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Smart Cities: An Engine of Urban Economic Growth

The Government of India is encouraging investments at the transmission and distribution level to boost access to reliable and continuous power supply through various schemes. Recent reports by several independent agencies have rated the power transmission sector as the most attractive for infrastructure investment in India.

In another 10 years from now, Urban India will grow at a phenomenal pace, housing 40 per cent of the country's population with a contribution of 75 per cent towards the GDP. The pressures of a fast-growing population and rapid urbanisation on the limited resources available can be quite telling. Bracing for these challenges, the Central government is coming up with 100 Smart Cities across the country, which will involve development of a sustainable urban ecosystem that drives economic growth and enhances the quality of life through technological applications, infrastructure development, higher efficiency and improved services without putting a strain on the limited resources. An engine of growth for the economy, Smart Cities involve comprehensive development of physical, institutional, social and economic infrastructure that can cater to the futuristic requirements of rapidly growing urban hubs. Buoyant and resilient enough to cope with the pressures of fast-paced urbanisation, these cities have typical features like assured electricity and water supply, proper sanitation, solid waste management, Information and Communication Technologies (ICT) applications, efficient public transport, robust IT connectivity and digitalisation.

However, it is efficient power supply which forms the backbone of any Smart City because it is a prerequisite to all the processes involving these "Cities of the Future". The efficient flow of electricity, in turn, depends on a robust and efficient transmission network, to which smart grid applications hold the key. Though smart electricity in a typical Smart City is characterised by features like sustainability, affordability and smart and automated metering, it all begins with making a grid smart and responsive. To put it simply, a smart grid is an electrical grid which includes a variety of operational and energy measures, including smart meters, smart appliances, renewable energy resources and energy-efficient devices.

Involving enhanced use of digital information, smart grid applications employ technology to improve the reliability, safety and efficiency of the electric grid, while ensuring dynamic optimisation of grid operations and resources with comprehensive cyber security. With sustainability at the heart of its operations, the modern-day smart grid system should also be capable of integrating large amounts of renewable energy. To qualify as Smart, these "Futuristic Cities" must essentially involve deployment of "smart" technologies, which can be defined as real-time, automated and interactive technologies that optimise the physical operation of appliances and consumer devices. Integrated with consumer devices, these smart appliances can go a long way in optimising the smooth functioning of Smart Cities.

Efficient power supply depends on an efficient transmission and distribution (T&D) infrastructure, which is characterised by smart grid applications like Supervisory Control and Data Acquisition (SCADA), Distribution Management System (DMS) and Outage Management Systems (OMS). Catering to efficient power supply, these applications are one of the most crucial components of any Smart City as they entrust grid operators with more tools and functions for analysis and control. So, essentially, it is smart grids which make smart cities. The automated and computerised applications used under SCADA to detect errors and identify troublesome equipments reduce the need for manpower and bring down the costs, aided by lower operation and maintenance expenses, and ensure a faster response. Besides, the outages are fewer and the time taken to resolve faults is considerably reduced.

A vital component of smart grid technology, SCADA systems are equipped

with a self-correcting mechanism, enabling collection and storage of information relating to any indications for troubleshooting and maintenance, thus making the power systems smart and robust. Acquiring real-time data and controlling the signals at the same time is extremely crucial for any state Discoms so that the power system network is well equipped to deal with faults. The information and communication technology in smart grids can help Discoms improve their analysis pertaining to customer load patterns and tariffs, thus resulting in better services to consumers.

Smart grid applications basically involve increased use of digital information and technology to improve reliability, security and efficiency of the grid, dynamic optimisation of grid operations and resources, introduction of real-time, automated and interactive technologies that optimise the functioning of appliances and integration of smart appliances and consumer devices. A Smart City can optimise electricity consumption by recording real-time data pertaining to residential, commercial and industrial consumers through automated smart grids based on remote monitoring and micro-grids.

So, an integrated grid with an IT backbone is a must. These smart grids not only reduce energy consumption and make electricity supply more efficient, they also manage power generation from renewable technologies. Besides, they are more resilient as they can run on-the-go diagnostics and self-correction mechanisms and update the results in no time. These capabilities help minimize power losses to a considerable extent and equip utilities with the necessary information for enhancing efficiency through meticulously planned operations.

While smart grid technologies are necessary to make the T&D infrastructure capable of handling large amounts of electricity being injected into the grid, they are also ideal for integration of large-scale renewable energy systems. The sustainable development of Smart Cities is typically supported by environment-friendly solar energy devices.

In a country like India with abundant sunlight, solar energy can meet a major part of our future energy needs. The decentralised solar energy produced in smart cities should be integrated to smart grids to serve local communities. What makes urban smart energy so attractive from the consumer's perspective is the fact that it offers the opportunity to break the domination of a centralised distribution system and make power more local. Micro-grid projects in smart cities can improve system resilience substantially. For instance, in 2017, the disastrous power outages across North America as a result of storms and wildfires did not create any problems in states like Texas and California which had invested in localised micro-grids.

The idea to come up with Smart Cities may involve huge money, but given the long-term advantages, the investment is worth it down to the last penny.