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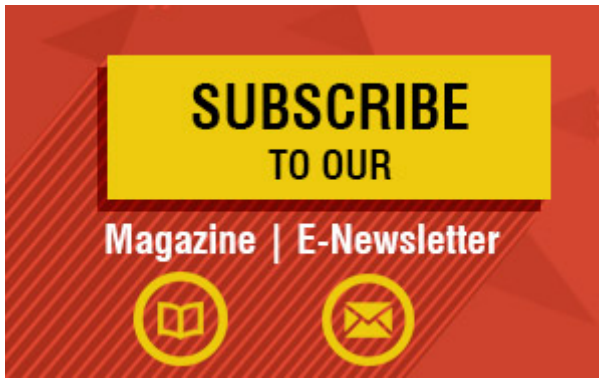
Infrastructure TODAY

SMART GRID TECHNOLOGIES TO ADDRESS NEW DYNAMICS

INTERVIEW / JAN 2019



SOCIAL

India needs smart grid systems on account of the changes in the entire dynamics of the electric power system and the need to maintain its very complex and prodigious grid, says **Reji Kumar Pillai, President, India Smart Grid Forum (ISGF).** There is also a need to go beyond the present narrative of being a power surplus nation and undertake renovation and modernisation of thermal plants as also add the new generation capacities of coal, nuclear, hydro and renewables. The failure to do that would result in a return of power cuts, he warns in this comprehensive interaction with **INFRASTRUCTURE TODAY.**

Why do the Indian grids need to imbibe smart technologies?
We operate one of the biggest and the most complex grids in the world, covering 3 millionsquare kilometres with 345 GW of connected load and over 250 million customers. This grid is growing at 8 to 10 per cent per annum, both in terms of connected capacity as well as customers. The government is targeting to add 175 GW of renewable energy to the grid by 2022. I am convinced that by 2022, we will achieve about 150 GW, if not more. A grid of around 500 GW with 30 percent plus renewables and 300

million plus customers will be very complex to manage. We need smart technologies and smarter systems to operate such a complex grid. Take the present example of Karnataka, which in the last three years has added 5,000 MW of solar power to the grid. During the monsoon season this year, the total load in Karnataka was less than 10,000 MW, while their total renewable capacity is over 12,000 MW. On a good day, with wind and solar, the state produces almost 100 per cent electricity from renewables which keeps going up and down all the time; and maintaining grid stability is a nightmare in that scenario. The states in Karnataka's neighbourhood like Tamil Nadu, Andhra Pradesh and Telangana will also be reaching that stage very soon. The entire dynamics of the electric power system has changed and we need smarter technologies to manage the grid.

How can such technologies aid in the decentralisation of the country's energy requirements?

The biggest challenge today is to provide 24X7 quality power to all the citizens in India. The generation capacity is idling, primarily because of the financial viability of distribution companies. But on the other side, customers who don't get quality power from the grid are resorting to alternate arrangements like diesel generating (DG) sets and inverters, which are several times more expensive than power from the grid. For example, in Gurugram, most of the big buildings are on DG sets and are paying Rs15-18 per unit of electricity. They will be more than happy to pay Rs8-10 per unit to Dakshin Haryana Bhijli Vitran Nigam (DHBVN) but the distribution company is unable to supply power though there are over 40,000 MW of thermal power stations lying idle in the country that could supply power at around Rs5 per unit. Something seems to have gone terribly wrong with the Indian power sector. Therefore, technologies need to be leveraged and policies need to be tweaked to resolve this problem. The per capita consumption of electricity in the country is still one-third of the world average, with a little over 1,000 kWh per person per year. At the same time, there is a narrative that we are a power surplus country because some power stations are lying idle owing to contractual issues. This, together with huge non-performing assets with banks, is preventing

boutique firms could open doors to easily tap financing from institutional investors both debt and equity.

the new generation capacities from coming online and is also keeping the investors away. Today, out of the daily average generation of 150,000 MW, at least half is coming from power plants that are 25 to 30 years old and require renovation and modernisation (R&M). Since, no multilateral lending agencies are willing to lend money for R&M of coal fired plants, we have to find resources internally and also build the new generation capacities of coal, nuclear, hydro, solar and wind. However, if we continue to believe that we are a power surplus country, we will return to the dark ages of the 1970s and 1980s when frequent power cuts used to be the norm.

However, the high cost of replacing existing equipment may prove to be a deterrent at least as far as brownfield projects are concerned. What are your own views on this challenge?

There is no other way out but to find the means to R&M of the existing coal plants that will help to reduce pollution levels, increase output and provide a pre-existing transmission infrastructure for power evacuation. Although several licenses were awarded to set up hydroelectric plants in the last 15 years, most of them could not be developed owing to a variety of reasons like the right of way, long transmission, hydrological issues, financial closure and environmental clearances. Moreover, we are at least a decade away from the completely digitalised grids that shall possess the ability to self-balance themselves to adjust to the intermittency of renewable generation resources. The new policies on the anvil related to emission reduction from thermal plants could significantly add to the cost of generation and pose technical and commercial challenges to generation companies. We need consistency in policies with a long-term vision which is lacking. With every change of the government, the minister, secretary, joint secretary and chief executive officer of a utility, the policies and programmes also change. In the present system of the governance in India, institutions do not learn even from their own mistakes as there is no mechanism to capture the learnings. Individuals who learn, move on frequently from one ministry to another. This is the bane of India.

Similarly, the existing regulatory guidelines framed for grids and utilities have become antiquated in view of the ongoing technological disruptions. Therefore, how proactive are the policy interventions at the federal and the state level in this regard?

India is far ahead of many countries in terms of the regulatory environment for electricity grid modernisation. What we lack is in the implementation, which is the primary responsibility of the states. The Ancillary Services Regulations issued in 2015 is yet to be operationalised. For smart grids, we have issued so many policies and regulations. Take net metering for instance. Every consumer in India toady can theoretically be a prosumer, i.e., both a producer and a consumer of electricity. From 2013 to 2016, all the 28 state regulatory commissions had issued net metering policies. ISGF is working with the Forum of Regulators and state electricity commissions for making it more prosumer friendly. We are now doing some modelling studies which indicate that most states have a cap of 25 per cent on the distribution transformer capacity for rooftop solar in their net metering policies. Our studies indicate that it can go up to 60-70 per cent in most parts of India, since our distribution system is overloaded and rooftop generation, which gets consumed in the low voltage grid will actually give a load relief to the distribution transformers. Our recommendation will be to change the net metering policies with at least 50 per cent of the distribution transformer capacity, which will actually start a revolution of rooftop solar in the country. ISGF has also been advocating for the Right to Electricity Act. Suppose you are a customer in Gurugram who is willing to pay Rs10 per unit of electricity to the distribution company. But owing to the frequent power cuts, depend on electricity from the DG set at Rs18 per unit. The smart grid technologies today can offer differential pricing to customers on a feeder and those who do not wish to buy at the Time of Use (ToU) tariff can either turn-off or reduce their consumption based on real time alters and price signals.

So, the Right to Electricity Act will help address this issue and will also take care of the financial viability of distribution companies. We followed the US model of regulation with separate regulatory commissions in each state.

Ideally, we should have gone for regional regulatory commissions in five regions. In that case, the regulators will not be appointed by one chief minister but by a group of chief ministers in the region. That way, the regulators would have had more freedom from state politics and work for the benefit of the sector and consumers, and not serve a short-term political agenda.

But distribution companies have resisted buying electricity from prosumers. That is because in the present scenario a 1 kW rooftop solar system costs anywhere between Rs50-60,000 and only the middle and upper-middle-class people can afford it. When they put up a solar panel on the roof, revenues of the distribution companies take a hit under the present tariff framework. We need to find a way that incentivises a prosumer without impacting the revenue of the distribution company. There are some models available such as allowing customers with rooftop solar to sell to other customers (peer-to-peer or P2P trading) rather than only to the distribution company. Today, at Rs50-60,000 per kW, the prosumer doesn't need the 30 per cent subsidy that the Ministry of New and Renewable Energy (MNRE) provides. That incentive should ideally go to the distribution company to upgrade the grid in order to integrate rooftop solar with low voltage grid.

Another area of concern is the security as smart grids and utilities will generate copious amount of data, which has the potential of being misused by vested interests. The maximum data that a utility gets is the 96 readings of your electricity consumption in 15-minutes blocks in a day. What can be misused with that data? Is it whether you are home or outside? Your Facebook and other social media accounts know a lot more about most of your activities in real time. Data security is a far bigger concern for the distribution company than the customers. Since July 2015, India made Internet Protocol version 6 (IPv6) mandatory for all equipment, networks and contents. All the networks in the country are now IP networks that can be monitored in real-time with any Network Management System (NMS). Although preventing cyber attacks may not be possible, we could monitor

and detect intrusions almost in real time and isolate such areas and take preventive actions quickly.

How important is it to educate the consumer about the benefits accruing from a smart grid and is enough being done in that direction?
The experience from around the world shows that whenever a smart metering programme is launched, the customers view it with suspicion as they suspect their monthly spend on electricity might go up. In many cases, the bill does go up because the existing old metres are not accurate. This often leads to agitations and protests by the consumers. Therefore, it is important to involve the customers from day one in the programme in a language that they understand. In a country like Australia or the US, it is very difficult to explain the benefit of smart metering to a consumer. But in India, we manage to convince them easily by informing them how it will help in avoiding power cuts. Instead of blackouts, we will be able to do brownouts. You will never need an inverter and voltage stabilisers as you will get minimum electricity to operate the lights and fans and the quality of power will be maintained in a smart grid. In addition, you will get pricing-related alerts during the day. When the electricity is cheap, you can run your washing machine, geyser and water pump to reduce your bill. The government-owned utilities need to plan their customer engagement before launching large smart metering programmes.

So, where does India start; should we aggressively embrace smart grid technologies or do we make a beginning with pilot projects?
In 2011-12, when 14 smart grid pilot projects were allocated to different distribution companies, the world over the technologies was still nascent. But in 2018, there is no need for any more pilots as most technologies like SCADA, DMS, distribution automation, substation automation, self-healing grid and smart metering have attained a maturity. There are over half a billion smart meters already in operation. We can commence large-scale deployments through sustainable business models. However, a major issue here is that our distribution companies do not have the technical and managerial capability to buy these technologies and maintain them. They

should instead buy these new systems as a service rather than making outright purchases or through the EPC contract model. Utilities should engage a service provider who will install the system and maintain it too for eight to ten years. The utilities will have to first study and evaluate their requirements and prepare a smart grid roadmap before embarking on large investments on isolated systems.

- Manish Pant

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