to the live environment.
FR 5.32	Easy Maintenance: Site should be easy to maintain, site should not require significant investment of time to keep site up and working with quick and easy fixes site should be easy to update with new content.
Design and Construction	
FR 5.33	Work closely with the BMC at each stage of the design to identify user needs and corresponding user interface requirements, workflows, and functionalities.
FR 5.34	Ensure integration of all elements including content, information format, compatibility with software platforms used by BMC and standards for content management.
FR 5.35	Select a platform that allows easy integration of multimedia products and user-friendly administrator interface.
FR 5.36	Create wireframes, storyboards and prototypes to propose options for implementation. Provide three (3) template designs for review in order to

	select a concept. Concepts should reflect the BMC's corporate identity, nature and purpose.
FR 5.37	Develop corresponding user interface components (web templates, style sheets, scripts, images, dashboards, social media interfaces) as needed.
FR 5.38	Use simple, cost-effective techniques to test designs with representatives of target audience prior to launch of site.
FR 5.39	Submit the final concept to BMC for review prior to 'going live.'
FR 5.40	Secure the existing website prior to transitioning to the new platform.
FR 5.41	Keep a full backup of the website through the duration of the project.
FR 5.42	BMC will own and host the new site design and will be provided with a full backup copy of the site design and code at the closing of the project.
FR 5.43	Content Migration - The complete migration of the new website to existing BMC URL. Deployment of new content.
Citizen's Facilitation Centre	
FR 5.44	The citizen facilitation centre would be manned by trained employees of the city. These employees shall assist the citizens with information, application or complaints. The employees shall also take care of e-mail, postal service letters and phone calls. The employees shall log into the portal and conduct the business required for the citizen.
Citizen Help Desk:	
FR 5.45	Facility to lodge New Complaints, Check Status • Integration Required with Grievance Redressal Module
FR 5.46	Facility to check citizen data • Birth / Death registrations • Bill Dues • Application Status • Payment Status • Renewal Status ➢ Integration Required with all Modules.
FR 5.47	Facility for Citizen Charter • Integration Required with Grievance Redressal Module
Application Acceptance and Delivery Outputs	
FR 5.48	Department-wise categorization
FR 5.49	Allow system to accept service specific inputs
FR 5.50	Capture of Mobile No. & E-Mail of Applicant
FR 5.51	Re-submission of rejected application after compliance
FR 5.52	Check-list for documents to be submitted along-with Application
FR 5.53	Define citizen charter (list of the officers & duration for service delivery)
FR 5.54	Fees to be accepted • Integration Required with Accounts

FR 5.55	Generate Token of Application acceptance
FR 5.56	Rejection Note in case of inadequate application
FR 5.57	Marking the application to Corresponding department /Ward / Officer • Integration Required with Workflow Module
FR 5.58	Delivery of the output through CFC or Internet • Integration Required with Departmental Modules
FR 5.59	**Payment Acceptance** • Integration Required with Accounts and Departmental Modules • Property Tax • Water Bills and Power Bills • License • All Departmental Services • Tender Document Fees • Any other
FR 5.60	**Citizen Services (General)** • Integration Required with Accounts and Departmental Modules • Nursing Home Registration (as applicable) • Registration of Hospitals • NOCs for other govt. departments • Tree Cutting / Trimming Service • Road / Water / Drainage / Electrical • Any other Service
MIS	
FR 5.61	SMS alert to applicant upon decision
FR 5.62	• Services Statistics • CFC-wise / KIOSK-wise • Department-wise
FR 5.63	Officer-wise list of services pending beyond the stipulated time • Integration Required with HRMS
Citizen Portal	
FR 5.64	It shall be a state of the art portal
FR 5.65	At the core of the stakeholders service experience will be BMC portal which will be a gateway to various stakeholders including citizens, tourists and businesses. The Portal will have an intuitive user interface for rendering various services and providing role based access to various systems in use at BMC. Through the Portal, any user can seek service, status check on service request, lodge an incident/complaint, get information, provide suggestions.
FR 5.66	The Face to face contact point for the citizens will be a Citizen Facilitation Centre. The Citizen Facilitation centre would be manned by trained

	employees of the BMC. These employees shall assist the citizens with information, application or complaints. The employees shall also take care of e-mail, postal service letters and phone calls. The employees shall log into the portal and conduct the business required for the citizen.
FR 5.67	The key objective of the Portal, Facilitation centre, Mobile App or the citizen centre will be to: • Provide Single Window services to citizens on anytime, anywhere basis • Provide a single and integrated view of BMC information system
FR 5.68	At each point, the process flow shall be through the portal.
FR 5.69	Broadly Portal is required to provide the following features • Role based access to core systems like ERP, GIS system and any other system • Link to E Government Services – Birth and Death certificate, Grievance redressal, Trade licenses, RTI, Legal case management • Management Reports and KPI Dashboard • Provision to request any service
FR 5.70	The portal would be accessed by: • General public & corporates • Citizen – residents • Tourists • Commercial establishments • Education establishment • Health establishment • BMC employees • Government • Third party vendor Each type of stakeholder shall have different needs and the portal will facilitate all requirements.
FR 5.71	The portal also needs to have mobile mirroring with Android, tablet & iPhone compatibility.
FR 5.72	Website, Citizen Portal and Mobile App shall be in English and Oriya and shall be user friendly.
FR 5.73	Website, Citizen Portal and Mobile App shall be single window service to stakeholders with a single and integrated view of BMC and BSCL information system.
FR 5.74	Multi-user system with multi-level security system included.
FR 5.75	The various users shall be authenticated from the common LDAP server for which the roles will get assigned from the server. Depending on their roles and responsibilities, the respective users should be taken to their respective home page. The layer shall visually integrate the applications in place with single-sign-on implemented. LDAP roaming profile shall ensure seamless mobility of the user.

FR 5.76	**Citizens who are residents:** This shall give him access to his ledgers, digital locker and registering complaints. It shall also facilitate payment of utility bills. The resident can swipe the smart card at either a kiosk or the citizen facilitation centre. Alternately they can log in using a property id. In any of the 3 cases, the basic data (including pending payments or dues) shall be populated for their viewing. The citizen can apply for certificates by clicking on the 'apply for certificates' link. This shall take the user to the e-Gov section for certificates. Similarly, the user may click on the RTI, Grievances or pay utility bills link by clicking 'apply for services'. It is expected that through one login one id, multiple departments can use common authenticated documents of a citizen from the respective citizen digital locker to provide services without the need of the citizen to provide same document to multiple departments within BMC. The citizen will need to interact with BMC for any of the following reasons (but not limited to): • Information • Consolidated application for utilities • Grievance / Complaints regarding municipal services • Primary education and medical needs (planned and maybe outsourced) • Allotment of Trade Licenses (direct or indirect) • Assessment & payment of taxes: Land related maintenance charges, and other government taxes as applicable • Utility Payment: Payments relating to electricity, water bills • Application & issue of Certificates • RTI All the above should be tiles on the landing page.
FR 5.77	**Industrial units** shall also have a section with a pre-decided format wherein they must upload key performance data every month or on a defined frequency. This will pertain to production, employment, tax paid, etc.
FR 5.78	**Commercial establishments** will have access to the data as citizens; with additions of links to the trade licenses of the e-Gov modules. They shall also have an MIS format to upload data for monthly MIS requirements.
FR 5.79	**Education institutions** will have access to data as above and in the future, will have a link from the portal for the citizen. They shall also upload MIS data such as (but not limited to): • Building self or rented and how much is area • Whether it has playground, lab facility, and library • Mid-day meals • Classrooms with infrastructure • Electricity • Water supply • Toilet availability • Gender wise students in each class

	• Teachers in the school with details (TGT PGT etc. and), Educational qualification, permanent or contractual, number of years of experience • School dropout rates • Passing students percentage It is required to create log-in category for educational institutions and formats for periodic upload of this data and flag delays in upload of the same. Further, there may be a need to integrate advanced technology such as virtual classroom with the e-governance services of BMC. The technology infrastructure required at the school level for the remote classroom shall be provided by the respective education institute but the necessary integration with e-governance shall be a part of the Project. In addition, the education institute will also integrate with the citizen smart card and periodically update information on citizens attending the school by sharing this information in a prescribed format to BMC.
FR 5.80	**Health centres** will have access to data as above and in the future, will have a link from the portal for the citizen. They shall also upload MIS data such as: • Patient Analysis • Utilization Reports for Nurses / Doctors • Occupancy reports • Patient Feedback Analysis • Generation of Daily/Monthly/Quarterly reports • Generation of reports required for Governmental bodies • Special Disease report • Birth & death intimation It is required to create log-in category for health centres and formats for periodic upload of this data and flag delays in upload of the same. Further, there may be a need to integrate advanced technology such as remote doctor, telepresence, appointment booking, availability of doctor, disease related information, etc. with the e-governance services of BMC. The technology infrastructure required at the health centre shall be provided by the respective institute but the necessary integration with e-governance shall be a part of the Project. In addition, the health centre shall also integrate with the citizen smart card and periodically update any information for the citizen by sharing this information in a prescribed format with BMC.
FR 5.81	**BMC employees** shall have access to the portal with respect to their work requirement. They shall access internal ERP and e-Gov systems for all approval and reporting purposes based on the clearances inherent in the role and hierarchy. The portal may be accessed for registering a complaint, issuing a certificate, verifying status of projects, updating GIS databases and other work flow requirements.
FR 5.82	**Any Outsourced employees:** They shall have access to operation and maintenance functions as required. Events shall be triggered on application for utilities, initiation of projects or receipt of complaints and passed on to the concerned employees.

FR 5.83	**BMC and Outsourced employees** shall have access to ERP & e-Gov modules. They shall also have access to the detailed desktop and web version of the GIS map to be able to respond to the event and update the database.
FR 5.84	Through service Portal, any user can seek service, status check on service request, lodging incident/complaint, getting information, providing suggestions.
FR 5.85	**Portal shall also be accessible in 3 languages – English, Hindi & Oriya**
FR 5.86	**Links:** Links should be placed within the website to allow individuals to contact institutions affiliated with the BMC and BSCL and access to the portal as well the respective Ministries *(can be called Useful Links)*.
FR 5.87	The user shall contact BSCL by following means: • In person through Citizen Facilitation Centre • Mobile Application • E-mail • Web Portal • Surface mail • Digital service kiosks In any of the above cases, the citizen query / data must interact with the ERP / e-Gov / Other system to be processed. It is expected that in any situation the query shall be directed to the portal and the data input by the citizen or the operator at the facilitation centre.
FR 5.88	**Easy access to Key performance indicators:** Seamless integration with BMC's and BSCL's dashboard data to provide continuously updated graphs and charts. This will be decided with BMC and BSCL input & consent.
FR 5.89	**Downloadable resources:** Provides a resource section with links to downloadable documents and templates appropriate to the audiences.
FR 5.90	**News/Update feed:** Constant and dynamic update feed on site home page. Displays announcements and notifications for new content additions on front page of site.
FR 5.91	**Calendar:** A dynamic calendar that displays events as well as filters for searching/sorting events.
FR 5.92	**Users-Only Content:** Certain content will be available ONLY to authenticated users. Account creation is limited to site administrators. User password recovery and profile management functionality is required.
FR 5.93	**Contact Form:** Provides a web-based contact form with anti-spam controls.
FR 5.94	**Social Media Engagement Tools:** New tools to improve interaction with social media
FR 5.95	**Blog:** The site should have a Blog section to facilitate discussions on various topics.
FR 5.96	**Career:** The site should have a career section which should accept online job application that would be fed directly into the HRM system.

FR 5.97	**Language Options:** The website ought to be easily translated into other languages even if documents remain in English.
FR 5.98	**Compatibility:** Site must be compatible with Google Chrome, Microsoft® Internet Explorer 8.0 or higher, Microsoft Edge, Mozilla Firefox, and Safari 5.0 or higher.
FR 5.99	**Mobile Access:** Site must be "responsively designed" to accommodate mobile users. This must include accommodations for slower, cellular internet connections. This includes compatibility with iOS, Android and other industry standard platforms.
FR 5.100	**Settings**: Website must not require plug-ins as a default.
FR 5.101	**Performance:** Site must be able to handle multimedia (video) with high performance.
FR 5.102	**Web Metrics:** Must be able to have a wide range of web analytics functionality that can track and analyse how people use the website and produce meaningful reports.
FR 5.103	**HTML Compliance:** Full compliance with HTML 5.0 or higher.
FR 5.104	**Content Migration:** MSI will transfer existing content into the new site template.
FR 5.105	**Parallel sites**: After 'Go Live' there should be two (2) sites running parallel, one for testing purposes and the other for production. All maintenance should be carried out in the test environment and be approved before migrating to the live environment.
FR 5.106	**Easy Maintenance:** Site should be **e**asy to maintain, site should not require significant investment of time to keep site up and working with quick and easy fixes site should be easy to update with new content.
FR 5.107	The Portal platform should support deployment on all three platforms - Linux, UNIX and Windows.
FR 5.108	The Portal platform should provide support for portal standards such as JSR 168, WSRP 2.0 and JSR-170
FR 5.109	Ability to provide single information view of the data coming from multiple sources such as web service, XML, SQL source, Web Pages and Spreadsheets.
FR 5.110	Should support Class II/Class III Digital Signature Certificate for Login, Signing & Encrypting massages & attachments.
FR 5.111	Support for centralized, web based user provisioning ensuring single definition of users, roles, groups and access rights.
FR 5.112	System shall have search capabilities that support powerful and comprehensive full-text searching, metadata searching or people search.
FR 5.113	It should support multiple databases like Oracle, SQL Server, DB2, Informix etc. without requirement of any additional software.
FR 5.114	Should be able to manage portal content using web content management from common content management repository through out-of-the-box integration.

FR 5.115	The portal solution should allow the users themselves to personalize their user interface.
FR 5.116	The portal solution should provide several layers of caching infrastructure to provide content to users. Access to content should be cached to reduce the load and increase performance.
FR 5.117	Portal should support a stand-alone, service-oriented architecture.
FR 5.118	Support for out of the box integration with content management system for web content management and publishing on the portal.
FR 5.119	Support for unified Single Sign On for internal integrated applications
FR 5.120	Support for personalization of home page using drag & drop functionality
FR 5.121	Support for personalized notifications and alerts
FR 5.122	The portal solution should provide analytics console for accessing portal metrics. The analytics console should be available as an integrated application so that the product is easy to learn and easy to deploy.
FR 5.123	The portal solution should provide secure and controlled access to the analytics console. Only portal administrators should be able to access the console without exposing data that might be sensitive or private.
FR 5.124	Portal should provide comprehensive tracking and graphical display of portal/community traffic, searched keywords, quick system response time (less than 1 sec on landing page), document downloads, user turnover, visit duration, etc.
FR 5.125	Portal should provide a next generation Web 2.0 portal framework built specifically for Web 2.0 services like wikis, blogs and other Collaboration functionalities like Communities
FR 5.126	Support for linking, tagging and RSS feeds
FR 5.127	Support for discussion forums
FR 5.128	Supports a single, integrated, best of breed development environment to enable consistent design time and run time environment.
FR 5.129	Leverages a common management console to manage all distinct applications/modules and also monitor performance.
FR 5.130	Provides ability to perform Advanced Search based on multiple metadata
FR 5.131	Supports secure crawling of the content sources and perform indexing
FR 5.132	Support for parallel querying to improve search query performance
FR 5.133	Search results are based on user's security role and display what the user is authorized to access.
FR 5.134	Ability to integrate with LDAP based security.
FR 5.135	Support for analytics on Search performed such as reports on most popular searches, documents not found etc. Based on this administrator can boost document relevancy and customize search results.
FR 5.136	Support for embedding Search as a Service so that searches can be invoked via Service API. Search facility should provide suggest facility

FR 5.137	It should provide rapid application development tool for designing the framework along with debugging facilities. This development tool should support server based implementation.
FR 5.138	Portal should provide Template driven portal development to simplify portal creation process
FR 5.139	The portal should implement security features, such as password complexity, automatic blocking (temporary/permanent) of user logins after given number of unsuccessful login attempts (should be parameterized), controlled access to content stored on the portal and logging of security incidents using Identity management solution.
FR 5.140	Reporting and Monitoring should be inbuilt and provided as part of Portal inherent capability.
FR 5.141	Inherent Portal analytics should be able to capture page traffic, portlet traffic, content usage, services and response times.
FR 5.142	Analytics console with inbuilt UI framework for Analytics reports, graphs and charts.
FR 5.143	Should support a single content management repository for both structured and unstructured content.
Birth & Death Certificate Module	
FR 5.144	Birth & Death Certificate Module shall have the functionality of offering following services: • Birth Certificate Application Request • Birth Certificate Application Status • Birth Certificate Printing • Birth Certificate Search • Birth Statistics • Death Certificate Application Request • Death Certificate Application Status • Death Certificate Printing • Death Certificate Search • Death Statistics • Birth Certificate Modification Request
FR 5.145	It shall be a Web based Scalable solution
FR 5.146	It shall have Secured authentication and authorization mechanism to enable internet access
FR 5.147	It shall have Scalable architecture framework for tech enabling plug and play solutions.
General Registration Requirement:	
FR 5.148	Portal shall have information about the Birth / Death processes & documents required for the convenience of the citizen
FR 5.149	System shall have facility to avail the service online & through CFC.
FR 5.150	System shall capture all the details and documents required for application

FR 5.151	System shall have facility to download required forms. System shall have provision for e-forms
FR 5.152	System shall have facility for online payment and through CFC.
FR 5.153	System shall have facility to send the alerts through SMS and email.
FR 5.154	System shall have facility to accept the request for certificate to be sent through courier/mail. For this system shall capture the address at which the certificate needs to be delivered and charges should be calculated accordingly.
FR 5.155	System shall have the facility to deliver the issued certificate via mail by official to the applicant.
FR 5.156	System shall have the provision to maintain Birth Register as defined in the process.
FR 5.157	System shall have the provision to maintain Death Register as defined in the process.
Registration of Birth/Death:	
FR 5.158	System shall provide an interface to hospitals/ individual for online registration of birth/death. Alternatively, same shall be done by CFC official using the similar interface once the information is received by the CFC official. The system shall follow due diligence to authenticate the identity of the applicant and the authority to apply and receive the certificate.
Data to be captured:	
FR 5.159	• Registration of Birth (Hospital / Home / Jail / etc.) ➢ Normal & Delayed Registration ➢ Child Details – Gender, DOB, Time, Weight, Name, Birth Place, Birth Mark etc. ➢ Parent Details – Name, Address, Qualification, Occupation ➢ Delivery Method, Informant Details, Attachments in case of delayed registrations ➢ Registration of Still Birth - Foetal Death Cause along with other birth registration details ➢ GIS (for marking the hospital + parents address) • Registration of Death ➢ Name and address ➢ Normal & Delayed Registration ➢ General Details – Gender, DOD, Time, Name, Attention type, Pregnancy related Death ➢ General Details –Death place type, death place, Cemetery type, Informants Details ➢ Medical Certificate Details - Death Cause, Death Manner • Defining charges For Birth and Death Services ➢ Delay Charges based on no. of days of delay ➢ Birth Certificate charges ➢ Death Certificate charges

	➢ Child Name Insertion charges ➢ Duplicate certificate charges • Integration with Web to validate the Birth / Death Certificate • Generation of birth and death certificates with provision of using digital signature and barcodes • Online facility for new hospitals to apply for registration to use the system • Integration to citizen and KPI database for updation and reflection in statistics.
Name Corrections in Birth/Death Certificates:	
FR 5.160	Govt. official shall be able to add/modify/delete the Birth and Death details based on the approval/right as per process.
FR 5.161	System shall have the facility to upload additional documents required.
Late Registration of Birth/Death:	
FR 5.162	System shall have the facility to allow the late registration of birth/death as per the rules.
FR 5.163	Application shall be automatically routed to the concerned Govt. Officials as per the duration gap of the registration as per the Birth/Death registration rule.
FR 5.164	Name Entry for Birth Registration
MIS:	
FR 5.165	Variety of Reports to be sent to State / Central govt. authority
FR 5.166	Monthly Summary Report of Birth
FR 5.167	Monthly Summary Report of Still Birth
FR 5.168	Monthly Summary Report of Death
FR 5.169	Birth / Death reports for various Health Schemes
FR 5.170	Reports to Health Department w.r.t. Death Causes in a particular period
FR 5.171	Reports to analyse services delivered through various delivery channels
FR 5.172	Birth Reports by Education of Father and Mother
FR 5.173	Birth Reports by Occupation of Father and Mother
FR 5.174	Birth Reports by Age of Mother
FR 5.175	Birth Reports by Sex and Month of Occurrence
FR 5.176	Birth Reports by Hospitals wise Counts
FR 5.177	Birth Reports by Sex ratios wise
FR 5.178	Child Mortality Report
FR 5.179	Report on Institutional Deaths
FR 5.180	Other periodic reports
Integration Requirement:	

FR 5.181	Document/workflow Management System
FR 5.182	Mailing and Messaging System
FR 5.183	SMS Gateway
FR 5.184	Accounting System.
FR 5.185	Finance System
FR 5.186	Payment Gateway
Trade Licensing	
This module shall have a linkage to the property tax module for appropriate tax assessment.	
FR 5.187	**Service Objective:** Permitting business units to trade
FR 5.188	**Stakeholders**: Citizen, Data Entry Operator, Marketing Inspector, Office Secretary, Dealing Assistant, Tax Collector, CEO
FR 5.189	**Process Input:** Declaration Form
FR 5.190	**Process Output:** Trade License
FR 5.191	**Integration Requirements:** SMS Gateway, Payment Gateway, GIS, ERP, Property tax, Utilities
FR 5.192	**Services:** License application, License Online Receipt Print, License Online Receipt Search, License Renewal
FR 5.193	**Configuration** • Business types - This includes the configuration of different business licenses. • Business Categories – This includes the configuration of business categories like Whole seller, retailer, manufacturer etc.
FR 5.194	**Master Data:** • Business owner types • Holidays • Products • License Types • License Groups • Licenses • Required Licenses • Business Rules • Product Usages • Product Permissions • License Reports • Signing Authority
Information in the Master	
FR 5.195	Sanitary zone/division information in the Sanitary Zones/wards/Division Master
FR 5.196	In the Revenue Master:

	• Revenue wards information under sanitary zones/wards/divisions • Revenue blocks under revenue wards information.
FR 5.197	Election Wards Information
FR 5.198	Locality categories
FR 5.199	Sanitary zones/ward/division allocation to Sanitary Inspectors (SI)
FR 5.200	Trade categories
FR 5.201	Sub-trade categories.
FR 5.202	Allow the configuration of: • Late fee details for the corresponding time periods in the penalty fee master • Trade rates • Revenue Block Categorizations
FR 5.203	Details of an applicant for a new trade license.
FR 5.204	Preparation of report of field inspection of the applicant's premises
FR 5.205	Recording the NOC/Installation Permission Details.
FR 5.206	Allow the Municipal Commissioner to view the recommendations of the SI/HO on a new license application.
FR 5.207	Facilitate the Commissioner to enter his remarks in the above case
FR 5.208	Capturing of the license fee/late fee details (Cheque/DD details, etc.)
FR 5.209	Generation of a new license after the information on the necessary approvals are recorded in the system.
FR 5.210	Allow printing of the license document from the system.
FR 5.211	Recording the application details from the application form submitted by the applicant.
FR 5.212	Data from the application collected for License renewal
FR 5.213	Recording of the trade License renewal details
FR 5.214	Recording of the Panchanama details collected from the SI reports
FR 5.215	Generation of the list of defaulters of renewal fees
FR 5.216	Generation of the list of license holders who wish to close their trades on their own
FR 5.217	Update the status of a trade license as 'active' or 'closed', and the reasons for closure are entered
FR 5.218	Recording of the details from the application submitted by the applicant for change of Title
FR 5.219	Generation of license with changed title, after necessary steps completed
FR 5.220	Allow printing of the above license
FR 5.221	Details of the un-assessed trades-individuals performing trade without a proper trade license

FR 5.222	Track the renewal notices sent to the license holders to renew their License.
FR 5.223	Track response dates, late fee applicability, etc. for the above
FR 5.224	Capture of grievances against a license, or in general.
FR 5.225	Generation of demand collection and balances revenue ward-wise for the ULB
FR 5.226	**Processes** • Issue of new license • Duplicate License • Registration of Application. • Verification of Application • License issue or rejection of the application • Renewal/Closure of license • Change in Name of Business • Change in Business • Transfer of License • Issuing the demand notice to the license holder for renewal of his trade license. Depending upon the timeliness of the payment of the license renewal fee, the license is either renewed or a closure notice is issued to the licensee. • Cancellation of License
FR 5.227	**Workflow** • Capture of License Details • License Holder's Details – One or multiple owners • Capture of Mobile No. / E-Mail ID • License holder's photograph(s) • Link to Property Number • License Details – Temporary/ Permanent License, Name of Business, Business Address, • Trade/ Business Details – License Type, Subtype - multiple levels to define types and sub types. • License type, sub-type, unit of measure wise license amount.
FR 5.228	**Issuance of License** • License Application • Calculation of License Fee • License Online Receipt Print • License Online Receipt Search • Letter of Intent • License Certificate • License Renewal
FR 5.229	**License Sanction Process**

	• Applicant Entry • Business Information Feeding and application number allocation. • Authenticate the application before registering it. • Receipt for issuing license. • Authenticate the application by the authority. • Sanction/Renewal of license • Rejection of license • Cancellation of application • Log Management of the issuing/renewal of licenses • Automatic/Manual Surcharge Calculation • Automatic Renewal of licenses on receipt but should be authorized by the authority.
FR 5.230	**Other departmental process:** • Scrutiny of Applications • Inspection Entry • Generation of Show cause Notice Hearing • Reminder Notice for Renewal • Cancellation of License by Force
FR 5.231	**Search facility** • For the issued licenses • Renewal of licenses • Pending Applications
FR 5.232	**The reports (at least):** • Different types of licenses • Pending Application Report • Expiry License Reports • Renewal License Reports • Notices for the renewal of licenses • Applicant List • Issued Card List • License Income Report • License status/log report
FR 5.233	**Integration with other Modules** • Finance module: - automatic posting of the receipt amount to the cash ledger and license ledger. Automatic renewal of the license on receipt. • SMS / email integration • GIS • ERP • Property tax • Utilities
FR 5.234	**MIS**

	• License Register • List of Defaulters • Reminder Notice for Renewal • Demand / Collection Register • Reports showing Changes in License Types, Business Partners, Cancellation Licenses, etc. • Facility to forecast the impact of reduction / deduction of License Fee
Right To Information (RTI) Module	
FR 5.235	RTI module shall provide all services under RTI under a single category
FR 5.236	RTI module shall be able to retrieve service request form
FR 5.237	RTI module shall be able to route the service request to concerned officer (Public Information Officer - PIO)
FR 5.238	RTI module shall have the functionality to accept service request even if the service request is not directed to particular section
FR 5.239	RTI module shall be able to route such application to CEOs' office for further re – routing
FR 5.240	RTI module shall allow CEO to allocate service request to concerned PIO for service request under "other categories"
FR 5.241	RTI module shall auto generate notification of pending service delivery request to concerned PIO on successful submission of service request
FR 5.242	RTI module shall be able to send SMS alert/Auto generated mails to the applicant and concerned authorities whenever required
FR 5.243	RTI module shall allow the concerned PIO to accept / reject the service request as per the guidelines of the RTI act
FR 5.244	RTI module shall in case of rejection, the system should allow the concerned PIO to state the reason of rejection
FR 5.245	RTI module shall in case of acceptance, the system should open a new page with all the accepted service request by the concerned PIO
FR 5.246	RTI module shall allow the PIO to send mail with a format of form B and Form C
FR 5.247	RTI module shall save the acceptance / rejection only on digital signature of the PIO
FR 5.248	RTI module shall auto generate notification to concerned officials about service request allocation
FR 5.249	The system should display content about RTI & RTI circulars. It should also display: • Names of PIO • Details of Departments: Introduction, Objectives, responsibilities, powers & duties of officers, employees with gross salary, activities, time limit, • Directory with telephone numbers. • Committee: Members, purpose, type, freq. of meeting, docs available for public.

	• Projects/ Activities: Budget head, work activities, allocated amount, current statistics. • Details of concessions, subsidies given, computerization done in various depts. • Integration required for updation of data for RTI with projects, accounts, HRMS, Fleet, material, asset. • Scope as per RTI Act
FR 5.250	Request shall be received on the portal, the mobile application or at the citizen facilitation centre. The request shall be forwarded appropriately and track kept of the information supplied and time lines. The request shall also be forwarded from the state government or information commission. In each case the information supplied has to follow the same path.
FR 5.251	MIS information shall include: • Number of RTI filed • Pending RTI • Department / Employees involved • RTIs closed
Legal	
FR 5.252	BMC shall decide what information shall be posted on the dashboard. The system should be linked to the ERP for payment to law firms. It should also link to the customer master (using property id) for any transaction / interaction / case for updation of current situation.
Master:	
FR 5.253	Advocates, Law firms & their fees
FR 5.254	Court Master
Case Management	
FR 5.255	Registration of new cases, allocate advocate, allocate BMC officer
FR 5.256	Facility to attach various documents related to the case
FR 5.257	Entry of Date of Hearing
FR 5.258	Alerts to officers w.r.t. hearing date
FR 5.259	Entry of hearing details
FR 5.260	Capture of judgment
FR 5.261	Details of payments to the advocates & law firms
FR 5.262	Linkage to the departmental data
FR 5.263	Linkage to GIS to capture location reference for cases
Legal Opinion on various departmental queries, agreement Formats to be stored in Document Management Module	
MIS	
FR 5.264	Case Pendency reports (Department-wise / advocate or law firm wise / Officer-wise)
FR 5.265	Reports w.r.t. Cases won / Lost / Appeals made

FR 5.266	Payments to the Legal Advisor / Law firms
FR 5.267	Repository for various act and provision with search option
FR 5.268	Integration / Link to Odisha Government site for references.
FR 5.269	Repository of all the cases since 1950 by High court and Supreme Court with search feature.
Welfare Schemes	
FR 5.270	Master Entry of the different Schemes • AIDS awareness • Family planning and MCH • School health program • Janani Suraksha Yojana • Jeevan Dayi Yojana • RCH programs • Self-employment slum / Non slum • Training schemes • Education • S.S.C. & H.S.C. scholarship schemes • Contributory Health schemes • ICDS immunization programs • Integrated child development project • Any other Schemes
FR 5.271	Creation of Database of beneficiaries
FR 5.272	Recording and accounting of the grants / funds received for implementation of various schemes
FR 5.273	Preparing of the budgets for the implementation of the schemes
FR 5.274	Allocation of work and fund required for implementation
FR 5.275	Recording and accounting for the expenditure incurred for the implementation of the project
FR 5.276	Generation of necessary reports needed to monitor the implementation of the schemes
Building Plan Approval	
FR 5.277	The Building plan Approval with Common Application Form is an E-Governance Project being developed under National Mission Mode Project (NMMP) in Bhubaneswar Municipal Corporation & Puri Municipality, Government of Odisha under JNNURM Program. This will have to be integrated with the ERP & E-governance system.
FR 5.278	This module must update the property master for appropriate tax assessment.
FR 5.279	Broad Functionality includes • Issuance of Commencement Certificate by applying through Common Application Form • Issuance of Occupancy Certificate

	• Empanelment of Technical Person • Renewal of Empanelment • De-listing of Empanelled Technical Person • Application View Interface to external agencies to add comments, process NOC.
FR 5.280	The system needs to be integrated with the existing applications for online citizen services and payments: • Axis Payment Gateway • Email and SMS services
FR 5.281	The entire application is broadly classified into four major sections as depicted on the figure above. • Client/Citizen Portal • Common Application Form • Building Plan Approval System • Citizen Delivery System
FR 5.282	Client/Citizen portal is the external interface where citizen and technical person are registered as a user to access the CAF application.
FR 5.283	Department users from BMC, BDA and external public agencies can access the CAF through Building Plan Approval system. Department users validates the documents as per the checklist based on project category, perform joint site inspection, if any discrepancies found during the process email or SMS notification sent to the citizen or technical person for re submission of application and supporting documents.
FR 5.284	External public agencies after site visit can put objection and provide comments to comply as per rules or can grant NOC for the same.
FR 5.285	Citizen Delivery system consists of all the MIS reports like site inspection report, employee turnaround time which are being used for departmental decisions.
FR 5.286	Key Features of client Portal • Technical person registration • Apply for Building plan approval using Common Application Form • Track status of application online • Apply for occupancy certificate
FR 5.287	Key Features of BPAS main portal • Receipt of Common application form • Add Noting, Site Inspection notice, forward to next level. • Auto Generated Scrutiny report • Upload NOC by public agencies • System generated building plan approval certificate
Property and Holding Tax	
FR 5.288	This module is currently being developed under NMMP program. Broad functionality is given below. Bidder shall make an assessment of the same and accordingly use, modify or replace the same.

FR 5.289	The Revenue department handles the assessment of holdings and based on the assessment calculate the holding tax and generates the demand letter.
FR 5.290	The key requirements for Holding Tax assessment includes the following sub-modules: • Collection of Holding Tax • Self-Assessment/ Calculation of Holding Tax by Citizens • Updating Property Attribute Information by BMC/PMC Staff • Migration of Holding Tax Data
FR 5.291	Holding Tax has got the nomenclature of Property Tax in Orissa Municipal Corporation Act, 2003. As per Orissa Municipal Act, the Holding Tax is a percentage of annual value. It constitutes the prime source of Revenue for the Municipal Corporation. The tax assessment base for Holding Tax may be on (a) capital/commercial value basis or (b) rental value basis. Holding Tax is paid annually as per the announcement of the concerned Municipal Corporation/Municipality.
FR 5.292	GIS Based property tax system covers the entire area of BMC jurisdiction and as a part of this system, a unique property tax identification number will be provided for each property. This unique identification number will be combination of ward number and plot number. GIS mapping of individual properties will bring un-assessed properties under the tax net. Satellite technology was used to measure the buildings, find out the nature of usage of the building, type of construction, number of floors and other related details.
FR 5.293	Geographic Information System solution consists of capturing, storing, editing, checking, integrating, manipulating, analysing and displaying geo-data related to positions on the Earth's surface and data related to attributes of the entities/holding tax payers in a ULB. Holding tax payer Indexing is defined here as a unique coding of index process for all types of holding tax payer into a data base structure, created with pre-determined attributes project area including locations with a facility using GIS tools to query and retrieve information. The holding tax payer indexing is essential for property tax database to maintain the system in a dynamic mode to meet the day-to-day imperative changes.
FR 5.294	The property data will have the Unique Identification Number generated from the new application which is a combination of Ward Number and Plot Number.
FR 5.295	All spatial data will be supplied by H&UD department which will be migrated to the new system. The spatial data will be available in .shp format.
FR 5.296	In order to hold property within the jurisdiction of the Municipal area, the property holder has to pay Holding Tax as per the Act.
FR 5.297	Any holding within Municipal Corporation limits having clear right, title, interest of the holder is liable to pay Holding Tax @ of 17.5% of the annual value of the holding depending on the nature of holding, i.e. either residential or commercial.
FR 5.298	Government buildings, Government Hospitals, Government Educational Institutions, Government Cultural Institution only pay 7.5% towards latrine

	tax & light tax and such institutions are being exempted of paying 10% Holding Tax as per the Act.
FR 5.299	In order to hold property within the jurisdiction of the Municipal area, the property holder has to pay Holding Tax as per the Act.
FR 5.300	Work Flow (As-Is Process Maps are given below)
FR 5.301	At the time of assessment /valuation if the ward supervisor / ward officer noticed that, there are buildings which are newly constructed. And till now they have not given the application for valuation of holding. For those building owners they will send the 1st Notice.
FR 5.302	Even after first notice, if the concerned person is not responding then the 2nd Notice will be send.
FR 5.303	Owner can submit the application directly without receiving any notice or even after receiving the notice.
FR 5.304	Submission of application form
FR 5.305	Once the valuation of the holding is done, next step is to send the notice of assessment where the tax details are mentioned.
FR 5.306	No Application form is submitted: - Even after sending the 2nd notice also if the person is not submitting the application form, in this case, BMC suomoto does the valuation and sends the notice of assessment.
FR 5.307	Based on the tax arrived in the notice of assessment BMC will send the demand notice.
FR 5.308	Holding Tax Calculation
FR 5.309	The amount of Holding Tax is different for both Residential & Commercial purpose.
FR 5.310	Residential: The Annual Value of a Holding for residential purpose is calculated as per following procedures: Step I - Plinth area of the holding in Sq. Meter x Rs 13.65 Step II - Deduct 15% of "Plinth area" towards repair & maintenance. Step III - Add 0.5% of the Land Cost where the holding is located (Land cost to be determined as per G.A. Department Notification dated 01.05.1998) Hence Annual Value Amount arrived through = (Step I + Step III – Step II) Holding tax is levied per annum@ 17.5% of the Annual Value whose break up is as follows: Holding Tax - 10% Latrine Tax - 2.5% Street Light - 5% Total = 17.5%
FR 5.311	Commercial: The Annual Value of Holding of a Commercial unit is calculated by the following procedures: Step I - Add Civil Cost of the Building + the cost of P.H & Electric fitting. Step II - Take 7.5% of the value arrived through step I Step III - Add 0.5% of the land cost with Step II Step IV - 17.5% of the Cost arrived at Step III is the Holding Tax payable per annum.
FR 5.312	Residential Holding Used On Rent: Tax to be fixed on holdings given on Rent the following procedure is followed: Step I - Monthly rent of the building x 12

	Step II - Deduct 15% of “Monthly Rent” towards maintenance cost Step III - Add 0.5% of the Land Cost where the building is located Step IV - Hence annual value of the building is (Step I + Step III – Step II) Holding Tax is levied @ 17.5% of the Annual Value arrived at Step IV
Integration with GIS	
FR 5.313	• Visualization of Property details in web based application for citizen • In case of updating GIS database, department user using needful application and workflow can update the holding/property data. • Thematic map view for department user to assess holding tax and due for the period. • User can print WYSIWYG (What You See What You Get) • The system should have provision using which the citizen can her/his calculate property tax based on attributes, geographical area and other variables using the GIS enablement data of his/her property online.

Process Flow (As-Is)

Bhubaneswar Municipal corporation
Department of Revenue Holding Tax Assessment & Collection
Owner
Applies for OC/BPA
Routine survey finds unassessed building
Prepare Ist notice form-143(5)
Ward Officer
List of holdings not assessed and tax not paid
Application for valuation of holding for assessment of holding tax
Yes
Assessment Done ?
No
Verifies form-143(5)
Ward Supervisor
Verifies the list & forwards to zonal deputy commissioner
Proceed with OC/BPA
Zonal Deputy Commissioner
Signs form-143(5) send to owner
Approves form-143(5)
Yes
Owner Responded
No
A
Ward Officer
Prepare the 2nd notice (Form-380) & forward to W.S
Ward Supervisor
Verifies form-380 & forwards to ZDC
Zonal Deputy Commissioner
Signs form-380 & sends to owner
Approves form-380
Yes
Owner Responds
No
A
Ward Officer
If the owner does not respond to the second notice also,BMC prepares the valuation and assessment of tax suo-moto.
A

A
Ward Officer
Does valuation of holding and calculation the tax and prepare notice of assessment
Ward Supervisor
Verifies the notice & forwards to ZDC
Zonal Deputy Commissioner
Approves the notice if tax<=10,000 Otherwise forward to AC
Is Tax <= 1000
Yes
Approve the notice & forwards to WO for demand notice
No
Ward Officer
Prepare demand notice & forwards to WS
Additional Commissioner
Approves & forwards to ZDC
Ward Supervisor
Verifies the notice & forward to ZDC
Zonal Deputy Commissioner
Forwards to WO for notice preparation
Zonal Deputy Commissioner
Approve demand notice upto Rs.10,000 above that, forwards to Additional Commissioner
Is Tax <= 10,000
Yes
No
C
D

Grievance / Complaint Redressal System	
FR 5.314	BMC provides various public utility services due to which, it might receive number of complaints/suggestions pertaining to its services. To address all these complaints it is necessary to have an efficient and effective grievance redressal mechanism. It helps in making the administration more accountable, responsive and user friendly. The objective of public grievance monitoring system is to provide multiple channels of grievance recording, in order to make it more citizens friendly and to provide linkages to different sections for increased transparency, citizen participation and performance accountability.
FR 5.315	BMC is very committed to high service levels to its citizens and has multiple mechanisms for citizens to register complaints. Some of these are: Mycitymypride, e-abhijog (run by the CM's office), a Monday grievance durbar, multiple help line numbers as well as the grievance redressal system developed under the e-municipality project.

FR 5.316	The purpose of this module will be to integrate inputs / complaints received on any of the systems and trigger events in the ERP system fir the complaint to be resolved efficiently. The work flows outlined in this document aims at effective monitoring of service levels and reducing repeat complaints.
FR 5.317	Grievance Management system should be a web based application where the citizen can send their concerned grievance & suggestion to the respective departments. The citizen may interact with BSCL and BMC using the portal, the mobile app, the kiosk or approach the citizen facilitation centre. In all these cases the work flow shall proceed from the portal.
FR 5.318	Once the grievance is received, it should have a work flow to trigger an event in the ERP system. The module should have a comprehensive Service Delivery Framework which – • Is easily accessible • Responsive to citizen's needs • Enables quick decision capability • Connects all stakeholders with right kind of information in the quickest possible timeline • Allows all stakeholders clear visibility and communication
FR 5.319	The solution should offers citizens ability of reaching out to BMC through variety of options to ensure broad based participatory framework of communication, thus enabling wider participation from citizens to improve service quality and civic liveability quality. The proposed system shall offer multiple options by way call-centre desk, walk-in at respective ULB offices, online through web portal, SMS & E-Mail, Web App, Mobile App, IVR, Call back service etc., to register a complaint. Further, a time bound call centre is also being proposed to support and manage in and out calls to and from Citizens. All complaints are to be allocated, routed and managed through an automated algorithm which is designed to identify actual resource within BMC to manage the complaint and thus removing human interface to work assignment. Further, concerned higher authorities within BMC are to be empowered with real-time mobile Apps and web Apps to monitor the complaint resolution process and capability to intervene if necessary, to help them in decision making process to take needful corrective actions. The system should automate enforcement of SLA policies and streamline and automate every process from initial citizen request to resolution more efficiently and cost effectively.
FR 5.320	The system should be capable of communicating with citizens and officers alike about the status and tracking of the complaints via SMS and email including unique tracking numbers.
FR 5.321	The complaint redressal system should enables configuration of BMC's respective geographical and administrative jurisdictions including service delivery essential information. The highest office in government pertaining to BMC management should have access capability to aggregated data and analytics from all the wards within the system.
FR 5.322	The system should have the ability to maintain different types of grievances caused to the citizens, department or section that needs to address the

	grievance, number of days within which the grievance needs to be addressed and nature of grievance whether it is financial or non-financial.
FR 5.323	It should have the ability to maintain the statuses of the grievances registered in the municipality. Also the ability to maintain the details of work/application that has not been addressed within the prescribed time, number of days of delay and compensation paid per day in case of delay in SLA of the grievances registered in BMC.
FR 5.324	The system must maintain the details of officers designated to redress grievances mapped to the department-section and the compensation details from the officer responsible and payment details to the citizens if the applications are not processed within the prescribed time. (Breach of SLA).
FR 5.325	On sending the grievance & suggestion the department officials are bound to respond to the grievance & suggestion as per the specified time frame. All grievances & suggestion would be allotted a unique number which would be the base for further correspondence. There would be automatic escalation plus provision for BMC staff to post confirmation of a 'before' and 'after' of the complaint. Following reports shall be generated by the applications: • All grievances registered during a given period • Pending grievance registered during a given period • Disposed grievance during a given period • Duration of grievances registered during the period • Repeated grievances registered during the period.
FR 5.326	All these reports can be generated departmental wise, grievance wise, department & grievance wise. On the basis of these reports analysis can be made and decisions shall be taken by government officials.
FR 5.327	BMC provides various public utility services due to which, it might receive number of complaints/suggestions pertaining to its services. To address all these complaints it is necessary to have an efficient and effective grievance redressal mechanism. It helps in making the administration more accountable, responsive and user friendly. The objective of public grievance monitoring system is to provide multiple channels of grievance recording, in order to make it more citizens friendly and to provide linkages to different sections for increased transparency, citizen participation and performance accountability.
FR 5.328	Modes of complaint registration
FR 5.329	• Through phone at call centre • Walk-in to a ULB office location • Online through web portal • Through E-Mail • Through SMS • Mobile App • Through IVR ➢ Based on Recorded details ➢ Call Back • Other existing complaint systems

FR 5.330	The system should be capable of converging information management and delivery system, which enables calls, collected through different communication channels to be converged on to the common distribution system and hence brings in commonality in allocation and response mechanism.
Complaint Registration	
FR 5.331	• Through Call Centre (Phone, e-Mail & SMS) ➢ A citizens calls designated telephone number ➢ Call centre operator registers the single or multiple complaints with required details ➢ Complaints through e-Mail / SMS shall be received at call centre ➢ Complainant shall be communicated the complaint tracking number(s) generated by the system and acknowledgement SMS send to the registered mobile number. • At ULB Location ➢ Citizen visits the ULB location in person to get his / her complaint registered ➢ Complaint shall be registered in the system with all due details and a printed acknowledgement receipt shall be given to the citizen. • Through Website ➢ Citizen shall be able to register his / her complaint on website and can print acknowledgement receipt • Through IVR ➢ Citizen calls on the designated number ➢ This feature shall be available when Call centre is not operational i.e. during non-working hours or when all lines at the call Centre are busy. ➢ Incase all the activated extension numbers are engaged with other calls or operator not available to receive calls, the IVR system activates call waiting message for the caller with the option to either wait or option to dial 9 and give missed call for call back to caller or register call via voice recording. ➢ IVR system shall record the complaint details provided by the citizen during the call ➢ Call centre operator registers the complaint based on the details provided in recording or calls back the citizen to register the complaint ➢ Citizen is given a complaint registration number via SMS
Complaint Allocation	
FR 5.332	Once a complaint is registered with the system, it automatically is assigned to a concerned area officer dealing with the problem based on the scientific algorithm engine built in to the system and allocation matrix defined. The system should automatically send an SMS to officer alerting him / her on the complaint. Application should offers following definable Allocation methods • Workload based allocation

	• Round robin allocation based on SLA hours • Sequential allocation of complaint to each member of the team If the complaint is not resolved and closed within the specified period, the same should get escalated to higher authorities. The allocation and escalation process should be fully automated and not require any human intervention; however, system should provide a feature to switch to manual allocation, if needed
Field Call Report in case of citizen area visit	
FR 5.333	The BMC officer updates the details of the work done along with the status of the complaint (Pending / closed) in the system against each FCR. The system shall maintain the history of the work done.
Complaint Closure	
FR 5.334	The officer needs to resolve a complaint within a specified SLA period. Once a complaint is resolved, the officer fills a field call report and submits to a superior, who in turn calls the complainant to seek his / her satisfaction on the measures undertaken to solve the problem. If the complaint is not redressed within a fixed number of hours, the system shoots off SMS to higher officials in hierarchy based on the escalation matrix defined.
Complaint Re-open Process	
FR 5.335	The Citizen has option to re-open his / her complaint if not satisfied with the services rendered. The Citizen can request to re-open the complaint via Email or Phone or SMS. Any complaint can be re-opened only if it is within the SLA or re-open hours set for that complaint. All re-opened complaints shall be escalated to concerned senior officials.
Complaint Status	
FR 5.336	The Citizen should be able to know the status of his / her complaint online from website or through phone / SMS.
Citizen Feedback	
FR 5.337	Citizen should have an option on the website to voluntarily provide their feedback on the complaint redressal process and also to comment on the satisfaction/dissatisfaction received by them while using the system.
Problem Category, Problem Category, SLA	
FR 5.338	The various problems, for which the complaints are raised, could be part of a particular Department. These problems are categorized as Drainage Maintenance, Footpath, Roads etc. could be part of Engineering department & Traffic signal/Central Verge plantation site, Tree cutting/trimming related problems could be part of Garden department. Application Administrator should be able to define standard SLA hours, problem category and problems. The application administrator shall be • Able to add/edit/delete standard SLA. • Able to add/edit/delete different type of problem category. • Able to add/edit/delete problems under problem category.

	• Able to attach standard SLA hours and department to each problem. • Admin shall be able to change status of problem category in active/inactive state.
Holiday, Department, Designation, Employee	
FR 5.339	The application administrator should be able to manage BMC's holiday calendar, department, designation and employee details in the system.
Allocation & Escalation Matrix	
FR 5.340	The application administrator should be able to maintain allocation matrix for the BMC's employees in resolving the various categories of problems for the area for which he / she is responsible to look at. This setup helps the Automatic Complaint allocation to the employees. Set the priority based on which the selected employee will receive the complaints for the selected department's problem category of his/her area. The application administrator should be able to set up the escalation matrix for each department at the various levels and to define what should be the mode of escalation communication for each of these levels and define their frequency. The system automatically escalates the complaints based on SLA, escalation matrix and the frequency defined.
Area Mapping, Area Transfer, Employee Transfer	
FR 5.341	Complaint allocation process should be tightly integrated with BMC's area, employees and complaints. Based on the problem location, the complaint should get allocated to the BMC official. Each area of a city is mapped with the BMC's operational area and each employee is mapped with location & department. The application administrator can transfer area from one operational area to another as well as an employee from one location to another. The transfer process shall be designed in such a way that all pending complaints shall be automatically be detached from the employee being transferred and the same shall be either automatically attached to the peer or higher official in hierarchy.
Complaint Transfer	
FR 5.342	ULB Official can transfer his / her pending complaints to another official from the same or different area / location.
Management Information System	
FR 5.343	Exhaustive reports ULB be generated by the system for officers at various levels for effective decision making and period review of operations. Some of the MIS reports generated from the system will be as follows: • Department Wise BMC Location wise SLA Summary (Within SLA v/s Beyond SLA) • Registration Mode wise Complaint Summary • Department wise ULB Location wise Average TAT Report • BMC Location wise TAT • Detailed Complaint Report with FCR

	• Detailed Complaint Report without FCR • SLA Wise Ageing Details • Location wise Complaint Status Summary • Complaint Transfer Summary • Department wise weekly status report – Registered, Closed, Within SLA / Beyond SLA • Reopen Complaint As on Date with complaint status • Location wise Registered v/s Closed Complaints • Missed call Detail • BMC Employee Reporting Hierarchy • List of on hold complaints • Operator wise / Location wise Login-Logout Report • List of mobile numbers from which complaints registered • List of complaints Transferred • BMC Location wise Standard SLA v/s Actual TAT report Real-time statistical reports for BMC locations/departments is made available to senior officers on web based as well as on based mobile applications.
Dashboard	
FR 5.344	Real-time processed information immensely aid senior officials in taking immediate corrective and preventive measures. Analytical reports help administration in identification of areas of concern and root-causes. The Grievances System shall provide a real-time dashboard.
Service Analytics Engine	
FR 5.345	The system should provide DIY (Do it yourself) data analytics platform based on the philosophy of analytics for all. The platform should provide a simple query bar and users can input their analytics requirements using a DRAG and DROP functionality. This offers enormous ease and ability to any kind of user irrespective of IT knowledge to mine high level analytics reports from the service data. The system should consume structured, semi structured and un-structure data to offer capabilities like deep web analytics. The system should offer advanced abilities such as: • Prescriptive analytics • Predictive analytics • Diagnostic analytics This ensures that users at different level can mine intelligence at click of a button which would aid policy decisions and empower the users to take quick and informed decisions.
Mobile App for Citizen	
FR 5.346	For a wider reach to citizen and leverage the mobile computing capabilities, Comprehensive Complaint Redressal System should have a mobile app for Smart phones. Citizen is made available a mobile app for complaint registration. The mobile app should have • Device Registration & profile creation • Complaint registration

	• Complaint Status • Upload geo location tagged pictures • Know your Location • Share App • Update Profile • Citizen Opinion
Mobile App for Complaint Closure	
FR 5.347	The mobile app should have a front-end Complaint Closure module for field. Below are the features of the Complaint Closure Mobile Application: • Easy-to-use authentication process via registered mobile number during initial application set up on the respective mobile devices • Facility to view the list of complaints allocated to the respective field officer along with the easy access to detailed information on each registered complaint • Visibility to problem location's image captured and submitted by the citizen, thereby facilitating field officer with ease of locating the problem area. • Real-time monitoring of problem based SLA compared to the defined SLA for each registered complaint allocated to the field officer, thereby allowing better complaint management. • The complaint is color-coded based on their defined SLA status and problem category – Red for complaints that crossed SLA period for resolution and Green for those complaints that are within SLA. • Facility to change complaint status from 'Open' to 'On Hold' or 'WIP' or 'Close'.
Decision Support System through Mobile App	
FR 5.348	By virtue of their duty, senior officials in ULBs and government are expected to move around. They demand a reliable and accurate system for taking necessary decisions in real-time mode. A mobile app developed for senior officers that provides real-time dashboard of operational parameters and highlights areas of concern. It also provides contact book of entire team, that immensely help senior officer in reaching out to the right officer instantly for taking appropriate and timely decisions.
Mobile Application	
FR 5.349	Bhubaneswar is a city of high tourist interest and hence the mobile application should be tourist friendly – having all information a tourist may require. This will include publishing transportation schedules, guides to different monuments, entry rates, amongst others.
FR 5.350	The portal should be mirrored on the mobile (all types of devices and operating systems) for an easy citizen experience. In addition work flows and alerts to officials shall all be integrated on the mobile device. In line with the NeGP objectives the MSI is required to deliver the following services through mobile governance
FR 5.351	The mobiles apps envisaged (but not limited to) are:

	• Grievances • Birth & Death • Trade licenses • RTI • Tourist • Property tax • Electricity bill payment • Water bill payment • Miscellaneous billing • Work flow for O & M
FR 5.352	E-municipality services including submission of forms and payments
FR 5.353	Acknowledgements and status updates related to delivery of public services
FR 5.354	Grievance registration and tracking
FR 5.355	Alerts related to emergencies, Government notifications and campaigns, weather information (for fishermen and farmers), tax reminders, pensions
FR 5.356	Alerts to nearest hospitals and police stations during accidents/ disasters
FR 5.357	Reporting suspicious activity to Law Enforcement agencies
FR 5.358	Maps and location-based services using GPS
FR 5.359	Employment opportunities (job ads, availability of jobs under NREGA)
FR 5.360	Mobile-based application filing, such as RTI filing, applying for government services, license renewals, etc.
FR 5.361	Citizen engagement: opinion polls and feedback gathering, stakeholder consultation
FR 5.362	Mobile-based polls
FR 5.363	Mobile work flow alerts to BMC employees.
FR 5.364	Mobile audit for BMC employees
FR 5.365	Ability to book key facilities at BMC
FR 5.366	Integration with weather, environmental and other sensors being provided
FR 5.367	The MSI is required to make the BMC Portal mobile-compliant:
FR 5.368	Open standards shall be adopted for mobile applications for ensuring the interoperability of applications across various operating systems and devices.
FR 5.369	Uniform/ single pre-designated numbers (long and short codes) shall be used for mobile-based services to ensure convenience: e.g. 51969 and 166 procured by DeitY for M-Gov Services.
FR 5.370	Exploit the exploit the mobile services delivery gateway, which would be a central hub for all mobile transactions for device and technology agnostic solutions.

FR 5.371	Provide mobile-based services through all delivery channels including SMS, Voice/ IVR, Unstructured Supplementary Service Data (USSD), GPRS/3G, SIM Toolkit, and mobile application store (m-Appstore).
Mobile Governance	
FR 5.372	Mobile mirroring is for web site, portal, e-governance & modules of ERP. It is also assumed that MSI would attempt to include as many services over mobile devices as possible, beyond the ones explicitly mentioned in this document. All the important features and functionalities envisaged in the present RFP should be made available through the mobile application. • The bidder should design the architecture and should be responsible for its robustness, reliability and scalability. The architecture as envisaged by BSCL is that the Portal provides the multi-channel communication interface which drives the mobile apps. • The Portal in turn integrates the ERP, e-Governance and other applications which are expected to provide out of the box proven and robust functionality which is running at multiple customer sites. • It is expected that the Bidder would study the detailed requirements related to ERP, e-Governance and other applications as specified in the RFP and detail out the functionality/business processes which would be provided on the Portal. • A subset of the Portal Functionality (which may be all functionality depending on the business process design suggested by the bidder) would be mobile enabled such as but not limited to the following: ➢ BSCL perspective: approval of leave applications, purchase requisitions, payment release etc., initiate a requisition, work order confirmation etc. ➢ Citizen perspective: apply for birth certificate, register a birth/death, lodge a complaint, pay property tax and other bills etc. ➢ Industry perspective: apply for water connection or electricity connection, apply for trade etc. • The bidder should not assume that the above mentioned examples is a complete list. It is repeated that the solution architects preparing the bid, must have an end to end business process perspective which cuts across business applications which also demonstrates the quality of resources deployed for preparing the solution design which should be included in the proposal. • Role based authorisation design should cover end to end business processes as well as the unit application component level The final list of business processes to be mobile enabled would be finalised during the project in a phase or sprint as planned by the bidder.
Web Based GIS	

FR 5.373	Orsac has already been contracted to survey and create the digitised map for BMC area. This map shall have plot boundaries. This is being executed on the ArcGIS platform of esri. The data shall be so available in a desk top version for editing. An arc GIS server shall be used for the web version and for publishing.
FR 5.374	The proposed Geospatial layer for different municipal functions will be as follows: • Municipal Boundary • Plot details • Property data • Land use: Residential, mixed, commercial, group housing, industrial, institutional, recreation, green areas/parks • Roads • Street lights • Water Supply lines: Supply lines, overhead tanks, valves, boosters • Storm water drains: Drainage networks, inlets • Sewage Lines: Sewage network and main holes • Electricity lines: electricity poles, substations, High tension lines. • Monuments and Heritage sites • Solid waste disposal sites and location of dustbins • Education Institutes • Health centres • Advertisement hoardings • Markets • Police stations/ chowkis • Post offices • Banks • Fire stations
FR 5.375	GIS integration aims at editing and publishing all the assets under BMC for better information management, accurate estimation and tracking. These assets can be streets assets, building assets, public assets and other transport and utility network.
FR 5.376	All the GIS layers are already available with BMC and the MSI is expected to create a web service according to the following requirements and publish it, along with customization of the application to integrate with e-governance and ERP modules and query modules. The MSI has to update the GIS data in the AMC period.
FR 5.377	BMC wishes to have 2 main views for publishing. • Public view: for common people who may view the vacant and occupied plots with all its attributes: dimensions, distance from roads and neighbouring plots, current land use and market value.

	• Second related view will be for Industrial or Citizen Residents. The query can be initiated using the resident smart card or QR code for access. In this view, ownership and tax details can be visible. • The detailed view will be for internal or city manager users. Here depending on authorisation level, data may be displayed. The editing rights of spatial and non-spatial data are with the city manager.
FR 5.378	The MSI shall keep the assets and their attribute information up-to-date. • Street Assets: Benches, street lights, traffic signals, signposts, garbage cans, fire hydrants, bus stops, bridges, overpasses and underpasses, tunnels, culverts, and guardrails. • Pipeline Network: Water supply system • Drainage Network: Rivers. • Utility Network: Electricity, cable, telephone. • Transport Network: Roadways, Rivers • Fleet Assets: Garbage trucks, ambulances, police vehicles, fire tenders, transport vehicles, construction equipment, and other vehicles. • Building Assets: Government offices, public buildings, educational buildings, public safety buildings, historic buildings, and sporting facilities. • Other Public Assets: Tourist facilities, religious facilities, monitoring stations, water and sewerage treatment plants, water wells, springs, reservoirs, dams, parks and playground equipment, trees, and car parks
FR 5.379	BMC internal users will require the following integration with the e-governance and ERP application: • Property Tax • Asset management- water, drain, sewage, electricity • Grievance redressal • Solid waste management • Utility payments • Land management system
FR 5.380	The integration has to be done on the concerned layer. The following are few of the integration points with the e-governance module
Property tax:	
FR 5.381	The attribute data with the property must store (but not limited to) data such as: • Property location geographic • Property location address • Status (vacant / sold) • Current use • Owner ship details • Property tax details

	• Utility details
FR 5.382	The user could: • Searching of Property Index Number • Property Tax link should be integrated and will have option to direct: • Property Tax-> Search on online receipt • Property Tax-> Search Ledger • Property Tax-> Pay online • GIS Application to Property Tax Module • Property Owner can be selected on the basis of : • Administrative boundary • Property Index Number • Property tax range selection • Period Selection • Who has paid, not paid. • On the basis of above search criteria, the selected Property data should be extracted: • Details of Property owner like Name, Address, PIN. • Details of Arrears There should be a link in Property Tax module for GIS View to drive into GIS Application to View/Analyse the property geographical locational details i.e. address, Plot Area, constructed area, etc.
The Utility Asset Management Module:	
FR 5.383	The GIS has to integrate with asset data of roads, water supply lines, sewage lines, storm water drains, electricity lines. The attribute shall include the following: • The location details • The geometry details • The engineering details • The attached property details
FR 5.384	The sub-modules should have the following functions: • GIS based Asset data visualization • GIS based asset maintenance management • GIS based asset construction management • GIS based web ticketing for complaint registration and solution
FR 5.385	The user should be able to annote the Place where the asset management activity is proposed by inserting a point/Line on the map and shall be created and saved in Project layer. A query can be generated on the project layer for Project Name, Functional Group, Budget, Project date and Project status. This may be accessed by other departments which will be affected by the project work.
GIS Application integration to Asset Management	
FR 5.386	• Searching of Zone/Ward/ GIS layers:

	• Built-up area for any property maintenance and Rent • Land use land cover (LULC) area for Vacant land • Transportation for any road maintenance • Sewage and Drainage for Maintenance • Public Lighting for maintenance • The Vacant Land will be linked with Asset Management-Asset Report-Asset Category-Market Value • This will be integrated with rent & maintenance • Query can be generated on project layer for Rent: Rent Type, Rental amount, Renewal date & Land: Market Value • The Building properties will be integrated with- Asset Management • Property Index Number
Solid waste management module	
FR 5.387	• Property Index Number Indexed with Garbage Collection Point(GCP) • Category of garbage collection points will be queried and viewed on Map based on PIN • Solid Waste Management-Reports-PIN, Category.
Utility payments	
FR 5.388	Utility payments link should be available. It should integrate and be directed to the following module:
FR 5.389	• Water & electricity Charges-> Search Connection Page • Water & electricity Charges-> Search online receipts • Water & electricity Charges-> Search Ledger • Water & electricity Charges-> Pay online Page • To select the consumer on the basis of : ➢ Administrative boundary o Zone o Word o Block/Locality ➢ Property Index Number ➢ Service No, ➢ Property Owner, ➢ House No.
FR 5.390	On the basis of above search criteria selected Property will integrate with utility payments Module (database) and highlight the search output (Spatial Highlights) in GIS application and dues report will be populated in a tabular Grid consisting of: • Details of Property owner like Name, Address, PIN • Details of Arrears.
FR 5.391	GIS integration with grievance management

FR 5.392	The public grievance can be made addressed through e-governance (to the ERP) application as well as through GIS. In grievance the citizens are expected to mention their complete address details or could use their QR code. And accordingly the grievance registration will be highlighted on the map.
FR 5.393	There shall be facility to mark the grievance to be addressed to which department. The grievance type shall be mentioned from options available: regarding service, bill payment, delay, incident etc. There will be grievance subtypes also.
FR 5.394	The grievance status shall be searchable by department as well as public: • By plot number • By ticket number • By grievance type • By Grievance subtype
FR 5.395	There shall be facility available to view the status of grievance resolving. • Solved • Unsolved • Under Process There shall be facility of escalation to higher level after a defined time period.
KPIs and Dashboard	
FR 5.396	Performance management, monitoring and evaluation are critical elements utilized by the city to improve organisational and individual performance and to enhance service delivery. The establishment and development of the performance management framework ensures integration between strategic planning and performance management by linking the solutions/services to indicators and targets that can be used to measure performance. Following is the proposed performance management framework, which is developed based on global city performance framework like ISO: 37120 and others
FR 5.397	**Service Performance:** Measures the performance of citizen services across areas like energy, water, waste, mobility, etc. to ensure more effective governance and delivery of services. Following are some of the illustrative performance indicators to assess performance across the areas of service performance: • Total electricity energy use per capita • Response time for emergency response services from initial call • Response time for fire department from initial call • Number of fire fighters per 100,000 population • Number of police officers per 100,000 population • Percentage of city population living in slums • Number of homeless per 100,000 population • Percentage of city population with regular solid waste collection

	• Percentage of city population with potable water supply service • Number of internet connections per 100,000 population • Number of personal automobiles per capita • Percentage of people using public transport to work • Doctor patient ratio in city hospital
FR 5.398	**Social Performance:** Performance management solution to monitor and track the performance of social services like health, education, safety, etc. This will help the municipals to assess whether the current state of these services is optimum and/or what are the improvement opportunities. Following are some of the illustrative performance indicators to measure social performance: • Percentage of students completing primary education • Primary education student/teacher ratio • Number of higher education degrees per 100,000 population • Number of physicians per 100,000 population • Percentage of convictions and case closure for criminal cases • Citizen score for city governance • Citizen score for citizen services • Doctor patient ratio in city hospitals
FR 5.399	**Environmental Performance:** Measurement of environmental health of the city to assess how good or bad is the state of environment and the areas the city needs to focus on for improvements. Following are some of the illustrative performance indicators to measure environmental performance: • Particulate matter concentration • Greenhouse gas emissions measured in tones per capita • NO2 concentration • SO2 concentration • O3 concentration • Noise pollution • Green area (in hectares) per 100,000 population • Annual number of trees planted per 100,000 population • And many more
FR 5.400	**Economic Performance:** Measurement of the state of the city's financials to track and monitor aspects like city's revenue generation, budgets, expenditure, industrial expansion, businesses development, employment, poverty etc. with the aim of making a city self-sustaining and increasing its revenue generation. Following are some of the illustrative performance indicators to measure economic performance: • City's unemployment rate • Assess value of commercial and industrial properties as a percentage of total assessed values of all properties • Percentage of city population living in poverty

	• Percentage of people in full time employment • Youth unemployment rate • Number of businesses per 100,000 population • Capital spending as a percentage of total expenditures • Own-source revenue as a percentage of total revenues • Tax collected as a percentage of tax billed
FR 5.401	The exact parameters will be finalized during implementation. However a performance management dashboard has to be provisioned and a facility to collect the information requirement for Dashboard has to be provisioned through Portal solution. It may also require integration with various information providers. MSI will be responsible for complete solution design along with integration with information sources for respective indicators. Wherever information needs to be collected from stakeholders residing in the township or entrepreneurs or various facilities in the township, portal solution will need to be developed by MSI so as stakeholders can provide the information required and the same can be presented on KPIs and dashboard.

5.5.2. ERP System

Functional Requirements

Revenue from Property Taxes, Land Leases & Other services	
FR 5.402	Detailed property tax functionality is given in the sections under e-governance. This module is currently under development and will need integration by the bidder. Functionality given below with respect to property tax is additional.
FR 5.403	• Property Tax: Creation of a sales order for property tax for each leased plot as well as periodic billing with functionality for : • The user to modify the property tax rates with history being maintained of the old rates • Property tax rates may vary from plot to plot and/ or customer to customer • Billing frequency of property tax may vary from plot to plot and/ or customer to customer • System should allow payment of early payment discounts • System should provide functionality for auto-generated reminder letter for unpaid property tax bills with automatic calculation and levy over interest and/or penalty • Tracking of payments received against property tax bills Interfacing (real time) shall be required with the Land Management System.
FR 5.404	Submission of property tax in subsequent years with changes or without changes in property details like structure, usage etc.: • Capture details of multiple owners • Handle listing of multiple usage types within a property • Handing rebates, specific standardized rules, and considering various factors while calculating ARV of the property. • Capturing floor wise details in case of buildings
FR 5.405	Functionality of Self-Assessment, subsequent assessments filed by the Citizen and making changes if any by BMC or BSCL.
FR 5.406	Functionality for revising property tax rates about issuing a notice to the owner/occupant informing him/her about the revision of rates. In case of joint ownership, functionality should provide for issuing notices to multiple parties. The address of these parties may not be the same as the property address and the system must be capable of storing these multiple address as per business requirement.
FR 5.407	Functionality for occupants/owners to file an objection against the revision notice.
FR 5.408	Fixing a Hearing in response to an objection by a citizen and issuing and intimation electronically and/or in letter format. The system should also

	provide the functionality to capture the proceedings of the Hearing and generating a final Hearing Order.
FR 5.409	Yearly property tax bill generation – handling arrears, penalty/interest, advance and self-assessment payments. There may be more than one component in the property tax bill like service tax or GST. The amounts against these components should be indicated clearly as separate line items
FR 5.410	Collection of tax payments with automatic bifurcation in predefined proportion or as per priority defined with handling of rebates for early payments
FR 5.411	Functionality for mutation (change in ownership) of property through heredity or by sale of property.
FR 5.412	Functionality for occupants/owners to file an objection against the mutation.
FR 5.413	Fixing a Hearing in response to the mutation objection by a citizen and issuing and intimation electronically and/or in letter format. The system should also provide the functionality to capture the proceedings of the Hearing and generating a final Hearing Order.
FR 5.414	Revaluation of Property upon survey/ identification of change in property by BMC.
FR 5.415	Customer Facilitation Centre: • Issue of transfer certificate • Issue of property tax assessment certificate • Issue of property extract • Issue of duplicate bill
FR 5.416	Functionality to upload existing property records with outstanding as on cut-off date that is available in digital format. System must provide functionality for manual data entry through user friendly online screens of such data
FR 5.417	Day to Day property tax related reports as per business requirement including interactive reports catering to what if scenarios
FR 5.418	Integration of property tax billing and collection status with GIS for visual display
FR 5.419	Advertisement Hoardings: • Creation of a sales contract and subsequent billing from advertisement hoardings • Registration of media agencies as customers • Functionality for booking an advertisement • Functionality for setting up new hoarding and display of advertisement • Functionality for renewal of advertisement contract
FR 5.420	BMC users must be able to carry out processes on the system like Contract Entry, Billing, Collection, Issue Renewal Notices, Contract Renewal, Suspension and Cancellation
FR 5.421	Rechargeable Work: creation of a sales order and raising an invoice for work done which is chargeable to a customer

FR 5.422	Usage of Telecom Fibre Network : creation of a sales order and raising an invoice for usage of fibre by telecom services providers: • Fixed rental basis • Percentage of revenue basis
FR 5.423	**Parking Lots**: Creation of a sales order and subsequent billing from parking lots
FR 5.424	**Miscellaneous Revenues**: Functionality to account for miscellaneous revenues from digital services, or rental for usage of community halls etc.
FR 5.425	Reports as per business requirements of BMC relating to Revenue from Property Taxes, Land Sales, Telecom Fibre Usage etc.
FR 5.426	**Rent and Lease**: • Booking of Estate • Rent Payment schedule • Department process like Contract Entry, Billing, Collection, Renewal Notice, Contract Renewal. • Reports
FR 5.427	**Advertisement & Hoarding (contract management):** • Registration of Media Agency • Application for booking of advertisement • Setting up new hording and display of advertisement • Renewal of Advertisement contract • Department process like Contract Entry, Billing, Collection, Renewal Notice, Contract Renewal, Suspension, Cancellation • Reports
Finance & Management Accounting	
General Ledger	
FR 5.428	Multi-currency functionality support and Indian GAAP (generally Accepted Accounting Principles) compliant ledger
FR 5.429	Functionality to define chart of accounts at group and entity level
FR 5.430	A robust journal with complete traceability of financial transactions. Entry deletion must not be allowed. Automatic reversal functionality must be provided for reversing transactions
FR 5.431	Posting of Transactions and Opening & Closing Periods
FR 5.432	Facility to create draft transactions with auditable transaction numbering feature
FR 5.433	Automatic transaction posting feature
FR 5.434	Feature to open and close financial periods
FR 5.435	Feature for adjustment periods in addition to the normal 12 periods for posting transactions in any financial year
FR 5.436	Feature to allow soft close and hard close of financial periods

FR 5.437	Restrict transaction posting only to open periods
FR 5.438	Capability to drill down into transaction details from period balances
FR 5.439	System should have functionality to maintain plan financial statements for any business unit within a legal entity or at corporate group level
FR 5.440	Facility to have hierarchical account structure
FR 5.441	System should allow maintenance of multiple plans for any financial year
FR 5.442	Provide the flexibility to record financial transactions for multiple legal business entities and generate required statutory financial statements like Profit & Loss, Trial Balance, Balance sheet and reconciliation reports for each entity
FR 5.443	Provide functionality for automated consolidation of accounts with out of the box functionality for setting-off of inter business entity payables and receivables consolidation of investments and multi-currency valuation
FR 5.444	Automatic generation of trial balance
FR 5.445	Provide functionality for the user to define the format and contents of financial statements.
FR 5.446	Provide multiple reports as required by users for monitoring and control purposes.
FR 5.447	Payments and Bank Reconciliation • Cash management forecast functionality • Bank transactions including reconciliation
FR 5.448	Manage incoming electronic payment and transfer of funds including net banking, credit cards or any other payment mechanism. Applicable for domestic(INR) and overseas payments in foreign currency
FR 5.449	Manage outgoing electronic payment and transfer of funds and transfer of funds including net banking, credit cards or any other payment mechanism. Applicable for domestic in INR and overseas payments in foreign currency
FR 5.450	Process cash and cheque payments with automatic handling of outstation cheques in Indian of foreign currency
FR 5.451	Re-grouping of GL balances according to pre-defined rules for statutory reporting; system should provide necessary information for preparing year end schedules for audit purposes
FR 5.452	Re-valuation of balances and open transactions in foreign currency according to local and global accounting standards
FR 5.453	The system should be able to generate a payment acknowledgement as and when required.
FR 5.454	System should have functionality to manage travel management and other transactions related to employees; should have functionality to maintain account for each employee
FR 5.455	Manual and automated cheque printing.
FR 5.456	Facility for preparing a forecast with varying time horizons. Provision required for automatic bank reconciliation

FR 5.457	Taxation, duties and levies accounting of tax transactions, detailed information flow, challan preparation and filing of different tax returns according to federal as well as state government legal requirements.
FR 5.458	Facility to maintain accounts as per Indian statutory requirements.
FR 5.459	Compliant with the GST procedures to be implemented in India.
FR 5.460	Facility to have multiple tax structures on transactions
Accounts Payable	
FR 5.461	Multi-currency functionality
FR 5.462	Automatic reconciliation of sub-ledgers with the control account in the General Ledger
FR 5.463	User must be able to create/maintain Vendor master record. Common master data of vendors with procurement is required
FR 5.464	Functionality to process one off payments for vendors with whom BMC does not intend to have a long term business relationship and maintain a separate master data record
FR 5.465	User defined facility to classify vendors in groups and assign separate number ranges. These number ranges could be assigned externally or internally by the business entity. The external number require flexibility to have alphanumeric characters
FR 5.466	System should allow fast data entry of invoices based on purchase order etc.
FR 5.467	The system must allow the business entity to assign vendors to separate control accounts in the general ledger
FR 5.468	System should provide functionality for electronic approvals of invoices based on preconfigured rules
FR 5.469	Functionality to block process vendor payments in case of dispute at invoice level or vendor level
FR 5.470	System must handle multiple modes of payment including electronic and must generate output as required by banks
FR 5.471	System must have necessary controls for managing sensitive information for vendors e.g. vendors' bank accounts
FR 5.472	Recording and monitoring of bank guarantees
FR 5.473	System should provide functionality at master data level of vendors to restrict operations of these accounts only by a certain set of employees
FR 5.474	System must allow monitoring of advances given to vendors
FR 5.475	Functionality for processing of payments for vendors with automatic vendor account posting and clearing
FR 5.476	Automatic system calculated TDS deductions for vendor payments
FR 5.477	Automatic posting of input tax (GST) whilst vendor invoice processing
FR 5.478	Functionality of automatically handling re-imbursement of expenses like transport, insurance during vendor invoice processing

FR 5.479	Whilst processing payments either automatically or manually, for vendors, the system should allow the advances to be adjusted partially or fully
FR 5.480	Facility to issue credit/ debit notes by the system
FR 5.481	Functionality for handling imports with T/T and L/C Process
FR 5.482	Functionality for system generated letters to vendors for balance confirmations
FR 5.483	Out of the box availability of reports for vendor reconciliations and other reports as per user requirement.
FR 5.484	Out of box functionality for online inquiries on vendor balances on various parameters and statuses
FR 5.485	System should have a strong reporting functionality that includes analysis of vendor master data, open invoices, overdue payments, payments made in advance, blocked invoices report etc.
Accounts Receivable	
FR 5.486	Multi-currency functionality is required
FR 5.487	Automatic reconciliation of sub-ledgers with the control account in the General Ledger
FR 5.488	User must be able to create/maintain Customer master record. Common master data of customers with sales/invoicing is a requirement
FR 5.489	Functionality to process invoices of one time customers where BMC does not wish to maintain a master debtors record
FR 5.490	Facility to classify customers in groups and assign number ranges. These number ranges could be assigned externally or internally by the business entity. The external number range may have alphanumeric characters
FR 5.491	The system must allow the business entity to assign separate control accounts for customers in the general ledger
FR 5.492	Functionality to block posting customer accounts
FR 5.493	System should provide functionality at master data level of customers to restrict operations of these accounts only by a certain set of employees
FR 5.494	System must allow monitoring of advances received from customers
FR 5.495	Automatic processing of receipts via cheque, electronic funds transfer or other means with auto posting of output tax which may be in the form of GST, VAT, sales tax, service tax or any other municipal levy. There could be business instances of more than one central tax, state tax or municipal levy
FR 5.496	While processing receipts either automatically or manually, for customers, the system should allow the advances to be adjusted partially or fully. The posting to customer debtors account should be automatic with clearing of the required entries
FR 5.497	Facility to issue debit notes and/or credit notes as applicable with ability to provide discounts and rebates
FR 5.498	Automatic interest calculation for overdue payment. The system must allow the user to specify the interest rates for a customer or a group of customers

FR 5.499	Functionality for automatic generation of reminder letters for overdue payments in the accounts receivable. The letter format should be user definable
FR 5.500	System should have functionality to provide reports including open customer invoice, payments received (partial or full), ageing analysis according to overdue dates
Asset Financial Management	
FR 5.501	Generate automatic asset numbering as well as manual numbering
FR 5.502	Maintain detailed information per asset item: asset description, asset class, asset serial number, asset bar code, location, asset main category and sub category, department/cost centre, custodian, employee number, purchase date, depreciation start date, service start date, vendor, PO reference, invoice reference, warranty start date, warranty end date, acquisition cost, salvage value, useful life and depreciation method and any other relevant asset information
FR 5.503	Maintain collective information of low value assets like items of furniture
FR 5.504	Define parent child asset relationships
FR 5.505	Add additional upgrading cost to an existing asset. System should provide a report showing the history of upgrades and also include the addition into the new depreciation run over the remaining period of the asset. E.g.: Capital construction projects
FR 5.506	Capture work in progress (WIP)/construction in progress (CIP) assets and later on convert them as normal assets and start depreciating
FR 5.507	Add WIP/CIP expenditures to an existing CIP assets through the accounts payable system
FR 5.508	The asset system should be allowed to be marked as physical inventory tracking asset and should generate physical inventory reports
FR 5.509	Ability to split an asset into multiple assets
FR 5.510	System should be able to depreciate assets using common depreciation methods: • Straight line • Double declining balance • Written down value method • User defined method of depreciation • Number of hours etc.
FR 5.511	Ability to calculate depreciation based on groups of assets: • By department • By cost centre
FR 5.512	Ability to recalculate depreciation on asset: • Based on a change in value • Based on a change in depreciation schedule • Based on a change in asset life
FR 5.513	Ability to capitalize assets

FR 5.514	Ability to perform “un-planned" depreciation
FR 5.515	Ability to automatically process and post transactions: • Depreciation expenses • Cost Adjustments, if any
FR 5.516	System should allow user definable depreciation formulas
FR 5.517	Ability to define depreciation conventions, such as Mid-Month convention, End-of-the-Month Convention etc.
Asset Transfers	
FR 5.518	Transfer assets between: • Divisions/Departments/Cost Centres • Locations • Custodians • Projects • Work Package (within a project) • Job (Specific activity within the work package)
FR 5.519	Transfer all or part of an asset
FR 5.520	Transfer groups of assets
FR 5.521	Ability to generate transfer slips in case of asset transfers
Assets Retirements	
FR 5.522	Fully retire
FR 5.523	Partially retire
FR 5.524	Retire by units
FR 5.525	Retire by cost
FR 5.526	Reinstate retired assets
FR 5.527	Ability to process sales of fixed assets with the Automatic creation of gain/loss transactions
FR 5.528	Different retirement accounts for gains and losses
Revalue assets	
FR 5.529	Revalue assets (change the basis of depreciation and net book value) and adjust the cost of an asset, e.g. capitalization of renovation cost, useful life, depreciation % and write off amounts
FR 5.530	Ability to revalue a single asset or group of assets based on percentage or value
FR 5.531	Ability to record and amortize revaluation reserve based on International accounting standards
Physical verification	
FR 5.532	Ability to maintain a physical control of assets and be able to track assets by serial number, asset number, custody number and project/ cost centre/ location.

FR 5.533	Ability to create a Fixed Assets Verification Sheet, containing asset code, location, physical balance.
Insurance	
FR 5.534	Ability to track asset insurance details such as sum insured, premium etc.
FR 5.535	Ability to generate a report showing insurance expiry dates
Reports	
FR 5.536	Generate fixed assets register by: • Department/Section • Location • Gain and Loss on asset sales • Projected Depreciation • Custodian • Cost Centre wise • Period depreciation reports – summary • Asset depreciation per period • Period
FR 5.537	Generate asset depreciation register (detail and summary)
FR 5.538	Report on fixed asset transactions history (i.e., *fixed asset movements*)
FR 5.539	Generate unposted depreciation calculation report before transferring them to GL but after running depreciation in the assets module
FR 5.540	Asset cost report
FR 5.541	Asset report by major and minor category
FR 5.542	Following activities should generate a report output: • Asset transfer • Asset Disposals • Asset retirement in the form of sale, scrap, write off etc. • Asset addition
FR 5.543	Generate automatic reconciliation report for GL and depreciation register
FR 5.544	Retirement Register by month / asset number” • by department • by location/region • by account • by account segment • by retirement type
Management and Cost Accounting	
Planning Budgeting Funds and Grants Management	
FR 5.545	Maintain an auditable record of source of funds which can be in the form of Grants, Loans, Equity, Debentures or any other source of funds which be appropriate for BMC.

FR 5.546	Provide the functionality to grant approvals for individual projects and maintain and auditable record of the source of funding for each project
FR 5.547	Maintain of record of the plan versus actual capital expenditure at project level
FR 5.548	Tracking of utilization of funds at project level with multi-level roll-up functionality
FR 5.549	Provide flexibility in reporting for budgeting and variance analysis
FR 5.550	Provide flexibility in reporting of spend and utilization reports
Management Accounting	
FR 5.551	System should have functionality to define internal organization structures for segment reporting and for internal reporting
FR 5.552	Should have functionality to amend organization structure according to business needs with complete audit trail of changes done
FR 5.553	System should have functionality to record business transaction for financial as well as for management account at the same time
Costing	
FR 5.554	Ability to capture and report costs against each dimension in the chart of account structure such as unit, department, location, product, project etc.
FR 5.555	Ability to define cost centres across the organization , including multiple legal entities under a common management control
FR 5.556	Ability to define various elements of costs for cost sheet preparation
FR 5.557	Facility to pool costs and then allocate / reallocate costs to other cost centres / across organization based on predefined basis
FR 5.558	Ability to create flexible cost collectors to collect costs for specific purpose / objective
FR 5.559	Ability to settle such collected cost to another cost centre, asset or WBS element or project
FR 5.560	Ability to print various cost allocation schedules prior to the financial closing of the period
FR 5.561	Ability to allocate overheads either on a percentage basis or as quantified by the service providing department
FR 5.562	Ability to allocate indirect process unit costs to direct process units based on direct cost ratio
FR 5.563	Ability to rerun cost allocations when the underlying data changes
FR 5.564	Ability to combine the costs for several input sources and allocate in one allocation source through parameters
FR 5.565	Ability to allocate common costs across departments/ products / units based on predefined basis.
FR 5.566	Provisions to add relevant taxes and duties wherever applicable
FR 5.567	Facility to reconcile costing reports with financial reports

FR 5.568	Flexibility to accept new detail lines/parameters for preparation of cost sheets
FR 5.569	Ability to derive the costs centres or cost collectors automatically based on the normal accounting postings
FR 5.570	Ability to assign budget for these cost collectors
FR 5.571	Ability to track the actual costs and budget costs on these cost collectors
FR 5.572	Ability to support variance analysis between budget and actual across various periods.
FR 5.573	Ability to set up availability control on these cost collectors and set up warning or error messages when the budget exceeds / matches the actual costs
FR 5.574	Ability to create these cost collectors for reporting purposes only as these costs cannot be allocated further
FR 5.575	Ability to compile the total costs in the primary cost collectors and settle the costs to other cost collectors
FR 5.576	Ability to create various reports about the costs collected in these cost collectors at various time periods and compare them with the budgets
FR 5.577	Ability to compute costs for inventory valuation purpose based on defined accounting policy
FR 5.578	Ability to support categorization of costs into fixed/ variable costs at process/product/cost centre levels or as required by users.
FR 5.579	Ability to accept costs/rates on adhoc basis, where prices have not been finalized.
FR 5.580	Ability to maintain mapping between chart of accounts and costing system along with cost centre/responsibility centre system.
FR 5.581	Ability to allocate cost in the same original GL account Head to multiple cost centres or other cost objects
FR 5.582	Ability to assign Fixed Assets to Cost Centres
FR 5.583	Ability to capture depreciation for cost sheet preparation from the fixed asset module
FR 5.584	Ability to charge of Depreciation to assigned cost centres automatically, while posting Depreciation entries
FR 5.585	Facility to determine cost for any process with or without depreciation and interest component and ability to transfer relevant amount to subsequent process.
FR 5.586	Ability to maintain cost sheets prepared on multiple basis for the same period for comparison purpose.
FR 5.587	Ability to perform Cost allocations (plan/actual cost accounting) based on full costs. Costs are not split into fixed and proportional costs as only a consolidated entry is posted onto the cost collector, for example canteen costs
FR 5.588	Allow to calculates wage costs using the fixed hourly rates determined in cost centre planning

FR 5.589	Allow Standard costing and Marginal Costing
FR 5.590	Ability to do Activity based costing
FR 5.591	Ability to collect actual Labour / factory overheads based on the settings like activity allocations made in the system
FR 5.592	Ability to have Cost Centre Accounting, including itemized costing for specific business events like marketing campaigns or trade fair participation
FR 5.593	Ability to add one or more cost centres or one or more nodes of the standard hierarchy for Cost Centre
FR 5.594	Ability to get the breakup of costs by way of different accounts
FR 5.595	Ability to get itemization or details of the standard cost estimates, where we can get the breakup of costs in the required parameters
FR 5.596	Ability to consider the planned overhead costs in the standard cost estimates based on cost centre planning and activities
FR 5.597	Ability to consider various overheads like material overheads, production overheads and Admin overheads
FR 5.598	Ability to cost roll up from lower levels to higher levels of WBS for Projects
FR 5.599	Ability to maintain cost estimates for materials sent on sub-contracting
FR 5.600	Ability to estimate costs and maintain costs for previous, current and future period in the system
FR 5.601	Ability to cost the subcontracting materials and the status of material lying with Sub-contractors
FR 5.602	Various MIS Reports based on the standard and actual costs and the analysis of variances
FR 5.603	Real-Time Integration of Costing with Financial Accounting
FR 5.604	System should have functionality to manage expenses incurred on work or jobs carried out for internal or external customer
FR 5.605	System should provide functionality to plan internal and external resources for various categories of jobs
FR 5.606	System should allow planning of various types of costs for different categories of jobs
FR 5.607	System should have functionality to keep track of costs and resources consumed on maintenance of internal or customer assets
FR 5.608	System should provide adequate control mechanisms for complete lifecycle management of a job or a work order; should have functionality to approve or reject a particular job or a type of expense for a job
FR 5.609	The module shall have: • Define Chart of Accounts as per the guidelines of NMAM • Maintain Bank Account Details • Maintain Details of Vendors • Budget provisioning – Provision for Original and Revised Budget

	• Re-appropriation of Budget between accounting heads • Provision to records Receipts • Transfer of Receipts – cash/cheque to Bank Accounts • Record direct debit/ credit to bank accounts in books of accounts • Entry of Bills /Invoice Received from vendors • Authorization of bills as per the work-flow defined • Payment Vouchers once the payment is approved. • Keep track of Cheque books and cheque leaves. • Facility for cheque printing • Direct Payment up to specific limit • Journal Voucher Entry • Authorization of Journal Voucher • Contra Voucher Entry • Reversal of Vouchers • Provision for Bank Reconciliation at any point in time. • Manage Deposits received from vendors, citizens. • Keep track of Grants received and expenses made against the specific grant • Keep record of Investment made and interest accrued on the investments • Loans management • Advances management
FR 5.610	Books of Accounts and Registers: • Cash Book, Bank Book, Cashier's Cash Book • Ledger – Single or Multiple account heads • Trial Balance, Income & Expenditure, Balance Sheet • Cash Flow Statement • Bill Register • Payment Register • Deposit Register • Investment Register • Loans Register • Advances Register.
Purchasing and Inventory Management	
Purchase Requisition	
FR 5.611	Ability to create Purchase Requisitions for goods and services
FR 5.612	Ability of employees (or authorized users) or departments to create requisitions and have visibility of PO's issued against these requisitions
FR 5.613	Ability to convert requisition to request for quotations (RFQ) automatically. RFQ should be attached to selected vendors based on past data/performance

FR 5.614	Ability to consolidate multiple purchase requisition from different departments
FR 5.615	Ability to monitor the status of purchase requisition raised
FR 5.616	Ability to attach documents (e.g. Word, excel, pdf etc.) with the header and lines of purchasing documents (PR, RFQ, Quotes and PO).
FR 5.617	Ability to raise Purchase Requisition against a project
FR 5.618	Ability to raise Purchase Requisition for service contract with vendors
FR 5.619	Ability to automatically create requisition if the quantity on hand goes below re order level
FR 5.620	Approvals of these requisition should conform to the powers vested in signing authorities. Necessary workflows must be available to facilitate approvals on the system
Receive & Evaluate Quotation	
FR 5.621	Ability to prepare Request for Quotation against a purchase requisition
FR 5.622	Ability to electronically send the request for quotation and link it to multiple Bidders
FR 5.623	Ability to enter the quotes received
FR 5.624	Ability to have an expiry date for the Quote
FR 5.625	Ability to Analyse Vendor's Quotations (Technically, Financially) on following criteria • Lowest Price • Best Delivery • By assigning points on quality offered • Payment Term • Landed Cost (Freight etc.) • Relationship with Vendor (Agent, supplier etc.) • User definable criteria System should be able to evaluate the quotation on the basis of above criteria
FR 5.626	Ability to copy vendor's quotation into PO either as a whole or selected lines
Purchase Order	
FR 5.627	Ability to convert quotation/requisition to purchase order
FR 5.628	Ability to create multiple purchase orders against a single quotation/requisition
FR 5.629	Ability to create purchase order for goods and services
FR 5.630	Ability to create purchase order for service contracts with vendors
FR 5.631	Ability to create long term contracts in the system with either a limit either on time period, quantity or value either a limit either on time period, quantity or value
FR 5.632	Ability to create multiple releases against the long term purchase contracts

FR 5.633	Ability to create replenishment automatically for specific items with respect to the inventory norms defined I.e. safety stock, reorder point, inventory turns
FR 5.634	Ability to enter the PO's in different currencies in the system.
FR 5.635	Ability to record purchase order acknowledgement from vendor
FR 5.636	Ability to enter price, state taxes, central taxes, GST, municipal levies, payment terms, special discounts, delivery instructions, delivery schedule etc. in purchase order/release order
FR 5.637	Ability to set receiving tolerance limits in purchase order or service order
FR 5.638	Ability to set 2/3/4 way matching requirements in the purchase order
FR 5.639	Ability to send approved PO electronically to vendors (Fax, email etc.)
FR 5.640	System should allow reprint of PO with 'copy' marked on the print out
FR 5.641	System should be able to capture information pertaining to freight, insurance, etc. at each line item selection as per the terms (CIF, FOB, etc.)
FR 5.642	Ability to capture penalty clause in PO (% wise, daily rate and lump sum)
FR 5.643	Ability to enter project details while creating purchase order and interface the details to project
FR 5.644	Purchase order processing is part of the procurement of materials and services. Its primary purpose is to convert demands to purchase orders (with or without reference to a contract) or delivery schedules for a scheduling agreement and to monitor the fulfilment of these documents
FR 5.645	MRP requirements linked to business plans and repair and maintenance programs
FR 5.646	Prepare and dispatch RFQs/RFPs/RFIs
FR 5.647	Consolidate discounts across orders under particular contracts
FR 5.648	Consolidate dispatching PO’s and PO lines against vendors
FR 5.649	Requirement to separate out carriage and transport costs
FR 5.650	Requirement to dispatch PO’s via various methods i.e. web, email, fax, post.
FR 5.651	Ability to assign Follow-up dates on purchase orders
FR 5.652	Ability to record Comments for follow up activities
FR 5.653	Ability to track different stages of a purchase order (like - In-progress, approved, rejected, closed etc.)
FR 5.654	Ability to follow up of shipment which are in transit by sea or air
FR 5.655	System should have provision for registration of documents received, awaiting arrival of ship
Receiving Good/Services	
FR 5.656	Ability to receive gods and services against a purchase order
FR 5.657	Ability to record inspection report for items

FR 5.658	Ability to update inventory on item receipt / post-inspection clearance for items with mandatory inspection requirements
FR 5.659	Ability to generate receiving document on receipt
FR 5.660	Ability to receive un-ordered receipts or substitute items with proper authorization as defined by business
FR 5.661	Ability to record multiple receipts against a single PO
FR 5.662	Ability to record serial number, expiry date and batch number during receipt for specific items (tracking item by serial number e.g. meters for water & electric tracking item by serial number e.g. meters for water & electricity)
FR 5.663	Ability to record labour hours and material consumed by an internal employee or contractor against a maintenance work order. These entries must reflect in the costs accumulated against a specific work order.
FR 5.664	System should have provision for rejection of unacceptable items with creation of Discrepancy Report
Invoice Receipt	
FR 5.665	The solution must accommodate various types of receipt - standard 3-way match, blanket (i.e. limit) order receipting, exemption on receipt for orders up to a specified value. Additionally the user must have an option of a 2 way match where the vendor need not submit an invoice. The payments are cleared by comparing the G/R or service entry sheet against a PO or purchase contract.
FR 5.666	**Receiving an Incoming Invoice,** The ability to receive, enter, and check vendors' invoices for correctness. The ability to manually enter incoming invoices and automated procedures for creating invoices, such as the automated processing of receipts or goods and services.
FR 5.667	**Verifying an Incoming Invoice The ability to check** incoming invoices for correctness in terms of their content, prices, state taxes, central taxes, GST, municipal levies and arithmetic, thus defining the basis for the payment run. The price and conditions are compared to the conditions in the purchase order, or the invoiced quantity is compared to the received quantity. If differences exceed user defined limits, the invoice should be blocked automatically for payment. Tax calculation and processing of delivery costs are also to be integrated
FR 5.668	The ability to for one person to process/verify the invoice and another person to approve the processing and processing of vendor invoices is required. Workflow functionality is necessary to control the process.
FR 5.669	**Release of Blocked Invoices** The ability to release invoices that have been blocked can be released for payment using a monitor function. The ability to automatically release of invoices for which the blocking reasons have been clarified. Workflow features support the release process.
FR 5.670	Requirement to create self-bill invoices against agreements or Contracts from within the solution.
FR 5.671	Requirement to reject invoices if they are not valid or legal documents.
Maintain Vendor Records	

FR 5.672	Ability to maintain the following information per vendor:
FR 5.673	Vendor code
FR 5.674	Vendor name
FR 5.675	Multiple Contact name
FR 5.676	Multiple Vendor address
FR 5.677	P.O. Box
FR 5.678	E-mail address
FR 5.679	Phone number (multiple)
FR 5.680	Fax number
FR 5.681	Default payment / credit term
FR 5.682	Default currency
FR 5.683	Multiple Vendor bank account number
FR 5.684	Default delivery options
FR 5.685	Product Description/category
FR 5.686	ISO Certification & validity
FR 5.687	System to be able to classify vendors as registered/ unregistered and certified/ uncertified, international/domestic.
FR 5.688	System to be able to capture the rules on which the vendor is to be assessed
FR 5.689	Ability to automatically update vendor rating based on pre-defined rule
FR 5.690	Ability to maintain approved supplier lists for inventory items
FR 5.691	Same entity can be both customer and vendor, link to be maintained and referred as related party
FR 5.692	Ability to have vendor specific payment terms
Approval Hierarchies	
FR 5.693	Ability to designate approval hierarchies to approve Purchase Requisitions, Purchase Orders and Vendor Quotations based on the following criteria:
FR 5.694	Amount limit
FR 5.695	Item ranges
FR 5.696	Account Ranges
FR 5.697	Ability to send an electronic notification to approver to take action on the Purchasing document submitted for approval
FR 5.698	Ability to send an electronic notification on approval or rejection of purchasing document (PR, PO and Quotation) to initiator
FR 5.699	Ability to automatically forward document for approval to next person in hierarchy if the document is delayed beyond the specified time with a designation
Purchasing MIS	

FR 5.700	Ability to track the status of PR's with respect to PR log date, Item code, quantity etc.
FR 5.701	Ability to track the status of PO's with respect to PO log date, Item code, quantity and expected time of arrival of the shipment
FR 5.702	Ability to generate report on pending PR/PO supplier-wise, item-wise and department-wise
FR 5.703	Ability to generate report when level stock on-hand below reorder level with information on PO pending, PR pending etc.
FR 5.704	System should have the ability to print summary of expected receipts
FR 5.705	Ability to print purchase register for the month
FR 5.706	Ability to generate reports on documents pending for approval on which no action has been taken for more than N number of days.
FR 5.707	Ability to inquire / report on the item purchase cost history over a user defined date range
FR 5.708	Ability to generate receipt register
FR 5.709	Ability to perform ageing analysis for outstanding Purchase Orders based on cost centre, vendor etc.
FR 5.710	Functionality to generate statutory reports/returns as required by state government for filing sales tax and/or excise duty returns
Maintain Inventory Items	
FR 5.711	Ability to setup and maintain item codes with different segments
FR 5.712	Ability to maintain the following information for items but not restricted to:
FR 5.713	Item code
FR 5.714	Item description
FR 5.715	Purchase lead time per item / supplier
FR 5.716	Vendor item code
FR 5.717	Default purchasing unit of measure
FR 5.718	Minimum stock level
FR 5.719	Item Status (Active, Obsolete, Blocked etc.)
FR 5.720	Expiry Date
FR 5.721	Serial Number and Batch Number (for serialized inventory tracking and batch tracking)
FR 5.722	Barcode
FR 5.723	Ability to group items into categories and sub-categories
FR 5.724	System to be capable of linking the supplier item code with the item code in the item master
FR 5.725	Ability to maintain conversions between units of measure
FR 5.726	System should have provision for serial-number control of items

FR 5.727	System must support bar coding and have the ability to scan pre-printed form containing bar codes, quantities, and item descriptions
Item Catalogs	
FR 5.728	Ability to maintain catalogs item-wise and supplier-wise
FR 5.729	Ability to update catalogs periodically through catalog imports
Locations	
FR 5.730	System should support creation of multiple warehouse locations and attach type/ categories of transactions which the warehouse locations can support
FR 5.731	System should have the ability to support warehouse area classification
FR 5.732	Ability to categorize locations and assign items to locations
Maintain Kits	
FR 5.733	Ability to define bill of materials/Kits
FR 5.734	Ability to explode bills and transfer individual items to Inventory
FR 5.735	Ability to combine individual items and issue the master item
Maintain Stock Levels	
FR 5.736	Ability to maintain minimum stock levels for items
FR 5.737	Ability to generate alerts if the quantity falls below pre-defined limits
FR 5.738	Ability to allow negative stock for specific items and record appropriate costing entries
FR 5.739	Ability to classify items based on ABC classification. ABC classification should be based on value of stock & value of movement within a year
Item Costing	
FR 5.740	Supports the following costing methods:
FR 5.741	Standard
FR 5.742	FIFO/LIFO
FR 5.743	Weighted average
FR 5.744	Ability to track the item cost for all material transactions
Transactions	
FR 5.745	Ability to define transaction types and set pre-defined rules for each transaction type
FR 5.746	Ability to issue items against:
FR 5.747	Internal Requisition (IR)
FR 5.748	Maintenance Work Order
FR 5.749	Material requisition from projects
FR 5.750	Ability to generate pick-lists for all material issue
FR 5.751	Ability to generate pick list sequentially. (If the store-keeper goes to a particular area system should give all items to be picked from that area)

FR 5.752	Ability to print location information on pick-slip
FR 5.753	Ability to inspect items on receipt
FR 5.754	Ability to Record quality issues and defect if any
FR 5.755	Ability to scan and record barcode information at the time of receipt
FR 5.756	Ability to upload Goods receipts voucher details from excel to the system.
FR 5.757	Ability to record items returned from Projects to Inventory
FR 5.758	Ability to provide provision for ageing inventory
Monitor Ageing Stock	
FR 5.759	Ability to generate stock aging report based on the receipt date by:
FR 5.760	Aging slots (in days)
FR 5.761	Item-wise
FR 5.762	Category-wise
FR 5.763	Ability to generate stock ageing analysis based on the receipt date
Physical Inventory & Cycle Counting	
FR 5.764	Ability to generate count sheets based on user defined criteria:
FR 5.765	Quantity, e.g. include items with quantity above 10 pieces
FR 5.766	Value, e.g. include the items with unit value above 50K
FR 5.767	Item Category
FR 5.768	Location
FR 5.769	Ability to sort the count sheets by:
FR 5.770	Item
FR 5.771	Location
FR 5.772	Shelf / bin number
FR 5.773	Ability to perform a re-count if the stock difference is beyond pre-defined limits
FR 5.774	Ability to identify the type of physical count adjustments as:
FR 5.775	Shortage / Excess
FR 5.776	Damaged (With percentage damage)
FR 5.777	Non usable items (scrap)
FR 5.778	Ability to monitor the items as count in progress, completed etc.
FR 5.779	Ability to define the cycle count frequency per item, e.g. every 30 days
FR 5.780	Ability to freeze normal inventory transactions during physical count
FR 5.781	The system should post the stock adjustments only after approval in system
Forecasting	
FR 5.782	Ability to perform min-max and re-order point planning

FR 5.783	System should have the provision for using standard Inventory forecasting techniques
Inventory MIS	
FR 5.784	Ability to report the transaction statistics by type (e.g. number of receipt transactions, shipments, transfers, returns etc.) by product group and month
FR 5.785	Ability to generate material transaction register
FR 5.786	Ability to generate item movement report to track all transactions based on following criteria
FR 5.787	Period-wise
FR 5.788	Item-wise
FR 5.789	Category-wise
FR 5.790	Transaction type wise
FR 5.791	Ability to generate damaged stock report
FR 5.792	Ability to generate stock expiry report period-wise
FR 5.793	Ability to track items reserved with reference
FR 5.794	Ability to track slow moving items based on following criteria
FR 5.795	Percentage movement
FR 5.796	Period-wise
FR 5.797	Item-wise
FR 5.798	Category-wise
FR 5.799	Transaction type wise
FR 5.800	System needs to provide a report at the end of each physical inventory/cycle counting/perpetual stock count indicating product category wise, item-wise, location wise, period-wise variances between the actual physical stock and stock in the system
FR 5.801	Ability to generate report on ABC classification based on stock value and movement in a year
FR 5.802	Ability to generate report on inventory balance on-hand with GRV details
FR 5.803	Non-moving items for a selected period detailing complete history from receipt until the last issue
E- Procurement	
General	
FR 5.804	The system must be able to log all the activities carried out on the system by any user.
FR 5.805	The administrator shall be able to make intelligent search on the log based on user name, time period, type of activity, etc.
FR 5.806	Audit trail of the entire system operations shall be maintained in secured environment.

FR 5.807	The E-Procurement system should adhere to stringent security norms like SSL, firewall and other security guidelines
FR 5.808	E-Procurement system will have native integration with back-end functionalities for operational procurement, inventory management.
FR 5.809	E-Procurement system will be capable to handle both materials and services
FR 5.810	The solution should have comprehensive business workflow engine to create and manage different kind of workflow requirements triggered by specific events.
FR 5.811	E-Procurement system should have comprehensive functionality for supplier evaluation
FR 5.812	Supplier evaluation can be done based on past purchase transactions considering different parameter like price, quality, delivery, services etc. The score of these parameters could be calculated automatically by the system or entered manually.
FR 5.813	System will have provision to conduct supplier evaluation based on feedback from business users through questionnaire. The questionnaire can be triggered on specific events automatically by the system or by conducting a web-based survey.
FR 5.814	It shall have standard reporting formats available. Reports shall be available in these standard formats at any given time.
FR 5.815	The system must provide detailed drilled down reports.
FR 5.816	The system must enable user to configure/develop reports on different parameters for trend analysis, reports on supplier participation etc.
FR 5.817	Management of user IDs and password and setting up hierarchy levels and role definitions for different users.
FR 5.818	The system must provide a supplier administration module to add, delete, enable or disable the suppliers or supplier group.
FR 5.819	The system must provide for reports in both flat file and Excel formats.
FR 5.820	The E-Procurement system should have document collaboration facility among Client, bidders and suppliers. They should be able to share documents in a secured manner online. The upload, download and storage of the documents would be folder-based and easy-to-use.
FR 5.821	The solution will have in-built capability to create purchasing documents, legal contracts with clauses, terms & conditions etc. and stored in a structured manner. The output could be PDF MS Word or XML file.
FR 5.822	Facility for empanelment/registration of suppliers on the portal
FR 5.823	Provision to create different questionnaire for different product categories and services
FR 5.824	Supplier will be able to register or apply for certain product or services themselves over internet by entering/answering basic questions.
FR 5.825	Based on supplier selection or application, a questionnaire can be sent to supplier in a secured manner to get more information

FR 5.826	The quotations can be categorized.
FR 5.827	Questions can be answered through texts, checkboxes, yes/no with validity.
FR 5.828	Designated person can check and review answers of the questions and then approve or reject the registration request.
FR 5.829	There will be supplier directory to check different supplier with their statuses
FR 5.830	Potential suppliers can be confirmed to be supplier of materials or services
FR 5.831	Supplier will receive administrative login and password information so that they can maintain their own information online
FR 5.832	After approval, supplier will be able to get notification for tenders, purchase order etc. to collaborate with Client
FR 5.833	Suppliers will get administrative role to create other user ids for their organizations to carry out different purchasing activities according to different roles.
E-Tendering	
FR 5.834	Employees will be able to raise purchase request themselves or on the behalf of other employee
FR 5.835	Solution should have the capability of team purchasing where they can do all the sourcing activities as a team and collaborate
FR 5.836	The system shall be capable of handling limited tenders, open tenders, global tenders, rate contract, reverse auction etc.
FR 5.837	There shall be no limit with the system in terms of interacting with Payment Gateways for purpose of financial transactions.
FR 5.838	E-tendering system will support complex service procurement where service can be defined in a multi-level service hierarchy with defined value limit
FR 5.839	For each type of payment, the work flow for making payment shall be part of the process. For example, if vendor has to make payment for tender form, the web page where tender forms are listed shall guide the user to make payment. Once the vendor chooses to pay he shall be taken to the payment gateway and payment shall be accepted.
FR 5.840	System shall be capable for adoption for supporting different kind of formats of tenders, tender conditions and output reports as defined by the Client
FR 5.841	The base currency of the System must be Indian Rupees. The currency shall be customizable/configurable in case of global tenders.
FR 5.842	The system must allow Users to locate tenders quickly through on-line search facilities in a variety of ways including tender no, generic descriptions, etc.
FR 5.843	The system should provide the following bid stages in the tendering process: • Pre-Qualification bid stage

	• Technical bid stage • Reverse auction • Price/commercial bid stage • Single stage, techno-commercial bid stage
FR 5.844	System should be configurable to create various types of users as mentioned below: • Authorized personnel from Client for access and use of the different modules of the system like NIT, bid preparation, bid evaluation etc. • Authorized personnel from the bidder organizations • System Administrators • Super user to control all operations on the e-Procurement Portal; and • Any other user such as payment gateway providers or as per the architecture of the proposed solution by the vendor / consortium.
FR 5.845	Secured electronic alert facility to the registered suppliers on the portal, whenever a new tender / corrigendum / addendum is published.
FR 5.846	Search facility for the tender floated on the web site category wise, tender no wise etc.
FR 5.847	Users shall enter the quantity required for tendering directly into the tender based on manual inputs received by them. On receipt of indent for a particular item, the user shall initiate the preparation of tender document along with technical requirements, payment terms, Schedule of requirements, price schedule etc.
FR 5.848	The tender document shall be prepared online. These shall be a provision to prepare each section, for example special conditions, functional requirement if any, schedule of requirements, price schedule, technical specification etc., separately by different users assigned by administrator.
FR 5.849	There shall be a work flow to get the prepared tender document approved online by the concerned section users for the purpose of floating same by the concerned procurement wing.
FR 5.850	The officers in the approving chain shall be able to view the tender document and place his remarks in the space provided for the purpose. These remarks and suggested changes shall be viewable to the user who prepared the document. He shall be able to imbibe these comments in to the tender document online.
FR 5.851	There shall exist a facility to authorized personnel of supplier organizations for - Online downloading of Complete Tender Documents, multiple Addendum and multiple corrigendum with online payments or offline payments received through demand drafts. Activation of Online/Offline payments modes shall be configurable.
FR 5.852	The GUI of the system shall have a tender designing facility. Designing of tender documents for different types of tenders such as EOI (expression of interest), Limited Tender, Advertised Tender, Global Tender both for works, consultancy and supply of goods and services shall be possible so as to include existing features of submission of bids with complete break up

	indicating basic rate, excise duty, sales tax/VAT, packing, forwarding, freight etc., with supply to multiple consignees.
FR 5.853	As and when addendum or corrigendum is posted, all suppliers who have officially procured tender document online should receive automatic online reminders through registered emails.
FR 5.854	The relevant approving authority should get an email alert whenever any tender has come to him/ her for approval.
FR 5.855	NIT shall be visible to users of in the approval hierarchy: The NIT approver should have the following functionalities: Approve the NIT, Reject the NIT, Route the NIT to a specific person for review, Insert comments
FR 5.856	For creation of NIT there shall be a proper approval process which may involve many users who are in a hierarchy. The transactions and remarks of such users shall be visible to all users in the same hierarchy. On final approval, already configured for each hierarchy, notice/message shall go the user who initiated the process.
FR 5.857	The NIT/Tender creator should be able to select any combination of these stages to create a single stage or two stage or 3 stage tender.
FR 5.858	A provision shall exist to take a print out or send mail to approved print media addresses in a predefined format.
FR 5.859	The System must provide the facility to publish the NIT on its web interface for public. The link for website shall be provided in official website also.
FR 5.860	On publication of the tender, the system should generate an email/SMS alert to the registered suppliers and concerned company users.
FR 5.861	It should be possible by configuration to have a copy of the Tender Document for free online viewing by prospective suppliers.
FR 5.862	The official copy of the Tender Document downloaded online after making the necessary payment, if any, (online or offline) should have a unique reference number such that these are not transferred to other Suppliers
FR 5.863	There should be facility for re-bidding for one or more bid parts without having to re-float the whole tender.
FR 5.864	The System must allow tenders to be tracked through their lifecycle, providing visibility of tender status, user comments and responses, evaluation & decision history, etc.
FR 5.865	The system shall have pre-bid queries/clarification functionality.
FR 5.866	The system should allow for issue of corrigendum’s/amendments to be published on the E-Procurement site.
FR 5.867	The system should be able to send an alert to the concerned vendors.
FR 5.868	All such corrigendum’s/amendments shall become the part of the tender on closing of the tender and shall be viewable accordingly.
FR 5.869	The bids, during submission, shall be encrypted using public keys of vendor. The opening of the submitted bids shall only be possible through private keys of the vendor either from his remote position or being present physically at company's location for tender opening. The same process shall be repeated for all the bids of different vendors.

FR 5.870	The vendor shall be allowed to revise his bid before due submission date of the bid as defined in the tender document. Only the last bid submitted by the vendor shall be considered by the system.
FR 5.871	The company users should have the facility of digitally signing the documents while issue of clarifications or any document issued to the bidders post or pre tender submission. For this purpose, bidders shall receive notification for any notice issues for tender clarification, addendum or corrigendum.
FR 5.872	After the submission of bids, it shall not be possible to change anything in the bid from either side. Bidder shall explain this feature in the bid response. The same process shall also be mentioned in the help menu of the portal.
FR 5.873	The system shall ensure secured flow of content and delivery of the messages with different users.
FR 5.874	It shall be possible to submit Bids, online, in single or multiple stages such as pre-qualification, technical and financial bids as specified in the respective tender or as per the procurement policy decisions.
FR 5.875	The bid submission process shall be designed in such a way that all required documents (pre-configured) and bid components shall be uploaded at the time of bid submission. In case any document is not uploaded, the bid submission process shall not be completed. The mandatory documents shall be indicated by the user uploading the tender by way of marking/ on various options during the tender preparation.
FR 5.876	It shall be possible that all key parameters of technical bids are filled by the bidders in a pre-defined format. The system shall have provision to allow any additional information/document that the prospective bidder may like to submit as part of the bid submission. Attachment feature needs to be provided for submission of documents.
FR 5.877	For financial bids, it shall be submitted in a pre-defined format. All the mandatory fields in the financial bids shall be filled without exception. Bidder shall not be allowed to progress further in case he/she leaves a field unfilled.
FR 5.878	Apart from listed items in financial bid, the vendor shall be allowed to insert additional items which he/she wants to quote as part of bid. Separately he/she shall also be allowed to give breakup cost of line items if required.
FR 5.879	It shall be possible to view the submitted bids in a consolidated fashion to both the bidder and BMC in a pre-defined format. The summary of bids shall be viewable to the bidder when they are submitting the bid and to BMC users when the bids are being opened.
FR 5.880	For the financial portion of the bid, it shall be possible to submit the name of the product, quantity offered, unit price, different taxes applicable, discounts offered and the total price, etc.
FR 5.881	The bidder shall be given the option to insert additional fields in the financial bid form to insert any additional levies/taxes to cater to extra ordinary charges/levies.
FR 5.882	For global tenders it should be possible to submit price-bids in prescribed Foreign currency as specified.

FR 5.883	All the received bids shall be stored in an encrypted form in an Electronic Secure tender box. These bids shall be time stamped and entire process shall be highly secure. It should not be possible to open and view the contents of the Electronic Secure Tender Box till the specified time has elapsed.
FR 5.884	Facility shall be available to the authorized users to login simultaneously within a defined period to open technical bid and price bid. All the designated persons need to be logged in within the time period and open the bid. Bid administrator will be able to assign technical bid and price bid openers in a tender.
FR 5.885	The System must not allow Users from viewing the bids before the tender opening date & Time.
FR 5.886	System should have the capability to involve internal and external experts for online bid evaluation
FR 5.887	Experts will be able to provide their score and comments online
FR 5.888	The comparative sheet of the price bids along with the technical bid details shall automatically get transferred to the Evaluation Committee members, whose email id shall be predetermined and configured in the system.
FR 5.889	The System must automatically process and save the bid evaluation results in a specified folder. Authorized users, including the Evaluation Committee members shall be allowed to view and evaluate the bidders' responses against the parameters specified and attach evaluation results to the bids with their comments. These comments shall not be visible to users other than the evaluation committee members. Each tender may have specific and unique evaluation group.
FR 5.890	For Price-bids of global tenders, it shall be possible to prepare related comparative charts in the offered foreign currency converted to INR as per the conversion factor defined. If the conversion factor has not been defined earlier at the NIT stage, then before opening of the comparative chart the system shall prompt the user to enter the necessary conversion factor.
FR 5.891	After evaluation process is over, the bid documents shall be stored in a secure manner with use of digital signatures etc. No tempering of these stored bids shall be possible as they may be required to be produced legally on a later date.
FR 5.892	The System must support separate workflows for Pre-Qualification, Technical, Commercial and Techno-commercial evaluation stages.
FR 5.893	For each stage of evaluation, the approver shall have the following functionalities: Approve the evaluation of the evaluator, Route the Evaluation to a specific person for view and comment either within the department or sub-department or between different departments, evaluation report
FR 5.894	Facility shall exist to prepare the report of the evaluation committee with the help of pre designed templates. The report shall be submitted through an online approval process in a desired/configured hierarchy.
FR 5.895	The facility shall exist for preparation of online contracts/P.O.s with basic formats readily available in the system. It shall be possible to insert any

	product specific conditions through a separate link or drop down menu or any other means so as to insert the same in the contract.
FR 5.896	Provision of awarding contract to one or more bidders based on tender conditions after proper approval through online approval process as in other modules of this tender. The parameter and percentage of quantity to each vendor shall be pre-defined at the time of NIT preparation.
FR 5.897	Create, approve and dispatch intimation of acceptance of tender for successful bidder and unsuccessful bidders.
FR 5.898	Create & Dispatch of purchase order to the selected single Suppliers
FR 5.899	Create & Dispatch of split/part purchase orders to the selected Suppliers.
FR 5.900	System should have provision to process tender fee. Bidders should be able to pay tender fee online
FR 5.901	Solution should have capability to handle EMD (Earnest money deposit). or Bank Guarantee) and Performance Bank Guarantee. Auto monitoring of expiry dates is required for Bank Guarantees.
FR 5.902	Solution should be able to manage waiver of EMD or tender fee.
Contracts Management	
FR 5.903	The contract management solution should facilitate searching and managing contractual as well as financial data flow.
FR 5.904	Template based Contract development process
FR 5.905	Enhanced Contract reviews to reduce risk and enhance predictability, help business achieve higher profits in terms of time, money, stakeholder's satisfaction
FR 5.906	Standardization across contracts across organisation
FR 5.907	Build Contracts basis prior experiences by applying learning through predictive & intelligent technology-led methodologies
FR 5.908	Reduced turnaround time to review Contracts with better consistency to provide better support to business
FR 5.909	Digital repository of contracts throughout lifecycle to develop & leverage knowledge
FR 5.910	Online legal support from experts to support BMC team on various aspect throughout Contract Lifecycle Management
FR 5.911	Fewer people deployment
FR 5.912	Capture and active management of contract master data of - any form main, individual and collective contracts, addendums, etc. - any type sales, purchase and rental contracts, service agreements, memberships, warranties, etc. - any category or type vendor and customer contracts, internal agreements, etc.
FR 5.913	Document management centre for all types of documents (documents stored in an optical archive and PC documents), Mails, internal notes and URL links
FR 5.914	Tracing and alerts management for key dates as terms of notice, renewal dates and other terms or due-dates

FR 5.915	Assignment of partners and contacts to predefined roles
FR 5.916	Customizable contract status management
FR 5.917	Activity and Task management
FR 5.918	Free definable user fields by contract types
FR 5.919	Form / template based printouts
FR 5.920	Data change history management (contract versioning, change documents, etc.)
FR 5.921	Ability to adapt the user interface on contract type level by customizing
FR 5.922	The contract management solution should integrate seamlessly with the overall solution. The existing user authorization elements should be reused and tightly integrated.
FR 5.923	The platform should be scalable to handle the load of an enterprise-wide contract management approach for BMC and BSCL.
Operations, Maintenance and Asset Lifecycle Management	
Properties, Roads, Pipeline, Fibre Network	
FR 5.924	Complaints received from the grievance redressal module will need integration to this module.
FR 5.925	Functionality is required to define a location which is a logical representation in the package, that would represent a property or physical location where any equipment such as meter, value, transformers, switches are installed. A location may also represent a road or a channel where a pipeline is housed.
FR 5.926	Functionality to map the properties and plots in BHUBANESWAR to a location in the package with the facility of external and internal number ranges
FR 5.927	Functionality for mapping roads on to location in the package which has linear characteristics
FR 5.928	Functionality for mapping fibre network channels on to location in the package which has linear characteristics
FR 5.929	Functionality for mapping pipelines on to location in the package which has linear characteristics
FR 5.930	Facility to hierarchically structure the locations in the package with no limitations on depth of the hierarchy. This facility is required for mapping of land parcels or plots as per a location or colony in BHUBANESWAR. Additionally in a plot the location which would house the meter or the valve would also be at a hierarchical level below the plot
FR 5.931	Facility to specify the Geographical Co-ordinates for each location
Equipment Master	
FR 5.932	Equipment Master should capture the following information: • Equipment ID (With intelligence built in the code) • Manufacturer • Supplier (if Different from Manufacturer)

	• Serial number • Date of (Purchase, Manufacture, Installed, Overhauled etc.) • Equipment / Component Hierarchy (e.g.: An electric motor can be a component of a major equipment) • Warranty information (timeframe, conditions, company through which the warranty is held, expiration date) • Functionality to define common Faults / Equipment • Functionality to link or attach manuals, operating procedures, graphs and other files to equipment • Installed by • Associated cost, histories and failures of a serialized piece of equipment as it moves throughout a plant or facility • Functionality to track time-related information for Piece of Equipment based on parent Equipment ➢ Time since new (TSN) ➢ Time since overhaul (TSO) • Functionality to input and track location of the Equipment / Components • Functionality to define multiple maintenance organizations within the company • Functionality to define list of spares required for an equipment
Resource Master	
FR 5.933	Functionality to record the details of maintenance engineers / technicians
FR 5.934	Functionality to record skill sets against the employee record
FR 5.935	Functionality to maintenance groups to assign responsibility of the equipment
FR 5.936	Functionality to maintain hourly rates for resources
Preventive / Predictive Maintenance	
FR 5.937	Functionality to create preventive / predictive maintenance schedules for all the equipment.
FR 5.938	Functionality to create preventive / predictive maintenance schedules for all the locations as logically defined in the system
FR 5.939	Functionality to create preventive / predictive maintenance schedules for linear assets and their associated locations as represented in the package
FR 5.940	Functionality to prepare preventive / predictive maintenance check sheets for each equipment / component. Predictive maintenance check sheets should have provision to record discrete values (E.g.: Current, Temperature, Vibration etc.)
FR 5.941	Functionality to define tolerance limits for key parameters like current, temperature etc. The limits should be equipment / component specific

FR 5.942	System should have functionality to provide planned costs for all the planned work based on maintenance schedules
FR 5.943	System should have necessary provisions to use master data properties to arrive at the planned costs and also must have integration with financials for reporting of both planned and actual costs
FR 5.944	Functionality to create preventive / predictive maintenance schedules based on any of the following parameters: • Operating hours (E.g.: For every 5000 hrs.) • Time based (E.g.: Daily, Weekly, Bi-Weekly, Monthly, Quarterly, Yearly etc.) • Combination of Operating hours / time (whichever comes first) • User defined rules (E.g.: If the observations of predictive maintenance are beyond acceptable limits, new preventive maintenance can be scheduled)
FR 5.945	Functionality to designate a parent / child relationship based on type of maintenance (E.g.: Changing a pump requires various other maintenance operations to be performed)
FR 5.946	Functionality to automatically generate work orders based on the preventive / predictive maintenance schedule
Notifications	
FR 5.947	System should have functionality to create notifications for planned and unplanned work
FR 5.948	System should allow creation of notification from multiple sources e.g. from portal / apps etc.
FR 5.949	System should have capture the details of the complainant in case of reactive maintenance
FR 5.950	System should have necessary functionality to capture the status of the service requests
FR 5.951	System should maintain a complete audit trail from registering of an incident to its conclusion
Work Orders	
FR 5.952	Functionality to generate notifications and/or work orders for the following types of maintenance • Breakdown Maintenance • Preventive Maintenance • Predictive Maintenance • Incident Management • Inspection • Calibration / Testing • Others (Modification, Major Overhaul, Design upgrades etc.). The user should be able to define the notification types

FR 5.953	Functionality is required for managing Incidents like a Burst Water Mains, Major Fire or Power Break Down. Announcements and Messaging on Bulletin Boards would be required. Additionally multiple citizens may call regarding the same incident, resulting in multiple work orders being raised thereby unnecessarily flooding the maintenance teams with work. In such an emergency situation the system should prevent duplication of work orders.
FR 5.954	The system should allow creation of a planned as well as reactive maintenance work orders for a location as represented in the package
FR 5.955	The system should allow creation of a maintenance work order for a linear assets and its associated locations as represented in the package
FR 5.956	Automatic notification and/or work order creation for alarms raised via the SCADA system. If necessary the MSI may have to develop a real time interface to achieve this functionality.
FR 5.957	Automatic notification and/or work order creation if a user raises any problem with a BMC asset like a street light through the portal. If necessary the MSI may have to develop a real time interface to achieve this functionality.
FR 5.958	Automatic notification and/or work order creation if a customer services representative in the call centre raises any problem with a BMC asset like an open manhole or pot-hole in the road through the portal. If necessary the MSI may have to develop a real time interface to achieve this functionality.
FR 5.959	ERP system should be capable to accept breakdown requests through any means with complete status tracking of these work orders till resolution via the Portal. There would instances where the work order is outsourced to a vendor or 3rd party for resolution.
FR 5.960	Drill down functionality is also required at work order level to verify the status of each task or operation which are included as a part of the work order
FR 5.961	Functionality to have workflow routing for work orders
FR 5.962	Functionality to track the status of a work order. System should be able to support the following status • Initiated / Waiting for Approval / Prepared / Planned • Waiting for material • Released / open (equipment down) • Completed / Cancelled • Soft Closing / Finally Closed
FR 5.963	Functionality to include the following information in work orders • Work Order Start and End Date • Type of work order (preventive maintenance, predictive maintenance, breakdown maintenance etc.) • Type of work (electrical, mechanical, etc.) • Equipment identification and description • Priority (E.g.: Urgent, Normal etc.)

	• Designated duration of work order (start/end date and time in minutes) • Where was work performed (location, site) • Nature of the problem • Customer (requestor) and method of contact • Date of (Problem reported, work completed etc.) • Resources required (labour, materials, equipment and tools) • Resource ID numbers • Resource availability • Lockout / tag-out procedures • Required permits • Testing requirements (to validate repair) • Detailed work plan (task sequencing and trade dependencies) • Fully integrated real time capture in the work cost details: Actual usage (labour time by employee id, parts, equipment time, time to complete and date completed). Out of the box functionality is also required to periodically review the work orders for allocation of overheads and settlement of variances. • Description of actual work performed • System should have functionality to create quotations for the work that need to be charged to customer. Should be able to produce an itemized quotation • System should have provisions to proceed or not to proceed with quotations depending upon customer's decision • Should have functionality to bill the customer for services rendered and material consumed, must produce an itemized bill • Equipment issues • Equipment condition • Cause of problem • Test results • Date and explanation of past work done on the equipment (type of work, nature of the work, completion time, employees who participated in the work) • Prepared by
FR 5.964	Functionality must be there to manage the warranty aspects of an equipment or any component or any spare part used in an equipment
FR 5.965	System should have functionality to track components/ spares used in an equipment with details like serial number/ manufacturer etc. and must have functionality to manage any component / spare part movement with complete audit trail

FR 5.966	Functionality to capture maintenance cost details like labour, costing of materials, services, overhead etc. (external or hired labour, specific maintenance group, etc.)
FR 5.967	Functionality to compare the actual labour hours entered by the technician to the standard labour hours estimated to accomplish the work
FR 5.968	Functionality to calculate labour costs based on type of hours worked (regular, overtime, periodic, corrective, breakdown, reactive, equipment modification, etc. by target rate)
FR 5.969	Functionality to automatically generate notifications/work orders based on the preventive / predictive maintenance schedule
FR 5.970	Functionality for configuration of a work order type, without any source code change of the ERP package
FR 5.971	Functionality to create work orders with varying work order types depending on the nature of the customer grievances or calls.
FR 5.972	Functionality of automatic integration of the Customer Services Portal to maintenance notification and/or work order creation
FR 5.973	System should have provision to print notification / work orders with detailed instructions for delivery of the job
FR 5.974	System should have functionality to update customer about the progress of the job and information may be transmitted by different modes e.g. updates on portal or SMS or Status update on APP
Maintenance History Management	
FR 5.975	Functionality to track general maintenance history data: • By Equipment Identification number, work order number etc. • By Location where service was done • By Maintenance Sections involved in the service
FR 5.976	Functionality to use maintenance history to assist in maintenance projections (i.e. resource usage during peak times)
FR 5.977	Functionality to track spare parts consumed against an equipment
FR 5.978	Functionality for automatic updation of maintenance history for an equipment or location (as represented in the system) by a work order.
MIS	
FR 5.979	Functionality to generate downtime report with the following details • Equipment details • Reason for failure • Corrective action taken • Spares consumed • Work-order details
FR 5.980	Functionality to generate downtime reports • Equipment-wise • Location-wise

	• Year to date
FR 5.981	Functionality to generate reports on the following for each equipment • Mean Time Between Failures (MTBF) • Mean Time to Repair (MTTR)
FR 5.982	Functionality to generate following reports for maintenance • Number of work orders issued and closed per month • Types of work orders opened and closed per month • Number of work orders generated per department • Number of work requests awaiting approval (total, by work order owner and by department whose approval has not been received) • Regular versus overtime hours • Planned versus unplanned costs, hours, usage, etc. • Downtime of equipment per work order, year to date, previous year, etc. • Effective production hours per day • Cost rates by resources • Cost by work type • Maintenance schedule compliance as a percentage of maintenance planned or scheduled jobs completed in a month • Number of work orders generated from PMs • Maintenance cost / Actual cost comparison for each equipment • Productivity measurement of manpower • Should have functionality to roll up planned / actual costs / planned hours/ actual labour hours consumed by different organization entities other than work order e.g. by department owning the asset. • Must have functionality to link technical assets with financial assets to provide asset lifecycle including non-cash expenses like depreciation
Projects and Works Management	
FR 5.983	**Capital Investment Planning –** To enable investment lifecycle management starting from short term / long term capital investment planning based on organization structure or any alternative structure that represents capital investment control organization, investment ideas, approval or rejection of investment ideas; allocation of funds for approved projects.
FR 5.984	**Project**: To enable project managers to better identify, select, prioritize, and manage projects. Including key performance metrics on budgets, schedules, and staffing. Solution to provide a centralised view of performance and at-risk elements. To also enable project managers to work closely together with team members and management. The comprehensive project management solution should enable BMC project managers to manage schedules, resources, assigned documents and

	materials, costs, and budgets. Team members need to be notified via workflow when they need to fulfil their project-related tasks thereby facilitating monitoring and control. Should have functionality to manage capital related work as well as operational expenditure.
FR 5.985	**Scheduling Functions:** To be able to schedule forwards and backwards according to the relationships between activities. Constraints need to be taken into account, with earliest and latest dates calculated, and floats determined. System should have integration facilities available for interfacing between third party products e.g. MS Project or Primavera.
FR 5.986	**Document Management:** Integration for drawings, technical specifications and other relevant project documents.
FR 5.987	**Costs:** The ability to plan costs using easy cost planning or by making use of the network calculation of internal and external work, services, and procurement planned in activities that are automatically calculated. The ability to map projects to internal orders or cost planning elements (WBS) elements to plan costs based on resource staffing and cost rates. Should have provision to maintain multiple versions of planned costs including base project cost plans, revisions in planned costs i.e. forecasting, calculation of estimated cost to complete. Should maintain a complete audit trail of changes carried out to any type of planned costs Must have provision to provide necessary restriction to different users for carrying out different activities related to planning of base costs and / or revision to original cost plans.
FR 5.988	Cost planning should have alternative options available from rough cut planning to detailed cost planning according to different stages of the project as the project progress.
FR 5.989	**Budget** the ability to control all expenditure during the execution phase. Additionally, the ability to break down the original budget into smaller packages of released budgets to allow an even more accurate availability control. System should have functionality to generate alerts based on pre-defined rule(s) in case of actual expenses or commitments exceed pre-defined limits.
FR 5.990	Resource and Time Management: The ability to assign resources and record time to resources assigned to any project or WBS- including for internal and external resources
Project Execution	
FR 5.991	The solution must enable the execution of a project based on the project plan including creation of documents, simulation of alternative project structures and analytics using Project system.
FR 5.992	BMC wishes to implement collaborative access to project documentation.
FR 5.993	**Confirmation** The solution must enable confirmation of actual time and costs for projects. The times entered become the actual times and costs for the project. Full change and cancellation handling are required. Approval of the time entered by appropriate authority should be available.

FR 5.994	**Project-Oriented Procurement/ Repairs**: Purchase Orders for goods and services will need to support multiple projects/WBS. Similarly, a single work order for repairs at the workshop may service multiple projects/WBS. System should have capability to identify goods procured for a specific project
FR 5.995	**Claim Management** BMC and BSCL requires to track contract variations, change requests, e.g. scope, as well as handling claims and/or disputes, this will include costs and/or income. Should have functionality to manage the approvals for claims recorded.
FR 5.996	**Project Cash Forecast** During execution, need to integrate project cash management and provide accurate information on incoming and outgoing payments.
FR 5.997	**Project Progress:** analysis/earned value analysis will be needed to determine planned and actual project progress values. Need to provide information on the state of projects and how they are developing. Need to display milestone trend analysis with the relevant dates in a project at different report dates. This is required to analyse/forecast periodic statuses to include costs (e.g. actual, value of work done, forecast), income and outputs
FR 5.998	**Progress Tracking**: Required to closely monitor the progress of tasks and activities and monitor project specific purchase orders.
FR 5.999	**Phase Approvals**: Required to protect phase approvals by a structured approval process including decision makers named by BMC corporate policies and digitally signed approval documents. Workflow is required to support an efficient and effective process.
FR 5.1000	**Procurement Process** must be able to access data from across BMC and BSCL departments and projects and consolidate the procurement process to provide a structured overview
FR 5.1001	**Project Reporting**: Need a flexible, comprehensive information system to monitor and control project data. Need to evaluate individual projects, partial projects, or multiple projects. Include overview reports and reports offering various degrees of detail is designed to meet the needs of both project management and ordinary project personnel. BMC and BSCL wishes to analyse expenditure by asset types
FR 5.1002	**Project Structuring** Required to create work breakdown structures (WBS) and networks, with their attendant activities and milestones. Structure a project using phases, tasks, checklists, and checklist items Integration may be required with external project scheduling package. System should have functionality to provide master project templates that can be used to create project structures especially for repetitive nature of projects
FR 5.1003	Project Costs: Required to plan costs using easy cost planning or by making use of the network calculation of internal and external work, services, and procurement planned in activities that are automatically calculable. Integration may be required with external project scheduling package.

FR 5.1004	**Budget** Require budget availability controls for all project expenditure during the execution phase. Additionally, the original budget to be broken down into smaller packages of released budgets to allow accurate availability control.
FR 5.1005	**Scheduling Functions** Requires scheduling capability of forwards and backwards task movements according to the relationships between activities. Constraints are taken into account, earliest and latest dates are calculated, and floats are determined. Additionally, require both bottom-up and top-down scheduling.
Project Accounting	
FR 5.1006	Project Accounting: The solution must enable the precise planning, budgeting and monitoring of detailed activities costs of a project, both large scale such as building a treatment plant, and small scale projects. It is expected that Project accounting will fulfil different purposes in different phases of the project: • Help calculate the level of costs and the expected revenues when planning a project. • Once the costs have been approved, it will form the basis for allocating the budget. • During project execution, it must monitor and check variances in the costs. • Must meet the requirements of local accounting standards for construction related projects • Must assist the project manager to ensure that the project is executed efficiently, on time, and within budget - which he or she achieves by ensuring that the required resources and funds are available as and when needed. BMC requires to report benefit achievements by project categories.
FR 5.1007	BMC requirement to analyse work in progress by planned asset class to ensure prompt recovery of capital taxation allowances.
FR 5.1008	BMC requires estimating, plan & capturing opex impact of capital investment.
FR 5.1009	BMC may have some assets where value requires calculating/grossing up as provided by 3rd party.
FR 5.1010	Integrated Planning and Tracking: BMC requires detailed financial integration including budgeting, cost planning and actual costs confirmations and commitments from various sources.
FR 5.1011	Settle Financial Data: required to transfers costs to Financial Accounting, Asset Accounting and Management Accounting to establish cost of equipment for use in maintenance decisions regarding economic value of renewal.
FR 5.1012	Development Collaboration requires to optimize a cross-enterprise asset/project development with internal and external teams including the sourcing of complex components. This requires a consistent central storage of all relevant data during the entire collaboration process and a secure integration of external partners and suppliers.

FR 5.1013	Automatic generation of requisitions for procurement of materials and/or services required for a Project. The material/services should be made available to the project neither to too early nor too late
FR 5.1014	Goods receipt of material and/or services specific to a project should load the costs on to the WBS. The material thus received should be reserved for the particular project and not be issued for other purposes
FR 5.1015	Cost roll up : functionality should be made available to roll up costs from one WBS to another
FR 5.1016	**The module shall cover:** • Classification of Works based on their types. • Maintain Vendor details • Maintaining rate schedules and revising the same • Defining a Project with Work Breakdown Structure • Estimation and submission for review and approval by the competent authority • Technical Sanction • Administrative Approval as per the workflow defined • Integration with e-Tendering • Awarding Work Order to a vendor • Facility to track the project status by project code through portal. • Facility to input / upload data upon the measurement/progress of work done. • Provision to enter site inspection details/report in the system or upload site visit report • Completion Certificate • List of Projects - Projects-wise, location-wise reports etc. • Project status report.
HR & Payroll System	
HR Management	
FR 5.1017	Talent Management: Require the ability to consolidate all the strategic employee development processes spanning the employees' career with the company from hire to retire, including recruitment, education, career development, and performance management. This should also encompass the company view of employee development, identifying and tracking high potential employees to ensure future leaders can be effectively promoted from within and that successors are identified for key positions.
FR 5.1018	Employee Self Service: Requirement is to enable employees to do such as access their records to check personal information and update likes of addresses, contacts, next of kin, bank details in lines with best practice. To enable people managers to process authority to recruit, authority to appoint, changes to terms and conditions and with built in work flows to enable forwarding for authorisations and governance and ultimately flowing to personnel records update and generation of appropriate letters or contractual change conformations

FR 5.1019	Manager Self Service: Requirement for people managers to process authority to recruit, authority to appoint, changes to terms and conditions and with built in work flows to enable forwarding for authorisations and governance and ultimately flowing to personnel records update and generation of appropriate letters or contractual change conformations
FR 5.1020	Case Management: Requirement to track progress of Absence Disciplinary and Grievance Cases and monitor performance of Unit/Team or Individual and with the requirement to attach Microsoft Word or Scanned Handwritten letters to Case files.
FR 5.1021	Performance Monitoring: Requirement to categorise transactional queries and escalate to Team Leader where SLA's are in "amber" or "red" status. Requirement to produce metrics relating to activity work load by Team and Individual. Integration required with the customer interaction portal, which would provide the source data for the transactional queries
FR 5.1022	Requirement to capture details of contractors and consultants who might be paid through the procurement process via third parties.
FR 5.1023	Workforce Analytics: Requirement the ability to produce metrics and Organisation charts relating to work force. Ability to do organisational modelling and workforce planning
FR 5.1024	Employee Performance Management: Requirement to provide a flexible framework to integrate corporate goals and strategies with team and individual goals as well as integrate management-by-objectives. It should also provide functionality Requirement to be able to tie compensation to performance.
FR 5.1025	Requirement to be able to capture individual development plans to roll up to training plans.
FR 5.1026	Requirement to allow individual training courses and development steps to be displayed and monitored.
FR 5.1027	Requirement to be able to produce metrics to show the distribution of individual performance within teams, departments, organization
FR 5.1028	Require the ability for each employee to manage their career paths and aspirations, either through self-service capabilities or as a result of planning with their managers. This should include Requirement the ability to match profiles against positions to determine skill and knowledge gaps which in turn are linked directly to training plans to fill the necessary qualifications. Require the ability to build structured career paths to give the employee guidance as to what the career progression might be based on their job within the organization.
FR 5.1029	Compensation and Benefits Management Requirement: to operate Flexi Benefits including the ability to make payments to 3rd parties for provided benefits.
FR 5.1030	Requirement to manage pensions administration as per BMC policies and rules
FR 5.1031	Require the ability to streamline and integrate essential workforce processes such as employee administration, payroll, time management, absence recording, and legal reporting. This should enable the company to

	standardise and consolidate all workforce-related processes and data onto one platform, and ensure that adherence to local regulations and laws can be attained. Requirement to provide a central repository for employee data integrated fully with other business applications, especially maintenance and service delivery
FR 5.1032	Requirement to "electronically" file documents including handwritten scanned letters to an employee personnel record. Requirement to produce individuals, teams and departments attendance / absence matrix and to "count down" sick pay entitlement, raise necessary alerts and correspondence are all requirements.
FR 5.1033	Time and Attendance: Requirement to optimise processes for planning, managing, and evaluating the working times and activities of internal and external employees via the Time Management capabilities.
FR 5.1034	Requirement to link BMC overtime rules to payroll to enable paperless/e-enabled automated authorisation and processing for payment to enable employees and managers to view attendees, holidays etc.
FR 5.1035	HR Processes and Forms: The ability to automate paper-intensive and time-consuming employee-related processes such as hiring, termination, organisational reassignment, and maternity leave. Data entry and flexible workflow templates are required to enable the BMC to handle routine workforce processes quickly.
FR 5.1036	To allow users to create project teams based on skills and availability, monitor progress on a project, track time, analyse results, and much more. The solution should empower users to eliminate redundant or ineffective projects, optimize productivity through the smarter use of resources, and manage the workforce as efficiently as possible.
Payroll Management	
FR 5.1037	Ability to maintain leave records for computation of increments/pay revision with retrospective effect
FR 5.1038	In addition to the standard payroll functions, the system should also comprise the following India-specific functions: • Indirect Evaluation • Basic Increments • Dearness Allowance • Housing • Car and Conveyance • Long Term Reimbursements • Fringe benefits • Income Tax • Third Party Deductions • Income from Other Sources • Tax on Arrears • Exemptions: ➢ Exemption on Leave Travel Allowance ➢ Exemption on Medical Reimbursements

	➢ Exemption on Medical Insurance ➢ Exemption on Child Education Allowance ➢ Exemption on Child Hostel Allowance ➢ Exemption on Other Allowances and Reimbursements ➢ Exemption on Leave Encashment • Previous Employment Tax Details • Professional Tax • Provident Fund • Employee State Insurance • Labour Welfare Fund • Nominations • Minimum Net Pay • Recovery of Rounding off Amounts • Loans Enhancement • One Day Salary Deduction • Mid-Year • Termination Work Bench • Gratuity • Superannuation • Forms as applicable
FR 5.1039	Ability to support configuration and parameterization of different pay components including facility to add/modify/delete pay components
FR 5.1040	Ability to maintain employee data cost centre wise
FR 5.1041	Ability to define pay structures at various levels and types (such as permanent, contract employees, consultants, trainees etc.)
FR 5.1042	Ability to support calculation of different allowances based on user-defined criteria
FR 5.1043	Ability to maintain all pay related rules (user definable) for automatic maintenance/ updating of data.
FR 5.1044	Facility to indicate carryover and partial recovery
FR 5.1045	Ability to generate monthly balance and cumulative balance position of various accounts related to payroll for user definable periods.
FR 5.1046	Ability to support withholding of any amount recoverable from employee against salary, Gratuity and other dues payable to employee
FR 5.1047	ability to enter, administer and perform payroll for company loans, Voluntary Deductions, Recurring Payments/Deductions and additional payments
FR 5.1048	Ability to prorate salary and allowance payment based on employee hire or resignation date
FR 5.1049	**The System must cater to:** • Keep records of Sanctioned Posts • Employment in case of Death of any employee - Compassionate recruitment

	• Capture Employee Data – Employee Master • Employee Promotions • Transfer of staff • Leave Management • Enquiry, Punishment Process • Annual Confidentiality report • Maintain Service Book
FR 5.1050	**Payroll Process:** • Keep records of Sanctioned Posts • Employment in case of Death of any employee - Compassionate recruitment • Capture Employee Data – Employee Master • Employee Promotions • Transfer of staff • Leave Management • Enquiry, Punishment Process • Annual Confidentiality report • Maintain Service Book
FR 5.1051	**Employee Self Service:** • Keep records of Sanctioned Posts • Employment in case of Death of any employee - Compassionate recruitment • Capture Employee Data – Employee Master • Employee Promotions • Transfer of staff • Leave Management • Enquiry, Punishment Process • Annual Confidentiality report • Maintain Service Book
FR 5.1052	**Reports:** • Attendance Register • Employee Detail Register • Transfer Detail report • Employee Pay Slip • Salary Summary Individual Report • Professional Tax Report • Pay Comparison Report • Bank Report • Yearly Salary Sheet Report • Income Tax Deducted Report • TDS Reports • Form 16 • Payroll register

	• Performance Report Appeals • Grievance Report (status, date of event and final ruling) • Workers compensation • Disciplinary actions (paid/unpaid etc.) • Future leave approval (e.g., approved, deferred, rejected) • Leave status (vacation, sick, injury or any other user definable field)
FR 5.1053	It should be noted that attendance information for employees may come from different sources. Hence integration will be required for field employees especially in the solid waste management system.
Water Utility Management and Billing	
FR 5.1054	**Customer Service Management:** Need to support all services oriented customer business processes. This includes the operation of customer facilitation centres with specific service processes such as customer billing, service order management, complaints & returns management, account & contact management and as follow-up process case management. An Internet-based self-service solution for occupants (owners or tenants) of a property or premise is also required. Hereinafter in reference to the detailed functionality related to water utilities, the term occupant includes owners as well as tenants
FR 5.1055	Service Order Management with Utility Billing: • Need service order management with billing to enable BMC to manage service businesses over the entire service life cycle process. • From service contact to create, assign processing and monitoring of service requests • To the management of customer connections and installed equipment/devices • Visibility of warranty and entitlements and the billing of time (effort) and materials spent on the work order. • To ensure service level targets are met, improve customer satisfaction • Reduce costs and increase revenue by reducing the service-to-cash cycle. • Improve service quality through 24x7 customer service - support multichannel interaction - collaborate with customers • Must be able to record and track all interactions with the customer no matter what the medium e.g. telephone or Fax etc. • All customer tracking information should be presented to the service agent in a simple and standardized format
FR 5.1056	Service Order Quotation: Need to offer a service order quotation before concluding the actual service order. This gives customers the opportunity to find out more about prices and delivery conditions before agreeing to the service order.

	Particularly important for Developer Services, Customer Side Leakage
FR 5.1057	Service Order Processing: • Need to allocate items to multiple external and internal recipients. These may be either billable or non-billable because of warranty claims, and they may stem from service orders or service confirmations. • Assign internal and external recipients when creating the service order or service confirmation. • When creating an amount allocation document, the bill-to party and invoice value are to be copied from the service order or service confirmation. Subsequently, the user will still be able to process or edit this data in amount allocation. • Functionality must allow for sign off / authority levels to be complied as per BMC policy
FR 5.1058	Service Confirmation Processing: Ability to confirm working times, materials used, and expenses for services performed. Plan these confirmation items in a service process (for example, a service order) or an in-house repair order. The field service representative should then be able to reference the work order for further action to complete the required business process
FR 5.1059	Billing: Need to create invoices in the name of occupants using one or more billing due list item. Ability to create the invoice with reference to the rate charged, delivery, or to the sales order. Additionally, need to create bill or invoices with reference to contracts.
FR 5.1060	Service Contract and Quotation Analysis: Need to be able to monitor customer satisfaction with services performed under contracts. Identify contract products/services with a high net value and produce an overview of the value and volume of active service contracts. Report which particular contracts the service employees are responsible for. Functionality must support monitoring and reporting the appropriate levels of customer satisfaction
FR 5.1061	Service Order and Quotation Analysis: Need to be able to report on current order volumes and support forecasts about fluctuations in business volumes for the forthcoming year. Need to take measures, e.g., to plan resources according to seasonal peaks or offer customers special service packages during quiet periods. Report by Customer Sector and Segment
FR 5.1062	• Customer Service Processes: Must be able to support all occupant-related processes within our customer facilitation centre environment(s) or self-service through the portal. For instance a partial list of these processes would include: ➢ move in ➢ move out and if required refund of security deposit ➢ meter-reading ➢ entry, ➢ bill correction

	• Customer Service Process (Collaborative) ➢ Instalment Plan Request ➢ Disconnections ➢ General Inquiry ➢ Billing Inquiry • New Connections and management of security deposit ➢ Budget Billing Request ➢ Business Partner Master Data Changes
FR 5.1063	The system must allow the new connection request to be made by an owner of a premise or property. Incase of an apartment block or building the property or premise may refer to an apartment
FR 5.1064	The system must allow a Move in/Move out process for an occupant for a property or premise
FR 5.1065	Identifying Account for Utility Service Processes: • During a customer contact, need to be able to use the multi-channel interface (telephone, E-mail, chat, and so on) to identify an account in the system. • Once account is identified and confirmed, the system provides customer information, such as the address, account balance, bills, dunnings, credit, and information on past customer contacts. • Need to be able to initiate business processes for a particular customer in the customer facilitation centre. And in addition, identify the premise, contract account objects and associated service zones.
FR 5.1066	Changing Account Data and Business Agreement Data: The call agent must be able to change account data or business agreement data. The system must allow the account and/or business agreement to be entered into with the occupant of a property or premise.
FR 5.1067	Master Data Overview (Account, Business Agreement, Consumption): During a customer contact, call fact sheets for an account, business agreement, and specific consumption data for an account in the system. To provide quick overview of the existing data, and to allows selection of individual objects from the overview (such as a bill) to be displayed in detail.
FR 5.1068	Processing Move-In: Be able to create a move-in in the Facilitation Centre (FC) as well as via the portal.
FR 5.1069	Processing Move-Out: Be able to create a move-out in the Facilitation Centre as well as via the portal.
FR 5.1070	Processing Move in/Out for Account: Be able to create a move-in/out for an account in the Facilitation Centre as well as via the portal. The account for move-in and move-out remains constant but the premise changes
FR 5.1071	Processing Move in/Out for Premise: Be able to create a move-in/out for a premise in the Facilitation Centre). The premise for move-in and move-out remains constant but the account changes

FR 5.1072	Entering Meter Readings: Ability to enter, check, and save the current meter reading. The meter reading may be estimated if an account cannot be accessed by a meter reader.
FR 5.1073	Changing Budget Billing Plan: Ability to change the budget billing plan. This could be done by changing the budget billing amount or the meter reading.
FR 5.1074	Bill Information/Bill Correction: Ability to add/change information to a bill and to correct it if the meter reading is incorrect
FR 5.1075	Malfunction Notification / Service Notification: Ability to create a malfunction notification in the system. There are different categories of malfunction (for example, meter not recording or recording inaccurate) with different reference objects (for example, connection object, apartment, meter).
FR 5.1076	Functionality for the customer agent to escalate an exception
FR 5.1077	Managing Financial Inquiries in Facilitation Centre: Enable customer agents to handle all types of finance-related inquiries with customers by providing access to finance-related data e.g. in the Invoice Display, Payment List, history or reminders and Balance Forward List of the Account or Business Agreement confirmed. The customer agent must be able to access the account balance for the customer's business agreements in a customer contact and display additional information (e.g. next due instalment, last payment or the last dunning notice for the business agreement) as well as a list of documents/document items grouped by several grouping criteria (e.g. all open items, all items included in a reminder letter/communication).
FR 5.1078	Processing Payments: Need to generate call lists from the reminder communication and reminder batch run, which are then available for use in the Facilitation Centre to chase customers by telephone/Internet and request payment for open items. Agents should be able to display the call list size, the period, or the duration of the call list, the number of customers, and the names of the customers who are to be called. They can also review the information to be obtained from the customer if the call list is assigned a script. The agents can gather information before they begin answering calls or calling customers themselves. Resulting from the conversation with the customer, and then take payments from the customer for the due items for chasing and create deferral for open items.
FR 5.1079	Change Service Location Data: Need to be able to change all relevant service location data (connection object, premise, and point of delivery) during contact with a customer. After identifying the premise, the call centre agent should be able to access the maintenance view for the service location. Here, the agent can change the connection object address, add additional premise data, or determine the grid for the point of delivery, for example.
FR 5.1080	Service Contract and Entitlement Management: Service contract and entitlement management enables all service entitlements – warranties, extended warranties, service contracts, and service level agreements to be defined and tracked. Service agreement terms can be adapted and created to suit the varying and diverse requirements of the customer base. When service calls are placed and service orders created the appropriate entitlement information is associated with that activity and can be checked

	by a service representative or via Web self-service at any time. Particularly used for Customer Side Leakage or Developer Services
FR 5.1081	Complaints and Returns Management: BMC requires complaints management which allows it to easily create, manage and track complaints and returns. Customers can request their preferred action including credit, refund, or replacement of the specified product and installation. Customer Agents are provided with all relevant information to make effective decisions and can take immediate action to comply with the customer request.
FR 5.1082	Warranty Analysis: Need to provide information about the amount of products/services with or without warranty, and monitor expired warranties.
FR 5.1083	**Collecting meter readings in the metering database**: The system shall have the ability to enter single meter reading as well as transfer meter reading from an external system.
FR 5.1084	The system should also be capable of interfacing with Spot billing devices and Meter Reading Instruments for uploading such meter readings data including consumer meter readings. The data of all such meters will normally be downloaded on an external server
FR 5.1085	System should provide data validation checks to minimize data entry errors. It should incorporate user supplied logics to check variations in consumption and generate exceptions. After data entry, the system should generate an Exception Report for non-reading of meters due to any reason. It shall also highlight possible inconsistencies in the metering data. After handling of exceptions by the respective officials, the system should be updated with the result of exception handling. While validating, if the meter reading found low / unacceptable based on earlier readings/trends the system should issue a work order for checking and replacement of meter. If the work orders are not closed with valid reason system should escalate the issue till the same is resolved
FR 5.1086	**Data Review** The system should provide the facility for the designated officials to review the metering data as per utility defined criteria. In case any discrepancy is found, the system will allow the data to be edited, with proper access rights and audit trails.
FR 5.1087	**Provision to interface with AMR** The system should be able to interface with Automatic Online Meter Reading devices. System should be capable to schedule and collect automatically readings from online connected consumer meters / zonal meters through automatic meter reading system. The system should generate exception in case meter reading found unacceptable after validation check
FR 5.1088	**Capturing Meter reading Data** The system should be capable of capturing meter reading data from a Meter Reading Book, handheld computers used for spot metering & billing for uploading and downloading the data. System should be capable to upload and download the data for a given set or group of consumers to Meter Reading Instruments (MRI)/Hand Held Computers (HHC) automatically. System should also keep log of MRI/HHC assigned to meter reader.
FR 5.1089	**Validations for the spot metering and billing data update:** The system should be able transfer or update the meter reading validation logic to the MRI and spot billing machines. The system should have the flexibility of

	validating the data uploaded from the meter reading instruments. The validation would include restricting the customer data uploads to those that were indicated in the meter reader's schedule.
FR 5.1090	**Prohibiting the wrong entry,** the system shall also have provision for prompting the Meter Reader at the time of entering wrong meter reading values in the spot billing machine.
FR 5.1091	**Monitoring meter reading plan** The system should make it necessary for the meter readers to upload all the meter readings according to the route plan generated within the timeframe stipulated by the utility. Otherwise exceptions should be generated and further meter reading can be entered only after clearance from specified authority. The system should track and generate the exception reports, for each meter reader to establish performance measures and determine deviations if any. It may include number of meters planned, number of meters actually read per day, number of wrong readings, unread meters by reason etc.
FR 5.1092	**Monitoring Customer Exception** The system should be able to track customer behaviour in terms of exceptions. For example: The number of times a customer figures in the list of exceptions.
FR 5.1093	**Supporting meter reading on trust** The system should also have the facility if desired by utility to enter the meter reading as specified by the customer by telephone/ fax/ web portal and record that the same is customer-specified. All customers who provide a reading on trust, should be inspected by the Utility after a specified time period.
FR 5.1094	**Overdue alert** In case a meter reading becomes overdue (Utility specified criteria), the system would generate the necessary exceptions and alerts.
FR 5.1095	**Accepting change in metering cycle** The system should be in a position to cater to changes in the metering cycle.
FR 5.1096	**Capability to store data for a specified period** The system should keep past metering data online for a period specified by the Utility guidelines from time to time.
FR 5.1097	**Interfacing with spot billing and MRI instruments** The system will support data downloading to and uploading from handheld devices used for Spot metering & billing and MRI. The devices would provide information about the meter number, customer code, meter reader's employee number, meter reading with date and time stamping, and billing amount.
FR 5.1098	**Meter reading for temporary connections** The System should be capable of accepting opening, closing and intermediate meter readings for temporary connections for generation of bills for such connection.
FR 5.1099	**Final meter reading for closure of connection** For all kinds of disconnections (whether a customer requests for termination of connection or utility disconnects due to non-payment), the system should accept the terminating meter reading (which will be out of cycle in most cases) for generating the last bill.
FR 5.1100	**Lifecycle monitoring and testing plan for meters** System must be capable of capturing complete meter history (such as type, Make, Model, Batch, Catalogue Number of meter, its place of installation, cycle and record of calibration/testing) throughout meter’s lifecycle, starting from arrival in stores till it is being scrapped or destroyed. System must be

	capable of capturing data like ordinary meter, electronic meter etc. System must be able to identify the meters, which are due for mass replacement or scheduled testing/calibrations and generate a work order for action by field staff. It is desirable that system should be able to interact with meter testing devices for obtaining test report.
FR 5.1101	Meter and Device Management: Require connection management processes for connection and device management infrastructure in transmission, distribution and metering companies. With the proposed installation of an Advanced Meter Infrastructure (AMI) it may be required to administrate and run remote and conventional meters in parallel. The system must provide the means to record meter details for a work order. Some examples of meter details are as follows: • Meter serial number • Date installed • Meter location • Meter size • Out-reader location • Manufacturer Type
FR 5.1102	**MIS generation** System should be capable to monitor and track the following : Meter reader's performance, Comparison of input versus expected consumption, variance in consumption for consumers etc.
FR 5.1103	**Tracking meter location** Current location of meter must be tracked i.e. in stores, under testing, at consumer premise, under overhauling etc. Data must be captured at appropriate locations and point of time to track the meter.
FR 5.1104	**Tracking meter status** The system will track the current status of the meter. Various options would include Correct Meter, Stuck-Up Meter, Sluggish Meter, Door Lock etc.
FR 5.1105	**Tracking meter/meter boxes Seals** Tracking & reconciliation of meter seals i.e. date, type no. of seals, sealed by condition of meter etc. including meter boxes.
FR 5.1106	**Maintain life cycle information linked to meter** The system shall have the ability to maintain life cycle information on meters. This includes information related to the purchase, movement, installation, inspection, testing and ultimately retiring/scrapping the meter.
FR 5.1107	**Maintain life cycle information linked to service point** The system shall have the ability to maintain life cycle information, including serial numbers on items that are linked to meters connections and service point.
FR 5.1108	**Editing capability** The system shall allow user to create copies of a given meter and its configuration and be able to edit individual copies as needed, e.g. when a new shipment of meter arrives.
FR 5.1109	**Tracking stock location** The system shall have the ability to maintain stock locations and asset inventory.
FR 5.1110	**Create meter identifier** The system shall associate each meter record with a permanent, unique identifier, determined by an authorized user. Duplicate meter identification numbers must be prohibited.

FR 5.1111	**Editing capability of recorded meter attributes** The system shall have the ability to add, update or delete data/attributes in all fields on the meter record. The ability to change a meter attributes from Billing to Non-Billing and vice versa.
FR 5.1112	**Procurement and Quality Management**: Requirement to purchase devices in a new device category. When the devices are delivered, to receive the goods and assign a serial number for each device (may be manual or automatically). Also sample check to determine whether the delivered devices meet requirements. If the check is successful, transfer the devices to the main stores. Requirement for management and classification of devices and meters. The system must be able to track meters throughout their lifecycle
FR 5.1113	**Adding meter record in batches** The system shall have the ability to add meters one at a time or in batches of meters.
FR 5.1114	**Recoding individual meter test results** The system shall have the ability to maintain unlimited individual test results on each meter.
FR 5.1115	**Recoding a group of meter test results** The system shall have the ability to maintain unlimited test results on a group of meters to support the analysis of purchase decisions and the annual meter recall program.
FR 5.1116	**Record connection type** The system shall have the ability to describe the meter connection type.
FR 5.1117	**Record bar coding information** The system shall have the ability to maintain bar coding information.
FR 5.1118	**Defining different types of meters,** The system must provide the requirement to hold multiple meter types including compound meters, parent meters and sub meters. This functionality must cover all meter types like abstraction, flow meters, zonal meters.
FR 5.1119	**Manufacturer and calibration validity** The system shall have the ability to define manufacturer and calibration validity for a class of meters.
FR 5.1120	**Integration with other applications** The system shall have seamless integration with Meter Data Management application, Material management application, Asset Management application, Water Distribution Management Systems, Audit System and GIS.
FR 5.1121	**Record meter status/conditions** The system shall have the ability to track status of a device such as in-store, issued for installation, installed, sent for repair etc.
FR 5.1122	**Provision to assign document / text/ drawing related information** The system shall have the provision to assign document / text/ drawing related information to a meter/device.
FR 5.1123	**Record transactions** The system shall have the ability to record transactions related to meter installation, removal and replacements.
FR 5.1124	**Allocate/grouping** The system shall have the ability to allocate / group a meter with a zone or water mains.

FR 5.1125	**Define single level or multi-level relationship** The system shall have the ability to define single level or multi-level main meter and sub-meter relationship.
FR 5.1126	**Create meter hierarchy** The system shall be able to zone mains customer meter hierarchy and be able to do water leakage management. For this purpose the MSI may be required to develop a report or query
FR 5.1127	**Define meter reading reason** The system shall have the ability to define meter reading reasons such as periodic meter reading, control reading, reading at move-in etc.
FR 5.1128	**Define and optimize meter route** The system shall have the ability to define and optimize route for the meter reader.
FR 5.1129	**Sequence meter route** The system shall have the ability to sequence routes.
FR 5.1130	**Transfer meter between route** The system shall have the ability to transfer single or a group of connections from one route to another.
FR 5.1131	**Provision to interface with GIS** The system shall have the ability to interface with GIS for generation of manual meter reading plan and optimal route planning.
FR 5.1132	**Attach note on meter reading** The system shall have the provision to include pre-defined notes from Meter reader in Meter reading result.
FR 5.1133	**Allocate expected consumption for a given period** The system shall have the provision to allocate expected consumption for a device for a given period which may be used in absence of any representative meter read for meter.
FR 5.1134	**Provision to create meter reading based on criteria** The system shall have the provision to create meter reading order for a customer or for large number of customers based on relevant selection criterion.
FR 5.1135	**Define estimation rules** The system shall have the ability to define rules for determining "estimated" reading.
FR 5.1136	**Define validation rules** The system shall allow user defined meter reading validations rules.
FR 5.1137	**Send failed reading based on rules** The system shall have the ability to send failed reads to responsible department based on defined process for validation.
FR 5.1138	**Minimize the data entry errors** The system shall have the provision to minimize the data entry errors by validating meter readings based on user defined rules.
FR 5.1139	**Audit trail of failed meter reading** The system shall have the ability to correct / release / reset / estimate a failed meter reading with audit trail.
FR 5.1140	**Record certification data** The system shall have the ability to hold certification validity data in the meter record.
FR 5.1141	**Accept interval data** The system shall have the ability to accept interval meter reading data from AMR system.

FR 5.1142	**Download consumption information** The system shall have the ability to download previous 12-month consumption information for any or all meters.
FR 5.1143	**Utilization of multiple formats for meter read input data** The system shall allow utilization of multiple formats for meter read input data. The responder shall specify the available formats in the proposed system.
FR 5.1144	**Conditions for meter reading accept/reject** The system shall have the ability for meter reading accept/reject conditions to be user defined.
FR 5.1145	**Extrapolate future interval values** The system shall have the ability to extrapolate future interval values that may be used for forecasting.
FR 5.1146	**Prepare customer usage profiles** The system shall have the ability to prepare customer usage profiles including charts and graphs.
FR 5.1147	**Create service orders from meter reading trouble codes** The system shall be able to create service orders from meter reading trouble codes.
FR 5.1148	**Define different frequencies for meter reading** The system shall have the provision to define different frequencies for meter reading.
FR 5.1149	**Generate paper route documents** The system shall have the ability to generate paper route documents.
FR 5.1150	**Manually enter readings from generated paper route documents** The system shall have the ability to manually enter readings from generated paper route documents in the exact same order as originally produced.
FR 5.1151	**Maintain meter reading notes** The system shall have the ability to maintain meter reading notes.
FR 5.1152	**Maintain reading codes** The system shall have the ability to maintain reading codes.
FR 5.1153	**Maintain Reading Instruction Codes and notes** The system shall have the ability to maintain Reading Instruction Codes and notes by Premise and be able to automatically send them to meter reading device.
FR 5.1154	**Maintain Meter Location Codes** The system shall have the ability to maintain Meter Location Codes.
FR 5.1155	**Maintain a complete audit trail of all changes** The system shall have the ability to maintain a complete audit trail of all changes to any data item activity.
FR 5.1156	**Instructions for auditing meter readings** The system shall have the ability to randomly or selectively produce instructions for auditing meter readings through service orders.
FR 5.1157	**Generate automatic letters/notices** The system shall have the ability to generate automatic letters/notices to customers.
FR 5.1158	**Capture the meter data from zonal meters.**
FR 5.1159	**Compare reading from consumer and zonal meters** The system shall have the ability to compare reading from consumer and zonal meters.
FR 5.1160	**Maintain different read types and billing selection priority** The system shall have the ability to maintain different read types and their billing selection priority (e.g. verified read, regular read etc.).

FR 5.1161	**Maintain locations and dates as meters move** The system shall have the ability to maintain locations and dates as meters move through the utility.
FR 5.1162	**Query and report on all meter physical locations** The system shall have the ability to query and report on all meter physical locations within the system.
FR 5.1163	**Maintain history** The system shall have the ability to maintain a history of readings, consumption and demand records.
FR 5.1164	**Display the Days of Services** The system shall have the ability to display the Days of Services (DOS) with the calculated consumption.
FR 5.1165	**Display cancelled calculated consumption** The system shall have the ability to display cancelled calculated consumption resulting from billing adjustment.
FR 5.1166	**Recognize multiple meter exchanges and perform consumption calculations** The system shall be able to recognize multiple meter exchanges and perform consumption calculations based on reads from both the old and new meters.
FR 5.1167	**Maintain relationships between consumption history and a customer, meter and premise.** The system shall have the ability to maintain relationships between consumption history and a customer, meter and premise.
FR 5.1168	**Store monthly demand data and corresponding charges** The system shall have the ability to store monthly demand data and corresponding charges.
FR 5.1169	**Display all relevant data and information related to a calculated consumption** The system shall have the ability to display all relevant data and information related to a calculated consumption, e.g. Reading Date, Charge Date, Days of Service, Billed Charges.
FR 5.1170	**Display the prorated consumptions** The system shall have the ability to display the prorated consumptions for each period separately.
FR 5.1171	GIS Grid reference required for meters
FR 5.1172	Water Billing Customer Categories- the system must allow the category of the customer to be configurable like Domestic, Group Housing Society, Non Domestic, Industrial, Commercial, Agricultural, Fire Hydrants, Temporary, Govt Agencies etc.
FR 5.1173	Water Bills for a particular Customer Category: system must be configurable to accommodate different tariff rates. The Water Bill line items must clearly indicate the various components which make up the bill. Incase the actual consumption during the billing cycle exceeds a certain threshold (configurable), the system should levy a surcharge either on the relevant bill component as per the applicable rate.
FR 5.1174	Surcharges and Rebates on components of Water Bills must be configurable. These could either be based on percentages or fixed amounts In certain cases rebates or subsidies are given to specific customers and the system must cater to this functionality requirement

FR 5.1175	Govt. Taxes and Levies: rates must be configurable and the system must automatically calculate the applicable amounts and apply them on the bills and if necessary show them as separate line items
FR 5.1176	Billing Cycle: the system must allow the billing cycle to be specified at customer master data level and/or customer category level. Further it should be possible to change the billing cycle applicable for a customer and/or customer category
FR 5.1177	Security Deposit: the interest rate on the security deposit must be parameterized and the interest amount should be automatically calculated and credited to the customer account. BMC should have the option of either crediting the security deposit and/or adjust this interest in the bill. Depending upon the change in water consumption, the required security deposit should be recalculated and a demand note be raised for the additional amount. Alternatively a credit note be raised in favour of the customer incase of a decrease in the required security deposit.
FR 5.1178	Retrospective Billing: system must have the functionality for retrospective recalculation of the water bills and issue a revised billing. The differential credit or debit amount should be automatically refunded and/or adjusted in the subsequent bills.
FR 5.1179	Rebate for Number of Bills: system must allow a configurable rebate for a customer depending on the number of bills generated in a year
FR 5.1180	Interest on delayed payments should be automatically calculated and debited to customer account as per a BMC specified rate of interest. For part month interest calculation the denominator of number of days in the month should be configurable either to thirty (30) or the actual days in the month.
FR 5.1181	Cheque/Cash Payment: for amounts above a certain configurable threshold the system must not accept cash payments.
FR 5.1182	Joint Invoicing: System must be configurable to handle electricity and water billing in one Invoice. System provides the ability to calculate and bill for all products and services on a single bill, including both metered and unmetered services
FR 5.1183	Collective Billing: System must be configurable to manage the group billing / collective billing in one invoice and payment should be adjusted accordingly
FR 5.1184	Billing Simulation: System must be configurable to generate billing based on estimation / reading for checking purpose.
FR 5.1185	Out sorting / Validation: System should be configurable to manage amount level validation at billing and Invoicing level and manual checks, block.
FR 5.1186	Billing reversal / Adjustment: System should be configurable to manage bill correction and adjustment in case of customer complaints / wrong bills
FR 5.1187	Manual Billing: System should be configurable to address old bill / archive bill generation requirement
FR 5.1188	Unscheduled Billing: System should be configurable to generate online billing for unscheduled cases like final bill online

FR 5.1189	Proration Scenario: System provides the ability to prorate based on the number of days that are outside the normal billing schedule. For example, billing days between 25-35 days is billed, based upon 30-days consumption / service charges, or anything outside of that range is billed based on the actual number of days.
FR 5.1190	System has the ability to prorate for days less than system or user- defined number of billing days.
FR 5.1191	System provides the ability to prorate a new bill based on the number of days active.
FR 5.1192	System provides the ability to prorate a final bill based on the number of days active.
FR 5.1193	Bill Print: System should be configurable to take print in Batch or online as per bill printing requirement for schedule or unscheduled billing (online printing)
FR 5.1194	System provides the ability to bill for multiple meters at a single location.
FR 5.1195	System provides the ability to accommodate back billing for a single period with a user-defined start and end date.
FR 5.1196	System provides the ability to produce duplicate copies of the bill.
FR 5.1197	Budget Billing: System calculates the average billing amount over a user-defined period for past billings.
FR 5.1198	System calculates the same monthly payment while capturing actual readings.
FR 5.1199	System provides a user-defined month for account to be reconciled (trued up). Difference between the budget months calculated and payment to the actual amount to be billed.
FR 5.1200	System will provide for estimating should actual reads not be available.
FR 5.1201	System provides the ability to estimate entire billing cycles or routes with user-defined read date.
FR 5.1202	System will calculate the estimated bill based upon the read date, not the bill date, to determine number of days in billing cycle.
FR 5.1203	System will automatically mark services that have been estimated with a unique identifier.
FR 5.1204	System should have the functionality for advance billing(especially for unmeasured customer categories) as well as billing in arrears based on actual or estimated consumption
FR 5.1205	**Analysis Reports**: • Demand analysis Report. • Collections analysis Report. • Revenue Recovery analysis Report. • Water Supply effectiveness Analysis Report. • Customer Service effective analysis Report.
FR 5.1206	**Executive Management Reports**:

	• Consolidated view of operational profit & loss for all circle officers • Drill down from the Transaction level to reports right up to section level • Change the sorting order and view the report contents with the new sort order
FR 5.1207	**Consolidated Reports** : • Consumption and sales • Revenue realization, revenue improvement • Customer complaints and water leakage losses • Executive Summary Report • Demand Vs. Collection • Summary information Report • Commercial Performance Report
FR 5.1208	**Single Parameter Reports:** • Improvement Reports • Revenue Reports • Operations Reports
FR 5.1209	**Daily Reports:** • Summary of % cumulative collections against correct month demand till date, last month
FR 5.1210	**Revenue Collection Report:** • Demand raised for the month (As spot billing is done throughout the month cumulative progress is presented) • % cumulative collection against correct month demand, till date for this month and for the last month • Monitoring of cumulative collection for the month till date against the demand raised
FR 5.1211	Other Reports: Other reports as per the Client requirements arising from time to time during project life cycle.
FR 5.1212	**The System shall cover:** • Citizen Service: Application for New Water Connection • Water Connection details given by Citizen: ➢ Support Metered and non-metered connections ➢ Capture details of multiple owners with Aadhar no. ➢ Maintain details of usage, no. of families, no. of taps, connection size, plumber's name. ➢ Billing address ➢ Property no. for which connection is being applied for • Water connection details given by department: ➢ Distribution line, road digging details if any, meter make, meter no., initial reading, maximum reading supported, and installation date. ➢ Details of security deposit if any

	➢ Generation of Work Order • Citizen Service: Closing of connection (Disconnection) • Citizen Service: Reconnection • Citizen Service: Change of ownership • Citizen Service: Change of usage • Citizen Service: Issuance of Duplicate Water Bill. • Citizen Service: No Due Certificate for arrears of water • Citizen Service: Meter Testing • Registration for Plumber. (New registration and Renewal of license) • Meter reading entry ➢ Capture and print meter reading picture on bill ➢ Flexibility to capture meter reading at any instance irrespective of any fix reading schedule. ➢ Facility to mark meter cut-off and restoration ➢ Handle scenarios where meter reading is not possible – meter is not working, stolen, tampered and apply standardized rules for calculating consumption and billing. • Meter reading data upload. • Water Billing ➢ Metered and non-metered billing. ➢ Define billing schedule and billing cycles ➢ Support fixed rates, slab-wise rates or telescopic rates. ➢ Support multiple tax/ charges ➢ Consider advance payments, penalty/ interest, arrears and rebate on early payments, meter rent where applicable. ➢ Facility to generate bill for one connection/ multiple connections ➢ Pro rata Billing • Collection – handling rebate on early payments. • Support for integration with Hand-held device for collections • Disputes registration and resolution • Facility to upload existing water connection records and outstanding as on cut-off date that is available in digital format • Data Entry of existing Water connection records and outstanding as on cut-off date that is not available in digital format • Reports ➢ Water Connection – List of consumers ➢ Plumber Register ➢ List of connections sanctioned ➢ Disconnection Register ➢ Security Deposits Register ➢ Meter Reading – based on various parameters

	➢ Water Consumption statement for a period ➢ Advance Register ➢ Demand Register ➢ Collection Register ➢ Outstanding Register ➢ Top Defaulters as per criteria
Electrical Utility Management and Billing	
FR 5.1213	**Customer Service Management:** Need to support all services oriented customer business processes. This includes the operation of customer facilitation centres with specific service processes such as customer billing, service order management, complaints & returns management, account & contact management and as follow-up process case management. An Internet-based self-service solution for occupants (owners or tenants) of a property or premise is also required. Hereinafter in reference to the detailed functionality related to electric utilities, the term occupant includes owners as well as tenants
FR 5.1214	Service Order Management with Utility Billing: • Need service order management with billing to enable BMC to manage service businesses over the entire service life cycle process. • From service contact to create, assign processing and monitoring of service requests • To the management of customer connections and installed equipment/devices • Visibility of warranty and entitlements and the billing of time (effort) and materials spent on the work order. • To ensure service level targets are met, improve customer satisfaction • Reduce costs and increase revenue by reducing the service-to-cash cycle. • Improve service quality through 24x7 customer service - support multichannel interaction - collaborate with customers • Must be able to record and track all interactions with the customer no matter what the medium e.g. telephone or Fax etc. • All customer tracking information should be presented to the service agent in a simple and standardised format
FR 5.1215	Service Order Quotation: Need to offer a service order quotation before concluding the actual service order. This gives customers the opportunity to find out more about prices and delivery conditions before agreeing to the service order.
FR 5.1216	Service Order Processing: • Need to allocate items to multiple external and internal recipients. These may be either billable or non-billable because of warranty claims, and they may stem from service orders or service confirmations.

	• Assign internal and external recipients when creating the service order or service confirmation. • When creating an amount allocation document, the bill-to party and invoice value are to be copied from the service order or service confirmation. Subsequently the user will still be able to process or edit this data in amount allocation. • Functionality must allow for sign off / authority levels to be complied as per BMC policy
FR 5.1217	Service Confirmation Processing: Ability to confirm working times, materials used, and expenses for services performed. Plan these confirmation items in a service process (for example, a service order) or an in-house repair order. The field service representative should then be able to reference the work order for further action to complete the required business process
FR 5.1218	Billing: Need to create invoices in the name of occupants using one or more billing due list item. Ability to create the invoice with reference to the rate charged, delivery, or to the sales order. Additionally, need to create bill or invoices with reference to contracts.
FR 5.1219	Service Contract and Quotation Analysis: Need to be able to monitor customer satisfaction with services performed under contracts. Identify contract products/services with a high net value and produce an overview of the value and volume of active service contracts. report which particular contracts the service employees are responsible for. Functionality must support monitoring and reporting the appropriate levels of customer satisfaction
FR 5.1220	Service Order and Quotation Analysis: Need to be able to report on current order volumes and support forecasts about fluctuations in business volumes for the forthcoming year. Need to take measures, e.g., to plan resources according to seasonal peaks or offer customers special service packages during quiet periods. Report by Customer Sector and Segment
FR 5.1221	• Customer Service Processes: Must be able to support all occupant-related processes within our call centre environment(s) or self-service through the portal. For instance a partial list of these processes would include: ➢ Move in ➢ Move out and if required refund of security deposit ➢ Meter-reading ➢ Entry, ➢ Bill correction. • Customer Service Process (Collaborative) ➢ Instalment Plan Request ➢ Disconnections ➢ General Inquiry ➢ Billing Inquiry • New Connections and management of security deposit ➢ Budget Billing Request

	• Business Partner Master Data Changes
FR 5.1222	The system must allow the new connection request to be made by an owner of a premise or property. Incase of an apartment block or building the property or premise may refer to an apartment.
FR 5.1223	The system must allow a Move in/Move out process for an occupant for a property or premise
FR 5.1224	Identifying Account for Utility Service Processes: • During a customer contact, need to be able to use the multi-channel interface (telephone, E-mail, chat, and so on) to identify an account in the system. • Once account is identified and confirmed, the system provides customer information, such as the address, account balance, bills, dunnings, credit, and information on past customer contacts. • Need to be able to initiate the business processes for a particular customer in the customer facilitation centre. And in addition, identify the premise, contract account objects and associated service zones.
FR 5.1225	Changing Account Data and Business Agreement Data: The call agent must be able to change account data or business agreement data. The system must allow the account and/or business agreement to be entered into with the occupant of a property or premise.
FR 5.1226	Master Data Overview (Account, Business Agreement, Consumption): During a customer contact, call fact sheets for an account, business agreement, and specific consumption data for an account in the system. To provide quick overview of the existing data, and to allows us selection of individual objects from the overview (such as a bill) to be displayed in detail.
FR 5.1227	Processing Move-In: Be able to create a move-in in the Customer Facilitation Centre (IC) as well as via the portal.
FR 5.1228	Processing Move-Out: Be able to create a move-out in the Customer Facilitation as well as via the portal.
FR 5.1229	Processing Move in/Out for Account: Be able to create a move-in/out for an account in the Customer Facilitation Centre as well as via the portal. The account for move-in and move-out remains constant but the premise changes
FR 5.1230	Processing Move in/Out for Premise: Be able to create a move-in/out for a premise in the Customer Facilitation Centre The premise for move-in and move-out remains constant but the account changes
FR 5.1231	Entering Meter Readings: Ability to enter, check, and save the current meter reading. The meter reading may be estimated if an account cannot be accessed by a meter reader.
FR 5.1232	Changing Budget Billing Plan: Ability to change the budget billing plan. This could be done by changing the budget billing amount or the meter reading.
FR 5.1233	Bill Information/Bill Correction: Ability to add/change information to a bill and to correct it if the meter reading is incorrect.

FR 5.1234	Malfunction Notification / Service Notification: Ability to create a malfunction notification in the system. There are different categories of malfunction (for example, meter not recording or recording inaccurate) with different reference objects (for example, connection object, apartment, meter).
FR 5.1235	Functionality for the customer agent to escalate an exception.
FR 5.1236	Managing Financial Inquiries in Customer Facilitation Centre: Enable customer agents to handle all types of finance-related inquiries with customers by providing access to finance-related data e.g. in the Invoice Display, Payment List, history or reminders and Balance Forward List of the Account or Business Agreement confirmed. The customer agent must be able to access the account balance for the customer's business agreements in a customer contact and display additional information (e.g. next due instalment, last payment or the last dunning notice for the business agreement) as well as a list of documents/document items grouped by several grouping criteria (e.g. all open items, all items included in a reminder letter/communication).
FR 5.1237	Processing Payments: Need to generate call lists from the reminder communication and reminder batch run, which are then available for use in the Customer Facilitation Centre (IC) to chase customers by telephone/internet and request payment for open items. Agents should be able to display the call list size, the period, or the duration of the call list, the number of customers, and the names of the customers who are to be called. They can also review the information to be obtained from the customer if the call list is assigned a script. The agents can gather information before they begin answering calls or calling customers themselves. Resulting from the conversation with the customer, and then take payments from the customer for the due items for chasing and create deferral for open items.
FR 5.1238	Change Service Location Data: Need to be able to change all relevant service location data (connection object, premise, and point of delivery) during contact with a customer. After identifying the premise, the call centre agent should be able to access the maintenance view for the service location. Here, the agent can change the connection object address, add additional premise data, or determine the grid for the point of delivery, for example.
FR 5.1239	Service Contract and Entitlement Management: Service contract and entitlement management enables all service entitlements – warranties, extended warranties, service contracts, and service level agreements to be defined and tracked. Service agreement terms can be adapted and created to suit the varying and diverse requirements of the customer base. When service calls are placed and service orders created the appropriate entitlement information is associated with that activity and can be checked by a service representative or via Web self-service at any time.
FR 5.1240	Complaints and Returns Management: BMC requires complaints management which allows it to easily create, manage and track complaints and returns. Customers can request their preferred action including credit, refund, or replacement of the specified product and installation. Customer Agents are provided with all relevant information to make effective decisions and can take immediate action to comply with the customer request.

FR 5.1241	Warranty Analysis: Need to provide information about the amount of products/services with or without warranty, and monitor expired warranties.
FR 5.1242	**Collecting meter readings in the metering database**: The system shall have the ability to enter single meter reading as well as transfer meter reading from an external system.
FR 5.1243	The system should also be capable of interfacing with Spot billing devices and Meter Reading Instruments for uploading such meter readings data including consumer meter readings. The data of all such meters will normally be downloaded on an external server.
FR 5.1244	System should provide data validation checks to minimize data entry errors. It should incorporate user supplied logics to check variations in consumption and generate exceptions. After data entry, the system should generate an Exception Report for non-reading of meters due to any reason. It shall also highlight possible inconsistencies in the metering data. After handling of exceptions by the respective officials, the system should be updated with the result of exception handling. While validating, if the meter reading found low / unacceptable based on earlier readings/trends the system should issue a work order for checking and replacement of meter. If the work orders are not closed with valid reason system should escalate the issue till the same is resolved
FR 5.1245	**Data Review** The system should provide the facility for the designated officials to review the metering data as per utility defined criteria. In case any discrepancy is found, the system will allow the data to be edited, with proper access rights and audit trails.
FR 5.1246	**Provision to interface with AMR** The system should be able to interface with Automatic Online Meter Reading devices. System should be capable to schedule and collect automatically readings from online connected consumer meters / Distribution Transformers meters through automatic meter reading system. The system should generate exception in case meter reading found unacceptable after validation check.
FR 5.1247	**Capturing Meter reading Data** The system should be capable of capturing meter reading data from a Meter Reading Book, handheld computers used for spot metering & billing for uploading and downloading the data. System should be capable to upload and download the data for a given set or group of consumers to Meter Reading Instruments (MRI)/Hand Held Computers (HHC) automatically. System should also keep log of MRI/HHC assigned to meter reader.
FR 5.1248	**Validations for the spot metering and billing data update:** The system should be able transfer or update the meter reading validation logic to the MRI and spot billing machines. The system should have the flexibility of validating the data uploaded from the meter reading instruments. The validation would include restricting the customer data uploads to those that were indicated in the meter reader's schedule.
FR 5.1249	**Prohibiting the wrong entry,** the system shall also have provision for prompting the Meter Reader at the time of entering wrong meter reading values in the spot billing machine.
FR 5.1250	**Monitoring meter reading plan** The system should make it necessary for the meter readers to upload all the meter readings according to the route

	plan generated within the timeframe stipulated by the utility. Otherwise exceptions should be generated and further meter reading can be entered only after clearance from specified authority. The system should track and generate the exception reports, for each meter reader to establish performance measures and determine deviations if any. It may include number of meters planned, number of meters actually read per day, number of wrong readings, unread meters by reason etc.
FR 5.1251	**Monitoring Customer Exception** The system should be able to track customer behaviour in terms of exceptions. For example: The number of times a customer figures in the list of exceptions.
FR 5.1252	**Supporting meter reading on trust** The system should also have the facility if desired by utility to enter the meter reading as specified by the customer by telephone/ fax/ web portal and record that the same is customer-specified. All customers who provide a reading on trust, should be inspected by the Utility after a specified time period.
FR 5.1253	**Overdue alert** In case a meter reading becomes overdue (Utility specified criteria), the system would generate the necessary exceptions and alerts.
FR 5.1254	**Accepting change in metering cycle** The system should be in a position to cater to changes in the metering cycle. Metering in certain cases maybe time-of-day (TOD), hourly, daily, fortnightly etc.
FR 5.1255	**Capability to store data for a specified period** The system should keep past metering data online for a period specified by the Utility guidelines from time to time.
FR 5.1256	**Interfacing with spot billing and MRI instruments** The system will support data downloading to and uploading from handheld devices used for Spot metering & billing and MRI. The devices would provide information about the meter number, customer code, meter reader's employee number, meter reading with date and time stamping, and billing amount.
FR 5.1257	**Meter reading for temporary connections** The System should be capable of accepting opening, closing and intermediate meter readings for temporary connections for generation of bills for such connection.
FR 5.1258	**Final meter reading for closure of connection** For all kinds of disconnections (whether a customer requests for termination of connection or utility disconnects due to non-payment), the system should accept the terminating meter reading (which will be out of cycle in most cases) for generating the last bill.
FR 5.1259	**Lifecycle monitoring and testing plan for meters** System must be capable of capturing complete meter history (such as type, Make, Model, Batch, Catalogue Number of meter, its place of installation, cycle and record of calibration/testing) throughout meter's lifecycle, starting from arrival in stores till it is being scrapped or destroyed. System must be capable of capturing data like ordinary meter, electronic meter etc. System must be able to identify the meters, which are due for mass replacement or scheduled testing/calibrations and generate a work order for action by field staff. It is desirable that system should be able to interact with meter testing devices for obtaining test report.

FR 5.1260	**MIS generation** System should be capable to monitor and track the following : Meter reader's performance, Comparison of input versus expected consumption, variance in consumption for consumers etc.
FR 5.1261	**Tracking meter location** Current location of meter must be tracked i.e. in stores, under testing, at consumer premise, under overhauling etc. Data must be captured at appropriate locations and point of time to track the meter.
FR 5.1262	**Tracking meter status** The system will track the current status of the meter. Various options would include Correct Meter, Stuck-Up Meter, Sluggish Meter, Door Lock etc.
FR 5.1263	**Tracking meter/meter boxes Seals** Tracking & reconciliation of meter seals i.e. date, type no. of seals, sealed by condition of meter etc. including meter boxes.
FR 5.1264	**Maintain life cycle information linked to meter** The system shall have the ability to maintain life cycle information on meters. This includes information related to the purchase, movement, installation, inspection, testing and ultimately retiring/scrapping the meter.
FR 5.1265	**Maintain life cycle information linked to service point** The system shall have the ability to maintain life cycle information, including serial numbers on items that are linked to meters connections and service point.
FR 5.1266	**Editing capability** The system shall allow user to create copies of a given meter and its configuration and be able to edit individual copies as needed, e.g. when a new shipment of meter arrives.
FR 5.1267	**Tracking stock location** The system shall have the ability to maintain stock locations and asset inventory.
FR 5.1268	**Create meter identifier** The system shall associate each meter record with a permanent, unique identifier, determined by an authorized user. Duplicate meter identification numbers must be prohibited.
FR 5.1269	**Editing capability of recorded meter attributes** The system shall have the ability to add, update or delete data/attributes in all fields on the meter record. The ability to change a meter attributes from Billing to Non-Billing and vice versa.
FR 5.1270	**Procurement and Quality Management**: Requirement to purchase devices in a new device category. When the devices are delivered, to receive the goods and assign a serial number for each device (may be manual or automatically). Also sample check to determine whether the delivered devices meet requirements. If the check is successful, transfer the devices to the main storage location. Requirement to management and classification of devices and meters. The system must be able to track meters throughout their lifecycle
FR 5.1271	**Adding meter record in batches** The system shall have the ability to add meters one at a time or in batches of meters.
FR 5.1272	**Recoding individual meter test results** The system shall have the ability to maintain unlimited individual test results on each meter.

FR 5.1273	**Recoding a group of meter test results** The system shall have the ability to maintain unlimited test results on a group of meters to support the analysis of purchase decisions and the annual meter recall program.
FR 5.1274	**Record connection type** The system shall have the ability to describe the meter connection type.
FR 5.1275	**Record bar coding information** The system shall have the ability to maintain bar coding information.
FR 5.1276	**Defining different types of meters,** the system shall have the ability to define different types of meters. For example; single-phase KWh meter, three-phase KWh meter, Demand meter etc.
FR 5.1277	**Define different types of registers** The system shall have the ability to define different types of registers in a device such as registers for recording consumption, on-peak consumption, off-peak consumption, active/reactive consumption, demand data etc.
FR 5.1278	**Record meter related equipment** The system shall have the ability to define other related equipment such as transformers, CT, PT, protection box etc. in the system.
FR 5.1279	**Capture meter related detailed information** The system shall have the ability to capture meter related detailed information such as number of registers, digital / analog display, unit of measurement, multiplication factor etc.
FR 5.1280	**Manufacturer and calibration validity** The system shall have the ability to define manufacturer and calibration validity for a class of meters.
FR 5.1281	**Integration with other applications** The system shall have seamless integration with Meter Data Management application, Material management application, Asset Management application, Energy Audit System and GIS.
FR 5.1282	**Record meter status/conditions** The system shall have the ability to track status of a device such as in-store, issued for installation, installed, sent for repair etc.
FR 5.1283	**Provision to assign document / text/ drawing related information** The system shall have the provision to assign document / text/ drawing related information to a meter/device.
FR 5.1284	**Record transactions** The system shall have the ability to record transactions related to meter installation, removal and replacements.
FR 5.1285	**Allocate/grouping** The system shall have the ability to allocate / group a meter with a transformer or feeder.
FR 5.1286	**Define single level or multi-level relationship** The system shall have the ability to define single level or multi-level main meter and sub-meter relationship.
FR 5.1287	**Create meter hierarchy** The system shall be able to maintain feeder-transformer-customer meter hierarchy and be able to do energy accounting. For this purpose the MSI may be required to develop a report or query

FR 5.1288	**Define meter reading reason** The system shall have the ability to define meter reading reasons such as periodic meter reading, control reading, reading at move-in etc.
FR 5.1289	**Define and optimize meter route** The system shall have the ability to define and optimize route for the meter reader.
FR 5.1290	**Sequence meter route** The system shall have the ability to sequence routes.
FR 5.1291	**Transfer meter between route** The system shall have the ability to transfer single or a group of connections from one route to another.
FR 5.1292	**Provision to interface with GIS** The system shall have the ability to interface with GIS for generation of manual meter reading plan and optimal route planning.
FR 5.1293	**Attach note on meter reading** The system shall have the provision to include pre-defined notes from Meter reader in Meter reading result.
FR 5.1294	**Allocate expected consumption for a given period** The system shall have the provision to allocate expected consumption for a device for a given period which may be used in absence of any representative meter read for meter.
FR 5.1295	**Provision to create meter reading based on criteria** The system shall have the provision to create meter reading order for a customer or for large number of customers based on relevant selection criterion.
FR 5.1296	**Define estimation rules** The system shall have the ability to define rules for determining "estimated" reading.
FR 5.1297	**Define validation rules** The system shall allow user defined meter reading validations rules.
FR 5.1298	**Send failed reading based on rules** The system shall have the ability to send failed reads to responsible department based on defined process for validation.
FR 5.1299	**Minimize the data entry errors** The system shall have the provision to minimize the data entry errors by validating meter readings based on user defined rules.
FR 5.1300	**Audit trail of failed meter reading** The system shall have the ability to correct / release / reset / estimate a failed meter reading with audit trail.
FR 5.1301	**Record certification data** The system shall have the ability to hold certification validity data in the meter record.
FR 5.1302	**Accept interval data** The system shall have the ability to accept interval meter reading data from AMR system.
FR 5.1303	**Record user defined interval meter reading data** The system shall have provision to record meter reading in 5 min / 10 min / 15 min / 30 min / 60 min or user defined interval meter reading data.
FR 5.1304	**Download consumption information** The system shall have the ability to download previous 12-month consumption information for any or all meters.

FR 5.1305	**Set user-defined variance parameters** The system shall have the ability to set user-defined variance parameters (e.g. % for high and low consumption from the previous 12-month average).
FR 5.1306	**Utilization of multiple formats for meter read input data** The system shall allow utilization of multiple formats for meter read input data. The responder shall specify the available formats in the proposed system.
FR 5.1307	**Conditions for meter reading accept/reject** The system shall have the ability for meter reading accept/reject conditions to be user defined.
FR 5.1308	**Extrapolate future interval values** The system shall have the ability to extrapolate future interval values that may be used for forecasting.
FR 5.1309	**Prepare customer usage profiles** The system shall have the ability to prepare customer usage profiles including charts and graphs.
FR 5.1310	**Maintain life cycle information on metering transformers** The system shall have the ability to maintain life cycle information on metering transformers. This includes information related to the purchase, movement, installation and ultimately retiring the transformer.
FR 5.1311	**Associate each metering transformer record with unique identifier** The system shall associate each metering transformer record with a permanent, unique user defined identifier.
FR 5.1312	**Create service orders from meter reading trouble codes** The system shall be able to create service orders from meter reading trouble codes.
FR 5.1313	**Define different frequencies for meter reading** The system shall have the provision to define different frequencies for meter reading.
FR 5.1314	**Generate paper route documents** The system shall have the ability to generate paper route documents so subdivision office can use them for reading.
FR 5.1315	**Manually enter readings from generated paper route documents** The system shall have the ability to manually enter readings from generated paper route documents in the exact same order as originally produced.
FR 5.1316	**Maintain meter reading notes** The system shall have the ability to maintain meter reading notes.
FR 5.1317	**Maintain reading codes** The system shall have the ability to maintain reading codes.
FR 5.1318	**Maintain Reading Instruction Codes and notes** The system shall have the ability to maintain Reading Instruction Codes and notes by Premise and be able to automatically send them to meter reading device.
FR 5.1319	**Maintain Meter Location Codes** The system shall have the ability to maintain Meter Location Codes.
FR 5.1320	**Maintain a complete audit trail of all changes** The system shall have the ability to maintain a complete audit trail of all changes to any data item activity.
FR 5.1321	**Instructions for auditing meter readings** The system shall have the ability to randomly or selectively produce instructions for auditing meter readings through service orders.

FR 5.1322	**Generate automatic letters/notices** The system shall have the ability to generate automatic letters/notices to customers.
FR 5.1323	**Capture the meter data from meters at Feeders, and HT/LT Consumers** The system shall have the provision to capture the meter data from meters at Feeders, and HT/LT Consumers (if required).
FR 5.1324	**Compare reading from consumer and transformer /feeder meters** The system shall have the ability to compare reading from consumer and transformer/feeder meters.
FR 5.1325	**Maintain different read types and billing selection priority** The system shall have the ability to maintain different read types and their billing selection priority (e.g. verified read, regular read etc.).
FR 5.1326	**Maintain locations and dates as meters move** The system shall have the ability to maintain locations and dates as meters move through the utility.
FR 5.1327	**Query and report on all meter physical locations** The system shall have the ability to query and report on all meter physical locations within the system.
FR 5.1328	**Maintain history** The system shall have the ability to maintain a history of readings, consumption and demand records.
FR 5.1329	**Display the Days of Services** The system shall have the ability to display the Days of Services (DOS) with the calculated consumption.
FR 5.1330	**Display cancelled calculated consumption** The system shall have the ability to display cancelled calculated consumption resulting from billing adjustment.
FR 5.1331	**Recognize multiple meter exchanges and perform consumption calculations** The system shall be able to recognize multiple meter exchanges and perform consumption calculations based on reads from both the old and new meters.
FR 5.1332	**Maintain relationships between consumption history and a customer, meter and premise.** The system shall have the ability to maintain relationships between consumption history and a customer, meter and premise.
FR 5.1333	**Store monthly demand data and corresponding charges** The system shall have the ability to store monthly demand data and corresponding charges.
FR 5.1334	**Display all relevant data and information related to a calculated consumption** The system shall have the ability to display all relevant data and information related to a calculated consumption, e.g. Reading Date, Charge Date, Days of Service, Billed Charges.
FR 5.1335	**Display the prorated consumptions** The system shall have the ability to display the prorated consumptions for each period separately.
FR 5.1336	GIS Grid reference required for meters
FR 5.1337	Electricity Billing Customer Categories- the system must allow the category of the customer to be configurable like Domestic, Group Housing Society, Non Domestic LT, Non Domestic High Tension, Industrial, Commercial,

	Agricultural, Metered Street lights, Unmetered Street Lights, Signals and Blinkers, Temporary, Govt Agencies etc.
FR 5.1338	Electricity Bills for a particular Customer Category: system must be configurable to accommodate different tariff rates corresponding to the sanctioned slabs of energy load. The Energy Bill line items must clearly indicate the various components which make up the bill. Incase the actual consumption during the billing cycle exceeds the sanctioned load by a certain threshold (configurable), the system should levy a surcharge either on the fixed portion and/or the variable portion as per the applicable rate. The system should be configurable such that the kVA shall be calculated on basis of actual power factor of the consumer, for the relevant billing cycle.
FR 5.1339	The system must allow chargeable energy rates to be variable depending on the time of day when the energy is consumed
FR 5.1340	Surcharges and Rebates on components of Electricity Bills must be configurable. These could either be based on percentages or fixed amounts In certain cases rebates or subsidies are given to specific customers and the system must cater to this functionality requirement
FR 5.1341	Govt Taxes and Levies: rates must be configurable and the system must automatically calculate the applicable amounts and apply them on the bills and if necessary show them as separate line items
FR 5.1342	Billing Cycle: the system must allow the billing cycle to be specified at customer master data level and/or customer category level. Further it should be possible to change the billing cycle applicable for a customer and/or customer category
FR 5.1343	Security Deposit: the interest rate on the security deposit must be parameterized and the interest amount should be automatically calculated and credited to the customer account. BMC should have the option of either crediting the security deposit and/or adjust this interest in the bill. Depending upon the change in sanction load, the required security deposit should be recalculated and a demand note be raised for the additional amount. Alternatively a credit note be raised in favour of the customer incase of a decrease in the required security deposit.
FR 5.1344	Retrospective Billing: system must have the functionality for retrospective recalculation of the energy bills and issue a revised billing. The differential credit or debit amount should be automatically refunded and/or adjusted in the subsequent bills.
FR 5.1345	Rebate for Number of Bills: system must allow a configurable rebate for a customer depending on the number of bills generated in a year
FR 5.1346	Interest on delayed payments should be automatically calculated and debited to customer account as per a BMC specified rate of interest. For part month interest calculation the denominator of number of days in the month should be configurable either to thirty (30) or the actual days in the month.
FR 5.1347	Cheque/Cash Payment: for amounts above a certain configurable threshold the system must not accept cash payments.

FR 5.1348	Joint Invoicing: System must be configurable to handle electricity and water billing in one Invoice. System provides the ability to calculate and bill for all products and services on a single bill, including both metered and unmetered services
FR 5.1349	Collective Billing: System must be configurable to manage the group billing / collective billing in one invoice and payment should be adjusted accordingly
FR 5.1350	Billing Simulation: System must be configurable to generate billing based on estimation / reading for checking purpose.
FR 5.1351	Out sorting / Validation: System should be configurable to manage amount level validation at billing and Invoicing level and manual checks, block.
FR 5.1352	Billing reversal / Adjustment: System should be configurable to manage bill correction and adjustment in case of customer complaints / wrong bills
FR 5.1353	Manual Billing: System should be configurable to address old bill / archive bill generation requirement
FR 5.1354	Unscheduled Billing: System should be configurable to generate online billing for unscheduled cases like final bill online
FR 5.1355	Proration Scenario: System provides the ability to prorate based on the number of days that are outside the normal billing schedule. For example, billing days between 25-35 days is billed, based upon 30-days consumption / service charges, or anything outside of that range is billed based on the actual number of days.
FR 5.1356	System has the ability to prorate for days less than system or user- defined number of billing days.
FR 5.1357	System provides the ability to prorate a new bill based on the number of days active.
FR 5.1358	System provides the ability to prorate a final bill based on the number of days active.
FR 5.1359	Bill Print: System should be configurable to take print in Batch or online as per bill printing requirement for schedule or unscheduled billing (online printing)
FR 5.1360	System provides the ability to bill for multiple meters at a single location.
FR 5.1361	System provides the ability to accommodate back billing for a single period with a user-defined start and end date.
FR 5.1362	System provides the ability to produce duplicate copies of the bill.
FR 5.1363	Budget Billing: System calculates the average billing amount over a user-defined period for past billings.
FR 5.1364	System calculates the same monthly payment while capturing actual readings.
FR 5.1365	System provides a user-defined month for account to be reconciled (trued up). Difference between the budget months calculated and payment to the actual amount to be billed.
FR 5.1366	System will provide for estimating should actual reads not be available.

FR 5.1367	System provides the ability to estimate entire billing cycles or routes with user-defined read date.
FR 5.1368	System will calculate the estimated bill based upon the read date, not the bill date, to determine number of days in billing cycle.
FR 5.1369	System will automatically mark services that have been estimated with a unique identifier.
FR 5.1370	System should have the functionality for advance billing(especially for unmeasured customer categories) as well as billing in arrears based on actual or estimated consumption
FR 5.1371	**Analysis Reports**: • Demand analysis Report. • Collections analysis Report. • Revenue Recovery analysis Report. • Power Supply effectiveness Analysis Report. • Customer Service effective analysis Report.
FR 5.1372	**Executive Management Reports**: • Consolidated view of operational profit & loss for all circle officers • Drill down from the Transaction level to reports right up to section level • Change the sorting order and view the report contents with the new sort order
FR 5.1373	**Consolidated Reports** : • Summary of the power purchase • consumption and sales • Revenue realization, revenue improvement • Customer complaints and commercial losses • Executive Summary Report • Demand Vs. Collection • Summary information Report • Commercial Performance Report
FR 5.1374	**Single Parameter Reports:** • Improvement Reports • Revenue Reports • Operations Reports
FR 5.1375	**Load Forecasting Reports:** • Short Term Load Forecasting Reports • Area Specific Load Forecasting reports
FR 5.1376	**Daily Reports:** Summary of % cumulative collections against correct month demand till date, last month
FR 5.1377	**Revenue Collection Report**:

	• Demand raised for the month (As spot billing is done throughout the month cumulative progress is presented) • % cumulative collection against correct month demand, till date for this month and for the last month • Monitoring of cumulative collection for the month till date against the demand raised
FR 5.1378	Other Reports: Other reports as per the business requirements arising from time to time.
Foundation Layer	
FR 5.1379	The details of each layers/components & sub-components of system architecture are given below:
FR 5.1380	**Access Channel:** Integrated Portal services shall be accessed online through Web and Kiosks via several end user devices (PC, Tablets, Smart-phones, etc.).
FR 5.1381	**Single Sign On (SSO):** System architecture should be SSO enabled: • Identity Provider: Active Directory Services (ADS) on MS-Windows Server 2012 R2 Standard Edition. • SSO Application: Web application that provides a secure SSO Application Interface including interface and secure web services for Identity and Application management lifecycle. • Process Flow: Only upon successfully authentication, the end-user shall land on the SSO Application wherein he would see a list of all the SSO-enabled applications. Once the authenticated user clicks on any application under the SSO Application, his/ her role/ access to that application is validated with Active Directory service in a secured manner and depending upon his role, access is denied/ granted to that application with the set of privileges mapped to the assigned role by that application. The user, after having finished his/ her work with the application, can go-back to SSO Application to select another application or directly Logout from the existing application. • The SSO application would also enable an authenticated user to review/ update his profile (self-service) using the SSO application.
FR 5.1382	**Presentation Layer**: The presentation layer i.e. User Interface shall be used for the receiving and delivery information for to and from the end-user of the application. It shall be responsive.
FR 5.1383	**Workflow Engine:** Workflow shall be used with the automation of procedures where documents, information or tasks are passed among participants according to a defined set of rules to achieve, or contribute to an overall business goal. A workflow engine shall manage and monitor the state of activities in a workflow, such as the processing and approval of various application forms, and determines which new activity to transition to according to defined processes.
FR 5.1384	**ESB/Middleware:**

	• An Enterprise Service Bus (ESB) is a software architecture model used for designing and implementing communication between mutually interacting software applications in a service oriented architecture (SOA). • The ESB supports SOAP Based integration, including SOAP/HTTP, SOAP/JMS, and SOAP/HTTPS and XML messages. • The ESB supports message record/ replay capability, DFDL standards-based parser for text and binary data, many programming languages (Java, ESQL, PHP, C#, VB, F#, C++) including .Net, natively web services, Graphical Data mapping for transforming XML, text, and binary data, transaction management (Automatic, Commit, Rollback), SSL, SFTP, and LDAP etc. • The ESB provide robust transaction control capabilities including uncoordinated auxiliary transactions. • The ESB have the capability to support design, editing and manipulation of WSDL, through an integrated tooling. • The ESB provide an integrated testing tool with auto test the integration components developed and integrated development environment for development, test and deployment and debug. • The ESB also support TLS 1.1 & TLS 1.2 to offer strict security requirements.
FR 5.1385	Integration with other existing e-Governance applications and SCADA systems of Utility Companies for real-time monitoring, billing and support.
FR 5.1386	**Application Design, Development & Customization**: • **Compliance with industry standards:** Solution shall be compliant with industry standards (their latest stable versions as on date) wherever applicable. This will apply to all the aspects of solution including but not limited to design, development, security, installation, and testing. • **Platform Flexibility:** Open Standards and Interoperability (Usage of standard APIs) shall be considered Web-centric, multi-tier architecture shall be used. • **Iterative Development:** Iterative approach shall be used to develop a software system iteratively and incrementally, allowing developers and users to take advantage of lessons learnt during the development or earlier iterations of the system development. In the iterative development approach, the whole process of System Development typically iterates through all the phases of the System Development Life Cycle (SDLC), starting from gathering requirements to delivering functionality of a working release. • **Compliance to SOA and EAI:** Application shall be based on Service Oriented Architecture (SOA) and EAI. All modules of the application shall expose key

	functionality through Software APIs in form of SOAP & WS-* or JSON & REST etc. so that they can be consumed by other applications. • **User Interface:** The application's UI should be based on HTML5 standard only and should be compatible with all devices like Desktop, Smartphone and tablet etc. The application interface should be responsive.
FR 5.1387	**Error Handling:** Ensure applications execute proper error handling so that errors will not provide detailed system information, deny service, impair security mechanisms, or crash the system.
FR 5.1388	**Rich User experience:** The solution shall have capability where any services like Payment Gateway, the mobile devices for queries/ reporting and providing day-to-day approvals by competent authorities as per authorized workflow for different kind of requests; and external entities like bank, departments and others can invoke this framework by passing the required parameters and specifying the desired output.
Technology Standards	
FR 5.1389	**Browser Compatibility:** The Integrated Application shall support common web and mobile browsers like Google Chrome, Internet Explorer, Firefox, Safari and Opera Mini etc.
FR 5.1390	**Bi-Lingual Support:** Application shall support at least Unicode 5.1/ 6.0 standard based Tri-lingual versions for user interface. It is expected to be in the Oriya, Hindi and English (India) languages.
FR 5.1391	**Anywhere Access:** Application shall be deployed on state government cloud to enable anytime, anywhere access and to address auto sync/ save, efficiency, peak load handling issues. Application shall be accessible on all popular devices (PC, mobile or tablets) and across all popular operating system platforms like Windows/ Apple for PCs and Android/ IOS for mobiles. The Integrated e-Office application should also function on the low bandwidth (64 Kbps/ GPRS).
FR 5.1392	**Scalability, Reliability and Flexibility:** The technology shall be scalable with Department's emerging requirements and m information handling needs of the government increases. The architecture must be scalable and flexible for modular expansion. The IA shall plan and provide for horizontal scalability in such a manner that a new server can be added (or removed) dynamically, as and when required in future, without disturbing the normal functioning of production system. The vertical scalability in servers in terms of additional processors and RAM will have to be provided for handling future growth in transactions.
FR 5.1393	**Interoperability:** The system shall be interoperable and should comply with open standards for easy integration. The entire system/ subsystem should be interoperable, in order to support information flow and integration. Operating systems and storage technologies from several suppliers must interact well with each other.
Security Standards	
FR 5.1394	**Application Access:** Ensure applications processing data properly for authenticated users (through central authentication systems), specifically: SSO Login. Establish authorizations for applications by affiliation,

	membership, or employment, rather than by individual. If individual authorizations are used, these should expire and require renewal on a periodic (at least annually) basis.
FR 5.1395	**Review:** Conduct code-level security reviews with professionally trained peers for all new or significantly modified applications; particularly, those that affect the collection, use, and/or display of confidential data. Conduct annual security tests of Internet applications.
FR 5.1396	**Security:** application shall support both HTTP and HTTPS (SSL certificate shall be provided).
Enterprise Content Management (ECM) System / Document Management System	
FR 5.1397	Facility to scan and upload • Paper documents • Photos • Email communication • Any other document;
FR 5.1398	Documents in electronic soft form (pdf, txt, xls, doc, ppt, picture files, TIFF, JPEG, GIF, even Zip Files) System generated documents
FR 5.1399	Ability to share documents scanned across several offices / departments.
FR 5.1400	The proposed system shall have Out of the Box capability of Digital Asset management to manage rich media content files.
FR 5.1401	Automatically create multiple formats of a corporate image or video and create additional formats with various aspect ratio on ingestion
FR 5.1402	Support multiple definitions of sets of renditions to be created for different classes of assets
FR 5.1403	System shall have support for management of image formats such as JPG, GIF, PNG, TIFF, PSD, and BMP; as well as output formats such as JPG, GIF, PNG, and PSD.
FR 5.1404	System shall have support for video formats such as Flash, Real, Windows Media Format, QuickTime, and others. Image and Video metadata is extracted and associated with the content item as object metadata.
FR 5.1405	Ability to check the quality of the scanned image and make corrections/adjustments to improve the quality of the scanned image.
FR 5.1406	The ECM shall support temporarily storing the scanned images locally before uploading to the central server.
FR 5.1407	Ability to support quick scanning and indexing of bulk documents. Scanning through browser plug-in.
FR 5.1408	Ability to support automatic cropping / masking of whole/any part of the document. This ability should be user defined and also document wise.
FR 5.1409	It shall be possible to scan and upload documents including pictures and images. Such document may be uploaded directly from third party premises over the web or from the office.
FR 5.1410	Ability to support Web based scanning
FR 5.1411	It shall be possible to set up and track both mandatory and non-mandatory documents.

FR 5.1412	Document types need to be pre-defined as a product / type of service / transaction type / workflow etc.
FR 5.1413	Confirm that the content was delivered and viewed as a proof of compliance with security policies
FR 5.1414	Grant access to documents offline for a specified period of time while maintaining audit capabilities.
FR 5.1415	The system shall have a native iOS and Android based mobile/tablet app for easy access of the information (document) while users are on the move.
FR 5.1416	Workflow for routing and tracking of documents, messages and Forms
FR 5.1417	Create Ad-hoc or predefined routes for automatic document routing on sequential / parallel routes. This must be offered as a base and standard product
FR 5.1418	Facility of associating a note-sheet with the file enabling users to comment and review.
FR 5.1419	Facility of attaching documents and folders in work items
FR 5.1420	Facility to act upon, forward, return or complete Work-items
FR 5.1421	Support for referring Work-items to other users outside the pre-defined route
FR 5.1422	Time –based/ Event -based reminders
FR 5.1423	Provision of putting shared and secured notes for collaborative working on Work items
FR 5.1424	Ability to support typical document imaging annotations which include:
FR 5.1425	Highlighting images and text in various colours to emphasize words or sections
FR 5.1426	Redacting (blacking-out or whiting-out) images and text to preserve confidentiality
FR 5.1427	Stamping images with words such as FAXED or CONFIDENTIAL, or with signatures denoting approval or denial
FR 5.1428	Attaching sticky notes that contain additional comments
FR 5.1429	An imaging system ’s security should control who can view
FR 5.1430	Annotations such as highlighting, stamps or sticky notes, and who can see through redaction. All annotations should be overlaid and not change the actual image.
FR 5.1431	Ability to support Printing, faxing and e-mailing documents
FR 5.1432	System shall provide web-based administration tool and provide a single point of access for managing and administering all repositories, servers, users and groups regardless of their location across the enterprise
FR 5.1433	The system shall allow content syndication service via xml based feeds , email alerts etc.
FR 5.1434	The system shall support versioning of contents, user should be able to access previous and next versions
FR 5.1435	Shall support storage of complete and multiple versions of content

FR 5.1436	Shall have major & minor release for draft & final release version of the document
FR 5.1437	Shall support the JSR 170, Java APIs/REST APIs/Web Service APIs that make content assets available to the application layer services or other Content Management (CM) solutions.
FR 5.1438	Shall support for storage of any type of contents such as JPG, TIFF, PDF, MS office files, audio, video, auto cad files etc.
FR 5.1439	The product shall support single metadata store for modules such as Document Management, Web Content Management, Records Management and Digital Asset Management
FR 5.1440	System should provide library services such as core content services, workflows, archiving, folders, content publishing, records management and security features.
FR 5.1441	Ability to support a single Security model for the content repository that is used to manage documents, records as well as web content.
FR 5.1442	Shall have out of box support for standards like BPM/BPEL to address complex workflow requirements.
FR 5.1443	System shall support for auditing for usage of content through audit trails.
FR 5.1444	System shall provide support for scheduling indexing.
FR 5.1445	Provides ability for administrators to archive and backup content.
FR 5.1446	Shall support for both centralized & distributed architecture.
FR 5.1447	Shall support for content cache for remote client.
FR 5.1448	Shall have policy-based, pluggable framework for reliability and secure access.
FR 5.1449	Shall have a comprehensive access control functions, depending on the user role & access levels
FR 5.1450	Shall support simple as well as complex workflows along with escalation routing and monitoring policy as defined by user
FR 5.1451	The proposed system shall be able to classify any piece of content as a record
FR 5.1452	Support for creation, declaration, classification, retention and destruction of business records.
FR 5.1453	System shall provide audit trails and certificate of destruction.
FR 5.1454	System shall provide the ability to freeze the records.
FR 5.1455	Product shall provide records managers with a single view into all retention schedules, disposition actions, and audit histories, facilitating the process of identifying and declaring records.
FR 5.1456	System shall allow for management of external content.
FR 5.1457	System shall support adapters to external repositories for managing records, such as file systems, content repositories and e-mail archives
FR 5.1458	Product shall provide generic adapters that can be configured for integration with other applications and repositories.

FR 5.1459	It shall have out of box components and integration options with Portal
FR 5.1460	The system shall provide ability to leverage multiple display templates for a content item
FR 5.1461	System shall support in-context web content contribution, preview, updates and approvals.
FR 5.1462	System shall provide support for multi-site management
FR 5.1463	The system shall provide spell-checking functionality. The language of the dictionary must be able to be changed for content authors producing content in other languages.
FR 5.1464	The system shall provide the ability to upload and associate media items to content items from within the content item authoring interface.
FR 5.1465	The system shall provide the ability to preview content as it will appear on pages where it is added in production prior to it being published
FR 5.1466	Digital Certificate Services The system should automatically enable/disable the Digital Signature Certificates (DSCs) of employees depending on the current status of each employee namely, fresh appointment / transfer / leave/ training / retirement etc. The system should accordingly enable DSC only for an “active” employee. Procurement of digital certificates for the users of the BMC will be the responsibility of the client.
FR 5.1467	MAILING AND MESSAGING SERVICES This would be used for sending the alerts as mail and SMS message to the registered users of the application and will be used for messaging and calendaring services. The Mail and SMS Server should provide a highly available, scalable and reliable platform for delivering secure communication services. It would be required to cluster this Server to ensure high availability and reliability. This server will also act as Messaging Server. It should provide with extensive security features ensuring the privacy of users and the integrity of communication through user authentication, session encryption, and content filtering to help prevent spam and viruses, and mechanisms to monitor and enable regulatory compliance. It should support standard SMTP, IMAP and POP3 services. The Messaging system should provide a secure messaging and collaboration – email solution with standard features like calendaring, contacts and tasks, Archiving, Directory and LDAP address book, web based access to emails and support for data storage. Other features to be supported include – per-user filtering policies, user management, mailing list manager and synchronization with MS Outlook / Lotus Notes/equivalent. Approximate size of mailbox for registered user should be 300MB.
FR 5.1468	PAYMENT GATEWAY The application would provide the online payment services through integration with the payment gateways. The solution shall support card payments using all the popular debit and credit cards (Visa, Master card etc.) and Direct Debit. For online payments, Secure Socket Layer (SSL) shall be used for supporting & securing the transactions taking place through the payment gateway. As Commercial transaction over internet is prone to Identity Theft and can cause financial loss to department and citizens, the solution would incorporate PCI DSS ver. 1.1 standards. Currently BMC has set up a payment gateway with Axis bank.
Integration and Interfaces	

FR 5.1469	The BMC functionality requirement is to create a SOA based enterprise framework to enable online integration for the various components as per the solution proposed by the MSI. This framework must include: • ERP • E Governance System • Command and Control System • Document Management System • Portal • Multi-channel communication interfaces which includes devices like desktops, laptops, tablets, mobile/handheld devices working on Android, Apple ,Windows or any other contemporary platform • Emails and SMS services • Web GIS • SCADA systems • Payment Systems (not limited to RTGS, PAYTM, BHIM, Credit Cards etc.) • Banks • Solid Waste Management System • Fleet Management Systems and Vehicle Tracking Systems • Traffic Management Systems • Systems relating to central and/ or state governments • Websites/portals of central and/or state governments • Systems owned by Vendors and/or City Operators • Police , Fire Brigade and other relevant state agencies • Systems/portal relating to any other domestic or international organisation as per BSCL business needs • Any other system to be included in the proposed solution by the MSI
FR 5.1470	Functionality should be provided for validation of data movement between source and target system
FR 5.1471	Functionality should be provided to prevent duplicate updates of batch data files provided by external entities. The scope of this requirement should not be limited to the following illustrative example like reconciliation statements provided by Banks
FR 5.1472	Not with standing anything contained in this RFP, the MSI solution cover all BMC business needs and should specify if the required interfaces needs to be bi-directional or uni-directional. During the course of the implementation there could be a BMC business needs which may arise which should be included in the MSI scope of work.
FR 5.1473	The BMC requirement is for online integration as a default. The MSI should propose a batch interface only because it is justified by business exigencies

5.5.3. Solid Waste Management

Functional Requirements

Solid Waste Management (Solid Waste Module)	
Solid Waste Tracking Module (Vehicle and Bin)	
FR 5.1474	System shall use the Automated Vehicle Locator Management System of the City Bus Intelligent Transport System with customized dashboard specific to monitoring and tracking of solid waste management activities
FR 5.1475	The waste collection vehicles shall be fitted with RFID readers. RFID readers identify the RFID tags installed in the each of the collection Bins and read the Bin details. This data shall be transferred through the GPS device unit having GSM/GPRS connectivity. RFID readers shall be integrated to the vehicle GPS device unit to achieve this functionality.
FR 5.1476	Weight sensors shall be placed at the fixed location over which Bin shall be placed every time it being served by the waste collection vehicle. The weight sensor shall sense the level of occupancy of the bin placed above and trigger alert signal to the city operation centre application through GPRS/GSM network.
FR 5.1477	Volume sensor shall be placed at the fixed location over Bin. When the volume of occupancy (waste) reaches to a particular threshold value, an alert/SMS shall be sent to control centre which then shall send the information to nearest vehicle for pick-up.
FR 5.1478	Volume/Fill level sensors can be either Ultrasonic or IR based to allow the system to identify the fill level and empty levels in a percentage basis and thereby garbage collection can be scheduled as a function of fill levels at different locations in the city.
FR 5.1479	Foul smell detection sensors/ Animal repellent sensors to be installed at select locations to the garbage bin to detect the quality of air being released into the atmosphere.
FR 5.1480	This system shall be integrate with the RFID system, weight and volume sensor system for bin collection management.
FR 5.1481	Application shall be hosted in the Intelligent City Operation & Management Centre (ICOMC). The application shall leverage on the advanced GPS and GIS technologies for route scheduling, route monitoring, reporting and providing a quick dashboard.
Transit Management System	
FR 5.1482	System shall facilitate data transfer through GPRS enabling the update of status by the designated compactors/ tippers/ other vehicle operators on waste pick-up from bins.
FR 5.1483	Application must enable the monitoring of transit system of transport of Municipal Solid Waste (MSW) from designated bins at all wards to Temporary Transit Stations (TTS) and thereafter to Solid Waste Treatment Centres
FR 5.1484	TTS and Waste Treatment entry/exit stations shall be installed with RFID Readers, License Plate Image Capture Camera, Barrier Gate and Weight Sensors to be integrated with a local controller and workstation.

FR 5.1485	Application must enable integration with RFID Readers, Weight Sensors, boom barriers and License Plate Image Capture Cameras to be installed at TTS and Treatment Centres.
FR 5.1486	Waste carrying Vehicles/Trucks shall be fixed with RFID Tags to enable their reading at the entry/exit stations of the TTS and Waste Treatment Plants.
FR 5.1487	Module must enable the tracking of vehicles' their inward/outward movement, weight of solid waste transported through TTS and waste Treatment Centres and transfer the same to the central control centre without any ability to change the data locally.
FR 5.1488	All the data shall be stored locally for a min. period of 60 days including the video and images captured.
FR 5.1489	Application must enable integration with SMS gateway to facilitate update of status as well as notification through SMS.
FR 5.1490	Module must enable the capturing of GIS information of the TTS and Treatment Centres by geo fencing of the same.
FR 5.1491	Geo tagging of all designated BINs in all 67 wards by which the latitude and longitude details are reflected in the module pin pointing the location of the BINs. All the BINs are to be codified before geo-tagging with a facility for future scalability.
FR 5.1492	Module must also enable the highlighting of the routes covered by the compactors/ tippers/ other vehicles involved through GIS mapping
FR 5.1493	This module should consider possibility of uploading of a picture (taken through phone immediately after unloading the bin and cleaning the surrounding of the bin) of the unloaded waste bin to ensure that the waste from the particular bin has been lifted.
Billing & Collection Module	
FR 5.1494	Module should facilitate the generation of demand note for billing.
FR 5.1495	Application must facilitate integration with payment gateway for online payment of the fees, fines and other kinds of financial transaction.
FR 5.1496	Module must also have the facilities to accept offline payment by capturing details of Demand Draft/ bank challan.
FR 5.1497	Application should enable integration with handheld POS devices to enable the update of onsite payment.
FR 5.1498	The billing and collection mechanism as well as the assessment of the penalty should be developed in line with the provision of the existing collection and transportation contracts to avoid any conflict in future.
Attendance module (HR)	
FR 5.1499	GPS based mobile device shall enable Authority's/Agencies field staff to register their attendance/presence throughout the day.
FR 5.1500	The system shall periodically track the location (with time stamping) of the staff through their GPS based mobile device and shall map it in the system with the pre-defined area coordinates.
FR 5.1501	Application should include the facility of handling the biographic details of all field level employees (both contractual and on-payroll)

FR 5.1502	The attendance data must be captured daily either on biometric devices or on supervisor certification
FR 5.1503	The device shall feed the data through GPRS/GSM network to the city operation Centre central application for reporting generation and alerts.
FR 5.1504	This data should be integrated with the HR system of BMC and payroll processing
Service Level Agreement (SLA Module)	
FR 5.1505	The module must enable the mapping of the existing Service Level Agreement with all the involved stakeholders for the solid waste management. Prospective bidders may contact BMC office to understand the SLA terms before submission of their bids.
FR 5.1506	The module should map the payment and penalty calculation as specified in the SLA
FR 5.1507	Should interact with the other relevant modules to calculate correct remuneration and penalty as per the prevailing contracts.
FR 5.1508	Module should be made configurable to enable the modification of rates of penalty and payment if needed
Grievance Redressal & Monitoring	
FR 5.1509	Grievance module should facilitate the registering of grievances and complaints.
FR 5.1510	Module should reflect the hierarchy of BMC for escalation of grievances for redressal.
FR 5.1511	The module should have full redressal workflow management system with auto escalation of grievances as per set time period & escalation hierarchy.
FR 5.1512	Module should be made fully configurable to set up desired levels of escalation hierarchy as well as configure the time period for escalation.
FR 5.1513	Application must integrate with SMS gateway to enable the notification of status through SMS.
FR 5.1514	Module must also integrate with Simple Mail Transfer Protocol (SMTP) to facilitate notifications to involved stakeholders/ parties through email.
FR 5.1515	Module must enable the capture of the complaints of the citizens through call-centre as well as through the web-application.
FR 5.1516	Generate unique compliant ID to enable tracking.
FR 5.1517	Status update in the web-portal to enable tracking of complaint/ grievance status by the citizens.
FR 5.1518	Module must enable the capture of images through mobile app for registration of complaints and grievances by concerned citizens.
FR 5.1519	System should facilitate Citizens complaints through SMS and its tracking.
FR 5.1520	Application should generate a system based complaints reports and their status and such report should be generated on daily basis.
FR 5.1521	These system reports will enable the BMC to assess the category of complaints and will give valuable inputs in addressing the waste management related issue.

Solid Waste Management (Construction Waste Module)

Registration	
FR 5.1522	Module should enable the registration of request for construction waste management by citizens through web application.
FR 5.1523	The module should enable the concerned citizens to request BMC services for waste removal and vehicle booking.
FR 5.1524	On upload of necessary information by the citizens, the request should be enabled to be escalated to the concerned authorities for verification and approval by the module.
FR 5.1525	Update of status of approval for request for construction/ dismantle through the web application.
Construction (Waste) Permit	
FR 5.1526	Generation of permit for construction/ demolition waste removal and transport through the module.
FR 5.1527	Module must allow the download of such permit by the citizen as well as notification to the concerned authority and citizen.
FR 5.1528	Application must enable the integration with SMS gateway and SMTP to enable notification update through SMS and e-mail.
FR 5.1529	Permit should have a unique ID for tracking and details of place, date and time for waste pickup.
Complaint & Grievance Management	
FR 5.1530	Grievance module should facilitate the registering of grievances and complaints

FR 5.1531	Module should reflect the hierarchy of BMC for escalation of grievances for redressal
FR 5.1532	The module should have full redressal workflow management system with auto escalation of grievances as per set time period
FR 5.1533	Module should be made fully configurable to set up desired levels of escalation hierarchy as well as configure the time period for escalation
FR 5.1534	Application must integrate with SMS gateway to enable the notification of status through SMS
FR 5.1535	The system should have facility to automatically send alert to the designated officer for job not done as per the schedule through SMS.
FR 5.1536	Module must also integrate with Simple Mail Transfer Protocol (SMTP) to facilitate notifications to involved stakeholders/ parties through e-mail
FR 5.1537	Module must enable the capture of the complaints of the citizens through call-centre as well as through the web-application
FR 5.1538	Generate unique compliant ID to enable tracking
FR 5.1539	Status update in the web-portal to enable tracking of complaint/ grievance status by the citizens
FR 5.1540	Module must enable the capture of images through mobile app for registration of complaints and grievances by concerned citizens
FR 5.1541	System should facilitate Citizens complaints through SMS and its tracking
Transit Management	
FR 5.1542	Application must enable the monitoring of transit system of transport of Construction waste from declared site of construction/ demolition
FR 5.1543	Application must enable integration with boom barriers at TTS and Treatment Centres
FR 5.1544	Module must enable the tracking of vehicles' inward and outward movement through RFID integration at TTS and waste Treatment Centres
FR 5.1545	Application must enable integration with SMS gateway to facilitate update of status as well as notification through SMS
FR 5.1546	Module must enable the capturing of GIS information of the TTS and Treatment Centres by geo fencing of the same
FR 5.1547	Module must also enable the highlighting of the routes covered by the compactors/ tippers/ other vehicles involved through GIS mapping
FR 5.1548	Solution should be able to capture the weigh bridge information and integrate with vehicle details and contractor details
Waste Management Facilities	
FR 5.1549	The application must record the clear demarcation of the waste, dump-yard and its related facilities through GIS mapping
Billing & Collection	
FR 5.1550	Module should facilitate the generation of demand note for billing
FR 5.1551	Application must facilitate integration with payment gateway for online payment of the fees, fines and other kinds of financial transaction

FR 5.1552	Module must also have the facilities to accept offline payment by capturing details of Demand Draft/ bank challan
FR 5.1553	Application should enable integration with handheld POS devices to enable onsite payment to the transporter present while removal of the construction waste through cash. The status of the payment is updated through GPRS by the handheld POS device.
FR 5.1554	The POS device must enable the generation of receipt of payment
FR 5.1555	The module may accept payment before removal of waste or after removal through online or offline payment
FR 5.1556	BMC may consider charging certain user charge (for various category of the waste generator) for management waste through various waste categories (construction, bio-medical, animal etc.) on behalf of the generator.
FR 5.1557	The module captures the collection of the payment made by the user and the status of the request raised by the user of service post payment.

Solid Waste Management (Bio-Medical Waste Module)

Registration [Hospitals, Medical Institute, Clinic & Patho-Lab]	
FR 5.1558	Module should enable the registration of request for bio-medical waste management by clinics/ patho-labs through web application
FR 5.1559	The module should enable the concerned user to request BMC services for waste removal and vehicle booking
FR 5.1560	On upload of necessary information by the requesting party, the request should be enabled to be escalated to the concerned authorities for verification and approval by the module
FR 5.1561	Update of status of approval/ rejection for request for bio-medical waste removal through the web application

Bio-Medical (Waste) Permit	
FR 5.1562	Generation of permit for bio-medical waste removal and transport through the module
FR 5.1563	Module must allow the download of such permit by the citizen as well as notification to the concerned authority and citizen
FR 5.1564	Application must enable the integration with SMS gateway and SMTP to enable notification update through SMS and Email
FR 5.1565	Permit should have a unique ID for tracking and details of place, date and time for waste pickup
Complaint & Grievance Management	
FR 5.1566	Grievance module should facilitate the registration of grievances and complaints
FR 5.1567	Module should reflect the hierarchy of BMC for escalation of grievances for redressal
FR 5.1568	The module should have full redressal workflow management system with auto escalation of grievances as per set time period
FR 5.1569	Module should be made fully configurable to set up desired levels of escalation hierarchy as well as configure the time period for escalation
FR 5.1570	Application must integrate with SMS gateway to enable the notification of status through SMS
FR 5.1571	Module must also integrate with Simple Mail Transfer Protocol (SMTP) to facilitate notifications to involved stakeholders/ parties through e-mail
FR 5.1572	Module must enable the capture of the complaints of the citizens through call-centre as well as through the web-application
FR 5.1573	Generate unique compliant ID to enable tracking
FR 5.1574	Status update in the web-portal to enable tracking of complaint/ grievance status by the citizens
FR 5.1575	Module must enable the capture of images through mobile app for registration of complaints and grievances by concerned citizens
Transit Management	
FR 5.1576	Application must enable the monitoring of transit system of transport of bio-medical waste from the requested Clinics/ patho-labs
FR 5.1577	Application must enable integration with boom barriers at TTS and waste Treatment Centres
FR 5.1578	Module must enable the tracking of vehicles' inward and outward movement through RFID integration at TTS and waste Treatment Centres
FR 5.1579	Application must enable integration with SMS gateway to facilitate update of status as well as notification through SMS
FR 5.1580	Module must enable the capturing of GIS information of the TTS and waste Treatment Centres by geo-fencing of the same
FR 5.1581	Module must also enable the highlighting of the routes covered by the compactors/ tippers/ other vehicles involved through GIS mapping

Waste Management Facilities	
FR 5.1582	The application must record the clear demarcation of the waste, dump-yard and its related facilities through GIS mapping, geo fencing and geo-tagging.
Billing & Collection	
FR 5.1583	Module should facilitate the generation of demand note for billing
FR 5.1584	Application must facilitate integration with payment gateway for online payment of the fees, fines and other kinds of financial transaction
FR 5.1585	Module must also have the facilities to accept offline payment by capturing details of Demand Draft/ bank challan
FR 5.1586	Application should enable integration with handheld POS devices to enable onsite payment to the transporter present while removal of bio-medical waste through cash paid to the transporter. The status of the payment is updated through GPRS by the handheld POS device.
FR 5.1587	The POS device must enable the generation of receipt of payment
FR 5.1588	The module may accept payment before removal of waste or after removal through online or offline payment
FR 5.1589	BMC may consider charging certain user charge (for various category of the waste generator) for management waste through various waste categories (construction, bio-medical, animal etc.) on behalf of the generator.
FR 5.1590	The module captures the collection of the payment made by the user and the status of the request raised by the user of service post payment.
Solid Waste Management (Animal Waste Management Module)	
Request for Service	
FR 5.1591	Module should enable the registration of request for service of BMC for animal waste (dead body) removal by citizens through web application
FR 5.1592	On upload of necessary information by the requesting party, the request should be enabled to be escalated to the concerned authorities for verification and approval by the module
FR 5.1593	Update of status of approval/ rejection for request for bio-medical waste removal through the web application
Report Unclaimed	
FR 5.1594	Module should enable the registration of request for service of BMC for unclaimed animal waste (dead body) removal by citizens through web application
FR 5.1595	The location of the unclaimed body on roads, by lanes, etc. need to be uploaded by the concerned party.
FR 5.1596	The request should be enabled to be escalated to the concerned authorities for verification and approval by the module
FR 5.1597	The module must enable the capture of images uploaded by citizens for the request though web & mobile application.
Burial Site Management	
FR 5.1598	Application must enable integration with boom barriers at Burial site

FR 5.1599	Module must enable the tracking of vehicles' inward and outward movement through RFID integration at Burial site
FR 5.1600	Application must enable integration with SMS gateway to facilitate update of status as well as notification through SMS
FR 5.1601	Module must enable the capturing of GIS information of the Burial site by geo-fencing of the same
Solid Waste Management (Monitoring Tool)	
Transparency Portal	
FR 5.1602	Design and development of a citizen centric transparency portal
FR 5.1603	The portal should provide up-to-date information on the activities of BMC
FR 5.1604	System should show the Graphical view of the statistical data
FR 5.1605	Provision of various MIS reports showcasing the work done by BMC including but not limited to. • Daily, weekly, monthly reports on item-wise, dept. wise and activity wise details • Attendance reports • Grievance reports showcasing in-progress, resolved and unattended complaints • Consolidated Report generation on TTS activity • Monitoring the activity and payment to contractors/ workers etc. • Billing and collection reports, etc.
Web GIS	
FR 5.1606	Design the web based GIS application denoting all the graphical locations.
FR 5.1607	Collect and configure the Geo-Locations as per the project requirement.
FR 5.1608	Design the Geo-fencing reporting portal
FR 5.1609	The GIS system should be web enabled and reporting should be role and right based.
FR 5.1610	Development of GIS system with spatial Database and integrate with the Data captured above for geographic queries and normal data queries.
FR 5.1611	GIS system shall have the required layers such as Zone, Circle, Ward and Locality Temporary transit locations.
FR 5.1612	Solution should provide GIS based interface to view all the BIN Points, at a glance, on location basis and BIN Points locations should be integrated with digital images.
GPS Tracking	
FR 5.1613	Movement of all the vehicles will be tracked by a GPS tracker.
FR 5.1614	The GPS device installation will be responsible of BMC, but MSI will give the specification.
FR 5.1615	The application software should have facility to read / integrate / capture the GPS data of the vehicle
FR 5.1616	Different kind of MIS report shall be generated from the application software

	for vehicle tracking.
FR 5.1617	There should be a provision of third party application integration / new application software developed by the MSI for the above purpose.
Mobile Application	
FR 5.1618	Development of mobile application in open source platform for each application module proposed under scope of work
FR 5.1619	Should include Grievance redressal module and ability to capture and upload image of related complaint or grievance
FR 5.1620	MSI should ensure the capability to incorporate other mobile applications related to BMC activities
FR 5.1621	App must also have the functionality to enable supervisors, transporters and other appropriate concerned officials to update the status of their activities
FR 5.1622	Capture images of BIN Points and transmit to the central server with text, image and GPS data such as date and time, Latitude and Longitude as per the schedule given by BMC.
FR 5.1623	App must enable the sending of related SMS when required
Other Aspects of Application Development	
FR 5.1624	System should have built in security for data capturing and transfer including devices used i.e. restricting to the authenticated devices only.
FR 5.1625	Encryption techniques if used for data security shall be of minimum 128-bit encryption.
FR 5.1626	The solution shall be operated in production, backup, test and staging environment.
FR 5.1627	Uptime of the system shall be maintained at least 99.749 %.
Solid Waste Management (System Features)	
FR 5.1628	The application software should have following features & technical Specifications;
FR 5.1629	The MSI should clearly define the solution architecture with technology stack.
FR 5.1630	The solution should be based on open source technology.
FR 5.1631	The solution recommended should comply with standards and guidelines of Govt. of Odisha & India.
FR 5.1632	The solution must have role based access and management according to the rules of BMC
FR 5.1633	The solution must have the ability for logging, audit, and tracking of any changes carried out on the database. Only authorized users according to their use rights may make entries to the database
FR 5.1634	The MSI should declare and propose the database software and development tools that they intend to use. Use of any licensed software and the implications for licensing must be fully disclosed.
FR 5.1635	The MSI must declare development environment for the proposed application software
FR 5.1636	The MSI must be a web-based application having the capability of being

	device and browser independent
FR 5.1637	The solution should support N-tier architecture
FR 5.1638	The solution must support Single-Sign On facility
FR 5.1639	The solution should support PKI based Authentication and Authorization, in accordance with IT Act 2000, using the Digital Certificates issued by the Certifying Authorities (CA).
FR 5.1640	The solution must maintain Interoperability Standards ensuring that the Software developed is easily integrated with the other Software
FR 5.1641	The architecture should be scalable (cater to increasing load of internal and external users and their transactions) and capable of delivering high performance
FR 5.1642	The solution must follow stringent security features such as • The security services used to protect the solution shall include: Identification, Authentication, Access Control, Administration and Audit and support for industry standard protocols. • The solution shall support advanced user authentication mechanisms including digital certificates and biometric authentication. • Security design should provide for a well-designed identity management system, security of physical and digital assets, data and network security, backup and recovery and disaster recovery system. • The solution should provide for maintaining an audit trail of all the transactions and should also ensure the non-repudiation of audit trail without impacting the overall performance of the system. • The overarching requirement is needed to comply with ISO 27001 standards of security
FR 5.1643	The solution must be compliant with latest versions of Industry Standards such as W3C specifications, Information access/transfer protocols SOAP, HTTP/HTTPS, etc.
Application Integration	
FR 5.1644	BMC presently hold few legacy systems and proposed solution should have facility to integrate with existing legacy systems and other systems BMC may acquire in future.
FR 5.1645	The required application must be made scalable and robust
FR 5.1646	It should be designed and developed in such a manner so as to allow integration with other applications in future if necessary
FR 5.1647	The application should be able to integrate with SMS Gateway, Payment Gateway, Handheld PoS Devices, SMTP, RFID Tracking and Boom Barriers
FR 5.1648	Integration with CCTV and live video streaming.
FR 5.1649	The system should facilitate transmission of information to BMC portal.
SMS Gateway Integration	

FR 5.1650	Co-ordinate to facilitate SMS Gateway.
FR 5.1651	Configure the Core application with the SMS gateway for sending and receiving SMS.
Operational Support (Onsite & Offsite)	
FR 5.1652	The MSI must provide operational support to BMC officials through both onsite and offsite
FR 5.1653	The MSI must provide onsite support in the form of assistance to all field officials / supervisors wherever they face problems in different wards.
FR 5.1654	Offsite support in the form of maintenance of implemented software
FR 5.1655	Submission of regular status reports
FR 5.1656	Resolution of all bugs and errors.
Operational Support Activities	
FR 5.1657	The following activities will be performed by the MSI under operational support period of the project without any additional cost. Accordingly, MSI should quote in the commercial bid. Hence, MSI should be ready to deploy required technical resources at the BMC office during the operational period as and when it is required along with computer & internet to perform the service. • Functional changes in the application software; • System administration; • Migration of transactional data; • Development of new form / report; • Generation of MIS report; • Supervision of Project; • Any changes in the workflow and core application framework; • Any new integration with other system.
Application Maintenance	
FR 5.1658	During maintenance phase MSI should provide upgrades, patches, fixes, security patches and updates of the application software.
FR 5.1659	MSI will provide a comprehensive warranty that covers all components after the issuance of the final acceptance of the application software by BMC.
FR 5.1660	MSI is responsible for the day to day operation & maintenance of the application which includes Frontend Modification (if any), Database related queries (Scheduling, backup), maintenance of the Database, and the Customization of report's format (if required) during the contract period
FR 5.1661	Onsite Warranty support
FR 5.1662	Onsite periodic support for patch management of application and the related database
Security Audit	
FR 5.1663	MSI has to get the application security audited by the CERT-IN empanelled Security Agencies.

FR 5.1664	MSI has to address all the compliances raised by the Security Agency and handover the security audited certificate before hosting in the OSDC.

TR - 5 Technical Requirements

RFID Readers	
TR 5.1	RFID Reader shall have operating frequency range of UHF 865 MHZ to 867 MHZ.
TR 5.2	RFID Reader shall have operating frequency range of UHF 865 MHZ to 867 MHZ.
TR 5.3	The RFID reading range of the transceiver antenna mounted on the vehicle at an average height of 3m above the road surface shall be up to 5m.
TR 5.4	RFID Reader antenna type shall be Circularly Polarized.
TR 5.5	RFID Reader shall comply with the protocol: EPC Gen 2, ISO 18000-6C and shall comply with the general conformance requirements of the standard.
TR 5.6	RFID Reader enclosure shall be light weight.
TR 5.7	RFID Reader technology employed should have the capability to optimize read rates for the bin identification application and adapt to instantaneous noise and interference level.
TR 5.8	RFID Reader shall have capability of diagnostic and reporting tools.
TR 5.9	The firmware should be upgradable to support future protocols.
TR 5.10	Reading of Tag & EPC memory for at least 2 tags per second for a moving vehicle with a speed limit of 40 kilometres/ hour.
RFID Tags	
TR 5.11	The tag shall be anti-metal, and could be mounted on the metallic surface.
TR 5.12	The tag shall be high temperature resistant and shall be capable of withstanding harsh or challenging conditions.
TR 5.13	The tag shall have long read and write distance.
TR 5.14	The tag shall be durable, reusable.
TR 5.15	The frequency range of the tag shall be between 865~867MHz.
TR 5.16	The tag protocol shall be ISO 18000-6C & EPC CLASS1 GEN2.
TR 5.17	The tag memory configuration shall be EPC: 96bit (H3) and User: 512bit (H3).
TR 5.18	The tag material compatibility shall be metallic and non-metallic substrates.
TR 5.19	The read range (m) on metal surface shall be max. 7.5m for Fixed Reader and max. 3m for handheld reader.
TR 5.20	The Mounting of tag shall be of screw, rivet, superglue, ribbon, double faced adhesive tape type.
Bin Volume Sensors	
TR 5.21	The ultrasonic bin level sensor shall be used to sense the distance from the mounting point to the bottom of the garbage bin or collection truck to measure fill levels. The sensor shall have in-built M2M communications capability for data transfer between sensor & ICOMC.
TR 5.22	The sensor shall sense distance of minimum 3 metres
TR 5.23	The sensor data shall be used to obtain the fill level of the waste bins.

TR 5.24	The sensor shall be IP67 rating (water & dust proof) and shall be capable to operate in conditions inside waste bins. These waste bins may be solid waste, wet waste, industrial waste, or others as per the site conditions.
TR 5.25	The sensor shall be easily mountable on the waste bin.
TR 5.26	The sensor shall have supporting Lithium Ion battery pack with a minimum working life of 10 years.
TR 5.27	The sensor should send automatic alarm to the ICOMC when the battery is about to run out of charge.
Sensor Processing Unit	
TR 5.28	The sensor processing unit shall be the on-board processing unit of the bin level sensors.
TR 5.29	The unit shall take input from the ultra-sonic bin level sensor
TR 5.30	The unit shall process the input from level sensor (bin) into desired output format and transmit back to the central system via M2M Communications.
TR 5.31	The unit shall send minimum 10 times or more (as required) data per day to the central software. This data pulling shall be user configurable.
TR 5.32	The unit shall send the data to central server when the bin & waste collection truck shall be 30%, 50%, 75% and 90% filled with different level of alarms as configured by the user. Once the bin & waste collection truck would be emptied, it shall send the signal to central software to confirm the same.
Static Weigh Bridge (SWB)	
TR 5.33	Digital road weighbridge model number as per weights and measures department : confirming to BIS 9281 standards based upon 8 load cells resting on I beam section and MS Plates platform size of 18 m x 3m 120 Tonnes.
TR 5.34	Structure type: Modular made of RS joists bolted with expansion joints as per BIS 2062 SAIL / TATA.
TR 5.35	Top deck Plates: Mild steel as per BIS 2062 SAIL.
TR 5.36	Load cells: Rocker Column type stainless steel with self-aligning principle.
TR 5.37	Load cells Mounting: MS galvanized with built in pad plates.
TR 5.38	Digital Weight Indicator: stainless steel housing with front panel calibration in accordance to W&M department and Model approval.
TR 5.39	Junction Box: stainless steel IP 65 built in surge protection.
TR 5.40	UFD: Outdoor display Board Stainless steel with LED for viewing in all-weather condition.
TR 5.41	Printer: • The printer shall be Laser Jet Printer • Print speed shall be 30ppm minimum (letter) • Printer resolution shall be 600 by 600 dpi or better with Resolution Enhanced Technology • The printer processor shall be 266 MHz • Printer memory shall be minimum 16 MB • The printer shall have at least one Hi-speed USB 2.0 port

TR 5.42	Software – Weight management and picture capture with GVW, DTM stamp, direction, material, source destination.
TR 5.43	SWB shall have the capability to work as standalone as well integrated system.
TR 5.44	Structure Material: The platform shall comprise of medium beams sections of SAIL/TATA as per BIS 2062 with 100% overloading capacity. Platform design would be universal i.e. the weighbridge can be used in Both Pit / Pit less type application. Furnishing 2 Epoxy coats to prevent any rusting, external weather conditions.
TR 5.45	Structure which can be fully expandable & relocatable and be used for a Pit or Pit less type foundation in case of relocations in the future. The Structure should have approval from any recognized institution IIT / NPL / designed as per Staad – III. Approx. Structural Weight – 11 Tonnes.
Barrier Gate	
TR 5.46	The barriers shall be capable of full lane open from a close state in less than 0.9 seconds.
TR 5.47	The housing and any mounting frame shall be fabricated from corrosion-resistant materials.
TR 5.48	It shall be IP 55 rated.
TR 5.49	The barrier shall be driven electrically.
TR 5.50	The barrier motor shall not be damaged when the barrier is blocked in any position
TR 5.51	Exit barriers shall have presence detectors independent system to prevent barrier arms coming down on vehicles while passing.
TR 5.52	Barrier shall be in the form of infrared units and dedicated embedded loops.
TR 5.53	Apart from the barrier arm, the mechanism may not have any moving protrusions that pose a risk to persons standing in close proximity to the barrier.
TR 5.54	The barrier arm shall be fabricated from a light, corrosion resistant material readily and inexpensively available in India.
TR 5.55	The barrier arm shall further have a protective mechanism whereby controlled fracture of the barrier arm occurs without damage to the housing or motor in the event of frontal collision.
TR 5.56	Preference will be given to non-destructive break-away mechanisms. Further, there shall be a protection mechanism to detect the presence of vehicles to avoid accidental hitting on the vehicles, whenever the boom is triggered for closing.
TR 5.57	Suitable power supply scheme shall be implemented by the Bidder to feed the Exit barrier to protect the source from being damaged due to electrical surges / spikes injected by the dynamic (inductive) load.
TR 5.58	Further, the drive shall be so designed as to the damping factor is just sufficient for the drive to operate the booms without any jerks during open / close to avoid freak hitting by the exiting vehicles.
TR 5.59	Barrier arms shall have retro-reflective red stripes in accordance with the local traffic sign standards.

ANPR Camera	
TR 5.60	For Automatic Number Plate Recognition (ANPR) specification, Please refer to Section 5.1.
Fixed and PTZ Camera	
TR 5.61	Please refer to the CCTV Specifications as mentioned under City Surveillance System Section 5.4.1.
SWM System Workstation	
TR 5.62	For SWM Workstation Specifications, Please refer to the Type 2 Workstation specification as mentioned under IT Infrastructure Section 5.7.4.1.
AVL System for Solid Waste Management System	
TR 5.63	Please refer to the Automatic Vehicle Location (AVL) specification as mentioned under Section IT and other common Infrastructure.

5.5.4. Multi-Services Digital Kiosk

Functional Requirements

Integrated Multi-Services Digital Kiosk	
FR 5.1665	Integrated Multi Services Digital Kiosks shall have integrated: • Emergency Call Button (ECB) • PTZ CCTV • Wi-Fi access point • Common Payment Card (CPC) • Ability to pay bills using e-wallet, debit card and credit card. • Touch Screen for availing citizen services with in-built interactive platform • Integration with environmental sensors to display information from various sensors • Solar Panel with batteries • Charging Slots • Static Advertisement around three faces • Microphone • Speaker • Keypad for entry of PIN for authentication • CPC reader • Printing of any receipts and bus tickets • All these components shall be supplied as part of the integrated multi services digital kiosk.
FR 5.1666	Integrated Multi-Services Digital Kiosk's power requirements shall be met by an integrated solar panel as primary source of power (with runtime of 8 hours) with support of raw power for backup purposes. The solar panel batteries shall be installed within the housing of the kiosk in an integrated manner.
FR 5.1667	Integrated Multi-Services Digital Kiosk shall be fixed units, embedded inside the ground that shall be weatherproof.
FR 5.1668	Integrated Multi-Services Digital Kiosk enclosure shall have the space to house all the hardware equipment required for the Multi-Services Digital Kiosk including switches, solar panel, batteries, printer for receipts and other associated accessories. All the wiring shall be concealed within the Multi-Services Digital Kiosk enclosure and shall not be visible from outside.
FR 5.1669	The Emergency Call Button (ECB) shall have the capability to trigger emergency communications with ICOMC. As the Emergency Call Button is pressed, the call should land up to the operator at the ICOMC from where it may be routed to the concerned department.
FR 5.1670	The ICOMC operator shall able to monitor the video of the user who triggered the ECB. Automatic video recording shall be enabled when ECB button is pressed at multi-services digital kiosks.

FR 5.1671	Integrated Multi-Services Digital Kiosk shall have in-built speakers and microphone for making an emergency call to/from the ICOMC and a keypad for accepting user input.
FR 5.1672	The integrated PTZ CCTV shall have the capability of recognition. Operator at the ICOMC shall be able to monitor the live feed from the CCTV. When the emergency button is pressed, the PTZ camera shall automatically focus on the person using the button with a video feed at the video wall at the ICOMC.
FR 5.1673	The Integrated Multi-Services Digital Kiosk shall have in-built charging slots i.e. two (2) USB ports and one (1) three pin standard plug port.
FR 5.1674	The user-interface panel shall built-in capacitive touch screen for interactive purposes including but not limited to: • Maps and navigation services i.e. displaying routes across Bhubaneswar. • Displaying of bus routes across Bhubaneswar • Information about Bhubaneswar along with e-governance services. • Environmental related information via integration with environmental sensors. • Places of attraction in Bhubaneswar. • Places near me services which may include hotels, government offices, shops, tourist attraction, etc. • Information about the events. • Emergency contact numbers such as hospitals, police, fire, etc. • Integration with e-governance system. • Integration with digital wallets, credit and debit cards for payments. • Integration with Common Payment Card (CPC) which is being envisaged as part of the Smart City Initiatives which shall be used to for making payments at multiple merchandises across Bhubaneswar. The CPC shall be issued by banks and shall be accepted at multi-services digital kiosks.
FR 5.1675	Integrated Multi-Services Digital Kiosk shall have a capabilities for making digital payments for: • Utility Bills for government services such as electricity, water, Wi-Fi, etc. • Citizen services • Tickets for the events around the city • Bus tickets • Any other BSCL/BMC supported activity/event
FR 5.1676	Integrated Multi-Services Digital Kiosk shall have in-built receipt/ticket printer having the functionality of printing of receipts, any other tickets, bus tickets etc.

FR 5.1677	The Integrated Multi-Services Digital Kiosk shall have the space for providing the static advertisement around three (3) faces.
FR 5.1678	The Integrated Multi-Services Digital Kiosk shall be multilingual i.e. it shall support languages such as English, Hindi and Oriya.
FR 5.1679	The Integrated Multi-Services Digital Kiosk shall have ECB and touch panel at an average height of 1.5m above ground.
FR 5.1680	Integrated Multi-Services Digital Kiosk shall be upgradable through a central system remotely over internet.
FR 5.1681	It shall be possible to monitor critical parameters related to health of kiosk device remotely using the network.

Technical Requirements

Integrated Multi-Services Digital Kiosks	
TR 5.64	Integrated Multi-Services Digital Kiosk's enclosure shall be made of metal or stainless steel fabric and shall be IP 65 rated. It shall be built to last in outdoor environment to support the Project operating conditions.
TR 5.65	Metal sheet of the Integrated Multi-Services Digital Kiosk housing shall be made in a minimum 16 gauge that can be powder coated as per the required colour choice.
TR 5.66	Integrated Multi-Services Digital Kiosk's enclosure shall have space to put all the required hardware including switches and associated accessories.
TR 5.67	Integrated Multi-Services Digital Kiosk's shall have integrated PTZ Camera mounted on the top of the Kiosk Enclosure. For PTZ Camera Specifications, Please refer to the City Surveillance System Section 5.4.1.
TR 5.68	Integrated Multi-Services Digital Kiosk shall also have integrated Wi-Fi access points. For Wi-Fi Access Point Specifications, Please refer to the City-Wide Wi-Fi Section 5.6.2.
TR 5.69	The Integrated Multi-Services Digital Kiosk shall also have integrated solar panel with batteries.
TR 5.70	The Integrated Multi-Services Digital Kiosk enclosure shall have integrated receipt printer for taking printout of bills payments receipt and events tickets etc.
TR 5.71	The Integrated Multi-Services Digital Kiosk shall have in-built speakers and microphone. Speakers shall be able to deliver clear stereo sound. Microphone shall be able to isolate the main sound source and minimize background noise. At any time, the speakers shall have an output audio of at least 10 dB above ambient noise.
TR 5.72	Integrated Multi-Services Digital Kiosk shall have proper ventilation arrangement for heat removal.
TR 5.73	Integrated Multi-Services Digital Kiosk shall have proper in-built wiring arrangement with spike proof power socket.

TR 5.74	Integrated Multi-Services Digital Kiosk shall have two (2) service doors with security key so that it can be easily accessed from there.
TR 5.75	Integrated Multi-Services Digital Kiosk shall be either fixed to ground or have shoes to hold it on a smooth surface.
TR 5.76	All electrical components shall have quick-disconnect terminals for easy service or removal. All wiring shall be concealed within the Integrated Multi-Services Digital Kiosk enclosure and shall not be visible from the outside of the unit.
Interactive user panel for Information of City Services	
TR 5.77	The panel shall have built-in capacitive touchscreen for interactive applications with required supporting software for dynamic content management from various sources connected to the system. The content management system shall include content from (but not limited to) – e-governance platform, services billing, Common Payment Card (CPC), Bhubaneswar organized/supported events, data from environmental sensors, digital advertising and promotions (provided as part of the content management system), city news and information, among others.
TR 5.78	The touch screen shall be all-glass with a transparent metallic conductive coating.
TR 5.79	The touch screen monitor shall have a min. resolution of 1280 x 1024 or better with screen size of minimum 24”.
TR 5.80	The screen shall support wide viewing angle, low power consumption, high contrast ratio, high aperture ratio, short response time.
TR 5.81	The content displayed on the panel shall be direct sunlight readable and shall support the feature of auto brightness control.
TR 5.82	The unit shall have the embedded thin client with quad core CPU 4GB memory, 32 GB Flash, 100 GB of secondary storage for local storage with required OS.
TR 5.83	The touch screen monitor shall be capable of withstanding most surface contaminants and must be ASTM-D-1308-02 and ASTM-F-1598-95 compliant.
TR 5.84	The touch screen monitor shall be NEMA 4X / IP66 rated and complete water-resistant seal compatible. It shall be capable of operating in outdoor rated environments and shall have a rugged screen.
Emergency Call Box	
TR 5.85	The ECB shall be integrated with the integrated multi-services digital kiosk and shall be monitored at the ICOMC.
TR 5.86	At the ICOMC, graphical display of the locations of the ECBs mounted on the multi-services digital kiosk shall be provided at the workstations to control, configure and manage ECBs at a minimum.
TR 5.87	The ECB shall be auto-dial operation and shall be capable of automatically answering incoming calls.
TR 5.88	The ECB shall communicate over 10/100/1000 BaseTX copper signal ports over Ethernet.

TR 5.89	The ECB shall support SIP based Voice over Internet Protocol (VoIP) communications standard.
TR 5.90	The ECB shall have network connectivity for monitoring via Web access (HTTP), SNMP, and shall provide the capability of e-mail notification of alarm conditions. Multiple alarms of the conditions shall be provided automatically.
TR 5.91	The ECB shall have automatic adjustment of output volume of audio based on ambient noise detection. At any given time, the sound output from ECB speaker shall be 6-10 dB above ambient noise.
TR 5.92	The call from ECB shall only be disconnected at the ICOMC. The user shall not have the capability to disconnect the call from the ECB itself.
TR 5.93	The ECB button shall be circular, red in colour and the panel shall have clear label of 'Emergency Call Button'.
Digital Payments	
TR 5.94	The Integrated Multi-Services Digital Kiosk shall have the capability for digital payments like electricity bills, water bills, Wi-Fi recharge/coupon, Payment of penalties (Challans, etc.), payment for any city supported events, etc.
TR 5.95	The Integrated Multi-Services Digital Kiosk shall have the capability to integrate with Common Payment Card (CPC) which shall be used for making payments at multiple merchandises across Bhubaneswar. The CPC shall be issued by Banks and will be accepted at most of the facilities in Bhubaneswar. The Bidder shall work in close coordination with the CPC Agency and other related agencies to make it workable.
TR 5.96	The Integrated Multi-Services Digital Kiosk shall accept all digital payments including credit card, debit card and e-wallets.
TR 5.97	The Integrated Multi-Services Digital Kiosk shall have option for taking printout of bills payments receipt and events tickets etc. through integrated receipt printer.
TR 5.98	The Integrated digital payments for Multi-Services Digital Kiosk shall comply with all the revenue/financial departments' norms and conditions for such online financial transactions in India and shall adhered to all such norms and conditions.
Common Payment Card (CPC) Reader	
TR 5.99	Integrated Multi-services digital kiosk shall have the capability of reading citizen specific CPC as an identity check for availing services.
TR 5.100	The CPC card reader shall be supported by a second level of authentication i.e. OTP via SMS at user registered number or similar that shall be inserted by the user using the keypad at the kiosk.
Miscellaneous	
TR 5.101	The Integrated Multi-Services Digital Kiosk shall be powered by 12/24/48VDC input as per the design requirements to support powering using solar as the primary power. Raw power will be provided for secondary power. The ECB inside the multi-services digital kiosk shall be powered using PoE or PoE+.

TR 5.102	The Integrated Multi-Services Digital Kiosk shall communicate over RJ45, HDMI, DVI and USB.
TR 5.103	The Integrated Multi-Services Digital Kiosk shall support operating temperature range of 0°C to +60°C with ambient relative humidity of 10-95% non-condensing.
TR 5.104	The ECB shall have a MTBF of at least 100,000 hours.
TR 5.105	The touch screen monitor shall have a MTBF of at least 50,000 hours.

Functional Requirements

Stand-alone Multi-Services Digital Kiosk	
FR 5.1682	Stand-alone Multi Services Digital Kiosks shall have integrated: • Ability to pay bills using e-wallet, CPC, debit card and credit card. • Touch Screen for availing citizen services with in-built interactive platform • Integration with environmental sensors to display information from various sensors • Keypad for entry of PIN for authentication • CPC reader • Printing All these components shall be supplied as part of the stand-alone multi services digital kiosk.
FR 5.1683	Stand-alone Multi-Services Digital Kiosk enclosure shall have the space to house all the hardware equipment required for the Multi-Services Digital Kiosk including switches (if applicable), printer for receipts and other associated accessories. All the wiring shall be concealed within the Multi-Services Digital Kiosk enclosure and shall not be visible from outside.
FR 5.1684	The user-interface panel shall built-in capacitive touch screen for interactive purposes including but not limited to: • Information about Bhubaneswar along with e-governance services. • Maps and navigation services i.e. displaying routes across Bhubaneswar. • Displaying of bus routes across Bhubaneswar • Places of attraction in Bhubaneswar. • Places near me services which may include hotels, government offices, shops, tourist attraction, etc. • Information about the events. • Emergency contact numbers such as hospitals, police, fire, etc. • Integration with e-governance system. • Integration with digital wallets, credit and debit cards for payments. • Integration with Common Payment Card (CPC) which is being envisaged as part of the Smart City Initiatives

	which shall be used to for making payments at multiple merchandises across Bhubaneswar. The CPC shall be issued by banks and shall be accepted at multi-services digital kiosks.
FR 5.1685	Stand-alone Multi-Services Digital Kiosk shall have a capabilities for making digital payments for: • Utility Bills for government services such as electricity, water, Wi-Fi, etc. • Citizen services • Tickets for the events around the city • Bus tickets • Any other BSCL/BMC supported activity/event
FR 5.1686	Stand-alone Multi-Services Digital Kiosk shall have in-built receipt/ticket printer having the functionality of printing of receipts, any other tickets, bus tickets etc.
FR 5.1687	The Stand-alone Multi-Services Digital Kiosk shall be multilingual i.e. it shall support languages such as English, Hindi and Oriya.
FR 5.1688	Stand-alone Multi-Services Digital Kiosk shall be upgradable through a central system remotely over internet.
FR 5.1689	It shall be possible to monitor critical parameters related to health of kiosk device remotely using the network.

Technical Requirements

Stand-alone Multi-Services Digital Kiosks	
TR 5.106	Stand-alone Multi-Services Digital Kiosk's enclosure shall be made of metal or stainless steel fabric and shall be IP 55 rated.
TR 5.107	Metal sheet of the Stand-alone Multi-Services Digital Kiosk housing shall be made in a minimum 16 gauge that can be powder coated as per the required colour choice.
TR 5.108	Stand-alone Multi-Services Digital Kiosk's enclosure shall have space to put all the required hardware including switches (if applicable) and associated accessories.
TR 5.109	The Stand-alone Multi-Services Digital Kiosk enclosure shall have integrated receipt printer for taking printout of bills payments receipt and events tickets etc.
TR 5.110	Stand-alone Multi-Services Digital Kiosk shall have proper ventilation arrangement for heat removal.
TR 5.111	Stand-alone Multi-Services Digital Kiosk shall have proper in-built wiring arrangement with spike proof power socket.
TR 5.112	Stand-alone Multi-Services Digital Kiosk shall have two (2) service doors with security key so that it can be easily accessed from there.
TR 5.113	Stand-alone Multi-Services Digital Kiosk shall be either fixed to floor or have shoes to hold it on a smooth surface.

TR 5.114	All electrical components shall have quick-disconnect terminals for easy service or removal. All wiring shall be concealed within the Stand-alone Multi-Services Digital Kiosk enclosure and shall not be visible from the outside of the unit.
Interactive user panel for Information of City Services	
TR 5.115	The panel shall have built-in capacitive touchscreen for interactive applications with required supporting software for dynamic content management from various sources connected to the system. The content management system shall include content from (but not limited to) – e-governance platform, services billing, Common Payment Card (CPC), Bhubaneswar organized/supported events, data from environmental sensors, digital advertising and promotions (provided as part of the content management system), city news and information, among others.
TR 5.116	The touch screen shall be all-glass with a transparent metallic conductive coating.
TR 5.117	The touch screen monitor shall have a min. resolution of 1280 x 1024 or better with screen size of minimum 24”.
TR 5.118	The screen shall support wide viewing angle, low power consumption, high contrast ratio, high aperture ratio, short response time.
TR 5.119	The content displayed on the panel shall be direct sunlight readable and shall support the feature of auto brightness control.
TR 5.120	The unit shall have the embedded thin client with quad core CPU 4GB memory, 32 GB Flash, 100 GB of secondary storage for local storage with required OS.
TR 5.121	The touch screen monitor shall be capable of withstanding most surface contaminants and must be ASTM-D-1308-02 and ASTM-F-1598-95 compliant.
TR 5.122	The touch screen monitor shall withstand surface contaminants such as dirt, dust and grease and shall be complete water-resistant seal compatible. It shall be capable of operating in indoor rated environments.
Digital Payments	
TR 5.123	The Stand-alone Multi-Services Digital Kiosk shall have the capability for digital payments like electricity bills, water bills, Wi-Fi recharge/coupon, Payment of penalties (Challans, etc.), payment for any city supported events, etc.
TR 5.124	The Stand-alone Multi-Services Digital Kiosk shall have the capability to integrate with Common Payment Card (CPC) which shall be used for making payments at multiple merchandises across Bhubaneswar. The CPC shall be issued by Banks and will be accepted at most of the facilities in Bhubaneswar. The Bidder shall work in close coordination with the CPC Agency and other related agencies to make it workable.
TR 5.125	The Stand-alone Multi-Services Digital Kiosk shall accept all digital payments including credit card, debit card and e-wallets.
TR 5.126	The Stand-alone Multi-Services Digital Kiosk shall have option for taking printout of bills payments receipt and events tickets etc. through integrated receipt printer.

TR 5.127	The Stand-alone digital payments for Multi-Services Digital Kiosk shall comply with all the revenue/financial departments' norms and conditions for such online financial transactions in India and shall adhered to all such norms and conditions.
Common Payment Card (CPC) Reader	
TR 5.128	Stand-alone Multi-services digital kiosk shall also have the capability of reading citizen specific CPC as an identity check for availing services.
TR 5.129	The CPC card reader shall be supported by a second level of authentication i.e. OTP via SMS at user registered number or similar that shall be inserted by the user using the keypad at the kiosk.
Miscellaneous	
TR 5.130	The Stand-alone Multi-Services Digital Kiosk shall be powered by raw power, 220V at 50 Hz. Any power conversion and UPS requirements shall be in scope of Bidder.
TR 5.131	The Stand-alone Multi-Services Digital Kiosk shall communicate over RJ45, HDMI, DVI and USB.
TR 5.132	The Stand-alone Multi-Services Digital Kiosk shall support operating temperature range of 0°C to +45°C with ambient relative humidity of 10-95% non-condensing.
TR 5.133	The touch screen monitor shall have a MTBF of at least 50,000 hours.

5.5.5. Education and Healthcare Management

Functional Requirements

Smart Classrooms	
FR 5.1690	As part of the Bhubaneswar Smart City, smart schools with 13 interactive digitally smart classrooms shall be set up.
FR 5.1691	Smart Classrooms shall be equipped with: • CCTVs • Digital Smart Board • Attendance Management System • LED TV/Display Screens
FR 5.1692	CCTV surveillance system shall be provided to monitor functioning of the smart classrooms by concerned authorities/command centre. Also, through the CCTV system, Lectures delivered shall be recorded and stored. These lectures shall later be delivered to schools as Video on Demand.
FR 5.1693	Digital Smart Boards shall be provided to interact with the students. Students at remote schools shall be able to see presenting teacher and whatever the teacher write on the smart board. Students at remote schools shall ask questions any time during the session or at the end of session, since it is two way fully interactive session.
FR 5.1694	Attendance Management System to monitor the attendance of the students and same to be communicated to the parents via SMS/email.
FR 5.1695	LED TV/Display Screens to interact with the students in remote classrooms.
FR 5.1696	The system shall be able to stream live sessions, while it is being presented; to schools which may not have infrastructure for two-way interactive class.
FR 5.1697	The hardware and software components shall be operative on “plug and play” basis, without the need of any proprietary license.
FR 5.1698	The technological solution should be such that it could be used in the offline mode (i.e. in the absence of internet).
FR 5.1699	The software and hardware provided should be flexible in such a way that any additional multimedia content in the form of video, lectures, animations, pictures, 2D/3D videos and additional questions created by subject teachers could be added into the database via a pen-drive or external hard disk and used in an effective and simple manner.
FR 5.1700	The smart classrooms shall be a comprehensive solution designed to assist teachers in meeting their day to day challenges and enhancing student’s academic performance with simple, meaningful and practical use of technology.
FR 5.1701	Provision for online update of the software according to changing syllabus and changing requirements shall be provided.
FR 5.1702	The software should provide inbuilt analytics software tracking student wise progress from marks obtained and suggesting areas of improvement.

FR 5.1703	The smart classrooms should have fire/smoke detectors to ensure safety of students
Software Solution for Smart Classrooms	
FR 5.1704	Software should be compatible with Windows
FR 5.1705	Contents should available in Oriya, Hindi and/or English depending on medium of language.
FR 5.1706	The multimedia educational contents should be mapped as per class wise, subject wise, chapter wise and topic wise.
FR 5.1707	It shall have the facility to customize lesson plans by the teacher.
FR 5.1708	Size of font for easy viewing from back benchers and quality of audible voice shall be sound.
FR 5.1709	It shall support blend of Videos, Interactive material, pictures, flowcharts and text that unfolds all the concepts in a layered, structured and hierarchical format.
FR 5.1710	It shall have provision to include of multimedia content based on story lines, minimum 2D animation, interactive games, live coverage, real life examples, music and riddles etc.
FR 5.1711	It shall support facility to incorporate own multimedia contents and contents from other resources like Computer Aided Learning (CAL), Directorate of Education.
FR 5.1712	It shall have provision to incorporate E-books especially of subject books.
FR 5.1713	It shall have Gallery/Galleries of well-known websites.
FR 5.1714	It shall also include MCQs, Quizzes, Chapter wise Question with answer, Higher order Thinking based questions (HOTs), Model Summative Assessment question papers and Value based Question(VBQ)
FR 5.1715	There shall be provision for virtual labs.
FR 5.1716	Practice material shall be there for OTBA (Open text Based Assessment), ASL (Assessment of Speaking and learning), Continuous Evaluation
FR 5.1717	It shall support facility to change platform of digital contents from English to Hindi and vice versa.
FR 5.1718	Facility for tele-education shall be provided.
FR 5.1719	Facility to generate administrative reports as regard usage of software by the individual/school teachers in the smart classroom to appropriate authority.
FR 5.1720	It shall have the facility to generate analytical performance reports of each student.
FR 5.1721	There shall be proper security features to protect the system from misuse within the class and online.
FR 5.1722	Support Manual (to include Installation academic content, Administration Manual and operational, instructional User Reference etc.) in English/Hindi/Oriya shall be provided.

Early Childhood Care Centres (E3C)	
FR 5.1723	The E3C shall have biometric systems connected to the main control centre to capture the attendance of the mothers, mothers to be and children along with system for capturing and storing detailed information and permit registration.
FR 5.1724	For children below 6 years, smart learning provision to be given with appropriate learning modules
FR 5.1725	The system installed at the E3C should recognize the registered attendees on every visit to facilitate attendance and data capture.
FR 5.1726	The system installed should record the resources allocated by the government for data capture.
FR 5.1727	The E3C shall be equipped with CCTV surveillance cameras to monitor and provide real time feed to ICOMC for the entry/exit area, utility/kitchen area, open areas within compound, rooms etc. as required.
FR 5.1728	The E3C shall also store the feed from the surveillance cameras for a period of seven days.
FR 5.1729	The E3C should be able to send reminder alerts for mothers or family members regarding regular updates on ICDS schemes, vaccinations, etc.
FR 5.1730	The provisions should be fully compliant with The National Nutrition Policy, The National Policy on Education and other such government standards for mother and child care and education.
FR 5.1731	Adequate Safety measures taken especially in case of fire and alarms sent to respective local authority and command centre.
Software Solution for E3C	
FR 5.1732	An app/website providing details about each student corresponding to their UID number in terms of: • Giving details of routines, activities, staffing, supervision of children and any key schemes or policies, managing children's behaviour, food and drink provided, etc. Can be done via Bhubaneswar One App against each child's UID/Biometric Data • Giving details like contact numbers, dietary needs and any allergies or health requirements, who has parental responsibility for the child, etc. • Record of each session which includes times of arrival and departure of each child, staff member and any visitors. Records of incidents and child protection concerns and intimation to command centre in case of emergency. • The software should list out detail course of action for each pregnant mother enrolled till the baby reaches six years of age corresponding to UID number
FR 5.1733	Biometric Data Record of all entitled residents (pregnant mothers and children) along with workers.

FR 5.1734	Biometric attendance record of all workers, children and mothers entitled to visit.
FR 5.1735	Provision for audit recording of all the resources (under health and food security) allocated, received and used by the E3C from the government under various schemes accessible by command centre and also for data analysis.
FR 5.1736	Contain instructions on procedure of administration of medicines and vaccination for health workers/volunteers.
FR 5.1737	Information on each staff member or volunteer including full name and address, emergency contact information, address and other relevant information available in Bhubaneswar One corresponding to each primary health centre registered.

Technical Requirements

Smart Classrooms	
Desktop Computers For Class Rooms/Resource Room	
TR 5.134	Please refer to the Type 3 Workstation Specification as mentioned under Section 5.7.4.1 (IT and Other Common Infrastructure).
Networking Specification	
TR 5.135	**LAN Equipment:** 24 Port Smart Switch with loop back detection, 24 x 1 CAT6 Patch Panel, RJ-45 connector, I/O box, Necessary electrical items and cables to connect and access device/terminal to desktop computer as per requirement.
Metallic Cabinet/Podium/other arrangement	
TR 5.136	Podium with lockable housing facility for the keep and safety of the desktop/ CPU /UPS /Keyboard /Mouse/remote/stylus. The entire system shall be placed in a single cabinet with floor bearing and floor supported to keep it strong and stable. The tray for the keyboard and mouse is placed high enough for the teachers to reach in ease. The cabinet shall be such that all hardware is placed in it with hidden speaker system and concealed wiring
Interactive White Board/White Board With Interactive Device/White Board With Interactive Projector (With Mounting Kit)	
TR 5.137	**Active Size:** Minimum 77/78” diagonal or above
TR 5.138	**Technology:** Infrared or latest technology*
TR 5.139	**Board surface:** Scratch resistant, Solid surface ; maintenance free, Compatible with ink marker, any object touch
TR 5.140	**Aspect Ratio:** 4:3 or 16:9 or 16:10
TR 5.141	**Writing Tools:** Pen/ stylus/ finger
TR 5.142	**Active Area:** Minimum active diagonal length of 2000 mm
TR 5.143	**Resolution:** 8000*8000
TR 5.144	**Operating system compatibility:** Compatible with Windows XP or higher

	operating system and compatibility with Linux Operating System*
TR 5.145	**Computer Interface:** Standard one USB
TR 5.146	**Power:** Through USB Port*
TR 5.147	**Annotation software:** Annotation software shall include features like draw, pens, annotate, erase, colour, shapes, sizes, text, edit, fonts, stamp, move, capture picture, video, save, rotate, undo, image gallery, print, floating key-board and background etc.*
Provision of Green Board	
TR 5.148	**Size and compatibility with White Interactive Board:** With white interactive board, the concessionaire shall also supply 5x4 feet Green Board as a traditional teaching aid. The viewing angle shall be such that students sitting in all corners of the classroom can see what is being written.
Projector System (Ultra Short Throw Including Interactive Projector	
TR 5.149	**Projection System:** DLP
TR 5.150	**Native Resolution:** WXGA(1280X800)
TR 5.151	**Brightness:** 2700 AL or higher
TR 5.152	**Contrast Ratio:** 10000:1
TR 5.153	**Aspect Ratio:** 4:3, 16:9, 16:10 and other prominent Aspect Ratios
TR 5.154	**Lamp Life(Normal/Economic Mode):** 3500/5000 Hrs.
TR 5.155	**Remote Control:** Full Function remote control unit for projector (To be supplied along with the projector)
TR 5.156	**Video compatibility:** PAL, SECAM, NTSC, HDTV, DTV
TR 5.157	**Wireless Connectivity, storage and LAN:** Multimedia Projector with wireless connectivity between PC and Projector, Storage media port and wireless LAN connectivity
Audio System	
TR 5.158	**Description:** 4.1 Digital Surround system (wall mounted)
CCTV Cameras And Other Related Items	
TR 5.159	Please refer to the CCTV System Specifications as mentioned under Section City Surveillance System.
UPS	
TR 5.160	1 KVA, Internal double battery, Backup 10-15 minute, input voltage: 160-280V
TR 5.161	For other specifications, Please refer to the UPS Specification as mentioned under Section 5.7.4.5 (IT and Other Common Infrastructure).
Server	
TR 5.162	Please refer to the Server Specifications as mentioned under Section 5.7.4.3 (IT and Other Common Infrastructure).

A schematic diagram of the Smart Classrooms

Early Childhood Care Centre (E3C)	
Desktop Computers (For Class Rooms/Resource Documentation)	
TR 5.163	Please refer to the Type 3 Workstation Specification as mentioned under Section 5.7.4.1 (IT and Other Common Infrastructure).

Networking Specification	
TR 5.164	**LAN Equipment:** 24 Port Smart Switch with loop back detection, 24 x 1 CAT6 Patch Panel, RJ-45 connector, I/O box, Necessary electrical items and cables to connect and access device/terminal to desktop computer as per requirement.
Metallic Cabinet/Podium/other arrangement	
TR 5.165	Podium with lockable housing facility for the keep and safety of the desktop/ CPU /UPS /Keyboard /Mouse/remote/stylus. The entire system shall be placed in a single cabinet with floor bearing and floor supported to keep it strong and stable. The tray for the keyboard and mouse is placed high enough for the teachers to reach in ease. The cabinet shall be such that all hardware is placed in it with hidden speaker system and concealed wiring
Interactive White Board/White Board With Interactive Device/White Board With Interactive Projector (With Mounting Kit)	
TR 5.166	**Active Size:** Minimum 77/78” diagonal or above
TR 5.167	**Technology:** Infrared or latest technology*
TR 5.168	**Board surface:** Scratch resistant, Solid surface ; maintenance free, Compatible with ink marker, any object touch
TR 5.169	**Aspect Ratio:** 4:3 or 16:9 or 16:10
TR 5.170	**Writing Tools:** Pen/ stylus/ finger
TR 5.171	**Active Area:** Minimum active diagonal length of 2000 mm
TR 5.172	**Resolution:** 8000*8000
TR 5.173	**Operating system compatibility:** Compatible with Windows XP or higher operating system and compatibility with Linux Operating System*
TR 5.174	**Computer Interface:** Standard one USB
TR 5.175	**Power:** Through USB Port
TR 5.176	**Annotation software:** Annotation software shall include features like draw, pens, annotate, erase, colour, shapes, sizes, text, edit, fonts, stamp, move, capture picture, video, save, rotate, undo, image gallery, print, floating key-board and background etc.*
Provision Of Green Board	
TR 5.177	**Size and compatibility with White Interactive Board:** With white interactive board, the concessionaire shall also supply 5x4 feet Green Board as a traditional teaching aid. The viewing angle shall be such that students sitting in all corners of the classroom can see what is being written.
LED TV/ Display	
TR 5.178	65 inches LED TV with minimum 2 HDMI inputs
TR 5.179	The model quoted shall be latest with minimum 1080p full HD capability.
Projector System (Ultra Short Throw Including Interactive Projector	
TR 5.180	**Projection System:** DLP
TR 5.181	**Native Resolution:** WXGA(1280X800)

TR 5.182	**Brightness:** 2700 AL or higher
TR 5.183	**Contrast Ratio:** 10000:1
TR 5.184	**Aspect Ratio:** 4:3, 16:9, 16:10 and other prominent Aspect Ratios
TR 5.185	**Lamp Life (Normal/Economic Mode):** 3500/5000 Hrs.
TR 5.186	**Remote Control:** Full Function remote control unit for projector (To be supplied along with the projector)
TR 5.187	**Video compatibility:** PAL, SECAM, NTSC, HDTV, DTV
TR 5.188	**Wireless Connectivity, storage and LAN:** Multimedia Projector with wireless connectivity between PC and Projector, Storage media port and wireless LAN connectivity
Audio System	
TR 5.189	**Description:** 4.1 Digital Surround system (wall mounted)
CCTV Cameras And Other Related Items	
TR 5.190	Please refer to the CCTV System Specifications as mentioned under Section City Surveillance System.
UPS	
TR 5.191	1 KVA, Internal double battery, Backup 10-15 minute, input voltage: 160-280V.
TR 5.192	For other specifications, Please refer to the UPS Specification as mentioned under Section 5.7.4.5 (IT and Other Common Infrastructure).
Server	
TR 5.193	Please refer to the Server Specifications as mentioned under Section 5.7.4.3 (IT and Other Common Infrastructure).

Functional Requirements

E-Primary Healthcare System	
FR 5.1738	e-Primary healthcare shall be an IT platform for integrating citizen's record available in various public offices to their unique ID for providing health, social welfare and care.
FR 5.1739	e-Primary Healthcare System shall support cloud based storage of vital parameters (pulse, BP, temperature, heart rate, blood glucose, etc.), blood test reports, previous record of harmful disease, chronic diseases, etc. taken latest and linked to each UID no. or biometric data and can be accessed from Bhubaneswar One through a security login system.
FR 5.1740	The software shall arrange a list of high priority surveillance patients on the basis of their parameters(mostly elderly, pregnant mothers) who can be instructed to raise alert to the Command Centre and the Health Centre in case of emergency (by dialling a particular number which is linked directly to the health/Command Centre)

FR 5.1741	Entitled Patients availing free medicines and other incentives by the government shall be intimated through messages from the database directly from command centre.
FR 5.1742	Integration of child's health information with e – Primary Health system shall be done.

Technical Requirements

e-Primary Healthcare System	
Desktop Computers For Class Rooms/Resource Room	
TR 5.194	Please refer to the Type 3 Workstation Specification as mentioned under Section 5.7.4.1 (IT and Other Common Infrastructure).
CCTV Cameras	
TR 5.195	Please refer to the CCTV System Specifications as mentioned under Section City Surveillance System.
UPS	
TR 5.196	1 KVA, Internal double battery, Backup 10-15 minute, input voltage: 160-280V
TR 5.197	For other specifications, Please refer to the UPS Specification as mentioned under Section 5.7.4.5 (IT and Other Common Infrastructure).
Server	
TR 5.198	Please refer to the Server Specifications as mentioned under Section 5.7.4.3 (IT and Other Common Infrastructure).
Finger Print Scanner	
TR 5.199	Finger Print Scanner shall be provided with capacitance sensing technology allowing 10 million rubs or better,
Fire and Smoke Detector (in each room)	
TR 5.200	Fire and Smoke detector shall be provided in each room with the alarm connected to ICOMC. Fire and Smoke sensor shall strictly adhere to the Standards mentioned in Building Fire Code.

5.6. Communications Network

5.6.1. Fibre Optic Infrastructure including Network Electronics

FR - 6 Functional Requirements

Fibre Optic Civil Infrastructure – Trench/Duct/Manhole/Handhole	
FR 6.1	The backbone and distribution trench (open/HDD) shall be provided by the MSI and shall be used for installation of the fibre optic infrastructure. The MSI shall provide the necessary provisions for crossing to connect the other side of the roads as applicable, which will be used for installing the fibre optic infrastructure.
FR 6.2	The access trench shall be provided by MSI for connectivity to every building (as applicable) and connectivity to every field device.
FR 6.3	Manholes and handholes shall be placed at strategic locations for the fibre optic infrastructure throughout the City RoW. These manholes shall be used for placing the fibre optic splice enclosure (FOSC).
FR 6.4	These manholes shall be sized per minimum 1mx1mx1m (lxwxd) inside clear space.
FR 6.5	The handholes inside the BSCL buildings shall be sized per minimum 0.5m x 0.5m x 0.5m (l x w x d) inside clear space.
FR 6.6	The fibre optic cable shall be installed inside dedicated Permanently Lubricated (PLB) High Density Polyethylene (HDPE) smooth wall configuration ducts inside the trench. These HDPE ducts shall be sized to provide sufficient future growth capacity for Bhubaneshwar.
FR 6.7	The HDPE duct shall be suitable for underground fibre optic cable installation by blowing as well as conventional pulling.
FR 6.8	The HDPE duct shall be suitable for laying in RCC trench, trenches by directly burying, and laying through trenchless digging i.e. Horizontal Directional Drilling (HDD).
FR 6.9	There are two (2) types of ducts for fibre optic laying to fulfil the end-to-end connectivity of the ICT infrastructure: • 1 times 4x40mm (OD) HDPE installed inside its dedicated HDPE outersleeve for backbone and distribution infrastructure. • 1x25mm (OD) HDPE duct to connect every field device access switch location.
FR 6.10	All HDPE ducts shall be colour coded as per EIA/TIA 598 standard.
FR 6.11	The duct shall be supplied with tracer wire and shall have in-built rodent protection chemical at outer sheath of every duct.
Optical Fibre Cable	
FR 6.12	End-to-end fibre optic infrastructure shall include only single mode Optical Fibre Cable (OFC), loose tube, armoured cable configuration rated for outdoor installations.

FR 6.13	All fibre optic cable shall be ordered in standard tube and colour configuration based on EIA/TIA 598.
FR 6.14	Each of the POP rooms and ICOMC shall be connected over a dedicated 1x 48 count fibre optic cable. It will only be terminated at the POPs and ICOMC location and will have redundant entry and exit paths. This 48 count fibre optic cable shall be provided in four (4) separate tubes i.e. 12 count per tube.
FR 6.15	For distribution, a dedicated 48 count fibre optic cable will be provided end-to-end in the respective zone. This fibre optic cable shall be provided in four (4) separate tubes i.e. 12 count per tube.
FR 6.16	For access network, a dedicated 12 count fibre optic cable will be provided. This will be ordered with 4 count per tube configuration.
UTP Copper Cable and Accessories	
FR 6.17	Outdoor-rated Unshielded Twisted Pair (UTP) Communications Category (CAT) 6 Cable with armouring to provide Ethernet connectivity between network switches and end devices such as CCTV, Wi-Fi, etc. located within 70 m from the switch location.
FR 6.18	The UTP cable shall be outdoor-rated UTP CAT 6 armoured cable and shall have a guaranteed transmission performance up to 250 MHz.
FR 6.19	Wherever installed, the UTP cables shall be supplied with either in-built surge suppressor or shall have additional surge suppressors as specified.
FR 6.20	Each conductor of the UTP cable shall be insulated with a coloured high density polyethylene jacket with varying twisted length to minimize crosstalk.
FR 6.21	Additional accessories to include CAT 6 Patch Cords required for data communications connections, CAT6 Patch Panels for cable termination and Surge Suppressors for protection from voltage spikes as per the design requirements.
FR 6.22	The UTP patch panels shall be sized to support the design requirements as per the RFQ cum RFP. At least 50% of the capacity of the patch panel ports shall be left as spare.
FR 6.23	The surge arrestor shall be such that they do not interfere with normal communications.
FR 6.24	The termination shall protect the cable terminations from water and mechanical damage and shall be resistant to salt corrosion.
FR 6.25	Any provided patch panel or wall plate shall provide mechanical support for all connections enclosed and shall maintain insulation between them.
FR 6.26	All cable entries shall be provided with appropriate cable pathway.
Fibre Optic Accessories	
FR 6.27	**Optical Connectors:** Optical connectors shall be used to terminate optical fibre for their interconnection and distribution.
FR 6.28	**Fibre Patch cords:**

	Fibre Patch cords shall be used to connect Fibre Termination Panel to the network switch.
Fibre Distribution Management System (FDMS)/Optical Cable Entrance Facility (OCEF) and Fibre Termination Panels:	
FR 6.29	OCEF/FDMS shall be installed at the ICOMC and at POPs and shall be used to manage all fibre entry/exit inside all POPs and ICOMC.
FR 6.30	The OCEF/FDMS shall be equipped with splice trays to accommodate the requirement of this Project.
FR 6.31	The OCEF/FDMS shall have built in slots to secure fibre and management clips to hold spools of slack fibre.
FR 6.32	The OCEF/FDMS shall have identification labels inside the door.
Fibre Optic Patch Panel:	
FR 6.33	Fibre Optic Patch Panels shall be installed at termination location at POP, ICOMC, BSCL plots and at every field switch location installed on the pole or cabinet.
FR 6.34	The Patch panels shall be capable of supporting SC type ports for backbone and distribution and SC/ST/LC type ports for access.
FR 6.35	The Patch panels shall have the capacity for terminating the number of fibre as required per the requirements of the Project plus additional 20% spare for future.
Intelligent Patching System:	
FR 6.36	At POP rooms and ICOMC, intelligent patch panels shall be installed for BSCL infrastructure.
FR 6.37	The Intelligent patching system shall comprise of intelligent patch panel, modules, and associated software to be provided at the POPs and ICOMC locations to manage network planning, implementation and operational activities like moves, adds and changes.
FR 6.38	System Hardware shall be capable of seamlessly feeding information directly into the software platform.
FR 6.39	The software platform shall provide fully accurate and comprehensive documentation of all network infrastructure components as well as advanced detection and alert capabilities to allow full control over the environment.
Communications Cabinets with Racks/ Field Cabinets	
FR 6.40	Please refer to the Communication Cabinets with Racks specifications mentioned under IT Infrastructure specification Section 5.7.4.2.
Fibre Asset Management	
FR 6.41	With implementation of a fibre optic network, there is a requirement to create a fibre asset management system for management of the infrastructure.
FR 6.42	The fibre asset management system shall be a purposeful-built tool that will allow mapping of all fibre counts in terms of count colour, number and allocation (entity or device) among other variables.
FR 6.43	Fibre asset management system shall be configurable and easy to operate and update. It is expected that post any implementation of the fibre optic

	infrastructure, this asset management system shall be updated on an on-going basis.
Active Electronics (Switches/Router, Media Converters, Wireless Gateways)	
FR 6.44	Industrial grade Layer-2 Ethernet switches shall be installed at the field for connectivity to field devices. These Layer 2 switches may support POE/POE+ as per the MSI's design requirements to connect various field devices.
FR 6.45	Stacked and interconnected Layer-2, industrial grade Ethernet switches shall be installed at field cabinets for distribution to field devices and plots.
FR 6.46	Layer 3 based Ethernet Switch/Router at all the Point of Presence (POP) and ICOMC locations for communication between the POPs and ICOMC to support a partial mesh architecture.
FR 6.47	Core router and Internet router for connectivity to the outside world.
FR 6.48	Each of the Layer 2 switch at the field (access switch) shall support at least 1 Gbps fibre per port for access and 1 Gbps for backhaul uplinks.
FR 6.49	Each of the Layer 2 switch at the field cabinets shall support at least 1 Gbps fibre per port for distribution with backhaul uplinks of 10 Gbps copper/SFP/SFP+ while the Layer 3 switches/routers at the POP and ICOMC shall have 40 Gbps support per port. Any attenuators required as part of the overall solution shall be provided by the MSI. Note that all fibre optic SFPs shall be ordered to support minimum 10 km distance for distribution and combination of 10km and minimum 25 km for backbone depending on the distance requirements. This shall be validated by the MSI during the design stage.
FR 6.50	The switches from any one vendor shall be interoperable with other brands.
FR 6.51	Communications Media Converter to be installed, if required, on a per device basis where the distance between the IP enabled device and the respective switch is greater than 70m.
FR 6.52	The Communications Media Converter shall enable fibre to copper and copper to fibre media conversion for IP enabled devices. MSI may also use an Ethernet extender as an alternative to the Media converter based on prior permission from BSCL.
FR 6.53	Wireless M2M Gateways to enable Internet of Things (IoT) shall be installed at cellular towers and/or streetlight poles.
FR 6.54	These gateways can support the data aggregation of the Smart Bins.
FR 6.55	The gateways shall be capable of supporting continuous communications among all devices.
FR 6.56	All the active devices shall enable security features in the network switches to disallow any unauthorized access to the port / network.
Network Management System (NMS)	
FR 6.57	The NMS shall facilitate the retrieval, storage, analysis and display of status information from all network devices attached to the system that are SNMP and/or ICMP capable, and shall facilitate remote configuration of these devices. NMS shall support both IPv4 and IPv6 device integration.
FR 6.58	The NMS shall provide the ability to view the network and its associated IP SNMP/ICMP enabled devices including switches and other IP devices

	connected over the network. It shall support a minimum of 5000 end points.
FR 6.59	The NMS should include all hardware and software required to configure, control and monitor the network connected SNMP/ICMP based devices.
Enterprise Management System (EMS)	
FR 6.60	The EMS shall be able to support the proposed hardware and software components (IT and Non-IT) deployed over the tenure of the Contract. The EMS shall be capable of providing early warning signals to the Helpdesk Agents on the performance issues, and future infrastructure capacity augmentation. The EMS shall also support single pane / dashboard with visibility across multiple areas of applications for monitoring.
FR 6.61	EMS shall provide at a minimum the following functions: • Configuration Management • Fault Management • Incident, Problem and Change Management • Asset Management • Remote Control • SLA Management & Monitoring • Performance Management • Monitoring Backup and Management • Event Management • Server, Storage and other Infrastructure Management • Monitor network components of the LAN & WAN • Network Link Monitoring • Helpdesk Monitoring, Management and Reporting • Traffic Analysis.
Help Desk	
FR 6.62	The helpdesk shall be a web enabled management system with SMS and email based alert system for the Helpdesk Call management and SLA reporting.
FR 6.63	Help desk facility shall be provided through Toll-free lines, landlines, helpdesk tool, E-mail, direct walk-in etc.
FR 6.64	The Help desk shall log user calls related to system and assign an incident/ call ID number. Severity shall be assigned to each call as per the SLAs.
FR 6.65	Helpdesk shall track each incident / call to resolution. Escalate the calls, to the appropriate levels, if necessary as per the escalation matrix agreed upon with Authority/authorized entity.
FR 6.66	Helpdesk shall analyse the incident / call statistics and provide monthly reports.
Rodent Repellent System	
FR 6.67	The entry of rodents and other unwanted pests shall be controlled using non-chemical, non-toxic devices. Ultrasonic pest repellents shall be provided in the false flooring and ceiling to repel the pests without killing them. However, the MSI shall conduct periodic pest control using chemical spray once in a quarter as a contingency measure to effectively fight pests.
Connectivity Requirements	

FR 6.68	Fibre optic infrastructure shall fulfil connectivity needs of all the smart city components, field devices, sensors etc. envisaged as part of the Project.

TR - 6 Technical Requirements

HDPE Duct	
TR 6.1	At a minimum the HDPE duct shall meet or exceed the applicable industry standards as listed below: • Indian standards including IS:4984- specifications for HDPE duct • ISO standards (ISO 9001, ISO 14000) • ASTM standards • TEC specifications • Other standards as detailed in this specification.
TR 6.2	The HDPE ducts shall be installed end-to-end across Bhubaneshwar. They will be used for backbone, distribution and access communications.
TR 6.3	The HDPE ducts shall be ordered in different configurations and colours as detailed in the functional requirements. These colours shall be maintained throughout the useful life of the duct.
TR 6.4	The 40mm (OD) with 3.5mm wall thickness and 20mm (OD) with 2.0mm wall thickness coilable HDPE ducts shall be of smooth configuration and shall be suitable for outdoor underground installations.
TR 6.5	All HDPE ducts shall be continuous. Where the duct reel ends, the HDPE ducts shall be joined using approved industry standard couplers or inside manholes/handholes. Where couplers are used, they shall be single piece HDPE coupler which shall be used to provide water proof and air proof secure fit in accordance with the manufacturer's recommended procedure for joining ducts.
TR 6.6	The duct sweeps shall not exceed 180 degrees for the sum total of duct sweeps for a section of duct between duct termination points (i.e. manholes and handholes).
TR 6.7	**Sheathing Raw Material:** • Shall be per IS 2530 • The Melt Flow Index shall be as per IS 33 • The outer sheath thickness shall be in the range 1.2 mm +/- 0.2 mm.
TR 6.8	The duct shall be free from visual defects like blisters, shrink holes, flaking, scratches groove lines & roughness.
TR 6.9	The duct's outer sheathing shall have in-built rodent protection for every duct.
TR 6.10	Minimum Bending Diameter shall be at least 15 times of outer diameter (OD) of the duct or as per standard manufacturer recommendations.
TR 6.11	Bending Performance: There shall be no damage when mounted on a mandrel of duct diameter for 30 minutes.

TR 6.12	In the HDPE Duct, the coextruded inner layer of solid permanent lubricant shall be integral part with HDPE and white in colour, clearly visible in cross section of duct. The inner lubricant material shall be of friction reducing, polymeric material. The lubricant materials shall have no toxic or dermatic hazards for safe handling.
TR 6.13	The coil shall be at least 300 meters in length.
TR 6.14	The pre-installed PP rope/Fishline shall be ordered along with the PLB duct. In this case PP rope/Fish line is safely tied to the end caps at either ends with hooks to facilitate pulling of the OFC cables at a later stage. The rope shall be polypropylene, and shall meet IS: 5175 standard. It shall have 1.5m of line coiled in the bottom of handholes and manholes at the end of each duct run.
TR 6.15	The duct shall be supplied with at least 0.6mm diameter in-built copper tracer wire. The tracer wire shall be 12 gauge, copper 600V insulated blue wire in all empty conduits. The tracer wire shall interconnect in the manholes and handholes. Tracer wire terminals shall have a tag to identify it as BSCL fibre. This tracer wire shall be provided for all sections where there is open trenching.
TR 6.16	The HDPE ducts shall be supplied in reels or coils after sealing both ends by end caps. The following markings shall be provided on each packing: • Code of product • Name of Manufacturer • Date of manufacturing • Length of PLB HDPE duct • Dimension of Outer diameter and Inner diameter • Client's name.
TR 6.17	All the duct shall be clearly marked at intervals of 1 meters with the following data which is not less than 5 mm high. The details of marking on duct shall be approved by BSCL before commencement of manufacturing: • BSCL with logo • Manufacture’s name or trade mark • Year and month of manufacturing • Type of PLB HDPE duct and size • Running length marking.
Laying of PLB HDPE Duct in Open Trench	
TR 6.18	HDPE ducts shall be laid in open trench or using HDD technique.
TR 6.19	The duct trench shall be dug as per route plan (indicating the various dimensions and other details of the trench) approved by the BSCL for each type of soil type.
TR 6.20	Due care and precaution during excavation shall be taken to avoid possible damage of any other underground plans/facilities in the proposed underground PLB HDPE Duct route and shall indemnify BSCL for all damages and shall be solely responsible for all the damages and losses.
TR 6.21	The minimum depth at which the duct shall be laid will be in compliance with DOT norms and telecom best practices.

TR 6.22	No blasting is permitted near permanent work or dwellings. Blasting shall be so made that pits are as close to the designed dimensions as practicable.
TR 6.23	The width of trench at the top and bottom shall be adequate for proper installation of PLB HDPE ducts with required quantities.
TR 6.24	The trench depth shall be measured from the bottom of the trench. Trench shall be located at the lowest point of lower area, if possible.
TR 6.25	In case of uneven ground, the MSI ensure that the bottom of the trench is not uneven, the MSI shall maintain minimum depth of the trench as per specifications and may be required to increase the depth at some locations and provide a suitable gradient in the trench.
TR 6.26	The backfilling and compacting of trench in layers of 200 mm, restoration of road, nalla, pavements etc. after the completion of laying work.
TR 6.27	Provided that the PLB HDPE ducts has been properly laid and jointed in the trench, and the back filling operation shall follow as closely as practicable.
TR 6.28	The back filling operation shall be performed in such a manner as to provide firm support under and above the PLB HDPE duct and to avoid bend or deformation of the PLB HDPE duct, when the PLB HDPE duct gets loaded with the back filled earth.
TR 6.29	Where in any location the back filling is unevenly centred over the trench due to carelessness or any other cause, it shall be redressed at the MSI's expenses.
TR 6.30	No debris shall be allowed in backfill at any time.
TR 6.31	At locations where the backfill material contains hard rocks, rock fragments and other hard materials which may cause damage to the pipe and where rock has been excavated from the trench and it is intended to refill the trench, the trench shall be initially filled. De-rocked loose earth above the top of the duct shall be screened through a suitable mesh if so required and backfilling only thereafter be completed and finished with excavated material.
Other Installation Requirements	
TR 6.32	During transportation and storing at the site duct, it is necessary to seal the ends of the duct with proper End caps against water penetration or other impurities.
TR 6.33	When installing duct in an open trench from a drum, it should be uncoiled from the bottom and not from the top of the drum.
TR 6.34	The fill ratio of the duct shall be in compliance with the National Electric Code (NEC) standard NFPA 70, ANSI/TIA 568 and ANSI/TIA 569.
TR 6.35	When placing multiple ducts in a single trench simultaneously, it is important not to cross or twist the ducts inside the trench, when installing large quantities of ducts it is possible to stack them one on top of the other in addition to side by side.
TR 6.36	Positioning of the ducts must be designed in the planning stage to ensure clarity between ducts placement.

TR 6.37	When placement of the duct is completed and connections of the duct ends are deferred to a later stage, it is advised to overlap duct ends by one meter from each side.
TR 6.38	Both ends of the duct must be properly sealed with end plug to prevent water, dust or any other foreign particle from entering into the duct.
TR 6.39	Pump out water, if any, from the trench before placement of duct.
TR 6.40	Whenever tree roots are found in the trench make sure to lay the ducts under the tree roots and not the above.
TR 6.41	Place the duct along the trench as straight as possible.
TR 6.42	Tightly close the ends of the ducts with self-tightening End Plug so that no dirt, dust or moisture into the duct.
TR 6.43	No spacer will be used however the duct should be tied together with cable tie at an interval of 2 meter positively so as to keep them together.
TR 6.44	**Installation of Plastic Couplers:** • Cut the duct at the same place where they overlap. Cutting should be done in such a way that the duct end matches with each other perfectly because it is very important for the coupling joints to be airtight. • Proper pipe shears or cutters must be used for smooth cutting. Do not use a hacksaw to cut the duct. • Deburr both the inside and the outside edges of the duct with a deburring tool • Apply a small amount of proper lubricant (liquid detergent) for better installation of plastic couplers. • Tighten the plastic coupler with C-Spanner.
TR 6.45	**End Plug:** • Close the ends of duct with end plugs so that moisture, dirt and dust do not enter inside the duct. • It seals the duct ends completely and prevents air, moisture from entering the duct, ever when it is laid underground. • Further interior surface of empty ducts also remains clean even after several years. • Inspect the Neoprene Rubber for various defects such as pin holes, cuts, etc. In case of any such defect, replace the rubber gasket with a new one.
TR 6.46	**Warning Tape:** • This warning tape shall be provided above the telecom duct throughout the route (for open trench only) at a depth of 50% of total trench depth. • Warning tape should be made of HDPE or LDPE (Low Density Poly Ethylene) and other inert material and shall be either bright yellow or orange in colour. • The thickness of tape shall be 1 mm and minimum width 150 mm with life of 25 years.

	• Neither the colour of tape nor the marking printed inscribed on it shall change or fade away throughout the life time of tape. • The tape should contain a printed message in English, Hindi and Marathi alternatively “WARNING BSCL OFC”.
TR 6.47	**Duct Route Indicators:** • Prefabricated or Precast RCC duct route Indicators are needed to be placed on the Duct Route for open trench. • The route indicator shall be made of RCC material. It shall have embedded on both sides “BSCL OFC”. • The route indicator shall be provided based on standard DOT practices. • Route indicators shall be fixed at every 50 meter interval in city area and at both ends of the road crossing.
Testing: Following testing specific to HDPE duct shall be met. For other testing requirements, refer to the testing section.	
TR 6.48	**Factory Testing Requirements:** • Factory acceptance tests shall be conducted on randomly selected final assemblies of all equipment to be supplied. Visual inspection shall be carried out on 100% basis for all the equipment/items offered. Factory acceptance testing shall be carried out on PLB HDPE and accessories. • From each batch PLB-HDPE duct presented by the MSI for Factory acceptance testing, the BSCL shall select random sample (s). • The following tests shall be carried out during Factory Acceptance Testing (FAT): ➢ Visual Inspection ➢ Dimension Check ➢ Hydraulic Characteristics ➢ Reversion Test ➢ Tensile Strength and Elongation Test ➢ Environmental Stress Crack Test ➢ Impact Strength Test ➢ Crush Resistance ➢ Mandrel Test ➢ Ovality Test ➢ Coil Set Test ➢ Internal Co-efficient of Friction ➢ Ash content ➢ Colour fading ➢ Optical Fibre Cable Blowing Test ➢ Air Pressure test on plastic coupler ➢ Ageing test on accessories

	• Dimensional test shall be carried out on 10% sample of the respective lot. • In case any of the selected samples fail, the failed sampled is rejected and additional 20% samples shall be selected randomly and tested. In case any sample from the additional 20% also fails the entire batch may be rejected.
TR 6.49	**Duct Integrity Test Procedure:** After laying the Duct network, HDPE ducts shall be tested for proper laying, crush, deformity and pressure testing. The MSI shall have to remove the obstruction/deformity of any kind before handing over of the Duct network to client.
Following tests are to be carried out on the laid HDPE duct:	
TR 6.50	**Duct Cleaning (Sponge Test):** • Compressed air should be blown through the duct in order to remove any dirt and water that has accumulated inside the duct with the help of suitable capacity Air Compressor. • A short blast of air about 2-3 bar shall be blown through the duct for about 2 minutes. • Sponge will be blown through the duct to thoroughly clean the duct from inside.
TR 6.51	**Crush and Deformity Test:** • This test is to be done to check the integrity of the duct. • During installation, while backfilling process there is a possibility of flattening, twisting or kinking of the duct. • This is also possible if the duct has not been uncoiled properly and is laid improperly. • Place the wooden shuttle in the duct. Note: Shuttle should be 80% of inner diameter of the duct and 150 mm in length. • Connect the Compressor pipe fitting to the duct. • Place the flexible wire grip to the downstream end of the duct. • Connect the air hose supply to the compressor and the equipment. • Open the discharge valve of the compressor and blow the shuttle through the duct. Note: The shuttle will pass through at a very high speed and must be trapped in flexible wire grip to avoid accident and injury.
TR 6.52	• Mandrel/Shuttle Test – A mandrel/shuttle of at least 90% of the inside diameter size shall be passed through the duct to test the clear pathway of the duct.
TR 6.53	**Pressure Testing:** • This test is carried out to detect leakage in duct, if any. Seal one end of the duct with End Coupler and then through End Coupler with valve, feed the compressed air into the duct.

	• Raise the pressure up to 5 Bar and then observe. After observing for 30 minutes, pressure drop of up to a max. 0.5 Bar is permissible.
TR 6.54	The detection device for detecting the presence of the buried HDPE Duct with co-extruded copper wire/tracer wire, shall have following features: • One set of Transmitter and Receiver along with suitable batteries in a portable box. • Capability to detect HDPE duct with co-extruded copper wire/tracer wire up to a depth of 3 meters. • Capability to emit peak audible signal when the HDPE duct with co-extruded copper wire/tracer wire is exactly below the receiver. • Capability to distinguish presence of passive metallic objects as well as current carrying metallic conductors other than the duct itself. • Capability to indicate the depth of the duct at which it has been buried. • Capability to change the frequency of detection current to avoid possibility of mixing up with detection of another HDPE Duct with co-extruded copper wire/tracer wire in the vicinity, if any. • It should have a backlit LCD display for visibility in low light conditions. • It should have rugged one piece case design and sealed keypad for withstanding tough weather conditions and for superior moisture resistance.
TR 6.55	**Impact Strength on individual duct:** • There shall be no crack/split when 9.1kg load (Tup B) dropped from 1.5 meters. Height after conditioning at 0ºC for one Hour. • Environmental Stress Crack resistance characteristics for duct: ➢ No cracking when tested with 10% LGEPAL solution, CO 0630 Solution at 500C for 96 Hours. ➢ The Tensile strength of yield shall be at least 20N/ mm2 as per ASTM F 2160, and ASTM D 638 Type IV. ➢ Hydraulic Characteristics - No Swelling leakage or bursting observed after 48 hours at an induced stress of 3.8 Mpa @ 800C as per IS 4984. ➢ Elongation at Break for both 40 mm and 20 mm duct shall be at least 500% as per ASTM F 2160, and ASTM D 638 Type IV standard.
HDPE Handhole	

<table>
<tr><td>TR 6.56</td><td>The product shall meet or exceed the following American Society for Testing and Materials (ASTM) Standards:
ASTM C 857-95: Standard Practice for Minimum. Structural Design Loading for Underground Precast. Concrete Utility Structures;
ASTM C 109: Standard Test Method for Compressive Strength of Hydraulic Cement Mortars;
ASTM C 580: Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concrete;
ASTM C 496: Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens;
ASTM C 543: Standard Specification for Pressure Vessel Plates, Alloy Steel, Quenched and Tempered Nickel-Chromium-Molybdenum;
ASTM C 1028: Standard Test Method for Determining the Static Coefficient of Friction;
ASTM C 570: Standard Specification for Oil- and Resin-Base Caulking Compound.</td></tr>
<tr><td>TR 6.57</td><td>Handholes shall be made of medium duty HDPE with Polymer Concrete Lid.</td></tr>
<tr><td>TR 6.58</td><td>Boxes, rings and lids should sustain a minimum vertical test load of 33,500 lb (AASHTO HS 20 loading) as a stand-alone unit, over a 10-inch x 20-inch square steel plate centred on the cover and body in accordance with ASTM C 857-95 design load A-16.</td></tr>
<tr><td>TR 6.59</td><td>The boxes, rings and lids shall meet the physical and chemical requirements listed in Table.
<table>
<tr><th colspan="3">Physical and Chemical Properties of Handhole components</th></tr>
<tr><th>Property</th><th>ASTM</th><th>Test Value</th></tr>
<tr><td>Compressive Strength</td><td>C 109</td><td>11,000 psi</td></tr>
<tr><td>Flexural Strength</td><td>C 580</td><td>1,800 psi</td></tr>
<tr><td>Tensile Strength</td><td>C 496</td><td>1,700 psi</td></tr>
<tr><td>Effects of Acids</td><td>D 543</td><td>Very Resistant</td></tr>
<tr><td>Effects of Alkalis</td><td>D 543</td><td>Very Resistant</td></tr>
</table>
*All ASTM Specifications shall be as per the current version.</td></tr>
<tr><td>TR 6.60</td><td>Holes for keeping service loops of duct shall be of suitable height and direction as per the Project requirements.</td></tr>
<tr><td>TR 6.61</td><td>Furnish lids that have a non-skid surface for pedestrian traffic with a minimum coefficient of friction of 0.50 in accordance with ASTM C 1028 without the use of coatings.</td></tr>
<tr><td>TR 6.62</td><td>All lids shall be manufactured with the markings “BSCL” in the logo area of the lid, in 25 mm recessed letters.</td></tr>
</table>

TR 6.63	Lid access points shall have recessed reinforced steel pull slots to allow for the removal of the cover with a hook or lever. Replace the lid if damage occurs to the pulling point.
TR 6.64	Bolts used on handholes and lids shall be stainless steel, recessed hex head bolts with washer.
TR 6.65	The top of handhole shall be flushed with the ground level.
TR 6.66	All PLB HDPE duct entries, cable entries and holes shall be properly sealed.
TR 6.67	Seal duct ends inside all handholes with at least 50mm thick duct caulking after fibre is installed. Seal vacant duct with a manufacturer end plug and attach detectable pull tape.
TR 6.68	Handholes shall have capabilities to absorb water as per ASTM 570 standards. They shall be provided with sump holes or open bottom for water drainage.
TR 6.69	The handholes shall be installed with a minimum of 101mm layer of small rock in the bottom to prevent mud and wildlife (rodents) from intruding the handholes. The gravel shall help facilitate drainage.
TR 6.70	No handholes shall be installed under direct traffic load and shall be only suitable for installation at boulevards or areas where there is pedestrian movement.
TR 6.71	The HDPE manholes shall have following markings provided on each unit: • Code of product • Name of Manufacturer • Date of manufacturing • Named as 'BSCL OFC HANDHOLE'
Manhole	
TR 1.1	Manhole shall be pre-cast RCC rectangular type with minimum wall thickness of 150mm and shall include 8mm diameter or more steel reinforcement.
TR 1.2	The base of manhole shall be minimum 150mm thick PCC (Plain Cement Concrete) and minimum internal clearance shall be at least 1mx1mx1m.
TR 1.3	Holes for keeping service loops of duct shall be at minimum 300mm height from internal base.
TR 1.4	All PLB HDPE duct entries, cable entries and holes shall be properly sealed.
TR 1.5	The size of the holes shall not be larger than 6mm from conduit outer diameter (sleeve). Seal conduit ends inside all manholes with at least 50mm thick duct caulking after fibre is installed. Seal vacant conduit with a manufacturer end plug and attach detectable pull tape.
TR 1.6	The manhole cover shall be heavy duty water tight FRC type. However, for easy handling purpose, the cover shall be constructed with suitable arrangement for lifting.
TR 1.7	The top of manhole should be flushed with the ground level.

TR 1.8	The manhole shall have suitable access from cable trench and sufficient holes in all walls for PLB HDPE duct entries and exits.
TR 1.9	Requisite brackets along with cable hangers for placing cable and splice box inside the manhole shall be provisioned and made of junk free material.
TR 1.10	The Manholes shall meet the physical and chemical requirements listed in Table.

Physical and Chemical Properties of Manhole components		
Property	**ASTM**	**Test Value**
Compressive Strength	C 469	>17,000 psi
Flexural Strength	D 790	>1,400 psi
Chemical Resistance		Retail > 75% of Original Strength
Impact Resistance	D 2444	>70 ft-lb
Friction Coefficient	C 1028	>0.6

*All ASTM Specifications shall be as per the current version.

TR 1.11	Manholes shall be equipped with a covered sump hole for drainage and shall be reasonably waterproof. Manholes shall have reasonable level of gravel bed extending 203mm to 305mm beyond the outer edges of the manhole.
TR 1.12	Manholes shall have capabilities to absorb water as per ASTM standards as per current version.
TR 1.13	All manholes shall have grounding halo installed that wraps the manhole and is connected to the ground rod. The halo shall be tin coated, copper ribbon that shall be anchored to concrete approximately 457 to 610mm apart. The halo shall be bonded to ground rod with non-insulated 6 AWG solid copper conductor.
TR 1.14	The manholes shall be placed on 152mm of compacted rock or sand to ensure uniform distribution of soil pressure on floor.
TR 1.15	No manhole shall be installed under direct traffic load and shall be only suitable for installation at boulevards or areas where there is pedestrian movement.
Optical Fibre Cable	
The Single mode optical fibre shall meet or exceed the following industry standards:	
TR 6.72	ITU-T G.652- Characteristics of a single-mode optical fibre and cable.
TR 6.73	ANSI/ICEA S-87-640-1999 - Standard for Optical Fibre Outside Plant.
TR 6.74	Telcordia GR-20: Generic Requirements for Optical Fibre and Optical Fibre Cable.
TR 6.75	All applicable TIA/EIA standards for single mode fibre cable and those listed in these technical requirements.

TR 6.76	The fibre optic cable shall be single mode, loose tube armoured cable which shall be ordered in different fibre count and tube configuration as detailed in the functional requirements.
TR 6.77	The single mode optical fibre shall enable dual operating wavelengths at 1310nm and 1550nm nominal. The optical fibre shall be non-dispersion shifted.
TR 6.78	Single mode fibre shall have attenuation not greater than 0.36 dB/km at 1310 nm and 0.25 dB/km at 1550 nm.
TR 6.79	The single mode optical cable shall have the cladding diameter = 125.0µm ±1.0 and Mode Field diameter = 9.2µm ± 0.4.
TR 6.80	The single mode optical cable shall have polarization mode dispersion (PMD) coefficient ≤ 0.2 at 1310nm.
TR 6.81	Fibre attenuation measurements shall be made in the factory in accordance with EIA-455-78A for single-mode fibre. The spectral width of the source used to measure attenuation shall be less than 10 nm.
TR 6.82	When Optical Time Domain Reflectometer (OTDR) is used, measurements shall be made from both directions and the results shall be averaged.
TR 6.83	The attenuation of the single mode fibre shall be distributed uniformly throughout its length such that there are no point discontinuities in excess of 0.1 dB at 1310 nm or 1550nm wavelength. Fibre shall have no voids, air bubbles, or streaks in them. Factory splicing is not permitted. Attenuation Uniformity shall be measured in accordance with EIA-455-59.
TR 6.84	The Chromatic Dispersion of single mode fibre shall be measured in accordance with EIA-455-175 or EIA-455-168.
TR 6.85	The cut-off wavelength of cabled fibre shall be less than 1260 nm. The wavelength shall be measured according to EIA-455-170.
TR 6.86	The single mode fibre optic cable shall be armoured cable that shall be suitable for outdoor installations, with protection against rodents.
TR 6.87	The minimum bending radius of the fibre optic cable shall be at least 15 times the diameter of the cable or better during operation, and shall be at least 10 times the diameter of the cable or better during installation.
TR 6.88	Fibre optic cable shall be able to withstand a pulling tension of at least 2700N without any resulting damage.
TR 6.89	The optical fibre coating and/or buffer shall consist of materials that are environmentally stable in order to reduce long term effects of stress corrosion caused by moisture absorption. The coating shall be suitable for removal by industry standard mechanical stripping methods. No chemicals shall be required to strip the coating and/or buffer material.
TR 6.90	Colour coding of individual tubes and fibre shall be in accordance with EIA-598. The fibre colour coding shall be visible throughout the life of the cable. Colour concentrates or inks used to colour the optical fibre shall be heat stable and shall not be capable of permeating through the protective fibre coating causing transmission degradation of the optical fibre.
TR 6.91	All cable shall be supplied on wooden reels, with both ends of the cable accessible for testing. Each reel shall be clearly labelled with the cable

	code, length, and date of manufacture. All reels shall be protected with solid (2x4) wooden lagging, intended for export shipment.
TR 6.92	Material used in optical fibre cables must not support galvanic action. The core cladding shall be all glass that is predominately silica (SiO_2). Phosphorus, if used as a dopant in the optical fibre, shall be limited to a minimum to reduce the potential effects on fibre attenuation due to hydroxyl ions.
TR 6.93	All fibre optic cables shall be spliced inside dedicated manholes as per the Project requirements.
TR 6.94	Cable Code and Length Marking shall comply with Telcordia GR-20 standards. This shall include sequentially numbered length markings in meters imprinted on the jacket, and this length marking shall not be reset to zero along the cable length.
TR 6.95	In addition to length markings, each length of the cable must be permanently marked to include the following: • Manufacturer cable and ID code • Year of manufacturer (cable) • Customer Name “BSCL” • Number of fibre • SM (single mode)
TR 6.96	The entire fibre length shall be capable of withstanding a potential tensile stress of not less than 100 kpsi (0.7 Gpa).
TR 6.97	Dry water-blocking materials shall be applied over the cable core to prevent the ingress of water, and movement along the cable sheath.
TR 6.98	Fillers may be included in the cable core to lend symmetry to the cable cross-section where needed. The buffer tubes shall be enclosed in a cable sheath as specified in this section.
TR 6.99	The cabled optical fibre shall maintain mechanical and optical integrity through an operational temperature range of 0°C to +70°C.
TR 6.100	The change in attenuation for single-mode fibre shall not be greater than 0.05 dB/km at 1310 nm and 1550 nm at the operational temperatures limits.
TR 6.101	Temperature cycling measurements shall be made in accordance with EIA-455-3A as per below: • Storage Temperature: 0°C to 60°C • Installation Temperature: 0°C to 55°C • Operating Temperature: 0°C to 70°C
TR 6.102	The cable shall maintain its mechanical and optical performance for an in-service period exceeding 25 years. The MSI shall provide documentation proof to validate this.
TR 6.103	Lightning withstand current shall comply with Telcordia GR-20 standards.
TR 6.104	A sheath slitting cord is required for each sheath.
Installation Requirements:	

TR 6.105	The cable shall support a vertical rise up to 10 m without intermediate cable support.
TR 6.106	The outer jacket of the cable shall be fungus inert and shall be suitable for long term exposure to sunlight and weather.
TR 6.107	Each cable shall be reeled in such a way that both ends of the cable are readily accessible for testing, without any need for unreeling. The inner end of the cable shall be properly secured to prevent whipping when the end of the reel is reached. A minimum of 3 m of the inner end of the cable shall be accessible for optical testing. The inner end must be securely fastened or protected against shipping or installation damage.
TR 6.108	A 30m slack per cable in every manhole and 15m slack per cable inside every handhole shall be placed along the fibre optic cable route as per BSCL requirement.
TR 6.109	Each length of cable shall be wound on a separate cable reel.
TR 6.110	Suitable mechanical pulling aids shall be deployed to ensure that the maximum pulling tension is not exceeded at any time during the installation.
TR 6.111	Tags shall be installed at all cable end points (manholes, handholes, etc.).
TR 6.112	The cable shall be neatly dressed, labelled and organized.
Testing: Following testing specific to fibre optic cable shall be met.	
TR 6.113	**Factory Testing Requirements:** • Prior to shipment, Factory-controlled tests shall be performed to verify compliance of the above stated specifications. • Each cable reel shall be shipped with test results indicating the length of the cable reel and the attenuation at 1310 nm and 1550 nm for each fibre, as applicable. A copy of these test results shall also be provided to BSCL or their designate. • Any test that reveals the materials or equipment does not meet the stated specifications shall constitute failure. • Visual inspection shall be carried out on 100% basis for all the equipment/items offered. • Dimensional test shall be carried out on 10% sample of the respective lot. • In case any of the selected samples fail, the failed sampled is rejected and additional 20% samples shall be selected randomly and tested. In case any sample from the additional 20% also fails the entire batch may be rejected.
TR 6.114	**Pre-Installation Testing Requirements:** • Once delivered to the MSI, the MSI shall, prior to installation, conduct a reel test. • Inspecting for any physical damage of the reel or cable.

	• Measure using an OTDR, the attenuation at 1310nm and 1550nm for one fibre from each buffer tube from both ends of the cable.
TR 6.115	**Post-Installation Testing Requirements:** • Inspecting for any physical damage of the exposed portions of cable. • Measure using an OTDR, the attenuation at 1310 nm and 1550 nm for every fibre from each buffer tube from both ends of the cable. This includes all connectorized and unconnectorized links with intermediate cable butt splices as applicable. • Inspecting for proper slack loops inside manholes.
TR 6.116	**Mechanical Testing Requirements:** The cable shall meet the following test requirements without physical damage to the cable and/or cable components and without degradation of optical transmission.
TR 6.117	**Crush And Impact Test (Outdoor Cable):** A crush and impact test shall be carried out on a sample of cable approximately 10 m in length according to the method stated in EIA-455-41, and EIA-455-25A /IEC 794. Optical loss measurements are to be made at the 1550 nm nominal wavelength. A permanent or temporary increase in the attenuation loss value greater than 1.0 dB/test-fibre-km shall constitute failure.
TR 6.118	**Twist And Flexibility Test:** A twist and flexibility test shall be carried out on a sample of cable approximately 5 m in length according to the methods stated in EIA-455-85/IEC 794, and EIA-455-104. Optical loss measurements are to be made at the 1550 nm nominal wavelength. A permanent or temporary increase in the attenuation loss value greater than 1.0 dB/test fibre-km shall constitute failure
TR 6.119	**Water Ingress Test:** A water ingress test shall be carried out on a sample of cable according to the requirements of EIA-455-82A/IEC 794. No water shall leak through the open end of the 1.0m test sample.
TR 6.120	**Certificates And Proof Of Factory Testing:** The bandwidth and attenuation of every fibre in each cable shall be tested in the factory. Single mode measurements shall be taken at 1310 nm and 1550 nm. These factory test results shall be provided with the cable. One copy shall be attached to the cable reel, inside the lagging, prior to shipment, and one copy shall be sent to BSCL's Project management office.
UTP Copper Armoured Cable and Accessories	
TR 6.121	The cable shall comprise of four (4) uniformly twisted insulated conductor pairs. Each pair shall have different colour insulation for identification and the two cores of any one pair shall also have different coloured insulation for the identification of a specific core.

TR 6.122	The laid up core shall be wrapped with aluminium tape and bonded with an overlap to provide 100% shielding.
TR 6.123	A tight fitting polyethylene jacket shall be extruded over the shield.
TR 6.124	Conductors shall be twisted to form pairs with an average mutual capacitance of less than 56 nF/km with a far end crosstalk loss of 69 dB/km or better.
TR 6.125	The cable shall have a water repellent filled core and shall have a sunlight and weather resistant jacket of polyethylene (e.g. XLPE).
TR 6.126	Each conductor in the cable shall consist of #23 AWG (0.57 mm), stranded high conductivity copper with a D.C. loop resistance of less than 60 ohms/ loop km.
TR 6.127	The cable shall have a guaranteed transmission performance up to 250 MHz.
TR 6.128	The cable shall have characteristic impedance of 100 ± 15 (Ohms).
TR 6.129	Materials used in the cable shall not support galvanic action.
Copper Patch Cords	
TR 6.130	Patch cords fabricated from UTP cable shall be of suitable length to connect field devices with the switch/ FTP. Patch cords shall be sized to minimize excess cable interconnecting equipment, with cables routed and dressed to maintain a neat appearance.
TR 6.131	Patch cords shall be terminated with 8-pin 8-conductor “RJ-45” style connectors.
TR 6.132	Pre-fabricated patch cords shall be supplied in individual packages.
TR 6.133	All cabling and connectors shall be in accordance with ANSI/TIA/EIA-568-B.
Copper Patch Panel	
TR 6.134	The copper communication cable shall be terminated at the associated patch panel or field device.
TR 6.135	The patch panels shall be sized to support the design requirements.
TR 6.136	The standard termination is to be according to ANSI/TIA/EIA-568A.
TR 6.137	The termination shall protect the cable terminations from water and mechanical damage and shall be resistant to salt corrosion.
TR 6.138	All material of the termination and associated mounting accessories shall be non-reactive and the complete assembly shall not support galvanic cell action.
TR 6.139	All cable entries shall be provided with appropriate cable pathway.
TR 6.140	Any provided patch panel or wall plate shall provide mechanical support for all connections enclosed and shall maintain insulation between them.
TR 6.141	Connectors shall be sealed water resistant, and shall accommodate the #23 AWG gauge solid conductors. Insulation displacement terminal lugs are permitted.
Fibre Optic Splice Closure (FOSC)	

TR 6.142	Be capable of accepting minimum six (6) cables in a butt splice configuration. Any additional cables shall be supported using standard accessories provided by the manufacturer.
TR 6.143	Fibre Optic Splice Closures shall be IP 68 rating.
TR 6.144	Be re-enterable without the use of additional parts or special materials.
TR 6.145	Not require special tools to enter or assemble.
TR 6.146	Be constructed of non-corrosive materials.
TR 6.147	Have a life expectancy of at least 25 years.
TR 6.148	Be capable of storing up to 3.0m lengths of expressed buffer tubes.
TR 6.149	Accommodate splice organizers which accept heat-shrink fusion protectors or splice protection packs.
TR 6.150	Have provisions for storing Fibre splices and un-spliced Fibre/buffer tubes.
TR 6.151	Be non-filled (no encapsulating material) to prevent water intrusion.
TR 6.152	Meet all performance standards over the operating temperature range of 0°C to +60°C.
TR 6.153	Be capable of preventing a 3.0m water head from intruding into the splice compartment for a period of 7 days, and a 2.0m water head for an indefinite period of time.
Optical Connectors	
TR 6.154	The optical connectors shall comply with Telcordia GR-326-CORE, NWT, American Society for Testing and Materials (ASTM), Telecommunications Industry Association (TIA), as well as Underwriters Laboratories for flammability tests.
TR 6.155	Optical connectors shall conform to the following standards at a minimum: • Small form factor SC and SC/ST/LC • UPC type • Push-on/pull-off interconnection, dry contact, physical contact • Suitable for single-mode installations • Simple polishing tools for infield installation • Available in duplex styles • Connector strain relief limits cable bending radius • Adapters available to mate with other connectors • Insertion Loss < 0.2 dB • Return Loss > -55dB • Repeatability <= 0.1 dB • Thermal Shock <= 0.1 dB • Temperature Cycling <= 0.1 dB 0°C to +60°C (40 Cycles) • Humidity Cycling <= 0.1 dB +60°C (10-95 percent)
Fibre Patch Cords	
TR 6.156	Patch cord material shall conform to the following standards at a minimum:

	• House a single fibre in a 900 micron tight buffer tube. • House the tight buffer in a flame retardant jacket with space between the jacket and tight buffer filled with Kevlar strength components. • Be available in duplex configurations. • Both mating faces of each connector shall be cleaned using fibre optic cleaning solvent cleaning wipe or patch prior to mating the connector surfaces.
Fibre Distribution and Management System (FDMS)/Optical Cable Entrance Facility (OCEF)	
TR 6.157	The system shall be modular and shall provide compact fibre patching/ splicing system.
TR 6.158	The system shall be fully equipped with necessary accessories such Fan-outs, Fibre Arrangement System, SC and SC/ST/LC connectorised patchcords, 0-dB adapters etc.
TR 6.159	The system shall be able to accommodate all types of optical fibre cable structures.
TR 6.160	The system must guarantee trouble-free extension with no downtime maintenance.
TR 6.161	The system shall have a patch distribution frame with a capacity to meet the Project requirements.
TR 6.162	Each splice tray shall accommodate minimum 48 fibres.
TR 6.163	The system shall have metal housing with movable drawer and integrated fibre management.
TR 6.164	The system shall have a front door with latch for patch cord protection and management.
TR 6.165	The system shall have dedicated cable management and routing to limits bend radius. The cable management could be horizontal or vertical as deemed fit for best performance and shall comply with Industry Standards.
TR 6.166	The system shall have slack storage in sliding tray to manage and protect excess optical fibre length.
TR 6.167	The system shall be supplied with adjustable mounting bracket available for 19" rack mounting.
TR 6.168	The device shall support operating temperature range of 0°C to +45°C with ambient relative humidity of 10-90% non-condensing.
Fibre Optic Patch Panels	
TR 6.169	The Patch panels shall adhere to Telecordia GR-449 Core or equivalent specifications.
TR 6.170	The Patch panels shall be capable of supporting SC type ports for backbone cabling and SC/ST/LC for distribution and access cabling.
TR 6.171	The Patch panels shall include the mounting hardware for EIA/TIA standard racks as per rack requirements.
TR 6.172	The Patch panels shall provide a minimum of four cable entry points.

TR 6.173	The Patch panels shall support rings to maintain minimum fibre bending radius, and to prevent accidental physical damage.
TR 6.174	The Patch panels shall provide physical protection for the individual fibres.
TR 6.175	The Patch panels shall provide terminating facilities for fibre optic connectors, including the through adapter.
TR 6.176	The Patch panels shall provide a lockable compartment in which fusion splice trays are housed which is separate from the fibre patching area.
TR 6.177	The Patch panels shall provide bulkhead mounting hardware for a variety of connectors but shall be equipped with SC and SC/ST/LC connectors unless otherwise noted.
Intelligent Fibre Optic Patching System	
TR 6.178	The system hardware shall accommodate intelligent modules that utilize minimal additional rack space for scalability and growth of network management in a low risk and cost-effective manner.
TR 6.179	The modular patch panel shall offer the choice of an installation that is fully intelligent or “intelligent ready” for future upgrades.
TR 6.180	The front of the panel shall include LEDs located above each port that indicate the connectivity status, as well as multi-functional push buttons for guiding technicians through moves, adds, and changes (MACs).
TR 6.181	The system shall have an interface unit at the centre of the panel to add further built-in functionality such as patch cord tracing and maintenance operations, without the need for additional control equipment.
TR 6.182	The panel shall offer a method for labelling in compliance with TIA/EIA 606-A labelling standards.
TR 6.183	System Hardware shall be capable of seamlessly feeding information directly into the software platform.
TR 6.184	The software platform shall provide fully accurate and comprehensive documentation of all network infrastructure components as well as advanced detection and alert capabilities to allow full control over the environment.
TR 6.185	The software platform shall have the capability of real time viewing of Communication Racks for remote site management from the ICOMC or any other connected location.
TR 6.186	The software platform shall provision to provide real time information of devices movement from one location to other.
TR 6.187	The software shall automatically provide complete linkage information (from switch port up to the end device) in graphical format, providing full end-to end visibility and automatic updates of new locations when moves occur.
TR 6.188	The software shall identify between unauthorized and authorized changes on the network connectivity and send alerts accordingly.
TR 6.189	The software shall provide complete Fault Summary with customizable log files to generate reports for various requirements.

TR 6.190	In case any changes are made to the network (patching) during a planned (power) down time, the software shall register and report the changes if any during the power down time, once the system is up again, without any human intervention.
TR 6.191	The software shall be capable of integrating the solution with any 3rd party software or in.
TR 6.192	The software shall be provide with an unlimited user licenses to enable use by multiple users.
Communications Cabinets with Racks	
TR 6.193	Please refer to the Communication Cabinets with Racks specifications mentioned under IT Infrastructure specification Section 5.7.4.2.
Active Electronics	
Ethernet Switch – Layer 2- Industrial Grade Field Switch	
TR 6.194	The Industrial Grade Switch installed at the field both at street light poles and inside field cabinets.
TR 6.195	The distribution switches i.e. switches installed inside field cabinets shall have at least 16 10/100/1000 Base TX ports with at least three (3) 10 Gigabit Ethernet Fibre SFP ports for backhaul connectivity.
TR 6.196	The access switches i.e. switches installed on street light poles shall have at least 8 10/100/1000 Base TX ports with at least four (4) 1 Gigabit Ethernet Fibre SFP ports for backhaul connectivity.
TR 6.197	The industrial grade switches shall at a minimum carry IP30 rating.
TR 6.198	The industrial grade switches shall support – • IEEE 802.3, 802.3u, 802.3ab, 802.3z, 802.3x protocols. • IEEE 802.1D for STP, 802.1w for Rapid STP, 802.1s for Multiple Spanning Tree Protocols. • IEEE 802.1q for VLAN tagging, 802.1p for CoS, 802.1X for Authentication and 802.3ad for port trunk LACP. • Broadcast storm protection, port lock/port security, RADIUS, TACAS+, SSL/SSH security.
TR 6.199	The industrial grade switches shall support – • IPv4/v6, SNMP v1/v2/v3, LLDP, port mirror, RMON, Server/Client, DHCP, TFTP, Telnet, Flow control, IGMP v1/v2.
TR 6.200	All switches installed on-field shall be capable of working in the harsh environmental conditions with immunity to EMI and heavy electrical surges. They shall support: • EN-60950-1 or equivalent • EN 55022/24 or CISPR 22 • FCC Part 15B Class A • IEC 60068-2-27 and 2-32 or equivalent • IEC 60068-2-6 or equivalent

TR 6.201	The switches shall be powered by 12/24/48VDC or 24VAC input as per the design requirements with dual redundant inputs and integrated power supply. The terminal blocks for the power supply options shall support reliable, maintenance-free connections.
TR 6.202	The industrial grade switches shall support operating temperature range of 0°C to +65°C (without any fans) with ambient relative humidity of 5-95%, non-condensing.
TR 6.203	All Layer 2 Ethernet switches shall be managed switches and shall comply with the following as a minimum: • IEEE: ➢ 802.3u (fast Ethernet, 100Mbps) ➢ 802.3z (1000BaseFX) and additional 802.3ae for backhaul of distribution switches ➢ 802.3ab (1000BaseTX) ➢ 802.3x (Full Duplex with flow control) ➢ 802.3ad LACP ➢ IEEE 802.1D MAC Bridges ➢ IEEE 802.1p Priority ➢ 802.1q (VLAN) ➢ 802.1x (radius) ➢ IEEE 802.1AB Link Layer Discovery Protocol (LLDP) ➢ 802.1s (multiple spanning tree protocol) ➢ 802.1w (rapid spanning tree protocol) ➢ 802.3ad (port trunking) • Safety: ➢ UL CSA 60950 ➢ CAN/CSA-C22.2 No 60950 ➢ EN 60950 • Electromagnetic emissions: ➢ FCC Part 15 Class A • IGMP v1/v2 • TACACS+ and Radius • SNMPv1/v2c/v3
TR 6.204	All Layer 2 switches at a minimum shall support the following: • IPv4/IPv6 • CoS • IP Multicast • Security • Storm Control • Dynamic Trunking Protocol • Spanning Tree Route Guard • Secure Sockets Layer (SSL)/SSH • Network Management • Non-Blocking Type

	• Support Auto-Sensing • Support Auto-Negotiation
TR 6.205	The fibre optic ports shall support the required distance i.e. between switches at different locations.
TR 6.206	All switches shall support standard 19” rack mount or DIN rail mounting options. In addition, the industrial grade switches shall also support mounting on streetlight poles and shall be compact style.
TR 6.207	All switches shall have the function to enable/disable ports for limiting unauthorized access to the network.
TR 6.208	All switches shall support SNMP (v1/v2/v3) to allow for management using common network management tools.
TR 6.209	All switches shall support Network Time Protocol (NTP) for time synchronization.
TR 6.210	All switches shall support multilevel user passwords for prevention against unauthorized configuration.
TR 6.211	All switches shall support SSH or SSL based security and MAC based port security.
TR 6.212	All switches shall support RADIUS authentication service.
TR 6.213	The device shall have LED indicators for Power, LAN, Signal, RS-232, and Ethernet Link & Activity.
TR 6.214	All switches shall have a Mean Time Between Failure (MTBF) of at least 250,000 hours.
Ethernet Switch & Router – Layer 3	
The Layer 3 Ethernet switch/router includes three types –Type I-Backbone Ethernet switch/router, Type II – Core router and Internet router, and Type III – Server/workstation connectivity Ethernet Switch.	
Type I - Backbone Ethernet Switch/Router	
TR 6.215	The Layer 3 based backbone Ethernet switch/router shall be installed for backbone connectivity.
TR 6.216	The Layer 3 based backbone Ethernet switch/router shall have minimum 8 SFP+ ports that are a minimum SFP+ links with 40 Gb/s connectivity including Copper and Fibre ports as per the design requirements. These ports shall support hot swap modules to support upgrade of ports in the future. Any attenuators required for inter-switch connectivity shall be provided by MSI.
TR 6.217	The backbone switch/router shall have a minimum switching capacity of 640 Gbps, non-blocking.
TR 6.218	The backbone switch/router shall support IP/MPLS connectivity and shall be carrier grade. This clause shall not apply for Server/Workstation switches.
Type II – Core Router and Internet Router	
TR 6.219	The core router shall be installed at the ICOMC for connectivity to outside world.

TR 6.220	The core router shall have a minimum throughput of 80 Gbps per slot.
TR 6.221	The core router shall have at least four (4) - 40 Gigabit Ethernet Small Form-Factor Plus Pluggable (SFP+) ports, and six (6) x GbE SFP ports.
Type III – Server/Workstation Connectivity Ethernet Switch – Minimum 48 Ports	
TR 6.222	The Layer 3 based Ethernet switch shall be installed for connectivity to servers and workstations at ICOMC and POP.
TR 6.223	The Layer 3 based Ethernet switch shall have a minimum of 48 ports Ethernet interface with a combination of 1/10 Gig SFP+ ports.
Common Requirements – Switch/Router	
TR 6.224	All Layer 3 switches/routers shall comply with • IEEE: ➢ 802.3u (fast Ethernet, 100Mbps) ➢ 802.3z (Gigabit Ethernet) ➢ 802.3ae (10 Gigabit Ethernet) ➢ 802.3x (Full Duplex with flow control) ➢ 802.1q (VLAN) ➢ 802.3p (CoS) ➢ 802.1d (spanning tree protocol), 802.1w (rapid spanning tree protocol) and 802.1s (multiple spanning tree protocol) ➢ 802.3ad (link aggregation control protocol) ➢ 802.3 (Management) • RFC 3031 MPLS (Multi-protocol Label Switching) – not for server/workstation switches • IPv4/v6IGMP v1/v2/v3 • VRF • Routing Information Protocol v2 (RIPv2), Enhanced Interior Gateway Routing Protocol (EIGRP), Open Shortest Path First Version 2 (OSPFv2), Border Gateway Protocol (BGP), and Intermediate System-to-System (IS-IS) • OPFv3, BGPv3, and EIGRPv6 • Policy based routing • Multicast • ACL • VRF • Per port QoS configuration • Safety: EN/IEC/UL CSA 60950-1 • Electromagnetic emissions: ➢ FCC Part 15 Class A
TR 6.225	All layer 3 switches/routers shall support IP/MPLS based networking (except for switches for servers/workstations).
TR 6.226	All switches/routers shall support standard 19” rack mount or DIN rail mounting options.

TR 6.227	All interfaces shall be modular.
TR 6.228	The switches/routers shall support at least one (1) dual personality port (RJ-45 or USB micro-B) serial console port.
TR 6.229	The switches/routers shall be supported with LED indicators for easy troubleshooting.
TR 6.230	The switches/routers shall support operating temperature range of 0°C to +40°C with ambient relative humidity of 10-90% non-condensing.
TR 6.231	The backbone switches/routers shall be powered by 220-240VAC, 50Hz input as per the design requirements with hot swappable dual redundant power supply and redundant variable speed fans.
TR 6.232	The switches/routers shall have a Mean Time Between Failure (MTBF) of at least 250,000 hours.
General Requirements – Core Router	
TR 6.233	The core router shall be chassis based with modular architecture for scalability with Redundant - Route Processor, Power supply, Switching fabric; and shall deliver multiple IP services over a flexible combination of interfaces.
TR 6.234	Shall support Network Interface module.
TR 6.235	The core router shall have a total switching capacity of at least 400 Gbps non-blocking.
TR 6.236	The core router shall be support standard TIA/EIA 19” rack mounting.
TR 6.237	The core router shall be configurable up to 64K MAC addresses.
TR 6.238	The core router shall support 15000 multicast routes.
TR 6.239	The core router shall support both IPv4 and IPv6 policy based routing.
TR 6.240	The core router’s management functionality shall be greater than SNMP v2.
TR 6.241	The core router shall have event and system history logging capabilities. The Router shall generate system alarms on events and capable of log analysis.
TR 6.242	The core router at a minimum shall support the following protocols: • IPv4/IPv6 • QoS/CoS • IP multicast • General: ➢ IEEE 802.1D MAC Bridges ➢ IEEE 802.1p Priority ➢ IEEE 802.1Q VLANs ➢ IEEE 802.1s Multiple Spanning Trees ➢ IEEE 802.1w Rapid Reconfiguration of Spanning Tree • Security: ➢ RFC 1492 TACACS+ ➢ RFC 2138 RADIUS Authentication

	➢ RFC 2866 RADIUS Accounting ➢ Secure Sockets Layer (SSL)/ SSH • Network Management: ➢ IEEE 802.1AB Link Layer Discovery Protocol (LLDP) • RFC 3031 MPLS (Multi-Protocol Label Switching) • RFC 1098 A Simple Network Management Protocol (SNMP) • RFC 2819 Four groups of RMON: 1 (statistics), 2 (history), 3 (alarm) and 9 (events) • ANSI/TIA-1057 LLDP Media Endpoint Discovery (LLDP-MED) • SNMPv1/v2c/v3
TR 6.243	The core router shall be powered by 220-240VAC/50Hz input as per the design requirements.
TR 6.244	The core router shall support N+1 hot swappable redundant power supply module with redundant fan modules.
TR 6.245	The core router shall comply with the following standards: • FCC 47 CFR Part 15 Class A; • VCCI Class A • AS/NSZ Class A • ICES-003 Class A • EN55022/CISPR 22 Information Technology Equipment • Emissions: EN55024/CISPR 24 Information Technology Equipment • Immunity: EN300 386 Telecommunications Network Equipment • EMC: EN50082-1/EN61000-6-1 Generic Immunity Standard; • Safety: UL60950-1; CSA C22.2 No. 60950; EN 60950-1; IEC 60950-1; • AS/NZS 60950.1
Media Converter	
TR 6.246	Communications Media Converter, if required shall be installed, on a per device basis where the distance between the IP enabled device and the respective switch is greater than 90m.
TR 6.247	The device shall comply with: • IEEE 802.3- Standard defining the physical layer and data link layer media access control of wired Ethernet; • CSA/UL 60950; and • EN 50121-4.
TR 6.248	The device shall enable fibre to copper and copper to fibre conversion for devices where the distance between the IP enabled device and the switch is greater than 70m.

TR 6.249	The device shall have transmit and receive data LED indicators for quick and easy troubleshooting.
TR 6.250	The device shall support full duplex and half duplex operation (configurable).
TR 6.251	The device shall have link pass through support.
TR 6.252	The device shall have an integrated high-reliability power supply.
TR 6.253	The operating temperature, power input voltage, surge, ESD and vibration should comply with applicable sections of EN 50155.
TR 6.254	The device shall enable fibre to copper and copper to fibre conversion for devices where the distance between the IP enabled IP enabled device and the switch is greater than 90m.
TR 6.255	The device shall be powered by 220-240VAC/50Hz or 24VDC/24VAC input as per the design requirements.
TR 6.256	The device shall be protected against overload current and reversed polarity.
TR 6.257	The device shall support LC/ST/SC connectors for single-mode fibre optic connection.
TR 6.258	The device shall communicate over 10/100/1000BaseTX copper signal port over Ethernet.
TR 6.259	The interfaces shall be modular.
TR 6.260	The device shall be supported with LED indicators for easy troubleshooting.
TR 6.261	The device shall support operating temperature range of 0°C to +60°C with relative humidity of 5-95% non-condensing.
TR 6.262	The device shall be compliant with necessary cUL, UL, RoHS, CRoHS & WEEE regulations.
TR 6.263	The device shall at a minimum carry IP30 rating for use in harsh environmental conditions.
TR 6.264	The device shall have a Mean Time Between Failure (MTBF) of at least 350,000 hours.
Wireless Gateway	
TR 6.265	Gateways shall be able to operate on the RF network to support IoT.
TR 6.266	Gateways shall support operations in cellular bands.
TR 6.267	Gateway shall be rugged & shall be able to work in open environment conditions.
TR 6.268	Gateway shall be IP 67 rated.
TR 6.269	Gateways shall have internal antenna and shall support required connector for external antenna.
TR 6.270	Gateways shall support minimum 128-bit AES encryption.
TR 6.271	It shall have the minimum storage of 2GB SD Card which shall be further expandable.

TR 6.272	The device shall be powered by 220-240VAC/50Hz or 12/24/48VDC input as per the design requirements.
TR 6.273	RF output power shall be as per the DOT standard requirements and shall be programmable.
TR 6.274	The device shall communicate over Ethernet and have in-built RJ45 connectors.
TR 6.275	The device shall support operating temperature range of 0°C to +60°C with ambient relative humidity of 10-95% non-condensing.
TR 6.276	Mean time between failures (MTBF) of gateway shall be 100,000 hours.
Network Management System (NMS)	
TR 6.277	The NMS shall have an integrated user-friendly application.
TR 6.278	The NMS shall include all required licenses and shall be scalable for management of service provider configurations.
TR 6.279	The NMS shall provide real-time monitoring of the entire network infrastructure and shall allow users to easily navigate with graphical interface and easy to use network management tools.
TR 6.280	The NMS shall provide at a minimum, event alert via the email or pop-up alarm or export to CSV.
TR 6.281	The NMS shall automatically generate reports on a daily, weekly and monthly basis in formats including graphs, bar charts, distribution and summary. The system shall be capable of printing out reports and also exporting the reports to other systems or web servers.
TR 6.282	The NMS shall display a simple map of the whole network as a tree and shall have the option of direct selection of objects. The system shall provide a navigation tree to display the current alarm status of each subnet. All the system shall support PAN/ ZOOM feature and shall have all the devices visible in one window along with the provision for these two features.
TR 6.283	The NMS shall provide polling agents to upload status, changes or alerts of the local devices attached with the Ethernet enabling devices.
TR 6.284	The NMS shall provide real time Management Information Bases (MIBs) displays and shall provide the MIB variable data in tabular or graphical format. The MIB displays shall provide various expressions like utilization, percentage errors and volume.
TR 6.285	The NMS shall provide features for security and accountability and shall generate a log file for any user access to configuration or platform changes.
TR 6.286	The NMS shall be capable of managing any SNMP/ICMP device from any vendor.
TR 6.287	The NMS shall support SNMPV1, SNMPV2C and SNMPV3 and shall automatically discover and poll SNMP and ICMP devices.
TR 6.288	SNMP traps for all IP enabled devices shall be provided by the respective product manufacturers.
TR 6.289	The NMS shall allow notifications to be automatically sent to phones, offsite workstations, etc. for efficient response.

TR 6.290	The NMS shall monitor as a minimum the base station units and the subscriber station units along with other IP enabled equipment that is being provided as part of this Project.
TR 6.291	The NMS shall allow for providing different levels of security access i.e. viewing, logging and managing.
TR 6.292	The NMS shall allow for display different colours for the links including red, green, orange, yellow to show the status of the links and the connected devices.
TR 6.293	The NMS hardware shall be externally powered using input voltage of 100-240VAC/50-60Hz.
TR 6.294	The NMS hardware shall be connected to the head-end switch using a CAT6 or better cable.
TR 6.295	The NMS shall have secure wired and wireless guest access that provision controlled wireless access to tenants, while keeping the network secure.
TR 6.296	The NMS shall have role-based access control provides flexibility to segment the wireless network into one or more virtual domains controlled by a single management platform.
TR 6.297	The NMS must provide an interface for IT helpdesk personnel to create guest credentials.
TR 6.298	The NMS shall be supplied with a server with Windows or Linux based OS (latest) or later and a workstation. • For NMS Server Specifications, Please refer to the Server specifications mentioned under IT Infrastructure specification Section 5.7.4.3. • For NMS Workstation Specifications, Please refer to the Workstation specifications mentioned under IT Infrastructure specification 5.7.4.1.
Enterprise Management System (EMS)	
Availability - Monitoring, Management and Reporting	
TR 6.299	The proposed system shall support multiple types of discovery like IP range discovery – including built-in support for IPv6, Seed router based discovery and discovery whenever new devices are added with capability to exclude specific devices.
TR 6.300	The proposed system shall support exclusion of specific IP addresses or IP address ranges.
TR 6.301	The discovery shall be able to identify and model of the network asset.
TR 6.302	The proposed system shall provide a detailed asset report, organized by proper naming of all devices, listing all ports for all devices. The proposed system shall provide sufficient reports that identify unused ports in the managed network infrastructure that can be reclaimed and reallocated. The proposed system shall also intelligently determine which ports are operationally dormant.
TR 6.303	The proposed system shall determine device availability and shall exclude outages from the availability calculation with an option to indicate the reason.

TR 6.304	The proposed system shall provide out of the box root cause analysis.
TR 6.305	The proposed system shall include the ability to monitor and visualize a virtualized system infrastructure by discovering and monitoring virtual machines and providing ability to depict the logical relationships between virtual servers and virtual machines.
TR 6.306	The proposed solution shall detect virtual server and virtual machine configuration changes and automatically update topology and shall raise alarm when VM migrations happen between hosts.
Service Level - Monitoring, Management and Reporting	
TR 6.307	The proposed service management system shall provide a detailed service dashboard view indicating the health of each of the component and services provisioned as well as the SLAs.
TR 6.308	The system shall provide an outage summary that gives a high level health indication for each service as well as the details and root cause of any outage.
TR 6.309	The system shall be capable of managing IT and Non-IT resources in terms of the business services they support, specify and monitor service obligations, and associate users/Departments/ Organizations with the services they rely on and related Service/Operational Level Agreements. Presently, services shall include E-mail, Internet Access, Intranet and other services hosted.
TR 6.310	The Service Level Agreements definition facility shall support defining a set of one or more service that specify the Service obligations stipulated in an SLA contract for a particular time period (weekly, monthly, quarterly, etc.).
TR 6.311	SLA violation alarms shall be generated to notify whenever an agreement is violated or is in danger of being violated. These alarms shall be automatically shared with the authorized people.
TR 6.312	The system shall provide the capability to designate planned maintenance periods for services and take into consideration maintenance periods defined at the IT resources level. In addition the capability to exempt any service outage from impacting an SLA shall be available.
TR 6.313	The reports supported shall include one that monitors service availability (including Mean Time to Repair (MTTR), Mean Time between Failure (MTBF), and Maximum Outage Time thresholds) and the other that monitors service transaction response time.
TR 6.314	The system shall provide a historical reporting facility that shall allow for the generation of on-demand and scheduled reports of Service related metrics with capabilities for customization of the report presentation.
Application Performance - Monitoring, Management and Reporting	
TR 6.315	The proposed solution shall proactively monitor all user transactions for any web-application hosted; detect failed transactions; gather evidence necessary for triage and diagnosis of problems that affect user experiences and prevent completion of critical business processes.
TR 6.316	The proposed solution shall determine if the cause of performance issues is inside the application, in connected back-end systems or at the network layer.

TR 6.317	The proposed solution shall correlate performance data from HTTP Servers (external requests) with internal application performance data.
TR 6.318	The proposed solution shall see response times based on different call parameters. For example the proposed solution shall be able to provide CPU utilization metrics.
TR 6.319	The proposed Solution shall be able to correlate Application changes (code and configuration files) with change in Application performance.
TR 6.320	The proposed solution shall allow data to be seen only by those with a need to know and limit access by user roles.
TR 6.321	The proposed solution shall measure the end users' experiences based on transactions.
TR 6.322	The proposed solution shall give visibility into user experience without the need to install operators on user desktops.
TR 6.323	The solution shall be deployable as an appliance-based system acting as a passive listener on the network thus inducing zero overhead on the network and application layer.
TR 6.324	The proposed solution shall be able to provide the ability to detect and alert which exact end users experience HTTP error codes such as 404 errors or errors coming from the web application.
TR 6.325	The proposed system shall be able to detect user impacting defects and anomalies and reports them in real-time for Slow Response Time, Fast Response time, Low Throughput, Partial Response, Missing component within transaction.
TR 6.326	The proposed system shall be able to instantly identify whether performance problems like slow response times are within or outside the Data centre without having to rely on network monitoring tools.
TR 6.327	The proposed system shall be able to provide trend analysis reports and compare the user experience over time by identifying transactions whose performance or count has deteriorated over time.
Systems and Database Performance - Monitoring, Management and Reporting	
TR 6.328	The proposed system shall addresses management challenges by providing centralized management across physical and virtual systems.
TR 6.329	The proposed system shall be able to monitor various operating system parameters such as processors, memory, files, processes, file systems, etc. where applicable, using operators on the servers to be monitored.
TR 6.330	It shall be possible to configure the operating system monitoring operators to monitor based on user-defined thresholds for warning/critical states and escalate events to event console of enterprise management system.
TR 6.331	It shall also be able to monitor various operating system parameters depending on the operating system being monitored yet offer a similar interface for viewing the operators and setting thresholds.
TR 6.332	The proposed solution shall support monitoring Processors, File Systems, Log Files, System Processes, and Memory etc.

TR 6.333	The proposed tool shall provide Process and NT Service Monitoring wherein if critical application processes or services fail, administrators are immediately alerted and processes and services are automatically re-started.
TR 6.334	The proposed tool shall be able to provide Log File Monitoring which enables administrator to watch system logs and text log files by specifying messages to watch for. When matching messages gets logged, the proposed tool shall notify administrators and enable to take action like sending an email.
TR 6.335	The proposed database performance management system shall integrate network, server & database performance management systems and provide the unified view of the performance state in a single console.
TR 6.336	It shall be able to automate monitoring, data collection and analysis of performance from single point.
TR 6.337	It shall also provide the ability to set thresholds and send notifications when an event occurs, enabling Database Administrators (DBAs) to quickly trace and resolve performance-related bottlenecks.
TR 6.338	The proposed system shall provide Performance Management and Reporting — Provides real-time and historical performance of physical and virtual environments enabling customers gain valuable insights of a given virtual container of the relative performance of a given Virtual Machine compared to other Virtual Machines, and of the relative performance of groups of Virtual Machines.
TR 6.339	Role based Access — Enables role-based management by defining access privileges according to the role of the user.
TR 6.340	The proposed Virtual Performance Management system shall integrate latest virtualization technologies.
Helpdesk - Monitoring, Management and Reporting	
TR 6.341	The proposed helpdesk system shall provide flexibility of logging, viewing, updating and closing incident manually via web interface.
TR 6.342	The proposed helpdesk system shall support ITIL processes like request management, problem management, configuration management and change order management with out-of-the-box templates for various ITIL service support processes.
TR 6.343	Each incident shall be able to associate multiple activity logs entries via manual update or automatic update from other enterprise management tools.
TR 6.344	The proposed helpdesk system shall be able to provide flexibility of incident assignment based on the workload, category, location etc.
TR 6.345	Each escalation policy shall allow easy definition on multiple escalation levels and notification to different personnel via window GUI/console with no or minimum programming.
TR 6.346	The proposed helpdesk system shall provide grouping access on different security knowledge articles for different group of users.

TR 6.347	The proposed helpdesk system shall have an updateable knowledge base for tech al analysis and further help end-users to search solutions for previously solved issues.
TR 6.348	The proposed helpdesk system shall support tracking of SLA (Service Level Agreements) for call requests within the help desk through service types.
TR 6.349	The proposed helpdesk system shall be capable of assigning call requests to tech al staff manually as well as automatically based on predefined rules, and shall support notification and escalation over email, web etc.
TR 6.350	The proposed helpdesk system shall integrate tightly with the knowledge tools and CMDB and shall be accessible from the same login window.
TR 6.351	It shall support remote management for end-user & allow analysts to do the desktop sharing for any system located anywhere, just connected to internet.
TR 6.352	Remote desktop sharing in the system shall be operator less & all activity shall be automatically logged into the service desk ticket.
TR 6.353	It shall allow IT team to create solution & make them available on the end – user login window for the most common requests.
Traffic Analysis through EMS	
TR 6.354	The proposed system shall enable central management of user access privileges and allow deploying baseline security polices so that the right people have access to the right information. It shall proactively secure access to data and applications located on Linux, UNIX and Windows system servers.
TR 6.355	The traffic analysis system shall be from same OEM providing Network Fault & Performance Management System.
TR 6.356	The tool shall support Flow monitoring and traffic analysis for NetFlow, J-Flow, sFlow, Netstream, IPFIX technologies.
TR 6.357	The solution shall provide a central web based integration point for NetFlow based reporting and able to report from a single console across at least 100,000 interfaces.
TR 6.358	The solution shall be of the type passive monitoring without a need to install any probe or collector for data collection.
Incident Management and Root Cause Analysis Reporting	
TR 6.359	An information security incident is an event (or chain of events) that compromises the confidentiality, integrity or availability of information. All information security incidents that affect the information or systems of the enterprise (including malicious attacks, abuse / misuse of systems by staff, loss of power / communications services and errors by users or computer staff) shall be dealt with in accordance with a documented information security incident management process.
TR 6.360	Incidents shall be categorized and prioritized. While prioritizing incidents the impact and urgency of the incident shall be taken into consideration.

TR 6.361	It shall be ensured that the incident database is integrated with Known Error Database (KeDB), Configuration Management Database (CMDB). These details shall be accessible to relevant personnel as and when needed.
TR 6.362	Testing shall be performed to ensure that recovery action is complete and that the service has been fully restored.
TR 6.363	When the incident has been resolved, it shall be ensured that the service desk records of the resolution steps are updated, and confirm that the action taken has been agreed to by the end user. Also, unresolved incidents (known errors and workarounds) shall be recorded and reported to provide information for effective problem management.
TR 6.364	Information security incidents and weaknesses associated with information systems shall be communicated in a manner allowing timely corrective action to be taken.
TR 6.365	Controls related to incident management need to be implemented and each implemented control shall have a documentary evidence to substantiate and demonstrate effective implementation.
Change and Configuration Management	
TR 6.366	Change management provides information on changes, and enables better control of changes to reduce errors and disruption in services.
TR 6.367	All changes shall be initiated using change management process; and a Request For Change (RFC) shall be created. All requests for change shall be evaluated to determine the impact on business processes and IT services, and to assess whether change shall adversely affect the operational environment and introduce unacceptable risk.
TR 6.368	All changes are logged, prioritized, categorized, assessed, authorized, planned and scheduled to track and report all changes.
TR 6.369	Ensure review of changes for effectiveness and take actions agreed with interested parties. Requests for change shall be analysed at planned intervals to detect trends. The results and conclusions drawn from the analysis shall be recorded and reviewed to identify opportunities for improvement.
TR 6.370	Controls related to change management need to be implemented and each implemented control shall have a documentary evidence to substantiate and demonstrate effective implementation.
TR 6.371	The roles and responsibilities of the management shall include review and approval of the implementation of change management policies, processes and procedures.
TR 6.372	A configuration management database shall be established which stores unique information about each type Configuration Item CI or group of CI.
TR 6.373	The Configuration Management Database (CMDB) shall be managed such that it ensures its reliability and accuracy including control of update access.
TR 6.374	The degree of control shall maintain the integrity of services and service components taking into consideration the service requirements and the risks associated with the CI.

TR 6.375	Corrective actions shall be taken for any deficiencies identified in the audit and shall be reported to the management and process owners.
TR 6.376	Information from the CMDB shall be provided to the change management process and the changes to the CI shall be traceable and auditable.
TR 6.377	A configuration baseline of the attached CI shall be taken before deployment of a release into the live environment. It shall be stored in the safe environment with appropriate access control.
TR 6.378	Master copies of CI shall be recorded in the CMDB and shall be stored in secure physical or electronic libraries which shall be referenced in the configuration records. This shall be applicable to documentations, license information, software and hardware configuration images.

5.6.2. City Wide Wi-Fi

Functional Requirements

General	
FR 6.69	City wide Wi-Fi Network shall comprise of the following components: • Access Points (Aps) including the mounting infrastructure • Wireless Controllers • Wi-Fi Management System • Associated active and passive infrastructure
FR 6.70	City-wide Wi-Fi shall have a secure, seamless and redundant network. It shall support industry standard based two (2) step authentication procedure.
FR 6.71	City-wide Wi-Fi services shall be provided across all public spaces and other strategic locations in consultations with the Client.
FR 6.72	The target bandwidth proposed per end-user is 2 Mbps throughout the City on a per session basis for the 30 minutes or 50 MB per session that will be given to the user at no cost.
FR 6.73	The system shall be designed for scalability and allow future expansions in terms of subsequent project phases, increased user density and geographical coverage.
FR 6.74	The Wi-Fi transition from one access point to another shall be seamless. Users must be able to use same login details even if they move from one Wi-Fi zone to another.
FR 6.75	All BSCL promotions can use the Wi-Fi network without any cost.
FR 6.76	Advertising streams shall be planned and implemented carefully. Because of the advertising, there shall not be a scenario where the citizen is unable to login to the network for a long time and gets annoyed.
FR 6.77	It is expected that the time taken by the user to login and use the Internet from the time he sees the initial page shall be less than 3 minutes.
Access Point	
FR 6.78	For the implementation of a city Wi-Fi network, the following are the types of infrastructure being proposed for Wi-Fi Access Points: • Outdoor Rated Access Points (AP) on Smart Poles; • Outdoor Rated Access Point (AP) co-located on Street Light Pole; • Integrated with Multi-Services Digital Kiosk.
FR 6.79	The access points shall be capable of managing and configuring remotely through a wireless controller.
FR 6.80	Wi-Fi access point shall support dual frequencies (in compliance with DoT and TRAI regulations) including both 2.4 GHz and 5 GHz spectrum. It shall support wireless mesh configuration for redundancy of the network in case of a fibre link being unavailable.

FR 6.81	Access points shall support 802.11ac wave II multi-user MIMO.
FR 6.82	Access points shall have an integrated in-built antenna.
FR 6.83	User can create a profile which will be authenticated using his mobile number (SMS) and email. Further, user can also login using his city application i.e. smart card based session.
FR 6.84	Access Point and Multi-Services Digital Kiosks shall be connected using dedicated fibre optic infrastructure for backhaul to Point of Presence (POP).
FR 6.85	The Wi-Fi access point shall be controller based that can be managed by using Wi-Fi controller at ICOMC or POP.
FR 6.86	The Wi-Fi access point shall be configurable using a Wireless Management system. The software shall include profile configuration, built-in diagnostic, alignment tools, network mapping, network monitoring and maintenance and highly developed security features.
Wi-Fi Controller	
FR 6.87	Wi-Fi network shall include Wi-Fi controller to monitor, manage, and control access points from the ICOMC.
FR 6.88	The controller shall ensure seamless roaming within city limits.
FR 6.89	The controllers should communicate back and forth with the centralized security system and network management system in real time.
FR 6.90	The controller shall have inbuilt wireless intrusion protection capabilities.
Wi-Fi Management System	
FR 6.91	The City-wide Wi-Fi shall also include a Wi-Fi management software and application with a secure login procedure.
FR 6.92	Wi-Fi management system shall be a centralized system to monitor, analyse, and configure wireless network in automatic fashion. It shall be an authentication and management system for the city Wi-Fi network and shall be installed at the ICOMC or POP.
FR 6.93	The system shall be capable of providing Access Point groups with the highest quality network resource allocation by analysing the past 24 hours of RF network statistics, and optimizing the network for the next day.
FR 6.94	GUI: The system shall have a configurable graphical user interface (GUI) to provide user friendly experience for policy management, and day to day administration functions.
FR 6.95	Database: The system shall have a centralized database and subscriber management system.
FR 6.96	The Wi-Fi network shall support multiple BSSIDs as needed to support the overall concept of operations including support for multiple operators.
FR 6.97	Fully redundant Authentication, Authorization, and Accounting (AAA) services with OTP/password shall be provided to support city wide services.
FR 6.98	The Wi-Fi network shall include a billing software that shall automatically generate the revenue from all the services being offered using this network. This billing software will have transparent interface with BSCL's systems.

User Login Authentication and Plans	
FR 6.99	Beyond the 30 minutes or 50 MB limit, the user shall have to go through the process of logging in again. At this stage, the MSI may offer custom plans to the users.
FR 6.100	Industry standard two (2) step authentication shall be required for all sessions.
FR 6.101	iOS and Android applications to be given for seamless connectivity to network-Autodetect/Autologin.
FR 6.102	The user shall have the option of either logging in by viewing advertising or can obtain a coupon for the session for a nominal cost.
FR 6.103	Premium plans shall be offered to the users on daily, weekly or monthly subscriptions basis. Also, there shall be plans for the residential or industrial users who can pay a small premium to use their dwelling Wi-Fi service across the city.
FR 6.104	Users shall have an option to enable/ disable connection to city Wi-Fi.
FR 6.105	Users shall also get prompts and alerts for excess data usage.
FR 6.106	Multiple payment gateway integration required allowing the users to make the payments using online/ offline mode, including prepaid mobile balance & e-wallet applications and coupon based.
FR 6.107	BSCL shall be able to generate MIS report to view overall usage, collections and other usage statistics over a defined time period.
Encryption and Security	
FR 6.108	The Wi-Fi network shall have built-in encryption mechanism to encrypt all communications and data transfer over the Wi-Fi for all the users of Wi-Fi.
FR 6.109	Wi-Fi network shall not connect to rogue networks. It shall be segmented for public and utility networks by using VPNs or separate networks in the wired core so that any traffic from the Internet users is not routed into any other sensor network and vice-versa.
FR 6.110	Wi-Fi network shall support Protected Extensible Authentication Protocol (PEAP) protocol.
FR 6.111	Wi-Fi network shall have a wireless network content filtering tool for filtering of malicious content on the internet such as pornography sites, rogue sites, torrents etc.
FR 6.112	The Wi-Fi Network shall support industry standard two step authentication for secure login procedure.
FR 6.113	The Wi-Fi Network shall allow users to roam securely from one access point to another, within or across subnets, without any perceptible delay security during re-association.
FR 6.114	The Wi-Fi Network shall support BSSID based IEEE 802.1X authentication and accounting.
FR 6.115	The Wi-Fi network shall support MAC based authentication to provide simple authentication based on users MAC address.

Technical Requirements

General	
TR 6.379	The Wi-Fi central hardware and software shall be installed at the POP or ICOMC.
TR 6.380	• Organization IEEE: ➢ IEEE 802.11a/b/g/n/ac • Organization European Standard (EN): ➢ EN50121-1 EMC ➢ EN50121-4- Immunity ➢ EN6061-1-2 Medical • Organization Underwriters Laboratory and IEC: ➢ UL 2043 ➢ IEC 61373 Shock and Vibration • IP67 and NEMA 4X • Department of Telecommunications guidelines • Telecom Regulatory Authority of India guidelines
Access Point	
TR 6.381	The Wi-Fi access point shall be Outdoor rated, dual radio, 802.11ac Wave II, 5-GHz and 2.4-GHz. It shall support operations in 802.11a/b/g/n/ac.
TR 6.382	The Wi-Fi access point shall be supplied with MIMO sectoral (120x30 degrees) or omni-directional antennas (both in-built) as needed to meet the design requirements of the Project. It shall support multiple unique antenna patterns. The antennas shall have antenna gain required to support the coverage requirements of the Project.
TR 6.383	The Wi-Fi access point shall have a built-in spectrum analyser capable of part-time or dedicated spectrum analysis through the provided solution to identify sources of RF interference.
TR 6.384	The Wi-Fi access point shall be controller based that can be managed by using Wi-Fi controller at ICOMC/POP.
TR 6.385	The Wi-Fi access point shall be configurable using a Wireless Management system. The software shall include profile configuration, built-in diagnostic, alignment tools, network mapping, network monitoring and maintenance and highly developed security features.
TR 6.386	The Wi-Fi access point shall provide the fastest and highest throughput with lowest latency even in the most challenging RF environment.
TR 6.387	The Wi-Fi access point shall support dual frequency as authorized by DoT.
TR 6.388	The total transmitted power (EIRP) of the Wi-Fi access points shall be in compliance with the regulations of the Department of Telecom (DoT), India.
TR 6.389	The Wi-Fi access point shall have multiple SSIDs with QoS and security policies.
TR 6.390	The Wi-Fi access point shall allow setting up of configurable speeds per user and configurable number of users. It shall support upto 100 concurrent users at any time.

TR 6.391	The Wi-Fi access point shall support reliable multicast video to maintain video quality.
TR 6.392	The Wi-Fi access point shall also support additional features for BSCL staff members as needed using a separate secure SSID. Each AP shall support at least 16 different BSSIDs.
TR 6.393	The Wi-Fi access point shall be IEEE 802.3af/at Power over Ethernet (POE)/POE+ compliant.
TR 6.394	The Wi-Fi access point shall support: • Minimum One PoE+ autosensing port 10/100/1000BASE-T Ethernet network interface (RJ-45). • Power over Ethernet or Power over Ethernet+.
TR 6.395	The Wi-Fi access point shall have LED based visual indicator for: • Power/System status • Link status
TR 6.396	The Wi-Fi access point shall be capable of working at a temperature range of 0˚C to 60˚C and at a humidity of 5% to 95%, non-condensing.
TR 6.397	The Wi-Fi access point shall be IP67 compliant and NEMA 4X rated.
TR 6.398	The Wi-Fi access point must support IPV4 and IPV6.
TR 6.399	The Wi-Fi access point shall support telnet and/or SSH login/ console for troubleshooting.
TR 6.400	The Wi-Fi access point shall be reliable ensuring fast, dependable bandwidth and industry standard encryption for security.
TR 6.401	The Wi-Fi access point shall independently be configurable to handle security, mesh, RF Management, QoS, roaming, local forwarding without the need for a controller so as to increase performance of the WLAN network.
TR 6.402	The Wi-Fi access point shall be supplied with OEM mounting kit and shall support pole mounting option for locations on street light poles or smart poles.
Wi-Fi Controller	
TR 6.403	The controller shall support 802.11a/b/g/n/ac.
TR 6.404	Each controller shall support at least 500 access point nodes at a minimum and shall be scalable as and when required up to 2500 nodes.
TR 6.405	The Controller shall support redundancy feature i.e. Active: Active and Active: Standby features. Same licence shall be shared by the controllers.
TR 6.406	The controller shall ensure a high throughput even in the most challenging RF environment.
TR 6.407	The controller shall be highly available with minimum downtime.
TR 6.408	The controller shall ensure seamless roaming.
TR 6.409	The controller shall have inbuilt wireless intrusion protection capabilities.
TR 6.410	The controller shall have ability to map SSID to VLAN and it shall ensure VLAN reliability by proactively determining and adjusting to changing RF

	conditions.
TR 6.411	The controller shall support user load balancing to balance the number of users across multiple APs to optimize AP and user throughput.
TR 6.412	The controller shall allow BSCL staff members to download/view performance of services utilised by subscribers with key information of username, MAC, IP, location, duration, upload/download and disconnection reason.
TR 6.413	The controller shall be capable of managing authentication, encryption, IPv4 and IPv6 Layer 3 services.
TR 6.414	The controller shall have hot swappable redundant power supplies to maintain uninterrupted network operations.
TR 6.415	The controller shall meet the following power specifications: • AC input voltage: 100 VAC to 240 VAC • AC input frequency: 50-60 Hz
TR 6.416	The controller shall meet the following environmental specifications: • Operating temperature range: 0°C to 40°C • Operating humidity of 10% to 95% non-condensing
TR 6.417	The Wi-Fi controller shall be reliable ensuring fast, dependable bandwidth and industry standard encryption for security.
TR 6.418	The controllers shall support two (2) dual-media ports: 2 x 10 Gigabit Ethernet interface or more.
TR 6.419	The controller shall be rack mountable.
TR 6.420	The controller shall support minimum 2500 concurrent users
TR 6.421	The controller shall support 1+1, 1+N, and N+N backup configurations.
TR 6.422	The controller shall support synchronization of 802.1X state information and wireless client's 802.11 information from master to backup controller.
TR 6.423	The controller shall support Static IP routing for both IPv4 and IPv6 networks.
TR 6.424	The controller shall support minimum 250 VLANs.
TR 6.425	The controller shall support airtime fairness feature to ensure equal RF transmission time for wireless clients.
TR 6.426	The controller shall support web-based authentication to provide a browser-based environment to authenticate clients that do not support the IEEE 802.1X supplicant.
TR 6.427	The controller shall support AES or TKIP encryption to secure the data integrity of wireless traffic
Wi-Fi Management System	
TR 6.428	Wi-Fi management system shall be a centralized system to monitor, analyse, and configure wireless network in automatic fashion. It shall be an authentication and management system for the city Wi-Fi network and shall be installed at the ICOMC. It shall support plug-and-play environment with zero configuration.

TR 6.429	GUI: The system shall have a configurable graphical user interface (GUI) to provide user friendly experience for policy management, and day to day administration functions.
TR 6.430	Database: The system shall have a centralized database and subscriber management system.
TR 6.431	The system shall be capable of providing Access Point groups with the highest quality network resource allocation by analysing the past 24 hours of RF network statistics, and proactively optimizing the network for the next day.
TR 6.432	It shall be integrated with tool for monitoring and managing radio frequency (RF) dynamics within the wireless network, to include the following functions and benefits: • Accurate location information for all wireless users and devices • Up-to-date heat maps and channel maps for RF diagnostics • Visual display of errors and alerts
TR 6.433	The system shall be capable of restricting bandwidth to a user/users as per the policies.
TR 6.434	The system shall be both IPv4 and IPv6 compliant.
TR 6.435	The system shall be capable of logging and creating real time reports for users per access point and controller the bandwidth usage.
TR 6.436	The system shall be capable of displaying a list of managed devices and access points associated to the Wi-Fi controller.
TR 6.437	Subscriber services: The system shall provide the users with a self-service portal to enable the new users to register, subscribe, seek information on tariff and billing, update user profile, and make payment through the portal.
TR 6.438	The system shall support SNMPv3, SSHv2 and SSL/SSH for secure management.
TR 6.439	The system shall support AP grouping to enable administrator to easily apply AP-based or radio-based configurations to all the APs in the same group.
TR 6.440	The system shall support selective firmware upgrade APs, typically to a group of APs minimize the impact of up-gradation.
Server	
TR 6.441	The system shall support a centralized servers for user authentication, authorization and accounting.
TR 6.442	The server shall have an integrated embedded management solution to monitor the server for ongoing management, service alerting, reporting and remote management.
TR 6.443	Please refer to the Server Specification as mentioned under IT infrastructure Section 5.7.4.3.

5.6.3. Environment Monitoring System

Functional Requirement

FR 6.1	Environmental sensor station shall monitor following parameters and include the following integrated sensors inside one station: • Carbon Monoxide (CO) sensor • Ozone (O_3) sensor • Nitrogen Dioxide (NO_2) sensor • Sulphur Dioxide (SO_2) sensor • Carbon Dioxide (CO_2) sensor • Particulate/SPM Profile (PM_{10}, $PM_{2.5}$, and TSP) sensor • Temperature sensor • Relative Humidity sensor • Wind Speed sensor • Wind Direction sensor • Rainfall sensor • Barometric Pressure sensor; and • Noise sensor.
FR 6.2	Environmental Sensor station shall be housed in a compact environmentally rated outdoor enclosure. It shall be an integrated module which shall monitor overall ambient air and noise quality among other parameters as detailed in point above.
FR 6.3	Environmental sensor station shall be ruggedized enough to be deployed in open air areas such as streets and parks.
FR 6.4	Mounting of the environmental sensor module shall be co-located on streetlight pole or shall be installed on a tripod stand or a standalone pole.
Digital Display Screen (DDS)	
FR 6.5	DDS shall be installed at identified strategic location and will be used to display environmental parameters along with other promotional messages. The integrated DDS software application will allow user to publish specific messages & general informative messages.
FR 6.6	DDS shall be integrated with the environmental station for automatically displaying information from environmental sensors.
FR 6.7	A DDS software system shall be provided to the ICOMC for message preparation monitoring and control of the DDS. The DDS shall communicate with ICOMC using an IP based network.
FR 6.8	DDS software application will provide the normal operator to publish predefined sets of messages (textual / image) along with information from environmental sensors. The application shall have an option for supervisor (someone with appropriate authority) to bypass the control during certain situations and to write in free-text mode.
FR 6.9	DDS software application will accommodate different access rights to various control unit functionalities depending on operator status and as agreed with the client. Software should be GUI based, and capable to

	handle up to 10 DDS signage. User should be able to select desired location in Map and this should enable user to see the live status of that specific DDS.
System Software	
FR 6.10	Environmental sensor station shall have a pre-installed software.
FR 6.11	Software shall display real time and historical data in chart and table views for dashboard view of the Client.
FR 6.12	Software shall display trends of environmental parameters based on user specific time periods.
FR 6.13	It shall be possible to configure and calibrate the sensors through the software from a remote location.
FR 6.14	Alarms shall be generated for events where the environmental parameters breaches the safe or normal levels.

Technical Requirement

Carbon Monoxide (CO) Sensor	
TR 6.444	Range of CO sensor shall be between 0 to 1000 PPM.
TR 6.445	Resolution of CO sensor shall be 0.01 PPM or better.
TR 6.446	Lower detectable limit of CO sensor shall be 0.040 PPM or better.
TR 6.447	Precision of CO sensor shall be less than 3% of reading or better.
TR 6.448	Linearity of CO sensor shall be less than 1% of full scale or better.
TR 6.449	Response time of CO sensor shall be less than 60 seconds.
TR 6.450	Operating temperature of CO sensor shall be 0°C to 60°C.
TR 6.451	Operating pressure of CO sensor shall be ±10%.
Ozone (O_3) Sensor	
TR 6.452	O_3 Sensor shall have a range of at least 0-1000 PPB.
TR 6.453	Resolution of O_3 sensor shall be 10 PPB or better.
TR 6.454	Lower detectable limit of O_3 sensor shall be 10 PPB or better.
TR 6.455	Precision of O_3 sensor shall be less than 2% of reading or better.
TR 6.456	Linearity of O_3 sensor shall be less than 1% of full scale.
TR 6.457	Response time of O_3 sensor shall be less than 60 seconds.
TR 6.458	Operating temperature of O_3 sensor shall be 0°C to 60°C.
TR 6.459	Operating pressure of O_3 sensor shall be ±10%.
Nitrogen Dioxide (NO_2) Sensor	
TR 6.460	NO_2 Sensor shall have a range of at least 0-10 PPM.
TR 6.461	Resolution of NO_2 sensor shall be 0.001 PPM or better.
TR 6.462	Lower detectable limit of NO_2 sensor shall be 0.001 PPM or better.

TR 6.463	Precision of NO_2 sensor shall be less than 3% of reading or better.
TR 6.464	Linearity of NO_2 sensor shall be less than 1% of full scale.
TR 6.465	Response time of NO_2 sensor shall be less than 60 seconds.
TR 6.466	Operating temperature of NO_2 sensor shall be 0°C to 60°C.
TR 6.467	Operating pressure of NO_2 sensor shall be ±10%.
Sulphur Dioxide (SO_2) Sensor	
TR 6.468	SO_2 Sensor shall have a range of at least 0-20 PPM.
TR 6.469	Resolution of SO_2 sensor shall be 0.001 PPM or better.
TR 6.470	Lower detectable limit of SO_2 sensor shall be 0.009 PPM or better.
TR 6.471	Precision of SO_2 sensor shall be less than 3% of reading or better.
TR 6.472	Linearity of SO_2 sensor shall be less than 1% of full scale.
TR 6.473	Response time of SO_2 sensor shall be less than 60 seconds.
TR 6.474	Operating temperature of SO_2 sensor shall be 0°C to 60°C.
TR 6.475	Operating pressure of SO_2 sensor shall be ±10%.
Carbon Dioxide (CO_2) Sensor	
TR 6.476	CO_2 Sensor shall have a range of at least 0-5000 PPM.
TR 6.477	Resolution of CO_2 sensor shall be 1 PPM or better.
TR 6.478	Lower detectable limit of CO_2 sensor shall be 10 PPM or better.
TR 6.479	Precision of CO_2 sensor shall be less than 3% of reading or better.
TR 6.480	Linearity of CO_2 sensor shall be less than 2% of full scale.
TR 6.481	Response time of CO_2 sensor shall be less than 60 seconds.
TR 6.482	Operating temperature of CO_2sensor shall be 0°C to 60°C.
TR 6.483	Operating pressure of CO_2 sensor shall be ±10%.
Particulate Profile Sensor	
TR 6.484	Particulate profile sensor shall provide simultaneous and continuous measurement of PM_{10}, $PM_{2.5,}$ SPM and TSP (measurement of nuisance dust) in ambient air.
TR 6.485	Range of $PM_{2.5}$ shall be 0 to 230 micro gms / cu.m or better.
TR 6.486	Range of PM_{10} shall be 0 to 450 micro gms / cu.m or better.
TR 6.487	Lower detectable limit of particulate profile sensor shall be less than 1 µg/m3.
TR 6.488	Accuracy of particulate profile sensor shall be <± (5 µg/m3 + 15% of reading).
TR 6.489	Flow rate shall be 1.0 LPM or better.
TR 6.490	Operating temperature of the sensor shall be 0°C to 60°C.
TR 6.491	Operating pressure of the sensor shall be ±10%.

Temperature Sensor	
TR 6.492	Temperature sensor shall have the capability to display temperature in °Celsius.
TR 6.493	Temperature range shall be -10° to +100°C.
TR 6.494	Sensor accuracy shall be ±0.3°C (±0.5°F) or better.
TR 6.495	Update interval shall be 10 to 12 seconds.
Relative Humidity Sensor	
TR 6.496	Range of relative humidity sensor shall be 1 to 100% RH.
TR 6.497	Resolution and units of relative humidity sensor shall be 1% or better.
TR 6.498	Accuracy of the sensor shall be ±2% or better.
TR 6.499	Update interval shall be less than 60 seconds.
TR 6.500	Drift shall be less than 0.25% per year.
Wind Speed Sensor	
TR 6.501	Wind speed sensor shall have the capability of displaying wind speed in km/h or knots.
TR 6.502	Range of sensor shall be 0-60 m/s.
TR 6.503	Accuracy of wind speed sensor shall be ±5% or better.
TR 6.504	Update interval shall be less than 60 seconds.
Wind Direction Sensor	
TR 6.505	Range of the wind direction sensor shall be 0° to 360°.
TR 6.506	Display resolution shall be 16 points (22.5°) on compass rose, 1° in numeric display.
TR 6.507	Accuracy shall be ±3% or better.
TR 6.508	Update interval shall be 2.5 to 3 seconds.
Rainfall Sensor	
TR 6.509	Rainfall sensor shall the capability of displaying level of rainfall in inches and millimeter.
TR 6.510	Daily Rainfall range shall be 0 to 99.99” (0 to 999.8 mm).
TR 6.511	Monthly/yearly/total rainfall range shall be 0 to 199” (0 to 6553 mm).
TR 6.512	Accuracy for rain rates shall be up to 4”/hr (100 mm/hr) or ±4% of total.
TR 6.513	Update interval shall be less than 60 seconds.
TR 6.514	0.02” or (0.5mm) of rainfall shall be considered as a storm event with 24 hours without further accumulation shall end the storm event.
Barometric Pressure sensor	
TR 6.515	Barometric pressure sensor shall have the capability of displaying barometric pressure in Hg, mm Hg and hPa/mb.
TR 6.516	Range of barometric pressure sensor shall be 540 hPa/mb to 1100 hPa/mb.

TR 6.517	Elevation range of the barometric pressure sensor shall be -600 m to 4570 m.
TR 6.518	Uncorrected reading accuracy shall be ±1.0 hPa/mb at room temperature or better.
TR 6.519	Equation source of the sensor shall be Smithsonian Meteorological tables.
TR 6.520	Equation accuracy shall be ±0.01" Hg (±0.3 mm Hg, ±0.3 hPa/mb) or better.
TR 6.521	Elevation accuracy shall be ±10' (3m) to meet equation accuracy specification or better.
TR 6.522	Overall accuracy shall be ±0.03" Hg (±0.8 mm Hg, ±1.0 hPa/mb) or better.
TR 6.523	Update interval shall be less than 60 seconds.
Noise Sensors	
TR 6.524	Noise sensor shall detect the intensity of the ambient sound in a particular area.
TR 6.525	Nosie Sensors shall be installed for the outdoor applications.
TR 6.526	Noise sensor shall be able to identify the areas of high sound intensity ranging from 30 dBA to 120 dBA.
TR 6.527	Noise sensor shall have resolution of 0.1 dBA.
Air Quality Monitoring Station Software	
TR 6.528	Software shall be pre-installed on every built system.
TR 6.529	It shall be possible to connect to the station using internet browser on computer tablet or mobile without any need of installing software for viewing information.
TR 6.530	Software shall display real-time and historical data in chart and table views.
TR 6.531	Software shall display trends of environmental parameters based on user specified time periods.
TR 6.532	It shall be possible to configure and calibrate the sensors through the software from a remote location.
TR 6.533	Software shall display and export sensor diagnostic information.
TR 6.534	User shall be able to change sensor module settings through the software and from remote locations.
TR 6.535	Administrator shall be able to manage access privileges for only authorized users.
TR 6.536	Alarms shall be generated for events where the environmental parameters breaches the safe or normal levels.
TR 6.537	It shall be integrated at the ICOMC for the purposes of monitoring, display of information and control of the system.
TR 6.538	Software shall be integrated with e-Governance applications such as City portal and City applications. Real time environmental information shall be published on these portal as part of open data initiative.

Digital Display Screen (DDS)	
TR 6.539	The DDS shall be installed at location identified by Client. The DDS shall be outdoor rated.
TR 6.540	DDS shall have be True Colour. Text on the DDS shall be readable in bright sunlight.
TR 6.541	The pixel pitch of DDS shall be minimum 5mm.
TR 6.542	The model size of DDS shall be minimum 160X160 mm.
TR 6.543	The model pixel of DDS shall be minimum 32X32 Pixels.
TR 6.544	The lattice density of DDS shall be minimum 27000 dots/square meter.
TR 6.545	The viewing distance shall be between 4m to 30m. The screen size shall be proposed accordingly to ensure that the character height is at least 50mm.
TR 6.546	The average power consumption shall not exceed the 740W/square meter.
TR 6.547	The refresh frequency of DDS shall be ≥ 400HZ.
TR 6.548	The horizontal view angle shall be > 110 degree.
TR 6.549	The working temperature shall be between 0℃ to +60℃ & humidity shall be between10% to 90%.
TR 6.550	The DDS shall have a Power Supply unit to support AC 110-240 V.
TR 6.551	The MTBF of DDS shall not be less than 100,000 hours.
TR 6.552	The grey scale shall be 12 bit/ 1 colour.
TR 6.553	The Brightness shall be 6500 cd/square meter.
TR 6.554	The blind spot rate shall be minimum < 0.00001.
TR 6.555	The IP rating shall be minimum IP66 for front as well as rear.
TR 6.556	Message shall be readable even in broad daylight without any shade & displayed image shall not appear to flicker to the normal human eye (>6000 cd/m2).
TR 6.557	The Display capability of DDS shall be fully programmable, full colour, full matrix, LED displays & shall have Alpha-numeric, Pictorials, Graphical & video capabilities.
TR 6.558	The Display Language shall be support both pictograms and multilingual (English, Oriya and Devanagari) text.
TR 6.559	The Display Front Panel shall utilize a front face that is smooth, flat, scratch-resistant, wipe-clean & shall be 100% anti-glare.
TR 6.560	The message Creation shall be through both ICOMC Application and locally.
TR 6.561	The DDS shall support Multilingual (Oriya/English/Hindi etc.) languages and all fonts supported by Windows.
TR 6.562	The DDS shall have the facility of auto dimming adjusts to ambient light level.
TR 6.563	The Display size of DDS shall be minimum 70 inches diagonal.

TR 6.564	The DDS shall have the access control mechanism so that the usage is regulated.
TR 6.565	The DDS shall be wall, Pole or gantry mounted. The mounting accessories shall be the part of DDS.
TR 6.566	The DDS shall have automatic on/off operation.
General	
TR 6.567	Each environmental sensor shall be housed in modules and further integrated into one single enclosure.
TR 6.568	The design shall be modular in nature which shall have the capability to add additional environmental sensors in the future into the enclosure.
TR 6.569	Data of all the environmental sensor shall be available on the same software interface.
TR 6.570	It shall be possible to remove or replace individual sensor modules without affecting the functioning of rest of the system.
TR 6.571	It shall be possible to mount the air quality monitoring station to a pole, tripod or wall mounting brackets.
Environmental Requirements	
TR 6.572	Enclosure shall be rugged weather proof IP65 rated and shall house the power modules, thermal management system, embedded PC and user configured analyser modules as well.
TR 6.573	Environmental operating range shall be 0°C to +60°.
Electrical Requirements	
TR 6.574	Power requirements of the system (environmental station and DDS) shall 220-240 VAC, 50Hz. It shall have an in-built NEMA 5-15P plug factory installed.
TR 6.575	All modules inside the enclosure shall operate from 12VDC power. The MSI shall be responsible for any power conversions required for operations of this system.
Networking requirements	
TR 6.576	Environmental station and DDS shall support communications by Ethernet (RJ45) or Fibre optic communications.

5.6.4. Smart Pole

Functional Requirements

General	
FR 6.15	The smart pole infrastructure shall comprise of: • LED based lighting fixtures • Cellular Antenna • Wi-Fi Access Point • CCTV cameras • Storage space for electronic and network equipment
FR 6.16	The mounting structure shall consist of foundation, main structure, and accessories.
FR 6.17	The smart poles shall be aesthetically and visually appealing. They shall be as per the latest industry standard products being offered on other similar projects.
FR 6.18	All wiring, heating/cooling shall be concealed within the Smart Pole enclosure and shall not be visible from the outside of the unit.
Smart Poles	
FR 6.19	The pole shall be ground base monopole type of minimum 12 meter height and shall be able to support the loading of the mounting structure as given below: • Capable of hosting LED light luminaries. • Capable of hosting up to three (3) number of cellular antennas for different cellular providers. • Minimum two (2) number of Wi-Fi Access Points. • Minimum two (2) number of CCTV cameras (embedded inside luminaire housing). • Capable of hosting two number of single cross-arms of 1.5 metre length. • Capable of hosting one network switch and UPS. • Capable of withstanding the weight all the proposed mounting systems and accessories with an additional 30%-40% weight withstanding capacity.
FR 6.20	The camouflaging material (to cover RF equipment) shall have ability to transmit/receive RF signals with minimal losses due to material.
FR 6.21	All equipment mounted at pole shall be covered and it shall not be visible from outside.
FR 6.22	Smart pole shall also be equipped with safety devices and lightening protection kit etc.

Technical Requirements

General	
TR 6.577	The Poles and mast shall meet the requirements of the following standards and rules as applicable: • IS: 875 Part-3 (1987) :Code of practice for Design loads (other than earth quakes) for structures • IS: 800 (1994) : Code of Practice for General Construction in Steel • IS 7205(1974) : Safety code for erection of Structural Steelwork • IS: 4759(1996): Hot-dip zinc coatings on structural steel and other allied products • IES (Illuminating Engineering Society) LM-79: Luminaires efficiency (photometry data) for any one; • IES (Illuminating Engineering Society) LM-80:LED chip data; • EN62471: Photo biological Safety for Humans; • IP 65: Luminaires Ingress Protection for Outdoor Luminaires;
TR 6.578	All materials of mounting structure used for smart pole shall be coated by hot-dip galvanizing after all fabrication works has been completed.
TR 6.579	Smart pole shall have following network connectivity options: • Fibre based transmission; • Microwave based transmission.
TR 6.580	Smart pole shall be capable of operating temperature range of 0°C to +60°C with ambient relative humidity of 10-95% non-condensing.
Smart Pole	
TR 6.581	• Exact mounting arrangement of all devices/equipment at smart pole shall be finalized by MSI with the Client prior to ordering of the smart pole.
TR 6.582	**Earthing & Lightening Protection** • Earthing and Lighting Protection shall be provided to protect equipment from damage and personnel from harm which may result from excessive voltages during a lightning strike. • Equipotential conditions shall be maintained throughout the site by bonding. • For earthing of the pole, 25x6mm GI strips shall be bounded to the pole at the termination of the ground as per relevant Indian Standards. • In addition to the sections for erecting the pole to its full height, the following accessories shall be supplied: ➢ Anti – Climb Shields ➢ Pole Grounding Kit ➢ Mounting structure

	➢ LED Fixtures ➢ Waveguide Supports ➢ Lighting ➢ Pole Painting
TR 6.583	**Complete Pole** • Each erected pole, under conditions of negligible wind, shall not deviate from the vertical position by more than one-eighth of one percent of its height. • Each erected pole, under conditions of negligible wind, shall be straight within 25mm of the nominal geometric position. • Each erected pole shall be free of inherent twist. • Where bolts are placed in a generally vertical position, the bolt heads shall be uppermost.
LED Fixture	
TR 6.584	The LED lighting fixtures shall consist of CRCA powder coated, extruded aluminium or pressure die cast aluminium (sand/gravity casting shall not be considered). Aluminium grade LM 6063/LM 6 or better conductivity heat sink material shall be used for housing of luminaires.
TR 6.585	The control gear of the LED lighting fixtures shall be designed in such a way that the temperature rise of all critical electronic components is restricted to 35ºC to 40ºC above ambient temperature.
TR 6.586	The LED fixtures shall be Ingress Protection (IP) 65 rated.
TR 6.587	The efficiency of the LED lamps at 85ºC junction temperature shall be more than 80%.
TR 6.588	The working life of the LEDs at temperature of more than 85ºC for maximum current shall be more than 50,000 hours of continuous operation.
TR 6.589	The Colour Rendering Index (CRI) shall be of nominal 70 or better as per CRI standards.
TR 6.590	Variation in illumination level shall be +/- 2% in input voltage range from 150VAC to 270VAC.
TR 6.591	Electronic efficiency of LED driver circuit shall be more than 85%.
TR 6.592	The illumination shall not have infra-red and ultra-violet emission. This shall be confirmed by the manufacturer provided information.
TR 6.593	LEDs used in the products shall be tested for photo biological safety as per IEC / EN62471.
Wi-Fi Access Point	
TR 6.594	For specification of Wi-Fi Access Point, refer to section 5.6.2
CCTV Camera	
TR 6.595	For specification of CCTV cameras, refer to section 5.4.1.

5.7. Intelligent City Operations and Management Centre (ICOMC)

FR - 7 Functional Requirements

FR 7.1	ICOMC shall provide a holistic and real time view of all city operations on a video wall along with individual views on operator workstations.
FR 7.2	ICOMC shall enable monitoring, control and automation of various city operations in order to ease and organise city operations.
FR 7.3	ICOMC shall enable system and cross system analytics through smart city platform in order to make city operations intelligent.
FR 7.4	ICOMC shall leverage information provided by multiple city systems in order to provide an integrated, seamless, proactive and comprehensive response mechanism for day-to-day city operations and challenges.
FR 7.5	ICOMC shall provide real time dashboards, visualizations, KPIs, historical trending, analytics and other intelligent features to facilitate city operations analysis by city administrators.
FR 7.6	ICOMC shall provide alarm features for immediate notification to city administrators in case critical event occurs in the city.
FR 7.7	The Digital Content Management System (DCMS) provided as part of ICOMC will manage and drive all visual content to the various display devices, including the video display wall. All city systems will display content through the DCMS.
FR 7.8	The operators will also manage and control various systems, and dispatch to system maintenance staff. They will be responsible for monitoring and managing all integrated city systems out of the ICOMC.
FR 7.9	The Smart City Platform shall normalize, analyse and use this data for efficient operations and management of the city.
FR 7.10	All workstation units of the operator workstations shall be installed at the central rack rooms so that space at the ICOMC operator desks can be optimized. The operators and other personnel operating from the ICOMC shall only have displays, keyboard and mouse at their workstation desks.
FR 7.11	The platform shall receive direct feeds and raw data from the City Systems. City Systems shall include the following: • e-Governance and ERP • Telecommunication Network • Power & Water IoT/SCADA • Smart Solid Waste • Street Lights • Traffic Management • Parking System • Tracking System • Environmental Sensors • Surveillance • Emergency Response

	• Education • Healthcare • Building Management System (BMS) • Any other system being provided as part of this RFP. It shall also receive, normalize and make good data received from social media integration. It is required that the platform supports both structured and unstructured data inputs.
FR 7.12	Direct connections and data from devices / systems shall include real-time City Systems data, KPIs and video feeds from CCTV cameras.
FR 7.13	Visual data from City Systems shall be integrated into the platform user interface and directed to the display content management system for display on the video display wall and boardroom monitor.
FR 7.14	The platform shall be capable of managing/monitoring data and visualizations for all City Systems.
FR 7.15	The platform shall be capable of managing/monitoring all city functions. These functions shall be incorporated into the platform with a single user interface.
FR 7.16	The platform shall support integration with all other systems being provided by others as part of this Project and as provided by other Contractors.
FR 7.17	Some of the systems shall have their respective SCADA system for monitoring and control. Using the smart city platform, visualizations of all data received from these SCADA systems is possible. However, only critical functionality defined using the SOPs shall be enabled using the smart city platform for the purposes of monitor and control of these systems.
FR 7.18	The platform (or an integrated component of the platform) shall be capable of performing data consolidation, normalization, and cross system analytics.
FR 7.19	The platform shall be user configurable and compatible with all standard industry protocols for individual systems. It shall be the only system through which all data consolidation, normalization and cross system and individual analytics shall be performed for all city systems.
Facilities Management and Building Management Systems (BMS)	
FR 7.20	Interface with the Building Management Systems (BMS) installed in ICOMC, BSCL, BMC and other key buildings for monitoring and control of all the building systems and parameters available through the BMS.
FR 7.21	Interface with all the BMS or IP enabled fire alarm system for monitoring of essential parameters.
FR 7.22	Log calls/jobs on the helpdesk database utilizing helpdesk software (inquiries may be received by telephone, facsimile, email or in person).
FR 7.23	Allocate and dispatch work orders to directly employed (or subcontracted) maintenance team.
FR 7.24	Take ownership of the Preventative Maintenance (PM) schedule and track reactive maintenance (RM) service requests using the ERP system.

FR 7.25	Track progress of PM and RM service requests against pre-determined KPIs.
FR 7.26	Report back to client and contract staff on progress of each PM and RM service request and close out service requests when completed using the ERP system.
FR 7.27	Maintain asset information held in the database using the ERP system.
FR 7.28	Update site specific facilities management files and other documentation for helpdesk compliance.
FR 7.29	Dispatch of emergency services.
FR 7.30	Create awareness within the city for energy consumption and utilization via information received from smart meters and other SCADA based trunk infrastructure.
Solid Waste Management (SWM)	
FR 7.31	Monitoring of the smart waste management system web application real-time level information for containers as well as the automatic warning system which notifies when containers require attention.
FR 7.32	Real-time monitoring of solid waste collection vehicles.
FR 7.33	Log calls/jobs on the helpdesk database utilizing helpdesk software (inquiries may be received by telephone, facsimile, email or in person).
FR 7.34	Dispatch waste management service request calls to the appropriate internal and field personnel.
FR 7.35	Track progress of waste management service requests against pre-determined KPIs.
FR 7.36	Report back to clients and contract staff on progress of each waste management service request and close out service requests when completed.
FR 7.37	Maintain asset information held in the helpdesk database.
FR 7.38	Update site specific waste management files and other documentation for helpdesk compliance.
FR 7.39	Billing and payments associated with the waste collection agency as applicable using the ERP system.
Communications Network	
FR 7.40	Monitoring of the smart telecommunications management system for telephone/internet issues and outages (including any alarms) in terms of passive infrastructure.
FR 7.41	Monitoring and control of the city Wi-Fi infrastructure.
FR 7.42	Monitoring and control of all actives implemented as part of the BSCL infrastructure.
FR 7.43	Log calls/jobs on the helpdesk database utilizing helpdesk software (inquiries may be received by telephone, facsimile, email or in person) using the ERP system.
FR 7.44	Dispatch telecommunications service request calls to the appropriate internal and field personnel using the ERP system.

FR 7.45	Track progress of telecommunications service requests against pre-determined KPIs.
FR 7.46	Report back to client and contract staff on progress of each telecommunications service request and close out service requests when completed using the ERP system.
FR 7.47	Maintain asset information held in the helpdesk database using the ERP system.
FR 7.48	Update site specific telecommunications files and other documentation for helpdesk compliance.
FR 7.49	Billings and collections from telecom service providers for revenue sharing using the ERP system.
City Security	
FR 7.50	Accurately and promptly observe, monitor and operate closed circuit television (CCTV) cameras and related equipment, and, where necessary direct Police Officers to real time incidents.
FR 7.51	To identify, report, and record anything suspicious, in line with ICOMC procedures.
FR 7.52	To operate the cameras and equipment effectively ensuring that best possible evidential quality images are recorded.
FR 7.53	To ensure all equipment is functioning correctly, carry out equipment checks as required and report all faults to relevant personnel, carry out basic non-technical system maintenance as required.
e-Governance & ERP	
FR 7.54	Monitoring of the status of e-Governance systems located at various Multi-Services Digital Kiosks /sites throughout city as well as through the online system.
FR 7.55	Integrate with citizen card via both QR code generation and reading system.
FR 7.56	Log calls/jobs on the helpdesk database utilizing helpdesk software (inquiries may be received by telephone, facsimile, email or in person) using the ERP system.
FR 7.57	Dispatch e-Governance Multi-Services Digital Kiosks /site service request calls to the appropriate internal and field personnel.
FR 7.58	Track progress of e-Governance Multi-Services Digital Kiosks/site service requests against pre-determined KPIs.
FR 7.59	Report back to client and contract staff on progress of each e-Governance Multi-Services Digital Kiosks/site service request and close out service requests when completed using the ERP system.
FR 7.60	Maintain asset information held in the helpdesk database using the ERP system.
FR 7.61	Update site specific e-Governance Multi-Services Digital Kiosks/site files and other documentation for helpdesk compliance.
FR 7.62	Monitor key performance indicators for ERP system in terms of billing, finance, HR, procurement and other modules.

Street Lighting	
FR 7.63	Monitoring of circuits, central control and automation while integrating with the feeder panel based street lighting system.
FR 7.64	Log calls/jobs on the helpdesk database utilizing helpdesk software (inquires may be received by telephone, facsimile, email or in person) using the ERP system.
FR 7.65	Dispatch staff for service request calls using the ERP system.
FR 7.66	Maintain asset information using the ERP system.
Environmental Sensors	
FR 7.67	Monitor key inputs from pollution sensors, noise sensors, particle sensors, etc.
FR 7.68	Create awareness within the city based on dynamic inputs received from sensors and display output to various interfaces including city application, multi-services digital kiosks and Digital Display Screen (DDS).
FR 7.69	Inputs to various regulations and permissions as needed in terms of carbon content, and content of other particles and gases in around Bhubaneswar.
Multi-Services Digital Kiosks and Emergency Communications	
FR 7.70	Interface with emergency communication modules in multi-services digital kiosks for monitoring and action on emergencies reported by citizens.
FR 7.71	Interface with police, fire and ambulance as needed for emergency services.
FR 7.72	Real-time monitoring of emergency dispatch vehicles.
FR 7.73	Receives and evaluates calls, emails, and online form submissions from internal and external customers requesting information on City services, procedures, activities, resources, and programs in support of the 24-hours-per-day/7-days-per-week; provide information and assistance in an efficient manner.
FR 7.74	Assesses nature or urgency of the issue; determines and establishes priority of call; resolves the issue or escalates and/or transfers call to appropriate staff/agency as necessary.
FR 7.75	Identifies the type of service being requested by listening, asking relevant questions, evaluating information obtained, and determining City services available to successfully handle the request.
FR 7.76	Creates or researches customer information in the Customer Relationship Management (CRM) system; records information on all customer inquiries or problems; provides updates on previously created cases.
FR 7.77	Follows system and department-specific procedures to create service requests and work orders in specialized department software systems.
FR 7.78	Conducts research using various City and public resources to provide customers with complete, accurate, and thorough answers to requests for information, inquiries, and/or problems.
FR 7.79	Dispatches calls in accordance with established procedures and policies using a computerized dispatch system, including determining priority of calls and contacting and sending appropriate response unit.

FR 7.80	Observes and complies with departmental policies and procedures, customer service quality standards, and compliance guidelines.
Education	
FR 7.81	Monitor key ratios (KPIs) that will be important inputs for economic indicators.
FR 7.82	Monitor any bus-level infrastructure like CCTV, and location of buses as required.
Healthcare	
FR 7.83	Monitor key ratios (KPIs) that will be important inputs for economic indicators.
FR 7.84	Monitor location of ambulances by obtaining feeds from the healthcare facility owners.
Traffic Management	
FR 7.85	Recognize, identify and monitor the infracting vehicles in real-time / off-line mode for various violations at junctions and in streets.
FR 7.86	The system shall have the ANPR Non-intrusive modes of enforcement on TVDS and Speed.
FR 7.87	The system at the ICOMC should be integrated with the E-Challan system to enable E-Challan generation, payment and billing process.
FR 7.88	Public Address (PA) System is disseminate the information to the citizen particularly emergency situation messages to reach quickly.
FR 7.89	The system should be able to integrate other network PA systems or third party application systems where the alerts are generated to broadcast messages at ICOMC.
FR 7.90	The system should be able to generate various statistics, reports & MIS from time to time at ICOMC.
FR 7.91	Dynamic Message Sign (DMS) board shall provide feedback to the ICOMC on the DMS status of Active / Inactive.
FR 7.92	The system should maintain the history of messages archived for future reference and analysis.
FR 7.93	The ATCC system shall provide multiple interfaces to share the data seamlessly to different sub systems e.g. signalling system to configure and determine the traffic signal duration based on the traffic congestion, weather conditions, traffic pattern and other factors.
FR 7.94	The system at the ICOMC shall feed the traffic density information to the associated junctions of critical junction subsystem to determine the expected traffic from its previous junction and traffic signal duration.
FR 7.95	The system at the ICOMC shall integrate with the ATSC module to support RLVD and TSP for bus system.
Smart Tracking System	
FR 7.96	CAD/AVL System: Vehicle location monitoring for the following vehicles shall be done at ICOMC: • BPTSL Buses

	• Water/Wastewater service vehicles • Firefighting vehicles • Ambulances • Solid waste management (also include CAD) • Police vans • Any other client owned vehicle
FR 7.97	Complete operations management of the BPTSL Bus System shall be provided from ICOMC.
FR 7.98	Fare Collection System (FCS) at ICOMC shall be capable of providing analysis and reporting to allow reconciliation and audit of the various operations for the bus system.
Analytics and Visualizations	
FR 7.99	Through the smart city platform, various critical functionalities including historian, trending, analytics, visualizations, dashboards etc. shall be achieved. The analytics required for the smart city platform shall be integrated with the overall solution. Analytical capabilities of the platform shall include streaming data analytics, data quality, reporting and data exploration, forecasting, predictive and prescriptive analytics and optimization.
FR 7.100	Smart city platform shall be capable of communicating with various types of sensors/devices and their management platforms/applications for single/multiple services irrespective of the OEM, software and applications that they support. Data exchange between various sensors and their management applications shall strictly happen using this platform making it one true source of data abstraction, normalization, correlation and enabling further analysis. Adequate security checks and mechanisms shall be provided as part of the platform to ensure data confidentiality and limit any unauthorized access.
FR 7.101	ICOMC shall make use of cross-system data analytics from historian and real-time information received from independent systems through smart city platform to aid in the operations and management of city services.
FR 7.102	The platform shall have ability to synthesize, analyse and integrate data from all City systems. It should provide analytical insights for running real time sensors and to decision makers for policy making and optimized decision making.
FR 7.103	The platform shall have the ability to generate alarms based on user provided inputs as defined in the SOPs.
FR 7.104	Analytic outputs shall be derived from historic and real-time information received from the various city systems. The analytic outputs shall also support forecasting based on various inputs and shall support setting of targets for various parameters.
FR 7.105	ICOMC shall have integration and deployment capabilities for web, applications, real time dashboards, business intelligence, workflow, event management, KPIs, monitoring and resource optimization along with integration with analytics.

FR 7.106	ICOMC shall be able to support rule engine for multiple event correlation, What-if analysis tools, threat detection tools, capabilities for integration with social media platforms.
FR 7.107	ICOMC shall be capable of alarm management functionalities such as: • Targeting: Locate the sensor in GIS display which has detected the security risk or has malfunctioned and include automatic coloured notifications • Alarm description: basic information about nature of alarm • Device: Name of sensor or system • Acknowledgement and dismissal of alarms • SOPs: list of activities which needs to be carried out by operator for category of alarms • Provision of filter of alarms • Archiving of alarms • Searching of alarms
FR 7.108	ICOMC shall be capable of audit trail functionalities for user activities in order to effectively track response time on events by integrating with the ERP system.
FR 7.109	Reporting function shall be a part ICOMC dashboard visualization tool. It shall provide information about current status of the ICOMC on functions performed. Following functionalities shall be supported by Reporting Module as a minimum: • Reporting module shall offer a library of “statement”, “report” and “predefined dashboards” which can be easily modified as per BSCL needs. • It shall allow the design of new reporting templates (creation of new fields, graphical formats, flat tabular formats, calculations, sorting, totals, sub totals, combination of existing reports etc.). Moreover, the users should be able to export/import data for/from external applications not limited to for example excel/ MS-access, for specific reports. • It shall allow creation or insertion of graphics into the generated documents or reports or dashboards. Nevertheless, “developing customer documents” must be within the reach of the users. • Print outs shall be available on paper (A4 and A3) and in an electronic file format, as text files in column, Microsoft Word, Microsoft Excel or Adobe PDF document. In addition to the Microsoft suite of products, compatibility should also be ensured with the corresponding open source equivalent suite of office products. • Generating recurring reports should be automated.
FR 7.110	ICOMC shall be capable of analytics for various city systems in order to provide operators and city administrators with situational awareness and an understanding of historical trends. For instance, baselining of frequency and nature of registered complaints shall be done along with response time to address them. Analytics can also enable program administrators to

	quickly determine eligibility for benefit programs and match the right services to citizen needs, prevent fraud and waste of funds, as well as be used for planning purposes.
FR 7.111	ICOMC shall be capable of analytics for city systems where it shall develop insight into possible future conditions or events. Analytics shall measure the efficacy of services delivered and also help operators and city personnel to test scenarios. For instance, in case of heavy fire emergencies, it shall be able to predict response time of firefighting and ambulance vehicles to these emergencies based on inputs from tracking systems.
FR 7.112	Energy and Water Optimization shall be present where algorithms shall optimize energy and water use with input from weather forecast, electricity pricing, future energy demands, water reservoir levels, etc. and leverage integration from SCADA based network being provided by Others.
FR 7.113	Healthcare and Education analytics shall be present where ERP data shall assist healthcare and education planning (e.g. number of schools, hospital beds) along with integration with citizen smart card.
FR 7.114	ICOMC shall be capable of crowd management and analytics where detection/scheduling of crowd gathering shall influence Wi-Fi bandwidth management, solid waste management, street lighting, first responders preparation, etc.
FR 7.115	ICOMC shall support vision of crowd sourcing and analytics of data from various platforms i.e. city application and web portal among others for the purposes of empowering citizens.
FR 7.116	Capability of asset management where ERP data and connected vehicle information shall assist with scheduling of vehicle maintenance or determining if a renewal of assets is required.
FR 7.117	On receiving a fire or emergency alarm from BMS, ICOMC shall automatically alert firefighting authorities using automatic notifications. ICOMC shall also alert medical facilities for dispatch of ambulances and to make necessary provisions in hospitals for victims.
FR 7.118	ICOMC shall have the capability to take environmental condition feed from meteorological department or cable TV or any other applicable inputs. In case of rain predictions, ICOMC shall automatically alert departments for preventive maintenance of water logging issues.
FR 7.119	Display of Standard Operating Procedures (SOPs) shall be available where step-by-step instructions based on Client's policies and tools to resolve the situation shall be presented to operator in a quick and easy way for operator to verify the situation.
FR 7.120	The platform User Interface (UI) shall provide the operator an ability to control the configurations of city systems via applications installed and integrated on the platform, or via remote control applications that allow remote modifications of the city systems' facilities.
FR 7.121	The platform UI shall allow operators to configure the windows displayed on the executive dashboard. It shall also allow the users to change the workflow of systems.
FR 7.122	The platform graphical user interface (GUI) shall present information on standard workstations. It shall have the following capabilities:

	• Able to present management data such as dashboards, alarm and alerts, resource management information, incident information in colour coded, clear, simple and unambiguous, logical format. • Colour coding on the platform application GUI shall represent the different status of a task or incident/alert. • GUI layout and arrangement of windows shall be user customizable. • Be able to present information and distinguish between an early warning or anticipation type set of data and emergency or crisis operating mode.
FR 7.123	The platform shall be capable of presenting information in a browser based format such that it is accessible from any terminal connected to the ICOMC with a web browser. The supported browsers shall include but not limited to IE, Chrome, Firefox and Safari. In addition, the platform shall also be able to present information on mobile devices such as tablets and smartphones while maintaining the basic UI features.
FR 7.124	The platform shall provide user and subscription management by providing different tier of user categorization, authentication, authorization and services based on the subscriptions.
FR 7.125	Part of the visualization at the Bhubaneswar ICOMC will include monitoring a set of relevant ISO 37120 indicators. Some sample indicators are provided below: • Assessed value of commercial and industrial properties as a percentage of total assessed value of all properties • Primary education student/teacher ratio • Total residential electrical energy use per capita (kWh/year) • Energy consumption of public buildings per year (kWh/m²) • Fine particulate matter (PM2.5) concentration • Number of in-patient hospital beds per 100,000 population • Percentage of the city's solid waste that is recycled • Green area (hectares) per 100,000 population • Percentage of city population with potable water supply service • Total domestic water consumption per capita (litres/day)
FR 7.126	Analytic capabilities are envisaged to understand the real-time and batch data to act with intelligent decisions. The analytics shall integrate both with historical and real-time streaming data from water, energy, parks, street lighting, and batch data from e-Governance and ERP applications, among others responding to citizen-provided information.
FR 7.127	Automatically detect when citizen services are needed as indicated but not limited to the following: • Water treatment plant issues, water quality degradation and water flow analysis for recycling. It should include:

	• Distributed water management - Industrial & Residential (neighbourhood) Water Consumption Forecasting, Waste Water Quality Assessment, Treatment Effectiveness and Recycle Water usage is important. • Real time streaming analytics on tweets and social media events, blogs, grievances and discussion portal with data quality and content categorization. • Dynamically sense the citizen environment and mitigate government service disruptions through social media and other citizen data. • Healthcare and Education analytics shall be present where ERP data shall assist healthcare and education planning including the following but not limited to: ➢ Patients trends ➢ Disease Trends ➢ Identifying relationship with patient demographics location and disease trends ➢ Modelling mortality rate. • Provide proven intelligence system for planning and asset maintenance for Smart Electricity Grid which is envisaged to be with 100% underground cable network: ➢ Enable Peak Load Profiling for understanding system peak, feeder and transformer peak. ➢ Network hierarchical Load Forecasting capabilities with advance algorithms to handle meter data and SCADA/Historian data that can integrate weather data such as temperature. It should also support end-use models for the industrial city and establish the linkage with production details of the industries and the industry setup and bulk load commissioning. ➢ Provide predictive modelling for transformer fault and cable fault with analysis of Real Time Streaming Analytics on IoT Data for alarms / alerts on Asset Conditions based on predictive model. ➢ Provide proven intelligence to integrate AMI / AMR data, Billing Data and other data sources to detect non-technical loss to generate. ➢ Provide system reliability dashboard with SAIDI/SAIFI/MAIFI/CAIDI parameters on an hourly basis across the areas, feeders and up to the transformer level with linkages with failure and investment data. • Public Security Analytics: ➢ Enable the law enforcement to identify the area of security concerns. ➢ Forecast the man power required for surveillance in high risk area. ➢ Identify hidden areas of security concerns. ➢ Profile each area based on the type of predominant crime.
FR 7.128	The smart city platform shall be a single, integrated platform that shall provide seamless metadata exchange and single administration interface.

FR 7.129	The platform shall provide capabilities of integration with big-data and shall provide in-memory analytics capabilities.
FR 7.130	The centralized analytics shall take an enterprise approach by supporting analytics throughout the infrastructure including from cloud/on-premises to edge and any point in between.
FR 7.131	Streaming analytics capabilities shall include machine learning streaming capabilities such as regressing, decision tree, filtering live stream data, etc.
FR 7.132	The smart city platform shall have capabilities of visual monitoring of event streams, configure real-time dashboards for analytical ICOMC, interactive filters, and query dynamic live stream with support of automatic notifications through SMS, email and other alerts.
FR 7.133	The memory engine shall provide various types of dashboards and capabilities that allow drilling down on the dashboards and interlinkages of report objects and integration with GIS.
FR 7.134	The platform shall use leading text analytic solution to synthesize feedback comments and provide actionable intelligence.
Video Display Wall	
FR 7.135	Video display wall content will not be switched frequently and shall be displayed real-time. It shall be rated for 24x7 operations.
FR 7.136	Functionality of centre zone for common viewing, for example map of the city can be enlarged and copied to the centre of the display wall for general reference.
FR 7.137	Option to create multiple layouts shall be present.
FR 7.138	Video display wall shall be integrated with Display Content Management System (DCMS) so content managed in the DCMS can be displayed on the video wall.
FR 7.139	Ability for all CCTV video, CATV, web pages, IoT and all other display content to be routed to the board room.
FR 7.140	Ability to manage the content within the boardroom or at the operators' consoles.
FR 7.141	Ability to add content from an ICOMC workstation or boardroom computer.
FR 7.142	The video display wall product selected shall be durable for optimal use in a 24/7 operational mode.
FR 7.143	The focus of the design characteristics are ergonomics for the various viewers, quality and stability of the images, uniformity across the whole area, availability of the system, limited maintenance and low disruption of the control room operations.
FR 7.144	Video display wall shall be capable of displaying High Definition (HD) content.
FR 7.145	Gaps between screens shall be negligible to view HD graphics on multi screens.
FR 7.146	Auto calibration feature shall be provided to avoid periodic maintenance.
FR 7.147	There shall be a user interface for all settings and operational parameters.
Helpdesk	

FR 7.148	Helpdesk facility shall be provided through Toll-free lines, landlines, helpdesk tool, E-mail, direct walk-in etc.
FR 7.149	The helpdesk shall be a web enabled management system with SMS and email based alert system for the Helpdesk Call management and SLA reporting.
FR 7.150	Helpdesk shall have minimum 24 call centre operators providing 24x7 services in following shifts: • Ten (10) operators each in two shifts each; • Four (4) operators in one shift.
FR 7.151	The Helpdesk shall log user calls related to system and assign an incident/ticket number/call ID number.
FR 7.152	Helpdesk shall be able to categorize the calls through IVRS as per below: • Emergency • Grievance • Query • Feedback
FR 7.153	Helpdesk shall escalate the calls to the appropriate levels such as all calls under emergency category shall be forwarded to the concerned department such as Police, Ambulance or Fire.
FR 7.154	A call escalation matrix shall be developed as part of the system and shall be agreed upon with BSCL.
FR 7.155	The call centre operators shall provide relevant information/ clarification on the spot in case of an informational query or providing necessary troubleshooting assistance in case of a logged issue.
FR 7.156	In case of technical issues for which a resolution is not possible instantly, the operator shall submit the request into the system for escalation and further track it.
FR 7.157	Following metrics are required for maintaining customer satisfaction: • Average Call Response Time / Average Speed of Answer – this is the average time taken by callers waiting in a queue to be attended by an helpdesk operator; • Average Call Handling Time – this is the average amount of time during which helpdesk operator works with callers, including actual talk time, hold time and after call work / wrap up time. • Abandoned call rate – this is the percentage of calls abandoned by a caller when a caller is in helpdesk operator queue. • Customer survey results (call satisfaction levels)
FR 7.158	Helpdesk shall analyse the incident/ call statistics and provide daily and monthly reports such as: • Average speed of answer; • Service Level percentage; • Calls Offered; • Calls Handled;

	• Abandoned Call Rate; • Average Talk Time; • Average Hold Time; • Average Handle Time; • Longest Delay before Answered; • Outbound Call Volume; • Outbound Call Duration; • Average Delay before Abandon; • Longest Delay before Abandon; • After Call Work (Wrap up).
Digital Voice Logger Server	
FR 7.159	The Recording should be done in HDD and archiving in back up media.
FR 7.160	It shall have at least 100 ports and expandable to additional 50 ports in future. The Recording shall be done from Digital extension side and it shall be recorded in digital voice logger which is capable to record calls between extension lines also.
FR 7.161	The Recorded voice shall be indexed and linked with Incident Report Number with real time and date. The voice logger shall have the CTI capabilities that will automatically track the incoming call. The recording shall go on till the call is disconnected.
FR 7.162	It shall be possible to configure automatic voice recording on answering the call by the Operator.
FR 7.163	It shall be based on the above mentioned server configuration with additional 500 GB of Hard disk, maximum 5U space and suitable OS and Software/ Hardware.
FR 7.164	Voice Logger software compatible with the call Centre package.
FR 7.165	Software & hardware required to record the wireless communication.
Automatic Call Distribution (ACD) Requirements	
FR 7.166	The ACD solution shall have the following facilities: • Call Distribution; • Intelligent and Skill based call-routing; • Call Queuing facility; • Call forwarding Facility; • Recorded announcement Features; • Call routing to operator on “longest idle basis”; • Monitoring and reporting tools for supervisor position.
FR 7.167	ACD shall have the following functionality: • Identifying or determining the region from which the call is originating and greeting the caller in English/Hindi/ Oriya • Queuing or holding the call for an operator if none is immediately available

	• Keeping callers informed as to the status of the call and providing information to callers while they wait in queue
FR 7.168	It shall be possible to define Operator Preference options using: • Longest total time in idle state since login • Longest time in idle state since last status change; and • Longest total time since last ACD call • Alarms for callers in queue & Call-back message support
FR 7.169	ACD system shall be designed such that it can handle minimum 30 calls efficiently
FR 7.170	ACD system shall seamlessly integrate with IVRS and EPABX
FR 7.171	ACD shall provide the capability of combining data with the Interactive Voice Response (IVRS) menu system that can intelligently route calls requesting further assistance
Call Transaction Log	
FR 7.172	A call transaction log for both inbound and outbound calls shall be created automatically by the CTI server while a call is received by the ACD system.
FR 7.173	The call transaction log shall be saved on the hard-disk of the active CTI server automatically while the call is dropped (Customer or operator).
FR 7.174	The call transaction log shall contain the following minimum information: • Time of call received into ACD • Time of call answered by operators • Time of call disconnect • Duration of call in ACD • Call handling time by the operators • Both source and destination operator ID • In case of call from PSTN, Trunk ID shall also be included • ANI and DNIS; and • User data from IVRS or Intelligent work station
FR 7.175	The CTI server shall be able to synchronize itself to the ACD Clock.
Supervisor Module	
FR 7.176	Any supervisor shall be able to monitor or control any group in the Helpdesk.
FR 7.177	It shall show the live activity of each operator in details as well as in a summarized fashion including information like total number of calls received, calls answered, average response time etc.
FR 7.178	The Supervisor console shall also graphically display live status of the call session summary, number of call waiting in the queue, call traffic etc.
FR 7.179	Live status of the group shall be shown, including waiting calls and calls being answered currently.
FR 7.180	Access to the supervisor console shall be restricted; and
Audit Trail	

FR 7.181	It shall have a comprehensive audit trail detailing every user activity including system/security administrators with before and after image.
FR 7.182	Audit trails presented by the system shall be very detailed with all the related fields, such as User ID, time log, changes made before and after, Machines ID etc.
FR 7.183	It shall have the facility to generate security report(s) and audit the whole process from logs reports at any future date. The system shall have complete audit trail of any changes to the system e.g. alert generated, system configuration etc.
FR 7.184	The system shall not allow audit log to be deleted and any attempts to delete must be logged.
FR 7.185	The system shall have at a minimum following standard reports: • List of users, user privileges and status • User sign-off and sign-on • User violation – unsuccessful logon attempts • User additions, amendments and deletions with before & after image

TR - 7 Technical Requirements

Video Display Wall (VDW)	
TR 7.1	The VDW shall be provided as per the following requirements: • In ICOMC: 16x4 cubes of 70” each; • In Command and Control Centre-Type 1: 3x2 cubes of 70” each.
TR 7.2	Each of the above VDW shall be made up of DLP™ rear-projection cubes. Each DLP™ display cube shall measure 70 inches in diagonal. It shall include all controllers required for its operations.
TR 7.3	The native resolution of each Visual Display Unit / Rear Projection Module should be 1920 X 1080 pixels (Full HD) and should have LED as its light source with ultra-thin configuration.
TR 7.4	It shall have an aspect ratio of 16:9.
TR 7.5	The light source lifetime of the LED shall be at least 80,000 hours.
TR 7.6	The brightness uniformity of the VDM shall be >95%.
TR 7.7	The Rear Projection Module shall have LED as its light source.
TR 7.8	The screen shall have adjustable low inter screen gap 0.6 mm or lesser to give seamless viewing experience.
TR 7.9	The Cube shall have redundancy in power supply, LED light source and its driver circuitry.
TR 7.10	The dashboard shall be capable of simultaneously displaying one (1) to one hundred (100) independent sets of information on the video display wall. Specific outputs to be displayed shall be chosen by operators.

TR 7.11	The VDW shall include video walls mounted close to each other to give a seamless viewing experience.
TR 7.12	Each cube of the VDW shall have its own IP address and on-board web server to provide standard information like status and health.
TR 7.13	The VDW shall be the primary visual information point to see CCTV videos, incident alarms, IoT screens, network health conditions, GIS maps, and any application running on city systems.
TR 7.14	The VDW shall provide a collaborative visual for operators and management to work and coordinate on various tasks in different situations.
TR 7.15	The VDW product selected shall be durable for optimal use over a long time in a 24/7 operational mode.
TR 7.16	The VDW shall provide image uniformity across the whole display area.
TR 7.17	The VDW shall have system availability with limited maintenance and low disruption of the operations room operations.
TR 7.18	The VDW shall be capable of displaying high definition (HD) and standard definition (SD) content.
TR 7.19	The VDW shall provide minimum viewing angles of: • Horizontal - ½ gain: ±35 degrees, 1/10 gain: ±57degrees • Vertical - ½ gain ±10 degrees, 1/10 gain: ±28 degrees
TR 7.20	Auto colour and brightness management mechanism to be provided.
TR 7.21	The VDW shall have a user interface for all settings and operational parameters.
TR 7.22	The VDW shall support with enhanced brightness of at least 300 cd/m² to accommodate ambient light expected inside the room.
TR 7.23	The VDW units shall be new and current to the manufacturer's product line. The units shall not be discontinued products.
TR 7.24	Each VDW unit shall have front-access to the projection modules and internal components of the cubes for maintenance purposes.
TR 7.25	The brightness uniformity of each display cube and across the entire VDW shall be at least 95%.
TR 7.26	The video display cubes shall have anti-reflective screens in order to reduce reflection and glare on the display wall.
TR 7.27	The VDW shall not daisy chain video communications from one display cube to another. There shall be a direct video connection from the display content management system to each display cube.
TR 7.28	All video display cubes shall have a consistent image quality, automatic and continuous colour calibration and uniform brightness across the display wall.
TR 7.29	The VDW will have at least one (1) female DVI-I/HDMI input connector.
TR 7.30	The VDW shall have 10/100/1000 copper Ethernet communications port.

TR 7.31	A pedestal shall be provided to support the VDW. If the manufacturer's standard pedestal does not comply with the height requirement, the MSI shall supply a custom setup.
TR 7.32	The support structure shall be with a laminate finish.
TR 7.33	The support structure shall have open internal space for equipment.
TR 7.34	The support structure shall incorporate sound proofing to prevent noise penetration from the equipment/s into the operations room.
TR 7.35	The support structure shall have easy to open rear access covers.
TR 7.36	The MSI shall provide lateral support for the VDW. If fixations are required behind the VDW, the MSI shall propose and design an appropriate support system.
TR 7.37	The VDW pedestal shall be physically secured to the concrete floor of the building. It shall not sit on top of the raised floor.
TR 7.38	Each VDW projection engine shall be modular to allow sub-components to be replaced without disruption to other components.
TR 7.39	Each display cube shall not exceed a thermal dissipation of eight hundred (800) BTU per hour under normal operating conditions.
TR 7.40	The VDW shall allow for easy maintenance of modules, colour sync systems, etc. where downtime is no greater than twenty (20) minutes.
TR 7.41	The AC input power shall be 110-240 VAC +/- 10% at 50/60 Hz +/- 1Hz. Power consumption of each cube shall be less than 300W.
TR 7.42	The VDW shall have an operational temperature between ten degrees Celsius (10°C) to thirty degrees Celsius (30°C).
TR 7.43	The VDW shall have a relative humidity of 20 to 80%, non-condensing or better.
TR 7.44	The VDW shall be of sufficient design, manufacturing and operational quality to provide twenty-four (24) hours, seven (7) days a week mission critical functionality.
TR 7.45	The VDW shall have redundancy of critical components like light module, drivers and power supplies.
Display Content Management System (DCMS) or Video Wall Management System	
TR 7.46	The DCMS shall include the VDW controller for the Operations Room VDW and a system to manage the visual content.
TR 7.47	The DCMS shall be able to display visual content on any network attached display device.
TR 7.48	The DCMS shall be able to input, manage, and distribute visual content, including digital CCTV video, web pages, CATV, workstation applications, and active screens from any networked workstation.
TR 7.49	The DCMS shall be able to decode, transmit, manage, and display the following formats of digital streaming video: • MPEG-4 • H.264

TR 7.50	The DCMS shall treat the VDW as a single display. It shall act as a single canvas with no pixel separation.
TR 7.51	The DCMS shall have the ability to create multiple spaces for different users to control display content. The DCMS shall be able to create a minimum of six (6) distinct operator controlled display areas. These display areas cannot cross over into another. The display areas can be created anywhere within the VDW.
TR 7.52	The DCMS shall be able to create display layouts for any sized display, including boardroom monitor and the operations room display. The DCMS shall be able to save a minimum of one hundred (100) display layouts for every display device within the ICOMC.
TR 7.53	The DCMS shall be able to manage users and roles. The DCMS shall have an administrator role to have master control of all functions.
TR 7.54	The DCMS shall be able to separate the video wall into variable sized sections so that system defined users can manage only their portion of the video wall. Users not belonging to a particular group managing another portion of the video wall shall not be entitled to change layouts and sources.
TR 7.55	The DCMS shall be able to stretch, re-position, and resize any video source on any display device.
TR 7.56	The DCMS shall be supplied with a user interface (UI) independent of other systems.
TR 7.57	The DCMS shall have a seamless interface within the VMS UI of the CCTV. All DCMS interactions within the Video Management System shall be no more than three (3) mouse clicks to execute a DCMS function. The DCMS UI shall have the ability to run independently while the Video Management System is running.
TR 7.58	The DCMS shall be accessible on any networked workstation or networked monitor with OPS on the ICOMC network.
TR 7.59	The DCMS shall be able to create and edit user groups. DCMS permissions for users and user groups shall be customizable. At a minimum the definable permissions shall include UI function rights, viewing access rights, source list access rights, and display access rights.
TR 7.60	The DCMS shall include an administrator role that shall be able to manage system configuration, sources, user groups, and user authentication.
TR 7.61	All users on the DCMS shall have a password-protected login.
TR 7.62	The DCMS shall be able to display a minimum of two hundred (200) independent visual sources simultaneously on the VDW in the Operations Room. The sources shall be of 4CIF resolution.
TR 7.63	The DCMS shall be able to display a minimum of twenty (20) independent visual sources simultaneously on all boardroom or auxiliary display device. The sources shall be of 4CIF resolution.
TR 7.64	The DCMS shall be able to create and add borders and text overlays to individual original video content source. The borders and text overlays shall have selectable options for colour, widths, text size, and flash on/off.

TR 7.65	The DCMS shall be able to display a minimum of ten (10) web browser applications without the use of screen capturing from an external network source.
TR 7.66	The DCMS shall be able to select and display any region of a multi-monitor display on a DCMS connected source. For example, if an operator has three (3) monitors, the operator can select monitors one (1) through two (2) for display on the VDW, while leaving monitor 3 for local display only.
TR 7.67	Visual content from networked sources shall be transmitted and displayed with no pixel loss or degradation.
TR 7.68	The DCMS shall be able to accept a minimum input of four (4) CATV video sources;
TR 7.69	The DCMS shall be able to control and manage all CATV tuners remotely from all video connected rooms in the ICOMC;
TR 7.70	The DCMS shall be able to search for networked video sources.
TR 7.71	The DCMS shall have the ability to accept and use General Purpose Interface (GPI) triggers from the BSCL's systems to activate pre-set image configurations.
TR 7.72	The DCMS workstation client software shall run on an industry standard-based operating system.
TR 7.73	The DCMS shall be able to run a minimum of twenty (20) workstation client software instances simultaneously.
TR 7.74	The DCMS shall have the ability to self-monitor and provide alerts to the administrator and designated users via e-mail.
TR 7.75	The DCMS shall have a SDK and API openly available without charge for future integration with third party applications.
TR 7.76	The AC input power shall be 110-240 VAC +/- 10% at 50/60 Hz +/- 1Hz.
TR 7.77	The DCMS shall support 10/100/1000 Ethernet communications for device management and other communication.
TR 7.78	All DCMS hardware shall have an operational temperature between ten degrees Celsius (10°C) to thirty degrees Celsius (30°C).
TR 7.79	The DCMS shall have redundancy of critical components to support a twenty-four (24) hours, seven (7) days a week mission critical functionality.
Video Wall Management Software	
TR 7.80	The software should be able to pre configure various display layouts and access them at any time with a simple mouse click or schedule/timer based.
TR 7.81	The software should be able display multiple sources anywhere on video wall in any size.
TR 7.82	The software should enable the users to see the desktop of the graphics display wall remotely on the any PC or above connected with the DCMS and Video Wall over the Ethernet and change the size and position of the various windows being shown.
TR 7.83	The software should enable various operators to access the display wall from the local keyboard and mouse of their workstation connected with the DCMS and Video Wall on the Ethernet.

TR 7.84	The software should copy the screen content of the workstation connected on the Ethernet with the DCMS to be shown on the Display wall in scalable and moveable windows in real time environment.
TR 7.85	The video wall management software should support open APIs to enable system integrators to integrate it with their Software. Multiple application programmer's interface (API) to facilitate third-party software to control and access Wall management software features including ability to query the available perspectives, launch sources in windows, switch perspectives, switch current window contents to available inputs for both networked or non-networked sources(on the input cards), query overall system status, and launch Applications.
TR 7.86	Key features of Video Wall management Software • Central configuration database • Browser based user interface • Auto-detection of network sources • Online configuration of sources, displays and system variables • Backup & restore capabilities • Scheduled backup • Advanced remote logging • Full resolution and full frame rate preview of all networked sources • Remotely monitor displays over the network with the actual preview of all sources shown • Drag and drop from sidebar to mini display for quick perspective changes • Integrated soft KVM for remote control of displays • Perspectives can be opened and shown on both workstations and displays alike • Standard and custom Tiling configuration • Share your perspectives with other workstations or displays Decorators including: UMD, IDC, Source Name, Time (time zone aware), Date, Text, Logo, Message Ticker, Source status.
TR 7.87	Video Wall Control Software shall allow commands on wall level or cube level or a selection of cubes : • Switching the entire display wall on or off. • Setting all projection modules to a common brightness target, which can be either static (fixed) or dynamic to always achieve maximum (or minimum) common brightness between projection modules. • Fine-tune colour of each cube
TR 7.88	The integrated view shall provide a database that • records all events • can record full status at given time intervals • can be exported to excel/html

	• show internal patterns
TR 7.89	Log file functions (full Audit trail capabilities) • Logs are not automatically overwritten ➢ Client logs ➢ Central server logs • Logs contain the following information ➢ Individual User ID that has control of the video wall at any given time ➢ Name of PC that has control of video wall at any given time. ➢ Time control was taken. ➢ Time control was released Time stamps in log shall be at the one (1) second interval, or less
Monitor	
TR 7.90	The Monitor shall be provided in the Command and Control Centre Type 2 and Boardrooms.
TR 7.91	The display shall utilize LED technology.
TR 7.92	The display shall be seventy inches (70”) diagonal.
TR 7.93	The display shall have a native resolution of Full HD 1920 x 1080 pixel density.
TR 7.94	The display shall have an aspect ratio 16:9.
TR 7.95	The display shall display a minimum contrast ratio of 1500:1.
TR 7.96	The display shall be equipped with an OPS-Compliant Slot.
TR 7.97	The display shall have a built-in tuner.
TR 7.98	The display shall be a commercial grade product.
TR 7.99	The display shall have a built-in low profile speaker.
TR 7.100	The display shall have a typical brightness greater than 300 cd/m^2.
TR 7.101	The net weight of the display shall be less than 100 kgs.
TR 7.102	The display shall be matt black and have thin bezels no greater than 20mm.
TR 7.103	The AC input power shall be 110-240 VAC +/- 10% at 50/60 Hz +/- 1Hz.
TR 7.104	The boardroom monitor shall equipped with at least one (1) of each input format including HDMI, Display Port, DVI-D, VGA 15-pin D-Sub, RS232C, and Ethernet (RJ45).
TR 7.105	The display shall be equipped with at least one (1) of each output format including Stereo Mini-Jack, External Speaker Jacks, DVI-D, and RS-232C.
TR 7.106	The boardroom monitor shall be operational in temperature between ten degrees Celsius (10°C) to thirty degrees Celsius (30°C).
Collaboration System	
TR 7.107	The collaboration system shall be user friendly with no more than 3 steps for setup.
TR 7.108	The collaboration system shall be able to transmit HD video and audio.

TR 7.109	The collaboration system shall have security encryption protocols in safe and secure wireless transmission of data.
TR 7.110	The collaboration system shall support auto scaling to fill entire screen of any display size.
TR 7.111	The collaboration system shall support a local area network connection between transmitter and receiver, without having to ride on corporate LAN, and still maintaining capability to connect to corporate LAN as needed.
TR 7.112	The collaboration system shall be is a small form factor easy for installing in small tight spaces.
TR 7.113	The collaboration system shall support mobile connection via app.
TR 7.114	The collaboration system shall not require software to be downloaded in user laptop or computer to allow sharing of contents.
TR 7.115	The collaboration system shall have the capability to accept software update through network.
TR 7.116	The AC input power shall be 110-240 VAC +/- 10% at 50/60 Hz +/- 1Hz.
TR 7.117	The collaboration system shall communicate via its own independent Wi-Fi or network LAN.
TR 7.118	The signal transmitter and receiver pair shall be operable between 0 and +50 °C / 10% to 90%, non-condensing.
Teleconferencing System	
TR 7.119	The Teleconferencing System shall use a telecommunications channel to link people at multiple locations. All IP phones shall be IPv4 and v6 compliant.
TR 7.120	The Teleconferencing System shall be interactive to provide two-way communications.
TR 7.121	The Teleconferencing System shall have conference phone with speaker that delivers performance required for the application and area.
TR 7.122	The Teleconferencing System shall use an audio signal processor that serves as the platform for the teleconference to integrate with the room audio system and control system.
TR 7.123	The Teleconferencing System shall have feature set for SIP-based VoIP platforms.
TR 7.124	The Teleconferencing System shall reduce listener fatigue by turning ordinary conference calls into crystal-clear interactive conversations.
TR 7.125	The Teleconferencing System shall deliver high-fidelity audio from 160 Hz to 22 kHz.
TR 7.126	The Teleconferencing System shall capture both the deeper lows and higher frequencies of the human voice for conference calls that sound as natural as being there.
TR 7.127	The Teleconference phone shall feature a large multi-line high-resolution LCD display of at least 3”.
TR 7.128	The phone shall be able to store contacts with quick dial feature.
TR 7.129	The teleconferencing system shall have configurable software.

TR 7.130	The Teleconferencing System shall support network power (POE) or DC power supply.
TR 7.131	The Teleconferencing System shall support 10/100/1000 Ethernet network.
TR 7.132	The Teleconferencing System shall be operational in temperature between ten degrees Celsius (10°C) to forty degrees Celsius (30°C).
Video Conferencing (VC) System	
TR 7.133	The VC system shall allow live visual connection between two or more people residing in separate locations for the purpose of communication.
TR 7.134	The VC system shall be flexible, provides interactive content collaboration to distant teams.
TR 7.135	The VC system shall support transmission of full-motion video images and high-quality audio between 2 or more locations.
TR 7.136	The VC system shall support multipoint videoconferencing which allows three or more participants to sit in a virtual conference room and communicate to each other.
TR 7.137	The VC system shall have the following capabilities: white boarding, annotating, and application sharing from a computer or tablet. All shall be included as part of a comprehensive, collaborative video session.
TR 7.138	The VC system shall have innovative facial-tracking algorithms to accurately frame all room participants.
TR 7.139	The VC system shall support 16:9 and 4:3 aspect ratio, automatic gain control, and intelligent audio mixing.
TR 7.140	The VC system shall support multiple video sources.
TR 7.141	The VC system shall have the capability to zoom in and follow the person speaking.
TR 7.142	The VC system camera shall offer visual clarity with a HD sensor, and shall be available with 12x zoom and a wide-angle lens adapter.
TR 7.143	Participants shall be able to have the following feature controls using Remote Control or GUI of video system through the multipoint control unit: • Mute My Line / Unmute My Line • Increase Broadcast Volume / Decrease Broadcast Volume • Mute All Except Me / Cancel Mute All Except Me • Change Password • Mute Incoming Participants / Unmute Incoming Participants • Play Help Menu • Enable Roll Call / Disable Roll Call • Roll Call Review Names / Roll Call Stop Review Names • Terminate Conference • Start Personal Layout • Change To Chairperson • Increase Listening Volume / Decrease Listening Volume

	• Override Mute All • Start Recording / Stop Recording / Pause Recording • Secure Conference / Unsecured Conference; and • Show Number of Participants
TR 7.144	The VC system camera shall be mountable on flat panel display or on a shelf in the cart.
TR 7.145	Controls of the VC system shall be accessed via the room control system to maintain a single source for control.
TR 7.146	The VC system shall include a codec, camera, microphone with option to extend additional microphone/s and remote controller for user control.
TR 7.147	The VC system UI shall be intuitive and easy to use.
TR 7.148	The VC system shall support following video standard protocols: • H.261, H.263, H.264 AVC • H.263 & H.264 video error concealment
TR 7.149	The VC system shall have at a minimum, the following video inputs; • 2 x cameras • 1 x HDMI 1.3 • 1 x VGA
TR 7.150	The VC system shall have at a minimum, the following Audio input. • 1 x camera • 1 x HDMI • 1 x 3.5 mm stereo line-in
TR 7.151	The VC system shall have at a minimum, the following Audio output; • 1 x HDMI • 1 x 3.5 mm stereo line-out
TR 7.152	The VC system shall have at a minimum, the following other interfaces; • 2 x USB 2.0 • 1 x RS-232 • 8-pin mini-DIN
TR 7.153	The AC input power shall be 110-240 VAC +/- 10% at 50/60 Hz +/- 1Hz.
TR 7.154	The VC system shall use 1 x 10/100/1000 Ethernet and support IPv4 and IPv6.
TR 7.155	The VC system shall be operational in temperature between ten degrees Celsius (10°C) to thirty degrees Celsius (30°C).
Other Monitors	
TR 7.156	The other monitors shall be of LED flat panel screen technology with following size: • 24-inch diagonal • Widescreen format (16:9 aspect ratio) • Thin bezel not exceeding ½ inch • HD 1920x1080 resolution

	• Minimum input of 1xDP, 1x HDMI, 1xDVI • Energy Saving • Allow tilt and swivel motion • Black colour
TR 7.157	The monitor shall have high refresh rate to eliminate screen flicker causing eyestrain and headache.
TR 7.158	The monitor shall support the same refresh rate as the workstation video card.
TR 7.159	The monitor shall have response time sufficient to limit ghosting in video, in particular on detail video monitor.
TR 7.160	The monitor shall have accurate depiction of colour to enable distinction of colour coding used in display content, and video monitors).
TR 7.161	The monitor shall have highly focused distortion-free images, to enable accurate reading of map detail and distinction of items close to one another on display content.
TR 7.162	The monitor shall have even level of brightness across entire screen.
TR 7.163	The monitor shall have good colour convergence on all points of screens; no bleeding out of colours at the edges of characters.
TR 7.164	The monitor shall have anti-glare screen.
TR 7.165	The monitor shall have adjustment controls (e.g., brightness/contrast) easily accessible, easy to locate and easy to use.
TR 7.166	The AC input power shall be 110-240 VAC +/- 10% at 50/60 Hz +/- 1Hz.
TR 7.167	The monitors shall be operational in temperature between ten degrees Celsius (10°C) to thirty degrees Celsius (30°C).
TR 7.168	The monitor shall be designed for Designed for 24/7 operations over 5 year period.
Ceiling Speakers	
TR 7.169	The ceiling speakers shall have high power and high sensitivity with extended frequency responses.
TR 7.170	The ceiling speakers shall have wide, controlled constant directivity dispersions for optimum coverage.
TR 7.171	The ceiling speakers shall have output of at least 15W peak. They shall have in-built amplifiers or shall be supported by an external amplifier.
TR 7.172	The ceiling speakers shall have a conical coverage pattern of at least 105 degrees (1kHz – 6 kHz).
TR 7.173	The ceiling speakers shall be in a colour to match the ceiling and surrounding interior design.
TR 7.174	The ceiling speaker shall have a diameter not greater than 8.5”.
TR 7.175	MSI shall quantify and space speakers to provide full audio coverage within the operation room and boardroom.
TR 7.176	The ceiling speakers shall follow the manufacturer recommendation for connectivity.

TR 7.177	The Ceiling Speakers shall automatically adjust the output audio level based on ambient noise. This may require either in-built noise sensors with the ceiling speakers or an independent ambient noise monitoring system.
TR 7.178	The ceiling speakers shall be operational in temperature between ten degrees Celsius (10°C) to forty degrees Celsius (40°C).
Room Control System including Panel	
TR 7.179	The boardroom and the operations room shall have their independent room control systems. All systems including shadowing, lighting, HVAC, audio etc. being provided as part of the ICOMC shall be integrated using this room control panel.
TR 7.180	The room control systems shall support a minimum of 7” touch panel display.
TR 7.181	The touch panel displays shall support a resolution of 1920 x 1080.
TR 7.182	The touch panel displays shall be desk mount with a cradle.
TR 7.183	The touch panel displays shall be wireless.
TR 7.184	The touch panel interfaces shall be intuitive and easy to use.
TR 7.185	The touch panel displays shall support full battery operations.
TR 7.186	The touch panel displays shall support full motion video preview and monitoring.
TR 7.187	The room control processors shall support secure industry standard communication protocol. HTTP, HTTPS, SSH, SFTP, SMTP, NTP, DHCP, DNS, ICMP and IPv4.
TR 7.188	The room control processors shall support the required number of ports for connection with variety of device following contract documents.
TR 7.189	The room control processors shall support 10/100/1000 Base-T.
TR 7.190	The room control processors shall support Ethernet-controllable devices.
TR 7.191	The room control processors shall support automatic clock synchronization.
TR 7.192	The room control panels shall support control system synchronization.
TR 7.193	The room control panels shall support multi-level password protection.
TR 7.194	The room control panels shall support an easy to use browser based user interface.
TR 7.195	The room control system hardware shall be rack mountable.
TR 7.196	The room control systems shall integrate with other non-AV systems in the room. This includes and not limited to window coverings and lights in both the operations room and boardroom.
TR 7.197	The AC input power shall be 110-240 VAC +/- 10% at 50/60 Hz +/- 1Hz.
TR 7.198	The room control system shall be operable between 0 and +50 °C / 10% to 90%, non-condensing.
Operator Console	
Materials	

TR 7.199	Consoles are primarily a workspace that support operator workstations and monitors for monitoring various systems at the ICOMC, including the independent city systems and smart city platform. They maximize workspace for both the operators and communications staff, while meeting the ergonomic and occupational needs for staff working shift patterns with 24/7 coverage.
TR 7.200	All operator consoles shall be designed to meet the shape, dimensions, and orientation requirements within the Operations Room.
TR 7.201	The consoles shall satisfy the functional, aesthetic and ergonomic requirements of the working environment of the Operations Room staff.
TR 7.202	All console materials and components shall be of sufficient design, manufacturing, and operational quality to provide dependable and durable performance for constant use 24 hours a day, every day of the year.
TR 7.203	The consoles shall provide work surfaces with multiple vertical locations (stand / sit system) - standing height, work surface height, and below work surface height.
TR 7.204	The consoles shall be of a modular design, allowing for future equipment and room layout configurations.
TR 7.205	The consoles shall be fabricated to meet or exceed recognized industry quality standards (e.g., ANSI/BIFMA or equivalent).
TR 7.206	The consoles shall be designed to accommodate a variety of computer displays, communications and operator interface devices and include appropriate power and data cabling management for said devices.
TR 7.207	Each console shall be capable of accommodating, as a minimum: • Operator desk and chair • Three (3) wide-screen 610 mm (24 inch) LED monitors • One (1) standard keyboard • One (1) standard mouse • One (1) set of headset jacks mounted underneath desk • One (1) VOIP telephone • One (1) two-way radio (future) • Free space for paperwork • Desk slats for binder/manual storage; and • One (1) large file drawer for storage
TR 7.208	A selection of finishes shall be available for all console components. The console provider shall provide sample finishes to coordinate with the Operations Room environment, millwork, aesthetics, and the adjacent Cabin / Boardroom furniture finishes.
TR 7.209	All console components shall include trim pieces including fillers, connectors, full or partial end trims, top caps, etc. as required to create a professional appearance.
TR 7.210	All consoles and components shall not display manufacturer or vendor logo, name, or equivalent signage and nameplates.
Structure	

TR 7.211	Each console main structure shall be constructed of thick wall custom profile extruded aluminium alloy, or structural equivalent (e.g., 10 gauge steel).
TR 7.212	Structural assembly components (e.g., cabinet frames) shall be constructed of precision-tooled cold-rolled steel, or structural equivalent, and finished with durable electrostatic powder coat finish, or equivalent.
TR 7.213	Levelling glides shall provide a maximum height adjustment of up to 64 mm (2.5 inch) for each console and component.
TR 7.214	Consoles shall provide work surface stability at all vertical positions including full height (stand) position, via suitable structural components such as a third leg.
Mounting System	
TR 7.215	Each console shall furnish a mounting system consisting of either a work surface mount (with articulated arm) or slat wall mount (with double pivoting articulating arm).
TR 7.216	Mounting systems shall be available from 13 mm (4 inch) to 305 mm (12inch) in height utilizing a vertical stackable option in incremental heights above the console work surface.
TR 7.217	Stacking elements shall be load-bearing on all tiers and shall use like parts as base panels (i.e. skins, electrical, horizontal beams, etc.) to create a professional appearance.
TR 7.218	Mounting systems shall be capable of being equipped with a maximum of three (3) monitor arms at each console. Monitor arms shall be removable and interchangeable with other consoles. Monitor arms shall be easily moveable horizontally across the mounting system if slat wall mount is used.
TR 7.219	Each monitor arm shall be capable of supporting a variety of typical LED monitor sizes and types (including iPads and other types of tablets) weighing up to and including 23 kg (50 lbs).
TR 7.220	Each monitor arm shall have swivel, tilt, and height-adjustable capability with appropriate positive friction or mechanical locking mechanism to maintain the desired positions and orientations. Monitor arms should be single touch adjustable for ease of use.
Wiring and Cabling	
TR 7.221	Special components shall not be required to bring power, data, and communication wiring into consoles.
TR 7.222	The console placements in the Operations Room and dimensions shall be adjusted accordingly to integrate all cabling service entry accesses in the floor.
TR 7.223	Consoles shall not obstruct or interfere with any raised floor access location cabling services or functionality.
TR 7.224	All consoles shall provide suitable provisions to regain reasonable access to each raised floor access location to preserve the ability to install future power/cabling services into the console via cabling service entry accesses in the floor.

TR 7.225	Each console shall provide a built-in cable management system that accommodates two (2) wiring runs, one (1) for power and one (1) for data and communication (e.g., through hollow leg space or other hollow spaces in the structure).
TR 7.226	Cable management system shall provide continuous and appropriate components to protect all cables, including those connected with extension cords, during height adjustable work surface vertical height transitions.
TR 7.227	The cable management system shall provide appropriate access points and continuous cable management throughout the entire console, including but not limited to: • All floor access locations; and • Entire height adjustable work surfaces of each console, including returns
TR 7.228	The cable management system shall be integrated, routed, and accessible to enable easy addition/removal of cables/wires in the future and shall not be interfered when adding or removing stacking elements.
TR 7.229	The cable management system shall have the capability to accommodate vertical cable runs in all stationary components neatly and internally.
TR 7.230	The cable management system in all stationary structures, bases, frames and components shall be capable of maintaining a minimum 51 mm (2 inch) bend radius required for any future cable.
TR 7.231	Power strips shall be durable metal construction or equivalent.
TR 7.232	Power strips shall not incorporate any surge, overload, or power on/off switch.
TR 7.233	Each console shall provide one (1) fully integrated sixteen (16) receptacle power strip mounted horizontally throughout the entire height adjustable work surface frame, accessible from the work surface.
TR 7.234	Each console shall provide two (2) fully integrated four (4) receptacle power strips mounted vertically at each back corner.
TR 7.235	Each console shall be provided with two (2) computer extension cables that shall connect workstations in the Rack Room to I/O endpoints at the consoles in the Operations Room. Extension cables may consist of powered cable extender units. Extension cables shall be a suitable length, fully shielded, and interface with video, mouse, keyboard, speakers, and microphone computer interfaces.
TR 7.236	Each computer extension cable shall provide the following connectors at the workstation end in the Rack Room: • One (1) HD-15/HDMI male video • One (1) USB female keyboard and DVI/HDMI adaptor • One (1) USB female mouse and DVI/HDMI adaptor • Two (2) USB female (spares) • One (1) 3.5 mm male speaker; and • One (1) 3.5 mm male microphone
TR 7.237	Each computer extension cable shall provide the following connectors at the height adjustable work surface end:

	• One (1) HD-15/HDMI female video • One (1) USB female keyboard and DVI/HDMI adaptor • One (1) USB female mouse and DVI/HDMI adaptor • Two (2) USB female (spares) • One (1) 3.5 mm female speaker; and • One (1) 3.5 mm female microphone
TR 7.238	Wiring and cabling details provided in this set of specifications are indicative only. The console provider shall confirm the wiring and cabling details with the BSCL or their designate during the detailed design of the consoles.
Work Surfaces and Counters	
TR 7.239	All work surfaces shall be: • 25 mm (1 inch) minimum density core particle board or MDF thickness • 20 kg (44 lbs) minimum density core particle board or MDF • Utilize 3-ply construction with solid grade high pressure composite laminate
TR 7.240	All work surfaces and counters shall be finished in solid grade high pressure composite laminate with minimum thickness of 1.2 mm.
TR 7.241	All work surfaces shall have high scratch resistance, seamless joints, class A flammability rating, and be non-porous.
TR 7.242	All work surface and counter nosing (e.g., edge treatment PU nosing) shall be integrated into the work surface top providing a durable, resistant, yet smooth surface, i.e., Polyurethane or equivalent.
TR 7.243	All work surfaces and counters shall be available in curvilinear shapes including corner, extended corners, peninsula, visitor, spanner, linking, transitional, wave, and bridge designs.
TR 7.244	All work surfaces design shall incorporate ergonomic standards including knee well space, view/reach distances, and keyboard height.
TR 7.245	All work surfaces and counters shall be capable of supporting a minimum static load of 75 kg per linear meter (50 lbs per linear foot) at any vertical position.
TR 7.246	All work surface nosing edges, excluding joints, shall have a waterfall-type edge and finger pull.
TR 7.247	The console provider shall provide work surface, nosing, and edge styles, finishes, and construction material choices available for the same fixed lump-sum operations consoles contract price.
TR 7.248	Plastic laminate finish of all work surfaces and counters shall adhere to the minimum criteria for the resistance of wear, boiling water, high temperature, cigarette burns, fading, dimensional stability, staining, and uniformity of appearance.
TR 7.249	All joints required on a console's height adjustable work surface shall be even in height along the entire length of the joint to form a continuous working area/counter appearance.

TR 7.250	Work surfaces and work surface accessories shall accommodate cable routing, access, management and storage. Easy access to cable routing shall be provided via a system such as hinged panels with brush strip.
TR 7.251	The back section of each console adjustable height work surface shall be capable of being installed a minimum of 51 mm (2 inch) lower, together with the slat wall (if used) relative to the rest of the work surface.
Height-Adjustable Work Surfaces	
TR 7.252	Each console shall provide height-adjustable work surfaces, enabling Operations Room staff to work from various vertical positions while sitting or standing. Slat walls (if used) shall automatically raise and lower at the same rate and distance as the work surface is raised or lowered.
TR 7.253	Each console's entire work surface shall be fully height-adjustable.
TR 7.254	Height-adjustable work surfaces shall be capable of being raised to a minimum height of 1,118 mm (44 inch) above the floor and shall be capable of being lowered to a minimum height of 686 mm (27 inch) above the floor.
TR 7.255	Each console height adjustment system shall provide buttons or similar to raise, stop, lower, and return to one of two (2) preset vertical positions.
TR 7.256	Each console height adjustment system shall smoothly and evenly lift and lower all work surfaces together and provide the capability to stop at any time to provide a stable and secure work surfaces at any position within the height range of travel.
TR 7.257	Each console height adjustment system shall provide a minimum of two (2) adjustable preset vertical positions. One (1) preset shall position the console to the standard sit height of 724 mm (28.5 inch) and one (1) preset shall positions the console to standard stand height of 1,067 mm (42 inch). Any additional preset vertical positions available shall be set as directed by the BSCL or their designate. All presets shall be fully adjustable.
TR 7.258	The height adjustment system shall be capable of lifting a minimum static load of 200 kg (440 lbs).
TR 7.259	The height adjustment system shall be capable of adjusting the work surface the maximum range of travel (i.e., from the lowest/ highest to the highest/ lowest elevation) within 15 seconds.
TR 7.260	The height adjustment system velocity shall be constant and virtually the same rate when lifting and lowering work surfaces.
TR 7.261	Cable management system shall function without requirement for manual alteration, as the work surfaced is height-adjusted. Cables during lift and lowering operation shall be controlled and protected via a suitable mechanism such as a flexible cable chain or equivalent.
TR 7.262	Sufficient space shall be provided between moving and stationary components for safe movement, with no pinch points.
TR 7.263	Each console shall provide reasonable maintenance and service access to height adjustment system electrical and mechanical components.
Desk Binder/Manual Storage	
TR 7.264	Each console shall have one (1) binder/manual storage unit above desk top.

TR 7.265	Binder/manual storage slats shall be at least 0.61 linear metres (2'-0" linear feet) and secured to desk top.
Free Work Space	
TR 7.266	Each console shall have sufficient free work space for paper work on the console desk top.
TR 7.267	Free work space shall be at least 0.61 linear metres (2'-0" linear feet) of the console desktop.
Keyboard Trays	
TR 7.268	Each console shall have an ergonomic keyboard tray drawer installed underneath the desk workspace.
TR 7.269	Ergonomic keyboard tray drawers shall glide on steel ball bearings and shall be mounted with durable metal hardware.
Large File Drawer	
TR 7.270	Each console shall have one (1) large file drawer unit with lockable casters for storage below the desk top, minimum 305 mm (12 inch) high.
TR 7.271	As a minimum, the following drawer fronts construction material shall be available: • 17 mm (11/16 inch) particle board core with high-pressure laminate facing and edges • Steel with powder coated finish; and • Wood veneer with solid wood facing and edges
TR 7.272	Drawer glide shall be a minimum two-part precision steel ball bearing suspension, with cushioned stops, both in and out.
TR 7.273	File drawer is to expose a minimum of 100% of its overall length when fully extended from the console.
TR 7.274	File drawer shall have drawer bumpers to cushion and quiet the drawer.
TR 7.275	Drawer dividers and one (1) pencil tray shall be included in the file drawer. The pencil tray should be about 102 mm (4 inch) wide and 25 mm (1 inch) deep, and the length of the pencil tray shall be equal to the width of the drawer. The pencil tray shall be secured in the drawer in such manner to prevent its sliding during the operation of the drawer.
TR 7.276	File drawer shall be provided with compressor/hanging rails for side-to-side filing.
TR 7.277	File drawer shall accommodate legal and letter paper filing.
Reliability	
TR 7.278	Consoles shall be designed for high durability and performance.
TR 7.279	Consoles shall be warranted for 24/7 use.
Operator Workstations	
TR 7.280	Please refer to the Type 1- Workstation Specification as mentioned under IT Infrastructure Section 5.7.4.1.
Task Lights	

TR 7.281	Task lights shall maintain the required lux level (400-500 lux).
TR 7.282	The task lights shall have a professional appearance and ergonomic design to complement the console and Operations Room and Cabin / Boardroom aesthetics.
TR 7.283	Task lights cords shall be non-handed.
TR 7.284	Task lights reflector shade shall be designed to provide a glare-free lighting on work surfaces.
TR 7.285	Task lights shall be provided with a weighted base providing a minimum 340° arm rotation.
TR 7.286	The task light on/off switch shall be located in the front of the light for easy accessibility.
TR 7.287	All task lights shall use LED or low voltage lamps. Each task light shall be provided with two (2) suitable lamps. One (1) shall be installed for immediate use and one (1) shall be delivered to the ICOMC as a spare.
Multi-Functional Printers including Scanner	
TR 7.288	Printers shall be of latest laser technology & for duplex printing (colour and black and white) for all paper size including but not limited to A4, A3 size.
TR 7.289	It shall have Print Speed 30ppm or above.
TR 7.290	It shall have Resolution Min 600 x 600 dpi or better.
TR 7.291	It shall have Memory 1 GB or higher.
TR 7.292	It shall have Copy speed 12ppm or better.
TR 7.293	It shall have scanner of Flat Bed type with ADF.
TR 7.294	It shall have Interface USB 2.0, Ethernet Port.
TR 7.295	It shall have the duty cycle of monthly 5000 pages at minimum.
TR 7.296	Full toner Cartridge shall be supplied with the printer.
TR 7.297	It shall have input tray capacity of minimum 100 sheets.
TR 7.298	It shall have output tray capacity of minimum 100 sheets.
TR 7.299	Printer shall be accompanied with the necessary accessories such as connecting cables, driver media, etc.
Contact Centre Solution (For Helpdesk)	
TR 7.300	The contact centre solution for Helpdesk shall include VoIP based EPBAX, IVRS, Automatic Call Distribution (ACD), Voice Logger Server among other hardware and software. Using the contact centre solution, citizens can contact BSCL through the emergency communications system or through the contact centre helpline number.
TR 7.301	The contact centre solution shall be able to route voice/ VOIP calls from centralized Interactive Voice Response System (IVRS) to respective call centre (s) along with interaction history of the calling party.
TR 7.302	The callers shall be able to access the various services through state-of-art centralized integrated Interactive Voice Response System (IVRS). The information is envisaged to be available to the customer through telephone (IVRS) and call centres operators.

TR 7.303	The IVRS shall establish two way communication on the same channel with customers through recorded synthesized voice in Hindi / English / Oriya or in combination of languages to give information, reply to queries and provide other.
TR 7.304	IVRS shall be modular and scalable in nature for easy expansion without requiring any change in the software.
TR 7.305	It shall be possible to access IVRS through any of the access devices such as Landline telephone, Mobile phone (GSM as well as CDMA) etc.
TR 7.306	IVRS shall support various means of Alarm indications in case of system failures, e.g. Functional error, missing voice message prompt, etc., and shall generate error Logs.
TR 7.307	The system shall have the ability to define business rules based upon which the system shall quickly identify, classify and prioritize callers, and using sophisticated routing, to deliver interactions to the best qualified operator in the any of the connected local/remote call centre, regardless of interaction channel.
TR 7.308	The application shall provide (Computer-Telephony Integration) CTI services such as: • Automatic display (screen pop) of information concerning a user/customer on the call operator screen prior to taking the call based on ANI, DNIS or IVR data. • Synchronized transfer of the data and the call to the call centre operator. • Transfer of data corresponding to any query raised by any IP operator regarding a query raised by a customer whose call is being attended by the call IP operator. • Call routing facilities such as business rule based routing, skills-based routing etc.
TR 7.309	The application shall support integration to leading CTI middleware vendors.
TR 7.310	It shall provide pre-integration with industry standard IVR servers and enhance routing & screen-pop by passing forward the information.
TR 7.311	It shall provide facilities for outbound calling list management, and software based predictive or preview dialling.
TR 7.312	The application shall allow service level plans to be varied by day, time of day, or a specific date.
TR 7.313	Call Centre Operator's Desktop: The operators desktop shall have an application which shall fulfil the following functionalities: • It shall provide consistent operator interface across multiple media types like fax, SMS, telephone, email, and web call back. • Operator shall have VoIP based telephones (with digital display pads) on the workstation with wireless headsets. • It shall provide the operators with a help-desk functionality to guide the operators to answer a specific query intelligently.

	• It shall also provide an easy access to operators to previous similar query which was answered successfully. • It shall also be possible to identify a request to be a similar request made earlier. • It shall be possible for operators to mark a query as complex/typical and put in to database for future reference by other operators. • It shall be possible for operators to escalate the query.
TR 7.314	IVRS shall be able to get information /text/data from databases, convert to voice, and speaks it back to the caller in relevant/desired language.
TR 7.315	IVRS shall maintain log of all services offered which can be used for audit and analysis purpose.
TR 7.316	System shall provide for 100% recording of calls using a call logger. The recording shall contain detailed call information and the solution must provide advanced searching capabilities.
TR 7.317	Call Centre representative must have view to unified screen giving both network & service view.
TR 7.318	There shall be enough provision for supervisory view supported by Supervisory terminals.
TR 7.319	System shall be able to integrate with e–mail / sms gateway so that appropriate messages can be sent to the relevant stakeholders after the interaction and any updates thereon.
TR 7.320	Shall intelligently and automatically responds to email inquiries or routes inquires with skills based routing discipline to operators.
TR 7.321	Shall have an Intelligent distribution of email to operators.
TR 7.322	The contact centre solution shall support the following: • System shall be able to route emails to the Call agent using single system, based on the availability and skills and shall be able to send auto-acknowledgement. • System shall provide unified agent licenses to handle voice calls and emails. • System shall support auto-forward capabilities to pre-defined cell phone numbers i.e. auto patching. • System shall support single solution for inbound calls, outbound calls and emails handling and intelligently route the calls to available call agent.
EPABX System	
TR 7.323	For EPABX system, refer to EPABX Specification in Section 5.7.4.6
CTI Server, Data Base Server, Digital Voice Logger Server	
TR 7.324	It shall have latest compatible chipset supporting above processor.
TR 7.325	It shall have 64 GB memory (8x8 GB) DDR4 -1066MHz registered ECC DIMMs & expandable to up to 1.5TB.
TR 7.326	The Server shall support 48 DIMM Slots or higher.

TR 7.327	It shall have features of advanced ECC memory protection and memory mirroring.
TR 7.328	It shall have 4* 500 GB 15K SAS 6Gbps 2.5in Slim HS HDD (Hot swappable) scalable up to 16 drives.
TR 7.329	It shall have integrated hardware RAID controller and shall support Raid 0, 1 and 5 and should be provided with RAID Controller with 512 MB NV Cache.
TR 7.330	It shall have internal DVD-RW as an optical drive.
TR 7.331	The graphics controller shall be of minimum 8Mb memory.
TR 7.332	It shall have minimum 2 * 1 GbE & 2* 10Gbe network ports.
TR 7.333	It shall have minimum 7 PCI-E slots.
TR 7.334	It shall have ability to remotely configure machines completely with advance settings utility.
TR 7.335	It shall have redundant hot swap power supplies.
TR 7.336	It shall have minimum 4 hot swap redundant cooling fans. Fans should automatically adjust speeds depending on the temperature inside the server chassis.
TR 7.337	The server shall be able to alert impending failures on maximum number of components. The components covered under alerting mechanism shall at least include Processors, memory, hard disk drives.
TR 7.338	Server shall support high availability clustering.
TR 7.339	It shall have maximum form factor of 4 U.
TR 7.340	The server shall come with systems management licensed software from the OEM with Remote Power On & Power Off, Remote KVM and other features.
Network Time Protocol (NTP) based Digital Clock	
TR 7.341	The digital clock shall be synced with the Network Time Protocol (NTP).
TR 7.342	The Network Time Server (NTS) shall be a high-bandwidth NTP time server.
TR 7.343	The NTS shall synchronize with a GPS satellite.
TR 7.344	The NTS shall support a 50 nanosecond time accuracy to UTC.
TR 7.345	The NTS shall have minimum of 3 independent 10/100 Base-T ports.
TR 7.346	The NTS shall comprise of high resolution display and numeric keypad.
TR 7.347	The NTS shall compliance with IPv6 and IPv4.
TR 7.348	The NTS shall have a secure web-based management application that is intuitive for easy control and maintenance.
TR 7.349	The NTS shall support SSH, SSL, SCP, SNMP v3, custom MIB, HTTPS and Telnet protocol.
TR 7.350	The NTS shall be equipped with USB ports.
TR 7.351	The NTS shall have independent time references: GPS, IRIG B, 1PPS, 10 MHz.

TR 7.352	The NTS shall have versatile timing outputs; IRIG B, 1PPS, 10 MHz.
TR 7.353	The NTS shall be easy to configure.
TR 7.354	The NTS shall be able to synchronize a minimum of 500 clocks.
TR 7.355	The NTS shall include GPS antenna.
TR 7.356	The GPS antenna shall be roof-top mountable.
TR 7.357	The GPS antenna shall be rugged and all-weather.
TR 7.358	The GPS antenna shall have amplifier: LNA +40 dB gain and bandpass filter for out-of-band interference rejection.
TR 7.359	The GPS antenna shall come with industry standard cable with low-loss, and capable for lengths of up to 1000 feet without signal degradation.
TR 7.360	The NTP digital clock shall display digital characters in red colour.
TR 7.361	The NTP digital clock shall retains time and date during loss of power and/or reference using a battery backed real-time clock (RTC) chip and maintenance-free rechargeable battery.
TR 7.362	The NTP digital clock shall support configuration of time zone and daylight saving time parameters.
TR 7.363	The NTP digital clock shall include a software utility which provides easy configuration of clocks and generators attached to network.
TR 7.364	The digital clock shall have fully configurable network settings, including DHCP/BOOTP/STATIC IP.
TR 7.365	The digital clocks configuration shall be saved to non-volatile memory and survives power losses.
TR 7.366	The digital clock shall have password protection that prevents unauthorized clock configuration tampering.
TR 7.367	The digital clock shall have option to display time in 12- or 24-hr format – hh:mm:ss.
TR 7.368	The digital clock shall have option to display date in mm:dd:yy, dd:mm:yy or yy:mm:dd.
TR 7.369	The digital clock shall have adjustable brightness levels.
TR 7.370	The time and date shall be visible at 350 feet (100 meters).
TR 7.371	The digital clock shall be wall-mountable and comes with required mounting brackets.
TR 7.372	The digital clock case shall be in black colour.
TR 7.373	The AC input power shall be 110-240 VAC +/- 10% at 50/60 Hz +/- 1Hz.
TR 7.374	The digital clock shall support 10/100/1000 Ethernet network.
TR 7.375	The digital clock shall have an operational temperature between zero degrees Celsius (0ºC) to forty degrees Celsius (40ºC).
Matrix Switcher	
TR 7.376	The Matrix Switcher shall have a modular chassis with minimum 8 slots for I/O board insertion.

TR 7.377	The Matrix Switcher shall have a minimum of 16x16 I/O configuration.
TR 7.378	The Matrix Switcher shall support a wide selection of input and output boards that provides a variety of signal types and formats including analog, digital and control.
TR 7.379	The Matrix Switcher must support full digital signal routing of up to 1080p.
TR 7.380	The Matrix Switcher shall support signal transmission through CATx cable from transmitters and receivers.
TR 7.381	The Matrix Switcher shall have seamless switching between sources.
TR 7.382	The Matrix Switcher shall support HDCP.
TR 7.383	The Matrix Switcher must be compatible with all new AV devices.
TR 7.384	The Matrix Switcher shall be capable of audio breakaway.
TR 7.385	The Matrix Switcher shall have a simple and easy to use configuration software.
TR 7.386	The Matrix Switcher shall be capable of providing power to connected transmitter and receiver devices.
TR 7.387	The Matrix Switcher shall be rack mountable.
TR 7.388	The AC input power shall be 110-240 VAC +/- 10% at 50/60 Hz +/- 1Hz.
TR 7.389	The Matrix Switcher shall be operable between 0 and +50 °C / 10% to 90%, non-condensing.
Wireless Microphone Systems	
TR 7.390	The wireless microphone shall be synchronized via RF remote channel.
TR 7.391	The wireless microphone shall be able to pick up audio from anywhere in the room, while maintaining quality audibility.
TR 7.392	The wireless microphone shall have a 24 MHz bandwidth (13 MHz for the E band).
TR 7.393	The wireless microphone shall have greater than 103 dB(A) signal-to-noise ratio.
TR 7.394	The wireless microphone shall have a Total Harmonic Distortion less than 1%.
TR 7.395	The wireless microphone shall support pick-up pattern applicable to table setup.
TR 7.396	The wireless microphone shall have frequencies tunable in steps of 25kHz.
TR 7.397	The wireless microphone shall incorporate a clip-on microphone and body pack.
TR 7.398	The AC input power shall be 110-240 VAC +/- 10% at 50/60 Hz +/- 1Hz.
TR 7.399	The wireless microphone shall use Radio Frequency for communication.
TR 7.400	The wireless microphone be operational in temperature between ten degrees Celsius (10°C) to thirty degrees Celsius (30°C).
Audio Processor	
TR 7.401	The audio processor shall have auto switching/mixing capability.

TR 7.402	The audio processor shall accept microphone and line level signals.
TR 7.403	The audio processor shall support external volume and mute control.
TR 7.404	The audio processor shall have balance and unbalance signals.
TR 7.405	The audio processor shall be able to rack mount, shelf mount on cabinet or under desk.
TR 7.406	The AC input power shall be 110-240 VAC +/- 10% at 50/60 Hz +/- 1Hz.
TR 7.407	The audio processor shall be operable between 0 and +50 °C / 10% to 90%, non-condensing.
Audio Distribution Amplifier	
TR 7.408	The audio distribution amplifier shall have balanced or unbalanced stereo or mono on a captive screw connector, unbalanced stereo or mono on RCA connectors and a 3.5 mm stereo mini jack.
TR 7.409	The audio distribution amplifier shall have an automatic clip limiter.
TR 7.410	The audio distribution amplifier shall have front panel bass, treble, and input level controls.
TR 7.411	The audio distribution amplifier shall be able to rack mount, shelf mount on cabinet, or under a desk as per design.
TR 7.412	The AC input power shall be 110-240 VAC +/- 10% at 50/60 Hz +/- 1Hz.
TR 7.413	The audio distribution amplifier shall be operable between 0 and +50 °C / 10% to 90%, non-condensing.
Audio Extractor	
TR 7.414	The audio extractor shall be HDCP compliant.
TR 7.415	The audio extractor shall be capable of HDMI/DP audio de-embedding with analog stereo and digital S/PDIF audio outputs.
TR 7.416	The audio extractor shall be capable of de-embedding audio with/without HDMI/DP outputs connected.
TR 7.417	The audio extractor shall have simultaneous analog stereo and digital S/PDIF outputs.
TR 7.418	The audio extractor shall automatically equalize input cables.
TR 7.419	The amplifier shall be able to rack mount, shelf mount on cabinet, or under a desk.
TR 7.420	The AC input power shall be 110-240 VAC +/- 10% at 50/60 Hz +/- 1Hz.
TR 7.421	The audio extractor shall be operable between 0 and +50 °C / 10% to 90%, non-condensing.
Distribution Amplifier	
TR 7.422	The distribution amplifier shall have HDMI & DP connector inputs.
TR 7.423	The distribution amplifier shall have at least two HDMI & DP connector outputs.
TR 7.424	The distribution amplifier shall be HDCP Compliant.
TR 7.425	The distribution amplifier shall continuously verify HDCP compliance.

TR 7.426	The distribution amplifier shall support computer-video to 1920x1200, including HDTV 1080p @ 60Hz and 2k.
TR 7.427	The distribution amplifier shall support HDMI& DP specification features including data rates up to 6.75 Gbps, deep colour up to 12-bit, Lip Sync, and HD lossless audio formats.
TR 7.428	The distribution amplifier shall equalize input cables automatically.
TR 7.429	The distribution amplifier shall have built-in scaling capability to match monitor display resolutions.
TR 7.430	The amplifier shall be able to rack mount, shelf mount on cabinet, or under a desk.
TR 7.431	The AC input power shall be 110-240 VAC +/- 10% at 50/60 Hz +/- 1Hz.
TR 7.432	The distribution amplifier shall be operable between 0 and +50 °C / 10% to 90%, non-condensing.
AV Auto Switcher	
TR 7.433	The AV auto switcher shall have automatic switching capability between inputs.
TR 7.434	The AV auto switcher shall meet the minimum number of video and audio ports to support the design as a minimum. And additional 2 video and 2 audio ports for future connection.
TR 7.435	The AV auto switcher shall be capable of audio breakaway.
TR 7.436	The AV auto switcher shall have automatic scaling output and can support up to HDTV 1080p.
TR 7.437	The AV auto switcher shall have multiple digital and analog input.
TR 7.438	The AV auto switcher shall be HDCP compliant.
TR 7.439	The AV auto switcher shall be easily configurable with user friendly interface.
TR 7.440	The AV auto switcher shall be able to rack mount, shelf mount on cabinet or under desk.
TR 7.441	The AC input power shall be 110-240 VAC +/- 10% at 50/60 Hz +/- 1Hz.
TR 7.442	The AV auto switcher shall be operable between 0 and +50 °C / 10% to 90%, non-condensing.
USB KVM Extender	
TR 7.443	Please refer to the KVM Extender specifications as mentioned under IT Infrastructure Section 5.7.4.4.
Communication Cabinets with Racks	
TR 7.444	Please refer to the Communications Cabinet with Racks specifications as mentioned under IT Infrastructure Section 5.7.4.2.
Smart City Platform	
TR 7.445	The platform shall serve as the integration point for all infrastructure domains within the city, operating with strong security and high reliability for 24 hours per day and 7 days a week.

TR 7.446	The platform shall be operational with low network latency at all times. It shall have an inbuilt historian and shall provide real-time information, along with historical information and analytics.
TR 7.447	Management dashboard that provides the real-time status shall be automatically updated when certain actions, incidents and resources have been assigned, pending, acknowledged, dispatched, implemented, and completed. The above attributes shall be colour coded.
TR 7.448	Smart city platform shall include the following core components as a minimum: • Business Rules and SOP definitions – it shall enable users to define the business rules around incidents handling and emergency response as per the agreed SOPs with the Client for a smart city. • Platform – The platform shall provide a common data integration layer which can collect and contextualize information from disparate data sources regardless of individual source specific protocol. The platform shall support templatization to allow 'build-once-deploy-everywhere" functionality. • Incidents lifecycle engine – It shall manage the life cycle of incidents and related entities via pre-defined workflows. The workflow could cut across multiple systems via the interfacing modules. Workflow for operational alerts and escalations should be triggered automatically without human intervention. • Task management – It shall manage planning, preparation of an incident including resource allocation, task management, etc. • Analytics and MIS – It shall provide users with business analytics, reporting and tools to organize, evaluate and efficiently perform day to day operations. • Reports and dashboards – It shall provide filterable reports and dashboards about critical information pertaining to incidents and KPIs collated in a single view which can be drilled down further for more detailed information. • Security and Roles – It shall manage roles definition for internal and external access. • Historian: ➢ Platform shall have in-built function to store all platform related data for a user defined period of time. ➢ The platform data store shall support high-speed data acquisition and efficient data compression. The data compression for the data storage functionality shall not use any algorithms that do not allow for the storage of the tag data at their scanned rate. The stored data records shall be able to recreate the process data without any losses. ➢ The platform shall provide a real-time relational database storage for long-term storage of process data. The data store

	shall enable the storage of real-time and historical data for each analog, discrete or string tag name. It shall also store summary, event, alarm and configuration data. ➢ The platform data store shall have store and forward capability. If the data store is offline or unreachable, the engine servicing active objects shall store data locally, and forward the buffered data to the data store with time stamps and quality information when the data store server is available. • Centralized data archiving for operational data – It shall provide facility for centralized storage of operational data (time series or transactional) with high granularity and data compression capabilities. • Mobility – It shall enable operators and the crew members to access the workflow task assigned to them and act using the native mobile application. They should be able to close the loop of workflow by acknowledging the real time status of action assigned to them.
TR 7.449	The platform shall have cross functional workflows with ability to communicate between people, devices and systems.
TR 7.450	The platform software provided shall consist of Human Machine Interface (HMI) system with support for supervisory and process control, real-time data acquisition, alarm and event management, historical data collection, report generation, local or remote telemetry communications to PLC's/RTUs and internet/intranet access.
TR 7.451	The platform shall allow the operators to develop customizable SOP templates based on actual requirements.
TR 7.452	The platform shall be able to issue, log, track, manage and report on all activities underway during these modes of operation: • anticipation of incident • incident or crisis • recovery; and • incident simulation
TR 7.453	The platform shall allow creation of hierarchy of incidents and be able to present the same in the form of a tree structure for analysis purposes.
TR 7.454	The dashboard content and layout shall be configurable and information displayed on these dashboards shall be filtered by the role of the person viewing dashboard.
TR 7.455	The platform shall provide complete view of facilities, sensors, and alarms in an easy-to-use and intuitive GIS-enabled graphical interface with a powerful workflow and business logic engine.
TR 7.456	The platform shall integrate with GIS and map information and be able to dynamically update information on the GIS maps to show status of resources.
TR 7.457	The platform shall have the ability to extract data in desired formats for publishing and interfacing purposes.
TR 7.458	The platform shall have mobility devices & applications for field staff to ensure fast restoration of services in case of alarms & issues. In case of

	non-attending of alarm, decision escalations will be done automatically. After closure of issue, the workflow shall be closed with feedback from those devices.
TR 7.459	The platform shall have tightly integrated System to have all relevant information of all assets in Smart City Area to give real time status of assets & update automatically in case of failure. Note that as part of this project, an asset management system is being provided via the ERP system. Some of these functionalities shall be met using the asset management system provided as part of the ERP system.
TR 7.460	All data on the platform shall provide ability to attach documents and other artefacts to incidents and other entities.
TR 7.461	The platform shall use a hybrid architecture consisting of cloud computing and local storage and processing. In general, active data and direct feeds shall be processed and stored in local servers; historical information shall be stored on the cloud.
TR 7.462	The platform server shall be backed up at least once a day.
TR 7.463	It shall be possible to combine the different views onto a single screen or a multi-monitor workstation.
TR 7.464	The platform shall provide possibility to connect to workstations in order to be displayed in one or more video wall with one or more module/application/solution being independently and/or simultaneously being displayed and functional. The platform shall be customizable, scalable, and flexible for integration of all City Systems.
TR 7.465	The platform shall maintain a comprehensive and easy to understand audit trail of read and write actions performed on the system.
TR 7.466	The system shall also provide an integrated user interface to other third party information systems part of other packages (if any).
TR 7.467	The smart city platform shall take feeds/inputs from various sensors, citizens, real-time systems, processed data and legacy data to enable proactive monitoring, analytical prediction and cross-system communications for making an intelligent city. In terms of analysis, using this platform, the city can achieve analytics, big data analytics, business intelligence and real-time event processing. Through this platform, various 'mined' information can be shared with city officials and citizens in form of reports, dashboards, standard APIs and open-data. The platform should also allow the manufacturers of the sensors to develop integrations themselves using SDKs without affecting the applications and existing integrations. It shall also leverage an in-built IoT layer which will enable realization of all desired functionalities of the RFP. This IoT layer shall integrate and enable cross system communications along with all analytics features desired as part of the RFP for various IoT devices being installed as part of the project at present and in future.
TR 7.468	The platform shall integrate devices using their respective APIs into this platform. It shall be able to integrate any type of sensor immaterial of the technology or vendor of the respective sensor and application.
Platform Software	

TR 7.469	Platform software shall be capable of processing all inputs from all City Systems, including active data and direct feeds, with low network latency.
TR 7.470	The platform software shall provide output to the DCMS in DCMS-compatible formats – e.g., webpages and H.264.
TR 7.471	Tools for data collection and analysis, monitoring and control all services Tools shall include, but not limited to: • Applications on the platform to process inputs from select City Systems; and • Remote control software to directly monitor and control select City Systems at the facilities.
Platform Hardware	
TR 7.472	The platform hardware shall be housed within the ICOMC Rack Room.
TR 7.473	The platform hardware shall consist of multiple components including servers, storage, racks, networking systems, other IT equipment, policy-based security systems, along with supporting HVAC systems, mechanical systems, and electrical systems.
TR 7.474	City Systems using the local servers and storage shall have network connections to the platform hardware.
TR 7.475	The platform servers shall be designed such that no more than 50% of the server's hardware performance (RAM, processors, storage, etc.) is being used at any given time.
Video Display Wall	
TR 7.476	The dashboard shall be capable of simultaneously displaying one (1) to one hundred (100) independent sets of information on the video display wall. Specific outputs to be displayed shall be chosen by operators.
TR 7.477	The platform shall have the ability to automatically reconfigure the video display wall based on thresholds being met on user defined analytic parameters.
Operator's Workstation, Manager's Workstation and Boardroom Display	
TR 7.478	Platform visuals shall be displayable as an individual window, or as combination of several windows of information on the operators' workstation, manager's workstation, and boardroom display.
Electrical	
TR 7.479	The AC input power shall be 110-240 VAC +/- 10% at 50/60 Hz +/- 1Hz.
Communications	
TR 7.480	The platform hardware shall have Ethernet communications for device management. All the equipment shall support 10/10/1000 Ethernet network.
TR 7.481	The platform hardware shall support connections of up to 1000 Mbps bandwidth.
Environmental	
TR 7.482	The platform shall be operational in temperature between ten degrees Celsius (10°C) to thirty five degrees Celsius (35°C).

Local On-Site Servers	
TR 7.483	Please refer to the Servers specifications as mentioned under IT infrastructure Section 5.7.4.3.
Other Specification	
Lighting	
TR 7.484	All overhead lighting shall be LEDs both recessed direct and indirect lighting, including pot-lights.
TR 7.485	The overhead lighting treatment shall be incorporated into the other ceiling elements to create an aesthetic specialty ceiling design, in combination with the Rooms.
TR 7.486	Overhead lighting intensity shall be: • For Operations Room: at least 400 lux • For Cabin/Boardroom: at least 500 lux • For Rack Room: at least 500 lux
TR 7.487	Dimming control shall be continuous (all lights dimmable) and zone-based (with a minimum of 4 lighting zones on separate circuits).
TR 7.488	Dimming control shall have various configurations preset for the ideal operations lighting environment, based on the perimeter glass wall natural lighting conditions (e.g., sunny, cloudy, partly cloudy, night, etc.).
TR 7.489	Appropriate wall boxes for corresponding dimmer size shall be provided. Dimmers shall not be ganged in one box.
TR 7.490	Manual switches shall be used for on / off lighting control and for overriding any preset lighting configurations.
TR 7.491	Cover plates for switches shall match the colour of switches, receptacles, and receptacle cover plates. Cover plates shall be of the same manufacturer as the devices.
TR 7.492	All lighting fixtures shall be of high-grade quality over and above the standard level of quality for office lighting.
TR 7.493	Lighting arrangement shall accommodate console locations.
TR 7.494	Lighting shall be configured in order to reduce glares and reflections on console monitors and on the video wall, as well as accommodate any other lighting needs the monitors and video wall may have.
Ceiling	
TR 7.495	The specialty ceiling treatment shall incorporate the following as a minimum: • Overhead lighting • Suspended audio system components (e.g., speakers) • Fire / CO alarms • Wet sprinklers; and • Sound absorption ceiling tiles
TR 7.496	In the Operations Room, the specialty ceiling treatment shall also accommodate a fill-in wall partition between the upper edge of the video display wall and the ceiling.

TR 7.497	In Rack Room, the ceiling shall be open (to the concrete slab) to allow access to cable and fibre infrastructure and HVAC system. The ceiling slab shall be reinforced to support the fully loaded weight of cable trays, fibre trays, and the overhead electrical (power) raceway. Each of these will be securely fastened to the ceiling slab with either uni-strut bars or hangers and threaded rods.
Floors	
TR 7.498	Flooring with proper acoustic treatment shall be used to reduce the impact sound by at least 14dB.
TR 7.499	A 12 in / 0.30 m raised floating floor shall be installed, bolted to the understructure (i.e., pedestals).
TR 7.500	The raised floating floor shall have the ability to be accessed from any location within the Operations Room and Cabin / Boardroom.
TR 7.501	The baseboard treatment shall extend to conceal the 12 in / 0.3 m raised floating floor.
TR 7.502	The raised floating floor shall be capable of supporting general loading of 600 – 1200 kg / m^3 (123 – 245 lb / ft^2).
TR 7.503	The raised floating floor shall be capable of supporting in excess of the concentrated static loading of the consoles, video wall and loaded equipment racks.
TR 7.504	The raised floating floor shall be grounded.
TR 7.505	The pedestal / supporting structure for the video wall shall be fastened to the concrete slab floor.
TR 7.506	Stub conduits shall be installed in the concrete slab floor (underneath the raised floating floor) of the Operations Room.
Glass Partition Walls	
TR 7.507	The Glass partition walls to be provided between the Board Room/Cabin and Operations Room shall be made up of 12mm toughened laminated glass with frame-less structure.
TR 7.508	The glass partition shall be supported by 600mm high Modular metal partition (having the same finish as that of wall cladding) from the floor.
TR 7.509	Proper structure shall be made to ensure the fixing of glass from slab above false ceiling and flooring.
TR 7.510	Safety film shall be applied on the glass to avoid shattering.
TR 7.511	Glass shall be fitted on anodized extrusion with tool less technology and shall have a provision for replacing glass with perforated sheet/acoustic tile by removing the glass.
Environmental Conditions to be Maintained inside ICOMC	
Temperature	
TR 7.512	The temperature level shall be set at 22°C +/- 1°C.
TR 7.513	The temperature shall be digitally controlled by the building automation system; however, the occupants shall have the ability to override the automated set room temperature with a manual control in the room.

Humidity	
TR 7.514	Relative humidity level shall be constant and set to 45% - 55%.
Acoustics	
TR 7.515	A high level of noise will be generated by ICOMC activities, therefore sound insulation and sound absorptive measures shall be installed in the ICOMC, Command and Control Centre-Type 1 and Command and Control Centre-Type 2 (e.g., ceiling panels / tiles, wall panels).
TR 7.516	In order to mitigate acoustic issues, floor to slab construction is required for all walls and partitions.

5.7.1. Building Management System

Functional Requirements

Building Management System (BMS)	
General	
FR 7.186	BMS shall be installed at ICOMC building to provide the following functionalities as a minimum but not limited to: • Monitoring and control of building automation (cooling/heating control, ventilation control) • Monitoring and control of internal and external lighting in the building • Monitoring of electrical power distribution system through multi-function meters • Monitoring of DG Parameters (as applicable) • Integration with the Fire detection and alarm system • Monitor and manage energy consumption throughout the building for the purpose of tracking quality and usage of electricity • Integration with video surveillance system inside ICOMC • Integration with access control • Monitoring and control of UPS
Key functionality of BMS system	
Integration with Other systems	
FR 7.187	**Integration with HVAC System:** • Monitor and control ON/Off status and generate alarms. • Monitor and control temperature, pressure, humidity being maintained by the AC. • Monitor energy consumption related to HVAC; • BMS shall integrate with following HVAC components at a minimum (as applicable) for comprehensive monitoring and control: ➢ Central Chiller Water Systems; ➢ Air Handling Units (AHU); ➢ Fan Coil Units (FCU); ➢ Treated Fresh Air (TFA) Fans; ➢ Ventilation and Exhaust Fans; ➢ Pressurization Fans.
FR 7.188	**Integration with Lighting System:** • Functionality: ➢ Lighting control through time based sensors • Control Required: ➢ MCCB On/Off command for internal and external lighting ➢ Scheduling of On/Off of lights through BMS software

	• Monitoring Required: ➢ MCCB and On/Off status
FR 7.189	**Integration with Electrical Power Distribution System:** • Monitoring and Control functions for electrical power distribution system is as follows: ➢ Maximum demand monitoring ➢ Break status monitoring ➢ Trip status monitoring ➢ On/Off status • Breaker On/Off, trip Monitoring on a real-time basis • Status to be monitored (ON/OFF/Trip Status and relay indications and alarm): ➢ HT and LT Boards ➢ ON/OFF station at all other panels ➢ Transformers to be monitored ➢ Trip status
FR 7.190	**Integration with DG Parameters (as applicable):** • DG Sets to be monitored • Monitoring of following parameters to be done: ➢ DG On/Off status ➢ Frequency ➢ Trip status ➢ Engine fail to start (U/V Trip) ➢ Alternator field failure ➢ Alternator fail to built-up voltage ➢ DG Trip due to earth fault ➢ DG Trip due to overload ➢ DG Room Temperature ➢ Inlet Cooling Water Temperature ➢ Outlet Cooling Water Temperature ➢ Cooling water flow OK ➢ Day tank low/high ➢ HSD Tank low/high ➢ DG over speed feedback ➢ Low lube oil pressure ➢ Common engine fault alarm ➢ Auto synchronizing panel breaker status ➢ Battery weak ➢ Battery low voltage alarm ➢ PLC controller failure alarm ➢ Emergency stop operated ➢ Reversed power ➢ Oil pressure

	➢ Common shutdown • Control: ➢ Auto sync panel breaker On/Off control ➢ Emergency stop • Field Devices: ➢ Day tank and HSD tank fuel level measurement using tank level sensors ➢ Day tank and HSD tank flow measurement using flow switch sensors ➢ Fuel tank temperature monitoring
FR 7.191	**Integration with Fire Alarm and Detection System:** IP based Fire alarm system shall integrate with the BMS and the status of the fire detection system shall appear on BMS.
FR 7.192	**Integration with UPS:** UPS shall be integrated with BMS via open protocols. Monitoring of following parameters shall be done via BMS: • Battery voltage • DC voltage • Battery charging/discharging status • Estimated time before shutdown during battery discharge • Battery charging/discharging current • Load on bypass • UPS in maintenance • Rectifier failure alarm • Inverter failure alarm • Battery discharge status • Low battery warning alarm • Low battery shutdown alarm • Battery disconnect alarm • Overload alarm • Fan failure alarm • Power fuse failure alarm • Output over/under frequency alarm • Static switch unable alarm • Bypass not available alarm; and • Common alarm
FR 7.193	**Integration with Energy Monitoring System:** • The energy monitoring software shall be a web-enabled monitoring system intended to monitor the entire electrical distribution infrastructure, from incoming utility feeds to low voltage distribution points. • The system shall be designed to monitor and manage energy consumption throughout the facility, whether within a single building or across a network of buildings,

	to improve energy availability and reliability, and to measure and manage energy efficiency. • Software required for energy monitoring shall be an integral part of BMS and shall provide a seamless user experience for managing all systems integrated with the BMS. • Key features shall include: ➢ Data acquisition for metering devices, sensors and other intelligent electric devices. ➢ Graphical, real time displays of electrical distribution system for monitoring of voltage, current, power, frequency, THD, power factor, individual harmonics etc. ➢ Reporting tools with standard report templates which shall include billing reports, energy usage reports, trend reports, energy comparison reports, alarms and exception reports etc. ➢ Power Quality Analysis ➢ Energy Analytics and Measurement ➢ Energy Budgeting ➢ Energy predictive analysis ➢ Interactive historical data display and trending ➢ Demand Limiting / Load Rolling ➢ Real Time Data Tables with Standard Views ➢ Interactive Alarm Analysis with Standard Views ➢ Power Factor monitoring and reporting ➢ Interoperability with disparate devices and systems; and ➢ Third Party Device Integration through Modbus RTU and Modbus TCP protocols
FR 7.194	**Integration with Video Surveillance System:** • For a comprehensive BMS and to provide a uniform view of all systems, video surveillance with a fully IP based Network Video Recording (NVR) system shall be integrated with the BMS. This shall work in conjunction with access control and intrusion detection system to provide one-stop security solution. • BMS shall start recording video stream upon triggering from intruder alarm system and access control system. • The integrated system shall be used through the video surveillance system's own User Interface Client and also through the integrated user interface of the BMS system. • Following functionalities shall be supported by BMS upon integration with video surveillance system: ➢ Web usage and client application both shall be supported; ➢ The BMS shall support receiving of real time values, trends, alarms and event logs from the connected systems. Different levels of logs (e.g. warning, error, info) shall be available.

	➢ The BMS shall support modification of set points, time schedules and manual (override) controls in the connected systems. ➢ BMS shall support an event mapping mechanism for triggering of functions, e.g. starting video recording and turning on lights from events like unauthorised access attempt. ➢ BMS shall include centralized alarm dispatching features for all connected systems, using e.g. SMS and email. The system shall support triggering of functions based on the events from the other connected systems. ➢ The BMS shall be modular in structure, consisting of services, which are flexible to add, configure and to update.
FR 7.195	**Integration with Access Control System:** • The Access Control shall be intended to control physical access to premises and detects unauthorized access. The Access Control shall ideally be implemented as one unified system with smart network controllers and interface panels. • Access control system has the capability to classify users so that they can have access only to spaces where they are allowed to enter according to programmed time schedules. • Access Control shall be integrated with the BMS in order to provide a unified solution for security management. • Following functionalities shall be supported by BMS upon integration with access control: ➢ Access control and intrusion system shall be monitored through a graphical user interface. Web usage and client application both shall be supported. ➢ The BMS shall support receiving of real time values, trends, alarms and event logs from the connected systems. Different levels of logs (e.g. warning, error, info) shall be available. ➢ The BMS shall support modification of set points, time schedules and manual (override) controls in the connected systems. ➢ The BMS shall be modular in structure, consisting of services, which are flexible to add, configure and to update.
FR 7.196	**Integration with DG Synchronization, Auto Load Control and Auto Mains Failure Panel:** Integration shall be with DG Synchronization, auto load control and auto mains failure panel to give status to BMS.
System Architecture	
FR 7.197	Overall system architecture shall be as following: • Management Level for system monitoring and management • System Level for intelligence of the system and data aggregation; and

	• Field Level for industry standard sensors, actuators, peripherals etc.
FR 7.198	Building Management System shall consist of Administration and Programming Control Station, Ethernet network controllers, software, a family of Standalone Digital Control Units (SDCUs) consisting of field DDCs, field devices and sensors, along with a complete system of electrical interlinking wiring to fill the intent of the specification.
FR 7.199	BMS shall support open protocols such as BACnet/IP, LonWorks, and/or Modbus protocol.
FR 7.200	BMS shall provide a graphical, operator interface that allows for instant access to any connected system through a BMS software and web based standard browser.
FR 7.201	Following features shall be offered by BMS software: • Alarms • Automatic monitoring • Help facility • Logging • Report generation • Time scheduling • Data storage • Point History and Trending • Totalization • Web based software
External Integration	
FR 7.202	BMS shall integrate with ICOMC.
FR 7.203	All monitoring and control functionalities present at the BMS shall be made available at the ICOMC.

Technical Requirements

General	
TR 7.517	Building Management System (BMS) shall incorporate industry standard operating systems, communication networks and protocols. The system shall be designed to be completely modular in structure and freely expandable at any stage.
TR 7.518	Overall system architecture shall be as following: • Management Level for system monitoring and management • System Level for intelligence of the system and data aggregation; and • Field Level for industry standard sensors, actuators, peripherals etc.

TR 7.519	Each layer of the system shall operate independently of the next level up, in order to allow for fault tolerant system functionality. Most importantly, the System Level shall operate independently without support from the Management Level.
TR 7.520	Building Management System shall consist of Administration and Programming Control Station, a family of Standalone Digital Control Units (SDCUs) consisting of field DDCs, field devices and sensors, BMS software and web-based graphical interface. The BMS shall provide control, alarm detection, scheduling, reporting and information management for the entire facility as specified in this bid document.
TR 7.521	BMS shall consist of an Enterprise Server, which enables multiple DDCs (including all graphics, alarms, schedules, trends, programming, and configuration) to be accessible from a single workstation simultaneously for operations and engineering tasks.
TR 7.522	For Enterprise reporting and robust reporting capability outside of the trend chart and listing ability of the Workstation, a Reports Generating Application shall be installed on a BMS computer
TR 7.523	The system shall be support BACnet/IP, LonWorks, and/or Modbus protocol.
Standard Network Support	
TR 7.524	All DDCs, Workstation(s) and Servers shall be capable of residing directly on the Client's Ethernet TCP/IP LAN/WAN with no required gateways. Furthermore, the DDCs, Workstation(s), and Server(s) shall be capable of using standard, commercially available, off-the-shelf Ethernet infrastructure components such as routers, switches and hubs.
System Expansion	
TR 7.525	The BMS system shall be scalable and expandable at all levels of the system using the same software interface, and the same TCP/IP level and fieldbus level controllers. Systems that require replacement of either the workstation software or field controllers in order to expand the system shall not be acceptable.
TR 7.526	Web-Based BMS operation shall be supported directly by the DDCs and require no additional software.
TR 7.527	The system shall be capable of using graphical and/or line application programming language for the DDCs.
Workstation Requirements	
TR 7.528	The control station shall support 30 days of recording of BMS data.
TR 7.529	Please refer to the Workstation specification as mentioned under IT Infrastructure Section 5.7.4.1.
General Administration and Programming Workstation Software	
TR 7.530	System architecture shall be truly client-server in that the Workstation (Control Station) shall operate as the client while the DDCs shall operate as the servers. The client is responsible for the data presentation and validation of inputs while the servers are responsible for data gathering and delivery.

TR 7.531	The workstation functions shall include monitoring and programming of all DDC controllers. Monitoring consists of alarming, reporting, graphic displays, long term data storage, automatic data collection, and operator-initiated control actions such as schedule and setpoint adjustments.
Web Based BMS Requirements	
TR 7.532	Any user on the network can access the system, using the following: • Internet Explorer 11 or better • Mozilla Firefox • Google Chrome
User Interface	
TR 7.533	The operator panel on a workstation shall provide the primary interface for operator access to the BMS while also providing a tool for the annunciation of alarms and the reporting function. The operator shall have the option of switching between a text based and graphic based user interface at any time. Additionally, it shall be possible to create customized workspaces that can be assigned to user groups.
User Security	
TR 7.534	The software shall be designed so that each user of the software can have a unique username and password. This username/password combination shall be linked to a set of capabilities within the software, set by and editable only by, a system administrator.
TR 7.535	The sets of capabilities shall range from View only, Acknowledge alarms, Enable / disable and change values, Program, and Administer. The system shall allow these capabilities to be applied independently to each and every class of object in the system. The system shall allow a minimum of 10 users to be configured per workstation.
Help Facility	
TR 7.536	Software shall be provided to facilitate programming and storage of the system operation manuals in the hard-disk. The operation manual shall be retrieved by Online Help mode so as to enable the operator to self-learn the system operation, command, or function as and when needed.
TR 7.537	The facility shall contain both text and graphics to provide information about the selected function directly.
Alarms	
TR 7.538	The software shall be capable of accepting alarms directly from controllers, or generating alarms based on evaluation of data in controllers and comparing to limits or conditional equations configured through the software. Any alarm (regardless of its origination) shall be integrated into the overall alarm management system and shall appear in all standard alarm reports, be available for operator acknowledgment, and have the option for displaying graphics, or reports.
TR 7.539	Multiple priority levels of alarm shall be made available. Priority levels shall be deemed Critical Alarms and Non-critical (general) Alarms. Critical alarms shall take precedence over non-critical alarms, and high priority over low priority under normal operations.

TR 7.540	It shall be possible to automatically provide details on alarms to authorized users via emails and SMS facilities.
Logging	
TR 7.541	It shall be possible to log the status or value of system points at regular intervals or on change of state and store this on hard-disk at any of the workstation.
TR 7.542	It shall be possible to archive this information for future reference.
Report Generation	
TR 7.543	Standard reports shall be provided that shall be operator selectable to appear on the operator workstation and any selected printer on the network.
TR 7.544	Each report shall be capable of being automatically viewed/emailed to a user/recipient in Microsoft Word, Excel, and/or Adobe .pdf format.
TR 7.545	Reports can be of any length and contain any point attributes from any controller on the network.
TR 7.546	Image management functionality shall be possible to enable the system administrators to easily upload new logos or images to the system.
TR 7.547	The utility profile shall display the total consumption, measured peak for the current period and the previous period.
TR 7.548	Report generation tool shall display trending information of various building operations.
Data Storage	
TR 7.549	A history file capability shall be provided to allow automatic storage of certain records plus allow the operator to selectively direct critical real time system data and activity to a mass storage device for later recall and analysis.
TR 7.550	It shall be possible to access software packages so that the operator may format display or printouts in the form of: • Spread sheets • Bar charts • Curve plots
TR 7.551	History files shall be the source data for stored trend reports to be used for records and system analysis.
Time Scheduling	
TR 7.552	There shall be real time clock facility to help in time scheduling. The scheduling feature shall not be dependent on a central database or an operator workstation.
TR 7.553	From the workstation, it shall be possible to configure and download schedules for any of the controllers on the network.
Point History	
TR 7.554	For every analog and digital point in the system, point history shall be maintained.

TR 7.555	The system shall provide point history graphs for analog/digital points.
Point Trend	
TR 7.556	BMS shall be capable of point trending.
TR 7.557	Trend samples shall be displayed in either tabular or graphical format. A minimum of eight trended points shall be able to be displayed concurrently on a graph or report.
Totalization	
TR 7.558	For every digital point, the system shall be able to calculate: • Cumulative on-time • Cumulative off-time
TR 7.559	For every point, analog and digital, the system shall be able to calculate: • Cumulative time in alarm • Cumulative time overridden by operator • Cumulative time offline
Audit Trail	
TR 7.560	The workstation software shall automatically log and timestamp every operation that a user performs at a workstation, from logging on and off a workstation to changing a point value, modifying a program, enabling/disabling an object, viewing a graphic display, running a report, modifying a schedule, etc.
Database Manager	
TR 7.561	BMS shall include a database manager to allow the data to be managed on an integral and non-redundant basis. It shall be able to make additions and deletions to database, without affecting the existing data.
Web Based BMS Operator Software:	
TR 7.562	General: • Day-to-day operation of the system shall be accessible through a standard web browser interface, allowing technicians and operators to view any part of the system from anywhere on the network via an IP address or dedicated webpage. • The system shall be able to be accessed on site via a mobile device environment with, at a minimum, access to overwrite and view system values.
TR 7.563	Graphic Displays • The browser-BMS interface must share the same graphical displays as the Control Workstations, presenting dynamic data on site layouts, floor plans, and equipment graphics. The browser's graphics shall support commands to change setpoints, enable/disable equipment and start/stop equipment.
TR 7.564	Alarm Management • Through the browser interface, a live alarm viewer identical to the alarm viewer on the control workstation

	shall be presented, if the user's password allows it. Users must be able to receive alarms, silence alarms, and acknowledge alarms through a browser. If desired, specific operator text must be able to be added to the alarm record before acknowledgement, attachments shall be viewable, and alarm checklists shall be available.
Direct Digital Controller (DDC)	
IP based Direct Digital Controller (DDC) Hardware Requirement	
TR 7.565	All the controllers should be UL listed and BTL certified supporting to BACnet Protocol, LonWorks or Modbus. In case, controller is not BTL certified, equivalent or higher certification shall be required.
TR 7.566	The controllers shall support BACnet, LonWorks or Modbus (all) on native backplane.
TR 7.567	DDC's shall have 20% as overall spare capacity & at least one spare of each type of port shall be provided.
Direct Digital Controllers (DDC) Capabilities	
TR 7.568	Controllers shall combine both network routing functions, control functions, and server functions into a single unit.
TR 7.569	Controllers shall provide the interface between the field control devices, and connect with the control station.
TR 7.570	Controllers must be able to perform the following energy management functions as a minimum: • Time & Event programs • Holiday Scheduling • Optimum start and stop program • Night purge • Load reset • Zero energy band • Duty cycle • Enthalpy analysis and control • Run Time Totalization • Sequencing and Optimization • Exception scheduling
TR 7.571	Each DDC must have the ability to serve out web pages containing the same information that is available from the WorkStation. The development of the screens to accomplish shall not require any additional engineering labour over that required to show them at the WorkStation itself.
BACNet Fieldbus and BACNet SDCUs	
TR 7.572	**Networking** IP Network: All devices that connect to the WAN shall be capable of operating at 10 megabits per second or 100 megabits per second.
Field Input / Output Devices	

TR 7.573	**List of Field Devices** BMS shall optimize the performance of the building systems based on the input from field sensors. Field sensors to be decided and installed by the MSI as approved by the Client.
Enclosures and Panels	
TR 7.574	Enclosures for Controllers and Electrical Panels: All the controllers shall be housed in Lockable Vandal proof boxes which shall either be floor mounted or wall mounted. These shall be free standing, totally enclosed, dust and vermin proof and suitable for the climatic conditions.
Data Communication	
TR 7.575	The communication between IP controllers shall be via a dedicated communication network as per manufacturer's standards. Controller microprocessor failures shall not cause loss of communication of the remainder of any network. All networks shall support global application programs, without the presence of a host PC.
Testing	
TR 7.576	All the certificates and test reports submitted by MSI should be from UL/NABL approved labs.

5.7.2. GIS Platform

Functional Requirements

Data Services	
Data Design, Modelling & Services	
FR 7.204	MSI shall finalize the data list with all its structure & metadata for approval
FR 7.205	MSI shall carry out data integration requirement study with stake holders and submit SRS (System Requirement Study) and Architecture document for approval by considering following factors (not limited to): • Best GIS practices shall be followed in spatial positional accuracy, GIS layers overlay matching accuracy, data correctness and completeness • All the ICOMC generated, stored, linked data shall be available as necessary to integrate with BhubaneswarOne through web services or data sharing through live/real time, offline, periodical, etc. as deemed to be appropriate • Apart from ICOMC data, all other required data for BhubaneswarOne shall be carried out with suitable data design and data modelling • All required Data Modelling, Design shall be carried out by MSI to get Design Document approved from client • Scale of mapping shall be 1:1000 or better as per requirement • Integration of G2C, G2G & G2B data • Integration, Export & Import of various formats of data such as KML, JSON, XLS, XML, etc. with external systems • 3D Data of city • Objective of BhubaneswarOne shall be kept as basis for design
FR 7.206	All required data (spatial and non-spatial) are to be arranged by MSI. Client will help by issuing required authorization letters.
FR 7.207	MSI shall carry out collection of data from various agencies or Government departments
FR 7.208	Data creation - Necessary Survey, collection from various sources, compilation, digitization, accurate geo-referencing, migration, data conversion, integration & maintenance shall be carried out by MSI
FR 7.209	Responsible for identifying Data Gaps & take necessary measures & tasks to complete the data
FR 7.210	Existing data in BhubaneswarOne shall be verified for accuracy, completeness & correctness. Any shortcomings shall be rectified or updated as appropriate

FR 7.211	It is responsibility of MSI regarding required Data Quality, Correctness & completeness. MSI shall follow standard QA-QC practices in data management.
FR 7.212	Onsite support of one senior GIS Analyst full time shall be provided during contract period for technical support and coordination with stakeholders
FR 7.213	Maintenance & Operation of BhubaneswarOne Data shall be carried out during MSI's contract period
GIS Integration is required with the following modules	
Property Tax	
FR 7.214	The attribute data with the property must store (but not limited to) data such as: • Property location geographic • Property location address • Status (vacant / sold) • Current use • Owner ship details • Property tax details • Utility details
FR 7.215	User Shall be able to • Searching of Property Index Number • Property Tax link should be integrated and will have option to direct: • Property Tax-> Search on online receipt • Property Tax-> Search Ledger • Property Tax-> Pay online • GIS Application to Property Tax Module • Property Owner can be selected on the basis of : • Administrative boundary • Property Index Number • Property tax range selection • Period Selection • Who has paid, not paid. • On the basis of above search criteria, the selected Property data should be extracted: • Details of Property owner like Name, Address, PIN. • Details of Arrears There should be a link in Property Tax module for GIS View to drive into GIS Application to View/Analyse the property geographical locational details i.e. address, Plot Area, constructed area, etc.
Utility Asset Management Module:	
FR 7.216	• The GIS has to integrate with asset data of roads, water supply lines, sewage lines, storm water drains, electricity lines. The attribute shall include the following:

	➢ The location details ➢ The geometry details ➢ The engineering details ➢ The attached property details
FR 7.217	The sub-modules should have the following functions: • GIS based Asset data visualization • GIS based asset maintenance management • GIS based asset construction management • GIS based web ticketing for complaint registration and solution
FR 7.218	The user should be able to annote the Place where the asset management activity is proposed by inserting a point/Line on the map and shall be created and saved in Project layer. A query can be generated on the project layer for Project Name, Functional Group, Budget, Project date and Project status. This may be accessed by other departments which will be affected by the project work.
FR 7.219	Asset Management • Searching of Zone/Ward/ GIS layers: • Built-up area for any property maintenance and Rent • Land use land cover (LULC) area for Vacant land • Transportation for any road maintenance • Sewage and Drainage for Maintenance • Public Lighting for maintenance • The Vacant Land will be linked with Asset Management-Asset Report-Asset Category-Market Value • This will be integrated with rent & maintenance • Query can be generated on project layer for Rent: Rent Type, Rental amount, Renewal date & Land: Market Value • The Building properties will be integrated with- Asset Management • Property Index Number
Solid waste management module	
FR 7.220	• Property Index Number Indexed with Garbage Collection Point(GCP) • Category of garbage collection points will be queried and viewed on Map based on PIN • Solid Waste Management-Reports-PIN, Category.
Utility payments	
FR 7.221	• Utility payments link should be available. It should integrate and be directed to the following module: ➢ Water & electricity Charges-> Search Connection Page ➢ Water & electricity Charges-> Search online receipts ➢ Water & electricity Charges-> Search Ledger

	➢ Water & electricity Charges-> Pay online Page ➢ To select the consumer on the basis of : o Administrative boundary: Zone, Ward, Block/Locality o Property Index Number o Service No, o Property Owner, o House No. • On the basis of above search criteria selected Property will integrate with utility payments Module (database) and highlight the search output (Spatial Highlights) in GIS application and dues report will be populated in a tabular Grid consisting of: ➢ Details of Property owner like Name, Address, PIN ➢ Details of Arrears.
Grievance Redressal	
FR 7.222	The public grievance can be made addressed through e-governance (to the ERP) application as well as through GIS. In grievance the citizens are expected to mention their complete address details or could use their QR code. And accordingly the grievance registration will be highlighted on the map. • There shall be facility to mark the grievance to be addressed to which department • The grievance type shall be mentioned from options available: regarding service, bill payment, delay, incident etc. • There will be grievance subtypes also. • The grievance status shall be searchable by department as well as public: ➢ By plot number ➢ By ticket number ➢ By grievance type ➢ BY Grievance subtype • There shall be facility available to view the status of grievance resolving. ➢ Solved ➢ Unsolved ➢ Under Process There shall be facility of escalation to higher level after a defined time period.
Application Services	
Application - Design & Development	
FR 7.223	MSI shall get acquainted with current BhubaneswarOne system in all respects

FR 7.224	Detailed system requirement study, architecture & design shall be carried out with project stake holders and get approvals from client by considering following factors (not limited to): • Enterprise level Architecture, Design & Development • Service Oriented Architecture, Scalability, Interoperable standards and Agile development • User Experience with portal • Web Design and Content Management: Innovative or latest proven trends of Graphics design, Web pages, UI buttons & Tools development • Real time performance of portal at user end • User friendly & Interactive interface: Innovative UI Techniques, Easy & minimum clicks based operation by users, Scale, zoom factor based Map features display, Best practices of map features display, advanced techniques of features & symbols display management • Map cartography - International standard shall be followed in terms labelling, colour, line type, Aesthetics, Symbology, Feature overlap management, etc. • Development of Functions, Tools, Analysis, Dashboard • Development of customized advanced analysis, query, search and report generation functions as per requirement by Enterprise level integration with various systems. Implement customized spatial analysis, weightage based thematic analysis, Spread analysis, Neighbourhood analysis, required real-time geoprocessing, Thematic mapping functions, etc. followed by generation of user friendly reports • Objectives of BhubaneswarOne shall be kept as basis for design • Web Services: Development and Enablement of Web Services for integration with external systems and access by external systems – Both in BhubaneswarOne, ICOMC systems, SCADA systems and third-party systems as per requirement • Development of Mobility Solutions, Web Apps and Location Analytics • One-stop-shop or single point of interface for users of BBSR with regard to access of all smart city implementations & features • Integration & Development with Crowd sourcing, Social Media, Mobile & other Internet trends • Development of any sub systems and portals for ease of use • Integration of G2C, G2G & G2B functions • Integration, Export & Import of various formats of data such as KML, JSON, XLS, XML, CSV, GPS data, etc. with external systems • All Security aspects are considered for development

FR 7.225	Development shall be done using Portal for ArcGIS framework with best practice programming language and web development
FR 7.226	Existing functions in BhubaneswarOne shall be reviewed from its objectives, user requirement & making it successful. Any shortcomings shall be rectified or updated as appropriate
FR 7.227	Integration with external system such as ORSAC (Odisha Space Application Centre), WRIS (Water Resource Information System), ODMS (Odisha Disaster Management System), etc.
FR 7.228	Integration with Open Data System
FR 7.229	Integration with ESRI City Engine for better visualization and carrying out Urban & Transportation analysis
FR 7.230	Application development life cycle shall include best practices of coding, testing, UAT, deployment, go-live, support & maintenance
FR 7.231	Promotion & Branding of BhubaneswarOne through Digital media, Social Media, Apps & Internet
FR 7.232	Development of user communication & exchange systems through SMS, email, blogs & forums
FR 7.233	Software installations, settings, administration, data-base fine tuning for higher efficiency, performance tunings & settings, maintaining optimal database shall be carried out
FR 7.234	Conduct study, design and develop all the requisite interfaces/connectors/adapters to facilitate seamless integration & data flow and ensure open standard architecture within the existing and third party applications
FR 7.235	Develop a robust geospatial information system and decision support mechanism to aid decision making process for planning and implementation of various developmental programs in Bhubaneswar
FR 7.236	Integration with distributed computing i.e. Cloud Computing as per client requirement
FR 7.237	Manage complete operations and maintenance of the developed application and ensure that the developed application is bug / error free, running smoothly and simultaneously incorporate necessary changes in the application functionality
FR 7.238	Provide Database & System Administration support, User management & Maintenance, Backup management, Debugging, modification, tuning, monitoring and updation in the Application Software as and when required
FR 7.239	Proper version control and configuration management of the source code
FR 7.240	Handover complete source code to client after completion of project
FR 7.241	Tentative list of Main Modules (not limited to) • BTCD (ABD) • Maps (Pan city) • Asset Management (Utilities related) • Services

	➢ Dash Boards (For Integrated data from ICOMC & other systems) ➢ Other Queries, Reports & Analysis • Point of Interest (Heritage, Hospitals, Banks, Police Stations, Schools, etc.) • User Facilities (Tools, Feedback, Draw, Events, etc.)
FR 7.242	Proposed Functions list for development is given in Technical Requirements/Specification section 5.17.4.7
FR 7.243	Onsite support of one senior GIS programmer full time shall be provided during contract period for technical support and coordination with stakeholders
FR 7.244	Necessary assistance shall be provided for Cyber Security Audit of the BhubaneswarOne system
FR 7.245	Maintenance & Operation of BhubaneswarOne system shall be carried out during MSI's contract period
Hardware & Software sizing	
FR 7.246	MSI shall carry out existing setup study, analyse risk & business requirements, and carry out SRS by considering performance, scalability & other necessary factors. Submit SRS & architecture document for approval
FR 7.247	Hardware, Network & related system design document should be submitted for approval
FR 7.248	Client will procure the necessary hardware, software and setup the system. MSI shall assist in procurement with assistance of right brand, pricing, quality, etc. for successful procurement & efficient system setup

Technical Requirements

Proposed Data List and Functions

Apart from existing data & functions with BhubaneswarOne, following new Data List, Functions & Modules are envisaged. Phasing of implementation, Data List and Functions List will be finalized by client during design stage

S No.	Data List	Functions List	Module
TR 7.577	Water Supply	Network Display Asset Management Functions	Maps & Asset Management
TR 7.578	Electrical Network	Network Display Asset Management Functions	Maps & Asset Management
TR 7.579	Storm Water	Network Display Asset Management Functions	Maps & Asset Management

S No.	Data List	Functions List	Module
TR 7.580	Property Tax (Integration with BMC Property Tax Management)	Tax status & management	Other Services
TR 7.581	Road Network (Links & Node structure based)	Routing, Travel direction & other Navigation support Integration with ICOMC	Maps & Others Services
TR 7.582	Google Maps	Integration	Maps
TR 7.583	Air & Water Quality	Environmental KPI	Maps & Other Services
TR 7.584	Industrial Areas, IT Hubs, Upcoming Ports	Regional Economic Hub Analysis	Maps & Other Services
TR 7.585	Informal Settlements, Affordable Housing	Housing for all Analysis	O Maps & other Services
TR 7.586	Open Space, Mixed Landuse	Community KPI, Mobility KPI	Maps & Other Services
TR 7.587	Earthquake, Flood, Cyclone	Eco Analysis	Maps & Other Services
TR 7.588	Children Friendly Datasets	Reach to Children Hangout places	Other Services
TR 7.589	Bird Watching places	Reach to Bird Watching places	Other Services
TR 7.590	Housing layouts, Available plots, Upcoming schemes	Housing reports	Other Services
TR 7.591	Urban related data & guidelines	Urban Analysis	Other Services
TR 7.592	3D Data	3D visualization, urban analysis	Other Services
TR 7.593	Crowd Sourcing Data	Mobile functions	Mobile App
TR 7.594	Mobile Map	Map view functions	Mobile App
TR 7.595	Others	-	-
TR 7.596	ICOMC Data :		
TR 7.597	Incident Data	Incident Management System (Incident location & details, Alert system, etc.) Emergency Response System	Dashboard
TR 7.598	Traffic Data	Traffic Management (Traffic status, Live camera footage, etc.)	Dashboard

S No.	Data List	Functions List	Module
TR 7.599	Transit Data	Transit management (Bus route explore, directions of route, etc.)	Dashboard
TR 7.600	E-Governance ERP Data	E-Governance management	Other Services
TR 7.601	Others	-	-
TR 7.602	BTCD Data:		
TR 7.603	LED, Solar, Waste to Energy installations	Carbon Footprint Analysis	BTC & Other Services
TR 7.604	Rain water harvesting	Management	BTC & Other Services
TR 7.605	Solid Waste	Network Management	BTC & Other Services
TR 7.606	OFC Network	Network Management	BTC & Other Services
TR 7.607	Wi-Fi Network	Network Management	BTC & Other Services
TR 7.608	Streetlight	Network Management	BTC & Other Services
TR 7.609	Others	-	-
TR 7.610	System Integrations:		
TR 7.611	My City My Pride	Grievance management	Dashboard
TR 7.612	WTS's Water Monitoring	Monitoring	Dashboard
TR 7.613	Mo Sathi – Mobile App	Women's Safety	Dashboard
TR 7.614	CTS Police App	Citizen Safety	Dashboard
TR 7.615	Others	-	-

General	
TR 7.616	With regard to Data Services the MSI can make site visit at clients place at his own expenses to get general overview of existing & pending data
TR 7.617	Client provides Hardware, Software License & Networking to host BhubaneswarOne system as per proposed sizing by MSI
TR 7.618	All works & outputs shall be done very professionally. MSI are highly encouraged to bring innovativeness & value adds for faster turnaround of work with better quality
TR 7.619	MSI to submit their strategies, plans & process in terms of Quality maintenance, Best practices for all concerned activities of this assignment

TR 7.620	MSI to submit his understanding of the project, detailed methodology of implementation with regard to Data Services, Application Services, Sizing, Training & Handholding, AMC
TR 7.621	Attention to due diligence of data, Quality of data & application, portal user experience needs utmost attention & importance
TR 7.622	Entire work shall be carried out to client's satisfaction
TR 7.623	Any deviations from mentioned scope of work shall be listed separately by MSI in their proposal
TR 7.624	Submit Proposed Team structure and CV's of Key professionals along with proposal for evaluation

5.7.3. Data Hosting

Functional Requirement

Data Centre (DC) and Disaster Recovery Centre (DRC) Infrastructure	
FR 7.249	The proposed DC/DRC solution must adhere to all regulatory and security standards for hosting Government services as directed in the guidelines by Government (GOI) and Government of Odisha.
FR 7.250	BSCL shall approve DC/DRC sites and services based on detailed assessment report submitted by the MSI. Any known conformity of the site or services, including the locations of sites and security procedures, would lead to rectification and alteration to be made by the MSI.
FR 7.251	DC/DRC should be Active-Active mode in different seismic zones with near zero time latency.
FR 7.252	DC/DRC should be dynamically scalable to deploy virtual servers, push configuration and monitoring policies with no impact on existing data, applications and storage.
FR 7.253	DC/DRC should have dynamic load balancing capability.
FR 7.254	DC/DRC should meet uptime institute Tier III standards.
FR 7.255	DC/DRC should adhere to latest industry standards for security like ISO 27001, EAL (Evaluation assurance level).
FR 7.256	DC/DRC should not have any single point of failure.
FR 7.257	DC/DRC should have built-in redundancy mechanisms for high availability.
FR 7.258	BSCL should have secured and seamless access to its data, applications, services and storage.
FR 7.259	Disaster Recovery centre should cater to minimum 10% load for replicating critical components with dynamic provisioning capability to handle 100% load in case of failures at data centre.
FR 7.260	The data centre capabilities should be sporadically and periodically validated during project implementation and post go-live to ensure apt enter operability between DC & DRC.
FR 7.261	There should be adequate backup mechanism (Power, Bandwidth, Application, and Data) in Dc & DRC.
FR 7.262	STPI shall provide the conditioned space including HVAC, Cabinets and racks, Mechanical systems, Electrical systems and raw power to host the DC and DRC.
FR 7.263	The hardware, software and associated accessories for the tier-III DC and DRC shall be provided by the MSI.
FR 7.264	Data centre shall have multiple components including but not limited to: • Servers; • Networking systems; • Other IT equipment; • Policy-based security systems;

FR 7.265	The DC shall scalable, simple, flexible, modular and stable as per the requirements.
FR 7.266	99.99% Uptime is required for the DC Environmental Infrastructure and services.
FR 7.267	Console room should have provision for one working table, placing two consoles and one Almirah for keeping all operational manuals and associated documents.
FR 7.268	Minimum three levels of access control security are required to enter in to the server room. Server room access control should be based on dual authentication.
DC/DRC Monitoring Dashboard	
FR 7.269	MSI should provide a dashboard view for their DC/DRC solution for BSCL for virtually monitoring all smart city project related DC & DRC activities inclusive of hardware, application, data, bandwidth, manage hosting services, storage from the ICOMC.
FR 7.270	The system should provide ability to monitor, manage, control and report performance of all smart city project servers.
FR 7.271	The system should have virtual server dashboard to monitor and manage capacity of server, utilization, devices and services running on server.
FR 7.272	The system should allow for easy deployment of servers, operating systems application and services for integrating and managing such components collectively.
FR 7.273	The system should provide rack-view monitoring for power consumption, capacity, services deployed, and servers up, down and in critical state.
FR 7.274	The system should provide browser and OS independent console and web interface.
FR 7.275	The system should automatically act on policy deployment, pre-configurations and pre-defined SOPs.
FR 7.276	The system should provide route cause analysis in case of failure.
FR 7.277	The system should automatically log incidents and generate real-time alerts.
FR 7.278	The system should stringent role based security model to allow any authorised users to access and administer the system.
FR 7.279	The system should able to generate automatic and manual notifications, alerts and reports based on performance to the concerned operators/individuals.
Integration with other Systems	
FR 7.280	The DC shall be capable of integrating with other components as needed.

Technical Requirement

WAN / Internet Router	
TR 7.625	Multi-Services: Should deliver multiple IP services over a flexible combination of interfaces
TR 7.626	Ports: As per overall network architecture proposed by the bidder, the router should be populated with required number of LAN/WAN ports/modules, with cable for connectivity to other network elements.
TR 7.627	Interface modules: Must support up to 10G interfaces as per the design. Must have capability to connect with variety of interfaces.
TR 7.628	Protocol Support : • Must have support for TCP/IP, PPP, X.25, Frame relay and HDLC • Must support VPN • Must have support for integration of data and voice services • Routing protocols of RIP, OSPF, and BGP. • Support IPV4, IPV6 • Support load balancing
TR 7.629	Manageability: Must be SNMP manageable
TR 7.630	Traffic control: Traffic Control and Filtering features for flexible user control policies
TR 7.631	Bandwidth: Bandwidth on demand for cost effective connection performance enhancement
TR 7.632	Remote Access: Shall have remote access features
TR 7.633	Redundancy: • Redundancy in terms of Power supply(s). Power supply should be able to support fully loaded chassis • All interface modules, power supplies should be hot-swappable
TR 7.634	Security features: • MD5 encryption for routing protocol • NAT • URL based Filtering • RADIUS/AAA Authentication • Management Access policy • IPSec / Encryption

	• L2TP
TR 7.635	QOS Features: • RSVP • Priority Queuing • Policy based routing • Traffic shaping • Time-based QoS Policy • Bandwidth Reservation / Committed Information Rate
Data Centre TOR (Top of the Rack) Switch	
TR 7.636	Ports: • 24 or 48 (as per density required) 1G/ 10G Ethernet ports (as per internal connection requirements) and extra 2 numbers of Uplink ports (40GE) • All ports can auto-negotiate between all allowable speeds, half-duplex or full duplex and flow control for half-duplex ports.
TR 7.637	Switch type: • Layer 3
TR 7.638	MAC: • Support 32K MAC address.
TR 7.639	Backplane: • Capable of providing wire-speed switching
TR 7.640	Throughput: • 500 Mbbs or better
TR 7.641	Port Features: • Must support Port Mirroring, Port Trunking and 802.3ad LACP Link Aggregation port trunks
TR 7.642	Flow Control • Support IEEE 802.3x flow control for full-duplex mode ports.
TR 7.643	Protocols: • IPV4, IPV6 • Support 802.1D, 802.1S, 802.1w, Rate limiting • Support 802.1X Security standards • Support 802.1Q VLAN encapsulation, IGMP v1, v2 and v3 snooping • 802.1p Priority Queues, port mirroring, DiffServ • DHCP support • Support up to 1024 VLANs • Support IGMP Snooping and IGMP Querying • Support Multicasting • Should support Loop protection and Loop detection,

	• Should support Ring protection
TR 7.644	Access Control: • Support port security • Support 802.1x (Port based network access control). • Support for MAC filtering. • Should support TACACS+ and RADIUS authentication
TR 7.645	VLAN: • Support 802.1Q Tagged VLAN and port based VLANs and Private VLAN • The switch must support dynamic VLAN Registration or equivalent • Dynamic Trunking protocol or equivalent
TR 7.646	Protocol and Traffic: • Network Time Protocol or equivalent Simple Network Time Protocol support • Switch should support traffic segmentation • Traffic classification should be based on user-definable application types: TOS, DSCP, Port based, TCP/UDP port number
TR 7.647	Management: • Switch needs to have a console port for management via a console terminal or PC • Must have support SNMP v1,v2 and v3 • Should support 4 groups of RMON • Should have accessibility using Telnet, SSH, Console access, easier software upgrade through network using TFTP etc. Configuration management through CLI, GUI based software utility and using web interface
TR 7.648	Resiliency: • Dual load sharing AC and DC power supplies • Redundant variable-speed fans
Servers	
TR 7.649	Processor: • Latest series/ generation of 64 bit x86 processor(s) with Ten or higher Cores • Processor speed should be minimum 2.4 GHz • Minimum 2 processors per each physical server
TR 7.650	RAM: • Minimum 64 GB Memory per physical server
TR 7.651	Internal Storage: • 2 x 300 GB SAS (10k rpm) hot swap disk with extensible bays
TR 7.652	Network interface:

	• 2 X 20GbE LAN ports for providing Ethernet connectivity • Optional: 1 X Dual-port 16Gbps FC HBA for providing FC connectivity
TR 7.653	Power supply: • Dual Redundant Power Supply
TR 7.654	RAID support: • As per requirement/solution
TR 7.655	Operating System: • Licensed version of 64 bit latest version of Linux/ Unix/Microsoft® Windows based Operating system)
TR 7.656	Form Factor: • Rack mountable/ Blade
TR 7.657	Virtualization: • Shall support Industry standard virtualization hypervisor like Hyper-V, VMWARE and Citrix.
Blade Chassis Specifications	
TR 7.658	Minimum 6U size, rack-mountable, capable of accommodating minimum 8 or higher hot pluggable blades
TR 7.659	Dual network connectivity of 10 G speed for each blade server for redundancy shall be provided
TR 7.660	Backplane shall be completely passive device. If it is active, dual backplane shall be provided for redundancy.
TR 7.661	Have the capability for installing industry standard flavours of Microsoft Windows, and Enterprise Red Hat Linux Oss as well as virtualization solution such as VMware.
TR 7.662	DVD ROM shall be available in chassis, can be internal or external, which can be shared by all the blades allowing remote installation of software
TR 7.663	Minimum 1 USB port
TR 7.664	Two hot-plug/hot-swap, redundant 10 Gbps Ethernet or FCoE module with minimum 16 ports (cumulative), having Layer 2/3 functionality
TR 7.665	Two hot-plugs/hot-swap redundant 16 Gbps Fibre Channel module for connectivity to the external Fibre channel Switch and ultimately to the storage device
TR 7.666	Hot plug/hot-swap redundant power supplies to be provided, along with power cables
TR 7.667	Power supplies shall have N+N. All power supplies modules shall be populated in the chassis.
TR 7.668	Required number of PDUs and power cables, to connect all blades, Chassis to Data Centre power outlet.
TR 7.669	Hot pluggable/hot-swappable redundant cooling unit
TR 7.670	Provision of systems management and deployment tools to aid in blade server configuration and OS deployment

TR 7.671	Blade enclosure shall have provision to connect to display console/central console for local management such as troubleshooting, configuration, system status/health display.
TR 7.672	Single console for all blades in the enclosure, built-in KVM switch or Virtual KVM features over IP
TR 7.673	Dedicated management network port shall have separate path for remote management.
Primary Storage	
TR 7.674	Solution/ Type: IP Based/iSCSI/FC/NFS/CIFS
TR 7.675	Storage: • Storage Capacity should be minimum 5 TB (usable, after configuring in offered RAID configuration) • RAID solution offered must protect against double disc failure. • Disks should be preferably minimum of 3 TB capacity • To store all types of data (Data, Voice, Images, Video, etc.) • Storage system capable of scaling vertically and horizontally
TR 7.676	Hardware Platform: • Rack mounted form-factor • Modular design to support controllers and disk drives expansion
TR 7.677	Controllers: • At least 2 Controllers in active/active mode • The controllers / Storage nodes should be upgradable seamlessly, without any disruptions / downtime to production workflow for performance, capacity enhancement and software / firmware upgrades.
TR 7.678	RAID support: • RAID 0, 1, 1+0, 5+0 and 6
TR 7.679	Cache: • Minimum 128 GB of useable cache across all controllers. If cache is provided in additional hardware for unified storage solution, then cache must be over and above 128 GB.
TR 7.680	Redundancy and High Availability: • The Storage System should be able to protect the data against single point of failure with respect to hard disks, connectivity interfaces, fans and power supplies
TR 7.681	Management software: • All the necessary software (GUI Based) to configure and manage the storage space, RAID configuration, logical

	drives allocation, snapshots etc. are to be provided for the entire system proposed. • Licenses for the storage management software should include disc capacity/count of the complete solution and any additional disks to be plugged in in the future, up to max capacity of the existing controller/units. • A single command console for entire storage system. • Should also include storage performance monitoring and management software • Should provide the functionality of proactive monitoring of Disk drive and Storage system for all possible disk failures • Should be able to take "snapshots" of the stored data to another logical drive for backup purposes
TR 7.682	Data Protection: • The storage array must have complete cache protection mechanism either by de-staging data to disk or providing complete cache data protection with battery backup for up to 4 hours
Secondary Storage	
TR 7.683	Solution/Type: • Secondary Storage (Archival/Backup) can be on any media such as Tapes, Disks, Disk systems, etc. or its combination. (so as to arrive at lower cost per TB) • May or may not use de-duplication technology • Compatible with primary storage • Must use latest stable technology platform, with support available for next 7 to 10 years.
TR 7.684	Backup Size: • To store data as required, to meet the archival requirement for different type of data/information
TR 7.685	Hardware Platform: • Rack mounted, • Rack based Expansion shelves
TR 7.686	Software Platform: • Must include backup/archive application portfolio required
TR 7.687	Retrieval time: • Retrieval time for any data stored on secondary storage should be max. 4 hours for critical data & 8 hours for other data. This would be taken into account for SLA calculation. (Critical data means any data needing urgent attention by the Judicial System or by Police Dept. for investigation / terrorist treat perception).
KVM Switch	

TR 7.688	KVM Requirement: • Keyboard, Video Display Unit and Mouse Unit (KVM) for the IT Infrastructure Management at Data Centre
TR 7.689	Form Factor: • 19” rack mountable
TR 7.690	Ports: • minimum 8 ports
TR 7.691	Server Connections: • USB or KVM over IP.
TR 7.692	Auto-Scan: • It should be capable to auto scan servers
TR 7.693	Rack Access: • It should support local user port for rack access
TR 7.694	SNMP: • The KVM switch should be SNMP enabled. It should be operable from remote locations
TR 7.695	OS Support: • It should support multiple operating system
TR 7.696	Power Supply: • It should have dual power with failover and built-in surge protection
TR 7.697	Multi-User support: • It should support multi-user access and collaboration
Server Load balancer	
TR 7.698	Server Load Balancing Mechanism: • Cyclic, Hash, Least numbers of users • Weighted Cyclic, Least Amount of Traffic • NT Algorithm / Private Algorithm / Customizable Algorithm / Response Time
TR 7.699	Redundancy Features: • Supports Active-Active and Active-Standby Redundancy • Segmentation / Virtualization support along with resource allocation per segment, dedicated access control for each segment
TR 7.700	Routing Features: • Routing protocols RIPv1/RIPv2/OSPF • Static Routing policy support
TR 7.701	Server Load Balancing Features: • Server and Client process coexist • UDP Stateless

	• Service Failover • Backup/Overflow • Direct Server Return • Client NAT • Port Multiplexing-Virtual Ports to Real Ports Mapping • DNS Load Balancing
TR 7.702	Load Balancing Applications: • Application/ Web Server, MMS, RTSP, Streaming Media • DNS, FTP- ACTIVE & PASSIVE, REXEC, RSH, • LDAP, RADIUS
TR 7.703	Content Intelligent SLB
TR 7.704	HTTP Header Super Farm
TR 7.705	URL-Based SLB
TR 7.706	Browser Type Farm: • Support for Global Server Load Balancing • Global Server Load Balancing Algorithms • HTTP Redirection, • HTTP • DNS Redirection, RTSP Redirection • DNS Fallback Redirection, HTTP Layer 7 Redirection
TR 7.707	SLB should support below Management options • Secure Web Based Management • SSH • TELNET • SNMP v1, 2, 3 Based GUI • Command Line
Tape library	
TR 7.708	Make: • Must be specified by MSI
TR 7.709	Model: • Must be specified by MSI. All relevant technical information/brochures must be submitted
TR 7.710	Technology: • LTO 6
TR 7.711	Number Drives: • Two LTO 6 Drives
TR 7.712	Media Slots: • Minimum 45
TR 7.713	Interface: • Minimum 4 Gbps FC Interface

TR 7.714	Power Supplies • Redundant Hot Swap Power supply
TR 7.715	Fans: • Redundant Hot Swap cooling fans
TR 7.716	Software: • Security and Remote Management Software
TR 7.717	Supported Backup Software: • Should support industry leading backup software such as Symantec Net Backup
TR 7.718	Accessories: • With all required cables and accessories to install and configure in standard 19” rack and to connect to Server/SAN switch
Fire Proof Enclosure	
TR 7.719	The overall design of the safe should be suitable for safe storage of computer diskettes, tapes, smart cards and similar devices and other magnetic media, paper documents, etc. the safe should have adequate fire protection.
TR 7.720	Capacity: • 300 Litres
TR 7.721	Temperature to Withstand: • 1000° C for at least 1 hour
TR 7.722	Internal Temperature: • 30° C after exposure to high temperature For 1 hour
TR 7.723	Locking: • 2 IO-lever high security cylindrical / Electronic lock

5.7.4. IT and Other Common Infrastructure

5.7.4.1. Workstations

The specification for all the Workstations (including operator workstation) shall be common.

Technical Requirements

Type 1 Workstations	
TR 7.724	The workstations shall have a wireless optical mouse with USB connection complying with FCC and CE norms.
TR 7.725	The workstation shall be Energy star 5.0/BEE star certified.
TR 7.726	The workstations shall be rack mounted.
TR 7.727	The workstations shall have a 107 Quiet Key English wireless keyboard with USB connection.
TR 7.728	Keyboards, Mouse and accessories shall be connected via respective signal extender as required.
TR 7.729	Workstation shall have a standard audio sound card and speakers.
TR 7.730	The workstations shall have an Intel Core i7, 4th Generation, quad core processor with 3.40 GHz, with 2MB secondary level cache or better.
TR 7.731	The workstations shall have at least 16 GB DDR3 memory @ 1600 MHz.
TR 7.732	The workstations shall have a min. of 4 DIMM slots supporting up to 32GB ECC. One DIMM Slot must be free for future upgrade.
TR 7.733	The workstations shall have a min. 1 TB SATA III hard disk @ 7200 RPM or higher.
TR 7.734	The workstations shall have shall a colour LED monitor of minimum 21” diagonal non-glare screen and a dual AMD Radeon HD 7470 full height video adapter with VGA, DVI, and HDMI ports or better.
TR 7.735	The workstations shall have graphic accelerator of ATI Rage Pro/AGP graphics accelerator, 5 MB SDRAM. The workstation shall provide connectivity to dual monitors and Video Wall.
TR 7.736	The graphics card shall have a minimum resolution of 2560 x 1440 with 5ms response time or better specifications.
TR 7.737	The workstations shall have a DVD multi burner and Dual Layer DVD-RW as an internal optical drive or better.
TR 7.738	The workstations shall have an industry-standard professional-grade operating system. Acceptable systems include Microsoft Windows 8 or better.
TR 7.739	The workstations shall have at the minimum ports: 1 serial, 6 USB 2.0 or higher with 2 in the front, integrated autosensing RJ-45 network interface, and Line-In/Mic In and Line-out/speaker Out (3.5 mm) audio in/out jacks.
TR 7.740	The workstations shall have an expansion bus of 3 PCI Slots; 4 ISA Slots (3 slot shared).
TR 7.741	The workstations shall have Microsoft Office Professional and Antivirus.

TR 7.742	Other pre-loaded software (open source/ free) shall be Latest version of Adobe Acrobat Reader, Scanning Software (as per scanner offered). These software shall be pre-loaded (at the facility of OEM or any other location) before shipment to Authority offices/locations.
TR 7.743	The AC input power shall be 230 VAC +/- 10% at 50/60 Hz +/- 1Hz.
TR 7.744	The workstations shall have a dual port 1 Gbps Ethernet network interface card.
TR 7.745	The workstation shall be operational in temperature between ten degrees Celsius (10°C) to thirty degrees Celsius (30°C).
TR 7.746	The workstation shall be loaded with advanced antivirus, antispyware, desktop firewall, intrusion prevention (comprising of a single, deployable agent) which can be managed by a central server.
Type 2 Workstations	
TR 7.747	The workstations shall have a wireless optical mouse with USB connection complying with FCC and CE norms.
TR 7.748	The workstation shall be Energy star 5.0/BEE star certified.
TR 7.749	The workstations shall have a 107 Quiet Key English wireless keyboard with USB connection.
TR 7.750	Keyboards, Mouse and accessories shall be connected via respective signal extender as required.
TR 7.751	Workstation shall have a standard audio sound card and speakers.
TR 7.752	The workstations shall have an Intel Core i7, 4th Generation, quad core processor with 3.40 GHz or better.
TR 7.753	The workstations shall have at least 16 GB DDR3 memory @ 1600 MHz.
TR 7.754	The workstations shall have a min. of 4 DIMM slots supporting up to 32GB ECC. One DIMM Slot must be free for future upgrade.
TR 7.755	The workstations shall have a min. 1 TB SATA III hard disk @ 7200 RPM or higher.
TR 7.756	The workstations shall have shall a colour LED monitor of minimum 21” diagonal non-glare screen and a dual AMD Radeon HD 7470 full height video adapter with VGA, DVI, and HDMI ports or better.
TR 7.757	The workstations shall have graphic accelerator of ATI Rage Pro/AGP graphics accelerator, 5 MB SDRAM. The workstation shall provide connectivity to dual monitors and Video Wall.
TR 7.758	The graphics card shall have a minimum resolution of 2560 x 1440 with 5ms response time or better specifications.
TR 7.759	The workstations shall have a DVD multi burner and Dual Layer DVD-RW as an internal optical drive or better.
TR 7.760	The workstations shall have an industry-standard professional-grade operating system. Acceptable systems include Microsoft Windows 8 or better.

TR 7.761	The workstations shall have at the minimum ports: 1 serial, 6 USB 2.0 or higher with 2 in the front, integrated autosensing RJ-45 network interface, and Line-In/Mic In and Line-out/speaker Out (3.5 mm) audio in/out jacks.
TR 7.762	The workstations shall have an expansion bus of 3 PCI Slots; 4 ISA Slots (3 slot shared).
TR 7.763	The workstations shall have Microsoft Office Professional and Antivirus.
TR 7.764	Other pre-loaded software (open source/ free) shall be Latest version of Adobe Acrobat Reader, Scanning Software (as per scanner offered). These software shall be pre-loaded (at the facility of OEM or any other location) before shipment to Authority offices/locations.
TR 7.765	The AC input power shall be 230 VAC +/- 10% at 50/60 Hz +/- 1Hz.
TR 7.766	The workstations shall have a dual port 1 Gbps Ethernet network interface card.
TR 7.767	The workstation shall be operational in temperature between ten degrees Celsius (10°C) to thirty degrees Celsius (30°C).
TR 7.768	The workstation shall be loaded with advanced antivirus, antispyware, desktop firewall, intrusion prevention (comprising of a single, deployable agent) which can be managed by a central server.
Type 3 Workstations	
TR 7.769	The workstations shall have a wireless optical mouse with USB connection complying with FCC and CE norms.
TR 7.770	The workstation shall be Energy star 5.0/BEE star certified.
TR 7.771	The workstations shall have a 107 Quiet Key English wireless keyboard with USB connection.
TR 7.772	Workstation shall have a standard audio sound card and speakers.
TR 7.773	The workstations shall have an Intel Core i7 4th Generation, quad core processor with 3.40 GHz or better.
TR 7.774	The workstations shall have at least 8 GB DDR3 memory @ 1600 MHz.
TR 7.775	The workstations shall have a min. of 4 DIMM slots supporting up to 32GB ECC. One DIMM Slot must be free for future upgrade.
TR 7.776	The workstations shall have a min. 1 TB SATA III hard disk @ 7200 RPM or higher.
TR 7.777	The workstations shall have shall a colour LED monitor of minimum 21” diagonal non-glare screen and a dual AMD Radeon HD 7470 full height video adapter with VGA, DVI, and HDMI ports or better.
TR 7.778	The graphics card shall have a minimum resolution of 2560 x 1440 with 5ms response time or better specifications.
TR 7.779	The workstations shall have a DVD multi burner and Dual Layer DVD-RW as an internal optical drive or better.
TR 7.780	The workstations shall have an industry-standard professional-grade operating system. Acceptable systems include Microsoft Windows 8 or better.

TR 7.781	The workstations shall have at the minimum ports: 1 serial, 6 USB 2.0 or higher with 2 in the front, integrated autosensing RJ-45 network interface, and Line-In/Mic In and Line-out/speaker Out (3.5 mm) audio in/out jacks.
TR 7.782	The workstations shall have an expansion bus of 3 PCI Slots; 4 ISA Slots (3 slot shared).
TR 7.783	The workstations shall have Microsoft Office Professional and Antivirus.
TR 7.784	Other pre-loaded software (open source/ free) shall be Latest version of Adobe Acrobat Reader, Scanning Software (as per scanner offered). These software shall be pre-loaded (at the facility of OEM or any other location) before shipment to Authority offices/locations.
TR 7.785	The AC input power shall be 230 VAC +/- 10% at 50/60 Hz +/- 1Hz.
TR 7.786	The workstations shall have a dual port 1 Gbps Ethernet network interface card.
TR 7.787	The workstation shall be operational in temperature between ten degrees Celsius (10°C) to thirty degrees Celsius (30°C).
TR 7.788	The workstation shall be loaded with advanced antivirus, antispyware, desktop firewall, intrusion prevention (comprising of a single, deployable agent) which can be managed by a central server.

5.7.4.2. Communication Cabinets with Racks

Functional Requirements

Communications Cabinets with Racks	
FR 7.281	The cabinets shall be capable of accommodating all the network devices to support the design requirements.
FR 7.282	All cabinets shall be designed to carry the anticipated load of all equipment that shall be installed inside the cabinet including having at least 30% spare capacity per rack.
FR 7.283	All cabinets shall be provided with standard accessories including vertical and horizontal cable manager, lights, fans, and power bars as needed to support the design requirements of this Project.

Technical Requirements

Communications Cabinets with Racks	
TR 7.789	The cabinets shall be capable of accommodating all the network devices to support the design requirements and shall include at least size 42U racks.
TR 7.790	All cabinets shall be supplied with standard 19” wide rack mount assemblies that shall allow for mounting of standard rack-mount equipment.
TR 7.791	All cabinets shall be supplied with standard lockable doors.

TR 7.792	The cabinets shall be IP55 rated.
TR 7.793	All cabinets shall have provision for cable entry from top & bottom of rack with knock-off, pre-punched marked openings.
TR 7.794	All cabinets shall have vertical cable managers in front with suitable accessories on each side of the rack with covers for concealed wiring within the rack.
TR 7.795	Front door shall be made of Tinted toughened glass and should be lockable.
TR 7.796	All cabinets shall have equipment mounting frame (rail notches) for mounting of equipment.
TR 7.797	Shelves for equipment placement shall be provided as required.
TR 7.798	All cabinets shall be designed to carry the anticipated load of all equipment that shall be installed inside the cabinet with at least 30% spare per rack.
TR 7.799	All cabinets shall be provided with standard accessories including vertical and horizontal cable manager, lights, fans, and power bars as needed to support the design requirements of this Project.
TR 7.800	The rack shall have ventilation louvers or uniform perforations on side panel & rear door & equipment cooling with fans (4nos.) housed in fan trays.
TR 7.801	Two strips each with minimum 8 numbers of 5A/15A, 230 VAC power outlets with MCB, inbuilt surge suppressor & line filter for conditioned power output shall be provided.
TR 7.802	The device shall support operating temperature range of 0°C to +45°C with ambient relative humidity of 10-90% non-condensing.
Outdoor Enclosure (as needed)	
TR 7.803	Minimum 6RU weather proof NEMA 4X/IP65 compliant UV resistant outdoor metallic enclosure in conformance with DIN 41494.
TR 7.804	Vandal proof design with single side door and with minimum IP 55 compliant industrial lock.

5.7.4.3. Servers

Technical Requirements

TR 7.805	Servers will be provided to support local processing and storage as per the solution proposed by the Bidder and as per the Application.
TR 7.806	A sufficient number of physical servers shall be provisioned such that their CPU, RAM, and other key server component performance do not individually exceed 50% utilization individually.
TR 7.807	The MSI shall provision sufficient amount of storage to support the operational needs.
TR 7.808	The server shall have 2x Dual Core Intel Xeon E7-8893 v4, 2.66 GHz, 15 MB Cache, 1333 MHz FSB or better.

TR 7.809	The server shall have 16 GB of RAM and 5 TB of storage as a minimum. The memory shall be scalable to double the capacity configured.
TR 7.810	The Server shall include hard drives based on volume of data to be stored. The transaction data storage requirements shall be estimated based on total transactions & related calculations as per the functional requirements.
TR 7.811	The server shall be scalable to 2 processors with each having a minimum of 6 cores per processor.
TR 7.812	The server shall include a Network Controller, 2 Gigabit Server Adapters with TCP/IP Offload Engine one standalone and one embedded on the motherboard.
TR 7.813	The Server shall include (6) PCI-Express x4 or (2) PCI-X 64-Bit/133MHz.
TR 7.814	The Server shall include at least 5 - USB 2.0 or higher (preferable) compatible ports.
TR 7.815	The Server shall include 2-Hot plug redundant power supplies and cooling fans.
TR 7.816	The Server shall have an Optical Drive 48x SATA CDRW/DVD Combo Drive.
TR 7.817	The Server shall include 1 Serial port and 1 VGA (+1 front VGA on rack models).
TR 7.818	The Server chassis shall be rack mountable and include rack mounting hardware.
TR 7.819	The Server shall include a RAID 5 storage controller supporting up to (8) hot-plug Serial-attached SCSI (SAS) drives.
TR 7.820	The Operating System shall be Licensed version of 64 bit latest version of Linux/ Unix/Microsoft® Windows based Operating system.
TR 7.821	Suitable commercial off-the-shelf antivirus software shall be provided for the duration of the contract.
TR 7.822	The central system server shall have a hot standby to mitigate any risk of failure in central system which halts the system performance.
TR 7.823	Server shall be designed to provide a fully redundant and fault tolerant system and shall be available for 99.99% or greater. The unscheduled down time shall be less than 0.01%.
TR 7.824	Server shall be provided with the server load balancers and link load balancers as needed to optimize the overall IT infrastructure operations.
Link Load Balancer	
TR 7.825	Link load balancer shall be an appliance based solution with minimum 64 bit speed core architecture and purpose built hardware for overall high performance. It shall have a minimum of 64 GB RAM and at least 8x10G SFP+ ports. It shall have minimum of 120 Gbps throughput. Shall support security features like reverse-proxy firewall, sync-flood and denial of service attack protection from day one. It shall support multiple Internet links in active-active load balancing and active-standby failover mode.

TR 7.826	It shall support built-in failover decision/health-check conditions. It shall also support failover and High Availability (HA) requirements. It shall have redundant power supplies. Shall support script based functions support for content inspection, traffic matching and monitoring of HTTP, SOAP, XML, diameter, generic TCP, TCPS.
Server Load Balancer	
TR 7.827	Multi-tenant hardware with multicore CPU support. It shall support minimum four (4) virtual instances and shall be scalable to 16 instances on the same appliance. Shall have minimum of 10 Gbps of system throughput per virtual instance to support multiple load balancing and security functions. Shall have minimum of 8x10G SFP+ interfaces from day one. Shall have security features like reverse-proxy firewall, sync-flood and denial of service attack protection from day one.
TR 7.828	Server load balancers shall support script based functions support for content inspection, traffic matching, and monitoring of HTTP, SOAP, XML, diameter, generic TCP and TCPS.

5.7.4.4. USB KVM Extender

Technical Requirements

USB KVM Extender	
TR 7.829	The extender shall extend USB, keyboard, audio, video and mouse signals through a single cable CATx cable.
TR 7.830	The extender shall provide control on both the local and remote location. Controls include and not limited to video, keyboard, mouse and USB.
TR 7.831	The extender shall extend signals to a minimum distance of 300m via CATx cable.
TR 7.832	The extender shall automatically synchronizes the time delay of RGB signals to compensate for distance and support Auto Signal Compensation (ASC).
TR 7.833	The extender shall support high resolution video up to 1920 x 1200Hz (150 m); 1280 x 1024 at 300 m.
TR 7.834	The AC input power shall be 110-240 VAC +/- 10% at 50/60 Hz +/- 1Hz.
TR 7.835	The extender shall support auto-negotiable 10/100/1000 Ethernet network.
TR 7.836	The extender shall be operational in temperature between ten degrees Celsius (10°C) to thirty degrees Celsius (30°C).

Other Common Infrastructure

5.7.4.5. Uninterruptable Power Supply (UPS)

Functional Requirements

FR 7.284	The UPS unit shall be on-line UPS with extendable rack system.
FR 7.285	MSI will responsible to calculate the tentative equipment load. Based on the MSI design, a 3:3 phase UPS or a 3:1 phase UPS shall be proposed
FR 7.286	The UPS design shall ensure that a single component/ device failure shall not result in failure of the entire UPS system. The design of UPS System shall be modular to permit easy maintenance.
FR 7.287	The various overload capacities of inverters, static switch, and step down transformer/voltage stabilizer as specified herein are the minimum requirements.
FR 7.288	The UPS system to be supplied by the MSI shall have maximum humming noise level of 65 DB one meter away from the UPS cabinets. This shall not exceed 69 dBA measured 5 feet from surface of the UPS.

Technical Requirements

TR 7.837	The UPS unit shall include Valve Regulated Sealed Maintenance Free Lead Acid Batteries shall be used with a 20 hours discharge rating with a typical lifetime of five (5) years and minimum reserve time of four (4) hours under full load conditions. The battery system design shall be provided with necessary devices to prevent deep discharge beyond recommended limits to prevent the batteries discharging beyond end cell voltage specified by the battery maker. The connections from battery to battery shall be by using copper bus bar strips.
TR 7.838	Minimum backup time of the UPS shall be 30 minutes unless otherwise specified in various subsystems of the RFP.
TR 7.839	UPS shall be of N+1 redundant configuration to ensure 99.9% of uptime of the operations.
TR 7.840	UPS shall support: • Output Power Factor at Full Load:- Unity Power factor (KVA=KW) • Input Power Factor at Full Load:- > 0.99 (full load).
TR 7.841	The UPS unit shall provide an output of 230V AC 50 Hz. The MSI shall be responsible for any conversions needed to support this output configuration.
TR 7.842	The UPS and batteries shall be mounted in a separate cabinet & the enclosure shall be under lock & key, utilising the minimum possible space and arranged in an aesthetic manner.
TR 7.843	The UPS shall be of True online with double conversion topology.
TR 7.844	The UPS shall have a microprocessor-based unit status and control display with the status and alarm indicators displayed on the status LED indicator and LCD display.
TR 7.845	The UPS unit shall have load level indicators that display the approximate electrical load placed upon the UPS. The UPS unit shall have a row of battery level indicators that display the approximate battery capacity.
TR 7.846	The UPS shall have self-diagnostic functionality to detect any failure/fault in the UPS system and shall display the same on the LCD display of the UPS.
TR 7.847	The UPS unit shall have a minimum of the following LED indicators: • UPS Mode: On-line, Backup/Battery and Bypass; • Over Load Indicator: This will display when UPS is running on overload; • Battery Status Indicator: This will illuminate when battery is low or faulty/disconnected; and • System Fault: This will illuminate when there is some fault or interruption in UPS.
TR 7.848	The UPS unit shall have minimum of the following audible alarms:

	• Line Failure: This will be audible when required input electrical supply to UPS is not available; • Battery Low: This will be audible when battery voltage falls below the threshold value; • Bypass Mode: This will be audible when UPS is running on bypass mode; and • System Fault: Audible alarm will be generated when any fault is detected in the UPS system.
TR 7.849	The UPS unit shall have following readings on the LCD panel as minimum: • Voltage and frequency Levels: This shall display input and output voltage and frequency levels; • Battery Voltage: This shall display battery voltage in Volts; • Load: This shall display the load connected in percentage to the UPS output; and • Temperature: This shall display the internal temperature of UPS unit for overheating.
TR 7.850	The UPS unit shall include full-time protection from sudden voltage increase with inrush protection and AC line filtering.
TR 7.851	UPS shall provide an overload alarm and circuit breaker designed to operate at an overload of 200% surge.
TR 7.852	The UPS unit shall include Ethernet communication port to support remote management and monitoring capabilities using SNMP including alarm contacts and remote shutdown. Remote monitoring and testing software shall be included. The manufacturer shall provide all SNMP traps.
TR 7.853	The UPS unit shall be capable of starting without input power. The unit shall start up and operate from the battery, with output frequency same as the last operating frequency.
TR 7.854	The UPS unit shall include automatic restart. Upon restoration of utility AC power after complete battery discharge, the UPS shall automatically restart and resume operation.
TR 7.855	The UPS unit shall be enclosed to prevent accidental contact with energized parts.
TR 7.856	The UPS unit shall have a built-in input fuse and/or a circuit breaker for protection from over voltage and current variations.
TR 7.857	The UPS unit shall provide an over voltage shutdown and shall have overvoltage protection.
TR 7.858	The UPS unit shall provide short circuit shutdown protection.
TR 7.859	External battery charger (if required) for the specified battery bank shall be provided. The battery charger shall automatically recharge the battery.
TR 7.860	The external battery charger shall be provisioned to be mounted in the cabinet or UPS itself. Except this, no separate space will be provided for mounting of the external charger.
TR 7.861	The UPS unit shall be compliant to IEC 62040-1 safety standards.

TR 7.862	The UPS system shall have an operating temperature of 0 degrees to 40 degrees C.
TR 7.863	Any field UPS system (as per MSI's design) shall be supplied with an environmentally rated cabinet for installation of the UPS and batteries. The cabinet shall have a rating of IP 55. The cabinet shall be supplied with in-built fans and proper ventilation as needed to ensure that the temperature inside the cabinet does not exceed 40 degrees C at any given point in time.
TR 7.864	All the Input and output cabling and related ancillary works (civil/electrical, etc.) shall be in the scope of the Bidder.
TR 7.865	UPS shall be compatible for integration with Building Management System (BMS), if applicable.

5.7.4.6. EPABX System

Technical Requirements

EPABX System	
TR 7.866	It shall have provision for at least 100 IP phone extensions expandable to 150 Extensions.
TR 7.867	It shall have 6 Party Internal/External Multi group Tele-conferencing facility to all the Call Takers, Dispatchers and Supervisors/ Managers etc.
TR 7.868	It shall be provided with Digital Operator Console.
TR 7.869	It shall support all the standard features like Call Transfer, Call Forward, Call pick-up, Call hold, Call Barge-in, Call Back, Do not disturb, Speed Dialling, Call Parking, Paging (both external and internal), Class of Service, Calling Line Identification (CLI) on digital as well as analog extension and external lines etc.
TR 7.870	It shall be possible to park up to 10 calls in the system.
TR 7.871	At minimum, it shall have 1 Trunk Card of 8 lines with Caller Line Identification (CLI) to connect Land Line / GSM Phones.
TR 7.872	It shall have ISDN PRI Cards 4 Nos. at minimum that shall be expandable for 8 Nos.
TR 7.873	It shall have PCM-TDM, IP, Non-blocking as technology.
TR 7.874	It shall support all Telecom interfaces.
TR 7.875	It shall have ISDN interface for digital & Basic interface for Analog lines.
TR 7.876	It shall support analog, digital and IP/ Soft phone.
TR 7.877	It shall have maximum loop resistance of 2500 ohms including telephone for analog extensions.
TR 7.878	It shall have Integrated Voice messaging system with required channels for IVRS function.
TR 7.879	It shall have Voice messaging-Pre-defined text to voice conversion information.
TR 7.880	It shall have an estimated wait time in case if all operators are busy.
TR 7.881	It shall have voice mail instructions to caller in case all the operators are busy.
TR 7.882	It shall have maximum loop resistance of 1200 ohms at –48 Volts DC for analog trunk lines.
TR 7.883	It shall have 6 party In and Out Multi group conferencing facility to be provided to all the Call Takers, Supervisor and Manager etc. (To be configurable Dynamically).
TR 7.884	It shall have Digital Extension telephone instrument with following features: • Programmable one touch keys; • Display-tilt able Graphical display; • Keys with LED; • Optical call alert RED status LED. • Menu/speaker with RED LEDS

	• 4 Programmable keys with dual function; • 10 fixed function keys. • Control keys+/- • 5 way navigator • Hands free talking (full Duplex) • No Mechanical parts. • Should support add on key panel module. • Interface - 3.5 mm jack for connecting handset • Headset with microphone
TR 7.885	Hands free/Headphone shall support following features: • Wired • On-the-ear Headset • Closed Headset • 32 ohm Headset Impedance • 40 mm Headset Driver Units • Headset Frequency Response: 10 - 24000 Hz • Headphone Jack: 3.5 mm • Cord Type: 1.3m • Microphone Type: Built-in-Microphone • Noise Reduction and Cancellation: Passive Noise Reduction (Microphone) • Other Sound Features: Pure Bass, Blocks Ambient Noise
TR 7.886	It shall support SIP based communications.
TR 7.887	It shall provide industry tested, proved and market leading switches to ensure smooth installation and protecting businesses existing call centre hardware investment.

5.7.4.7. Data Security

The smart city network architecture shall adopt an end-to-end security model that protects data and infrastructure from malicious attacks, thefts, natural disasters, etc. The architecture shall be implemented in such a way that the system is protected from hackers and other threats. The data security system shall address security policies, hardware and software, along with the connectivity between the field device and the respective application.

Note that the client at its discretion may have the authority to carry a security audit of the entire system during the course of the Project or post implementation at regular intervals.

Functional Requirements

Functional Requirements	
FR 7.289	An end-to-end data security system shall be provided for strong and reliable security for the entire fibre infrastructure, active electronics, Wi-Fi system, surveillance system, and other field equipment, software and hardware.

FR 7.290	Overall, the IT architecture shall refer to the architecture suggested by National Institute of Standards and Technology (NIST) and CSA's (Cloud Security Alliance) Cyber Security Guidelines for Smart City Technology Adoption.
FR 7.291	Firewall shall be implemented at ICOMC and POP for network security.
FR 7.292	Security services used to protect the overall solution shall include: identification, authentication, access control, administration and audit, as per industry standards and protocols.
FR 7.293	System shall support advanced user authentication mechanisms including digital/e-certificates, biometric authentication, e-signatures, etc. and shall have compliance with all state level and national level initiatives.
FR 7.294	Security design shall support industry standards based identity management system, security of physical and digital assets, data and network security, backup and recovery, along with disaster recovery system.
FR 7.295	The system shall be capable of detecting denial of service (DDoS) and remediation.
FR 7.296	The system shall include industry standards based firewall and antivirus, and shall provide content filtering, tracking, lockdown, and malware detection and prevention capabilities.
FR 7.297	The MSI shall ensure that the security policy is maintained and updated as per the latest industry standards including ISO 27001, BS 7799 and BS 15000 guidelines.
FR 7.298	Message exchange between various applications should be fully encrypted and authenticated. Any applications hosted on cloud should talk to the applications hosted on cloud only through predefined APIs.
FR 7.299	All applications hosted on cloud should support multi-tenancy with adequate authentication, encryption and role based access control mechanism.
FR 7.300	All communications to the devices and their respective management applications shall happen through the Project specific network. Adequate security checks to protect the data shall be implemented as part of the overall data security.
FR 7.301	Any wireless sensors implemented as part of the Project shall only communicate to authorized wireless networks and shall not connect to rogue networks. This shall be in compliance with the guidelines as published by Department of Telecom (DoT).
FR 7.302	Wireless layer of the network shall be segmented for public use and for city utilities by using VPN or separate networks in the wired core.
FR 7.303	All traffic from city equipment/sensors to the application servers shall be encrypted Secure Socket Layer (SSL) or SSH and authenticated prior to sending any information. The data at rest or in transmit must be encrypted.
FR 7.304	All authentication of sensors in the network shall happen at the time of implementing the sensors and adding them to the system and shall be based on physical characteristics of sensors like MAC ID, Device ID, etc.

FR 7.305	The field equipment shall not have any physical interface for administration. Monitoring of systems and networks shall be undertaken remotely.
FR 7.306	The POP facilities shall have the following – firewall, intrusion detection and intrusion prevention systems, web application firewalls, behavioural analysis systems for anomaly detection, correlation engine, denial of service prevention device, advanced persistent threat notification mechanism, etc.
FR 7.307	All applications implemented as part of the Project shall undergo static and dynamic security testing before implementation and shall be continuously tested with respect to security on a regular basis at least once a year.
FR 7.308	All information that flows on the network should be encrypted to ensure safety and privacy of confidential data. The devices at each endpoint of the network should be authenticated (using mechanisms based on attributes like passwords).The authentication system used on these endpoint devices shall ensure that only authorized users are sending data over the network and there is no rogue data that is sent to the control systems to generate false alarms or sabotage the systems.
FR 7.309	Care shall be taken while transmitting confidential information over public networks to other government agencies with a prior permission from the concerned authority.
FR 7.310	Confidential information not being actively used, when stored or transported in computer-readable storage media (such as magnetic tapes or CDs), shall be stored securely under lock and key.
FR 7.311	Unauthorized disclosure of data shall be protected when computers are sent out for repair or used by others within or outside ICOMC and the data could be deleted. All data stored on hard disks shall be backed up and erased via user-transparent processes.
FR 7.312	All the internet activity shall be logged and monitored, and appropriate network devices shall be deployed so that access controls and related security mechanisms could be applied.
FR 7.313	Any system attacks should be well defended at device level and overall system level and shall include anti-virus mechanism. All system logs shall be properly stored and archived for future analysis.
FR 7.314	Data Security System shall be able to provide a complete network management for the Client. It shall monitor and report the performance, utilization, status, vulnerabilities and failures in the network in real time. It shall also monitor and manage access control and policy, security breaches and shall prevent detects and attacks on the network.
Data Integrity:	
FR 7.315	Data integrity must be ensured with a high level of requirement.
FR 7.316	Stability of data over time and in the procedures of physical media data shall be guaranteed and the protection of data content shall be ensured.
FR 7.317	Audit Trails: The application shall allow the management of compliance audit following the international standards for as appropriate for a Smart City.

FR 7.318	All acts of creation / modification / deletion must be registered with user identification and time stamp. Additionally, there must be an auditable trace of user sign-on and user sign-off with details of IP Address, Date, Time etc. The records must be accessed using specific and legible statements irrespective of the programming language.

Technical Requirements

Firewall	
TR 7.888	Firewall shall consist of stateful firewall and stateless filters.
TR 7.889	Firewall shall have the capability for proactive network attack detection.
TR 7.890	Firewall shall prevent replay attack.
TR 7.891	Firewall shall have min. 6 10/100/1000 Base-T GE ports; 4 x 10G SFP+ ports and shall be expandable as required.
TR 7.892	Firewall shall have a unified access control with functionalities such as: • TCP reassembly for fragmented packet protection • Brute force attack mitigation • SyN cookie protection • Zone based IP spoofing • Malformed packet protection
TR 7.893	Firewall shall have an Intrusion Prevention System (IPS) with following features: • Stateful Operation: ➢ TCP Reassembly ➢ IP Defragmentation ➢ Bi-directional Inspection ➢ Forensic Data Collection ➢ Access Lists • Signature Detection: ➢ Customer signatures creation ➢ Custom signatures ➢ Dynamic signature update ➢ Automatic signature sync • Alerts and updates: ➢ Alerting SNMP ➢ Log File ➢ Syslog ➢ E-mail ➢ Daily and emergency updates • Security Maintenance: ➢ 24/7 Security Update Service ➢ Real-time and History reports of Bandwidth usage per policy

	➢ Protocol anomaly detection ➢ IPS attack pattern obfuscation ➢ User role based policies ➢ User based application policy enforcement ➢ Provision for external bypass switch
TR 7.894	Firewall shall have a file-based antivirus with following feature: • Antispyware • Anti-adware • Anti-keylogger • Anti-malware • Antivirus • Anti-spam • Scanning of OP3, HTTP, SMTP, IMAP, FTP protocols • Signature database • Integrated enhanced web filtering • Content filtering – based on MIME type, file extension and protocol commands • Redirect web filtering
TR 7.895	Firewall shall have following user authentication capabilities: • Third party user authentication: RSA secure ID, LDAP, RADIUS • RADIUS accounting • XAUTH VPN, Web based, 802.X authentication • PKI certificates
TR 7.896	Firewall shall have the following additional capabilities: • VPN functionalities with 2000 simultaneous VPN tunnels • Encrypted throughput: minimum 800 Mbps • Concurrent connections: up to 100,000
Antivirus	
TR 7.897	Antivirus shall be able to detect and block malicious software in real time, including viruses, worms, spyware, Trojan horses, adware, and Rootkit etc. It shall provide zero-day detection technology.
TR 7.898	Antivirus shall protect the system from multiple forms of anomalous network behaviour that is designed to disrupt system availability and stability.
TR 7.899	Antivirus shall be able to identify infections by name, category, severity, hosts and user etc.
TR 7.900	Antivirus shall be able to report Bot incidents by specific malicious activity (spyware, IP scanning, spam etc.). The antivirus shall have built in intelligence and co-relation capability to inspect, detect and block active and dormant bots.

TR 7.901	Antivirus shall be able to block devices based on Windows Class ID. Devices shall include USB, Infrared, Bluetooth, Serial Port, Parallel Port, Fire Wire etc. Antivirus shall block or give permissions for such devices.
TR 7.902	Antivirus shall protect transmission of data being sent to hacker system who has spoofed their IP or MAC address.
TR 7.903	Antivirus shall scan email traffic including email client like Outlook.
TR 7.904	Antivirus shall include content filtering and data loss prevention.
TR 7.905	Antivirus shall have features to prevent peer to peer sharing, streaming media, games and other applications from internet.
TR 7.906	Antivirus shall have built in URL filtering.
TR 7.907	Antivirus shall provide standard and customised reports.

5.7.4.8. Databases

Any commercially available database like Oracle/Informix/MS SQL /DB2 shall be provided along with license and support and upgrade costs.

Functional Requirements

Databases	
FR 7.319	Database License should be un-restricted and perpetual, to prevent any non-compliance in an event of customization & integration.
FR 7.320	Databases shall support multi hardware platform.
FR 7.321	Database shall provide standard SQL Tool for accessing the database. The tool should be able to monitor, maintain and manage the database instance, objects, and packages.
FR 7.322	Database shall have built-in backup and recovery tool, which can support the online backup.
FR 7.323	Database shall be able to provide database level storage management mechanism, which should enable the availability by means of creating redundancy, automatically balance the data files across the available disks, i/o balancing across the available disks for the database for performance, availability and management.
FR 7.324	Database shall support for central storage of data with multiple instances of database in a clustered environment access the single database/multiple database.
FR 7.325	Should be an enterprise class database with the ability to support connection pooling, load sharing and load balancing when the load on the application increases.
FR 7.326	Database shall provide native functionality to store XML, within the database and support search, query functionalities.
FR 7.327	Database shall have built-in DR solution to replicate the changes happening in the database across DR site with an option to run real-time reports from the DR site without stopping the recovery mechanism.

FR 7.328	Database shall have Active-Passive failover clustering with objectives of scalability and high availability.
FR 7.329	Database shall provide mechanism to recover rows, tables when accidentally deleted. The mechanism should provide ways and means of recovering the database.
FR 7.330	Database shall provide functionality to replicate / propagate the data across different databases.
FR 7.331	Ability to add nodes to cluster on fly with no downtime with-out Unloading/ reloading data.
FR 7.332	The RDBMS should support partitioning feature in table level object.
FR 7.333	Database shall provide native functionality to store XML, Images, Text, Medical Images, CAD images within the database and support search, query functionalities.
FR 7.334	Database shall include tools for enterprise class high availability solution like monitoring performance, diagnose and alert for problems, tuning bottlenecks, resource monitoring and automatic resource allocation capabilities.
FR 7.335	RDBMS must support the SQL queries.
FR 7.336	Database shall provide security mechanism at foundation level of the database, so that the options and additions to the database confirm the security policy of the organization without changing the application code. Shall confirm to security evaluations and conformance to common criteria.
FR 7.337	Database shall provide control data access down to the row-level so that multiple users with varying access privileges can share the data within the same physical database.
FR 7.338	Database shall support for enhanced authentication by integrating tokens and biometric technologies.
FR 7.339	Database shall provide functionality for classifying data and mediating access to data based on its classification for multi-level security and mandatory access control, manage access to data on a "need to know" basis.
FR 7.340	Database shall be having native auditing capabilities for the database. Should support optional Audit Capability to store the audit records in separate audit store with monitoring & reporting for multiple databases to detect any security breaches.
FR 7.341	Database shall be having built-in provision to Administer database / database clusters, Monitor performance, Maintain database, Backup and recovery, Recovery management, Disaster recovery management.
FR 7.342	The Management tool should provide advisory-based performance tuning tool which help to tune the queries or objects, SQL analysis, SQL access.
FR 7.343	The enterprise database should provide single web-based console for management of the database.
Restart and Recovery	
FR 7.344	Availability of recovery/restart facilities of the DBMS.

FR 7.345	Automated recovery/restart features provided that do not require programmer involvement or system reruns.
FR 7.346	Program restart should be provided from the point of failure.
FR 7.347	Ability to manage recovery/restart facilities to reduce system overhead.
FR 7.348	Provides extra utilities to back up the databases by faster means than record by record retrieval.
FR 7.349	Provides clear error reporting, recovery and logging.
FR 7.350	Describe recovery strategies that needs to be in place.
FR 7.351	System should support mirroring for DRP.
Backup Procedures	
FR 7.352	Describe Backup Procedures you plan to deploy.
FR 7.353	Describe backup application(s) your proposed solution use.
FR 7.354	Provide details of data backup and restore processes and procedures for all data elements.
FR 7.355	Provide details of automated archiving procedures to copy active data to storage media when archive 'age' is reached.
Error Handling	
FR 7.356	Ability to trap a transaction failure through: • Application Software • DBMS • Availability of manual containing all system error messages and correction procedures
System Control	
FR 7.357	Provide details of the 'Audit trail' facility for your proposed solution.
FR 7.358	Should provide adequate auditing trail facility.
FR 7.359	System should record the date and time stamp for all records.
FR 7.360	Ability to track terminals from where the system is accessed.

6. Roles and Responsibilities

6.1. Master System Integrator (MSI)

MSI shall be responsible for providing a complete system that incorporates all specification requirements, including but not limited to:

- Provide all components as per the Project requirements;
- Deployment of a competent team of experts for each system solution with relevant prior experience and depth of knowledge in each functional area. Team of experts shall be able to supervise end to end business processes for all project components;
- Scheduling the activities and accordingly deploying the resources in a pragmatic manner in order to complete the implementation of the smart solutions components within the required scope, quality and time constraints;
- Project Team and Management: Since the continuity of the key members of the project team is essential, MSI to follow diligent process for ensuring continuity of key personnel assigned for implementation of the project. For project team, MSI shall carry out following responsibilities:

➢ At the project initiation, the MSI will share the profiles of the "Key Personnel" with Client and these key profiles shall meet the minimum eligibility criteria highlighted in the RFP as well as the proposal submitted by the MSI;

➢ Regular meetings between key personnel and the Client or its representative to discuss project implementation and progress;

➢ Deployment of a project structure for effective governance, monitoring, review and risk mitigation;

- Provision of all Testing services, up to and including the System Acceptance Test;
- Provision of all Installation and Configuration services defined as part of RFP;
- Provision of detailed Documentation for the MSI's solution;
- Provision of all Training and associated documentation for Client's personnel;
- MSI shall provide Project Quality services as following:

➢ Adoption of standard methodology encompassing project documentation at various phases, following robust review mechanisms and ensuring quality at all the stages of the project;

➢ The MSI is expected to deploy all the quality assurance mechanisms as per international quality standards for this project;

➢ Smart solutions systems shall be deployed in such a manner that they are scalable and upgradations of hardware and software are possible with minimal efforts. MSI shall include product upgrade as part of scope during installation;

➢ Detailed quality assurance plan for all the phases of the project shall be provided by the MSI.

- MSI shall be responsible for the following feedback, monitoring and adoption mechanism:

- Stakeholder Mapping : The MSI will put together a structure and mechanism for ensuring that all the relevant stakeholders are consulted, feedback adopted and key differences identified, so as to facilitate standardization as well as user adoption;
- MSI shall indicate the deliverables which shall go for internal review and accordingly the level of expertise that will be deployed for the reviews and the deliverables which will follow quality assurance plans;
- If any of the deliverables are not accepted by the Client, it shall have the right to seek deployment of experts from MSI to review the deliverables. Client shall also hire third party experts to review the deliverables, if required;
- Mechanism to adopt feedback/audit findings: There are three types of feedback for the deliverables – from the users/stake holders, from the internal experts of the MSI and the third party experts hired by BSCL. The following is expected from the MSI on these feedbacks/audit findings:
  - All the feedback shall be discussed with Client and based on the guidance of Client, the feedback shall be incorporated into the project;
  - Since the feedbacks/audit findings for any rework is by nature correcting the inadequacy of quality of the work produced in the first place, Client will not accept any change notice requests for these reworks;
  - MSI shall build in adequate mechanisms to control the risks of time over runs possibly due to effort required to rework bad quality deliverables;
  - MSI shall indicate in the beginning of each phase how it plans to take feedback and the mechanisms to incorporate the feedbacks into the project plan and deliverables;
  - MSI shall report to Client how the feedbacks have been incorporated into the project deliverables and take a sign off from the designated authority of Client.
    - Warranty for all equipment and software, up to and following System Acceptance, and provision of a System Warranty following System Acceptance;
    - All Spare Parts for the MSI Solution to meet the SLA requirements;
    - Technical Support services following System Acceptance;
    - MSI to coordinate with Client to complete the civil and electrical work as required;
    - MSI to coordinate with all necessary stakeholders involved in the project for successful and smooth implementation;
    - MSI shall provide all the integration support and develop necessary API, Program and necessary development to integrate with city operations with the ICOMC, ERP systems and e-Governance applications;
    - MSI shall be responsible for demonstrating software development/implementation to the client periodically in Bhubaneswar as per the project requirements;
    - Training for relevant personnel;

- Secure storage of all equipment on-site;
- Cost of consumables required for this project shall be borne by the MSI for the period of the contract. The MSI shall maintain adequate storage and replenish the consumables in discussion with the Client to ensure smooth functioning of the impacted systems.
- Opening and maintain of project office in Bhubaneswar throughout the course of the Contract. Maintaining any on-site office during construction (temporary) shall also be the responsibility of the MSI;
- Maintenance support for system and field equipment;
- MSI to depute Maintenance Support staff, Helpdesk Support staff and Facility Maintenance Staff during Comprehensive Maintenance phase (DLP + AMC phase) as per the requirements in the RFP.
- Client may at any anytime during the contract period choose to undertake an independent third party audit of the implemented system including both application and infrastructure audit. The MSI shall support this audit.

6.2. Client

Through its authorized personnel and representatives BSCL shall:

- Provide basic infrastructure (power, space, access) required at each facility for installation of System equipment and for Training;
- Client shall provide space for the POP room;
- Shall approve any provision of raw electricity up to mains power distribution panel at ICOMC, POP rooms, other sites;
- Client shall pay the electricity bill for the smart solutions components under the scope of this contract;
- Assign a Project Manager with the authority to make decisions (and/or designate representatives with such authority) on behalf of Client;
- Participate in all scheduled project activities, attend scheduled meetings and promptly respond to new meeting requests, requests for information, technical support or other necessary communication activities;
- Provide staff, and facilities for all Training held in accordance with the Training Plan;
- Participate and approve the results of all tests, in accordance with the Test Plan;

Any coordination or permits required for performing works in the project area;

- Client shall assist the MSI in:

➢ Obtaining necessary permits or permissions for any activities requiring outside authorization;

➢ Coordinating logistical arrangements to receive project related equipment at project facilities;

➢ Providing access to field implementation locations as required;

➢ Timely acquisition of required technical data from other parties;

- Obtaining any new, changed, or updated operational information necessary for the MSI to configure and initialize the system; and
- Scheduling and coordination for staff participating in training sessions as per the agreed training schedule.

7. Implementation Schedule (Activities, Milestones and Deliverables)

MSI shall deliver all project activities/milestones/deliverables to the Client as per the timelines stated in this section. MSI shall submit at least two (2) versions of each deliverable as per following:

- Draft Version; and
- Final Version.

Client or its authorized representative shall take thirty (30) days to review and provide comments on all respective deliverables. MSI shall ensure that all comments provided by the Client or its authorized representative shall be incorporated in the final version of all deliverables.

All deliverables indicated in the tables below are indicative only and shall be read in conjunction with the Scope of Work section and Standard Form of Contract of the RFP for detailed requirements. Client or its authorized representative reserves the right to ask for additional information, documents and deliverables throughout the Project.

Activities/Milestones/Deliverables	Timeline (T)
Inception Report	T + 1 Month
Detailed Design Report (All Phases)	T + 2 Months
Quick Wins	T + 3 Months
Operational Acceptance + Go-Live of Communications Network	T + 12 Months
Testing, Commissioning and Integration Plans for Communications Network	
Operational Acceptance + Go-Live of Smart Traffic Management System	T + 12 Months
Testing, Commissioning and Integration Plans for Smart Traffic Management System	
Operational Acceptance + Go-Live of Smart Tracking System	T + 12 Months
Testing, Commissioning and Integration Plans for Smart Tracking System	
Operational Acceptance + Go-Live of Smart Parking Management System	T + 15 Months
Testing, Commissioning and Integration Plans for Smart Parking Management System	
Operational Acceptance + Go-Live of Smart Governance and Smart Connect	T + 18 Months
Testing, Commissioning and Integration Plans for Smart Governance and Smart Connect	
Operational Acceptance + Go-Live of Smart Response and Incident Management System	T + 20 Months
Testing, Commissioning and Integration Plans for Smart Response and Incident Management System	

Activities/Milestones/Deliverables	Timeline (T)
Operational Acceptance + Go-Live of Intelligent City Operations and Management Centre (ICOMC)	T + 22 Months
Testing, Commissioning and Integration Plans for Intelligent City Operations and Management Centre (ICOMC)	
End to End Handover (Completion of Burn-In Period) and Commencement of DLP & AMC Phase (7 Years)	T + 24 Months
All 'As-Built' drawings, Training Manuals, Maintenance Manuals, User Manuals, Administrator Manuals, Wiring Diagrams, Interface Documents/protocols, APIs, etc. and any other document as per RFP.	T + 24 Months

7.1. Quick Wins

Immediately after signing the contract, the MSI shall implement components/modules that shall be termed as "Quick Wins". These are components/modules that will help public see on ground progress and provide the needed atmosphere to build the staffing capacity and interest in Smart City implementation. The following activities shall be taken up by the MSI in this Stage:

- Activity 1 – Grievance Redressal System: The selected MSI shall within two months of signing the contract shall start the deployment of a COTS product for cross-agency Grievance Redressal system. The System shall satisfy the requirements set forth in this tender document.
- Activity 2 – Smart Tracking System: The selected MSI shall within the first two months of deployment shall commission the smart tracking solution which at a minimum should track all the buses, solid waste vehicles and Police vehicles. The system shall provide ETA information of buses on a mobile application.
- Activity 3: Design and launch of Citizen Connect Mobile App on the basis of www.smartcitybhubaneswar.gov.in with enhanced services as required.

Activity 4: - Augmentation of services and information delivery through www.bhubaneswarone.in including improvement of user interface and activities to increase visitor count

8. Service Level Agreement (SLA)

8.1. Purpose

- The purpose of Service Levels is to define the levels of service provided by the MSI to the Client for the duration of the contract. The benefits of this are:

➢ Help the Client control the levels and performance of MSI's services;

➢ Create clear requirements for measurement of the performance of the system and help in monitoring the same during the Contract duration.

- The Service Levels are between the Client and MSI.

8.2. Service Level Agreements & Targets

- This section is agreed to by Client and MSI as the key performance indicator for the project;
- The following section reflects the measurements to be used to track and report system's performance on a regular basis. The targets shown in the following tables are for the period of Contract.

8.3. General Principles of Service Level Agreements

8.3.1. Service Level Agreements

Service Level Agreement (SLA) shall become the part of the Contract between the Client and the MSI. SLA defines the terms of MSI's responsibility in ensuring the timely delivery of the deliverables and the correctness of the deliverables based on the agreed performance indicators as detailed in this section.

The MSI shall comply with the SLAs to ensure adherence to project timelines, quality and availability of services throughout the duration of the Contract. For the purpose of the SLA, definitions and terms as specified in the document along with the following terms shall have the meanings set forth below:

- "Total Time" – Total number of hours in consideration for evaluation of SLA performance.
- "Downtime" – Time period for which the specified services/components/system are not available in the concerned period, being considered for evaluation of SLA, which shall exclude downtime owing to Force Majeure and reasons beyond control of the MSI.
- "Scheduled Maintenance Time" – Time period for which the specified services/components/system with specified technical and service standards are not available due to scheduled maintenance activity. The MSI shall take at least 15 days prior approval from the Client for any such activity. The scheduled maintenance shall be carried out during non-peak hours and shall not exceed more than four (4) hours and not more than four (4) times in a year.
- "Uptime" – Time period for which the specified services are available in the period being considered for evaluation of SLA.
- Uptime (%) = [1- {(Total Downtime) / (Total Time - Scheduled Maintenance Time)}]*100.

Penalties shall be applied for each criteria individually and then added together for the total penalty for a particular quarter.

- "Incident" – Any event/abnormalities in the service/system being provided that may lead to disruption in regular/normal operations and services to the end user.
- "Response Time" – Time elapsed from the moment an incident is reported to the Helpdesk either manually or automatically through the system to the time when a resource is assigned for the resolution of the same.
- "Resolution Time" – Time elapsed from the moment incident is reported to the Helpdesk either manually or automatically through system, to the time by which the incident is resolved completely and services as per the Contract are restored.

8.4. Measurements & Targets

8.4.1. Implementation Phase related SLAs

During Implementation phase any delay in deliverables and milestones shall attract liquidated damages as per GCC Clause 55.

8.4.2. Operation & Maintenance Phase related SLAs (During DLP & AMC Period)

These SLAs shall be used to evaluate the performance of the services post the Implementation Phase and commencement of the O&M Phase. These SLAs and associated performance shall be monitored on quarterly basis. Penalty levied for non-performance as per SLA shall be deducted through subsequent payments due from the Client or through the Performance Bank Guarantee.

The Scheduled Maintenance Time shall be agreed upon with the Client as per the definition given as part of this section of the Contract.

The Exhibit below provides the Service Level's (SLA) to be adhered by the bidder during the operational hours of the project/system/sub-system/components. The scheduled maintenance and the scheduled down time shall be carried out by the Bidder during the non-operational hours of the project. In case of not meeting the SLA's, the corresponding penalties as defined in the Exhibit below shall apply:

8.4.2.1. Traffic Violation Detection System- Availability

"Availability": When the system is working properly performing all business and functional requirements as defined in this RFP.

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
1	ANPR Camera	High	99.5%	0.50%	5000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 5000 shall be imposed.

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
2	IR Illuminator	Low	99%	1.0%	2000	For every decrease of 1.0% in availability of each device & its associated component in a quarter, a penalty of 2000 shall be imposed.
3	Overview Camera	High	99.5%	0.50%	5000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 5000 shall be imposed.
4	Local processing Unit (LPU)	High	99.5%	0.50%	10000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 10000 shall be imposed.
5	Red Light Violation Detection (RLVD) Sensor	High	99.5%	0.50%	2000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 2000 shall be imposed.

8.4.2.2. Automatic Number Plate Recognition (ANPR)- Performance/Accuracy

"Detection Accuracy": The detection accuracy of an ANPR system is measured against the license plates been detected by the system. Any license plate not correctly detected by ANPR system shall be considered as unreadable and specified penalty shall be applicable.

"Conversion Accuracy": The conversion accuracy of an ANPR system is measured against the license plates been correctly converted into alpha numeric format by the system. If any license plate can not be correctly converted by ANPR system, the specified penalty shall be applicable

S. No	Component	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
1	ANPR detection Accuracy	95%	1%	5000	For every decrease of 1% in detection in a quarter, a penalty of 5000 shall be imposed
2	ANPR conversion Accuracy For Standard Number Plate	85%	1%	10000	For every decrease of 1% in conversion of number plate by system in a quarter, a

S. No	Component	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
					penalty of 10000 shall be imposed.
3	ANPR conversion Accuracy For Non-Standard Number Plate	70%	1%	10000	For every decrease of 1% in conversion of number plate by system in a quarter, a penalty of 10000 shall be imposed.
4	Speed Accuracy: should be ± 5% w.r.t actual speed of the vehicle	90%	1%	5000	For every decrease of 1% in speed accuracy by system in a quarter, a penalty of 5000 shall be imposed.
5	RLVD : Violations detection accuracy	90%	1%	5000	For every decrease of 1% in RLVD violation detection accuracy by system in a quarter, a penalty of 5000 shall be imposed.

8.4.2.3. Automatic Traffic Counter and Classifier (ATCC) – Availability

"Availability": When the system is working properly performing all business and functional requirements as defined in this RFP.

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
1.	ATCC Sensors and associated components	High	99%	0.50%	10000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 10000 shall be imposed

8.4.2.4. Automatic Traffic Counter and Classifier (ATCC) – Performance/Accuracy

"Accuracy": The accuracy of ATCC system is measured against the correct counting of vehicles and correct classification of Vehicle class. Any Vehicle not correctly counted and classified shall be considered as non-performance and specified penalty is applicable as per the below parameters.

S. No	Component	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
1	ATCC Counting Accuracy	92%	1%	10000	For every decrease of 1% in accuracy of each device in a quarter, a penalty of 10000 shall be imposed
2	ATCC	**85%**	1%	10000	For every decrease of 1% in

S. No	Component	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
	Classification Accuracy				accuracy for each class of each device in a quarter, a penalty of 10000 shall be imposed

8.4.2.5. Public Address System- Availability

"Availability": When the system is working properly performing all business and functional requirements as defined in this RFP.

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
1	VoIP/ Amplifier with Built-in DSP	Moderate	99%	0.50%	5000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 5000 shall be imposed.
2	PAS Speakers	Moderate	99%	0.50%	10000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 10000 shall be imposed.
3	Ambient Noise Sensor	Moderate	98%	1%	5000	For every decrease of 1% in availability of each device & its associated component in a quarter, a penalty of 5000 shall be imposed.
4	PAS Operator Console	Moderate	99%	0.50%	5000	For every decrease of 0.50% in availability of each device in a period of one month, a penalty of 500 shall be imposed

8.4.2.6. Dynamic Message Sign (DMS) – Availability

"Availability": When the system is working properly performing all business and functional requirements as defined in this RFP.

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
1.	Dynamic Message Sign (DMS)	High	99%	0.50%	5000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 5000 shall be imposed

8.4.2.7. Traffic Accident Recording System (TARS)– Availability

"Availability": When the system is working properly performing all business and functional requirements as defined in this RFP.

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
1.	Field Device for Recording Accident	Moderate	99%	0.50%	5000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 5000 shall be imposed

8.4.2.8. Automatic Vehicle location System (AVL)– Availability

"Availability": when the system along with required hardware is properly performing all business and functional requirements as defined in this RFP. 3G/GPRS connection availability is excluded from this.

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
1	AVL OBU Availability	High	99.50%	0.50%	5000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 5000 shall be imposed.

8.4.2.9. Passenger Information System (PIS)– Availability

"Availability ": when the system along with required hardware is properly performing all business and functional requirements as defined in this RFP. PIS displays showing distorted/ partial/ non-readable messages/ information shall also be considered as unavailable.

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
1	PIS Display Availability	High	99.00%	0.50%	5000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 5000 shall be imposed

8.4.2.10.Electronic Ticketing – Availability

"Availability": ETM when under operations is fully functional with all its features & functions along with required hardware & software as per the functional & technical specifications defined in this RFP. At any given point of time the ETM required for running operations shall be available & in fully functional working condition.

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
1.	Handheld ETM Machine Availability	High	99.50%	0.50%	7500	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 7500 shall be imposed

8.4.2.11.Parking Management System (PMS)– Availability

"Availability": When the system is working properly performing all business and functional requirements as defined in this RFP.

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
1.	Entry/ Exit Boom Barrier	Moderate	99%	0.50%	7500	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 7500 shall be imposed
2	Entry Ticket Dispenser/ Barcode Reader/ QR code reader/Thermal Receipt Printer	High	99.50%	0.50%	10000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 10000 shall be imposed
3	Entry/Exit Fixed CCTV Cameras	Moderate	99%	0.50%	10000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 10000 shall be imposed.
4	Parking Occupancy Sensor	Moderate	99%	0.50%	1000	For every decrease of 0.50% in availability of each device & its associated component

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
						in a quarter, a penalty of 1000 shall be imposed
5	Parking Guidance Signal/ Parking Availability Display	Moderate	99%	0.50%	2500	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 2500 shall be imposed
6	Parking controller	High	99.50%	0.50%	10000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 10000 shall be imposed
7	Camera Based Sensors	Moderate	99.50%	0.50%	10000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 10000 shall be imposed
8	Parking Handheld Units	High	99.50%	0.50%	7500	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 7500 shall be imposed

8.4.2.12.Surveillance System– Availability

“Availability”: When the system is working properly performing all business and functional requirements as defined in this RFP.

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
1	Fixed CCTV / CCTV – PTZ	Moderate	99%	0.50%	10000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 10000 shall be imposed.

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
2	PTZ Keyboard with joystick	Low	99%	0.50%	5000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 5000 shall be imposed.
3	NVR	High	99.5%	0.50%	500000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 500000 shall be imposed.

8.4.2.13.Solid Waste Management System– Availability

"Availability": When the system is working properly performing all business and functional requirements as defined in this RFP.

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
1	RFID Reader	Moderate	99%	0.50%	5000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 5000 shall be imposed.
2	Bin volume sensor/ Sensor Processing Unit	Moderate	99%	0.50%	2500	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 2500 shall be imposed
3	Barrier Gate	Moderate	99%	0.50%	7500	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 7500 shall be imposed
4	Static Weigh Bridge	High	99%	0.50%	15000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 10000 shall be imposed.

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
5	ANPR Camera	High	99.5%	0.50%	5000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 5000 shall be imposed.
6	Fixed CCTV / CCTV – PTZ	Moderate	99%	0.50%	10000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 10000 shall be imposed.
7	AVL System for Collection vehicles	High	99.50%	0.50%	5000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 5000 shall be imposed

8.4.2.14. Multi-Services Digital Kiosk– Availability

"Availability": When the system is working properly performing all business and functional requirements as defined in this RFP.

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
1	Multi-Services Digital Kiosk	High	99%	0.50%	10000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 10000 shall be imposed.

8.4.2.15. Education and Healthcare Management – Availability

"Availability": When the system is working properly performing all business and functional requirements as defined in this RFP.

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
1.	CCTV Cameras	Moderate	99%	0.50%	10000	For every decrease of 0.50% in availability of each device & its

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
						associated component in a quarter, a penalty of 10000 shall be imposed.
2	Digital Smart Boards	Moderate	99%	0.50%	10000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 10000 shall be imposed.
3	Attendance Management System	Moderate	99%	0.50%	5000	For every decrease of 0.50% in availability in a quarter, a penalty of 5000 shall be imposed.
4	LED Display Screen	Low	99%	1%	2000	For every decrease of 1% in availability of each device & its associated component in a quarter, a penalty of 2000 shall be imposed.

8.4.2.16.Communications Network– Availability

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
1.	Overall Network Availability in backbone, distribution and access levels	High	99.50%	0.25%	10000	For every decrease of 0.25% in availability of each device & its associated component in a quarter, a penalty of 10000 shall be imposed
2	Mean Time To Repair (MTTR) for Fibre	High	≤ 4 hours	30 mins	5000	For every increase of 30 mins in repairing of Fibre & its associated component in a quarter, a penalty of 5000 shall be imposed

8.4.2.17.City Wi-Fi system- Availability

"Availability": When the system is working properly performing all business and functional requirements as defined in this RFP.

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
1.	Availability of Wi-Fi through Access Points (AP)	High	99%	0.25%	10000	For every decrease of 0.25% in availability of each device & its associated component in a quarter, a penalty of 10000 shall be imposed
2	Average bandwidth to each end user (Based on maximum concurrent user per AP defined in this RFP).	High	2 Mbps	0.25 Mbps	50000	For every decrease of 0.25 Mbps in average bandwidth in a quarter, a penalty of 10000 shall be imposed
3	Authentication of user (Time taken for user to successfully connect to the Wi-Fi network from the and welcome screen is filled and submitted with required information)	High	within 3 mins	1 min	100	For every increase of 1 min in authenticating the user by each device in a quarter, a penalty of 100 shall be imposed

8.4.2.18.Environmental Monitoring System- Availability

"Availability": When the system is working properly performing all business and functional requirements as defined in this RFP.

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
1.	Environmental Sensors / Digital Display Screen (DDS)	Moderate	99%	1%	10000	For every decrease of 1% in availability of each device & its associated component in a quarter, a penalty of 10000 shall be imposed

8.4.2.19.Command & Control Centre- Availability

"Availability": When the system is working properly performing all business and functional requirements as defined in this RFP.

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
1.	Video wall/ Controller / Display content Management System/ Matrix Switcher	High	99.90%	0.10%	10000	For every decrease of 0.10% in availability of each device & its associated component in a quarter, a penalty of 10000 shall be imposed
2	Collaboration System/ Video conference System/ Wireless Microphone system	Moderate	99%	1%	2000	For every decrease of 1% in availability of each device & its associated component in a quarter, a penalty of 2000 shall be imposed
3	LED Display/Tele conference Phone with Speakers/ Ceiling Speakers/ Monitors/ Room Control system including panel/Operator Console/ Digital Clock	Low	99%	1%	2000	For every decrease of 1% in availability of each device & its associated component in a quarter, a penalty of 2000 shall be imposed
4	Contact Centre Solution including all associated components	High	99.90%	0.10%	5000	For every decrease of 0.10% in availability of each device & its associated component in a quarter, a penalty of 5000 shall be imposed
5	Audio Processor/ Audio Distribution/ Audio Extractor/Dis	Moderate	99%	0.50%	5000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 5000 shall be imposed

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
	tribution Amplifier /AV Auto Switcher					
6	CCTV System/ Fire Detection and Suppression System/ Water Leak Detection System/Access Control System	Moderate	99%	0.50%	10000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 10000 shall be imposed.

8.4.2.20.Building Management System (BMS)- Availability

"Availability": When the system is working properly performing all business and functional requirements as defined in this RFP.

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
1	BMS System	High	99 %	1%	10000	For every decrease of 1% in availability of each device & its associated component in a quarter, a penalty of 10000 shall be imposed

8.4.2.21.Data Hosting & IT Infrastructure- Availability

"Data Hosting & IT Infrastructure Availability": When the system is working properly performing all business and functional requirements as defined in this RFP.

"UPS Availability" is defined as: When UPS is available in full working condition as defined in this RFP. UPS running in "Bypass" mode shall also be considered as unavailable. Availability shall be calculated only for power outages that are less than the UPS backup time. Power outages beyond UPS backup time shall be excluded from the SLA calculations.

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
1	Server / Storage / Tape drive/	High	99.90%	0.10%	50000	For every decrease of 0.10% in availability of each device & its

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
	Router/Link Load Balancer/ UPS					associated component in a quarter, a penalty of 50000 shall be imposed
2.	Firewall	High	100%	0.10%	100000	For every decrease of 0.10% in availability of each device & its associated component in a quarter, a penalty of 100000 shall be imposed
3	Workstations/ Multifunctional Printer /Printer/ KVM Extender /LED Display/ Monitor	Moderate	99%	0.50%	5000	For every decrease of 0.50% in availability of each device & its associated component in a quarter, a penalty of 5000 shall be imposed

8.4.2.22.Security

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
1.	Security Reporting	High	Quarterly security report to be submitted with 100% KPIs defined for security (agreed with Client at start of project)	1 day	2000	For every delay of one day a penalty of 2000/day shall be imposed
2	Vulnerability assessment and closure	High	Vulnerability assessment for all systems/subsystems shall be performed at least once every quarter and all detected vulnerabilities to be closed within 7 days. Client may appoint third party agency to cross-check	1 day	2000	For every delay of one day after 7 days a penalty of 2000/day shall be imposed
3	Penetration testing	High	Penetration testing shall be conducted once every quarter.	1 day	2000	For every delay of one day after 7

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
			All vulnerabilities shall be closed within 7 days.			days, a penalty of 2000/day shall be imposed
4	Application Security	High	Cyber Crime/Hacking/Data Theft/Fraud attributable to MSI To be evaluated per occurrence.	1 day	2000	For every delay of one day a penalty of 2000/day shall be imposed

8.4.2.23.Helpdesk- Performance

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
1	Average Call Response Time / Average Speed of Answer (Average time taken by callers waiting in queue to be attended by the Operator)	High	95% of incoming calls within 10 seconds (4 rings)	0.50%	20000	For every increase of 0.50% in attending incoming calls within 10 seconds (4 rings) calculated over a period of one quarter, a penalty of 20000 shall be imposed.
2	Average Call handling Time	High	95% of incoming calls shall have average call handling time of less than 180 seconds.	0.50%	15000	For every increase of 0.50% in average call handling time calculated over a period of one quarter, a penalty of 15000 shall be imposed.
3	Abandoned Call Rate	High	1%	0.10%	50000	For every increase of 0.50% in abandoned call rate calculated over a period of one quarter, a penalty of 50000 shall be imposed
4	Helpdesk – Logging of service ticket	High	99.00%	0.50%	20000	For every decrease of 0.50% in logging of service ticket number

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
	number					calculated over a period of one quarter, a penalty of 20000 shall be imposed
5	Helpdesk – Resolution of ticket logged	High	99.00%	0.50%	20000	For every decrease of 0.50% in resolution of service ticket calculated over a period of one quarter, a penalty of 20000 shall be imposed.

8.4.2.24. Application- Availability

"Availability": When an application is working properly, performing all business processing to the end user with all activities and tasks. Each application's availability shall be measured separately to calculate downtime.

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
1	Availability of following critical applications and their related portals/interface: TVDS Application/ ATCC Application / PAS Application /DMS Application / AVL Application /Web Applications/ IVR/ SMS /PIS Application/ ETM Application/ Transit Management Application/ PMS Application/ VMS Application/ Web Portal/ Mobile/City Application/ Kiosk Application / Citizen Facilitation Centre Application/ Web GIS/ Finance and Accounts/ Misc. Billing/ Utility and Billing/Purchase and Inventory Management /EMS/ NMS /Smart City Platform/Contact Centre	High	99.50%	0.25%	50000	For every decrease of 0.25% in availability of each application (Calculated individually) in a quarter, a penalty of 50000 shall be imposed

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
	Solution/ Grievance Redressal and Record Management					
2.	Availability of following less critical applications including their portals/interface: BMS/ e-tender and e-procurement, inventory management/ Operations , maintenance and asset life cycle management/ HR & Payroll/ Projects and Works Management/ Contract Management/ Document Management and Digital locker / Education Management/ Health care Management/ Solid waste Management / Smart Classroom Solution including Central Application/Smart Healthcare Solution application / TARS Application/any other application.	Moderate	99.50%	0.25%	50000	For every decrease of 0.25% in availability of each application (Calculated individually) in a quarter, a penalty of 50000 shall be imposed.
3	Percentage of transactions meeting the prescribed response time (within 10 seconds) for Business transactions for following applications and their related portals/interface: TVDS Application/ ATCC Application / PAS Application /DMS Application / AVL Application /Web Applications/ IVR/ SMS	Response time shall be calculated as time elapsed between sending request from client to server and receiving the response. Assume connection speed of 2 Mbps for testing	95%	1%	10000	For each instance of decrease by 1% in achieving required response time, a penalty of 10000 shall be imposed.

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
	/PIS Application/ ETM Application/ Transit Management Application/ PMS Application/ VMS Application/ Web Portal/ Mobile/City Application/ Kiosk Application / Citizen Facilitation Centre Application/ Web GIS/ Finance and Accounts/ Misc. Billing/ Utility and Billing/Purchase and Inventory Management /EMS/ NMS /Smart City Platform/Contact Centre Solution/ Grievance Redressal and Record Management/ BMS/ e-tender and e-procurement, inventory management/ Operations , maintenance and asset life cycle management/ HR & Payroll/ Projects and Works Management/ Contract Management/ Document Management and Digital locker / Education Management/ Health care Management/ Solid waste Management / Smart Classroom Solution including Central Application/Smart Healthcare Solution application / TARS Application/ any other application.	Response time to be measured at interval of 30 minutes and averaged quarterly				
4	Percentage of transactions meeting the prescribed Loading time (within 4 seconds) for all pages for following	Average Loading time for applications (including	95%	1%	5000	For each instance of decrease by 1% in achieving

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
	applications and their related portals/interface including web applications: TVDS Application/ ATCC Application / PAS Application /DMS Application / AVL Application /Web Applications/ IVR/ SMS /PIS Application/ ETM Application/ Transit Management Application/ PMS Application/ VMS Application/ Web Portal/ Mobile/City Application/ Kiosk Application / Citizen Facilitation Centre Application/ Web GIS/ Finance and Accounts/ Misc. Billing/ Utility and Billing/Purchase and Inventory Management /EMS/ NMS /Smart City Platform/Contact Centre Solution/ Grievance Redressal and Record Management/ BMS/ e-tender and e-procurement, inventory management/ Operations , maintenance and asset life cycle management/ HR & Payroll/ Projects and Works Management/ Contract Management/ Document Management and Digital locker / Education Management/ Health care Management/ Solid waste Management / Smart Classroom Solution including	web applications) shall be calculated as average of time taken by all pages of an application to be loaded over Internet or through network				required loading time, a penalty of 5000 shall be imposed.

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
	Central Application/Smart Healthcare Solution application/ TARS Application/ any other application.					

8.4.2.25.Problem Management SLA

S. No	Component	Severity Level	Requirement	Falls By / Increases By	Penalty (INR)	Calculation (Currency in INR)
1	Problem Management MSI shall analyse all the incidents and provide a root cause report quarterly if there are more than 10 incidents of the same type. MSI shall take the needed corrective action to prevent further issues due to the same cause	High	Within 5 days	1 day	5000	For every increase in number of day after 5 days to submit the root cause report, the penalty of 5000/ day shall be imposed.

8.5. Severity level

Each SLA component is categorized into severity levels which are high, moderate & low. Depending on the severity of the component, the downtime will be multiplied by multiplication factor (f) as indicated in the table below:

Downtime multiplication factor (f)	Severity Level wrt resolution time		
	High	**Moderate**	**Low**
1	Up to 2 hours	Up to 4 hours	Up to 8 hours
2	>2 & ≤3 hours	> 4 & < 5 hours	> 8 & < 12 hours
4	>3 & <5 hours	> 5 & < 10 hours	> 12 & < 15 hours
10	> 5 hours	> 10 hours	> 15 hours

$$Total\ Downtime\ (of\ each\ component) = \sum_{i=1}^{n} (Downtime\ of\ individual\ device)i\ X\ (f)i$$

8.6. Reporting Procedures

MSI representative shall prepare and distribute Service level performance reports in a mutually agreed format by the **5th working day of subsequent month**. The reports shall include **"actual versus target"** Service Level Performance, a variance analysis and discussion of appropriate issues or significant events. Performance reports shall be distributed to Client management personnel as directed by Client.

Also, MSI may be required to get the Service Level performance report audited by a third-party Auditor appointed by the Client.

8.7. Service Level Change Control

8.7.1. General

It is acknowledged that this **Service Levels may change as Client's business needs evolve over the course of the contract period.** As such, this document also defines the following management procedures:

- A process for negotiating changes to the Service Levels;
- An issue management process for documenting and resolving particularly difficult issues;
- Client and MSI management escalation process to be used in the event that an issue is not being resolved in a timely manner by the lowest possible level of management.

Any changes to the levels of service provided during the term of this Agreement shall be requested, documented and negotiated in good faith by both Parties. Either Party can request a change.

Service Level Change Process: The Parties may amend Service Level by mutual agreement in accordance. Changes can be proposed by either Party. Unresolved issues shall also be addressed. MSI's representative shall maintain and distribute current copies of the Service Level document as directed by Client. Additional copies of the current Service Levels shall be available at all times to authorized Parties.

Version Control / Release Management: All negotiated changes shall require changing the version control number. As appropriate, minor changes may be accumulated for periodic release or for release when a critical threshold of change has occurred.

Section 6. Standard Form of Contract

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Section - 6

S T A N D A R D F O R M O F C O N T R A C T

***Project Name*: Implementation of Smart Solution Projects under Smart City Project in Bhubaneswar City**

Name of Assignment:
Selection of Master System Integrator for implementation of Bhubaneshwar Smart City Solutions

Project Name:

Selection of Master System Integrator for implementation of Bhubaneshwar Smart City Solutions

Contract No._____

between

Bhubaneswar Smart City Limited

and

[Name of the MSI]

Dated:

I. Contract Agreement

THIS CONTRACT AGREEMENT is made

the ***[insert: ordinal]*** day of ***[insert: month], [insert: year].***

BETWEEN

1. ***Bhubaneswar Smart City Limited,*** *a SPV Company incorporated under the Companies Act, 1956 and having its principal place of business at 2nd Floor, Block 1, BMC Bhawani Office Complex, Saheed Nagar, Bhubaneswar - 751007,represented by its CEO (hereinafter called "the Client"),*

And

2. **[Insert: name of MSI],** *a corporation incorporated under the laws of* [insert: country of MSI] *and having its principal place of business at* [insert: address of MSI] *(hereinafter called "the MSI" who is the successful Bidder, which expression unless repugnant to the context or meaning thereof, be deemed to mean and include its beneficiaries, successors, administrators and permitted assigns).*

WHEREAS the Client desires to engage the MSI to Supply, Install, achieve Operational Acceptance of, and support the following Information System: **Selection of Master System Integrator for Implementation of Bhubaneshwar Smart City Solutions in Bhubaneswar, Odisha, India***.* ("the System"), and the MSI has agreed to such engagement upon and subject to the terms and conditions appearing below in this Contract Agreement.

NOW IT IS HEREBY AGREED as follows:

Article 1. Contract Documents	1.1	Contract Documents (Reference GCC Clause 1 (n)) The following documents shall constitute the Contract between the Client and the MSI, and each shall be read and construed as an integral part of the Contract: (a) This Contract Agreement and the Appendices attached to the Contract Agreement; (b) Special Conditions of Contract; (c) General Conditions of Contract; (d) Technical Requirements (including Implementation Schedule); (e) The Bidder's bid and original Financial Proposal; (f) ***[Add here: any other documents].***
	1.2	Order of Precedence In the event of any ambiguity or conflict between the Contract Documents listed above, the order of precedence shall be the order in which the Contract Documents are listed in Article 1.1 (Contract Documents) above, provided that Appendix 5 shall prevail over all provisions of the Contract Agreement

		and the other Appendices attached to the Contract Agreement and all the other Contract Documents listed in Article 1.1 above.
	1.3	Definitions (Reference GCC Clause 1) Capitalized words and phrases used in this Contract Agreement shall have the same meanings as are ascribed to them in the General Conditions of Contract.
Article 2. Contract Price and Terms of Payment	2.1	Contract Price (Reference GCC Clause 36) The Client hereby agrees to pay to the MSI the Contract Price in consideration of the performance by the MSI of its obligations under the Contract. The Contract Price shall be the aggregate of: ***[insert: amount in figures],*** as specified in the Grand Summary Price Schedule. The Contract Price shall be understood to reflect the terms and conditions used in the specification of prices in the detailed price schedules, including the terms and conditions of the associated Incoterms, and the taxes, duties and related levies if and as identified.
Article 3. Effective Date for Determining Time for Operational Acceptance	3.1	Effective Date (Reference GCC Clause 10) The time allowed for supply, installation, and achieving Operational Acceptance of the System shall be determined from the date when all of the following conditions have been fulfilled: (a) This Contract Agreement has been duly executed for and on behalf of the Client and the MSI; (b) The MSI has submitted to the Client the performance security in accordance with GCC Clause 39 (c); (c) ***[specify here: any other conditions, for example, opening/confirmation of letter of credit].*** Each party shall use its best efforts to fulfil the above conditions for which it is responsible as soon as practicable.
	3.2	If the conditions listed under 3.1 are not fulfilled within two (2) months from the Effective Date as per GCC Clause 10, because of reasons not attributable to the MSI, the Parties shall discuss and agree on an equitable adjustment to the Contract Price and the Time for Achieving Operational Acceptance and/or other relevant conditions of the Contract.

Article 4. Appendices	4.1	The Appendices listed below shall be deemed to form an integral part of this Contract Agreement.
	4.2	Reference in the Contract to any Appendix shall mean the Appendices listed below and attached to this Contract Agreement, and the Contract shall be read and construed accordingly.

APPENDIXES

Appendix 1: List of Sub-Contractors

Appendix 2: Categories of Software

Appendix 3: Custom Materials

Appendix 4: Revised Price Schedules (if any)

Appendix 5: Minutes of Contract Finalization Discussions and Agreed-to Contract Amendments

IN WITNESS WHEREOF the Client and the MSI have caused this Contract Agreement to be duly executed by their duly authorized representatives on the day and year first above written.

For and on behalf of the Client:

Signed:

in the capacity of ***[insert: Name with title or other appropriate designation]***

For and on behalf of the MSI:

Signed:

in the capacity of ***[insert: Name with title or other appropriate designation]***

II. General Conditions of Contract

A. General Provisions

1. Definitions	Unless the context otherwise requires, the following terms whenever used in this Contract have the following meanings: (a) "Activity" means an activity or action specified in the Section 5 – Technical Requirements, which is to be performed by the MSI as a part of the scope of Work. (b) "Applicable Law" means all laws in force and effect in India, as on the date of the Contract, or which may be promulgated or brought into force and effect after the date of the Contract, including all regulations, rules and notifications made thereunder and all judgments, decrees, injunctions, writs, orders, directives and notifications issued by any court or Authority, as may be in force and effect during the subsistence of the Contract and applicable to either Party, their obligations or this Contract, from time to time. (c) "Affiliates" means, in relation to the MSI, a Person who Controls or is Controlled by such MSI, or a Person who is under the common Control of the same Person who Controls such MSI. (d) "Authority" means the GoI, GoO or any local authority or any department, instrumentality or agency thereof or any statutory body or corporation (to the extent acting in a legislative, judicial or administrative capacity and not as a contracting party with the Client or the MSI) or commission under the direct or indirect control of the central, state or local government or any political sub-division thereof or any court, tribunal or judicial body within India. (e) "Breakage Costs" means the amount payable by the Client to the MSI that is attributable to the losses, costs, claims and expenses that have been or will reasonably and properly be incurred by the MSI in respect of: (i) any contracts placed that cannot be terminated, without such losses, costs, claims and expenses being incurred; and (ii) any expenditure incurred in anticipation of the performance of the Services, provided however that the MSI has used its reasonable endeavours to mitigate the losses, costs, claims and expenses incurred, as a result of the termination of the Contract due to a Client default (as set out in GCC Clause 18 b), to the extent that such losses, costs, claims and expenses are or may be incurred in connection with the performance of the Services. (f) "CEO" means Chief Executive Officer of the Client.

	(g)	"Clause" means a clause of the GCC, as may be supplemented by the SCC.
	(h)	"Client" shall have the meaning ascribed to it in the preamble of the Contract.
	(i)	"Client Event of Default" has the meaning ascribed to it in GCC Clause 18 b.
	(j)	"Client Indemnified Party" has the meaning ascribed to it in Clause 19.1.
	(k)	"Communication" has the meaning ascribed to it in Clause 6.1.
	(l)	"Conflict of Interest" shall have the meaning ascribed to it in GCC Clause 22 read with ITB Clause 2 of Section 1 of the RFP.
	(m)	"Contract" means the Contract Agreement entered into between the Client and the MSI, together with the Contract Documents referred to therein. The Contract Agreement and the Contract Documents shall constitute the Contract, and the term "the Contract" shall in all such documents be construed accordingly.
	(n)	"Contract Documents" means the documents specified in Article 1.1 (Contract Documents) of the Contract Agreement (including any amendments to these Documents).
	(o)	"Contract Agreement" means the agreement entered into between the Client and the MSI using the form of Contract Agreement contained in the Sample Forms Section of the Bidding Documents and any modifications to this form agreed to by the Client and the MSI. The date of the Contract Agreement shall be recorded in the signed form.
	(p)	"Contract" shall have the meaning ascribed to it in clause 1 of the Form of Contract.
	(q)	"Control" in relation to a Person, means: (i) the ownership, directly or indirectly, of more than 50% of the voting shares of such Person; or (ii) the power, directly or indirectly, to direct or influence the management and policies of such Person by operation of law, contract or otherwise. The term "Controls" and "Controlled" shall be construed accordingly.
	(r)	"Day" means a working day unless indicated otherwise.
	(s)	"Defect Liability Period" (also referred to as the "Warranty Period") means the period of validity of the warranties given by the MSI commencing at date of the Operational Acceptance Certificate of the System or

		Subsystem(s), during which the MSI is responsible for defects with respect to the System (or the relevant Subsystem[s]) as provided in GCC Clause 57 (Defect Liability).
	(t)	"Deliverable" means a work product (including materials, equipment, installations, reports, software, know-how, design, drawings, diagrams, maps, models, specifications, analysis, solutions, data base, programmes, technical information, data and other documents) to be prepared and submitted by the MSI as a part of the Services, in accordance with the terms of this Contract and the term "Deliverables" shall be construed accordingly. The list of Deliverables to be provided by the MSI is set out in the Technical Requirements.
	(u)	"Deliverable Due Date" means, with respect to a particular Deliverable, the date by which such Deliverable (in a final and approved form) is required to be submitted by the MSI to the Client for all the Modules, as specified in the Work Schedule.
	(v)	"Effective Date" means the date on which this Contract comes into force and effect pursuant to GCC Clause 10.
	(w)	*deleted*
	(x)	"Force Majeure" shall have the meaning ascribed to it in GCC Clause 65.
	(y)	"GCC" means these General Conditions of Contract.
	(z)	"GoO" means the Government of Odisha.
	(aa)	"GoI" means the Government of India.
	(bb)	"Good Industry Practices" means the exercise of that degree of skill, diligence and prudence, and those practices, methods, specifications and standards of safety and performance, as may change from time to time and which would reasonably and ordinarily be expected to be used and exercised by a skilled and experienced MSI engaged in the performance of services of the type, size and nature similar to the Services required by MSI under this Contract.
	(cc)	"Indemnified Party" has the meaning ascribed to it in GCC Clause 19.
	(dd)	"Intellectual Property Rights" means, in respect of the Services, any copyright, trademarks, technology, know-how, industrial processes, proprietary information, licenses, patents, permissions from or agreements with licensors of any processes, methods and systems incorporated or to be incorporated in the

		performance of the Services, registered designs, franchises, trade secrets, data bases, source codes, brand names, service marks, trade names, and any other intellectual and industrial property rights, whether registrable or not, subsisting or recognized under the Applicable Law or laws of any other jurisdiction, including all applications, renewals, extensions and revivals thereof.
	(ee)	"Key Expert" means an individual engaged by the MSI to provide the Services or any part thereof (required of MSI under this Contract), who has the minimum qualification and experience as specified in Section 5 – Technical Requirements.
	(ff)	"LOA" means Letter of Award.
	(gg)	"Local Currency" means the official currency of India (i.e., Indian Rupees).
	(hh)	"Module" means a component of the Smart Solutions Project in relation to which the MSI is required to execute the Work and provide Services, as described in greater detail in the GCC, SCC and Technical Requirements.
	(ii)	"MSI" shall have the meaning ascribed to it in the preamble of the Contract.
	(jj)	"MSI Event of Default" has the meaning ascribed to it in GCC Clause 18 a.
	(kk)	"MSI Indemnified Party" has the meaning ascribed to it in Clause 19.2.
	(ll)	"Operational Acceptance Certificate" means a certificate issued by the Client to the MSI upon the Client's approval of the relevant Deliverable/milestone, which may be endorsed by the Client in accordance with GCC Clause 54.3.
	(mm)	"Party" means the Client or the MSI, as the case may be, and "Parties" means both of them.
	(nn)	"Payment Schedule" means the schedule for payment of the Price to the MSI, as set out in the SCC.
	(oo)	"Performance Security" means a duly executed, irrevocable and unconditional bank guarantee to be procured and maintained by the MSI in accordance with GCC Clause 39 read with the SCC, to secure the due and proper performance of the Contract.
	(pp)	"Person" means any individual, company, corporation, firm, partnership, trust, sole proprietor, limited liability partnership, co-operative society, Government Company or any other legal entity.

	(qq) "Personnel" means, collectively, the managers, engineers, support team, and any other personnel of the MSI engaged by the MSI to perform the Work or Services or any part thereof under the Contract. (rr) "The Post-Warranty Service Period (AMC Phase)" means the number of years **defined in the SCC** (if any), following the expiration of the Warranty Period during which the MSI may be obligated to provide Software licenses, maintenance, and/or technical support services for the System, either under this Contract or under separate contract(s). (ss) "Project Manager" of the Client shall be either the Client's Project Manager or the Client's authorized representative. (tt) "Proposal" means the submission made by the MSI pursuant to the RFP. (uu) "RFP" means Request for Proposal dated along with schedules, annexures, appendices and any subsequent amendment issued by the Client for appointment of the MSI. (vv) "SCC" means the special conditions of contract with specific details and information to supplement (and not override) the GCC. (ww) "Section" means a section of the Contract. (xx) "Services" means the work to be performed by the Bidder pursuant to the Contract, as described in greater detail in the RFP document. (yy) "Solution" means the Goods and Services to be performed by the MSI pursuant to this Contract, as described in Section 5 – Technical Requirements. (zz) "Taxes" means all taxes, duties, imposts, levies and charges pursuant to any law (whether currently in force or coming into force on or after the Effective Date), including income tax, service tax, value added tax, central sales tax, customs duty excise duty, fees, cess, octroy, entry tax, and any interest, surcharge, penalty or fine in connection therewith. (aaa) "Third Party" means any person or entity other than the Client and the MSI. (bbb) "Technical Proposal" means the technical proposal forming part of the Proposal submitted by the MSI in response to the RFP. (ccc) "Variation" has the meaning ascribed to it in GCC Clause 14.2.

	(ddd)	"Variation Order" has the meaning to it in GCC Clause 14.5.
2. Relationship between the Parties	**2.1**	Nothing contained herein shall be construed as establishing a relationship of master and servant or of principal and agent as between the Client and the MSI. The MSI, subject to this Contract, has complete charge of the Personnel, if any, performing the Services required of MSI under this Contract and shall be fully responsible for the Services performed by them or on their behalf hereunder.
3. Governing Law	**3.1**	This Contract, its meaning and interpretation, and the relation between the Parties shall be governed by the Applicable Law.
4. Language	**4.1**	This Contract has been executed in the language specified in the SCC, which shall be the binding and controlling language for all matters relating to the meaning or interpretation of this Contract.
5. Headings	**5.1**	The headings are for convenience of reference only and shall not limit, alter or affect the meaning of this Contract.
6. Communications	**6.1**	Any communication, approval, notice, report, consent, certificate or request required or permitted to be given or made pursuant to this Contract ("**Communication**") shall be in writing in the language specified in the SCC. Unless otherwise specified in the Contract, any such Communication shall be sent by electronic mail or facsimile transmission, with a confirmation copy by courier or registered post to the address specified in the SCC. Any Communication sent by electronic mail or facsimile shall be deemed to have been received on the date of transmission and any notice served by courier or registered post shall be deemed to be received when actually delivered to the address specified in the SCC.
	6.2	A Party may change its address for Communication hereunder by giving the other Party notice of such change to the address specified in the SCC.
7. Location	**7.1**	The System shall be deployed at such locations as are specified in Section 5 – Technical Requirements hereto and, where the location of a particular task is not so specified, at such locations, as the Client may approve.

8. Authorized Representatives	**8.1**	Any action required or permitted to be taken, and any document required or permitted to be executed under this Contract by the Client or the MSI may be taken or executed by the officials specified in the SCC**.**
9. Corrupt and Fraudulent Practices	**9.1**	The MSI shall comply with the Client's policy in regard to corrupt and fraudulent practices as set forth in Attachment 1 to the GCC.
a. Commissions and Fees	**9.2**	The Client requires the MSI to disclose any commissions or fees that may have been paid or are to be paid to agents or any other party with respect to the selection process or execution of the Contract. The information disclosed must include at least the name and address of the agent or other party, the amount and currency, and the purpose of the commission, gratuity or fee. Failure to disclose such commissions, gratuities or fees may result in termination of the Contract.

B. COMMENCEMENT, COMPLETION, MODIFICATION AND TERMINATION OF CONTRACT

10. Effectiveness of Contract	**10.1**	This Contract shall come into force and effect on the date (the "Effective Date") of issuance of Letter of Award (LOA) to the MSI.
11. Commencement of Contract	**11.1**	The MSI shall submit in writing an acceptance of LOA and start the Project with Kick-off meeting no later than the date specified in the SCC.
12. Expiration of Contract	**12.1**	Unless terminated earlier pursuant to Clause 18, this Contract shall expire at the end of such time period after the Effective Date as specified in the SCC, unless extended in accordance with this Contract.
13. Entire Agreement	**13.1**	This Contract constitutes the entire understanding between the Parties regarding the scope of the System and supersedes all prior written or oral understandings, offers, agreements, communication or representations affecting the same subject matter. It is clarified that the obligations of the MSI under the RFP shall continue to subsist and shall be deemed to form part of the Contract.
14. Change or Modifications or Variations	**14.1**	Any change or modification or variation of the terms and conditions of this Contract, including any modification or variation of the scope of the System,

	may only be made by written agreement between the Parties. **14.2** Both the Client and the MSI may, at any time during the term of the Contract, propose a variation to the System or Solution and/or any other provision of the Contract (Variation). **14.3** No change made necessary because of any default of the MSI in the performance of its obligations under the Contract shall be deemed to be a Change, and such change shall not result in any adjustment of the Contract Price or the Time for Achieving Operational Acceptance. **14.4** Moreover, the Client and MSI will agree, during development of the Project Plan, to a date prior to the scheduled date for Operational Acceptance, after which the Technical Requirements for the System shall be "frozen." Any Change initiated after this time will be dealt with after Operational Acceptance. **14.5** *Client Proposed Variation:* (i) The Client may, at any time during the term of the Contract, instruct the MSI, by issuing a written notice, to carry out a Variation (a **Variation Order**). Provided that, the Client shall not propose a Variation which is not technically or financially feasible, such feasibility being determined in accordance with Good Industry Practice, or any Variation that constitutes unrelated work; (ii) Within fifteen (15) days of receipt of a Variation Order, the MSI shall submit a proposal setting out in sufficient detail the implications of the proposed Variation, including the (a) description of the work required or no longer required; (b) an estimate of the increase or decrease in the Total Value of Contract; (c) the Service Schedule; (d) the Supply Schedule and (e) Payment Schedule; (iii) Based on its review of the proposal submitted by the MSI, the Client may: (a) accept the proposal and the corresponding adjustments to the Total Value of Contract, Services Schedule, Supply Schedule and Payment Schedule; (b) provide its comments on the proposal seeking amendments and/or justification for the implications put forth by the MSI; or (c) reject the proposal submitted by the MSI and withdraw the Variation Order, within seven (7)

	days from the date of receipt of the MSI's proposal under Clause 14.5(ii); (iv) If the Client accepts the MSI's proposal under Clause 14.5(ii) of this Section, it shall issue an instruction identifying the offer that is being accepted and requesting the MSI to proceed with the Variation. Upon the Client's acceptance of the MSI's proposal, the MSI shall proceed with the Variation; (v) To the extent the Client seeks amendments and/or justification in the proposal submitted by the MSI, the MSI shall incorporate or address, in writing, the Client's comments and submit a revised proposal. On approval of the revised proposal in accordance with Clause 14.5 (iv), the MSI shall proceed with the Variation; (vi) On implementation of a Variation Order, the MSI shall be entitled to the agreed increase in the Total Value of Contract and/or adjustment to the Supply Schedule, Services Schedule or Payment Schedule for carrying out the Variation; (vii) Notwithstanding anything to the contrary in this Clause 14.5, the MSI shall be bound to implement any Variation that is necessitated by a Change in Law (*discussed in Clause 15 below*) and any consequent adjustment in the Total Value of Contract, Supply Schedule, Services Schedule or Payment Schedule, on account of such Variation, shall be determined in accordance with Clause *15* below. **14.6** *MSI Proposed Variation:* (i) The MSI may propose a Variation, which it considers necessary or desirable to improve the quality of the System and Solution to be deployed. While proposing a Variation, the MSI shall submit a proposal to the Client, with a statement setting out: (a) detailed particulars of the Variation; (b) the work required or no longer required; (c) an estimate of any adjustment in the Total Value of Contract; (d) any adjustment to the Supply Schedule, Services Schedule or Payment Schedule; and (e) any other effect the proposed Variation would have on any other provision of the Contract;

	(ii) Based on its review of the Variation proposed by the MSI, the Client may: (a) confirm the Variation; (b) provide its comments on the proposed Variation; or (c) reject the proposed Variation, while giving reasons in writing for such rejection, within seven (7) days of the submission of the proposal for a Variation. Upon the Client's acceptance of the proposed Variation, the MSI shall proceed with the Variation; (iii) To the extent the Client seeks amendments in the proposed Variation, the MSI shall incorporate or address, in writing, the Client's comments and submit a revised proposal. On approval of the revised proposal in accordance with Clause 14.6(ii), the MSI shall proceed with the Variation; (iv) If the Parties are unable to reach agreement regarding the terms of a Variation Order, such disagreement shall be resolved pursuant to GCC Clause 20. **14.7** Notwithstanding anything contained in this Clause 14, a Variation made necessary due to any act, omission or default of the MSI in the performance of its obligations under the Contract will not result in any increase in the Total Value of Contract or extension of any Deliverable Due Date. **14.8** No Variation invalidates the Contract. The MSI agrees that a Variation may involve the omission of any part of the Scope and further, the MSI agrees that the Client may engage others to perform that part of the Scope which has been omitted. The MSI further acknowledges that any omission or omissions will not constitute a basis to allege that the Client has repudiated the Contract no matter the extent or timing of the omission(s). **14.9** Notwithstanding anything contained in this Clause 14, the Client shall not agree to any Variation if: (i) the MSI seeks any Variation in its obligations which is due to any shortcoming or deficiency in the documents provided by the MSI; (ii) the Variation relates to repeat performance of the Solution due to the MSI's failure to comply with the Client's requirements; or (iii) escalation in the cost of equipment, materials or the work force, other than on account of a Change in Law.

	14.10	***If due to any reason the MSI and Client are not able to finalize a change in the system (ex: including a hardware component or a software functionality which was not anticipated earlier), the Client reserves a right to get the change executed by any other third party. However the component or functionality being a part of the comprehensive system, the original MSI shall have obligation to support any integration effort required whatsoever and extend full co-operation to the third party and the Client.***
	14.11	The unit rates as indicated in the Contract shall be fixed during the MSI's performance of the Contract and shall not subject to increase on any account for any variation order during the currency of the Contract.
15. Change in Law	**15.1**	For the purposes of this Contract, "Change in Law" means the occurrence of any of the following events after the date of execution of the Contract: (i) the modification, amendment or repeal of any existing Applicable Law; (ii) the enactment, promulgation, bringing into effect, adoption of any new Applicable Law; (iii) change in the interpretation or application of any Applicable Law by any Authority; (iv) the introduction of a requirement for the MSI to obtain any new approval or permit or the unlawful revocation of an applicable approval or permit; or (v) the introduction of any new Tax or a change in the rate of an existing Tax. Change in Law does not include: (i) any change in the (Indian) Income Tax Act, 1961 with regard to the taxes on the income of the MSI; (ii) any statute that has been published in draft form or as a bill that has been placed before the legislature or that has been passed by the relevant legislature as a bill but has not come into effect prior to the date of the Contract and which is a matter of public knowledge; or (iii) a draft statutory instrument or delegated legislation that has been published prior to the date of the Contract, which is under the active consideration or contemplation of the GoI or GoO and which is a matter of public knowledge.
	15.2	If, after the date of this Contract, there is any Change in Law which: (i) increases the cost incurred by the MSI in deploying the Project; and/or

		(ii) affects the Project Schedule. then the MSI may notify the Client and appropriate adjustments shall be made to the Total Value of Contract to account for the Change in Law. The notice shall be accompanied by all supporting documents, details and information required by the Client to assess the claims of the MSI. Provided that, if a Change in Law becomes applicable as a result of a delay by the MSI, then the MSI shall not be entitled to any adjustment in the Total Value of Contract and/or the Project Schedule. Where it is not possible to address the effect of a Change in Law (through an adjustment in the Total Value of Contract and/or the Project Schedule), the Parties shall agree on a mechanism, including amending the terms of the Contract, to mitigate the adverse effects of the Change in Law to MSI. If the Parties are unable to reach an agreement within thirty (30) days of the notification of a Change in Law, then the matter shall be referred to dispute resolution in accordance with GCC Clause 20.
16. Joint Venture	**16.1**	If the MSI is a Joint Venture/Consortium of two or more firms, all such firms shall be jointly and severally bound to the Client for the fulfilment of the provisions of the Contract and shall designate one of such firms to act as a leader with authority to bind the Joint Venture/Consortium as well as each member of the Joint Venture / Consortium. The composition or constitution of the Joint Venture/Consortium shall not be altered without the prior consent of the Client.
17. Suspension	**17.1**	The Client may, by written notice of suspension to the MSI, suspend all payments to the MSI hereunder if the MSI fails to perform or is in breach of any of its obligations under this Contract, including the carrying out of the Services, provided that such notice of suspension: (i) shall specify the nature of the failure or breach, and (ii) shall request the MSI to remedy such failure within a period not exceeding thirty (30) calendar days after receipt by the MSI of such notice of suspension.
18. Termination	**18.1**	This Contract may be terminated by either Party as per provisions set out below:

a. By the Client for MSI's default	**18.1.1** A "MSI Event of Default" means any of the events set out below, unless such event has occurred as a consequence of a default by the Client as set out in GCC Clause 18.1.8, a Change in Law or any event of Force Majeure ("MSI Event of Default"): (i) if the MSI fails to remedy a failure in the performance of its obligations hereunder, as specified in a notice of suspension pursuant to GCC Clause 17 within thirty (30) days of receipt of such notice of suspension or within such further period as the Client may have subsequently granted in writing; (ii) if the MSI becomes insolvent or bankrupt or enters into any agreements with its creditors for relief of debt or takes advantage of any law for the benefit of debtors or goes into liquidation or receivership whether compulsory or voluntary or, if the MSI is a corporation, a resolution is passed or order is made for its winding up; (iii) if the MSI's liability to pay delay liquidated damages reaches the cap on delay liquidated damages specified in GCC Clause 55.2 but the delay in respect of which the delay liquidated damages are payable continues to exist; (iv) If the MSI: (a) has abandoned or repudiated the Contract; (b) has without valid reason failed to commence work on the System promptly; (c) persistently fails to execute the Contract in accordance with the Contract or persistently neglects to carry out its obligations under the Contract without just cause; (d) refuses or is unable to provide sufficient Materials, Services, or labour to execute and complete the System in the manner specified in the Agreed and Finalized Project Plan furnished under GCC Clause 46 at rates of progress that give reasonable assurance to the Client that the MSI can attain Operational Acceptance of the System by the Time for Achieving Operational Acceptance as extended;

	(e) fails to provide sufficient Manpower, Material and Services for maintenance as required for meeting the SLA's specified under Service Level Agreement during the Maintenance Period (including warranty period and post-warranty service period); *(f)* If the penalties calculated as per SLA's specified under *Service Level Agreement,* exceed twenty percent (20%) of the monthly payment of Recurrent Cost (OPEX) for that particular month. (v) if the MSI has engaged in corrupt, fraudulent, collusive, coercive, undesirable or restrictive practice in competing for or in executing the Contract, including but not limited to wilful misrepresentation of facts concerning ownership of Intellectual Property Rights in, or proper authorization and/or licenses from the owner to offer, the hardware, software, or materials provided under this Contract; (vi) if the MSI fails to furnish, renew and/or maintain the Performance Security in accordance with this Contract; (vii) if the MSI assigns or transfers the Contract or its rights and obligations under this Contract without the prior written consent of the Client; (viii) if any of the MSI's representations and warranties are found to be false and/or misleading; or (ix) if the MSI is in breach of any Applicable Laws. **18.1.2** Without prejudice to other provisions of this Contract, upon the occurrence of a MSI Event of Default, the Client may deliver a notice to the MSI specifying the nature of the breach and giving a cure period of thirty (30) days to the MSI to cure the MSI Event of Default. Provided that, in case of occurrence of a MSI Event of Default set out in Clauses 18.1.1(ii), or 18.1.1 (iv), the Client shall have the right to terminate the Contract immediately, without any obligation to provide a cure period. **18.1.3** Subject to Clause 18.1.2, and except in case of the event set out at Clause 18.1.1 (iii), if by the end of the cure period, the MSI has not remedied the MSI Event of Default or taken steps to remedy the MSI Event of

	Default to the satisfaction of the Client, then the Client shall have the right to issue a termination notice, upon which this Contract shall terminate forthwith. **18.1.4** Upon receipt of the notice of termination under GCC Clause 18.1.1, the MSI shall, either immediately or upon such date as is specified in the notice of termination: (a) cease all further work, except for such work as the Client may specify in the notice of termination for the sole purpose of protecting that part of the System already executed or any work required to leave the site in a clean and safe condition; (b) terminate all subcontracts, except those to be assigned to the Client pursuant to GCC Clause 18.1.4(d) below; (c) deliver to the Client the parts of the System executed by the MSI up to the date of termination; (d) to the extent legally possible, assign to the Client all right, title and benefit of the MSI to the System or Subsystems as at the date of termination, and, as may be required by the Client, in any subcontracts concluded between the MSI and its Sub-contractors; (e) deliver to the Client all drawings, specifications, and other documents prepared by the MSI or its Subcontractors as at the date of termination in connection with the System. **18.1.5** The Client may enter upon the site, expel the MSI, and complete the System itself or by employing any third party. Upon completion of the System or at such earlier date as the Client thinks appropriate, the Client shall give notice to the MSI that such MSI's Equipment will be returned to the MSI at or near the site and shall return such MSI's Equipment to the MSI in accordance with such notice. The MSI shall thereafter without delay and at its cost remove or arrange removal of the same from the site. **18.1.6** ***(a)*** *If the termination takes place prior to the Operational Acceptance subject to GCC Clause 18.1.7(a), the MSI shall be entitled to be paid the Contract Price attributable to the portion of the System executed as on the date of termination and the costs, if any, incurred in protecting the System and in leaving the site in*

		a clean and safe condition pursuant to GCC Clause 18.1.4(a). Any sums due to the Client from the MSI accruing prior to the date of termination shall be deducted from the amount to be paid to the MSI under the Contract.
	(b)	*If the termination takes place after the Operational Acceptance subject to GCC Clause 18.1.7(b), the MSI shall be entitled to be paid the Contract Price attributable for supply of the System (Supply and Installation Cost) if any and portion of the recurrent cost up to the date of termination, and the costs, if any, incurred in protecting the System and in leaving the site in a clean and safe condition pursuant to GCC Clause 18.1.4(a). Any sums due to the Client from the MSI accruing prior to the date of termination shall be deducted from the amount to be paid to the MSI under the Contract. In such event, all rights of MSI related to monetization pursuant to GCC Clause 21.7, mentioned under Special Conditions of Contract, shall stand terminated without any additional compensation to the MSI.*
	18.1.7	
	(a)	*If the termination takes place before the Operational acceptance, the cost of completing the System by the Client as per the Contract shall be determined. If the sum that the MSI is entitled to be paid, pursuant to GCC Clause 18.1.6 (a), plus the reasonable costs incurred by the Client in the completing the Scope of Work, exceeds the Total cost, the MSI shall be liable to reimburse such excess money to the Client. If such excess is greater than the sums due to the MSI under GCC Clause 18.1.6, the MSI shall pay the balance to the Client, and if such excess is less than the sums due to the MSI under GCC Clause 18.1.6(a), the Client shall pay the balance to the MSI. The Client and the MSI shall agree in writing, on the computation described above and the manner in which any sums shall be paid.*
	(b)	*If the termination takes place after Operational acceptance, the cost of completing the remaining Scope of Work by the Client as per the Contract shall be determined. If the pro-rata sum that the MSI is entitled to be paid for*

	the maintenance period, pursuant to GCC Clause 18.1.6 (b), plus the reasonable costs incurred by the Client in the completing the Scope of Work, exceeds the total pro-rata Recurrent Cost of the Contract due, the MSI shall be liable to reimburse such excess money to the Client. If such excess is greater than the sums due to the MSI for the maintenance period under GCC Clause 18.1.6 (b), the MSI shall pay the balance to the Client, and if such excess is less than the sums due to the MSI for the maintenance period under GCC Clause 18.1.6 (b), the Client shall pay the balance to the MSI. The Client and the MSI shall agree in writing, on the computation described above and the manner in which any sums shall be paid.
b. By the MSI for Client's default	**18.1.8** A "Client Event of Default" means any of the following events set out below, unless such event has occurred as a consequence of a default by the MSI as set out in Clause 18.1.1, a Change in Law or any event of Force Majeure: (i) if the Client fails to pay any undisputed money due to the MSI pursuant to this Contract within forty five (45) calendar days after receiving written notice from the MSI that such payment is overdue; (ii) if the Client is in material breach of its obligations under this Contract and has not remedied the same within forty five (45) days (or such longer period as the MSI may have subsequently approved in writing) following the receipt by the Client of the MSI's notice specifying such breach; (iii) if the MSI is unable to carry out any of its obligations under the Contract for any reason attributable to the Client, including but not limited to the Client's failure to provide possession of or access to the site or other areas or failure to obtain any governmental permit necessary for the execution and/or completion of the System; (iv) if the Client becomes insolvent or bankrupt or enters into any agreements with its creditors for relief of debt or take advantage of any law for the benefit of debtors or goes into liquidation or receivership whether compulsory or voluntary; or, if the Client is a corporation, a

	resolution is passed or order is made for its winding up; (v) if the Client suspends the performance of the Services for more than sixty (60) days, for reasons not attributable to the MSI. **18.1.9** Without prejudice to other provisions of this Contract, upon the occurrence of a Client Event of Default, the MSI may deliver a notice to the Client specifying the nature of the breach and giving a cure period of thirty (30) days to the Client to cure the Client Event of Default. Provided that, in case of occurrence of a Client Event of Default set out in Clauses 18.1.8(iii) or 18.1.8 (iv), the MSI shall have the right to terminate the Contract immediately, without any obligation to provide a cure period. **18.1.10** If the Contract is terminated under GCC Clause 18.1.8, then the MSI shall immediately: (a) cease all further work, except for such work as may be necessary for the purpose of protecting that part of the System already executed, or any work required to leave the site in a clean and safe condition; (b) terminate all subcontracts, except those to be assigned to the Client pursuant to Clause 18.1.10(d) (ii); (c) remove all MSI's Equipment from the site and repatriate the MSI's and its Subcontractor's personnel from the site; (d) In addition, the MSI, subject to the payment specified in GCC Clause 18.1.11, shall: (i) deliver to the Client the parts of the System executed by the MSI up to the date of termination; (ii) to the extent legally possible, assign to the Client all right, title, and benefit of the MSI to the System, or Subsystems, as of the date of termination, and, as may be required by the Client, in any subcontracts concluded between the MSI and its Subcontractors; (iii) to the extent legally possible, deliver to the Client all drawings, specifications, and other documents prepared by the

	MSI or its Subcontractors as of the date of termination in connection with the System. **18.1.11** If the Contract is terminated under GCC Clause 18.1.8, the Client shall pay to the MSI all payments specified in GCC Clause 18.1.17, and reasonable compensation for all loss, except for loss of profit, or damage sustained by the MSI arising out of, in connection with, or in consequence of such termination. **18.1.12** Termination by the MSI pursuant to this GCC Clause 18 b is without prejudice to any other rights or remedies of the MSI that may be exercised in lieu of or in addition to rights conferred by GCC Clause 18 b. **18.1.13** In this GCC Clause 18, the expression "portion of the System executed" shall include all work executed, Services provided, and all Information Technologies, or other Goods acquired (or subject to a legally binding obligation to purchase) by the MSI and used or intended to be used for the purpose of the System, up to and including the date of termination. **18.1.14** In this GCC Clause 18, in calculating any monies due from the Client to the MSI, account shall be taken of any sum previously paid by the Client to the MSI under the Contract, including any advance payment paid pursuant to the SCC.
c. At Client's convenience	**18.1.15** The Client may at any time terminate the Contract for any reason by giving the MSI a notice of termination that refers to this GCC Clause 18 c. **18.1.16** Upon receipt of the notice of termination under GCC Clause 18.1.15, the MSI shall either as soon as reasonably practical or upon the date specified in the notice of termination: (a) cease all further work, except for such work as the Client may specify in the notice of termination for the sole purpose of protecting that part of the System already executed, or any work required to leave the site in a clean and safe condition; (b) terminate all subcontracts, except those to be assigned to the Client pursuant to GCC Clause 18.1.16 (d) (ii) below; (c) remove all MSI's Equipment from the site, repatriate the MSI's and its Subcontractors'

	personnel from the site, remove from the site any wreckage, rubbish, and debris of any kind; (d) in addition, the MSI, subject to the payment specified in GCC Clause 18.1.17, shall (i) deliver to the Client the parts of the System executed by the MSI up to the date of termination; (ii) to the extent legally possible, assign to the Client all right, title, and benefit of the MSI to the System, or Subsystem, as at the date of termination, and, as may be required by the Client, in any subcontracts concluded between the MSI and its Subcontractors; (iii) deliver to the Client all non-proprietary drawings, specifications, and other documents prepared by the MSI or its Subcontractors as of the date of termination in connection with the System; (iv) *If termination takes place after operational acceptance is achieved, the MSI shall fully comply with the Exit Management Plan as specified in Section E of GCC.* **18.1.17** In the event of termination of the Contract under GCC Clause 18.1.15, the Client shall pay to the MSI the following amounts: (a) the Contract Price, properly attributable to the parts of the System executed by the MSI and payable recurrent cost on pro-rata basis, if project is in Maintenance Period, as on the date of termination; (b) the costs reasonably incurred by the MSI in the removal of the MSI's Equipment from the site and in the repatriation of the MSI's and its Subcontractors' personnel; (c) any amount to be paid by the MSI to its Subcontractors in connection with the termination of any subcontracts, including any cancellation charges; (d) costs incurred by the MSI in protecting the System and leaving the site in a clean and safe condition pursuant to GCC Clause 18.1.16 (a); and

	(e) the cost of satisfying all other obligations, commitments, and claims that the MSI may in good faith have undertaken with third parties in connection with the Contract and that are not covered by GCC Clause 18.1.17 (a) through (d) above.
d. Termination for Force Majeure	**18.1.18** If a Force Majeure event affecting any Party subsists for a continuous period of one hundred eighty (180) days, then either Party may issue a notice of termination to the other Party. Upon receipt of this notice, the Parties shall have a period of fifteen (15) days to agree on the manner in which the Contract may be progressed upon cessation of the Force Majeure event and the variations, if any, required to the Contract to address the consequences of the Force Majeure event. If on the expiry of the fifteen (15) day period, the Parties fail to arrive at an agreement, either Party may immediately terminate this Contract by written notice to the other Party. Notwithstanding anything to the contrary in this Contract, in case of occurrence of a Force Majeure event which affects one or more of the Modules but not the entire Contract, the Contract may be partially terminated with respect to the Modules affected by such Force Majeure event. Such partial termination shall not impact the validity of the Contract or the obligations of the MSI with regard to the Modules which are not affected by the Force Majeure event.
e. Cessation of Rights and Obligations	**18.1.19** Upon termination of this Contract pursuant to Clause 18, or upon expiration of this Contract pursuant to Clause 12, all rights and obligations of the Parties hereunder shall cease, except (i) any cause or action which may have occurred in favour of either Party or any right which is vested in either Party under any provision of the Contract as a result of any act, omission, deed, matter or thing done or omitted to be done by either Party before the expiry or termination of the Contract, (ii) the obligation of confidentiality set forth in Clause 23, (iii) the MSI's obligation to permit inspection, copying and auditing of their accounts and records set forth in Clause 26, (iv) the indemnity obligations of the Parties as set out in Clause 19; (v) the obligations in relation to intellectual property rights under Clause 42; and (vi) any right which a Party may have under the Applicable Law.

f. Cessation of Services	**18.1.20** Upon termination of this Contract by either Party , the MSI shall: (i) immediately upon dispatch or receipt of such notice, take all necessary steps to bring the Services to a close in a prompt and orderly manner and shall make every reasonable effort to keep expenditures for this purpose to a minimum; and (ii) transfer to the Client all documents, data, programmes, applications, software, equipment etc. developed or acquired by the Client for the purposes of performing the System along with the right to use the Intellectual Property in such documents, data, programmes, applications, software, equipment for the Project.
19. Indemnity and Limitation of Liability	**19.1** MSI's indemnity: The MSI must indemnify and hold harmless the Client and the Client's staff, their Affiliates and directors of their Affiliates (each a “Client Indemnified Party”) from and against any and all claims and losses suffered or incurred by the Client Indemnified Party, including claims by a third party, arising out of: (i) any failure of the MSI to pay taxes or any statutory dues; (ii) any non-compliance or violation of Applicable Law or applicable permits by the MSI; (iii) breach of the MSI's representations and warranties set out in the Contract; (iv) bodily injury, sickness or death of any person whatsoever engaged by MSI, Client or any of their subcontractor on the site during duty hours; (v) breach of the MSI's obligations under the Contract; (vi) physical damage to the Project Office or any property therein; (vii) loss of or physical damage to property of any third party; or (viii) infringement of the Intellectual Property Rights of any third party by the MSI under the Contract. **19.2** Client's indemnity: The Client agrees to indemnify and hold harmless the MSI and the Personnel (each a “MSI Indemnified

	Party") from and against any and all claims or losses suffered or incurred by the MSI Indemnified Party arising out of: (i) breach of the Client's representations and warranties under the Contract; or (ii) any non-compliance or violation of Applicable Laws or any Client's applicable permits or consents by the Client. **19.3** On receipt of a notice of any claim, which would entitle any Party ("Indemnified Party") to claim indemnification from the other Party ("Indemnifying Party"), the Indemnified Party shall, within a reasonable time, provide a written notice of the claim to the Indemnifying Party along with all the documents available with it in respect of the claim, specifying in detail the claim, the amount claimed by the third party, the date on which the claim arose and the nature of the default to which such claim relates (including a reference to the applicable provision of the Contract) and the Indemnifying Party shall settle the claim accordingly. The Indemnifying Party shall be entitled to but not obliged to participate in and control the defence of any such suit, action or proceeding at its own expense or direct the Indemnified Party to defend such claim, at the cost of the Indemnifying Party. If the Indemnifying Party elects to control the defence of any such suit, action or proceeding, the Indemnified Party shall render all necessary assistance for the purposes of enabling the Indemnifying Party to take the action referred to in this Clause 19.3. The Indemnifying Party may also request the Indemnified Party, at the cost of the Indemnifying Party to dispute, resist, appeal, compromise, defend, remedy or mitigate the matter or enforce against the third party the Indemnifying Party's rights in relation to the matter and in connection with proceedings related to the matter, use reputable advisers and lawyers chosen by the Indemnifying Party. The Indemnified Party shall not settle any such suit, action or proceeding without the prior written consent of the Indemnifying Party. **19.4** The Indemnifying Party agrees and acknowledges that it shall fully indemnify the Indemnified Party for all amounts paid and/or costs incurred by the Indemnified Party in accordance with this Clause 19. **19.5** Unless otherwise specified in the Contract, neither Party shall be liable to the other Party for any kind of

	indirect, punitive or consequential loss or damage or for any economic loss, loss of profit, loss of revenue, loss of use or business interruption which may be suffered by the other Party in connection with this Contract, except for losses caused by the fraud or wilful misconduct of the Party. **19.6** The Party entitled to the benefit of an indemnity under this Clause 19 shall take all reasonable measures to mitigate any loss or damage which has occurred. If the Party fails to take such measures, the other Party's liabilities shall be correspondingly reduced. **19.7** The obligation to indemnify stipulated in this Clause 19 is: (i) continuing, separate and independent obligation of the Parties from their other obligations and shall survive the termination of this Contract; and (ii) shall not be limited or reduced by any insurance, except to the extent that the proceeds of any such insurance are capable of being applied to reduce claims made against the affected Party. **19.8** For the purpose of this Clause 19: (i) “claim” means any claim, liability, proceeding, cause of action, action, suit, demand at law or in equity, in each case brought against either Party (including by any third party); and (ii) “loss” means all losses (excluding consequential losses, indirect losses and loss of profit), damages, liabilities, fines, interest, awards, penalties, costs (including, reasonable legal costs, lawyers' and arbitrators' fees), charges and expenses of whatever nature or howsoever occasioned including any of the above suffered by the non-defaulting Party or a third party as a result of any act or omission in the course of or in connection with the performance, non-performance or deficiency in the performance of obligations under this Contract.
20. Settlement of Disputes	Disputes shall be settled by arbitration in accordance with the following provisions: a) The seat of the arbitration shall be India and the arbitration proceedings shall be held in Bhubaneswar;

	b) The English language shall be the official language for all purposes; c) The arbitration shall be governed by the (Indian) Arbitration and Conciliation Act, 1996, as amended from time to time; d) Responsibility of payment for all costs of arbitration shall be as per the arbitration award; and e) The decision of the sole arbitrator or of a majority of the arbitrators (or of the third arbitrator if there is no such majority) shall be final and binding and shall be enforceable in any court of competent jurisdiction, and the Parties hereby waive any objections to or claims of immunity in respect of such enforcement.

C. RIGHTS AND OBLIGATIONS OF THE MSI

21. General	
a. Standard of Performance	**21.1** The MSI shall perform the Work with all due diligence, efficiency and economy, in accordance with Best Industry Practices and this Contract, and shall observe sound management practices, and employ appropriate information technologies, systems, support, maintenance, training and other related services or in accordance with Best Industry Practices. In particular, the MSI shall provide and employ only technical personnel who are skilled and experienced in their respective callings and supervisory staff who are competent to adequately supervise the work at hand. **21.2** The MSI confirms that it has entered into this Contract on the basis of a proper examination of the data relating to the System provided by the Client and on the basis of information that the MSI could have obtained from a visual inspection of the site (if access to the site was available) and of other data readily available to the MSI relating to the System as at the date twenty-eight (28) days prior to bid submission. The MSI acknowledges that any failure to acquaint itself with all such data and information shall not relieve its responsibility for properly estimating the difficulty or cost of successfully performing the Contract.

	21.3	The MSI shall be responsible for timely provision of all resources, information, and decision making under its control that are necessary to reach a mutually Agreed and Finalized Project Plan (pursuant to GCC Clause 46.2) within the time schedule specified in the Implementation Schedule in the Technical Requirements Section. Failure to provide such resources, information, and decision making may constitute grounds for termination pursuant to GCC Clause 18 a.
	21.4	The MSI shall adhere to the SLA requirements as specified in RFP.
	21.5	The MSI shall comply with Exit Management Plan as specified in GCC Section E.
	21.6	The MSI shall not subcontract (unless otherwise specified in the SCC) any part of the Services required of MSI under this Contract.
	21.7	Other obligations of the Bidder as specified in SCC.
b. Law Applicable	**21.8**	The MSI shall comply with all laws in force in India. The laws will include all national, provincial, municipal, or other laws that affect the performance of the Contract and are binding upon the MSI. The MSI shall indemnify and hold harmless the Client from and against any and all liabilities, damages, claims, fines, penalties, and expenses of whatever nature arising or resulting from the violation of such laws by the MSI or its personnel, including the Subcontractors and their personnel, but without prejudice to GCC Clause 33. The MSI shall not indemnify the Client to the extent that such liability, damage, claims, fines, penalties, and expenses were caused or contributed to by a fault of the Client.
	21.9	Throughout the duration of the Contract, the MSI shall comply with the prohibitions in India in relation to the import of goods and services when as a matter of law or official regulation, there is a prohibition on entering into or maintaining commercial relations with the country from where the import is proposed to be made.
	21.10	The MSI shall acquire in its name all permits, approvals, and/or licenses from all local, state, or national government authorities or public service undertakings that are necessary for the performance of the Contract, including, without limitation, visas for the MSI's and Subcontractor's personnel and entry permits for all imported MSI's Equipment. The MSI shall acquire all other permits, approvals, and/or

		licenses that are not the responsibility of the Client under GCC Clause 33.2 and that are necessary for the performance of the Contract.
22. Conflict of Interest	**22.1**	The MSI shall hold the Client's interests paramount, without any consideration for future work, and strictly avoid conflict with other assignments or their own corporate interests.
a. MSI Not to Benefit from Commissions, Discounts, etc.	**22.1.1**	The Contract Price pursuant to GCC Clause 36 shall constitute the MSI's only payment in connection with this Contract and the MSI shall not accept for its own benefit any trade commission, discount or similar payment in connection with activities pursuant to this Contract or in the discharge of its obligations hereunder, and the MSI shall use its best efforts to ensure that the Personnel and agents or either of them, similarly shall not receive any such additional payment.
b. MSI and Affiliates Not to Engage in Certain Activities	**22.1.2**	The MSI agrees that, during the term of this Contract and after its termination/completion, the MSI and its Affiliates, shall be disqualified from providing consultancy related to the Services, for the implementation of the Smart Solutions Project, unless otherwise indicated in the SCC.
c. Prohibition of Conflicting Activities	**22.1.3**	The MSI shall not engage, and shall cause its Personnel to not engage, either directly or indirectly, in any business or professional activities that would conflict with the activities assigned to them under this Contract.
d. Strict Duty to Disclose Conflicting Activities	**22.1.4**	The MSI has an obligation and shall ensure that its Personnel shall have an obligation to disclose any situation of actual or potential conflict that impacts their capacity to serve the best interest of the Client, or that may reasonably be perceived as having this effect. Failure to disclose said situations may lead to the disqualification of the MSI or the termination of this Contract.
23. Confidentiality	**23.1**	Except with the prior written consent of the Client, the MSI and the Personnel shall not at any time communicate to any person or entity any proprietary or confidential information, including information relating to reports, data, drawings, design software or other material, whether written or oral, in electronic or magnetic format, and the contents thereof; and any reports, digests or summaries created or derived from

	any of the foregoing that is provided by the Client to the Personnel; any information provided by or relating to the Client, its technology, technical processes, business affairs or finances or any other information acquired in the course of the Services, nor shall the MSI and the Personnel make public the recommendations formulated in the course of, or as a result of, the Solution subject to: (a) all Confidential Information shall be identified as confidential at the time of disclosure; (b) each Party will comply with all applicable export and import laws and associated embargo and economic sanction regulations, applicable to either Party, that prohibit or restrict the export, re-export, or transfer of products, technology, services or data, directly or indirectly, to certain countries, or for certain end uses or end users. Notwithstanding the aforesaid, the MSI and the Personnel may disclose such information to the extent that such information: (i) was in the public domain prior to its delivery to the MSI/Personnel or becomes a part of the public domain from a source other than the MSI/Personnel; (ii) was obtained from a third party with no known duty to maintain its confidentiality; (iii) is required to be disclosed under Applicable Laws or judicial/ administrative/arbitral process or by any government instrumentality, provided that such disclosure is made: (a) after giving a prior written notice to the Client; and (b) using reasonable efforts to ensure that such disclosure is accorded confidential treatment; (iv) is provided to the professional advisers, agents, auditors or representatives of the MSI on a needs basis as is reasonable under the circumstances, provided that the MSI shall require such professional advisers, agents, auditors or representatives to undertake in writing to keep the information provided confidential, and further provided that the MSI shall use best efforts to ensure compliance with such undertaking; (v) is independently developed by the recipient or is already in the possession of the recipient.

24. Liability of the MSI	**24.1**	Subject to the exclusions set out in the SCC, the overall liability of the MSI and the Client under this Contract shall not exceed the Contract Price, provided that this limitation shall not apply to any obligation of the MSI to indemnify the Client with respect to intellectual property rights infringement.
25. Insurance to be Taken out by the MSI	**25.1**	The MSI shall at its expense take out and maintain in effect, or cause to be taken out and maintained in effect, during the performance of the Contract, the insurance set forth below. The identity of the insurers and the form of the policies shall be subject to the approval of the Client, who should not unreasonably withhold such approval. (a) Cargo Insurance During Transport as applicable, 110 percent of the price of the Information Technologies and other Goods in a freely convertible currency, covering the Goods from physical loss or damage during shipment through receipt at the Project Site. (b) Installation “All Risks” Insurance as applicable, 110 percent of the price of the Information Technologies and other Goods covering the Goods at the site from all risks of physical loss or damage (excluding only perils commonly excluded under “all risks” insurance policies of this type by reputable insurers) occurring prior to Operational Acceptance of the System. (c) Third-Party Liability Insurance On terms as **specified in the SCC,** covering bodily injury or death suffered by third parties (including the Client’s personnel) and loss of or damage to property (including the Client’s property and any Subsystems that have been accepted by the Client) occurring in connection with the supply and installation of the Information System. (d) Automobile Liability Insurance In accordance with the statutory requirements prevailing in the Client’s Country, covering use of all vehicles used by the MSI (whether or not owned by them) in connection with the execution of the Contract. (e) Other Insurance (if any), as **specified in the SCC.**

	25.2	The Client shall be named as co-insured under all insurance policies taken out by the MSI pursuant to GCC Clause 25.1, except for the Third-Party Liability. All insurer's rights of subrogation against such co-insured for losses or claims arising out of the performance of the Contract shall be waived under such policies.
	25.3	The MSI shall deliver to the Client certificates of insurance (or copies of the insurance policies) as evidence that the required policies are in full force and effect.
	25.4	*deleted*
	25.5	If the MSI fails to take out and/or maintain in effect the insurance referred to in GCC Clause 25.1, the Client may take out and maintain in effect any such insurance and may from time to time deduct from any amount due the MSI under the Contract any premium that the Client shall have paid to the insurer or may otherwise recover such amount as a debt due from the MSI.
	25.6	Unless otherwise provided in the Contract, the MSI shall prepare and conduct all and any claims made under the policies effected by it pursuant to this GCC Clause 25, and all monies payable by any insurers shall be paid to the MSI. The Client shall give to the MSI all such reasonable assistance as may be required by the MSI in connection with any claim under the relevant insurance policies. With respect to insurance claims in which the Client's interest is involved, the MSI shall not give any release or make any compromise with the insurer without the prior written consent of the Client. With respect to insurance claims in which the MSI's interest is involved, the Client shall not give any release or make any compromise with the insurer without the prior written consent of the MSI.
26. Accounting, and Auditing	**26.1**	The MSI shall keep accurate and systematic accounts and records in respect of the Services required of MSI under this Contract, in accordance with internationally accepted accounting principles and in such form and detail as will clearly identify all relevant time charges and costs and the basis thereof.
	26.2	The MSI shall permit, the Client and/or persons appointed by the Client to inspect all accounts and records relating to the performance of the Contract,

		and to have such accounts and records audited by auditors appointed by the Client, if requested by the Client. Any act intended to materially impede the exercise of the Client's inspection and audit rights provided for under this Clause 26.2 shall constitute a material breach of the Contract, which would give the Client the right to terminate the Contract.
27. Time for Commencement and Operational Acceptance	**27.1**	The MSI shall commence work on the System within the period specified in the SCC, and without prejudice to GCC Clause 55.2, the MSI shall thereafter proceed with the System in accordance with the time schedule specified in the Implementation Schedule in the Section – 5 Technical Requirements and any refinements made in the Agreed and Finalized Project Plan.
	27.2	The MSI shall achieve Operational Acceptance of the System (or Subsystem(s) where a separate time for Operational Acceptance of such Subsystem(s) is specified in the Contract) within the time specified in the SCC and in accordance with the time schedule specified in the Implementation Schedule in the Section 5 – Technical Requirements and any refinements made in the Agreed and Finalized Project Plan, or within such extended time to which the MSI shall be entitled under GCC Clause 56 (Extension of Time for Achieving Operational Acceptance).

D. PERSONNEL

28. Description of Key Experts	**28.1**	The title, agreed job description and minimum qualification of each Key Expert to carry out the Work are described in ITB.
	28.2	All Key Expert as proposed by the Bidder should be full time employees of the Bidder (or JV/Consortium members) and shall be stationed at Bhubaneswar for the period of contract.
29. Replacement of Key Experts	**29.1**	Except as the Client may otherwise agree in writing and no changes shall be made in the Key Experts without the prior consent of the Client.
	29.2	A request for substitution of a Key Expert during the term of the Contract may be considered based on the MSI's written request.

	29.3	The Client may make a request in writing for the substitution of a Key Expert with an equal or better qualification and experience. On receiving request, the MSI shall provide substitution within 30 days of receipt of request for the respective Key Expert.
	29.4	In case any proposed resource resigns, then the MSI has to inform Client within one week of such resignation and the MSI shall promptly initiate a search for a replacement to ensure that the role of any member of the Key Expert is not vacant at any point in time during the contract period, subject to reasonable extensions requested by the MSI and its approval by the Client.
	29.5	If Client objects to any such replacement appointment, the MSI shall not assign the individual to that position and shall seek an alternative candidate in accordance with the resource requirements.
	29.6	The MSI needs to ensure at least 4 weeks of overlap period in such replacements. Client will not be responsible for any knowledge transition to the replacement resource and any impact/escalation of cost incurred by the MSI due to resource replacement.
	29.7	If in the first 6 month period from the Contract Effective Date and in any rolling 12 months period during the Term of the Contract, 15 percent or more of the members of the Key Expert cease or reduce their involvement in the Services required of MSI under this Contract for any reason other than with Client's prior written consent, the MSI shall:
	29.7.1	provide Client with a reasonably detailed explanation as to the reasons for such change, including, where applicable and permitted, notes from any exit interviews conducted by the MSI with any departing member of the Key Expert; and
	29.7.2	if such change to Key Expert has or is likely to have any material adverse impact on the provision of the Services required of MSI under this Contract or any substantial part thereof, undertake, at its own costs, such remediation acts as are reasonably necessary in order to improve the retention of the Key Expert including making reasonable changes to the human resources policies and procedures applicable to the Key Expert (including those related to compensation, benefits and other conditions so that they are competitive with the market) as may be necessary to

		ensure that such policies and procedures comply with Good Industry Practice.
30. Removal of Personnel	**30.1**	If the Client finds that any of the Personnel has committed serious misconduct or has been charged with having committed a criminal action, or if the Client determines that MSI's Personnel have engaged in any corrupt, fraudulent, coercive, collusive, undesirable or restrictive practices (as specified in Attachment 1 to the GCC) while performing the Work, the MSI shall, at the Client's written request, provide a replacement for such Personnel.
	30.2	In the event that any of Personnel is found by the Client to be incompetent or incapable in discharging assigned duties, the Client, specifying the grounds therefore, may request the MSI to provide a replacement.
	30.3	The replacement of any Personnel shall possess equivalent or better qualifications and experience and shall be approved by the Client.

E. EXIT MANAGEMENT AFTER OPERATIONAL ACCEPTANCE

31. Under Contract Completion	(a)	Before 6 months prior to the contract ending, the MSI shall fully train Client's staff or any other agency designated by Client who is designated to take over the maintenance of the System.
	(b)	The MSI shall be responsible for transferring all the knowledge regarding the Systems, technically and operationally to enable the new agency/ Client to carry out the requisite functions.
	(c)	All latest operations & technical manuals, configuration files, software, licenses, as-built drawings etc. shall be handed over to Client at least 3 months before contract completion.
	(d)	Client shall release the performance security to the MSI only after satisfactory Exit Management is achieved as part of the project and MSI is obligated to perform all required additional functions to facilitate the same for a smooth transfer of the duties.
	(e)	The Parties may, if mutually agreed, extend the contract in accordance with the terms and conditions **as specified in the SCC.**
32. Under Termination	(a)	After termination notice by the Client, the MSI shall as soon as possible and within 90 days (of Termination

upon MSI's Default / Client's Convenience (as per GCC Clauses 18 (a) and 18 (c))	Period) fully train Client's staff or any other agency designated by Client who is designated to take over the maintenance of the System. (b) The MSI shall be responsible for continuing the maintenance as per the scope of the contract during the Termination period as per the SLA's in the RFP. (c) The MSI shall be responsible for transferring all the knowledge regarding the Systems, technically and operationally to enable the new agency/ Client to carry out the requisite functions. (d) All latest operations & technical manuals, configuration files, software, licenses, as-built drawings etc. shall be handed over to Client within 1 month after termination notice. (e) Client shall release the requisite payments to the MSI pursuant to the GCC/SCC Clause 18 to the MSI only after satisfactory Exit Management is achieved as part of the project and MSI is obligated to perform all required additional functions to facilitate the same for a smooth transfer of the duties.

F. RIGHTS AND OBLIGATIONS OF THE CLIENT

33. Assistance and Services	**33.1** Unless otherwise specified in the SCC, the Client shall: (i) Assist the MSI with obtaining any applicable permits, including work permits and such other documents as shall be necessary to enable the MSI to perform the Services required of MSI under this Contract; (ii) The Client shall be responsible for timely provision of all resources, information, and decision making under its control that are necessary to reach an Agreed and Finalized Project Plan (pursuant to GCC Clause 46.2) within the time schedule specified in the Implementation Schedule in the Section 5 – Technical Requirements. **33.2** If requested by the MSI, the Client shall use its best endeavours to assist the MSI in obtaining in a timely and expeditious manner all permits, approvals, and/or licenses necessary for the execution of the Contract from all local, state, or national government authorities or public service undertakings that such authorities or undertakings require the MSI or Subcontractors or the

		personnel of the MSI or Subcontractors, as the case may be, to obtain.
	33.3	In such cases where the responsibilities of specifying and acquiring or upgrading telecommunications and/or electric power services falls to the MSI, as specified in the Section 5 – Technical Requirements, SCC, Agreed and Finalized Project Plan, or other parts of the Contract, the Client shall use its best endeavours to assist the MSI in obtaining such services in a timely and expeditious manner.
	33.4	The Client shall be responsible for timely provision of all resources, access, and information necessary for the Installation and Operational Acceptance of the System (including, but not limited to, any required telecommunications or electric power services), as identified in the Agreed and Finalized Project Plan, except where provision of such items is explicitly identified in the Contract as being the responsibility of the MSI. Delay by the Client may result in an appropriate extension of the Time for Operational Acceptance, at the MSI's discretion.
	33.5	The Client assumes primary responsibility for the Operational Acceptance Test(s) for the System, in accordance with GCC Clause 54.2, and shall be responsible for the continued operation of the System after Operational Acceptance. However, this shall not limit in any way the MSI's responsibilities after the date of Operational Acceptance otherwise specified in the Contract.
	33.6	The MSI is responsible for performing and safely storing timely and regular backups of its data and Software in accordance with accepted data management principles.
	33.7	All costs and expenses involved in the performance of the obligations under this GCC Clause 33 shall be the responsibility of the Client, save those to be incurred by the MSI with respect to the performance of the Operational Acceptance Test(s), in accordance with GCC Clause 54.2.
	33.8	The Client may depute Project Management Consultant (PMC) or competent personnel to properly carry out Delivery, Pre-commissioning, Installation, Commissioning, and Operational Acceptance, at or before the time specified in the Section 5 - Technical

		Requirements- Implementation Schedule and the Agreed and Finalized Project Plan.
	33.9	Provide to the MSI any such other assistance as may be specified in the SCC.
34. Access to Project Office	**34.1**	MSI to establish own office and maintain it throughout the contract period in Bhubaneswar which shall be used to deliver this project. Client may visit MSI office periodically to check the existence.
35. Counterpart Personnel	**35.1**	Unless otherwise specified in the Contract or agreed upon by the Client and the MSI, the Client shall provide sufficient, properly qualified operating and technical personnel, as required by the MSI to properly carry out Delivery, Pre-commissioning, Installation, Commissioning, and Operational Acceptance, at or before the time specified in the Section 5 - Technical Requirements -Implementation Schedule and the Agreed and Finalized Project Plan.
	35.2	The Client will designate appropriate staff for the training courses to be given by the MSI and shall make all appropriate logistical arrangements for such training as specified in the Section 5 - Technical Requirements, SCC, the Agreed and Finalized Project Plan, or other parts of the Contract.

G. PAYMENTS TO THE MSI

36. Total Value of the Contract	**36.1**	The Contract Price shall be as specified in the Contract Agreement.
	36.2	The Contract Price shall be a firm lump sum not subject to any alteration, except: (a) in the event of a Change in the System pursuant to GCC Clause 14 or to other clauses in the Contract; (b) in accordance with the price adjustment formula (if any) **specified in the SCC.**
	36.3	The MSI shall be deemed to have satisfied itself as to the correctness and sufficiency of the Contract Price, which shall, except as otherwise provided for in the Contract, cover all its obligations under the Contract.

37. Taxes and Duties	**37.1** The MSI is responsible for meeting any and all Tax liabilities arising out of the Contract in India or elsewhere, unless it is stated otherwise in the SCC. **37.2** All payments made by the Client to the MSI shall be subject to deductions and withholding of applicable Taxes in accordance with Applicable Laws. **37.3** If any tax exemptions, reductions, allowances, or privileges may be available to the MSI in the Client's Country, the Client shall use its best efforts to enable the MSI to benefit from any such tax savings to the maximum allowable extent. **37.4** For the purpose of the Contract, it is agreed that the Contract Price as specified in Contract Agreement is inclusive of all taxes, duties, levies, and charges prevailing at the date twenty-eight (28) days prior to the date of bid submission in the Client's Country. If any Tax rates are increased or decreased, a new Tax is introduced, an existing Tax is abolished, or any change in interpretation or application of any Tax occurs in the course of the performance of the Contract, which was or will be assessed on the MSI, its Subcontractors, or their employees in connection with performance of the Contract, an equitable adjustment to the Contract Price shall be made to fully take into account any such change by addition to or reduction from the Contract Price, as the case may be.
38. Currency of Payment	**38.1** Any payment under this Contract shall be made in Indian Rupees.
39. Securities	(a) Issuance of Securities The MSI shall provide the securities specified below in favour of the Client at the times and in the amount, manner, and form specified below. *(b) deleted* (c) Performance Security: (i) The MSI shall, within twenty-eight (28) days of the notification of Contract award, provide a security for the due performance of the Contract in the amount and currency **specified in the SCC;** (ii) The security shall be a bank guarantee in the form provided in the Sample Forms Section of

	the Bidding Documents, or it shall be in another form acceptable to the Client; (iii) The security shall automatically become null and void once all the obligations of the MSI under the Contract have been fulfilled, including, but not limited to, any obligations during the Warranty Period and any extensions to the period. The security shall be returned to the MSI no later than twenty-eight (28) days after its expiration; (iv) Upon Operational Acceptance of the entire System, the security shall be reduced to the amount **specified in the SCC,** on the date of such Operational Acceptance, so that the reduced security would only cover the remaining warranty obligations of the MSI.
40. Mode of Billing and Payment	**40.1** The MSI's request for payment shall be made to the Client in writing, accompanied by an invoice describing, as appropriate, the System or Subsystem(s), Delivered, Pre-commissioned, Installed, and Operationally Accepted, and by documents submitted pursuant to GCC Clause 49.5 and upon fulfilment of other obligations stipulated in the Contract. The Contract Price shall be paid as **specified in the SCC.** **40.2** No payment made by the Client herein shall be deemed to constitute acceptance by the Client of the System or any Subsystem(s). **40.3** Payments shall be made promptly by the Client, but in no case later than forty five (45) days after submission of a valid invoice by the MSI. **40.4** Notwithstanding anything to the contrary in the Contract, the Client may withhold from any payment due to the MSI any amounts that the Client deems reasonably necessary or appropriate because of any one or more of the following reasons: (i) Any penalties applicable on the MSI as per SLA; (ii) Failure by the MSI to provide certificates of insurance; (iii) Any overpayments made by the Client in a previous payment; (iv) Any payment required to be withheld under any Applicable Law;

		(v) The invoice is not accompanied by all necessary supporting documents; (vi) A dispute exists as to the accuracy or completeness of any invoice; or (vii) Any amounts due to the Client from the MSI under the Contract. **40.5** All payments under this Contract shall be made by wire transfer to the accounts of the MSI specified in the SCC.
41. Interest on Delayed Payments	**41.1**	If the Client had delayed payments beyond forty five (45) days after the due date or within the period set forth in the Contract, interest shall be paid to the MSI on any amount due by, not paid on, such due date for each day of delay at the annual rate stated in the SCC.

H. INTELLECTUAL PROPERTY

42. Copyright	**42.1**	The Intellectual Property Rights in all Standard Software and Standard Materials shall remain vested in the owner of such rights.
	42.2	The Client agrees to restrict use, copying, or duplication of the Standard Software and Standard Materials in accordance with GCC Clause 43, except that additional copies of Standard Materials may be made by the Client for use within the scope of the project of which the System is a part, in the event that the MSI does not deliver copies within thirty (30) days from receipt of a request for such Standard Materials.
	42.3	*The Client may assign, license, or otherwise voluntarily transfer its contractual rights to use the Standard Software or elements of the Standard Software, without the MSI's prior written consent, under the following circumstances:* *(a) To any agency that shall be responsible to operate the project in the future in the event of dilution of the Client or the responsibility being transferred from Client to other agency;* *(b) To any location or to any third party service provider if the Client decides to outsource the ITS maintenance to a third party;* *(c) Integrating with additional similar or non-similar hardware for additional functional needs as deemed suitable by the Client;*

		(d) In the event of termination of contract during the operational period. *The MSI shall protect the Client from any liabilities arising there from. The MSI shall indicate all those components in the software, if any, that cannot be bound by this condition explicitly while responding to the bid, and supporting with the corresponding evidence for the same.* **42.4** As applicable, the Client's and MSI's rights and obligations with respect to Custom Software or elements of the Custom Software, including any license agreements, and with respect to Custom Materials or elements of the Custom Materials, are specified in the SCC**. Subject to the SCC,** the Intellectual Property Rights in all Custom Software and Custom Materials specified in Appendices 14 and 15 of the Contract Agreement (if any) shall, at the date of this Contract or on creation of the rights (if later than the date of this Contract), vest in the Client. The MSI shall do and execute or arrange for the doing and executing of each necessary act, document, and thing that the Client may consider necessary or desirable to perfect the right, title, and interest of the Client in and to those rights. In respect of such Custom Software and Custom Materials, the MSI shall ensure that the holder of a moral right in such an item does not assert it, and the MSI shall, if requested to do so by the Client and where permitted by applicable law, ensure that the holder of such a moral right waives it. **42.5** The Parties shall enter into such (if any) escrow arrangements in relation to the Source Code to some or all of the Software as are **specified in the SCC** and in **accordance with the SCC.**
43. Software License Agreements	**43.1**	Except to the extent that the Intellectual Property Rights in the Software vest in the Client, the MSI hereby grants to the Client license to access and use the Software, including all inventions, designs, and marks embodied in the Software. All software licenses and applications specific to this Project shall be provided with perpetual, royalty free licenses. Such license to access and use the Software shall: (a) be:

	(i) nonexclusive; (ii) *fully paid up and irrevocable (except that it shall terminate if the Contract terminates before Operational Acceptance pursuant to GCC Clauses 18 b and 18 c*; (iii) valid throughout the territory of the Client's Country; and (b) permit the Software to be: (i) used or copied for use on or with the computer(s) for which it was acquired (if specified in the Section 5 – Technical Requirements and/or the MSI's bid), plus a backup computer(s) of the same or similar capacity, if the primary is(are) inoperative, and during a reasonable transitional period when use is being transferred between primary and backup; (ii) *the Software license shall permit the Software to be used or copied for use or transferred to a replacement computer**:*** ***provided the replacement computer falls within approximately the same or a higher class of machine and maintains approximately the same number of users, if a multi-user machine***; (iii) if the nature of the System is such as to permit such access, accessed from other computers connected to the primary and/or backup computer(s) by means of a local or wide-area network or similar arrangement, and used on or copied for use on those other computers to the extent necessary to that access; (iv) reproduced for safekeeping or backup purposes; (v) customized, adapted, or combined with other computer software for use by the Client, provided that derivative software incorporating any substantial part of the delivered, restricted Software shall be subject to same restrictions as are set forth in this Contract; (vi) *the Software license shall permit the*

	*Software to be disclosed to and reproduced for use (including a valid sublicense) by**: support service MSIs or their subcontractors, exclusively for such MSIs or subcontractors in the performance of their support service contracts,** subject to the same restrictions set forth in this Contract;* (vii) *In addition to the persons specified in GCC Clause 43.1 (b) (vi), the Software may be disclosed to, and **reproduced** for use by, **Client or its SPV entities or any other party which would take over the project in the future** subject to the same restrictions as are set forth in this Contract.* **43.2** The MSI's right to audit the Standard Software will be subject to the following terms: *(i) Maximum of 1 audit per calendar year is allowed by the Client and the duration of such audit shall not exceed 3 consecutive working days;* *(ii) The MSI shall get a prior written approval from Bhubaneswar Smart City Limited (BSCL) at least 1 week in advance on the nature, number of people and duration of the audit.* *The Client does not have any financial implication for conducting any such audit and can only extend necessary logistic support pertaining to relevant technical man power resources.*
44. Confidential Information	**44.1** The "Receiving Party" (either the Client or the MSI) shall keep confidential and shall not, without the written consent of the other party to this Contract ("the Disclosing Party"), divulge to any third party any documents, data, or other information of a confidential nature ("Confidential Information") connected with this Contract, and furnished directly or indirectly by the Disclosing Party prior to or during performance, or following termination, of this Contract. **44.2** For the purposes of GCC Clause 44.1, the MSI is also deemed to be the Receiving Party of Confidential Information generated by the MSI itself in the course of the performance of its obligations under the Contract and relating to the businesses, finances, MSIs, employees, or other contacts of the Client or the Client's use of the System. **44.3** Notwithstanding GCC Clauses 44.1 and 44.2:

	(a) The MSI may furnish to its Subcontractor Confidential Information of the Client to the extent reasonably required for the Subcontractor to perform its work under the Contract; and (b) The Client may furnish Confidential Information of the MSI: (i) to its support service MSIs and their subcontractors to the extent reasonably required for them to perform their work under their support service contracts; and (ii) to its affiliates and subsidiaries, in which event the Receiving Party shall ensure that the person to whom it furnishes Confidential Information of the Disclosing Party is aware of and abides by the Receiving Party's obligations under this GCC Clause 44 as if that person were party to the Contract in place of the Receiving Party. **44.4** The Client shall not, without the MSI's prior written consent, use any Confidential Information received from the MSI for any purpose other than the operation, maintenance and further development of the System. Similarly, the MSI shall not, without the Client's prior written consent, use any Confidential Information received from the Client for any purpose other than those that are required for the performance of the Contract. **44.5** The obligation of a party under GCC Clause 44.1 through 44.4 above, however, shall not apply to that information which: (a) now or hereafter enters the public domain through no fault of the Receiving Party; (b) can be proven to have been possessed by the Receiving Party at the time of disclosure and that was not previously obtained, directly or indirectly, from the Disclosing Party; (c) otherwise lawfully becomes available to the Receiving Party from a third party that has no obligation of confidentiality. **44.6** The above provisions of this GCC Clause 44 shall not in any way modify any undertaking of confidentiality given by either of the Parties to this Contract prior to the date of the Contract in respect of the System or any part thereof. **44.7** The provisions of this GCC Clause 44 shall survive the termination, for whatever reason, of the Contract for

	three (3) years or such longer period as may be **specified in the SCC.**

I. SUPPLY, INSTALLATION, TESTING, COMMISSIONING, AND ACCEPTANCE OF THE SYSTEM

45. Representatives	**45.1**	Project Manager If the Project Manager is not named in the Contract, then within fourteen (14) days from the Effective Date, the Client shall appoint and notify the MSI in writing of the name of the Project Manager. The Client may from time to time appoint some other person as the Project Manager in place of the person previously so appointed and shall give a notice of the name of such other person to the MSI without delay. No such appointment shall be made at such a time or in such a manner as to impede the progress of work on the System. Such appointment shall take effect only upon receipt of such notice by the MSI. Subject to the extensions and/or limitations **specified in the SCC** (if any), the Project Manager shall have the authority to represent the Client on all day-to-day matters relating to the System or arising from the Contract, and shall normally be the person giving or receiving notices on behalf of the Client.
	45.2	MSI's Representative
	45.2.1	If the MSI's Representative is not named in the Contract, then within fourteen (14) days of the Effective Date, the MSI shall appoint the MSI's Representative and shall request the Client in writing to approve the person so appointed. The request must be accompanied by a detailed curriculum vitae for the nominee, as well as a description of any other System or non-System responsibilities the nominee would retain while performing the duties of the MSI's Representative. If the Client does not object to the appointment within fourteen (14) days, the MSI's Representative shall be deemed to have been approved. If the Client objects to the appointment within fourteen (14) days giving the reason therefore, then the MSI shall appoint a replacement within fourteen (14) days of such objection in accordance with this GCC Clause 45.2.1;
	45.2.2	Subject to the extensions and/or limitations **specified in the SCC** (if any), the MSI's Representative shall have the authority to represent the MSI on all day-to-day matters relating to the System or arising from the

	Contract, and shall normally be the person giving or receiving notices on behalf of the MSI; **45.2.3** The MSI shall not revoke the appointment of the MSI's Representative without the Client's prior written consent, which shall not be unreasonably withheld. If the Client consents to such an action, the MSI shall appoint another person of equal or superior qualifications as the MSI's Representative, pursuant to the procedure set out in GCC Clause 45.2.1; **45.2.4** The MSI's Representative and staff are obliged to work closely with the Client's Project Manager and staff, act within their own authority, and abide by directives issued by the Client that are consistent with the terms of the Contract. The MSI's Representative is responsible for managing the activities of its personnel and any subcontracted personnel; **45.2.5** The MSI's Representative may, subject to the approval of the Client (which shall not be unreasonably withheld), at any time delegate to any person any of the powers, functions, and authorities vested in him or her. Any such delegation may be revoked at any time. Any such delegation or revocation shall be subject to a prior notice signed by the MSI's Representative and shall specify the powers, functions, and authorities thereby delegated or revoked. No such delegation or revocation shall take effect unless and until the notice of it has been delivered; **45.2.6** Any act or exercise by any person of powers, functions and authorities so delegated to him or her in accordance with GCC Clause 45.2.5 shall be deemed to be an act or exercise by the MSI's Representative. **45.3** Objections and Removals **45.3.1** The Client may by notice to the MSI object to any representative or person employed by the MSI in the execution of the Contract who, in the reasonable opinion of the Client, may have behaved inappropriately, be incompetent, or be negligent. The Client shall provide evidence of the same, whereupon the MSI shall remove such person from work on the System; **45.3.2** If any representative or person employed by the MSI is removed in accordance with GCC Clause 45.3.1, the MSI shall, where required, promptly appoint a replacement.

46. Project Plan	**46.1**	In close cooperation with the Client and based on the Preliminary Project Plan included in the MSI's bid, the MSI shall develop a Project Plan encompassing the activities specified in the Contract. The contents of the Project Plan shall be as **specified in the SCC** and/or Technical Requirements.
	46.2	The MSI shall formally present to the Client the Project Plan in accordance with the procedure specified in the SCC.
	46.3	If required, the impact on the Implementation Schedule of modifications agreed during finalization of the Agreed and Finalized Project Plan shall be incorporated in the Contract by amendment, in accordance with GCC Clauses 14 and 56.
	46.4	The MSI shall undertake to supply, install, test, and commission the System in accordance with the Agreed and Finalized Project Plan and the Contract.
	46.5	The Progress and other reports **specified in the SCC** shall be prepared by the MSI and submitted to the Client in the format and frequency specified in the Technical Requirements.
47. Subcontracting	**47.1**	*Appendix 1 (List of Approved Subcontractors) to the Contract Agreement specifies critical items of supply or services and a list of Subcontractors for each item that are considered acceptable by the Client.*
	47.2	*The MSI may, at its discretion, select and employ Subcontractors for such critical items from those Subcontractors listed pursuant to GCC Clause 47.1. If the MSI wishes to employ a Subcontractor not so listed, or subcontract an item not so listed, it must seek the Client's prior approval under GCC Clause 47.3.*
	47.3	*For items for which pre-approved Subcontractor lists have not been specified in Appendix 1 to the Contract Agreement, the MSI may employ such Subcontractors as it may select, provided: (i) the MSI notifies the Client in writing at least twenty-eight (28) days prior to the proposed mobilization date for such Subcontractor; and (ii) by the end of this period either the Client has granted its approval in writing or fails to respond. The MSI shall not engage any Subcontractor to which the Client has objected in writing prior to the end of the notice period. The absence of a written objection by the Client during the above specified period shall constitute formal acceptance of the proposed Subcontractor. Except to*

		the extent that it permits the deemed approval of the Client of Subcontractors not listed in the Contract Agreement, nothing in this Clause, however, shall limit the rights and obligations of either the Client or MSI as they are specified in GCC Clauses 47.1 and 47.2, in the SCC, or in Appendix 1 of the Contract Agreement.
	47.4	*The provisions as mentioned in GCC Clauses 47.2 & 47.3, does not apply on the sub-contractors whose qualifications are used by MSI to get qualified The MSI will not be allowed to change any such sub-contractor during any stage of the Contract.*
	47.5	*The MSI shall sub-contract/outsource work/services of at least 5% of the value of Opex cost to a local firm registered in the state of Odisha.*
48. Design and Engineering	**48.1**	Technical Specifications and Drawings
	48.1.1	The MSI shall execute the detailed design and the implementation activities necessary for successful installation of the System in compliance with the provisions of the Contract or, where not so specified, in accordance with good industry practice; The MSI shall be responsible for any discrepancies, errors or omissions in the specifications, drawings, and other technical documents that it has prepared, whether such specifications, drawings, and other documents have been approved by the Project Manager or not, provided that such discrepancies, errors, or omissions are not because of inaccurate information furnished in writing to the MSI by or on behalf of the Client.
	48.1.2	The MSI shall be entitled to disclaim responsibility for any design, data, drawing, specification, or other document, or any modification of such design, drawings, specification, or other documents provided or designated by or on behalf of the Client, by giving a notice of such disclaimer to the Project Manager.
	48.2	Codes and Standards Wherever references are made in the Contract to codes and standards in accordance with which the Contract shall be executed, the edition or the revised version of such codes and standards current at the date twenty-eight (28) days prior to date of bid submission shall apply unless otherwise **specified in the SCC.** During Contract execution, any changes in such codes and standards shall be applied after approval by the Client

	and shall be treated in accordance with GCC Clause 14.6.
	48.3 Approval/Review of Technical Documents by the Project Manager.
	48.3.1 The MSI shall prepare and furnish to the Project Manager the documents as **specified in the SCC** for the Project Manager's approval or review; Any part of the System covered by or related to the documents to be approved by the Project Manager shall be executed only after the Project Manager's approval of these documents. GCC Clause 48.3.2 through 48.3.7 shall apply to those documents requiring the Project Manager's approval, but not to those furnished to the Project Manager for its review only.
	48.3.2 Within thirty (30) days after receipt by the Project Manager of any document requiring the Project Manager's approval in accordance with GCC Clause 48.3.1, the Project Manager shall either return one copy of the document to the MSI with its approval endorsed on the document or shall notify the MSI in writing of its disapproval of the document and the reasons for disapproval and the modifications that the Project Manager proposes. If the Project Manager fails to take such action within the thirty (30) days, then the document shall be deemed to have been approved by the Project Manager;
	48.3.3 The Project Manager shall not disapprove any document except on the grounds that the document does not comply with some specified provision of the Contract or that it is contrary to good industry practice;
	48.3.4 If the Project Manager disapproves the document, the MSI shall modify the document and resubmit it for the Project Manager's approval in accordance with GCC Clause 48.3.2. If the Project Manager approves the document subject to modification(s), the MSI shall make the required modification(s), and the document shall then be deemed to have been approved, subject to GCC Clause 48.3.5. The procedure set out in GCC Clause 48.3.2 through 48.3.4 shall be repeated, as appropriate, until the Project Manager approves such documents;
	48.3.5 If any dispute occurs between the Client and the MSI in connection with or arising out of the disapproval by the Project Manager of any document and/or any modification(s) to a document that cannot be settled

		between the Parties within a reasonable period, then, in case the Contract Agreement includes and names an Adjudicator, such dispute may be referred to the Adjudicator for determination in accordance with GCC Clause 20. If such dispute is referred to an Adjudicator, the Project Manager shall give instructions as to whether and if so, how, performance of the Contract is to proceed. The MSI shall proceed with the Contract in accordance with the Project Manager's instructions, provided that if the Adjudicator upholds the MSI's view on the dispute, then the MSI shall be reimbursed by the Client for any additional costs incurred by reason of such instructions and shall be relieved of such responsibility or liability in connection with the dispute and the execution of the instructions as the Adjudicator shall decide, and the Time for Achieving Operational Acceptance shall be extended accordingly; **48.3.6** The Project Manager's approval, with or without modification of the document furnished by the MSI, shall not relieve the MSI of any responsibility or liability imposed upon it by any provisions of the Contract except to the extent that any subsequent failure results from modifications required by the Project Manager or inaccurate information furnished in writing to the MSI by or on behalf of the Client; **48.3.7** The MSI shall not depart from any approved document unless the MSI has first submitted to the Project Manager an amended document and obtained the Project Manager's approval of the document, pursuant to the provisions of this GCC Clause 48.3. If the Project Manager requests any change in any already approved document and/or in any document based on such an approved document, the provisions of GCC Clause 14 shall apply to such request.
49. Procurement, Delivery, and Transport	**49.1**	Subject to related Client's responsibilities pursuant to GCC Clauses 33 to 35 and Clause 37, the MSI shall manufacture or procure and transport all the Information Technologies, Materials, and other Goods in an expeditious and orderly manner to the Project Site. **49.2** Delivery of the Information Technologies, Materials, and other Goods shall be made by the MSI in accordance with the Section 5 – Technical Requirements.

	49.3 Early or partial deliveries require the explicit written consent of the Client, which consent shall not be unreasonably withheld. **49.4** Transportation **49.4.1** The MSI shall provide such packing of the Goods as is required to prevent their damage or deterioration during shipment. The packing, marking, and documentation within and outside the packages shall comply strictly with the Client's instructions to the MSI. **49.4.2** The MSI will bear responsibility for and cost of transport to the Project Sites in accordance with the terms and conditions used in the specification of prices in the Price Schedules, including the terms and conditions of the associated Incoterms. **49.5** Unless otherwise **specified in the SCC,** the MSI will provide the Client with shipping and other documents, as specified below: **49.5.1** For Goods supplied from outside the Client's Country: Upon shipment, the MSI shall notify the Client and the insurance company contracted by the MSI to provide cargo insurance by telex, cable, facsimile, electronic mail, or EDI with the full details of the shipment. The MSI shall promptly send the following documents to the Client by mail or courier, as appropriate, with a copy to the cargo insurance company: (a) Two copies of the MSI's invoice showing the description of the Goods, quantity, unit price, and total amount; (b) Usual transportation documents; (c) Insurance certificate; (d) Certificate(s) of origin; and (e) Estimated time and point of arrival in the Client's Country and at the site. **49.5.2** For Goods supplied locally (i.e., from within the Client's country): Upon shipment, the MSI shall notify the Client by telex, cable, facsimile, electronic mail, or EDI with the full details of the shipment. The MSI shall promptly send the following documents to the Client by mail or courier, as appropriate: (a) Two copies of the MSI's invoice showing the

	Goods' description, quantity, unit price, and total amount; (b) Delivery note, railway receipt, or truck receipt; (c) Certificate of insurance; (d) Certificate(s) of origin; and (e) Estimated time of arrival at the site. **49.6** Customs Clearance: The MSI will bear responsibility for, and cost of, customs clearance into the Client's country in accordance the particular Incoterm(s) used for Goods supplied from outside the Client's country in the Price Schedules.
50. Product Upgrades	**50.1** At any point during performance of the Contract, should technological advances be introduced by the MSI for Information Technologies originally offered by the MSI in its bid and still to be delivered, the MSI shall be obligated to offer to the Client the latest versions of the available Information Technologies having equal or better performance or functionality at the same or lesser unit prices, pursuant to GCC Clause 14. **50.2** At any point during performance of the Contract, for Information Technologies still to be delivered, the MSI will also pass on to the Client any cost reductions and additional and/or improved support and facilities that it offers to other clients of the MSI in the Client's Country, pursuant to GCC Clause 14. **50.3** During performance of the Contract, the MSI shall offer to the Client all new versions, releases, and updates of Standard Software, as well as related documentation and technical support services, within thirty (30) days of their availability from the MSI to other clients of the MSI in the Client's Country, and no later than twelve (12) months after they are released in the country of origin. In no case will the prices for these Software exceed those quoted by the MSI in the Recurrent Costs tables in its bid. **50.4** The MSI shall provide the Client: with all new versions, releases, and updates for all Software used in the system during the Maintenance Period at no additional cost to the Client.

	50.5	The Client shall introduce all new versions, releases or updates of the Software within nine (09) months of receipt of a production-ready copy of the new version, release, or update, provided that the new version, release, or update does not adversely affect System operation or performance or require extensive reworking of the System. In cases where the new version, release, or update adversely affects System operation or performance, or requires extensive reworking of the System, the MSI shall continue to support and maintain the version or release previously in operation for as long as necessary to allow introduction of the new version, release, or update. In no case shall the MSI stop supporting or maintaining a version or release of the Software less than twenty four (24) months after the Client receives a production-ready copy of a subsequent version, release, or update. The Client shall use all reasonable endeavours to implement any new version, release, or update as soon as practicable, subject to the twenty-four-month-long stop date.
51. Implementation, Installation, and Other Services	**51.1**	The MSI shall provide all Services specified in the Contract and Agreed and Finalized Project Plan in accordance with the highest standards of professional competence and integrity.
	51.2	Prices charged by the MSI for Services, if not included in the Contract, shall be agreed upon in advance by the parties (including, but not restricted to, any prices submitted by the MSI in the Recurrent Cost Schedules of its Bid) and shall not exceed the prevailing rates charged by the MSI to other Clients in the Client's Country for similar services.
52. Inspections and Tests	**52.1**	The Client or its representative shall have the right to inspect and/or test any components of the System, as specified in the Section 5 – Technical Requirements, to confirm their good working order and/or conformity to the Contract at the point of delivery and/or at the Project Site.
	52.2	The Client or its representative shall be entitled to attend any such inspections and/or tests of the components, provided that the Client shall bear all costs and expenses incurred in connection with such attendance, including but not limited to all inspection agent fees, travel, and related expenses.

	52.3	Should the inspected or tested components fail to conform to the Contract, the Client may reject the component(s), and the MSI shall either replace the rejected component(s), or make alterations as necessary so that it meets the Contract requirements free of cost to the Client.
	52.4	The Project Manager may require the MSI to carry out any inspection and/or test not specified in the Contract, provided that the MSI's reasonable costs and expenses incurred in the carrying out of such inspection and/or test shall be added to the Contract Price. Further, if such inspection and/or test impede the progress of work on the System and/or the MSI's performance of its other obligations under the Contract, due allowance will be made in respect of the Time for Achieving Operational Acceptance and the other obligations so affected.
	52.5	If any dispute shall arise between the Parties in connection with or caused by an inspection and/or with regard to any component to be incorporated in the System that cannot be settled amicably between the Parties within a reasonable period of time, either Party may invoke the process pursuant to GCC Clause 20 (Settlement of Disputes), starting with referral of the matter to the Adjudicator in case an Adjudicator is included and named in the Contract Agreement.
	52.6	*Client may employ qualified inspectors to inspect and certify the Information Technologies, Materials, and other Goods prior to shipment. A Prototype Approval Test might **be** requested by the Client to be conducted before shipment. If such a test is required, the expenses of the trip for the Inspectors shall be borne by the MSI.*
53. Installation of the System	**53.1**	As soon as the System, or any Subsystem, has, in the opinion of the MSI, been delivered, Pre-commissioned, and made ready for Commissioning and Operational Acceptance Testing in accordance with the Section 5 – Technical Requirements, the SCC and the Agreed and Finalized Project Plan, the MSI shall so notify the Client in writing.
	53.2	The Project Manager shall, within fourteen (14) days after receipt of the MSI's notice under GCC Clause 53.1, either issue an Installation Certificate in the form specified in the Sample Forms Section in the Bidding Documents, stating that the System, or major component or Subsystem (if Acceptance by major component or Subsystem is specified pursuant to the

	SCC for GCC Clause 54.2.1), has achieved Installation by the date of the MSI's notice under GCC Clause 53.1, or notify the MSI in writing of any defects and/or deficiencies, including, but not limited to, defects or deficiencies in the interoperability or integration of the various components and/or Subsystems making up the System. The MSI shall use all reasonable endeavours to promptly remedy any defect and/or deficiencies that the Project Manager has notified the MSI of. The MSI shall then promptly carry out retesting of the System or Subsystem and, when in the MSI's opinion the System or Subsystem is ready for Commissioning and Operational Acceptance Testing, notify the Client in writing, in accordance with GCC Clause 53.1. The procedure set out in this GCC Clause 53.2 shall be repeated, as necessary, until an Installation Certificate is issued. **53.3** If the Project Manager fails to issue the Installation Certificate and fails to inform the MSI of any defects and/or deficiencies within fourteen (14) days after receipt of the MSI's notice under GCC Clause 53.1, or if the Client puts the System or a Subsystem into production operation, then the System (or Subsystem) shall be deemed to have achieved successful Installation as of the date of the MSI's notice or repeated notice, or when the Client put the System into production operation, as the case may be.
54. Commissioning and Operational Acceptance	**54.1** Commissioning **54.1.1** Commissioning of the System (or Subsystem if specified pursuant to the SCC for GCC Clause 54.2.1) shall be commenced by the MSI: (a) immediately after the Installation Certificate is issued by the Project Manager, pursuant to GCC Clause 53.2; or (b) as otherwise specified in the Section 5 – Technical Requirements or the Agreed and Finalized Project Plan; or (c) immediately after Installation is deemed to have occurred, under GCC Clause 53.3. **54.1.2** The Client shall supply the operating and technical personnel and all materials and information reasonably required to enable the MSI to carry out its obligations with respect to Commissioning;

	Production use of the System or Subsystem(s) shall not commence prior to the start of formal Operational Acceptance Testing.
	54.2 Operational Acceptance Tests
	54.2.1 The Operational Acceptance Tests (and repeats of such tests) shall be the primary responsibility of the Client (in accordance with GCC Clause 33.5), but shall be conducted with the full cooperation of the MSI during Commissioning of the System (or major components or Subsystem[s] if **specified in the SCC** and supported by the Section 5 – Technical Requirements), to ascertain whether the System (or major component or Subsystem[s]) conforms to the Section 5 – Technical Requirements and meets the standard of performance quoted in the MSI's bid, including, but not restricted to, the functional and technical performance requirements. Operational Acceptance Testing shall be conducted in accordance with ***System, Sub-systems, tests, test procedures, and the required results for acceptance as specified in the* Section 5 – Technical Requirements (Testing Requirements);** At the Client's discretion, Operational Acceptance Tests may also be performed on replacement Goods, upgrades and new version releases, and Goods that are added or field-modified after Operational Acceptance of the System.
	54.2.2 If for reasons attributable to the Client, the Operational Acceptance Test of the System (or Subsystem[s] or major components, pursuant to the SCC for GCC Clause 54.2.1) cannot be successfully completed within the period **specified in the SCC,** from the date of Installation or any other period agreed upon in writing by the Client and the MSI, the MSI shall be deemed to have fulfilled its obligations with respect to the technical and functional aspects of the Section 5 – Technical Requirements, SCC and/or the Agreed and Finalized Project Plan, and GCC Clause 55.2 and 55.3 shall not apply.
	54.3 Operational Acceptance
	54.3.1 Subject to GCC Clause 54.4 (Partial Acceptance) below, Operational Acceptance shall occur in respect of the System, when: (a) the Operational Acceptance Tests, as specified in the Section 5 – Technical Requirements, and/or SCC and/or the Agreed and Finalized Project Plan have been successfully completed;

	or (b) the Operational Acceptance Tests have not been successfully completed or have not been carried out for reasons that are attributable to the Client within the period from the date of Installation or any other agreed-upon period as specified in GCC Clause 54.2.2 above; or (c) the Client has put the System into production or use for sixty (60) consecutive days. If the System is put into production or use in this manner, the MSI shall notify the Client and document such use. **54.3.2** At any time after any of the events set out in GCC Clause 54.3.1 have occurred, the MSI may give a notice to the Project Manager requesting the issue of an Operational Acceptance Certificate; **54.3.3** After consultation with the Client, and within fourteen (14) days after receipt of the MSI's notice, the Project Manager shall: (a) issue an Operational Acceptance Certificate; or (b) notify the MSI in writing of any defect or deficiencies or other reason for the failure of the Operational Acceptance Tests; or (c) issue the Operational Acceptance Certificate, if the situation covered by GCC Clause 54.3.1 (b) arises. **54.3.4** The MSI shall use all reasonable endeavours to promptly remedy any defect and/or deficiencies and/or other reasons for the failure of the Operational Acceptance Test that the Project Manager has notified the MSI of. Once such remedies have been made by the MSI, the MSI shall notify the Client, and the Client, with the full cooperation of the MSI, shall use all reasonable endeavours to promptly carry out retesting of the System or Subsystem. Upon the successful conclusion of the Operational Acceptance Tests, the MSI shall notify the Client of its request for Operational Acceptance Certification, in accordance with GCC Clause 54.3.3. The Client shall then issue to the MSI the Operational Acceptance Certification in accordance with GCC Clause 54.3.3(a), or shall notify the MSI of further defects, deficiencies, or other reasons for the failure of the Operational Acceptance Test. The procedure set out in this GCC Clause 54.3.4 shall be

	repeated, as necessary, until an Operational Acceptance Certificate is issued; **54.3.5** If the System or Subsystem fails to pass the Operational Acceptance Test(s) in accordance with GCC Clause 54.2, then either: (a) the Client may consider terminating the Contract, pursuant to GCC Clause 18 a; or (b) if the failure to achieve Operational Acceptance within the specified time period is a result of the failure of the Client to fulfil its obligations under the Contract, then the MSI shall be deemed to have fulfilled its obligations with respect to the relevant technical and functional aspects of the Contract, and GCC Clause 57.3 shall not apply. **54.3.6** If within fourteen (14) days after receipt of the MSI's notice the Project Manager fails to issue the Operational Acceptance Certificate or fails to inform the MSI in writing of the justifiable reasons why the Project Manager has not issued the Operational Acceptance Certificate, the System or Subsystem shall be deemed to have been accepted as of the date of the MSI's said notice. **54.4** Partial Acceptance **54.4.1** If so specified in the SCC for GCC Clause 54.2.1, Installation and Commissioning shall be carried out individually for each identified major component or Subsystem(s) of the System. In this event, the provisions in the Contract relating to Installation and Commissioning, including the Operational Acceptance Test, shall apply to each such major component or Subsystem individually, and Operational Acceptance Certificate(s) shall be issued accordingly for each such major component or Subsystem of the System, subject to the limitations contained in GCC Clause 54.4.2; **54.4.2** The issuance of Operational Acceptance Certificates for individual major components or Subsystems pursuant to GCC Clause 54.4.1 shall not relieve the MSI of its obligation to obtain an Operational Acceptance Certificate for the System as an integrated whole (if so specified in the SCC for GCC Clauses 40.1 and 54.2.1) once all major components and

		Subsystems have been supplied, installed, tested, and commissioned;
	54.4.3	In the case of minor components for the System that by their nature do not require Commissioning or an Operational Acceptance Test (e.g., minor fittings, furnishings or site works, etc.), the Project Manager shall issue an Operational Acceptance Certificate within fourteen (14) days after the fittings and/or furnishings have been delivered and/or installed or the site works have been completed. The MSI shall, however, use all reasonable endeavours to promptly remedy any defects or deficiencies in such minor components detected by the Client or MSI.

J. GUARANTEES AND LIABILITIES

55. Operational Acceptance Time Guarantee	**55.1**	The MSI guarantees that it shall complete the supply, Installation, Integration, Commissioning, and achieve Operational Acceptance of the System (or Subsystems, pursuant to the SCC for GCC Clause 54.2.1) within the time periods specified in the Implementation Schedule in the Section 5 – Technical Requirements and/or the Agreed and Finalized Project Plan pursuant to GCC Clause 27.2, or within such extended time to which the MSI shall be entitled under GCC Clause 56 (Extension of Time for Achieving Operational Acceptance).
	55.2	If the MSI fails to supply, install, commission, and achieve Operational Acceptance of the System (or Subsystems pursuant to the SCC for GCC Clause 54.2.1) within the time for achieving Operational Acceptance specified in the Implementation Schedule in the Section 5 – Technical Requirements or the Agreed and Finalized Project Plan, or any extension of the time for achieving Operational Acceptance previously granted under GCC Clause 56 (Extension of Time for Achieving Operational Acceptance), the MSI shall pay to the Client liquidated damages at the rate **specified in the SCC** as a percentage of the Contract Price, or the relevant part of the Contract Price if a Subsystem has not achieved Operational Acceptance. The aggregate amount of such liquidated damages shall in no event exceed the amount specified in the SCC (“the Maximum”). Once the Maximum is reached, the Client may consider termination of the Contract, pursuant to GCC Clause 18 a.

	55.3	Unless otherwise **specified in the SCC,** liquidated damages payable under GCC Clause 55.2 shall apply only to the failure to achieve Operational Acceptance of the System (and Subsystems) as specified in the Implementation Schedule in the Section 5 – Technical Requirements and/or Agreed and Finalized Project Plan. This Clause 55.3 shall not limit, however, any other rights or remedies the Client may have under the Contract for other delays. **55.4** If liquidated damages are claimed by the Client for the System (or Subsystem), the MSI shall have no further liability whatsoever to the Client in respect to the Operational Acceptance time guarantee for the System (or Subsystem). However, the payment of liquidated damages shall not in any way relieve the MSI from any of its obligations to complete the System or from any other of its obligations and liabilities under the Contract. **55.5** The liquidated damages as per GCC Clause 55.2 above, shall be applicable on all deliverables/milestones as defined in Implementation Schedule. The liquidated damages shall be calculated on the payment due against that deliverable/milestone which the MSI is failed to achieve.
56. Extension of Time for Achieving Operational Acceptance	**56.1**	The time(s) for achieving Operational Acceptance specified in the Schedule of Implementation shall be extended if the MSI is delayed or impeded in the performance of any of its obligations under the Contract by reason of any of the following: (a) Any Change in the System as provided in GCC Clause 14 (Change in the Information System); (b) Any occurrence of Force Majeure as provided in GCC Clause 65 (Force Majeure); (c) Default of the Client; or (d) Any other matter specifically mentioned in the Contract. By such period as shall be fair and reasonable in all the circumstances and as shall fairly reflect the delay or impediment sustained by the MSI. **56.2** Except where otherwise specifically provided in the Contract, the MSI shall submit to the Project Manager a notice of a claim for an extension of the time for achieving Operational Acceptance, together with particulars of the event or circumstance justifying such

		extension as soon as reasonably practicable after the commencement of such event or circumstance. As soon as reasonably practicable after receipt of such notice and supporting particulars of the claim, the Client and the MSI shall agree upon the period of such extension. In the event that the MSI does not accept the Client's estimate of a fair and reasonable time extension, the MSI shall be entitled to refer the matter to the provisions for the Settlement of Disputes pursuant to GCC Clause 20.
	56.3	The MSI shall at all times use its reasonable efforts to minimize any delay in the performance of its obligations under the Contract.
57. Defect Liability	**57.1**	The MSI warrants that the System, including all Information Technologies, Materials, and other Goods supplied and Services provided, shall be free from defects in the design, engineering, Materials, and workmanship that prevent the System and/or any of its components from fulfilling the Technical Requirements or that limit in a material fashion the performance, reliability, or extensibility of the System and/or Subsystems.
	57.2	The MSI also warrants that the Information Technologies, Materials, and other Goods supplied under the Contract are new, unused, and incorporate all recent improvements in design that materially affect the System's or Subsystem's ability to fulfil the Technical Requirements.
	57.3	In addition, the MSI warrants that: (i) all Goods components to be incorporated into the System form part of the MSI's and/or Subcontractor's current product lines, (ii) they have been previously released to the market, and (iii) those specific items **identified in the SCC** (if any) have been in the market for at least the minimum periods **specified in the SCC**.
	57.4	The Defect Liability (Warranty) Period shall commence from the date of Operational Acceptance of the System (or of any major component or Subsystem for which separate Operational Acceptance is provided for in the Contract) and shall extend for the length of time specified in the SCC.
	57.5	If during the Defect Liability (Warranty) Period any defect as described in GCC Clause 57.1 should be found in the design, engineering, Materials, and workmanship of the Information Technologies and other

	Goods supplied or of the Services provided by the MSI, the MSI shall promptly, in consultation and agreement with the Client regarding appropriate remedying of the defects, and at its sole cost, repair, replace, or otherwise make good (as the MSI shall, at its discretion, determine) such defect as well as any damage to the System caused by such defect. Any defective Information Technologies or other Goods that have been replaced by the MSI shall remain the property of the MSI. **57.6** The MSI shall not be responsible for the repair, replacement, or making good of any defect or of any damage to the System arising out of or resulting from any of the following causes: (a) improper operation or maintenance of the System by the Client; (b) normal wear and tear; (c) use of the System with items not supplied by the MSI, unless otherwise identified in the Section 5 – Technical Requirements, or approved by the MSI; or (d) modifications made to the System by the Client, or a third party, not approved by the MSI. **57.7** The MSI's obligations under this GCC Clause 57 shall not apply to: (a) any materials that are normally consumed in operation or have a normal life shorter than the Warranty Period; or (b) any designs, specifications, or other data designed, supplied, or specified by or on behalf of the Client or any matters for which the MSI has disclaimed responsibility, in accordance with GCC Clause 48.1.2. **57.8** The Client shall give the MSI a notice promptly following the discovery of such defect, stating the nature of any such defect together with all available evidence. The Client shall afford all reasonable opportunity for the MSI to inspect any such defect. The Client shall afford the MSI all necessary access to the System and the site to enable the MSI to perform its obligations under this GCC Clause 57. **57.9** The MSI may, with the consent of the Client, remove from the site any Information Technologies and other Goods that are defective, if the nature of the defect,

		and/or any damage to the System caused by the defect, is such that repairs cannot be expeditiously carried out at the site. If the repair, replacement, or making good is of such a character that it may affect the efficiency of the System, the Client may give the MSI notice requiring that tests of the defective part be made by the MSI immediately upon completion of such remedial work, whereupon the MSI shall carry out such tests. If such part fails the tests, the MSI shall carry out further repair, replacement, or making good (as the case may be) until that part of the System passes such tests. The tests shall be agreed upon by the Client and the MSI.
	57.10	If the MSI fails to commence the work necessary to remedy such defect or any damage to the System caused by such defect within the time period **specified in the SCC,** the Client may, following notice to the MSI, proceed to do such work or contract a third party (or parties) to do such work, and the reasonable costs incurred by the Client in connection with such work shall be paid to the Client by the MSI or may be deducted by the Client from any monies due the MSI or claimed under the Performance Security.
	57.11	If the System or Subsystem cannot be used by reason of such defect and/or making good of such defect, the Warranty Period for the System shall be extended by a period equal to the period during which the System or Subsystem could not be used by the Client because of such defect and/or making good of such defect.
	57.12	Items substituted for defective parts of the System during the Warranty Period shall be covered by the Defect Liability Warranty for the remainder of the Warranty Period applicable for the part replaced or three (3) months, whichever is greater.
	57.13	At the request of the Client and without prejudice to any other rights and remedies that the Client may have against the MSI under the Contract, the MSI will offer all possible assistance to the Client to seek warranty services or remedial action from any subcontracted third-party producers or licensor of Goods included in the System, including without limitation assignment or transfer in favour of the Client of the benefit of any warranties given by such producers or licensors to the MSI.

58. Functional Guarantees	**58.1**	The MSI guarantees that, once the Operational Acceptance Certificate(s) has been issued, the System represents a complete, integrated solution to the Client's requirements set forth in the Section 5 – Technical Requirements and it conforms to all other aspects of the Contract. The MSI acknowledges that GCC Clause 54 regarding Commissioning and Operational Acceptance governs how technical conformance of the System to the Contract requirements will be determined.
	58.2	If, for reasons attributable to the MSI, the System does not conform to the Section 5 – Technical Requirements or does not conform to all other aspects of the Contract, the MSI shall at its cost and expense make such changes, modifications, and/or additions to the System as may be necessary to conform to the Section 5 – Technical Requirements and meet all functional and performance standards. The MSI shall notify the Client upon completion of the necessary changes, modifications, and/or additions and shall request the Client to repeat the Operational Acceptance Tests until the System achieves Operational Acceptance.
	58.3	If the System (or Subsystem[s]) fails to achieve Operational Acceptance, the Client may consider termination of the Contract, pursuant to GCC Clause 18 a, and forfeiture of the MSI's Performance Security in accordance with GCC Clause 39 (c) in compensation for the extra costs and delays likely to result from this failure.
59. Intellectual Property Rights Warranty	**59.1**	The MSI hereby represents and warrants that: (a) the System as supplied, installed, tested, and accepted; (b) use of the System in accordance with the Contract; and (c) copying of the Software and Materials provided to the Client in accordance with the Contract. do not and will not infringe any Intellectual Property Rights held by any third party and that it has all necessary rights or at its sole expense shall have secured in writing all transfers of rights and other consents necessary to make the assignments, licenses, and other transfers of Intellectual Property Rights and the warranties set forth in the Contract, and for the Client to own or exercise all Intellectual Property Rights as provided in the Contract. Without limitation, the MSI

		shall secure all necessary written agreements, consents, and transfers of rights from its employees and other persons or entities whose services are used for development of the System.
60. Intellectual Property Rights Indemnity	**60.1**	The MSI shall indemnify and hold harmless the Client and its employees and officers from and against any and all losses, liabilities, and costs (including losses, liabilities, and costs incurred in defending a claim alleging such a liability), that the Client or its employees or officers may suffer as a result of any infringement or alleged infringement of any Intellectual Property Rights by reason of: (a) installation of the System by the MSI or the use of the System, including the Materials, in the country where the site is located; (b) copying of the Software and Materials provided the MSI in accordance with the Agreement; and (c) sale of the products produced by the System in any country, except to the extent that such losses, liabilities, and costs arise as a result of the Client's breach of GCC Clause 60.2.
	60.2	Such indemnity shall not cover any use of the System, including the Materials, other than for the purpose indicated by or to be reasonably inferred from the Contract, any infringement resulting from the use of the System, or any products of the System produced thereby in association or combination with any other goods or services not supplied by the MSI, where the infringement arises because of such association or combination and not because of use of the System in its own right.
	60.3	Such indemnities shall also not apply if any claim of infringement: (a) is asserted by a parent, subsidiary, or affiliate of the Client's organization; (b) is a direct result of a design mandated by the Client's Section 5 – Technical Requirements and the possibility of such infringement was duly noted in the MSI's Bid; or (c) results from the alteration of the System, including the Materials, by the Client or any persons other than the MSI or a person authorized by the MSI.

	60.4	If any proceedings are brought or any claim is made against the Client arising out of the matters referred to in GCC Clause 60.1, the Client shall promptly give the MSI notice of such proceedings or claims, and the MSI may at its own expense and in the Client's name conduct such proceedings or claim and any negotiations for the settlement of any such proceedings or claim. If the MSI fails to notify the Client within twenty-eight (28) days after receipt of such notice that it intends to conduct any such proceedings or claim, then the Client shall be free to conduct the same on its own behalf. Unless the MSI has so failed to notify the Client within the twenty-eight (28) days, the Client shall make no admission that may be prejudicial to the defence of any such proceedings or claim. The Client shall, at the MSI's request, afford all available assistance to the MSI in conducting such proceedings or claim and shall be reimbursed by the MSI for all reasonable expenses incurred in so doing.
	60.5	The Client shall indemnify and hold harmless the MSI and its employees, officers, and Subcontractors from and against any and all losses, liabilities, and costs (including losses, liabilities, and costs incurred in defending a claim alleging such a liability) that the MSI or its employees, officers, or Subcontractors may suffer as a result of any infringement or alleged infringement of any Intellectual Property Rights arising out of or in connection with any design, data, drawing, specification, or other documents or materials provided to the MSI in connection with this Contract by the Client or any persons (other than the MSI) contracted by the Client, except to the extent that such losses, liabilities, and costs arise as a result of the MSI's breach of GCC Clause 60.8.
	60.6	Such indemnity shall not cover: (a) any use of the design, data, drawing, specification, or other documents or materials, other than for the purpose indicated by or to be reasonably inferred from the Contract; (b) any infringement resulting from the use of the design, data, drawing, specification, or other documents or materials, or any products produced thereby, in association or combination with any other Goods or Services not provided by the Client or any other person contracted by the Client, where the infringement arises

	because of such association or combination and not because of the use of the design, data, drawing, specification, or other documents or materials in its own right. **60.7** Such indemnities shall also not apply: (a) if any claim of infringement is asserted by a parent, subsidiary, or affiliate of the MSI's organization; (b) to the extent that any claim of infringement is caused by the alteration, by the MSI, or any persons contracted by the MSI, of the design, data, drawing, specification, or other documents or materials provided to the MSI by the Client or any persons contracted by the Client. **60.8** If any proceedings are brought or any claim is made against the MSI arising out of the matters referred to in GCC Clause 60.5, the MSI shall promptly give the Client notice of such proceedings or claims, and the Client may at its own expense and in the MSI's name conduct such proceedings or claim and any negotiations for the settlement of any such proceedings or claim. If the Client fails to notify the MSI within twenty-eight (28) days after receipt of such notice that it intends to conduct any such proceedings or claim, then the MSI shall be free to conduct the same on its own behalf. Unless the Client has so failed to notify the MSI within the twenty-eight (28) days, the MSI shall make no admission that may be prejudicial to the defence of any such proceedings or claim. The MSI shall, at the Client's request, afford all available assistance to the Client in conducting such proceedings or claim and shall be reimbursed by the Client for all reasonable expenses incurred in so doing.
61. Limitation of Liability	**61.1** Provided the following does not exclude or limit any liabilities of either Party in ways not permitted by applicable law: (a) the MSI shall not be liable to the Client, whether in contract, tort, or otherwise, for any indirect or consequential loss or damage, loss of use, loss of production, or loss of profits or interest costs, provided that this exclusion shall not apply to any obligation of the MSI to pay liquidated damages to the Client; and (b) the aggregate liability of the MSI to the Client, whether under the Contract, in tort or otherwise, shall not exceed the total Contract Price,

	provided that this limitation shall not apply to any obligation of the MSI to indemnify the Client with respect to intellectual property rights infringement.

K. RISK DISTRIBUTION

62. Transfer of Ownership	**62.1** With the exception of Software and Materials, the ownership of the Information Technologies and other Goods shall be transferred to the Client at the time of Delivery or otherwise under terms that may be agreed upon and specified in the Contract Agreement. **62.2** Ownership and the terms of usage of the Software and Materials supplied under the Contract shall be governed by GCC Clause 42 (Copyright) and any elaboration in the Section 5 – Technical Requirements. **62.3** Ownership of the MSI's Equipment used by the MSI and its Subcontractors in connection with the Contract shall remain with the MSI or its Subcontractors.
63. Care of the System	**63.1** The Client shall become responsible for the care and custody of the System or Subsystems upon their Delivery. The Client shall make good at its own cost any loss or damage that may occur to the System or Subsystems from any cause from the date of Delivery until the date of Operational Acceptance of the System or Subsystems, pursuant to GCC Clause 54 (Commissioning and Operational Acceptance), excepting such loss or damage arising from acts or omissions of the MSI, its employees, or subcontractors. **63.2** If any loss or damage occurs to the System or any part of the System by reason of: (a) (insofar as they relate to the country where the Project Site is located) nuclear reaction, nuclear radiation, radioactive contamination, a pressure wave caused by aircraft or other aerial objects, or any other occurrences that an experienced contractor could not reasonably foresee, or if reasonably foreseeable could not reasonably make provision for or insure against, insofar as such risks are not normally insurable on the insurance market and are mentioned in the general exclusions of the policy of insurance taken out under GCC Clause 65; (b) any use not in accordance with the Contract, by

	the Client or any third party; (c) any use of or reliance upon any design, data, or specification provided or designated by or on behalf of the Client, or any such matter for which the MSI has disclaimed responsibility in accordance with GCC Clause 48.1.2. The Client shall pay to the MSI all sums payable in respect of the System or Subsystems that have achieved Operational Acceptance, notwithstanding that the same be lost, destroyed, or damaged. If the Client requests the MSI in writing to make good any loss or damage to the System thereby occasioned, the MSI shall make good the same at the cost of the Client in accordance with GCC Clause 14. If the Client does not request the MSI in writing to make good any loss or damage to the System thereby occasioned, the Client shall either request a change in accordance with GCC Clause 14, excluding the performance of that part of the System thereby lost, destroyed, or damaged, or, where the loss or damage affects a substantial part of the System, the Client shall terminate the Contract pursuant to GCC Clause 18 a. **63.3** Till the end of the Contract, the storage, safety and security of the equipment and the entire system shall be the responsibility of the MSI. All the equipment supplied by the MSI under the Contract shall be insured for sufficient value till the end of the AMC period. All associated costs shall be borne by the MSI.
64. Loss of or Damage to Property; Accident or Injury to Workers; Indemnification	**64.1** The MSI and each and every Subcontractor shall abide by the job safety, insurance, customs, and immigration measures prevalent and laws in force in the Client's Country. **64.2** Subject to GCC Clause 64.3, the MSI shall indemnify and hold harmless the Client and its employees and officers from and against any and all losses, liabilities and costs (including losses, liabilities, and costs incurred in defending a claim alleging such a liability) that the Client or its employees or officers may suffer as a result of the death or injury of any person or loss of or damage to any property (other than the System, whether accepted or not) arising in connection with the supply, installation, testing, and Commissioning of the System and by reason of the negligence of the MSI or its Subcontractors, or their employees, officers or agents, except any injury, death, or property damage

		caused by the negligence of the Client, its contractors, employees, officers, or agents.
	64.3	If any proceedings are brought or any claim is made against the Client that might subject the MSI to liability under GCC Clause 64.2, the Client shall promptly give the MSI notice of such proceedings or claims, and the MSI may at its own expense and in the Client's name conduct such proceedings or claim and any negotiations for the settlement of any such proceedings or claim. If the MSI fails to notify the Client within twenty-eight (28) days after receipt of such notice that it intends to conduct any such proceedings or claim, then the Client shall be free to conduct the same on its own behalf. Unless the MSI has so failed to notify the Client within the twenty-eight (28) day period, the Client shall make no admission that may be prejudicial to the defence of any such proceedings or claim. The Client shall, at the MSI's request, afford all available assistance to the MSI in conducting such proceedings or claim and shall be reimbursed by the MSI for all reasonable expenses incurred in so doing.
	64.4	The Client shall indemnify and hold harmless the MSI and its employees, officers, and Subcontractors from any and all losses, liabilities, and costs (including losses, liabilities, and costs incurred in defending a claim alleging such a liability) that the MSI or its employees, officers, or Subcontractors may suffer as a result of the death or personal injury of any person or loss of or damage to property of the Client, other than the System not yet achieving Operational Acceptance, that is caused by fire, explosion, or any other perils, in excess of the amount recoverable from insurances procured under GCC Clause 25 (Insurances), provided that such fire, explosion, or other perils were not caused by any act or failure of the MSI.
	64.5	If any proceedings are brought or any claim is made against the MSI that might subject the Client to liability under GCC Clause 64.4, the MSI shall promptly give the Client notice of such proceedings or claims, and the Client may at its own expense and in the MSI's name conduct such proceedings or claim and any negotiations for the settlement of any such proceedings or claim. If the Client fails to notify the MSI within twenty-eight (28) days after receipt of such notice that it intends to conduct any such proceedings or claim, then the MSI shall be free to conduct the same on its own behalf. Unless the Client has so failed to notify the MSI within

		the twenty-eight (28) days, the MSI shall make no admission that may be prejudicial to the defence of any such proceedings or claim. The MSI shall, at the Client's request, afford all available assistance to the Client in conducting such proceedings or claim and shall be reimbursed by the Client for all reasonable expenses incurred in so doing. **64.6** The party entitled to the benefit of an indemnity under this GCC Clause 64 shall take all reasonable measures to mitigate any loss or damage that has occurred. If the party fails to take such measures, the other party's liabilities shall be correspondingly reduced.
65. Force Majeure	**65.1**	"Force Majeure" shall mean any event beyond the reasonable control of the Client or of the MSI, as the case may be, and which is unavoidable notwithstanding the reasonable care of the party affected and shall include, without limitation, the following: (a) War, hostilities, or warlike operations (whether a state of war be declared or not), invasion, act of foreign enemy, and civil war; (b) Rebellion, revolution, insurrection, mutiny, usurpation of civil or military government, conspiracy, riot, civil commotion, and terrorist acts; (c) Confiscation, nationalization, mobilization, commandeering or requisition by or under the order of any government or de jure or de facto authority or ruler, or any other act or failure to act of any local state or national government authority; (d) Strike, sabotage, lockout, embargo, import restriction, port congestion, shipwreck, shortage or restriction of power supply, epidemics, quarantine, and plague; (e) Earthquake, landslide, volcanic activity, fire, flood or inundation, tidal wave, typhoon or cyclone, hurricane, storm, lightning, or other inclement weather condition, nuclear and pressure waves, or other natural or physical disaster; (f) Failure, by the MSI, to obtain the necessary export permit(s) from the governments of the Country(s) of Origin of the Information Technologies or other Goods, or MSI's Equipment provided that the MSI has made all reasonable efforts to obtain the required export

	permit(s), including the exercise of due diligence in determining the eligibility of the System and all of its components for receipt of the necessary export permits. **65.2** If either Party is prevented, hindered, or delayed from or in performing any of its obligations under the Contract by an event of Force Majeure, then it shall notify the other in writing of the occurrence of such event and the circumstances of the event of Force Majeure within fourteen (14) days after the occurrence of such event. **65.3** The Party who has given such notice shall be excused from the performance or punctual performance of its obligations under the Contract for so long as the relevant event of Force Majeure continues and to the extent that such Party's performance is prevented, hindered, or delayed. The Time for Achieving Operational Acceptance shall be extended in accordance with GCC Clause 56 (Extension of Time for Achieving Operational Acceptance). **65.4** The Party or Parties affected by the event of Force Majeure shall use reasonable efforts to mitigate the effect of the event of Force Majeure upon its or their performance of the Contract and to fulfil its or their obligations under the Contract, but without prejudice to either Party's right to terminate the Contract under GCC Clause 65.6. **65.5** No delay or non-performance by either party to this Contract caused by the occurrence of any event of Force Majeure shall: (a) constitute a default or breach of the Contract; (b) (subject to GCC Clauses 63.2, 65.3, and 65.4) give rise to any claim for damages or additional cost or expense occasioned by the delay or non-performance. if, and to the extent that, such delay or non-performance is caused by the occurrence of an event of Force Majeure. **65.6** If the performance of the Contract is substantially prevented, hindered, or delayed for a single period of more than sixty (60) days or an aggregate period of more than one hundred and twenty (120) days on account of one or more events of Force Majeure during the time period covered by the Contract, the Parties will

		attempt to develop a mutually satisfactory solution, failing which, either party may terminate the Contract by giving a notice to the other.
	65.7	In the event of termination pursuant to GCC Clause 65.6, the rights and obligations of the Client and the MSI shall be as specified in GCC Clauses 18 a and b.
	65.8	Notwithstanding GCC Clause 65.5, Force Majeure shall not apply to any obligation of the Client to make payments to the MSI under this Contract.

L. FAIRNESS AND GOOD FAITH

66. Good Faith	**66.1**	The Parties undertake to act in good faith with respect to each other's rights under this Contract and to adopt all reasonable measures to ensure the realization of the objectives of this Contract.

M. MISCELLANEOUS

67. Amicable Settlement	**67.1**	The Parties shall seek to resolve any dispute amicably by mutual consultation.
	67.2	If either Party objects to any action or inaction of the other Party, the objecting Party may send a written notice of dispute to the other Party providing in detail the basis of the dispute. The Party receiving the notice of dispute will consider it and respond in writing within fourteen (14) days after receipt. If such Party fails to respond within fourteen (14) days, or the dispute cannot be amicably settled within fourteen (14) days following the response of that Party, GCC Clause 20 shall apply.
68. Performance Security	**68.1**	The MSI shall furnish to the Client the Performance Security in the format set out in Appendix A, from a scheduled commercial bank in India, to secure the performance of its obligations under the Contract. The Performance Security shall be for an amount specified in the SCC.
69. Assignment	**69.1**	Except as expressly permitted in the Contract, the MSI shall not be entitled to divest, transfer, assign or novate all or substantially all of its rights, interests, benefits and obligations under the Contract, without the prior written consent of the Client.
	69.2	The Client shall be entitled to assign, transfer or novate its rights and obligations under the Contract or any part

	thereof to any third party or to an affiliate, without the requirement of any further consent from the MSI, provided that where such assignment is made to a third party, the Client shall use its best efforts to ensure that the third party to whom the benefits and obligations under the Contract or any part thereof has been assigned, has the necessary financial capability to comply with the obligations under the Contract.
70. Representation and Warranties	**70.1** <u>Client's Representations and Warranties</u> The Client makes the following representations and warranties to the MSI: (i) It has been incorporated as a company under the laws of India and is validly existing under those laws; (ii) It has power to enter into this Contract and comply with its obligations under it; (iii) This Contract and the transactions under it do not contravene its constituent documents or any Applicable Law or obligation by which it is bound or to which any of its assets are subject or cause a limitation of powers or the powers of its directors to be exceeded; (iv) It has in full force and effect the authorizations necessary for it to enter into this Contract and the transactions under it; and (v) Its obligations under this Contract are valid and binding and are enforceable against it in accordance with the terms of this Contract. **70.2** <u>MSI's Representations and Warranties</u> The MSI makes the following representations and warranties to the Client: (i) It has been incorporated/registered as a company/firm under the laws of [*Insert country of incorporation/registration*] and is validly existing under those laws; (ii) It has power to enter into this Contract and comply with its obligations under it; (iii) This Contract and the transactions under it do not contravene its constituent documents or any applicable law of its jurisdiction or obligation by which it is bound or to which any of its assets are subject or cause a limitation of powers or the powers of its directors to be exceeded;

	(iv) It has in full force and effect the authorisations necessary for it to enter into this Contract and the transactions under it; (v) Its obligations under this Contract are valid and binding and are enforceable against it in accordance with the terms of this Contract; (vi) It is not in breach of any Applicable Law in a way which may result in a material adverse effect on its business or financial condition; (vii) There is no pending or threatened proceeding affecting the MSI or any of its assets that would affect the validity or enforceability of this Contract, the ability of the MSI to fulfil its commitments under this Contract, or that could have a material adverse effect on the business or financial condition of the MSI; (viii) It has not been subject to any fines, penalties, injunctive relief or any other civil or criminal liabilities which in the aggregate have or may have a material adverse effect on its ability to perform its obligations under the Contract; (ix) It has the necessary skill and experience to perform the Services in accordance with this Contract; (x) It owns or has the right to use and license to the Client all Intellectual Property Rights in relation to the Services and the Deliverables to be provided under this Contract; (xi) The performance of the Services shall not infringe the Intellectual Property Rights of any third party and that the MSI has not received notice of any claim, and is not aware of any facts or circumstances that may give rise to such claim; (xii) It will perform its obligations under the Contract and conduct its business with a high level of integrity which is reasonably expected of an international contractor of similar size and profile, conducting a similar line of business, and will not engage in any corrupt, fraudulent, coercive, collusive, undesirable or restrictive practices; and (xiii) Without prejudice to any express provision contained in the Contract, the MSI acknowledges that prior to the execution of the Contract, the MSI has after a complete and careful examination made an independent evaluation of

	the Technical Requirements and any information provided by or on behalf of the Client and has determined to its satisfaction the nature and extent of risks and hazards as are likely to arise or may be faced by the MSI in the course of performance of its obligations hereunder.

II. General Conditions of Contract - Attachment 1

Attachment 1: Corrupt and Fraudulent Practices

1.1 The MSIs and their respective officers, employees, agents and advisers shall observe the highest standard of ethics during the selection process. Notwithstanding anything to the contrary contained in the RFP, the Client shall reject a Proposal without being liable in any manner whatsoever to the MSI, if it determines that the MSI has, directly or indirectly or through an agent, engaged in corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice (collectively the "Prohibited Practices") in the selection process. In such an event, the Client shall, without prejudice to its any other rights or remedies, forfeit and appropriate the Performance Security, if available, as mutually agreed genuine pre-estimated compensation and damages payable to the Client for, *inter alia,* time, cost and effort of the Client, in regard to the RFP, including consideration and evaluation of such MSI's Proposal.

1.2 Without prejudice to the rights of the Client under the RFP and the rights and remedies which the Client may have under the LOA or the Contract, if an MSI is found by the Client to have directly or indirectly or through an agent, engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice during the selection process, or after the issue of the LOA or the execution of the Contract, such Applicant or MSI shall not be eligible to participate in any tender or RFP issued by the Client during a period of 2 (two) years from the date such MSI is found by the Client to have directly or through an agent, engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice, as the case may be.

1.3 For the purposes of this clause, the following terms shall have the meaning hereinafter respectively assigned to them:

(i) "corrupt practice" means (a) the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence the action of any person connected with the selection process (for avoidance of doubt, offering of employment to or employing or engaging in any manner whatsoever, directly or indirectly, any official of the Client who is or has been associated in any manner, directly or indirectly with the selection process) or the LOA or has dealt with matters concerning the Contract or arising therefrom, before or after the execution thereof, at any time prior to the expiry of one year from the date such official resigns or retires from or otherwise ceases to be in the service of the Client, shall be deemed to constitute influencing the actions of a person connected with the selection process; or (b) save as provided herein, engaging in any manner whatsoever, whether during the selection process or after the issue of the LOA or after the execution of the Agreement, as the case may be, any person in respect of any matter relating to the Services or the LOA or the Contract, who at any time has been or is a legal, financial or technical MSI/ adviser of the Client in relation to any matter concerning the Contract;

(ii) "fraudulent practice" means a misrepresentation or omission of facts or disclosure of incomplete facts, in order to influence the selection process;

(iii) "coercive practice" means impairing or harming or threatening to impair or harm, directly or indirectly, any persons or property to influence any person's participation or action in the selection process;

(iv) "collusive practices" is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party[5];

(v) "undesirable practice" means (a) establishing contact with any person connected with or employed or engaged by the Client with the objective of canvassing, lobbying or in any manner influencing or attempting to influence the selection process; or (b) having a Conflict of Interest; and

(vi) "restrictive practice" means forming a cartel or arriving at any understanding or arrangement among MSIs with the objective of restricting or manipulating a full and fair competition in the selection process.

[5] For the purpose of this sub-paragraph, "parties" refers to participants in the procurement or selection process (including public officials) attempting either themselves, or through another person or entity not participating in the procurement or selection process, to simulate competition or to establish prices at artificial, non-competitive levels, or are privy to each other's bid prices or other conditions.

III. Special Conditions of Contract

[Notes in brackets are for guidance purposes only and should be deleted in the final text of the signed contract]

Number of GCC Clause	Amendments of, and Supplements to, Clauses in the General Conditions of Contract
GCC 1 (rr)	**The post warranty service period (AMC Phase) is:** 72 months (6 years)
GCC 3.1	The Contract shall be construed in accordance with the law in the state of Odisha / India.
GCC 4.1	The language is: English.
GCC 6.1 and 6.2	The addresses are: Client : Bhubaneswar Smart City Limited (BSCL) Attention : _____ Facsimile : _____ E-mail (where permitted):_____ MSI : _____ _____ Attention : _____ Facsimile : _____ E-mail (where permitted) :_____
GCC 8.1	The Authorized Representatives are: For the Client: [Insert name] Chief Executive Officer, Bhubaneswar Smart City Limited (BSCL) _____ For the MSI: *[name, title]*_____
GCC 11.1	**Commencement of Contract:** The number of days shall be 30 (Thirty) Days from issuance of LOA.
GCC 12.1	**Expiration of Contract:** The term of the Contract shall be One Hundred and Eight (108) Months, which may be extended on mutually agreed terms and

	conditions, subject to satisfactory performance of the Services by the MSI. If the term of the Contract is extended pursuant to the Clause 12 of the GCC, then the MSI shall also extend the validity of the Performance Security for an equivalent period.
GCC 21.6	Sub-Contracting allowed for following services: As per the list specified in BDS for ITB 5.1 (a) and 5.4.
GCC 21.7	Other Obligations of the Bidder: • The MSI shall be entitled for full monetization from city Wi-Fi network operations and retain this revenue in compliance with the requirements stated in the Section 5 – Technical Requirements and in consultation with the Client. MSI will not share any revenues realized from this monetization with the Client. At any given time, MSI shall consult and agree with the Client the terms and conditions of city Wi-Fi operations. The monetization of Wi-Fi will be limited to Wi-Fi services only. • The MSI shall be given rights to put extra duct and fibre which MSI can monetize. MSI will not share any revenues realized from this monetization with the Client. At any given time, MSI shall consult and agree with the Client the terms and conditions of these rights. • The MSI or any of its subcontractor or affiliate or consortium member or joint venture partner singly or together shall not be entitled to any compensation; or damages liquidated or otherwise; or monetization right which shall cease to exist upon termination of the Contract under either GCC 18 a, 18 b or 18 c. • The MSI shall not monetize any other hardware, software or solution under this Contract. • The MSI shall get the technical product data sheets approved by Client and its representative before supply of any material on-site. Client reserves the right to not evaluate the technical product data sheets during bid evaluation stage. • As specified in Section 5 – Technical Requirements.
GCC 22.1.2	The Client reserves the right to determine on a case-by-case basis whether the MSI should be disqualified pursuant to GCC Clause 22.1.2.

GCC 24.1	Exclusions of Liability of MSI: No exclusions.
GCC 25.1(c)	*The MSI shall obtain Third-Party Liability Insurance in the amount of **INR 10 crores.** The Insurance shall cover the entire Contract Period.*
GCC 25.1(e)	*i. The MSI shall meet the Client's liability and workers' compensation insurance in respect of its personnel of the MSI including subcontractors if any, in accordance with the relevant provisions of various labour laws as applicable, as well as, with respect to such Personnel, any such life, health, accident, travel or other insurance as may be appropriate;* *ii. The MSI while employing the man-power required for the Maintenance of the project shall be responsible for following all the required mandates as per the prevailing laws of the land. Ex: Income Tax rules, Labour Laws, Employee benefits, employee related insurances etc.; and* *iii. Insurance against loss of or damage to (a) equipment purchased in whole or in part with funds provided under this Contract, (b) the sub-systems that have been accepted by the Client (c) any documents (software of the IT systems) prepared by the MSI in the performance of the Services with a minimum coverage of two times the value of the contract.* *The insurance shall cover the entire contract period commencing from the date of the signing of the contract till the effective date of the expiry of the contract.* *The MSI shall maintain standard forms of comprehensive insurance including liability insurance, system and facility insurance and any other insurance for the personnel, assets, data, software, etc.* *The certificates of insurance shall indicate that the insurance company will notify the Client if, for any reason, the insurance coverage lapses.*
GCC 27.1	*The **MSI** shall commence work on the System within: **30** days from the date of signing of the Contract.*
GCC 27.2	*Operational Acceptance will occur on or before: T + 22 months, where T is the Effective Date.*
GCC 33.9	*The Client shall have the following other responsibilities:* • Obligations as stated in Section 5 – Technical Requirements.
GCC 36.2(b)	*Adjustments to the Contract Price shall be as follows**: none.***

GCC 39(c)(i)	*The Performance Security shall be denominated in the currency of the contract for an amount equal to **10 percent** of the **Contract Price**.*
GCC 39(c)(iv)	*After the completion of defect liability period, the Performance Security shall be reduced by 7 percent of the Contract Price. The remaining 3 percent shall be released to the MSI only after successful completion of the Post Warranty Service Period.*
GCC 40.1	Subject to the provisions of GCC Clause 40, the Client shall pay the Contract Price to the MSI according to the categories and in the manner specified below. The Total Contract Price shall be categorized as: I. Supply and Installation Cost : System Supply & Installation Cost (for providing the Smart City Solutions and achieving Operational Acceptance), which includes all the costs up to the Operational Acceptance; II. Recurrent Cost: Total of all Annual Recurrent Costs during DLP/Warranty Period and Post-Warranty Service (Comprehensive Maintenance) Period. **Total Contract Price = Supply and Installation Cost + Recurrent Cost** Within each such category, the Contract Implementation Schedule may trigger partial payments for the portion of the total Contract Price for the category corresponding to the goods or services actually Delivered, Installed, or Operationally Accepted, at unit prices and in the currencies specified in the Price Schedules of the Contract Agreement. **I. Supply and Installation Cost (SIC)**

Milestones	CAPEX							OPEX
	Smart Traffic	Smart Tracking	Smart Parking	Smart Response	Smart Governance*	Smart Communication	ICOMC	All Modules
Project Plan	2%							NA
Design	3%	3%	3%	3%	3%	3%	3%	
Supply of Equipment (prorata payment at	30%	30%	30%	30%	30%	30%	30%	

each 20% delivery)								
Installation Completion (prorata payment at each 20% installation)	20%	20%	20%	20%	20%	20%	20%	
System Acceptance	5%	5%	5%	5%	5%	5%	20%	
Go-Live & Commissioning by System								
• 90% System	7%	7%	7%	7%	7%	7%		
• 100% System	3%	3%	3%	3%	3%	3%		
Go-Live of All Systems (at ICOMC)								
• 90% System[6]	7%							
• 100% System	3%							
Go-Live of All Systems (at Final ICOMC)	5%							
AMC Period (7 years)	15% (Quarterly payments for 7 years)							100% (Quaterly payment for 7 years based on quoted AMC for that particular year)

[6] "90% System Live" shall mean the functioning complete in all respects of a system installed and commissioned by the Master System Integrator, with at least 90% of the BOQ items forming part of such system.

	II. Recurrent Cost (RC) Recurrent costs during the Maintenance Period –1/4th of the specified Annual recurrent cost to be paid quarterly during the AMC Phase i.e. 7 years. *All payment to be made upon respective approval by Client and its representatives.* *Payments for OFC (Communication Network) shall be made on a Pro Rata basis for each milestone based on actual OFC deployment and transfer to BSCL.*
GCC 40.5	Payments shall be done in below account of the MSI: *[insert account details viz.,* *(i) account name;* *(ii) account number;* *(iii) bank name and branch; and* *(iv) IFSC Code]*
GCC 41.1	**The interest rate is**: *SBI Base rate.*
GCC 42.4	*The Client's and MSI's rights and obligations with respect to Custom Software or elements of the Custom Software are as follows :* *i. The MSI shall hand over the source code for software, database, and executables to the Client which shall correspond 100% to the operational module and shall be verified and certified by an independent agency as identified by the Client. This is limited to all custom software and its subsystems provided by the MSI;* *ii. The Client may duplicate and use the software on different equipment, such as for back-ups, additional computers, replacements, upgraded units, etc.*
GCC 42.5	*Certified Software escrow contract is required for the execution of the Contract in case the MSI is not willing to handover the source* **code** *to the Client limited to the systems as defined in SCC 42.4 (ii). All costs associated with such Escrow Account shall be borne by the MSI. If Client intends to continue the Escrow account services after completion of the contract period, the Client can pay the fee for Escrow account services.*

GCC 44.7	*The provisions of this GCC Clause 44.7 shall survive the termination, for whatever reason, of the Contract for the period specified in the GCC.*
GCC 45.1	*No additional powers or limitations.*
GCC 45.2.2	*No additional powers or limitations.*
GCC 46.1	Chapters in the Project Plan shall address the following subjects: *(a) Project Organization and Management Plan;* *(b) Delivery and Installation Plan;* *(c) Training Plan;* *(d) Pre-commissioning and Operational Acceptance Testing Plan;* *(e) Maintenance support Service Plan;* *(f) Task, Time, and Resource Schedules;* *(g) Technical Support Plan.* *Any other submission relevant to the project as required by the Client or its Project Manager post contract award.*
GCC 46.2	*Within **twenty (20) days** from the Effective Date of the Contract, the MSI shall present a Project Plan to the Client. The Client shall, within **fourteen (14)** days of receipt of the Project Plan, notify the MSI of any respects in which it considers that the Project Plan does not adequately ensure that the proposed program of work, proposed methods, and/or proposed Information Technologies will satisfy the Technical Requirements and/or the SCC (in this Clause 46.2 called "non-conformities" below). The MSI shall, within **five (5)** days of receipt of such notification, correct the Project Plan and resubmits to the Client. The Client shall, within **five (5)** days of resubmission of the Project Plan, notify the MSI of any remaining non-conformities. This procedure shall be repeated as necessary until the Project Plan is free from non-conformities. When the Project Plan is free from non-conformities, the Client shall provide confirmation in writing to the MSI. This approved Project Plan ("the Agreed and Finalized Project Plan") shall be contractually binding on the Client and the MSI. In case of any deviation (which affects the project timelines and deliverables) from the finalized project plan during the course of the project, the MSI is required to update the same within 5 days of such deviation and notify the Client and get the approval as per the timelines mentioned above.*
GCC 46.5	*The MSI shall submit to the Client the following reports during the Contract period:*

	(a) Monthly progress reports, summarizing: *(i) results accomplished during the prior period;* *(ii) cumulative deviations to date from schedule of progress milestones as specified in the Agreed and Finalized Project Plan;* *(iii) corrective actions to be taken to return to planned schedule of progress; proposed revisions to planned schedule;* *(iv) other issues and outstanding problems; proposed actions to be taken;* *(v) resources that the MSI expects to be provided by the Client and/or actions to be taken by the Client in the next reporting period;* *(vi) other issues or potential problems the MSI foresees that could impact on project progress and/or effectiveness.* *(b) inspection and quality assurance reports;* *(c) system failure or fault reports;* *(d) monthly log of service calls and problem resolutions.* *Any other report as required by the Client which is related to the present procurement.*
GCC 48.3.1	*The MSI shall prepare and furnish to the Project Manager all the necessary documents for which the MSI must obtain the Project Manager's approval before proceeding with work on the System or any Sub-system covered by the documents. The following is an indicative but not an exhaustive list of documentation and the Project Manager can request for additional submissions during the course of the project:* ***i.*** *System detailed design;* ***ii.*** *System Operation manuals;* ***iii.*** *Project Organization and Management Plan;* ***iv.*** *Delivery and Installation Plan;* ***v.*** *Training Plan;* ***vi.*** *Pre-commissioning Plan;* ***vii.*** *Prototype Approval Tests and Plan;* ***viii.*** *Factory Acceptance Tests and Plan;* ***ix.*** *Pilot Tests and Plan;* ***x.*** *Burn-in Tests and Plan;* ***xi.*** *System Acceptance Tests and Plan;* ***xii.*** *Maintenance Support Service Plan;* ***xiii.*** *Task, Time, and Resource Schedules;*

	xiv. *Technical Support Plan;* ***xv.*** *Preventive Maintenance Plan;* **xvi.** *Exit Management Plan.*
GCC 49.5	*There are no Special Conditions of Contract applicable to GCC Clause* 49.5
GCC 54.2.1	*Operational Acceptance Testing shall be conducted in accordance with System, Sub-systems, tests, test procedures, and the required results for acceptance as specified in Section 5 – Technical Requirements (Testing Requirements).*
GCC 54.2.2	*Thirty (30) days from the date of System Acceptance.*
GCC 55.2	*Liquidated damages shall be assessed at 1.0 percent per week of System Supply and Installation Cost (SIC). The maximum liquidated damages are 10 percent of the System Supply and Implementation Cost (SIC).*
GCC 55.3	• Liquidated damages shall also be applicable to the Mile Stones as defined in the Section 5 – Technical Requirements. Liquidated damages shall be assessed at 1.0 percent per week of the total milestone payment. Maximum liquidated damages shall be 10 percent of the total milestone payment.
GCC 56	*There are no Special Conditions of Contract applicable to GCC Clause 56.*
GCC 57.3 (iii)	*The MSI warrants that the following items have been released to the market for the following* ***specific minimum time periods:*** *specific types of technologies and specific minimum time periods as mentioned below.* S. No | Equipment Name | Minimum time in market and under full satisfactory operational condition in a similar nature of project elsewhere 1 | | 2 | | *The MSI shall provide proven products, successfully working under the Environmental conditions similar to that of this Bhubaneswar Smart City Ltd., for the equipment's listed in the table above -- satisfying the commercial operations periods. The hardware functionality of all the equipment is specified in Section 5 – Technical Requirements of the RFP document. Software*

	customization to meet the technical and functional requirements specified in Section 5 – Technical Requirements is allowed.
GCC 57.4	*The Defect Liability (Warranty) Period (N) shall begin from the date of Operational Acceptance of the System and extend for **12 months**.*
GCC 57.10	*During the Maintenance Period, the MSI must commence the work necessary to remedy defects or damage within 2 hours of notification. The Service levels to which the MSI shall adhere to are specified in the **Section 5 – Technical Requirements**.*
GCC 68.1	Performance Security: (i) The Performance Security shall be for 10% of the Total Value of Contract; (ii) The Performance Security shall be issued by a Scheduled Commercial bank in India and acceptable to the Client. The Performance Security shall be valid until a date 60 days beyond the issuance of the Completion Certificate; (iii) The Client shall not make a claim under the Performance Security, except for amounts to which the Client is entitled under the Contract in the event of: (a) failure by the MSI to extend the validity of the Performance Security on extension of the validity of the Contract, in which event the Client may claim the full amount of the Performance Security; (b) failure by the MSI to pay the Client an amount due, as either agreed or determined pursuant to the dispute resolution process specified in the Contract, within forty two (42) days after determination of the dispute; (c) failure by the MSI to pay any damages due to the Client under the Contract; (d) failure by the MSI to pay any amounts that are due to the Client on termination of the Contract; (e) the MSI engaging in any corrupt, fraudulent, coercive, collusive, undesirable or restrictive practice. (iv) If the Performance Security is or becomes invalid for any reason during the term of the Contract, the MSI shall immediately notify the Client and provide the Client with a replacement Performance Security in the form set out in Appendix A within five (5) days of the earlier Performance Security becoming invalid;

	(v) If the validity period of the Performance Security is less than the period specified in sub-clause (ii) above, then no later than thirty (30) days before the expiry of the Performance Security, the MSI shall obtain an extension of the validity of such Performance Security and provide the Client with a copy of the renewed security. If the MSI fails to extend the Performance Security, the Client shall be entitled to draw on and claim the un-drawn amount thereunder, provided that the amount so received shall be treated as a cash security and to the extent that there are no outstanding claims, shall be released upon submission of a new Performance Security acceptable to the Client; (vi) The provision, maintenance or renewal of the Performance Security by the MSI in accordance with the terms of the Contract, shall be a condition precedent to any payment by the Client to the MSI. On completion of the contractual obligations under the Contract by the MSI, the Client shall return the Performance Security within twenty one (21) days of the last payment made to the MSI under the Contract.

IV. Appendices

Appendix A: Form for Performance Security

[*On Appropriate Stamp Paper*]

Bank Guarantee No.[ ]

To
Bhubaneswar Smart City Limited
AkashShova Building,
Sachivalaya Marg
Bhubaneswar, Odisha, 751001

WHEREAS …….. (MSI), a company incorporated under the Company Act, …… with its principal office at …… (hereinafter called "the MSI") has undertaken, in pursuance of contract no. …… dated …… Selection of Master System Integrator for implementation of Bhubaneshwar Smart City Solutions in the City of Bhubaneswar as a part of the pan-city smart solutions, which involve the use of technology, information and data to improve the traffic infrastructure and services within the city of Bhubaneswar (the Project), as a part of the implementation of Smart Cities Mission in Bhubaneswar (herein after called "the contract").

AND WHEREAS it has been stipulated by you in the said contract that the MSI shall furnish you with a bank guarantee by a scheduled commercial bank recognized by you for the sum specified therein as security for compliance with its obligations in accordance with the contract;

AND WHEREAS we have agreed to give the MSI such a bank guarantee;

NOW THEREFORE we hereby affirm that we are guarantors and responsible to you, on behalf of the MSI Firm, up to a total of Rs. ……../- (INR …… …….. only), and we undertake to pay you, upon your first written demand declaring the MSI to be in default under the contract and without cavil or argument, any sum or sums within the limits of Rs. ……../- (INR …… …….. only) as aforesaid, without your needing to prove or to show grounds or reasons for your demand or the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the MSI before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the contract to be performed thereunder or of any of the contract documents which may be made between you and the MSI shall in any way release us from any liability under this guarantee and we hereby waive notice of any such change, addition or modification.

This guarantee shall be valid until the …. day of …….

Our _____ branch _____*(Name & Address of the _____*branch) is liable to pay the guaranteed amount depending on the filing of claim and any part thereof under this Bank Guarantee only and only if you serve upon

us at our _____* branch a written claim or demand and received by us at our_____* branch on or before Dt. ……. otherwise bank shall be discharged of all liabilities under this guarantee thereafter.

……..

(Signature of the authorized officer of the Bank)

……

Name and designation of the officer

……..

……..

Seal, name & address of the Bank and address of the Branch

*Preferably at the headquarters of the authority competent to sanction the expenditure for purchase of goods/ services.

Appendix B: Project Data

Exhibit 202: List of Intersection for TVDS

Sl. No.	Corridor Name	Junction code	Junction/Square	Number of Legs	Approach and Number of Lanes				
					Approach 1	Approach 2	Approach 3	Approach 4	Approach 5
1	Janpath	J1	Shishu Bhavan Square	4	2	2	2	4	
2		J3	Master Canteen Square	4	2	4	2	4	
3		J5*	Satya Nagar / Ram Mandir Square	4	2	4	2	4	
4		J8	Vani Vihar Square	3	2	4	2		
5	Bidyut Marg	B1*	KIIT Square	3	3	1	3		
6		B2*	Patia Square	3	3	3	3		
7		B3*	Damana Square	4	2	3	1	3	
8		B4*	NALCO / Kalinga Hospital Square	4	3	3	1	3	
9		B5	Xavier / XIMB Square	3	3	1	3		
10		B6*	Jayadev Vihar Square	4	3	3	3	3	
11		B7	Nicco Park / The World / Behera Sahi Chowk	4	1	3	1	3	
12		B10	Power House Intersection	4	2	3	2	3	
13	Ekmara Corridor	E2	Airport Square	4	1	4	2	3	
14		E6	Delta Square	4	3	1	2	1	
15		E7	Baramunda Fire Station Square	4	3	2	1	2	
16	Lewis road Corridor	L2	Ravi Talkies Square	4	2	3	2	2	
17		L4*	Kalpana Square	3	3	3	3		
18		L8	Rasulgarh Square	4	4	3	2	3	
19		L10	Railway Station Road Chowk	3	3	2	3		
20	Sachivalya Marg	S1	Acharya Vihar Square	4	2	2	2	3	
21		S2	Nicco Park Road Square	4	2	3	2	3	
22		S5	Rabindra Mandap Square	3	3	2	3		
23		S7	A G Square	4	3	3	3	3	
24	Standalone Intersections	SA3	Khandagiri Square	4	2	2	1	2	
25		SA5	CRP Square	4	2	2	2	1	

Exhibit 21: Parking Locations List

S. No.	Name of the Parking Lot	Location
MLCP Locations		
1	Raj Mahal MLCP	Behind to BMC Marketing Complex and adjacent to Queen's Collection Jewellery on Raj Path.
2	Saheed Nagar MLCP	Beside Durga Mandap, opposite to Ramadevi Women's University on Janpath Road
3	Master Canteen MLCP	At Master Canteen Railway Station Complex.
Parking Lot Locations		
1	In front of Pantaloons, Sahid Nagar.	Plot No-1033/35 Mz- Sahid Nagar
2	In front of the Hotel Crown, IRC Village, Nayapalli	1427/1815 Jayadev Vihar
3	Parking Place near Hotel Swosti Premium	91/46,47 Samantapuri
4	In-front of Hotel Keshari, Kharvel Nagar	441/1200, 1561
5	Parking Space opposite Hotel Swosti, Kharvel Nagar	441/1193,Kharavela Nagar
6	Sriya Square to B.J.P Party office , Kharavela Nagar	441/366, 368, 157 Kharavela Nagar
7	In front of Srikunja, Ashok Nagar	253/ 1353,1364 Ashok Nagar
8	Parking at Unit-4 Hat	69, 235 Bhauma Nagar
9	Kalpana Square to Shishmo Hotel	2279/27 Gautam Nagar
10	Near Fire Station in-front of Rohan Motors	186/310 Paika Nagar
11	Parking space near Exhibition Ground	297/1010, 1004, 1014, 1015, 1018, 1466, 1465, 1470- Bhoi Nagar & Kharavela Nagar from Ekaram Hat to end of Exhibation ground boundary wall.(Both side) Unit-3
12	Parking space in front of Indian Oil office	619/1952- C.S. pur
13	Parking space in front of Tanishq Jewellery	619/1803(pt.),1950(pt.)- C.S,pur
14	Parking Space at Gandhi park	1427/56- Jaydev Vihar
15	Parking Space at Puspak Hotel backside to over bridge	1988/2360- Laxmisagar

S. No.	Name of the Parking Lot	Location
16	In front of Hotel Padma to Hotel Dipali	1988/2445,752- Laxmisagar, BJB Nagar
17	Parking space in front of Idea Office	490/441- Patia
18	Parking space at HDFC Bank, Nayapalli, near kalyan mandap	385/469/1625- Nayapalli
19	Parking space at in front of Hotel May Fair Lagoon. Jaydev Vihar.	Plot No-73,61,72,282 Khata- No.1427 Jayadev Vihar
20	Parking Lot in front of Hotel Hindustan International,	Kharvel Nagar, Unit-3, Bhubaneswar.
21	Parking lot in front of Khadi Board to Meher's Show-room off-street.	Kharvel nagar, Unit-3, Bhubaneswar.
22	Parking Lot in front of Bharat Furniture	Bapuji Nagar, Bhubaneswar.
23	Parking lot in front of Rabindra Medical Hall,	Bapuji Nagar, Bhubaneswar
24	Parking lot in front of Kamyab T.V.,	Unit-2,Ashok Nagar, Bhubaneswar
25	Parking lot in front of Hotel New Marrion,	Kharvel nagar, Bhubaneswar
26	On-street Parking from in front of Dhawan building to Pantaloons front	Near Vani vihar Square, Sahinagar, Bhubaneswar
27	On-street Parking from Trupti Petrol Pump to Entry Road of Nandakanan office.	Sahid Nagar, Bhubaneswar
28	On-street Parking from Rupali Square to Keyce South Indian	Sahid Nagar., Bhubaneswar
29	On-street Parking from in front of United Bank to in front of Peay Systems Building.	Sahid Nagar, Bhubaneswar
30	On-street Parking from Rupali Square to Maharshi College Square.	Sahid Nagar, Bhubaneswar
31	On street Parking lot in front of United Colours of Beneton to Catholic Church ,Near	Satya Nagar, Bhubaneswar
32	On street Parking lot in front of New Marrion to Sriya Sqr.	Kharavelnagar, Bhubaneswar.
33	On street Parking lot in front of Narula General Store to in front of Epari Sadasiva Jewellery	Kharavelnagar, Bhubaneswar.
34	On street Parking lot from sports emporium to in front of CODO DTP.	Kharavelnagar, Bhubaneswar.
35	On street Parking lot from City Jewellery to in front of Lalchand Jewellery.	Kharavelnagar, Bhubaneswar.
36	On street Parking lot from Ashoka market to in front City Residency	Ashok Nagar, Bhubaneswar.
37	Off street Parking from Royal Mid town to	Ashok Nagar, Bhubaneswar

S. No.	Name of the Parking Lot	Location
	Narayan Ayurved	
38	On street Parking lot from in front of Khadim shoes to in front of Sri lather	Ashok Nagar, Bhubaneswar
39	On street Parking lot from in front of Hotel Cashino Lodge to Raj Electronic	Bapuji Nagar, Bhubaneswar
40	On street Parking lot from in front of Raj electronic to SUZUKI Show room.	Bapuji Nagar, Bhubaneswar
41	On street Parking lot non-commercial side PWD road from Rajmahal Sqr. To Master Canteen Sqr. Rate: Rs.10/- for Each Four wheeler for 2 hours. & Rs.5/- for two wheeler for 4 hours.	Ashok Nagar, Bhubaneswar
42	On street Parking lot non-commercial side from opp.side from Lalchand Jewellery to Sriya Sqr. Rate: Rs.10/- for Each Four wheeler for 2 hours. & Rs.5/- for two wheeler for 4 hours.	Kharavelnagar, Bhubaneswar
43	On street Parking lot non-commercial side from Sriya Sqr. To Ram mandir Sqr. Rate: Rs.10/- for Each Four wheeler for 2 hours. & Rs.5/- for two wheeler for 4 hours.	Kharavelnagar, Bhubaneswar
44	On street Parking lot non-commercial side from IDBI Bank to Rupali Sqr.Rajmahal Sqr. Rate: Rs.10/- for Each Four wheeler for 2 hours. & Rs.5/- for two wheeler for 4 hours.	Unit-9,Bhoi Nagar, Bhubaneswar
45	On street Parking lot non-commercial side from Rupali Sqr. to Ramadevi College Gate No.2. Four wheeler for 2 hours. & Rs.5/- for two wheeler for 4 hours.	Unit-9,Bhoi Nagar, Bhubaneswar
46	In front of Raj Electronic,	Bapuji Nagar, Bhubaneswar
47	Back side of Kalamandir,	Ashok Nagar,Unit-2,Bhubaneswar
48	Big Bazar	Satya Nagar, Bhubaneswar
49	In front of Akash Institute	Unit-4,Bhubaneswar
50	In front of Godabarish Sahitya Sansada	Unit-3,Bhubaneswar
51	Unit-1,Haat (inside) cycle stand	Unit-1,Bhubaneswar
52	Unit-1,Haat (outside on street parking)	Unit-1,Bhubaneswar
53	Old Bus stand to Durga mandap on street parking	Unit-2,Bhubaneswar
54	In front of Hotel Pal-Height	Jaydev vihar, Bhubaneswar.
55	In front of Big Bazar,Patia	Patia, Bhubaneswar.
56	Parking at Fortune Tower	Jaydev vihar, Bhubaneswar.

S. No.	Name of the Parking Lot	Location
57	Parking in front of Keshari Mall	Unit-2, Bhubaneswar.
58	Parking in front of Liliput (Off Street)	Janpath, Sahid Nagar, Bhubaneswar.
59	Parking in front of Kalamindir to Reliance Show room(Off Street)	Sahid Nagar, Bhubaneswar.
60	Off Street Parking in front of Keyce South Indian	Sahid Nagar, Bhubaneswar.
61	Off Street parking Lot in front of Narula General Store to in front of P.C. Chand Jewellery	Kharvel Nagar, Bhubaneswar.
62	Off Street Parking in front of Bank of India to Style Shoes	Ashok nagar, Bhubaneswar.
63	Parking in front of Rayal Mid town to Narayan Ayurveda	Ashok nagar, Bhubaneswar.
64	Parking space at Khandagiri Hill	Khandagiri, Bhubaneswar.
65	Parking space at Khandagiri chakka, Near Police Station.	Khandagiri, Bhubaneswar.
66	Parking space at Lingaraj Temple,	Old town, Bhubaneswar.
67	Parking space in between I.G.Park & Jaydev Vhawn	Unit-2, Bhubaneswar.
68	In front of Hotel Sandy Tower	Jaydev Vihar, Bhubaneswar.
69	Parking space at In front of Hotel Suriyansu	C.S.Pur, Bhubaneswar.
70	Parking space at Iskon Temple	IRC Village, Nayapalli, Bhubaneswar.
71	Parking in front of Kar Clinic	Unit-4, Bhubaneswar.
72	In Front of Apollo Hospital	Acharya Vihar
73	In Front of Sum Hospital	Sampur
	Total	

Exhibit 22: ERP-E-Governance Initiatives in BMC

MODULE	TCS	TCS	ILFS	CSM
Civic Management				
Solid waste management (without GPS)	Y	Y		Y
Solid waste management (with GPS)				Y
Welfare schemes	Y	Y		
Grievance redressal	Y	Y		Y
Revenue management				
Property tax	Y	Y		
Trade license	Y	Y		
Building permission	Y	Y		
Building plan approval			Y	
Water connection & charges	Y	Y		
Birth & death	Y	Y		
Financial Management system				
Accounts	Y	Y		
Audit	Y	Y		
Stakeholders Interface system				
Portal	Y	Y		
MIS	Y	Y		
Integration of Odisha online with e-municipality		Y		
Integration of hand held devices with e-municipality		Y		
Implementation of e-Municipality Birth and Death Module in 314 CHCs of rural Odisha		Y		
Implementation of UC Management module		Y		
Integration of e-Taal with e-Municipality		Y		
Digitally signed and bar coded certificates		Y		
Digital Signature Token based user authentication		Y		
Integration of e-Mail and SMS		Y		
Works management			Y	
Human resource management system			Y	
Contract & procurement management			Y	
GIS base application			Y	
Document management system			Y	
Data digitisation			Y	
Integration with e-municipality			Y	

Exhibit 23: Digitization Need Analysis

S. No.	Component	Total Records	Digitized Records	Pending Records	Remarks
1	Property Information	96000	96000		Complete information not available. Information like exact address etc. missing. Data will have to be cleansed and updated.
2	Street Light Poles	18000	18000		Record available in excel format
3	Hoarding Information	2744	2744		Record available in excel format; Out of 2744, 898 is Government Hoardings and rest 1846 is privately held. This figure will go up as BMC has started a self-declaration drive for such hoardings in private plots.
4	Employee Records	1381	1381		1074- Regular employees, 126-general staff, 181-conservancy
5	**Infra Assets**				
a	Roads	1624.3 km			
b	Drains	461.73 km			
c	Vehicles	165	165		
d	Dust Bins	1808	1808		PMR-416, JAGRUTI-616, BMC-451, RAMKY-325; Record available in excel format
e	Engineering Projects	31		31	Engineering projects like Water ATMs, Abattoir, Kine Houses etc.
6	**IT Assets**				
a	Desktop	155	155		Record available in excel format
b	Laptop	6	6		Record available in excel format
c	UPS	150	150		Record available in excel format
d	Mobile Phone Sets	70	70		Record available in excel format
e	Biometric Devices - Wall Mounted	3		3	
f	Biometric Devices - Hand held	70	70		Record available in excel format
g	CCTV Cameras	30		30	
h	Network switches	41	41		Record available in excel format
i	Wi-Fi Dongle	30	30		Record available in excel format
j	Wi-Fi Access Points Devices	16	16		Record available in excel format
	Total	**120700**	**120636**	**64**	**These figures are almost close to the actual ones**

Exhibit 24: Transaction History

S. No.	Component	2016 - 17	2015 - 16	2014 - 15	Remarks
1	Property Tax	10,02,023.22	2,44,22,140.69	2,28,13,721.84	Tax Collected; No. of Users 55 - 60
2	Hoarding Tax	2,32,00,000	10,65,28,953	8,03,16,379	Tax Collected; No. of Users 10 - 15
3	Death and Birth Certificate	47,367	49,933	46,403	Number of Registrations
4	Kalyan Mandap Registration	70,89,063	59,99,236	95,54,267	2016-17 up to 21 February 2017
5	Marriage Registration				

Exhibit 25: Proposed Wi-Fi access point as per DPR by STPI