

**Implementation of Energy Efficient Smart Dimmable LED Street lights
along with per Pole basis SCADA System on Design, Build, Finance,
Operate, Maintain, & Transfer basis**



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Introduction

Pune, the Oxford of the East is a historical city in India with a glorious past, an innovative present and a promising future. Since 1950, the Pune Municipal Corporation is administrating the city and serving citizens. Pune Municipal Corporation has taken an initiative for implementing e-Governance. Success of e-governance depends on use of Information Technology in mobilization of Government resources and utilization of these scarce resources with an aim of providing a better service.



Function of Electrical Dept of PMC

- One the main function of Electrical Department is to install and maintain street lights in Pune city.
- Now a days mainly high pressure sodium vapour (HPSV) lights are used for main roads and internal roads are lighted with T5 fitting, LED fittings.
- High masts are also installed in various places. (Junctions cross roads)
- Selection street lights for particular roads is done on the basis of road width, traffic density ,pole height and the distance between two poles, to get sufficient lux levels as per BIS standards.



Present Scenario – Tentative summary of existing fittings

		HPSV			T5		LED			Metal Halide			Induction		
SN.	Word Name	70W	150W	250 W	56W	96W	45W	65W	90W	150W	250W	400W	150W	250W	Total
1	Nagar Road	1263	2060	1326	572	239	1052	492	3405	12	44	54	55	71	10645
2	Yerwada	664	619	1618	777	625	2310	143	3505	37	24	14	32	80	10448
3	Ghole Road	671	1189	1838	3422	1041	1423	87	10	5	1	92	53	9	9841
4	Karve Road	221	542	1166	3352	338	276	55	122	1	0	10	1	5	6089
5	Aundh	908	2215	1425	2214	301	643	59	64	18	36	64	78	33	8058
6	Warje	980	233	483	3692	1383	965	36	31	2	18	154	40	14	8031
7	Dhole Patil	485	1333	1590	419	691	466	143	1391	26	42	58	35	25	6704
8	Tilak Road	401	354	870	2162	360	1028	276	517	84	66	76	35	51	6280
9	Sahakarnagar	334	591	546	496	452	436	533	968	177	158	60	29	17	4797
10	Bibwewadi	496	1158	405	886	626	621	434	699	89	120	67	39	23	5663
11	Dhankawadi	300	1161	861	2846	478	902	303	376	65	78	88	72	60	7590
12	Hadapsar	704	988	1826	1876	237	3889	1100	563	51	148	165	134	77	11758
13	Kodhawa Wanwadi	1170	2197	1244	922	426	1321	1236	459	54	105	97	65	55	9351
14	Bhawani Peth	681	302	582	2289	157	1648	531	64	67	70	35	33	6	6465
15	Kasaba Vishrambagwada	372	327	235	863	82	3002	771	576	70	23	21	142	11	6495
	Total	9650	15269	16015	26788	7436	19982	6199	12750	758	933	1055	843	537	118215

Objective

- To achieve energy efficiency in Street lighting
- To Upgrade the existing electrical, structural & optical systems.
- To Implement SMART Dimming & Feedback monitoring controls
- To reduce Downtime with defined SLA
- To encourage PPP participation
- To monitor & control the entire street lighting system from one central location
- To reduce carbon footprint of Pune city (Approx. 15 K tons annually)
- To be a pioneer & establish a benchmark in LED street lighting implementation on PPP basis.

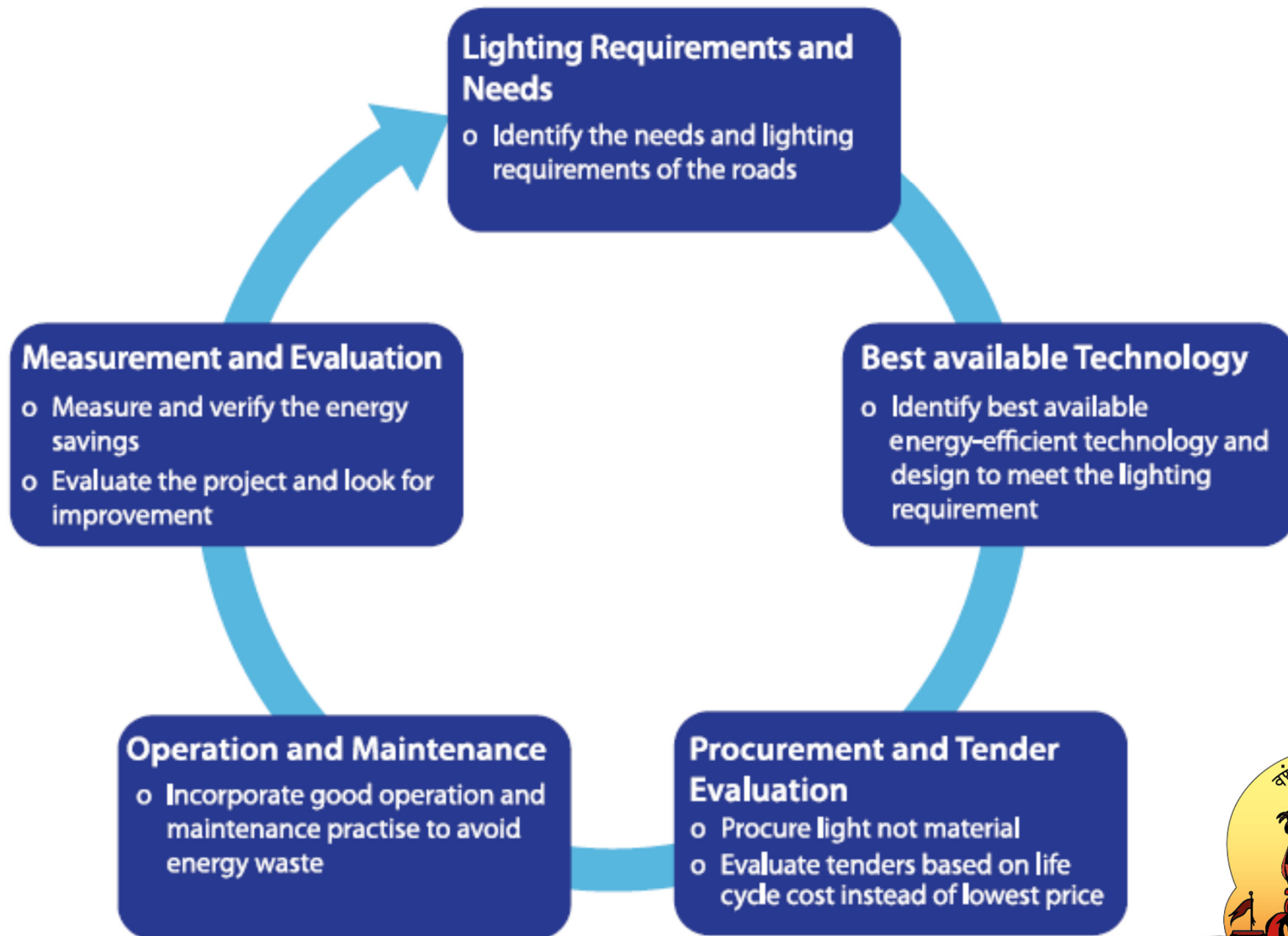


Goals

- To replace all existing conventional streetlight with energy efficient dimmable LED Street lights
- To replace, install & maintain smart per pole Street lighting controls to monitor remotely, have real-time feedback on the working street lighting system
- To improve / maintain the illumination levels on the streets as per IS 1944 , Indian Standard for the contract period of 12 years.
- To reduce downtime, achieve minimum energy savings upto 40 %
- Reduction in energy savings



Energy Efficiency Street lighting project Cycle



Where are the savings for LED ?

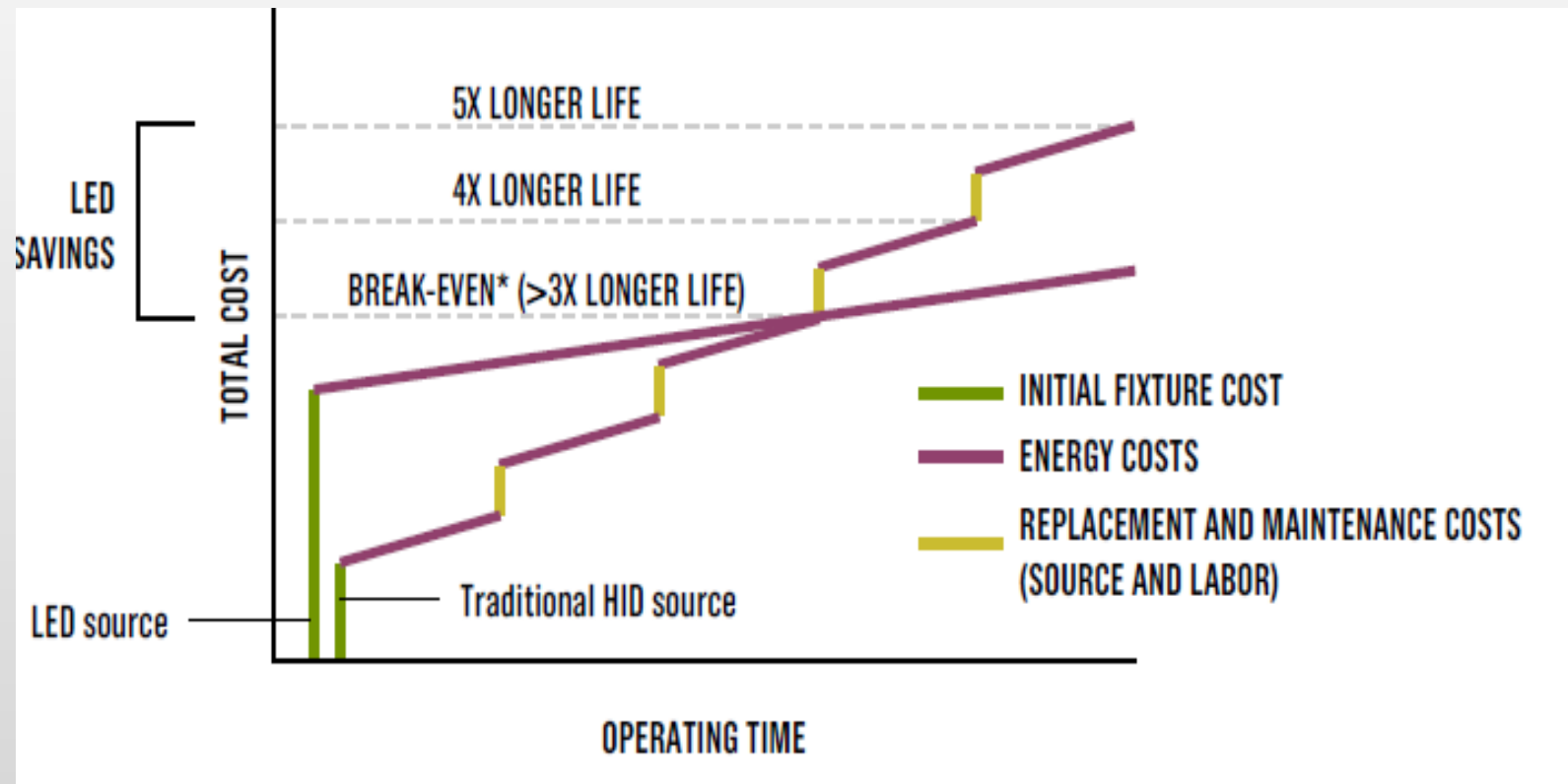
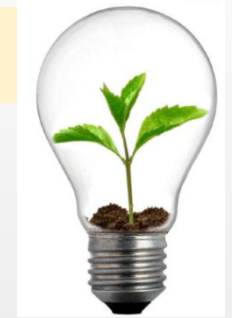


DIAGRAM: An example of indicative cost savings for LEDs versus traditional light sources. Despite the higher initial fixture costs, LEDs are replaced less frequently and provide ongoing energy cost savings.⁴⁹



LED Advantages



General Advantages

- Extremely long working life (>50000 burning hours)
- Reduced maintenance costs
- Growing Efficiency
- Instant Switch on mode
- Dimming option with no color temperature variations
- Filter free direct colored light emission
- Dynamic color control mode (DMX, DALI)
- Can be switched on also at low temperature (-40 deg C)
- Connected Lighting.



Energy efficiency



Packaging



Hazardous substances



Weight



Recycling and disposal



Lifetime reliability



LED Advantages

Design Related Advantages

- Wide choice of design solutions
- Bright, saturated colors
- Vibration resistant lights
- The objects lit are not subject to overheating



Environmental Advantages

- Mercury Free
- No IR or UV components can be found in the visible light spectrum
- Reduced use of Renewable & non renewable energy sources



Energy
efficiency



Packaging



Hazardous
substances



Weight



Recycling
and disposal



Lifetime
reliability



Present Situation / Inventory (Scope of Project)

Product type	Qty (No)	Total Wattage (KW)	Annual Energy Consumption (kWH)	Annual Energy Bill Estimated (Rs 5.8/unit)
2X24 W T5 street light (56 W)	27018	1,513.01	6,626,975.04	38,436,455.23
4X24 W T5 Street light (96 W)	7436	743.60	3,256,968.00	18,890,414.40
70 W SONT Streetlight	10050	844.20	3,697,596.00	21,446,056.80
150 W SONT Streetlight	15199	2,629.43	11,516,890.26	66,797,963.51
250 W SONT Street light	16105	4,541.61	19,892,251.80	115,375,060.44
250 W Floodlight	863	243.37	1,065,943.08	6,182,469.86
400 W flood light	1208	537.56	2,354,512.80	13,656,174.24
	77879	10,271.85	44,990,681.10	260,945,950.38

- Approximate 1850 no of Feeder Panels
- Hours of operation – 12 hours (6pm – to 6am)
- Manual Timer based ON / OFF operation
- No Provision for dimming
- Monthly average tariff rate of INR 5.8
- Theoretical energy expense approx. 30 crores annually



Proposed Replacement

Sr No.	Existing Street light / Flood light	Proposed LED equivalent
1	4 X 14 W T5 / 4X24 W T 5	35 W
2	70 W HPSV / 4X14 W T5	35 W / 72 W
3	150 W HPSV	60 W / 72 W
4	250 W HPSV	140 W / 170 W / 210 W
5	250 W FL	100 W LED FL
6	400 W FL	140 W FL

- The proposed wattages would provide same/ improved illumination
- Remotely controlled operation
- Dimming incorporated to vary illumination levels as per requirement



SMART Lighting controls – Benefits

- **Strong and increasing Smart Lighting needs**
 - Smart lighting control systems would enable improved Service levels, measurement & verification.
 - Web-based solutions will enable parties to seamlessly collaborate (cities, utilities, service providers, sub-contractors)
- **Decreasing cost of components and rising labor and energy costs**
 - LED will drive move from analog to digital - low incremental cost and effort to introduce intelligence
 - Labor costs will steadily increase
 - Energy costs will keep on increasing
- **Lighting as an Integral part of the Smart Grid**
 - The smart grid requires a maximum of energy-using products to be connected



AmpLight intelligent cabinet lighting solution

AmpLight

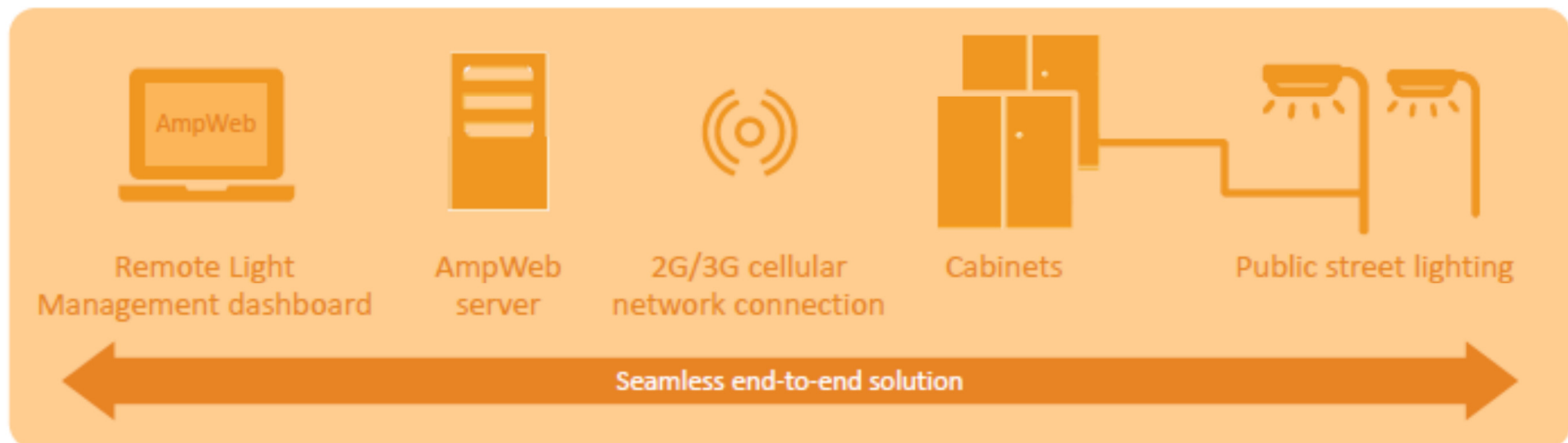
- Group-based street lighting control
- National or regional cellular network connectivity

AmpWeb remote management

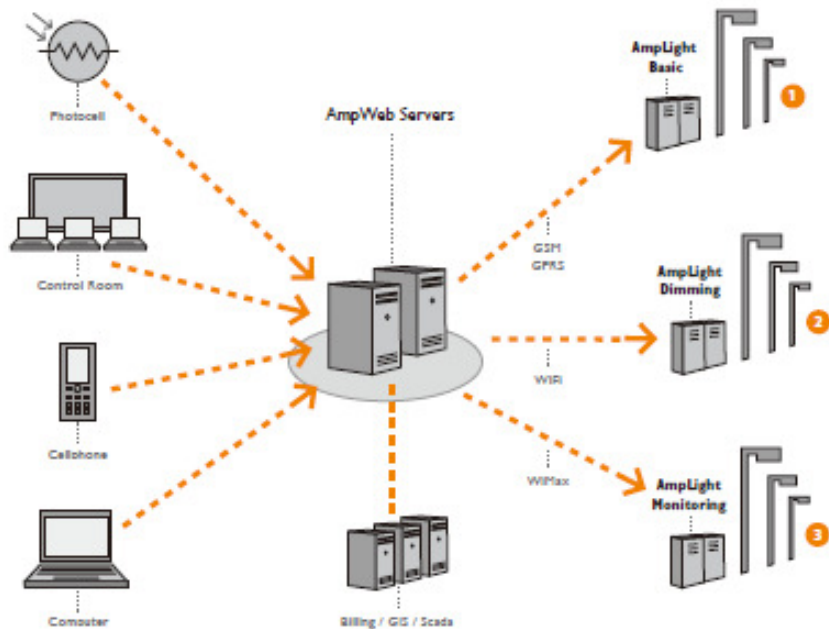
- Different hosting scenarios available for full flexibility
- Enterprise-hosted to leverage customer's IT infrastructure and capabilities
- National or regional hosting for secure and hassle-free operation

Feature packages

- Standard group control
- Advanced monitoring



Street Light Control System – Architecture / Benefits



- Load Balancing Information (Voltage, Current & PF)
- Exact identification of failures(Fuses, Circuit Breaker, Power Failure)
- Lamp glowing and non-glowing information
- Theft and functioning of switch gear
- Twilight based
- Alternate lighting pattern is possible & Dimming can be incorporated
- Communication via SMS/ GPRS/EDGE/ Radio / CDMA
- Number of hours of glowing, fault conditions , complete MIS report will generated.



Proposed LED Replacement

**51%
energy
savings**

Sr.No	Existing fixture type	Existing Light Fixture Wattage	LED System Wattage (In Watts including losses)	Minimum Guaranteed % Saving Offered
For Street lighting				
1	HPSV	70	37	56.47%
2	HPSV	150	72	36.40%
3a	HPSV	250	172	63.43%
3b	HPSV	250	210	41.71%
3c	HPSV	250	245	21.71%
4a	T5 (4X14 W)	56	37	28.75%
4b	T5 (4X14 W)	56	21	48.75%
5a	T5(4X24 W)	96	37	78.75%
5b	T5(4X24 W)	96	72	35.00%
For High Mast lighting				
1	HPSV/MH	250	100	65%
2	HPSV/MH	400	140	69%

- With Dimming the saving percentage would be increasing by further 10%
- The number of Switching points would be optimized
- Real time energy consumption data



Financials

- ***BOT Period of 12 years.***
- ***Percentage sharing of savings with Concessionaire – 98.5 %***
- ***Percentage sharing of savings with Corporation – 1.5%***

Benefits of LED Street lighting system

- Improved Lighting Quality and Public Safety Benefits
- Life expectancy of 15 years
- White light with high color rendering
- No light trespass.
- Lighting better than applicable IS standards
- Flexibility of controls & dimming



Salient Features

- Initial Cost of Replacement of Luminaires to PMC – NIL
- Initial Cost of Implementation of Controls systems – NIL
- Centralized Automatic feedback control & monitoring resulting in reduced maintenance, higher uptime & reduction of power theft
- Same / Better Illumination levels as compared to existing infra as per IS standards
- Reduced maintenance resulting in lesser inventory / Less manpower
- BOT period of 12 years



Actual site photos LED Installations



Before



After

Visual difference of LED Vs HPSV Lights

360 degree
light distribution
by HPS lamps

HPS lights



White zebra strips
are not clearly
visible

LED lights

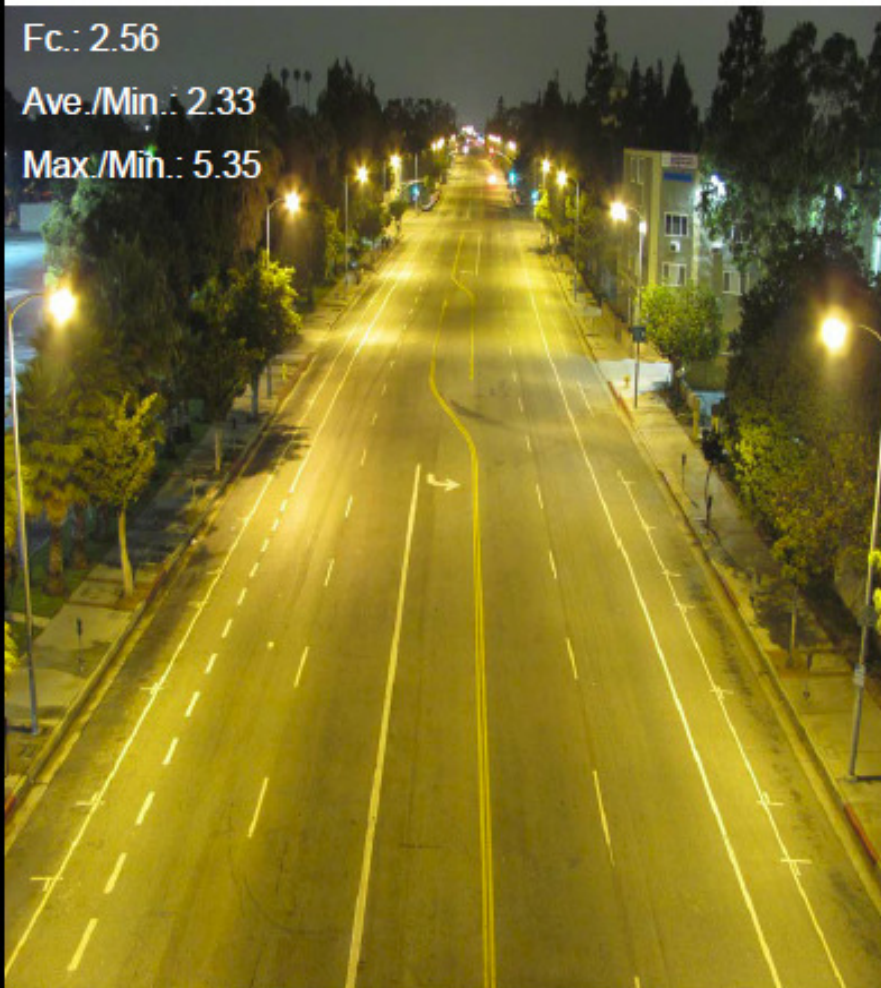


LED lights distribute
light in a sharply
defined angle

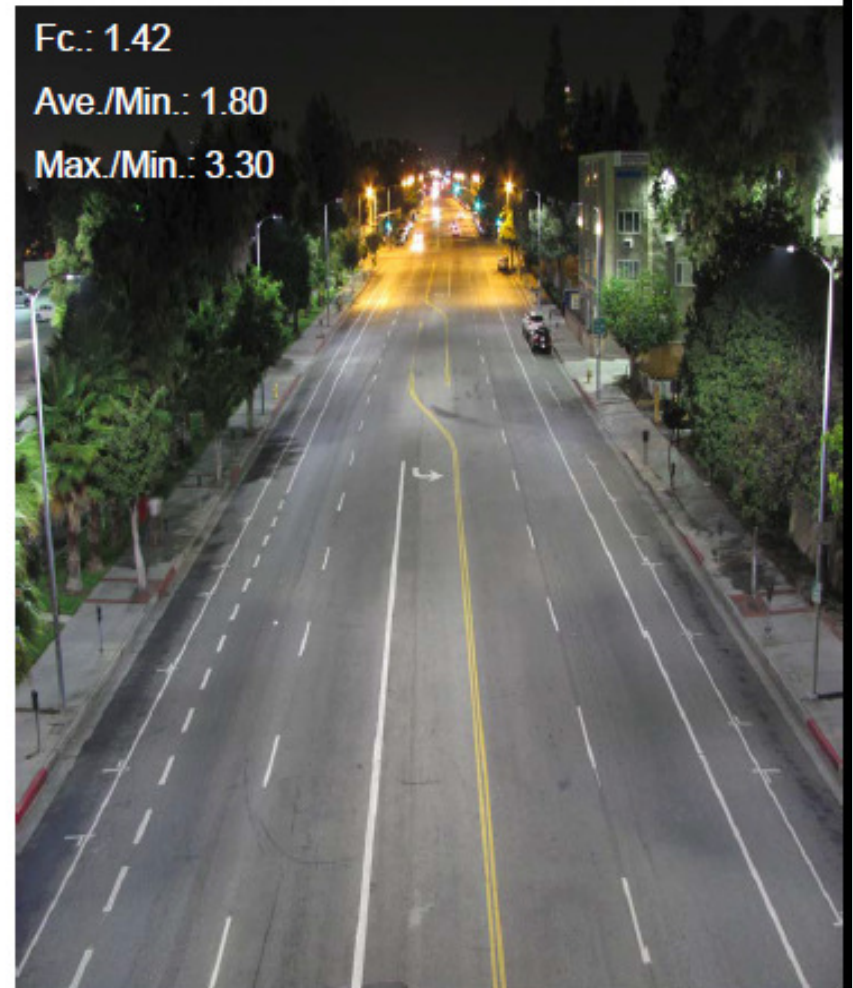
Shadows are
less prominent

Better color
Rendering

Site picture of LED against 310 W HPSV Lamp



BEFORE (310 W HPS)



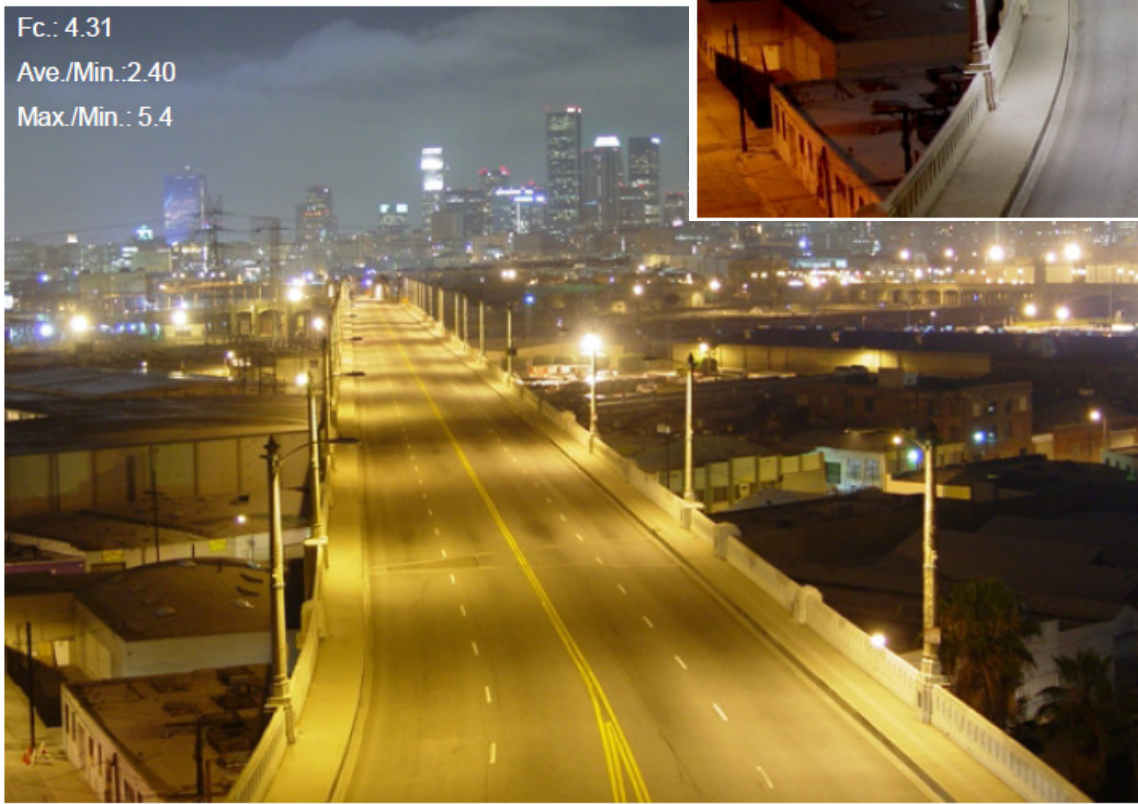
AFTER (LED)

After LED Conversion

Fc.: 3.48
Ave./Min.: 1.63
Max./Min.: 2.67



Fc.: 4.31
Ave./Min.: 2.40
Max./Min.: 5.4



200 w HPSV

Actual Site Images of LED Installation against 250 W HPSV Lamp, Pole height -10m, Inter pole spacing between 2 poles – 35 m







LED PPT

Thank You

