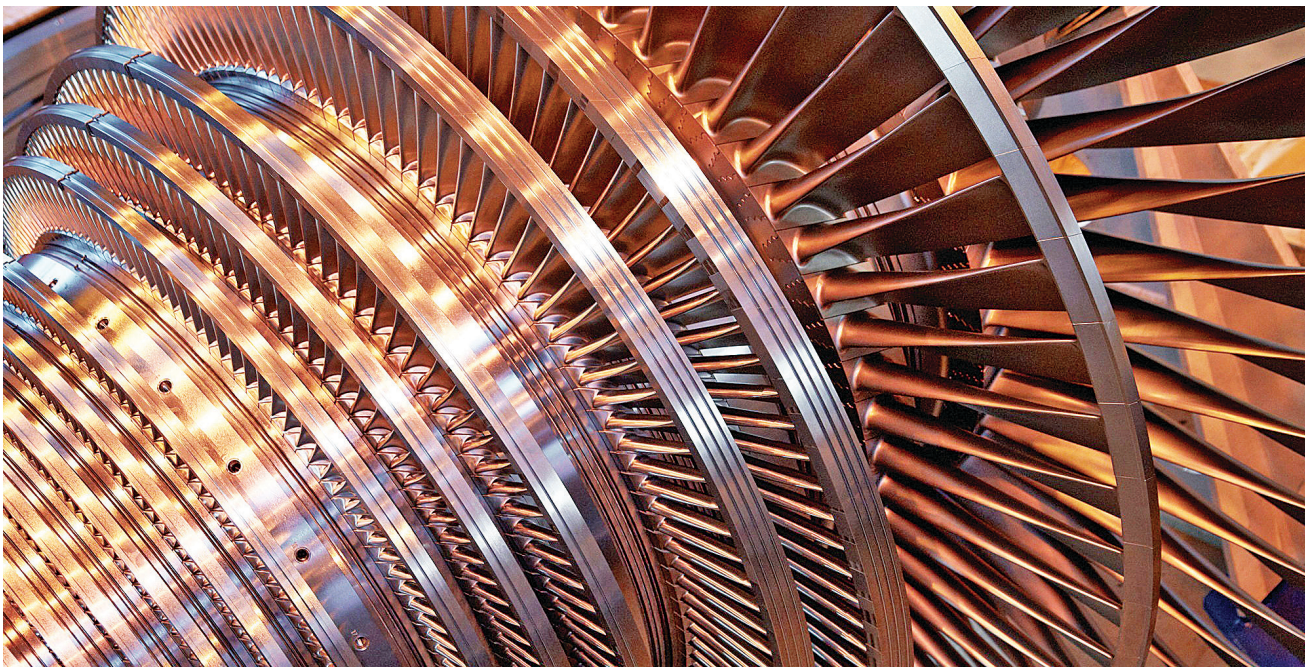


CORRECTIVE MEASURES COULD PERK UP OUTPUT

A flawed approach to power system planning has caused irreparable damage to the power sector and it might take decades for the country to tide over the implications. But with the Central as well as several state governments actively promoting electric vehicles and initiatives being taken to ban production and sale of petrol and diesel vehicles in the near future, the requirement for electricity from the transport sector is going to be very huge. The sector must plan meticulously for supporting the electrification of transportation – trains, metros, electric buses, electric cars, electric ferries, passenger and delivery drones, and other flying machines. **By REJI KUMAR PILLAI**



The \$5 trillion economy is an honourable target for a developing country and we always believe in aiming for the unachievable! Even if we do not reach there by 2022, we would be at a much higher level than the business-as-usual scenario. Powering the \$5 trillion economy is a formidable task owing to multiple challenges.

Firstly, electricity being the prime mover of the

economy, the power sector must grow at a rapid pace to meet the electricity requirements of the target. Presently, we operate the third largest power system in the world with installed capacity of about 356 GW. This consists of about 100 GW of thermal plants which are over 25 years old that require renovation and modernisation. It will be difficult to find international or even domestic funds for renovation of coal-based power plants as lenders shy



away from funding the “dirty coal”. During 2018-19, India consumed 1,547 terrawatthour (TWh) of electricity from the grid. This amounts to just 1,149 kilowatt hour (KWh) per person per year of consumption, which is less than one-third of world average per capita consumption of electricity.

Table 1: Comparison of per capita electricity consumption in select countries and their GDP

Country	Per capita consumption of electricity (in kWh), 2014	GDP in trillion \$, 2019
US	12,984	\$20.49
China	3,927	\$13.61
Japan	7,819	\$4.97
Germany	7,035	\$4.00
UK	5,129	\$2.83
France	6,939	\$2.78
India	1,149	\$2.73
Brazil	2601	\$1.87
Saudi Arabia	9,444	\$1.85
Canada	15,545	\$1.71
Russia	6,602	\$1.66
South Korea	10,496	\$1.62
Australia	10,059	\$1.43
Indonesia	811	\$1.12
Malaysia	4,596	\$0.99
Turkey	2,854	\$0.17

In order to reach the \$5 trillion economy target, we should at least double the power generation to 3000 TWh in next three years. The expected capacity by 2022 is 479 GW.

Table 2: Actual capacity (2019) and expected capacity (2022)

Type	Actual capacity as on March 31, 2019	Expected Capacity by March 31, 2022
Thermal (Coal + Gas)	226,279	243,038
Hydroelectric	45,399	51,301
Nuclear	6,780	10,080
Total of Thermal + Hydro + Nuclear	278,458	304,419
Wind	35,625	60,000
Solar	28,180	100,092
Other (Small Hydro+ Bio-Power)	13,834	15,072
Total of RE	77,639	175,164
Total	356,100	479,583

Considering that the total capacity addition under the 13th Five Year Plan is achieved by March 2022, the combined annual generation from thermal, hydro and nuclear plants may be 1,744 TWh (332 GW at 60 per cent plant load factor) and the total annual generation from the 175 GW renewable energy resources may be 229 TWh (at 15 per cent capacity utilisation factor), which add up to only 1,973 TWh. In our view, this will be grossly inadequate to support the \$5 trillion economy.

STRANDED ASSETS

The debate regarding stranded assets (power plants that were idling due to a host of commercial and policy-related issues) in the sector has contributed to the narrative of a “power surplus country” in the recent past. As a result, in the ongoing Five Year Plan no new coal plants were provisioned. At the time of plan finalisation about 50,025 MW of coal-based plants were under construction, which will be completed before 2022. Besides that, 115,326 MW of renewable energy, 15,330 MW of hydro, 4,340 MW of gas-based plants and the backlog of 2,800 MW of nuclear are scheduled in the Plan. This flawed approach to power system planning has caused irreparable damage to the power sector and it might take decades for the country to tide over the implications. A coal-based thermal plant will take three years or more to construct (after financial closure and environmental clearances), and the high-voltage transmission system to evacuate power would also take the same amount of time. Hydroelectric and nuclear plants require 7-10 years to build. Hence, any new plants planned now may not materialise by 2022. Even if we have to have new generation plants by 2025, we must put the execution on fast track.

Power generation capacity addition was a key priority area in the Five-Year Plans in the past three decades, and in the 11th and 12 Five-Year Plans 67,548 MW and 119,729 MW, respectively, were added.

Table 3: Historical generation capacity addition

Five Year Plan	Addition during Five Year Plan (in MW)	Cumulative capacity towards end of Plan (in MW)
7th Five Year Plan (1987-92)	21,051	63,636
8th Five Year Plan (1992- 97)	22,159	85,795
9th Five Year Plan (1997-02)	19,250	105,045
10th Five Year Plan (2002-07)	27,283	132,329
11th Five Year Plan (2007-12)	67,547	199,877
12th Five Year Plan (2012-17)	119,729	319,606
13th Five Year Plan (by March 2022)	187,821	479,583



In the present scenario itself (not accounting for the accelerated growth rate to support the \$5 trillion economy), the demand for electricity is set to grow at a faster pace in the coming years. We have completed electrification of the country's villages and also added 26.3 million new customers under the Sahaj Biji Har Ghar Yojana (Saubhagya) scheme in the last two years. Today all of them may not be getting 24X7 electricity supply, but the government is targeting to provide uninterrupted supply to all customers. The next push will be to augment the distribution network to support 24X7 supply and also eliminate load shedding through various policy interventions. This alone will see doubling of the power demand from the grid -- from not just the new domestic customers but also the 75 GW of DG sets supporting industry and businesses as stand-by power may be redundant when 24X7 supply from the grid is available.

The central as well as several state governments are actively promoting electric vehicles. There are initiatives to ban production and sale of petrol and diesel vehicles in the near future. The requirement for electricity from the transport sector is going to be very huge and the sector must plan meticulously for supporting the electrification of transportation. Be it trains, metros, electric buses, electric cars, electric ferries, passenger and delivery drones, and other flying machines, all new forms of transportation are soon going to be electric! The existing generation capacity (minus the plants that will either be retired or would run sub-optimally) in the country would be insufficient to meet the demand generated from 24X7 supply and transport sector. We need to look at alternative approaches to power the new demand.

RENEWABLE ENERGY

India has done exceedingly well on the renewable energy front. The present target of 175 GW of renewable energy by 2022 looks achievable provided certain policy fine-tuning is done soon. We have already achieved 80 GW, out of which 30 GW is solar. The rooftop solar target of 40 GW is presently lagging (having achieved only 2 GW till July 2019) for which the Government of India has approved a new scheme with incentives for both customers as well as electricity distribution companies. With prices of kilowatt (kW) size solar photo-voltaic (PV) systems around Rs 45,000 (including solar panels, inverter and installation cost), the rooftop solar

PV has already become economically attractive to most categories of customers in the country. They do not need any subsidies from the government. For scaling up rooftop solar PV, the distribution companies need support. In our view, the entire incentive from the governments should go to distribution companies for system upgrades to integrate rooftop solar systems with the grid.

The main impediments in adoption of rooftop solar PV by customers are, firstly, most distribution companies are not supporting it. Secondly, people do not know that it is economically beneficial to them. Finally, people do not know what systems to buy and how to get them installed. India Smart Grid Forum (ISGF) has been advocating that rooftop solar PV systems may be sold through appliances stores all across the country from where people could choose from a 0.5 kW, 1 kW or 2 kW systems and get it installed on their premises much like an electrician from the appliance store today comes to install an air conditioner or a washing machine. Government agencies and distribution companies must work jointly to build this ecosystem that could unleash a solar rooftop PV revolution in the country. This will also create millions of jobs.

SOLAR ENERGY NEEDS A BOOST

Several newly electrified villages that are not getting electricity every day owing to constraints in the distribution system may opt for solar PV and battery storage in the interim period. The beauty of solar PV is that it can be built in days or weeks. Even larger MW scale solar farms can be built in a few months, while the power transmission lines might take years to build. The rooftop solar PV is connected to the existing low-voltage grid that require minimum upgrades. So, 40 GW of rooftop solar PV target can actually exceed by 2022. When solar PV and storage batteries could support significant portion of the domestic demand, the traditional power plants could support the manufacturing sector. There are discussions about the plan to set up gigawatt-hour (GWh) of battery manufacturing capacity requires about \$100-million investment and about 18-24 months to build the plant. Since a policy announcement is still awaited, it is unlikely that large battery manufacturing plants will be operational before 2022. Hence, both solar cells and energy storage batteries need to be imported to meet the domestic demand in the near term.

In conclusion, a fact worth reiterating is that powering the \$5 trillion economy will be a herculean challenge unless we immediately correct the mistakes made in the recent past.



Reji Kumar Pillai is President, India Smart Grid Forum (ISGF)