



Transition of the energy sector in India

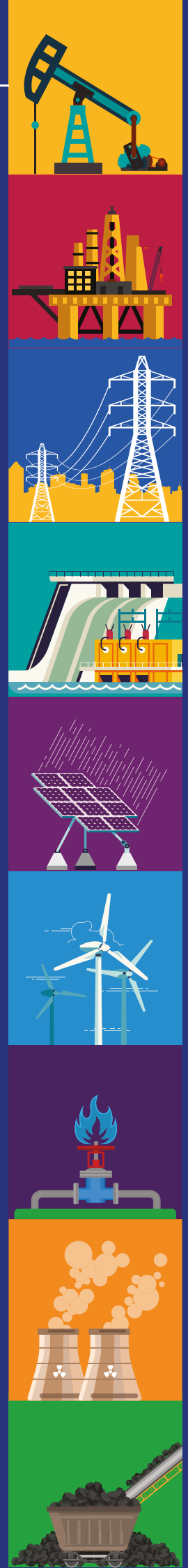
Creating a vision for the future

ENRich 2017

Changing Indian energy landscape
- Adapting to a new normal and reality

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A snapshot of the sector's evolution over the past three years...

The Indian energy sector has been rapidly evolving and has witnessed several changes in recent times. One can say that it's undergoing a transformation and disruption at the same time.

Generation

A record capacity of over 75 GW¹ was added over the last three years leading to over-capacity in thermal power. We don't see new thermal capacity being planned for some time, however, the existing capacity close to commissioning, or under construction will come to grid. Renewable / clean energy (RE) has become an irreversible trend with successively lower tariff discoveries i.e. INR2.44² per unit being the lowest tariff. Rooftop solar is yet to achieve critical mass, but is poised to pick up. Wind power has recently exhibited competitiveness with solar tariffs as low as INR2.64³ per unit have been discovered through recent competitive bidding processes. Overcapacity and weak demand growth (4.5 per cent)⁴ have led to stress in the sector – thermal to a large extent, and renewable seeing some signs. Recent cases of reneging of Power Purchase Agreements (PPA) have further added to the spectre, needing system-wide resolution to the stressed asset problem.

Transmission segment

Project development through competitive bidding has been made mandatory. FY16 witnessed projects of the order of INR21000 crore being awarded⁵ on the public private partnership (PPP) route. The pace dropped in FY 2017 to INR9800 crore due to weak uptake by the states. The sector has seen increased private participation especially the inter-state corridors. The pace of adoption at the state level has been slow, and needs stronger focus. Even at the Centre, we have seen a slow-down of bids, despite interest from private sector in this segment.

Distribution segment

A host of reforms and schemes have been undertaken including the flagship Ujjawal Discom Assurance Yojana (UDAY), with new elements embedded into it. Pockets of successes have started to appear with some states responding to the set targets, however there is still a long way to go. Distribution continues to be the most challenging segment of the sector. Loss reduction and sustainable tariff increases need to be accorded continued focus. Pilots on increased automation, smart grids and digital initiatives have also started to surface as critical elements of revival strategy. Regulatory issues on tariff structuring, better discipline in demand forecasting, capex assessment, enforcement of merit order etc. have started to gain recognition and need to be followed through. The Electricity Amendment Bill 2014 which aims to usher in retail competition, has seen renewed discussion in the recent times. The franchisee model saw revival in Rajasthan however results are yet to come out. The franchisee model needs to be redone completely, and private sector / international utilities participation needs to be encouraged to get this segment going.

Power market

The Central Electricity Regulatory Commission (CERC) introduced a rudimentary form of Ancillary Services regulation in 2017 which is a first step towards more robust grid management, particularly in light of increasing penetration of variable RE generation. A more detailed ancillary services market design remains work in progress. The need for deeper spot markets, capacity market and more advanced ancillary services market has been stressed upon in several forums, and needs to be evaluated.

Oil and gas market

The Government of India (GoI) has set out a vision of 10 per cent⁶ reduction in energy imports by 2022 in order to move towards a self-sufficient India. The policies in the upstream sector are driven with this vision and target. In 2015, a new policy for small fields known as Discovered Small Field (DSF) policy, was brought out offering improved fiscal terms viz. no oil cess applicable on crude oil production and moderate royalty rates. In the most recent DSF Bid Round 2017, a total of 134 bids were received for 34 contract areas from 47 companies⁷. Incorporating the learnings of DSF, in March 2017, the GoI introduced the Hydrocarbon Exploration and Licensing Policy (HELP) which aims at boosting the oil and gas production in India, through the participation of domestic and international companies under the significantly simplified fiscal and administrative regime. The GoI has also set up the National Data Repository (NDR) to facilitate diligent exploration of India's sedimentary basins, where interested investors can access, visualise and purchase Exploration and Production data.

1. Executive Summary reports, Central Electricity Authority (CEA), September 2014 and September 2017

2. Tariff for Bhadla Phase-IV Solar Park. Source- Press release, Press Information Bureau, 12th May 2017

3. Tariff for auctions conducted by Solar Energy Corporation of India (SECI). Source- Press release, Press Information Bureau, 05th October 2017

4. Compounded Annual Growth Rate (CAGR) for period FY2013-14 to FY2017-17. Source- Load Generation Balance Reports (LGBR), CEA.

5. FICCI in News, FICCI, 10th July 2017

6. Press release, Press Information Bureau, 22nd March 2017

7. "Discovered Small Fields Bid Round 2017", Directorate General of Hydrocarbons (DGH), 15th February 2017

Energy mix

Oil demand grew at unprecedented rate of ~8 per cent⁸ over the past two years. The International Energy Agency (IEA) has projected a 4 per cent⁹ average growth demand till 2040, backed by economic growth and corresponding strengthening of transport sector demand. Natural gas demand growth was robust in 2017 (9.2 per cent)¹⁰ in contrast with shrinkage (-6.3 per cent)¹¹ observed in 2015. However on an overall basis, gas demand has weakened on the back of domestic gas production constraints, which have limited gas availability for power sector. 14 GW¹² of stranded gas based projects were partially resuscitated with Regasified Liquefied Natural Gas (RLNG) auctions. While share of city gas distribution is currently small, future demand is likely to come up. Going forward, RE is likely to have a major influence on energy. Coal though for some period of time is likely to remain the predominant fuel in the Indian context. Similarly, in the case of oil, the transport sector is the largest user, wherein oil is expected to increasingly be replaced by electricity from RE as the prime mover. While sources such as coal and natural gas are likely to retain presence in energy mix, the convergence is bound to replace a large share of these fossil fuels in favour of RE.

The transition - how will the situation settle down?

The energy sector globally as well is undergoing significant disruption, and India is no different. Key trends that are redefining the energy sector landscape include – Decarbonisation, Decentralisation and Digitalisation. Various policy and other developments indicate India's energy sector already being significantly influenced by these trends:

Decarbonisation

India has committed to RE targets of 175 GW¹³ by 2022. As a signatory to Conference of Parties (COP) 21, India has further pledged¹⁴ to reduce emissions intensity by 33- 35 per cent by 2030 from 2005 level and have 40 per cent share of non-fossil fuel based sources in the total supply mix by 2030. In parallel, the GoI has indicated plans to supplement conventional vehicles with Electric Vehicles (EVs) in near future, which has large implications on energy and allied sectors. This transition will surely happen, but the pace may be different than what is being laid out by government, and more importantly will require number of key things at the policy and government end to make this journey less painful for the sector as a whole. Bio-fuels have a role to play, but again requires government support. Clean coal technologies are likely to find their way into the system as well going forward.

Decentralisation

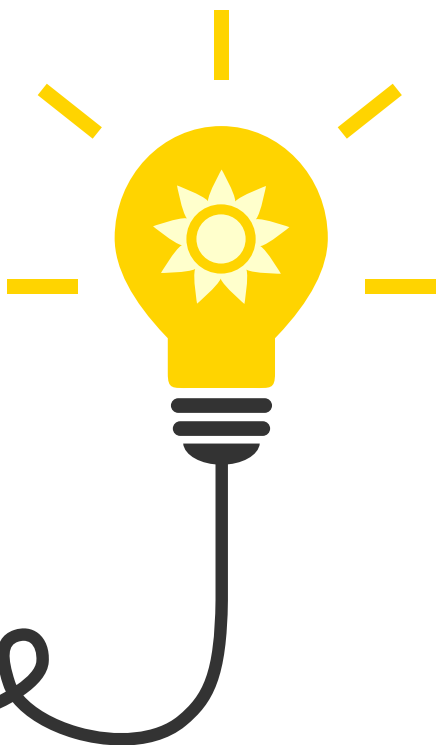
India aims to install 40 GW¹⁵ of solar rooftop by 2022. Several states in India have shown their commitment to the goal by announcing solar

roof-top policies and regulations. An eco-system for rooftops is a work in progress including the channelisation of low cost funds, technical innovations, new business models, etc. With storage prices declining rapidly, rooftop solar could clearly bring the next disruption and further support decentralisation. Viable models will certainly complement nation-wide electrification drives and aid in achieving energy access targets. Alongside, with the advent of electric vehicles the fungibility between fuels (electricity from coal, renewables and other sources), and oil and gas (for transport) is likely to be more pronounced. Such decentralisation will bring its own set of opportunities and challenges.

Digitalisation

Digital disruption in the utility sector can become a magnet for innovation. Consumers will be much more empowered as they will have the means of generating and/or actively managing their own services through smart grids, smart instruments and mobile applications. Utilities will become more operationally efficient and grids more resilient. Upon introduction of retail competition, digital will play a vital role in managing operations, consumer switching and provision of value added services etc. These services have implications beyond the power sector, into other utility services like city gas distribution, water and EVs.

A vision for the future of the sector will need to embrace the above trends, and will need to support movement of sector towards these through more organised sector structure and operations. Below we provide 12 key points that are important going forward.



8. BP Statistical Review, 2016 and 2017

9. India Energy Outlook, International Energy Agency (IEA), 2015

10. BP Statistical Review, 2016 and 2017

11. BP Statistical Review, 2016 and 2017

12. Press release, Press Information Bureau, 25th March 2017

13. State-wise break-up of RE targets, Ministry of New and Renewable Energy

14. Press release, Press Information Bureau, 02nd October 2015

15. Rooftop Executive Summary, MNRE, November 2017

Evolving a vision for the future

A comprehensive vision for the sector will necessitate comprehensive planning, sector re-organisation, policies and regulations, and preparedness. Some key points in this regard are enumerated as under:

Structural changes

Carriage and content segregation is now back on priority. Potential models for segregation, structuring options, the role of various entities and phasing of competition need to be actively debated to make the transition more amenable. There are a number of other considerations envisaged under the Electricity Amendment Bill 2014, such as Open Access in Distribution, Provider of Last Resort (POLR), role of intermediary entities, elimination of cross subsidies, and treatment of regulated assets etc. that will play a key role in shaping the next level of reforms. It is well understood that the transition will happen in phases however sector entities will need to gear up to respond to the challenges and opportunities that are likely to emerge.

Planning and design paradigms

are likely to change as variability and flexibility planning becomes critical with increased influx of RE and decentralised resources such as battery storage and EVs. An integrated view of the sector will be required to give signals for capacity addition (technology, phasing, location and quantum), evolve power markets and take policy decisions on areas such as tariffs and subsidy designs.

Future role of 'utility'

Under retail competition, utilities may evolve as network integrators, and will serve to integrate a diverse mix of generators, transmission entities and retail/customer demand. Agility in response and consumer orientation will be key. System operation at distribution level will most likely become a necessity, leading to the creation of more vibrant Distribution System Operators (DSO). The transition will require stronger distribution level planning and operations.

Contract structures

RE may not only put more pressure on the viability of new generation capacity (having higher fixed costs) but may also marginalise the operations of old plants (with high variable costs). As the pattern of use changes, discoms are likely to become averse to long term contracts. Investors however will seek long term agreements for assured debt service and returns. This calls for a fresh look alternative contract structures to ensure a win-win situation for buyers and investors alike, for e.g. limiting max. PPA term to 15 years (approx.. debt term) with the first seven years as traditional PPA with regulated prices and the next eight years with market-based prices.

Stressed assets resolution

Failure of under development projects to secure fuel and power linkages can further aggravate the stressed asset situation. Investment cycle needs to be rekindled and investor's interests safeguarded with swifter actions. Some of the low hanging fruits could be renegotiation of existing PPAs to get them to sustainable levels of tariffs aligned to resized capital structure. There needs to be delinking of coal supply and PPA requirements. Commercial mining needs to come in at the earliest. Other decisions can be around retirement of

old assets instead of mothballing new plants and creation of a stressed asset fund under National Investment and Infrastructure Fund (NIIF). Demand increase needs to be created by getting diesel generation based costly capacity out of the system.

Power markets

The power sector is tightly regulated with inflexible tariffs which typically don't change more than once a year. Transition to markets with high share of RE, integrated energy storage/ EVs, advanced ancillary services etc. will necessitate flexible tariffs to accommodate these technologies. Further, introduction of capacity market need to be considered for delinking the investments from electricity markets. Stronger ancillary services market also needs to be enabled for better grid resilience. Transmission capacity too needs to be made tradable to ensure full flexibility in resource deployment.

Oil and gas markets

Reducing energy imports would require increasing India's indigenous oil and gas production by maximising the potential of already discovered hydrocarbon resources in India. Infusing state-of-art Exploration and Production technologies, investments and best-in class management practices would help in production enhancement from existing mature fields. Further, for the development of gas markets and moving towards country's target of becoming a gas-based economy, competitiveness and transparency is critical. Dense pipeline network, city gas development ecosystem, competitive prices and fiscal and policy incentives for gas consumption would be the key enablers to ramp up the share of gas in the country's energy basket from the present 6.5 per cent to 15 per cent.¹⁶

16. "Text of Speech of Minister of Petroleum and Natural Gas Shri Dharmendra Pradhan at the Plenary Session of 7th Asian Ministerial Energy Roundtable in Bangkok", Ministry of Petroleum & Natural Gas, 2nd November 2017



Serving the rural connected

A large population is being connected through existing GoI programmes however serving these may not be economical. Innovative business models around Distributed Renewable Energy (DRE) to serve rural loads in an efficient manner will need to be evolved. Key enablers will be availability of low cost finance, effective modes of integration, co-existence with grid and community participation.

Obligation to serve

The 'Power for All' programme aims at provision of 24x7, quality and reliable electricity to all consumers. Electricity Act, 2003 provides an overall construct for this programme, which obligates utilities to supply electricity on request. However, the obligations are weakly adhered to and instances of penalties are limited. The recently-launched Saubhagya scheme aims to electrify 30 million un-electrified households which will bring many more consumers into the fold, stretching the utilities further to meet the obligation. Over and above capex planning and operational discipline, policy and regulatory measures are equally needed to fulfill the obligation. One way is to embed the 'Obligation to Serve' in the utility filings, where transparent and timely disclosures of load shedding hours and eventually reaching a zero load shed state should be the objective.

Technology as enabler for increased efficiency and customer responsiveness

Global utilities have evolved to become more smart and agile, responding to consumer needs and imbibing technological advancements. Technological developments enable utilities to innovate and develop customer-centric products and services such as demand response solutions, advanced energy management and visualisation, mobile applications for 24 hour monitoring and control, workforce management for advanced outage detection and restoration, blockchain etc. Also, the quality and reliability of supply and service will come to the fore with such technological advancements.

Cybersecurity

As technology adoption increases among the utilities, the number of digital transactions and processes is likely to increase significantly. It is of utmost importance to understand the risk of such cyber exposure and preparedness required to safeguard the grid, assets, and consumers. Concepts of cyber governance, cyber operation and resilience, cyber awareness, and compliance management will need to be embedded into the utility organisational processes. At the same time, customer privacy and data protection will need to be ensured in all transactions.

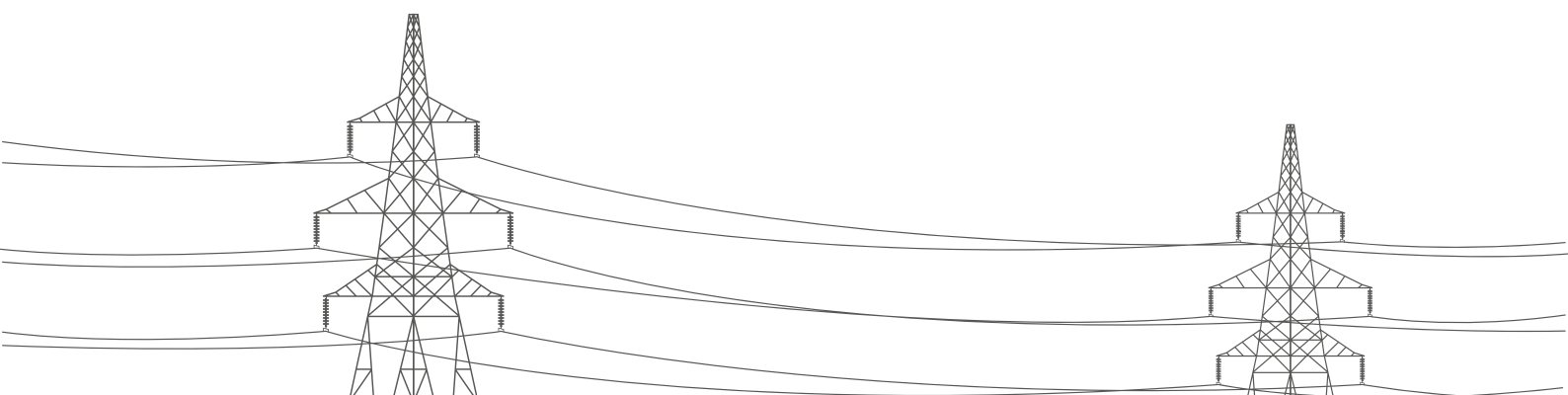
Skilling

Fast changes will necessitate the quick recognition of emerging trends and continuous skilling and re-skilling of manpower to adapt with the evolving requirement of the sector. While data analytics and automation are expected to be at the core of power sector operations, other areas requiring manpower readiness will be integrated resource planning, distribution planning, technology, energy storage, advanced system operations, etc.

It is critical that the vision for the future, underlying policies and strategies while taking note of the current state of the sector also take into account the evolving state, and embed the above aspects into its design. The GoI has demonstrated tremendous initiative and leadership in resolving current sector issues, and even as that remains in progress, it must lay clear pathways to ensure a well-functioning and vibrant energy sector in times to come.



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