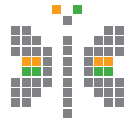




Ministry of Housing
and Urban Affairs
Government of India



Smart City
MISSION TRANSFORM-NATION



MITIGATE

Community level rooftop solar PV for EV charging and grid stabilization

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Problem Statement

India is witnessing a rapid urban growth trajectory with a projected increase of urban population from 340 million in 2008 to 590 million by 2030. Consequently, 700–900 million square meters of additional commercial and residential space is needed [1]. Since building stock accounts for a major share of energy consumption, the nation's energy demand is poised to grow multi fold. Despite the government's endeavour to transition to a cleaner energy source, penetration of renewable energy in urban areas remain low. For instance, of the targeted 40GW solar panel installation on rooftops of buildings by 2022 [2], only 4% has been achieved so far [3]. Further, lack of co-ordination in institutional priorities and processes acts as a barrier for higher percentage of cleaner fuel in the total energy mix. Additionally, the DISCOMs, being primarily a utility company selling power at distribution level, incurs loss of revenue due to PV installation and are thus not keen to facilitate PV integration.

Parallely, there is a radical shift taking place in the transport sector with e-mobility avenue for emission reductions. Sadly, the lack of EV charging infrastructure dissuades many buyers. This leads to a chicken-egg conundrum impairing penetration of electric vehicles on road.

Idea

Considering above challenges and opportunities, team MITIGATE investigates cross-sectoral aspects and proposes an idea to bridge the gap between supply and which is quite often seen problematic in the energy sector. The answer is a city agnostic turnkey solution enabling a distributed energy resource (DER) system for a community area, encompassing an off-grid rooftop PV system connected to an on-grid battery energy storage system (BESS). The BESS will support a fast DC charge station to charge electric vehicles completely in less than 1 hour. Further, the BESS can support the DISCOMs to defer the additional infrastructure to be built just to support peak demands, lowering the CAPEX costs for the DISCOMs.



Rationale

A report by WRI [4] indicates multiple challenges faced by the DISCOMs and the consumers to invest in residential PV installations. Concurrently, there are other pathways for reduction of emission and transition to cleaner sources of energy. The idea of off-grid rooftop PV in a DER system connected to BESS, which is further used for EV charging, effectively bridges the gap to manage the supply and demand. Also, it breaks the self-consumption application rational which acts as a barrier for DISCOM's loss of revenue. Bringing in DER system, increases the efficiency of the grid system by reducing transmission losses.

The rooftop solar PV helps the residents save on their electricity bills by considerable amounts, without any initial CAPEX. After the pre-assessment of techno-economic feasibility, the PPP business model helps to realize the potential for implementing a community level DER system, thereby integrating the green energy and the transportation sector. Going a step forward, an ecosystem gets created generating employment opportunities and giving the community the future ready infrastructure. The cross-sectoral solution goes in hand with six different national missions and policies, giving an edge over other solutions.

Results

This disruptive solution will facilitate higher PV penetration without harming the existing grid network as feared by the DISCOM's. Further the BESS will perform grid operations to stabilize the system during peak hours with stored energy. This solution will help mitigate 40 tonnes of CO₂ per kWh installed with an annual savings of ₹2.4 lac per kWh installed. The solution will also generate employment, incentivise the use EVs and create a mature ecosystem for penetration of green energy.

Bibliography

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- [4] WRI; Shakti, "HERE COMES THE SUN: RESIDENTIAL CONSUMERS' EXPERIENCES WITH ROOFTOP SOLAR PV IN FIVE INDIAN CITIES," 2018.

