“Smart grid can enable people to integrate the solar power”

Reji Kumar Pillai, President, India Smart Grid Forum (ISGF) and Chairman, Global Smart Grid Federation (GSGF) says rather than waiting for smart grids of renewable energy to evolve over time, India needs to maximise the emerging technologies to address its energy requirements.

How can smart grids be enhanced through integration of non-conventional energy sources such as solar?

Smart systems are required for visibility of power flows in real-time, and better predictability and flexibility of both supply and demand for integration of intermittent and variable generation resources such as solar and wind on to the grid. Now suppose a large cloud passes over a 500-MW solar farm resulting in the power generation coming down to 200 MW within a few seconds. That is a huge variation which the grid cannot accommodate without either increasing the generation from other resources immediately or reducing some load. Therefore, it is necessary to have smart systems by which the demand can be curtailed, by taking preventive actions in a few seconds. Similarly, in the case of wind, if it stops all of a sudden, the drop-in generation needs to be addressed by either increasing the generation from some other sources or curtailing the load in certain areas. The recent trend is to enlarge the control area over a large geography to make the mitigation mechanism more effective. In the western states of Maharashtra, Rajasthan and Gujarat, the variability of wind and solar can be addressed in a larger control area by reducing certain loads like water pumping and air-conditioning. Some industrial processes can also be shifted by few hours. But those kinds of interventions are possible only with smarter systems to monitor and control the grid from the utility control room. The distribution and transmission operators should be able to visualise the changing scenario of generation in real-time to determine what loads can be interrupted or shifted; and in case of surplus generation how to export it or store it or curtail generation from generators running on expensive fuel. Controlling of load and generation resources from the utility control room all the way up to the low voltage level is what is achieved with smart grid technologies.

It is said that the smart grid technology will open up more opportunities for solar power by providing a new energy value chain. Do you agree with this assessment?

Absolutely! Managing the generation of power from rooftop PV by consumers who are connected to the low voltage distribution grid is going to be an entirely different ball game and it will be a big challenge for the distribution grid operators. But, the large solar farms which are connected to high voltage transmission grids can be manged better. The low voltage side is a much bigger engineering challenge owing to reverse power flows from rooftop systems. Since not much work has been done in this area, this needs to be put on the fast track. There are net metering policies in all 29 states and seven union territories in India, and theoretically every consumer in India can be a ‘prosumer’ – producer and consumer of electricity. With constantly increasing prices of conventional power from the grid and steeply falling prices of PV panels, many consumers are finding it economically viable to have rooftop systems. However, distribution utilities are yet to be ready to give connections to a large number of them. This is going to open up a lot of opportunities in the value chain. There are microgrids, where with new technologies like blockchain coming in, you can sell your surplus generation from your rooftop solar to anyone connected to the grid. Today you have an option to only sell it back to the grid operator. Peer-to-peer trading will be facilitated by block chain technology, which is already demonstrated in the Brooklyn Microgrid, which

was commissioned a few months ago in the New York City. There rooftop generation from a home can be sold to anybody in the microgrid. Moreover, crypto currencies are going to help in this transition. The bitcoin and blockchain is going to change the entire energy value chain. Anybody will be able to sell from anywhere in the world. In September, when I was in South Africa, I came across an entrepreneur who has put up a pre-paid metre in a school in a low-income community that people can recharge using bitcoins from anywhere in the world. The Boston-based donors have been able to buy electricity for a few months for that school outside Johannesburg. That helps ensure power to the school as otherwise several schools in low-income communities in Sub-Saharan Africa do not have electricity.

How do you perceive the evolution of smart grid technology impacting the demand for solar power system and rooftop solar PV arrays?

Smart grid technologies can enable people to integrate the solar power generated from rooftop PV units with the grid more efficiently. As already stated, today, across the country, any consumer can become a prosumer. From 2013 to 2016, every state has issued net metering policies enabling customers to install solar PV on their roof. There are engineering challenges. For instance, in a street with 100 houses, if 40 homes put up rooftop PV, perhaps the distribution transformer may not able to take care of the reverse power flow into the network. But these are engineering issues that will be taken care by emerging technologies.

However, some industry experts believe that it is not advisable to embark on very big renewable energy grids of solar and wind in haste. What is your own view on this?

This view comes from geographies where people have had 24-hour electricity for the past several generations. They can afford to have that natural evolution but not us. Even today one-fourth of our population is neither connected to the electricity grid nor do those connected to the grid get 24X7 electricity supply. Therefore, we need not wait for such a natural evolution. We should embrace the emerging technologies and leapfrog. As I said earlier, there will be engineering challenges, but those can be resolved through technology. By all means we should go about implementing these new solutions with a big bang.

So, how are things likely to pan out in the renewable energy space in India?

I never make predictions. We have already ratified COP21 protocol on combating climate change. We have committed that 40 per cent of our energy is going to come from non-fossil resources by 2030. If that has to happen, it won't just be 175 GW of renewable energy, it has to be several times that number. There is an immediate need to finalise that plan with cooperation and commitment from all stakeholders and then work towards it with aggressive policies rather than making a guesstimate for 300,000 MW of solar power. As part of the ongoing programme, 40,000 MW are to come from rooftop PV. This is something that can actually happen if distribution companies cooperate because for most categories of customers rooftop solar has become economically viable. Today you pay Rs 9-10 per unit to the electric utility if you consume above 800 units on average. If you are a commercial establishment like an educational institution, hotel or hospital, you pay anything from Rs 8-10 in most parts of the country. However, with lowered price of solar panels, rooftop PV power costs less than Rs 6 per unit. Although it is economically attractive to most category of customers, what we don't have is educating the common man on where he can buy reliable systems and find tested and certified integrators for installation of rooftop systems. In 2015, the payback period for residential customers was seven or eight years. Now it has come down to three to four years.

Projects such as 500 MW solar farm have externalities like funding and transmission system to evacuate power over hundreds of kilometres. But if you want to install a rooftop system, you can do that within a week. The next-generation rooftop solar equipment that will be available in the market, will be of a much higher efficiency. Today all systems have 17-18 per cent efficiency, but the next generation equipment are going to have above 30 per cent efficiency. The prices are constantly coming down. And added to that, if you look at the storage system, battery prices have been constantly declining. Simultaneously, with the government moving very aggressively on electric mobility, electric vehicles are soon going to become a common feature on our roads. If you drive to your office in an electric car and plug it to the grid for charging; and the rooftop PV on the office building and parking lots will generate electricity and feed in to the grid, which can compensate for whatever your car has drawn from the grid. During the evening peak hours when the price of electricity is higher on the grid, your car can give power to your home. You can charge your car battery, later during the night hours when power is cheaper on the grid or at work next day. Grid evolution will take place in three stages. The first change will be that a large number of connected smart microgrids will be the backbone of the main grid. Secondly, most buildings will be grid interactive buildings which will have self-generation, storage, electric vehicles and intelligent systems to control load, generation and storage, including car batteries. These buildings will buy and sell electricity in the power market – buy and store when prices are low and sell when prices are high. Finally, the next evolution will be smart appliances buying electricity directly to power themselves from the cheapest resources selling through smart contracts established through blockchain.

Things are going to be pretty complex and exciting in the coming days! |ST|

- MANISH PANT