

FUTURE OF URBAN ELECTRICITY: MICROGRIDS

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The exponential growth of the human population has led to a rapid increase in the demand for reliable and sustainable electricity. While discoms are struggling to meet consumer demand, is there an alternative approach to resolve this issue?

As Indian cities are growing at an exponential rate, discoms are witnessing an urgent need for a regular, reliable and sustainable supply of electricity in order to ensure long-term growth. However, consumer demand for electricity varies significantly with the population density and consumer base and hence, discoms today are facing difficulty with regards to providing an undisrupted supply of electricity. With a significant working population, residential areas in cities have low demand during the day as compared to commercial areas. In the night, when business centres close and people return home, the situation is reversed. These local patterns result in congestion hot-spots in the network. Besides, the peak demand is seasonal and of short duration. For instance, on the afternoon of 2nd July, 2019, Delhi witnessed an all-time high peak demand of 7409 MW that lasted for a few minutes. Amongst the growing demand, irregular peak instances would become more frequent across all major cities. Yet, while planning their operations, the discoms have to account for such rare situations.

The discoms undertake several measures to meet consumer demands and serve reliably. Amid global concerns of climate change, the onus on them is to do this sustainably. Some of the usual solutions are contracting high capacity from generation companies, constructing new transformers and feeders in congested areas and laying new lines to transmit power. All of these solutions are cost-intensive propositions for discoms and some are also unfeasible due to space constraints. Furthermore, as the peak demand – for which this infrastructure is built – is of short duration, most of it remains underutilised. As a result of this resource inefficiency, this infrastructure becomes a financial burden for the discom.

Distributed generation systems like microgrids offer a vast opportunity for discoms to manage the demand locally. Microgrids are systems with an on-site generation and storage facility that serves the connected loads in a defined area. They are capable of operating independently of the main power grid. In cities, the generation source is generally a solar system, mounted on the roof, coupled with a battery. As solar generation is available only during the day, the battery enables storage of excess production for later use when solar is unavailable. Such systems, therefore, allow consumers to generate their electricity, optimise its usage as per the requirement and thereby, reduce their reliance on the grid electricity provided by discoms.

Empowering consumers with microgrids can help discom operations in multiple ways. Firstly, as the number of consumers connected to the network decreases, the network load and congestion reduces. Promoting such systems among a larger consumer base can potentially eliminate the need to construct new network elements like distribution lines, transformers and feeders. Secondly, as the generation and consumption points coincide, the transmission and distribution losses are lowered, improving efficiency. Finally, self-generation by consumers reduces the quantum of power procured by the discom from the conventional power plants. Solar energy is clean and environmentally benign.

In a time when vehicular and industrial pollution continues to impact city life, decreasing reliance on thermal power and opting for renewable energy would be prudent in pollution mitigation.

While these are the benefits to the discoms, microgrids can bring in considerable savings to the consumers as well. First, monthly electricity bills are lower as grid consumption is reduced. Second, by exporting the excess solar generation back to the grid, they gain financially. Although the tariffs and purchase rates vary across states, the cumulative gain to consumers is substantial. Also, it lasts as long as the system life, which could be up to 20 years. Finally, in the event of a power outage, these systems would continue to serve the consumers safely, by detaching from the network.

Microgrids are a lucrative proposition for discoms and consumers alike. Such innovative solutions are the need of the hour for discoms to ensure clean and reliable electricity supply to the consumers and to operate efficiently. However, to succeed, they have to overcome various obstacles like consumer willingness to adopt these systems and technical feasibility of the network. There is an urgent need to create awareness among stakeholders regarding the potential benefits of these systems, provide financing options for consumers and implement timely policies to facilitate deployment at large scale.