

- India's power sector is in a surplus due to stagnant demand and oversupply. Further, the entire business model is changing – from regulated to distributed and decentralised.
- The GoI is thrusting RE as an alternative source with an aim to target of 175 GW by 2022; however efficient integration into the extant grids will spell economic viability.
- Need of the hour is a comprehensive policy that considers a mix of power generation, energy demand and fair power distribution ensuring cheap and reliable power for all.

Power is one component of infrastructure that is critical for the economic growth and welfare of nations. Development of adequate infrastructure is the mainstay for sustained growth of the Indian economy. The Indian power sector is presently undergoing significant transformation in the context of various reform measures introduced by the government and evolving socio-economic conditions.

India's power sector is among the most diversified globally. Power generation ranges from conventional sources – coal, lignite, natural gas, oil, hydro and nuclear power to viable non-conventional sources such as wind, solar, agricultural and domestic waste. Installed generating capacity at end-March 2018 is 336 GW and excludes 60-90 GW of captive generation capacity.

The Indian power sector is currently facing a surplus situation owing to stagnant demand, and oversupply due to capacity addition. A generating capacity addition of 195 GW over the last decade has transformed the national deficit of 12% to a surplus. On the supply side, this is led by the government's push towards greater renewable energy (RE) deployment (and subsequent price drop) leading to historic lows for thermal PLFs. India's emission reduction commitments under COP21 has lent strong impetus to the growth of renewables capacity in India. India has an objective to set up a renewable power generation capacity to meet an RE target of 175 GW by 2022. This includes 100 GW from solar, 60 MW from wind, 10 GW from biomass and 5 GW from small hydro power plants. This addition will have significant implications not only on grid integration but also on conventional power generation plants.

In terms of demand, the financial situation of distribution companies (discoms) is precarious. The Ujjwal Discom Assurance Yojana (UDAY) was launched on 5 November 2015 by the government to improve the health of discoms; and 32 states and Union Territories have signed up. The scheme suggests improvement via four initiatives –

- (a) improve operational efficiency by reducing technical and commercial losses,
- (b) reduce cost of power
- (c) reduce interest cost of discoms, and
- (d) enforce financial discipline on discoms through alignment with state finances.

However, sustainability of the UDAY scheme is yet to be seen. This puts at risk around 50 GW of conventional power plants which are at various stages of development due to lack of power purchase agreements (PPAs) and fuel supply assurances. With rising complexity in doing business, key structural changes are required to ensure competitiveness of the power sector in India. Simultaneously, a complete ecosystem transformation is required for ease of investment in new capacities. We believe the following measures will promote development of the sector and enhance competitiveness.

Enhancing Competitiveness – Maintaining a Level Playing Field

There is a need to create a comprehensive policy for the industry by considering all factors such as generation mix, energy demand and thereby ensure cheap and reliable power for all. The challenges and solutions need to be understood jointly by the stakeholders, public and private partners to ensure sectoral growth. The government must ensure resource allocation to public and private sectors on an equal footing e.g. allocation of coal and gas to all utilities and the Section 62 tie-up for PSUs as well as private utilities. It should maintain a level playing field for power generators who have met revised environment norms versus those who have not through rewards, tender preferences etc.

The government could introduce a scheme such as the 'Gram Ujwala Yojana' where private companies can be invited to create infrastructure in 10-20 selected villages for generation and distribution with viability gap funding. An institution similar to Solar Energy Corporation of India (SECI) could be created for the purpose. The transmission projects could be bid on the basis of Ultra Mega Power Projects (UMPP) where in all ROW(Right of Way) and route survey could be done in advance for removing uncertainties and bringing in better competition to gain optimum costs.

Additionally, there is a need to maintain a level playing field between different sources of generation. At present, the price of RE is supported by different policy interventions such as 100% power offtake, free inter-state transmission charges etc. With capital costs to set up renewable energy plants reducing, the government could consider re-evaluation of these interventions to enhance competitiveness of the sector.

Introducing a Balanced Tariff Design

Distribution and retail supply of power is the most crucial link in the power sector value chain. Economic viability of this segment has major ramifications on viability of the entire sector. While the country has seen significant reforms in the generation and transmission segment through introduction of competition and participation of private sector in a big way, distribution continues to be plagued by legacy issues, despite the unbundling and corporatisation of state electricity boards (SEBs). A key reason for the distribution segment being slow on the path of reforms is the fact, that historically, the tariff design of power has been a sensitive politico-commercial issue. Delays in tariff revisions have resulted in the absence of cost reflective tariffs, and finally led to difficulties in introduction of retail competition and offering the supplier of choice to consumers. Numerous steps can be opted to ensure a balanced tariff design:

- Transparency with ease of understanding for retail consumers through simplification of tariff categories and slab structures
- Appropriate cost allocation with clear segregation of cost of energy, retail supply cost and transportation (i.e. wheeling) costs
- Tariffs that reflect the cost of efficient voltage level for consumer categories
- Subsidies to needy categories must be well targeted and direct
- Tariff structures to facilitate smoothening of demand curve (through time of use metering/ tariffs)
- Lastly, regulated tariffs should be such that they provide a level playing field to the incumbent utility, else competition in the sector will remain a distant dream.

Integrating with Renewables

Renewable energy generation from wind and solar has increased substantially during the last few years and forms a sizeable proportion of total generation today. At present, the total installed generation capacity in India is 330 GW, out of which the installed capacity of renewable energy sources is 57 GW (Source: CEA, MNRE). India has set an ambitious target of 175 GW of renewable generation capacity addition by year 2022, which includes 100 GW from solar, 60 GW from wind, 10 GW from bio-power and 5 GW from small hydro power projects. While there is significant focus on renewable power generation, we need to efficiently integrate renewable power into existing power grids in India until the grid scale battery technologies become economically viable.

Thermal generation must ramp down in the morning when solar generation comes into service and ramp up in the evening when solar generation reduces. Similarly, flexible generation like reservoir based hydro and gas-based plants are required to be pressed into service in order to meet evening peak demand. However, thermal plants operating at PLF of around 50% will result in fixed cost per unit becoming double in addition to the rise in heat rate. This means that cycling of thermal plants to integrate renewables is hardly any solution. In fact, a number of thermal plants may even need an economic shutdown during low demand periods. Several options are possible to integrate renewables effectively with the grid.

Renewable energy integration imposes increased cyclic duty on all conventional thermal generating units, whereas existing coal-based capacity would have to undergo capital expenditure to build frequent ramp-up or ramp-down capability. Old coal fired plants originally designed for and operated as base load units, may be required to operate on a more flexible basis with load variations and two shift operations. The plants would be shut down when solar generation picks up and would need to be restarted to meet evening peak demand when solar generation reduces.

The evening and morning valleys could be met by reservoir-based peaking hydro, which can easily meet the increasing requirement of ramping up and down and therefore, have full flexibility. Finally, pumped storage units (PSU) can play a major role as flexible generation resources meet peaking power demand and maintain system stability.

Digitalising Operations

While most companies scramble just to keep up with the relentless rate of innovation, the companies on the digital frontier continue to push the boundaries of technology use.

Industries can no longer afford to sleep through this storm and remain ignorant of the digital shifts happening around. That is the reason why almost all industries are testing the waters by applying numerous and disparate attempts before adopting any such idea in toto.

Power sector utilities, mostly thermal generation plants today, are challenged by complex industry dynamics – volatile market conditions, increased competition, stringent operational boundary, tighter regulations, changing workforce and constrained budgets. Business environments have little or no tolerance for inefficient operations and the associated cost overruns, missed generation targets, or safety/environmental incidents. The challenge for many plants – definitely for older ones as well as ageing and vintage assets - is how to help keep facilities running better, longer, cost-effectively and competitively.

Analytic-based digitisation is transforming the power sector in unprecedented ways bringing in a host of opportunities and challenges. While opportunities include new sources of value creation, higher cost efficiencies and differentiated business models, there are multiple challenges such as disruptive competition, customers changing power utilities, significant cost of inaction, unutilised vast data available etc. that utilities must deal with.

Even though globally utilities are at various stages of 'analytic digital', investment in this space is witnessing an upward shift. Digitalisation coupled with industry trends such as decentralisation and changing generation portfolios is expected to result in a larger change. Indian utilities have also realised the significance of digitalising the business as evident from a 5% CAGR increase in digital spend from 2011 to 2018. Going forward, Indian power players are aspiring to become 'new age utilities' that leverage digital applications across the value chain.

Companies that rapidly adopt and build skills in new technologies such as IoT, Analytics, Big Data, AI, blockchain etc. are likely to remain competitive.

- Manufacturers could use data analytics to optimise factory operations, boosting equipment utilisation and product quality while reducing energy consumption.
- Use of RFID tags for asset tracking could be used to optimise supply chain costs and streamline logistics.
- New technologies like Lora could be adopted for asset verification and store management. New technologies need start-ups and thus start-ups doing research in digitalisation for assisting manufacturing need separate incentivisation by way of angel capital, tax breaks, viability funding etc.
- Manufacturing companies are increasingly using sensor driven data to create an IoT network of its machines leading to higher efficiency, reduction of costs and reliability centered maintenance. Connected technology has streamlined and simplified processes.
- Productivity and quality need a big push in the manufacturing sector. Our benchmark versus global standards needs to perk up. There are IoT platforms available for digitising operations. These will bring analytic based cost optimised operations. This will also lead to a competent workforce. These useful package services could be made tax free to encourage adoption and thus increase productivity and quality.
- AI and machine learning algorithms are transforming the way the manufacturing industry collects information, performs skilled labour, and predicts consumer behaviour. Smart factories with integrated IT systems provide relevant data to both sides of the supply chain more easily, increasing production capacity.
- In the power sector, distribution utilities need to evolve to become Smart Discoms by leveraging digitalisation for meeting customer expectations in cost, quality and convenience. This is necessary from the point of view of being a part of smart city which is the expectation of all big cities.

Incentives or interest free loan could be brought in by regulators to help the discoms in digitalisation. Digitising customer services will do away with a majority of brick and mortar structures. This will provide service and reduce the cost of products. Safety standards: robotics and advanced tools must be introduced to enhance safety. The sectors need research centres to evolve new safety tools and equipment designed with a hands-off approach to ensure safety.

Building Capability

It is estimated that India's power generation capacity will double by 2027 (from 336 GW in 2018 to 640 GW in 2027). Concomitant with this massive demand for additional power, will be the demand for additional skilled manpower. It is estimated that the power sector will need an additional 1.5 million skilled manpower by 2025. Meeting this demand for additional skilled manpower in the entire chain of power sector and downstream value added services will be a challenge for the sector.

With the evolving power sector, companies will have to re-train their employees to not only have technical skills but also commercial and management acumen to be competitive. The sector today is not only changing generation mix-wise, but the entire business model is changing – from regulated to distributed and decentralised. Thus, the skills required to succeed in this environment is very different from the existing skill base. Coupled with an ageing workforce and new data driven technologies, it has become even more important for companies to focus on capability building. The government is cognizant of this and has launched a massive campaign called the "Skill India Mission" to counter this problem. But the government's efforts alone will not be enough, and the public private partnerships in this regard should support the government in effective deployment of this mission. The government could provide an enabling environment by rapidly overhauling the course materials, making it relevant to today's environment.