Debacle of the Power Policy in India: Generation, Transmission, Distribution and Regulation

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Introduction

India, being one of the largest economies and with a growing population, aims at inclusive and sustainable growth. India's commitment towards providing 24x7 power for all is aligned with the Sustainable Development Goal (SDG) 2030 of providing accessible, affordable, reliable, sustainable and modern energy for all (Goal 7). India's Intended Nationally Determined Contributions (INDC) also includes generation of 40% of electric power from non-fossil fuel sources by 2030. According to the World Economic Outlook Report (2019), India's electricity demand is expected to grow by 199% during 2018-2040 and requires 484% power system flexibility in order to adapt itself to changing conditions. According to IEA Review Report (2020), the energy efficiency improvements have avoided 15% of additional energy demand, oil and gas imports, air pollution and 300 million tonnes of CO_2 emissions between 2000 and 2018. However, the reliance is still on coal which accounts for two-thirds of electricity generated. Thus, India's effort towards increased electrification has to simultaneously progress with India's energy transition towards a greater share of Renewable Energy Sources (RES) in the total energy mix.

For achieving the goal of universal electrification, penetration of power supply amongst the rural households becomes crucial as 65% of India's population lives there. To achieve this objective, the Central Government launched Deendayal Upadhyay Gram Jyoti Yojana (DDUGJY) in 2015 (PMINDIA, 2015) under which, the target of achieving 100% rural electrification within 1000 days was set. This goal was achieved in April 2018. However, the concern arises with the government's definition of village electrification which declares 100% connectivity 'if at least 10% of households in a village have an electricity connection' (PIB, 2018). This does not give a true representation of the extent to which villages gained access to electricity since the announcement of this initiative. With this backdrop, the government came with Pradhan Mantri Sahaj Bijli Har Ghar Yojana (SAUBHAGYA, 2017). Under the scheme, 4 crore un-electrified households were to be provided with electricity by December 2018, which the government failed to meet. It is only in 2020, as per the Saubhagya Web Portal, that 99.9% of the households have been electrified.

The policy in pursuit of 100% household electrification is based on three parameters, namely, extension of power infrastructure to villages, electricity connection to households and providing affordable and reliable power supply in a sustainable manner (Dutt D'Cunha, 2018). While progress has been made in the last five years on the first two parameters, providing a sustainable power supply is still an issue to be dealt with. As per a survey by the ministry of Rural Development in 2017, only half of the approximately 600,000 villages in India get more than 12 hours of power supply (Sreekumar, Mandal, & Josey, 2019). In addition to this, 25% of health sub-centres and 40% of schools lack electricity connection. Along with the above problems, operational efficiency has also been seen as more than 20% of total electricity produced is lost in Transmission and Distribution (T&D) operations, which is the highest in the world (Zhang, 2018). The Global Competitiveness Report 2019 ranked India 108th amongst 141 countries in terms of electricity supply quality. This efficiency gap in the power sector costs the economy 4% of GDP yearly, which is equivalent to USD 86 billion, in FY 2016. In order to bridge efficiency gaps across all parameters, the government intends to bring about structural reforms in the electricity network of India.

With this backdrop, this article is divided into following sections. Section 2 provides brief account of power sector reforms in India. Section 3 discusses the current scenario with three subsections, each analysing the electricity sector into four segments of generation, transmission & distribution and regulation. Section 4 provides concluding remarks.

A Brief Account Of Power Sector Reform In India

Given the deteriorating financial performance and poor operating performance of the State Electricity Boards (SEBs), the onus of setting up new generation capacities fell increasingly on the Union Government. It was in such a situation that the central government set up two central public sector utilities: NTPC (National Thermal Power Corporation Limited) for thermal generation and NHPC (National Hydro Power Corporation Limited) for hydropower, to provide power to at least multiple states. This integrated policy was brought due to existing imbalances among the states with uneven resources. Moreover, there were difficulties in the interconnection between states (a plant in one state providing electricity to two or three states). Thereby, the transmission network associated with each of these power plants would automatically get extended

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into other states. And that's how the concept of regional grids came into existence.

Over the 1980s, energy shortages and the poor financial condition of SEBs continued and the cascading effect of agricultural subsidies caught successive governments as subsidies amounted to the majority part of their revenue. This was slowly spiraling into a crisis, which many economists suggested could be resolved by free markets. Power sector reforms began in the 1990s which showed limited results. Indian Electricity Act 1910 was amended to invite investment in power generation by the private sector (including foreign capital). Unbundling was done by separating generation, transmission, and the distribution aspects of the SEBs into three parts for focused attention. Power Trading Corporation (PTC) was set up in 1995 to negotiate between buyers and sellers (SEBs and handlers of Mega Projects). Central Electricity Regulatory Commission (CERC) and State Electricity Regulatory Commissions (SERCs) in 22 states, had been set up whose main function is to regulate the tariffs of power generating companies. A competitive work arena and transparency was required for a well- developed power sector. Distributional efficiencies were addressed by the Accelerated Power Development and Reform Programme (APDRP) introduced by the union government in 2001.

By 2002, The state governments controlled nearly 60% of power generating capacity, 30% by central government, the rest, 10%, was with the private sector (i.e., Independent Power Producers or IPPs). IPPs have been struggling with financial closure due to the weak financial situation of their sole buyer, i.e., SEBs, and lack of demand. Some IPPs could progress beyond the initial stage due to credit enhancement through guarantees from state and central governments as well as allocation of an escrow facility[1]. The states by overstating their escrow capacity signed Power Purchase Agreements (PPAs) which along with an absence of an alternative payment security mechanism, resulted in payment delay. This was done in Dabhol project in Maharashtra which dampened the morale of IPPs and even foreign investors became reluctant due to the bleak prospects in the sector. The cases of Karnataka giving projects to Cogentrix questioned the grounds on which any company is awarded with the contact, indicating transparency problems. Further, companies like Enron hid its mountains of debt and toxic assets from investors and creditors. Dispute over the Enron power project snowballed into a major controversy. Subsequently, the company's collapse affected thousands of employees and had other effects.

It was essential to resolve all the crises of the electricity system - the crisis of capital, performance, equity/access and environment. Solutions that focused on only one of those, for instance the capital crisis in the case of Enron-type deals, were sub-optimal and defective solutions that aggravated other crises. From a long-term point of view, the genuine solution to the crises of the electricity system was a shift to the new electricity paradigm, with the emphasis changing from energy consumption to energy services as an index of development.

In this background, Electricity Bill 2003 was enacted to laws related to generation, transmission and distribution of power. It provided for tariff reforms, separate electricity trading, open access, multiyear tariffs and constituted an appellate tribunal. Multi-year tariffs increased the cost borne by the consumers resulting in public resistance. The overall reform process had been both good and bad encompassing short term and long-term gains. While operational inefficiencies were treated, there was a need to address high electricity tariffs, transmission flexibility, proper pricing and a freely operating sector.

The amendments in 2005 emphasized primarily electricity safety, with the offences relating to theft of electricity, electric lines, and interference with meters as cognizable offences. It specified requirements for captive generation plants, distribution systems and proposed a setting up of grievance redressal cells by distribution licensee. The amendments of 2014 included renewable energy in the ambit, by making it mandatory for entities to procure electricity from a market representing the renewable energy sources. It was also made mandatory to provide an open access to electricity to consumers with a load of more than 1 MW by default, thus, allowing them to enter into bilateral agreements for procurement. Currently, more than one supplier could operate in an area, with giving consumers the power to choose the supplier. The concept of "smart grid" and "smart meters" were also incorporated.

Current Perspective

Currently private sector involvement is restricted to the electricity generation segment, whereas the public sector has a complete monopoly over the power transmission, distribution and regulation of power supply.

Generation of Electricity

By December 2019, 46.5% of all India installed capacity for electricity generation was owned by theprivate sector, followed by 28.3% by the State government and 25.1% by the Central government (CEA, 2019). With thermal energy constituting the largest share (70%), a large number of captive generation plants are run on diesel, which is one of the costliest sources for electricity generation. At the same time, the cost of electricity generation from solar energy is 14% cheaper compared to that of coal in the region (Sengupta, 2019). As a result, the government is steadily moving towards an increased share of RES capacity in electricity generation. The government has announced the target of achieving 175 GW of installed power capacity from RES, primarily from solar (100 GW) and wind (60 GW) energy by 2022. Today, the

share of RES in total installed capacity is 22.9% and it is expected to increase to 36.4% by 2022 and 42% by 2027 (CEA, 2019). India has the lowest cost of electricity generation from solar and wind energy, and its power tariff is the fourth cheapest in the Asia-Pacific region. Currently RE is largely cornered towards generation of electricity via micro-grids or solar rooftops. It is time for India to shift its priority from a centralized conventional power infrastructure to a decentralized RE-based infrastructure (NITI Aayog, 2017). However, this energy transition towards increased RES capacity has technical issues such as storage and intermittency which requires investment for adaptation and has a long gestation period. Thus, in the medium-term India will have to invest simultaneously in fossil fuel sources as well as RES. In the long run, the transmission and distribution operations should be capable of incorporating electricity supply via clean energy sources. The government has also proposed another initiative of construction of 'One Nation One Grid' where the regional and state grids are electrically connected to one National grid operating at a single frequency (GOI, 2019). The implementation of a national grid and incorporation of Renewable Energy should improve the efficiency of the T&D operations as well as decrease the cost of electricity generation, thus making it less dependent on power imports. Currently India is a net importer of electricity from Bhutan and exporter to Bangladesh and Nepal. By 2022, India is expected to become an even larger net importer of electricity, with 4500 MW import from Bhutan and 2450 MW export to Bangladesh and Nepal. Power import from Bhutan is primarily for electrification of the rural and underdeveloped areas of the North-Eastern Region (NER) of India. Indian power companies, in joint venture with their counterparts in Bhutan have built hydro-electric power plants, which is a major source of electricity both for domestic demand of the country and its imports to India. The government's bilateral agreement on this shows that import of electricity in NER is more cost-effective than generation of electricity from within India in NER which, has boosted electricity generation and quality of electricity supply. However, the problems in the state distribution segment persists which needs to be addressed for overall success.

Transmission and Distribution of Electricity

The inefficiency of State distribution and transmission comes from the operational and financial stress that public sector companies are facing, which reforms have failed to improve. As a result, generation companies are unwilling to enter into Power Purchase Agreements (PPAs) with state discoms due to fear of default on payments. This problem of debt in state discoms acting as defective intermediary regime, has resulted in stranded generation plants and unavailability of electricity supply even when the end consumer is willing to pay and producers have enough to supply.

In September 2015, the central government came up with the Ujjwal Discom Assurance Yojana (UDAY) which proposes that debt restructuring by states through sharing of burden and state backed discom bonds. This scheme intends to bring the aggregate technical and commercial (AT&C) losses to 15% and elimination of the Average Cost of Supply (ACS) - Average Revenue Realized (ARR) gap by 2019-20. However, ACS-ARR gap has actually increased from INR 0.17/unit in FY 2018 to INR 0.38/unit in FY 2019 and AT&C cost has increased from 18.72% in FY 2018 to 21.35% in FY 2019 (UDAY, 2019). Post UDAY, the debt came down from INR 2.7 lakh crores in FY 2015 to INR 1.5 lakh crore in FY 2017 but is expected to increase to pre UDAY levels in 2019 and 2020 (Thomas, 2019). Further, the average tariff increase reduction in AT&C losses were half of what was intended (CRISIL, 2019), thus, nullifying the positive impact of debt restructuring. However, the significant debt reduction signals behavioral approach of states towards acceptability that debt proposed to be absorbed will not affect their fiscal deficit and in turn will not affect their budgetary allocation from the central government. This positive approach would help in significantly increasing distribution utilities and their procurement of power. Over the years, the government had undertaken the role of lender of last resort. This can provide a disincentive for discoms to reform, as there is no commercial pressure on them to improve their structural orientation. There have been proposed legislative reforms which allows for privatization of the distribution sector and elimination of cross subsidization. The options of choosing the distribution network service from whom it wants to buy electricity, will increase the competition in the market prompting the state discoms to improve their financial health and improve overall efficiency at both the managerial and operational level. The policy proposes complete elimination of cross-subsidization and substituting a progressive tax structure with a common low base rate for all consumer segments. Currently, under cross price subsidisation, the industrial consumers are charged a tariff higher than the average cost of supply (ACS), and the surplus is then redirected towards subsidizing ACS to the vulnerable consumer segment, especially for agriculture consumers by charging a lower tariff. At the national level, on an average the industrial sector pays a tariff 12% higher than the ACS, whereas the agricultural sector, which is the largest subsidized sector pays a tariff which is 55% lower than the ACS (Bhattacharyya & Ganguly, 2017). At present, even the tax structure varies among states. Thus, the disparity between the prices incurred by different segments of consumers still remains large, while discoms continue to incur losses. In line with above, Electricity Amendment Bill, 2019 is awaited which needs to address the possiblity of price rises for agriculture and household consumers (UNI, 2020). Secondly, the proposed amendments will allow private generation companies to operate and distribute electricity directly from the point of generation to the point of

consumption, without making any prior investment in transmission lines which are developed and operated entirely by the public sector. On the positive side, privatisation might bring in uniformity in the operation of the sector and reduce multiple entity interest with differentiated motivation and targets. Hence, for overall benefits in long run, major structural changes are much needed for this sector.

Regulation of Electricity Sector

For the fourth segment, i.e., regulation, it is important to understand the framework under which policies are implemented and enforced. Electricity is under concurrent list which lets both Central Government and State Government decide on their policy discourse. The Electricity Regulatory Commission Act 1998 provided for setting up of Central/State Electricity Regulatory Commission to determine powers. However, the setting up of SERC was optional which increased the differences in approach across various states. The need for competitive environment, quality and reliable service to consumers, new concepts like power trading, open access, appellate tribunal, special provisions for rural areas and decentralizing of responsibilities to states resulted in enactment of India Electricity Act, 2003 which necessitated the restructuring and accountable functioning of State Electricity Regulatory Commissions. The key role of State Electricity Regulatory Commissions and Central Electricity Regulatory Commission is to regulate inter-state and intra-state trade, approve of tariffs for the sale of electricity and regulate licenses by setting performance standards and ensuring their compliance. The regulators have failed to ensure that the state discom regularly revise their prices and work on market principles. The functioning of state discoms depend upon how effective CERC is. It is recommended that there is need to improve the working and autonomy of the organisation with appropriate personnel (Standing Committee on Energy (2012). There is need for robust trading system which would promote free and fair competitive electricity market operation (Alagh, 2010). Electricity is traded on both a long term and short-term basis. The Unscheduled Interchanges (UI) mechanism, meant to ensure grid discipline, is being used by many states power utilities as a trading platform which results in high price trading. This results in a distortionary effect, as the buyer states have to pay high prices but the service is provided at subsidized cost. Moreover, the governance of electricity storage In India does not have any regulatory mechanism. The draft policy of National Energy Storage Mission (NESM) for India is under consideration which aims to establish a regulatory framework promoting the manufacturing and deployment of battery storage systems. The regulatory system for RES needs to be addressed so that the sector does not face the issues pertaining to the thermal power sector. This would help in promoting economies of scale in production, reduced losses and surplus being traded at cheaper rates based on market principles.

Conclusion

India's per capita electricity consumption has almost doubled between 2005-06 and 2017-18 (CEA, 2019) and its electrical energy requirement is estimated to grow at a CAGR of 5.84% between 2017-27 (REConnect, 2017). In line with this, the government of India has initiated reforms in the power sector by incorporating structural changes in the existing framework, and simultaneously incorporating RES in mainstream power infrastructure for long run sustainability. However, these come with the understanding of challenges as India's electricity structure is largely centered around the miserable performance and poor efficiency of the financially stressed state discoms. To address this issue, IEA (2020) recommends creation of a competitive wholesale power market which would aid the ambitious project of aa National Grid. In addition to the market-based reforms, privatization and elimination of cross subsidization might promote positive competition and improve quality of electricity supply, as Prime Minister Narendra Modi emphasized at the 16th IEF meeting India's energy future rests on four pillars – Energy Access, Energy Efficiency, Energy Sustainability and Energy Security. To achieve this, An integrated National Market would help in solving the price differences, give opportunities of economies of scale and help in revising the power sector subsidies. This requires combined efforts of legislative reforms and promotion of research and development for technological improvement in power supply. Along with it, there is scope for investigating the role of Artificial Intelligence (AI) in detecting the transmission and distribution losses. Promoting transparent inter-state and intra-state trading of electricity at viable market prices, Smart grids and meters are some of the measures which would help in improving both physical and digital infrastructure. As far as electrification is concerned, progress made in each of these pillars' rests highly on India's continued efforts in bringing reformative measures for the upgrading of its electricity network and incorporation of RE capacity in the power infrastructure.

Footnote

[1] Escrow facility is a special agreement through which IPPs get priority access to SEB revenue. Revenue from SEB customers is deposited in a separate bank account, which can be directly withdrawn by the IPP in case the SEB fails to honor IPP payments.

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