CHAPTER 2

CRITICAL REVIEW OF POWER SECTOR REFORMS IN KARNATAKA

2.1 Introduction

Power sector in Karnataka has experienced numerous hurdles and issues which demand immediate solution in order to enable smooth and adequate electricity supply to end-users. Thus, over a period of time, many reforms were initiated at the central and state level addressing problems and issues affecting quality power supply to all sectors. However, despite these reforms, there is evidence of power shortage and inefficiencies in power supply process in Karnataka. The present chapter investigates the components and process of the reforms and policy interventions by the Central and state governments in the sector, in order to examine their effect. It critically reviews the power sector reforms in the backdrop of the problems and issues facing the electricity industry in the state. In doing so, the chapter identifies loopholes in current policy interventions in order to give directions for future policy formulations.

The chapter is organised in four sections. Section 2.1 introduces the aim and content of the chapter, Section 2.2 provides the key issues and problems with power sector in India and Karnataka, and the review and analysis of the power sector reforms and policies are discussed in Section 2.3. The last section concludes the chapter.

2.2 Problems afflicting power sector in India and Karnataka

One of the first Indian states to initiate power generation is Karnataka with the setting up of hydro-electric project at Shivanasamudram in 1902. The development of power industry and the associated problems in Karnataka since then have not been exhaustively and exclusively discussed in literature. Many studies are based on all-India power sector scenarios and issues. To a large extent, a state-specific analysis is hindered because of the lack of availability of relevant data. While recognising the constraints of data availability, this section discusses the general issues and bottlenecks in the Indian power sector with particular reference to the situation in Karnataka, based on the available information using both the existing studies and data.
After independence, the Indian Constitution, which came into force in 1950, classified electricity under the Concurrent list, thereby giving both the centre and state jurisdiction over it. Further, according to the Industrial Policy Resolution, 1956, generation and distribution of electricity was to be the exclusive responsibility of the state. Thus, the process of electricity generation, transmission and distribution came under the purview of the state. Although power development in India was emphasised since the initial planning process, the execution process and pace of capacity addition was rather unimpressive in the beginning due to various hurdles.

During the first Five Year Plan (1951-56), the power sector development was moderate due to delays in investigations, initial arrangements of project execution, import of foreign machinery, and difficulties in obtaining steel and cement. The Second Plan (1956-61) aimed to achieve the essential capacity to expand supply areas, and to boost consumption by industries. The capacity target was not met in this plan as well. The shortfall in target achievement during the third Five Year Plan (1961-66) was attributed mainly to foreign exchange difficulties and delays in execution of some river valley projects (Venkataraman, 1972).

Majority of the states had formed State Electricity Boards (SEBs) by the beginning of third Five Year Plan, with assets and functions transferred from Public Works Department. The three annual plan periods (1966-69) prioritized on completing the projects in advanced construction stages and managed to add enough capacities to avoid power deficit in the beginning of the Fourth Plan. Notwithstanding, the augmentation in transmission and distribution was not adequate for the rising capacity addition. The fourth plan (1969-74) emphasized on laying inter-state and inter-regional lines, setting up a Rural Electrification Corporation, and establishing central generating stations.

By this period, there was widespread consensus on the unsatisfactory financial working of the SEBs. This led to the formation of Venkataraman Committee in 1964, which reviewed the financial conditions of the SEBs. The Committee recommended that SEBs target for an average return of 11% after meeting operational, maintenance and depreciation charges. The Boards were supposed to aim for sufficient surpluses to reinvest in future growth by enhancing operational efficiency, better utilisation of available capacity and tariff rationalisation. The target return of 11% could not be
achieved by the SEBs. In 1967-68, KEB earned the highest rate of return (9.6%) compared to other Indian states. This was partly attributed to the fact that during that period, generation was purely through hydro sources, which is much cheaper than thermal power, thereby allowing to earn more return (Venkataraman, 1972).

The situation in Indian power sector changed from surplus to deficit from the early 1970s, as rising demand exceeded supply (Rao, et.al., 1998). Thus, in order to augment power supply, the Central government established generation companies. like National Thermal Power Company (NTPC), National Hydro Power Company (NHPC) in 1975, North Eastern Electric Power Corporation (NEEPCO) in 1976, and Nuclear Power Corporation of India Limited (NPCIL) in 1987. Karnataka was the first Indian state to set up a separate generation company, Karnataka Power Corporation Limited (KPCL) in 1970, to "plan, construct, operate, and maintain" power projects in the state. The transmission and distribution was managed by the KEB.

Karnataka Electricity Board (KEB), which was formed in 1957, also faced the transition from surplus to shortage situation by 1970s. During 1970-71 to 1981-82, the process of planning and execution in KEB was observed to be defective (Rao, 1987). The study concluded that for KEB to work along commercial lines, it needed to prioritize execution of works based on the cost-benefit analysis, reduction in losses, technical requirement, and extension of services. The works should be executed within the quickest possible time. Critical problems with the Karnataka power sector were shortage of man-power, cost consuming KEB surpluses, soft lending policy of the state government to KEB, rural electrification with subsidised tariff for rural consumers, heavy T&D losses, and invisible energy wastage in regard to agricultural consumers (pumps working only 2-3 hours a day), which needed to be tackled urgently.

At all India level as well, the kind of policies, their implementations and the type and quality of institutions led to lack of accountability, irrational incentives, and inefficiency in the electricity supply industry (Rao, et.al., 1998). The notion of electricity as a special good which should be accessible to all, and the directive of the utilities to fulfil social objectives had undermined the economic principles the sector needed to follow to achieve efficiency, accountability, and sound financial health.
Absence of competition had also given way for political influence in the utilities' functioning, thereby leading to over-employment, inefficient use of resources, corruption and irrational tariff setting. The major reason for inefficiency lies in the lack of autonomy of the SEBs, as per Section 78(A) of the Electricity Supply Act, which allows States to provide policy directions to the SEBs. According to the Act, the State governments also appointed the members of the Boards. This visibly gave way to extreme interference in the Boards' day-to-day operations, especially in the tariff determination process, which was based more on social and political motives rather than economic efficiency.

Strikingly, the average cost of supplying power to agricultural and domestic consumers was the highest, although the tariffs charged to them were minimal. In fact, the agricultural tariff further declined from about 20 paise/kWh in 1975-76 to 15.8 paise/kWh in 1991-92 (Rao, et al., 1998). The cost of supplying power to these groups was covered partly by subsidies from the government and partly through cross-subsidization by industrial and commercial consumers. It resulted in lower competitiveness of the industries, huge subsidy burden on the government and towering losses of the SEBs. Thus, the SEBs had no incentive to function on commercial grounds, nor, did the governments ensure accountability of their operations. Such an uneconomical tariff policy also led to lower electricity consumption by the industries, whose contribution to GDP was rising, and higher consumption by the agriculture, whose contribution was falling.

Further, to resolve the excessive power demand, a large portion of the investment went into generation, compared to transmission and distribution segments, which resulted in overloading of the existing transmission lines, leading to high T&D losses, unplanned outages, and massive fluctuations. The T&D loss in India was enormously high in 1990-91, around 25%. As agricultural consumption was de-metered, the SEBs had incentive to misclassify the 'theft' component of electricity to agricultural consumption. Consequently, this estimate of T&D loss was often under-estimated and unreliable, and could be considered as a conservative estimate. In addition, while the generation grew at about 9% during the 1980s, the T&D network grew at a much lower rate of 6.4% per annum.
Electricity demand continued to exceed the supply, leading to persisting power shortages. In 1993-94, the peak deficit was the highest in Bihar (35%) and Karnataka (22%) (Rao, et.al., 1998). By the end of the 8th Plan (1996-97), India suffered from energy deficit as high as 11.5% and enormous peak deficit of 18% (Kannan and Pillai, 2001). They noted that the growth in capacity addition at all India level since the 1970s was quite impressive. Nonetheless, there were vast variations in regional and state-level growth. Karnataka experienced annual average compound growth rate of installed capacity of about 5% during 1970-98, which was lower than the all India rate of 6.9% and other major states, like Andhra Pradesh (8.7%) and Gujarat (6.4%).

Another critical issue was the enormous under-utilisation of the existing capacity, which was to the tune of 54% in 1997-98, which was attributed to low technical efficiency of the plants, and lack of technological progress. The plant availability and Plant Load Factor (PLF)\(^3\), which mainly determine the technical efficiency, were lower for SEBs, compared to Central and private sectors, due to older power plants, and poor maintenance, which resulted in higher outages. While these cumulative factors led to inadequate power supply in the country, there was high probability of electricity demand under-estimation, as it was estimated based on consumption, which was suppressed by power cuts, power rationing, forced outages, and huge fluctuations. Hence, the actual shortages were inclined to be much higher than the official estimates, which pose serious challenge for the power sector development.

The pre-reform problems in Karnataka are summarised in terms of the following fundamental areas:

- Power deficit due to scanty investment in the sector
- Adequacy and Availability of power
- Reliability of power
- Financial losses of the utilities due to differential tariff setting
- Technical problems, like high T&D losses, high AT&C loss and low capacity utilisation

\(^3\) Plant Availability Factor, PAF = [1 - planned maintenance rate - Forced outage ratio].

Plant Load Factor (PLF) of a plant, which is defined as the ratio of the electricity generated to the maximum amount of electricity that can be generated from an installed capacity during a period.
• Measurement issues with T&D loss and agricultural consumption, due to de-metering of the latter
• Faulty planning and implementation of policies and schemes

2.3 Power sector reforms and policies: a critical review

A snapshot of the major power sector reforms and policies in India and Karnataka are given in Table 2.1 and 2.2:

Table 2.1: Major power sector reforms in India and Karnataka

<table>
<thead>
<tr>
<th>Reform/ Policy</th>
<th>Year</th>
<th>Feature/ Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indian Electricity Act, 1910</td>
<td>1910</td>
<td>The State government may grant license to any person to supply electricity in an area, or place electric supply lines</td>
</tr>
<tr>
<td>Electricity (Supply) Act, 1948</td>
<td>1948</td>
<td>Provides for rationalization of production and supply of electricity, and details measures conducive to electrical development.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deals with the statutory powers and functions of the Central Electricity Authority (CEA), State Electricity Boards (SEBs), and Generating Companies</td>
</tr>
<tr>
<td>Karnataka Electricity Board (KEB) was formed</td>
<td>1957</td>
<td>KEB was formed to take responsibility of power supply in Karnataka</td>
</tr>
<tr>
<td>Karnataka Power Corporation Limited (KPCL) formed</td>
<td>1970</td>
<td>KPCL was formed in Karnataka to handle the electricity generation by majority of the plants. Karnataka was one of the first states to separate generation segment.</td>
</tr>
<tr>
<td>The Electricity Law (Amendment) Act, 1991</td>
<td>1991</td>
<td>Amendment to the Electricity Supply Act 1910 and 1948. Private companies can build, own, and operate power stations subject to certain terms and conditions</td>
</tr>
<tr>
<td>Electricity Regulatory Commissions Act</td>
<td>1998</td>
<td>To establish Central Electricity Regulatory Commission (CERC) at central level and State Electricity Regulatory Commission (SERC) at state level.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provisions to regulate and determine electricity tariffs, transmission tariffs and power purchase</td>
</tr>
<tr>
<td>Karnataka Electricity Reform Act (KERA)</td>
<td>1999</td>
<td>Provisions for establishment of KERC within 90 days, with its functions and powers Restructuring of electricity industry-unbundling and</td>
</tr>
<tr>
<td>Event</td>
<td>Year</td>
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<td>----------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Corporatisation of KEB to form Karnataka Power Transmission Corporation (KPTCL) and VisveswarayaVidyut Nigam Limited (VVNL)</td>
<td></td>
<td>Karnataka Electricity Regulatory Commission (KERC) constituted in Oct 1999 - To regulate the purchase, distribution, supply and utilisation of electricity, and tariff and charges payable as well.</td>
</tr>
<tr>
<td>Four Electricity Supply Companies (ESCOMs) established after unbundling distribution from KPTCL</td>
<td>2002</td>
<td>Bangalore Electricity Supply Company (BESCOM)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gulbarga Electricity Supply Company (GESCOM)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hubli Electricity Supply Company (HESCOM)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mangalore Electricity Supply Company (MESCOM)</td>
</tr>
<tr>
<td>The Electricity Act</td>
<td>2003</td>
<td>Central government initiative to &quot;to consolidate the laws relating to generation, transmission, distribution, trading and use of electricity and generally for taking measures conducive to development of electricity industry, promoting competition therein, protecting interest of consumers and supply of electricity to all areas, rationalization of electricity tariff, ensuring transparent policies regarding subsidies, promotion of efficient and environmentally benign policies, constitution of Central Electricity Authority, Regulatory Commissions and establishment of Appellate Tribunal.&quot;</td>
</tr>
<tr>
<td>One more ESCOM formed</td>
<td>2005</td>
<td>Chamundeshwari Electricity Supply Company (CESCOM) was formed</td>
</tr>
</tbody>
</table>
### Table 2.2: Main policies and schemes in power sector in India and Karnataka

<table>
<thead>
<tr>
<th>Policies and Schemes</th>
<th>Time of launch</th>
<th>Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Electricity Policy (Central level)</td>
<td>2005</td>
<td>Under the provisions of Section 3(1) of the Electricity Act 2003 Aimed to give access to electricity to all households in next 5 years, to fully meet the power demand by 2012, to make financial turnaround and achieve commercial viability of electricity sector</td>
</tr>
<tr>
<td>Rajiv Gandhi GrameenVidyuktikaran Yojana (RGGVY) (Central level)</td>
<td>2005</td>
<td>Scheme of Rural Infrastructure and Household Electrification to achieve the National Common Minimum Programme objective of providing access to electricity to all rural households over 4 years. Rs 5000 crore provided for the tenth Plan and 90% capital subsidy provided for rural electrification</td>
</tr>
<tr>
<td>Restructured Accelerated Power Development and reform Programme (R-APDRP) (Central level)</td>
<td>2008</td>
<td>Total outlay of Rs 51,577 crore to reduce distribution losses, achieve energy efficiency and energy accounting.</td>
</tr>
<tr>
<td>Nirantha Jyothi Yojana (Karnataka government)</td>
<td>2008-09</td>
<td>To segregate electricity load in rural areas to agricultural and non-agricultural consumers, in order to supply 24 hours electricity to rural households and small industries, while monitoring quality supply to irrigation pump sets The Government of Karnataka approved the implementation of the project in two phases, at the total costs of Rs 2123 crores with 40% equity and 60% to be borrowed as loan by the ESCOMs (Government of Karnataka, 2016)</td>
</tr>
<tr>
<td>Deen Dayal Upadhyaya Gram Jyoti Yojana (Central level)</td>
<td>2015</td>
<td>It replaced the RGGVY scheme, and aimed for:                                                                                      • Separation of agricultural and non-agricultural feeders                                                                                                     • Strengthening and augmentation of sub -</td>
</tr>
</tbody>
</table>
transmission & distribution infrastructure in rural areas, including metering at distribution transformers, feeders and consumers end

<table>
<thead>
<tr>
<th>Transmission &amp; Distribution Infrastructure in Rural Areas</th>
<th>Details</th>
</tr>
</thead>
</table>
| **Ujwal DISCOM Assurance Yojana (UDAY)** (Central level) | 2015 | • Target to improve financial condition and operational efficiency of DISCOMs  
• 75% of the DISCOM debt as on 30-09-2015 to be taken over by the States. |
| **Pradhan Mantri Sahaj Bijli Har Ghar Yojana (Saubhagya)** (Central level) | 2017 | • To achieve universal household electrification in India at the total cost of Rs.16,320 crore, with a Budgetary support of Rs. 12,320 crore. |

Details of the main reforms are given in *Appendix 2.1*.

The review of the reforms and policies should examine the following key questions:

- Whether the reforms have addressed all the problems and issues in Karnataka power sector?
- Whether they were implemented effectively and efficiently?
- Whether they had flaws, either in legislation, or implementation?
- Are the reforms adequate and relevant, given the problems?

Karnataka power sector has been diagnosed with innumerable problems in the pre-reform period, as discussed in Section 2.2. The situation after the 1991 privatisation and the Karnataka Electricity Reform Act (KERA), 1999 is studied and analysed in the context of the reforms, to understand if the policies were adequate, effective and relevant.

The earliest legislation on electricity by the Central government, the Indian Electricity Act, 1910, envisaged to regulate the private undertakings existing in India, prescribe the conditions to grant licenses, their responsibilities, and to ensure the safety of manpower operating equipments and appliances. However, it did not prescribe a coordinated development of power sector in the country. The need for amendments and new legislation for overall power sector development was fulfilled with the passing of the Electricity (Supply) Act, 1948, which was drafted with the help of experts from the United Kingdom, and followed along the lines of British Acts 1919 and 1926.
This Act aimed to rationalise the electricity production and supply, as well as to undertake measures conducive to power sector development in India. To enable power supply to semi-urban and rural areas efficiently and economically, it emphasized the development of a 'Grid system' by appropriate levels of government with legislative powers and semi-autonomous bodies to manage the system. The Act, thus, mandated the creation of the Central Electricity Authority (CEA), State Electricity Boards (SEB), state electricity consultative councils, local advisory committees, and rating committees. Section 59 of this Act, dealing with the principles for the Board's finances, states that:

"The Board shall, after taking credit for any subvention from the State Government under Sec. 63, carry on its operations under this Act and adjust its tariffs so as to ensure that the total revenues in any year of account shall, after meeting all expenses properly chargeable to revenues, including operating, maintenance and management expenses, taxes (if any) on income and profits, depreciation and interest payable on all debentures, bonds and loans, leave such surplus as is not less than three percent, or such higher percentage, as the State Government may, by notification in the Official Gazette, specify in this behalf, of the value of the fixed assets of the Board in service at the beginning of such year."

Despite such provisions, the financial position of the SEBs did not improve, mainly due to the faulty tariff setting, which was largely influenced by political factors. The report of Rajadhyaksha Committee on power in 1980 stated that the SEBs were regarded as 'promotional agencies' to be utilised to subsidise various classes of consumers with little or no control over tariff policy. Despite rise in installed capacity, the irrational tariff setting and increasing consumption led to huge power shortages in India by 1980. The committee noted that the shortages were chronic and bound to rise. The side-effects of the power deficit were load-shedding along with industries setting up costly captive power generating sets, which increased diesel consumption and raised the cost of production. The committee recommended that the SEBs should earn a rate of return of 15%, assuming the average interest rate on loans to SEBs to be 7%. More importantly, it recommended that all classes of consumers should not be charged less than the cost of providing them power. If some groups need special
subsidies, the Board should be given a subsidy equivalent to the loss by the State government.

Hans (1986) attributed the demand-supply gap to lack of accuracy, cohesion and control in planning as well as lack of co-ordination between policy planning and execution. Delays in project implementation due to inaccurate feasibility reports, and faulty site identification led to project cost escalation, and lack of supply, thereby resulting in power shortage. Shortfall in investment capability is another major reason for power deficit in India. There were many technical drawbacks as well, such as substandard equipment, erratic coal supply, bad quality coal, inefficient technology in mining, lack of trained personnel, strict test runs and efficient management of power plants. Inadequate investment in transmission and distribution segment also contributed to power shortages in India.

The serious crunch in public sector resources and funds for power sector investment by the late 1980s led to landmark reform in the form of the Electricity Laws (Amendment) Act in 1991, which allowed private sector to establish, operate, and maintain power generation plants of thermal, hydro, or renewable energy sources. The private developers were to be selected through the Memorandum of Understanding (MoU) route initially. However, it was changed to competitive bidding route since 1995. Since the SEBs were suffering from losses and their financial health was unattractive for investors, a large number of incentives were announced to make private players invest in power generation. The key incentives included the following:

- Provision for 16% return on equity at 68.5% PLF for thermal plants and 90% availability for hydro plants
- 100% foreign equity participation allowed for foreign private investors.
- A five-year tax holiday provided.
- Lowered excise duty on a large number of capital goods and equipment in power sector.
- Two-part tariff system introduced for Independent Power Producers (IPP) to recover the fixed costs and variable cost in electricity pricing.
- Debt-equity ratio of up to 4:1 permitted for private sectors.
- Power projects with outlay of less than Rs 100 crore not required to submit to Central Electricity Authority (CEA) for concurrence. For generation
companies selected through competitive bidding, the limit was raised to Rs 400 crore and further to Rs. 1000 crore (Shahi, 2005).

Despite provision of such grand incentives to attract private sector, which had deep implications for the fiscal health of the state governments, the progress of the IPPs till late 1990s was claimed to be hindered by difficulties, like litigation, financial arrangements, and delays in obtaining clearances and fuel supply agreements. On the other hand, the SEBs were at a disadvantage with the PPAs that favoured the private players with incentives like availability payment irrespective of plant utilisation rate, and high tariffs (D'Sa, Murthy and Reddy, 1999). Lack of outcomes in the initial stage, alongside huge amounts of foregone tax revenues and counter-guarantees to the private players, which severely affected the state finances, ushered in many criticisms from various spheres. The reform process so far failed to address some crucial aspects like lack of improvement in T&D system, and high 'commercial' losses, which undermined efficiency of power sector.

The wave of reforms in Indian power sector in the 1990s was greatly influenced by the World Bank, which promised to provide funds only under the condition that the states undergo reforms. Orissa was the first state to undertake restructuring of power sector, after which other states also followed suit. However, reforms were critiqued to have been guided by short term demand for meeting power shortage than by genuine desire to achieve long term goal of supplying cost-efficient and high-quality power. The inefficiencies are mainly due to lack of competition in the sector, and encroachment of political economy considerations in decision making and setting prices (Rao et.al., 1998).

Dubash and Ranjan (2001) noted that the reproduction of Orissa model on the national scale could lead to serious consequences. Yi-Chong (2005) further supported the view that the World Bank-led standard model for reforming and restructuring the electricity industry does not work, especially in developing countries. A single model developed as a template by the World Bank when transplanted into developing economies without understanding the situation in those countries might not be effective. This template was, however, retained, despite many failures. He asserted that the template did not fit the political and economical reality of Orissa. The distribution companies in Orissa were privatised in 1999, and an independent
regulatory commission was also formed to prevent government intervention from power sector. To make the template work, specific conditions had to be created artificially. To target foreign investors, the state assets were over-valued to make it attractive to investors. Due to this, the new corporation had to ensure high returns, which puts a heavy burden on tariffs.

Moreover, during the privatization of distribution segment, a lack of bidders created an unsatisfactory situation. The government washed its hands off the electricity industry after selling the state assets, and no longer pumped funds to the grid company (GRIDCO), according to the agreement with the Bank. Consequently, much of the funds from the Bank went to rehabilitation of transmission and distribution systems. Yi-Chong (2005) observed that not a single work was completed, and no benefits came from the large investment out of borrowed funds, carrying a heavy debt servicing burden. The Bank claimed that the worsening situation was due to low tariffs that could not cover cost of production, which was a consequence of political interference.

The persisting problems in power sector led to the adoption of the Common Minimum National Action Plan for Power (CMNPP) in the two conferences of Chief Ministers organised by the Indian government. CMNPP noted that the widening power deficits and poor financial health of SEBs necessitated improvement in their operational performance. Creation of regulatory commissions was identified as a step in that direction. This led to the passing of the Electricity Regulatory Commissions Act, 1998, which read as:

"An Act to provide for the establishment of a Central Electricity Regulatory Commission and State Electricity Regulatory Commissions, rationalization of electricity tariff, transparent policies regarding subsidies, promotion of efficient and environmentally benign policies and matters connected therewith or incidental thereto." (pg. 4).

In Karnataka, the regulatory commissions were formed after the passing of "The Karnataka Electricity Reform Act" (KERA) in 1999, which extends to the whole of Karnataka state, and came into effect from June 1, 1999. The aim and provisions of the Act are clearly given in the following statement:
"An Act to provide for the constitution of an Electricity Regulatory Commission ('The Commission') for the State of Karnataka; to provide for the restructuring of the electricity industry in the State, the corporatisation of the Karnataka Electricity Board and the rationalisation of the generation, transmission, distribution and supply of electricity in the State; to provide for avenues for participation of private sector entrepreneurs in the electricity industry in the State and generally for taking measures conducive to the development and management of the electricity industry in the State in an efficient, economic and competitive manner to provide reliable quality power and to protect the interest of the consumer including vesting in the Commission the powers to regulate the activities of the power sector in the State and for matters connected therewith or incidental thereto." (pg. 399).

The Act mandated the creation of Karnataka Electricity Regulatory Commission (KERC) within three months, with members to be appointed by the State government from persons selected by the selection committee, and one of them to be nominated the Chairman. It is important to note the main functions of the Commission, as laid down by the Act:

"(a) to regulate the purchase, distribution, supply and utilization of electricity, the quality of service, the tariff and charges payable keeping in view the interest of the consumer as well as the consideration that the supply and distribution cannot be maintained unless the charges for the electricity supplied are adequately levied and duly collected;

(b) to promote efficiency, economy and safety in the use of the electricity in the State including and in particular, in regard to quality, continuity and reliability of service, the standard of performance by the units engaged in the electricity supply industry in the State, the efficient utilisation and conservation of energy, appropriate demand side management and reduction of wastes and losses in the use of electricity and to enable all reasonable demands for electricity to be met;.." (pg. 410).
The functions contain most of the key solutions to the problems in electricity industry. However, the outcomes, especially, in reference to quality of service, efficiency, reliability of service, conservation of energy, and reduction of wastes have not been prominently visible.

Karnataka did undergo restructuring and corporatisation of the vertically integrated KEB and formed Karnataka Power Transmission Corporation Limited (KPTCL) in 1999 to handle transmission and distribution. The distribution segment was subsequently unbundled and handed to four Electricity Supply Companies (ESCOMs) in 2002 and one more in 2004. Nonetheless, the issues with low revenue collection on account of subsidised categories, commercial ‘theft’, high T&D losses, and low investment still persisted, as discussed elaborately in Chapter 4. The T&D loss was in the range of 30% in the late 1990s. The KERA, 1999 did not address the crucial aspects of inadequate rural electrification, high T&D losses, poor quality power supply and environmental concerns (D’Sa and Murthy, 2002).

To improve the technical and financial condition of power sector, the central government introduced several schemes. One such scheme was the Accelerated Power Development Programme (APDP), initiated in 2000-01, with Central Plan Assistance of Rs 1000 crore, to finance renovation & modernization and upgradation of old power plants, as well as sub-transmission & distribution network (below 33 or 66 kV) including energy accounting and metering (Government of India, 2001). Restructured Accelerated Power Development and Reform Program (R-APDRP) was later approved in 2008 with a total outlay of Rs. 51,577 crore for IT enablement & strengthening of distributions sector (Government of India, 2014). It was focused on towns and cities with population more than 30,000.

The reforms and policies in power sector so far were piecemeal, and uncoordinated, thereby necessitating the harmonization and rationalization of the provisions of the earlier Acts into a comprehensive legislation. This would preserve the core features, except those related to mandatory existence of SEBs, and introduce newer concepts to enhance competition in the electricity industry. Thus, the central government brought in the Electricity Bill, 2001, after wide discussions and consultations with the states and all stakeholders. The objectives of the Bill are reproduced in the Electricity Act (EA), 2003, which replaced the Indian Electricity Act, 1910, the Electricity (Supply)
Act, 1948, and the Electricity Regulatory Commissions Act, 1998. This Act extends to the whole of India except for Jammu and Kashmir. It mandates the preparation of the National Electricity Policy and Tariff Policy by the Central government, in consultation with the State Governments and the CEA, for power sector development based on optimal resource utilisation of coal, natural gas, nuclear matter, hydro, or renewable sources of energy. The EA 2003 is, thus, defined as:

"An Act to consolidate the laws relating to generation, transmission, distribution, trading and use of electricity and generally for taking measures conducive to development of electricity industry, promoting competition therein, protecting interest of consumers and supply of electricity to all areas, rationalization of electricity tariff, ensuring transparent policies regarding subsidies, promotion of efficient and environmentally benign policies, constitution of Central Electricity Authority, Regulatory Commissions and establishment of Appellate Tribunal and for matters connected therewith or incidental thereto." (pg. 1).

The main provisions of the Act are as follows:

- "Any generating company may establish, operate and maintain a generating station without obtaining license under this Act if it complies with the technical standards relating to connectivity with the grid..." However, large hydro power projects are required to prepare and submit to the CEA a scheme of estimated capital expenditure to obtain technical clearance.
- Any person or a group of persons can set up and operate a captive power plant, and would have open access to transmit power from the plant to any destination.
- Power trading is recognised as a distinct licensed activity.
- It is mandatory for every state to form an SERC, or joint electricity regulatory commission with another state. All Electricity Regulatory Commissions (ERCs) are given full responsibility of tariff determination, licensing, and setting and enforcing performance standards for licensees. The regulators are supposed to rationalise tariff under a multi-year tariff framework and reduce (and eliminate) subsidies.
• Transmission licensees are mandated to give non-discriminatory open access to the transmission lines.
• Creation of a national Appellate tribunal to hear appeals against the Commission's orders.

To ensure competition in electricity industry in India, the Electricity Act 2003 came to force. The Act mandates the Central and State Transmission Utilities (CTUs and STUs) to provide non-discriminatory open access to its transmission system for use by any licensee/generating company/consumer, subject to payment of ‘wheeling charge’ fixed by concerned regulatory commissions. However, Sankar (2004) observed that there are certain controversial provisions in the Electricity Act 2003 which needed to be clarified or modified, as the provisions on open access, surcharges, and cross subsidies are liable to result in multiple interpretation and legal tangles. He argued that regulatory commissions must adopt uniform procedures for tariff-fixing, to minimize uncertainty and encourage investment.

As per the Act, three national policies, namely, the National Electricity Policy (NEP), Tariff policy and Rural Electrification Policy, were to be published by the central government, in consultation with the states, to guide the ERCs. Although the Act was enacted in 2003, the NEP was notified only in 2005 February, Tariff policy was enacted in 2006 January, and Rural Electrification Policy in 2006 August.

The main objectives of the National Electricity Policy, 2005 are:

• To provide electricity access to all households in next five years, that is, by 2012.
• To fully meet electricity demand by 2012, to eliminate energy and peak shortages, thereby making adequate spinning reserve available.
• To enable good quality and reliable power supply efficiently at reasonable rates.
• To increase the per capita availability of electricity over 1000 units by 2012.
• To provide a minimum lifeline consumption of 1 unit/household/day as a merit good by 2012.
• To improve financial health and commercial viability of power sector.
• To protect consumers’ interests.
As per Section 3(4) of the Act, the CEA is also required to frame a National Electricity Plan once in five years and revise it from time to time, according to the National Electricity Policy. The Plan provides short and long term electricity demand forecasts, locations for capacity additions based on economics of generation and transmission, different technologies for all segments of power sector, and economical and sustainable fuel mix. The NEP addressed the key issues of rural electrification, generation, transmission, distribution, recovery of costs and targeted subsidies, enhancing private sector participation through competitive route, regulatory measures like time-of-use tariff, energy efficiency standards for utilities, and improving Renewable Portfolio Obligations (RPO\textsuperscript{4}). It emphasized on large scale development of hydro electric generation, which is clean and renewable, while the thermal generation should be expanded based on economic viability of types of inputs.

The Rural Electrification Policy, 2006 also aimed at:

- Provision of electricity access to all households by year 2009
- Supply of good quality and reliable power at reasonable rates
- Provision of minimum lifeline consumption of 1 unit per household per day by 2012

The electricity access to all households by 2009 and 2012 had been the targets of the Rural Electrification Policy and the National Electricity Plan. Nonetheless, Karnataka could not achieve 100% rural electrification either by 2009 or, 2012. The percentage of villages electrified in Karnataka as on 31st March, 2015 was 99.9% (Central Electricity Authority, 2016). While the achievement might seem impressive, the true concern is regarding the manner in which village electrification is defined:

"A village would be declared electrified if electricity is provided to public places like Schools, Panchayat Offices, Health centres, Dispensaries, Community Centres etc. and the number of households electrified are at least 10% of the total number of households in the village."

The accuracy of determining the actual number of electrified households is questionable, given the definition. Since merely 10% of households are required to be

\textsuperscript{4}RPO is the obligation to purchase a certain minimum level of renewable energy out of the total consumption in the area of a distribution licensee, mandated by the State Electricity Regulatory Commission (SERC) under the 2003 Electricity Act.
electrified for the whole village to be termed 'electrified', many households still remain without electricity connection till date. Only 87% of rural households are electrified in Karnataka, as per Census 2011 (Government of India, 2013-14). There are regional imbalances here as well. At district level, Bangalore had almost 100% household electrification, Yadgir 78%, Bijapur 81%, Kodagu 82%, and Belgaum 84% (CSTEP and SELCO Foundation, 2016).

Both the central government and state governments jointly endeavoured to achieve the objective of universal electricity access. The Central Government launched the ambitious scheme ‘Rajiv Gandhi Grameen Vidhyutikaran Yojana (RGGVY)’ in April, 2005, to electrify all un-electrified villages, or, hamlets and provide free electricity connections to BPL households. In this scheme, 90% grant was to be provided by the Central government, while 10% as loan by Rural Electrification Corporation (REC) to the State governments. It envisaged the formation of Rural Electricity Distribution Backbone (REDB) with substation of adequate capacity, Village Electrification Infrastructure, Decentralised Distributed Generation (DDG) system based on different sources. By April 2012, 1.05 lakh out of the targeted coverage of 1.10 lakh un-electrified villages and 1.95 crore free electricity connections out of targeted 2.30 crore BPL households had been released under RGGVY (Government of India, 2012).

The RGGVY was subsumed in the new scheme called Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY) in 2015. With an outlay of Rs. 76000 crore, this scheme aimed at providing 24*7 power supply, segregation of feeder into rural households and agricultural consumers, and strengthening of sub-transmission and distribution infrastructure, including metering, in rural areas. The most recent endeavour to achieve universal household electrification in India is the Pradhan Mantri Sahaj Bijli Har Ghar Yojana (Saubhagya) launched by the Indian government in 2017 October. It is necessary to achieve the basic facilities like electricity access, 24*7 supply of good quality power, etc. through the government schemes, nevertheless, it appears that many new schemes cropped up merely by renaming the older schemes with similar core features and targets by extending the target period.

REC is the nodal agency for the RGGVY scheme
Karnataka also launched its own scheme, called Niranatha Jyothi Yojana (NJY), which was taken up on pilot basis during 2008-09, in Malur taluk under BESCOM, and implemented in two phases over 129 Taluks, with a total cost of Rs. 2123 crore, comprising of 40% equity and remaining 60% to be raised by the ESCOMs as loan. This scheme aimed to bifurcate the agricultural loads and the non-agricultural loads, by drawing a new independent 11kV feeder, called the 'NJY feeder' which would serve the non-agricultural load. The existing feeder, which would carry only the irrigation pump sets (IP) load, was called the 'IP feeder'. This was mainly intended to supply good quality, reliable power to non-agricultural consumers for 24 hours, while having more control over agricultural load. 4 out of 5 ESCOMs in Karnataka, namely, BESCOM (Bangalore), CESC (Chamundeshwari), GESCOM (Gulbarga), HESCOM (Hubli) implemented NJY, while MESCOM (Mangalore) targeted to meet the 24 hour supply through Rural Load Management Scheme (RLMS).

A performance audit conducted by CAG, Government of Karnataka evaluated the achievements of NJY in the four ESCOMs between 2014 November and 2015 June. The observations highlighted that the implementation was below expectation. Only 25 out of the targeted 1748 feeders were commissioned within the scheduled date. Even after a delay in implementation of up to 3 to 4 years, the NJY was not completely implemented, with 543 feeders yet to be completed as of March 2015.

The reasons for under-achievement varied across different ESCOMs, ranging from lack of technical equipments and skilled manpower, incorrect estimates of works, to delay in approvals. Other reasons for defective implementation included delays in tender finalisation in GESCOM, delays by contractors in HESCOM, and delays in load bifurcation works in all ESCOMs. There was also inadequate funding to BESCOM and CESC. The ESCOMs could supply about 20 hours of three phase power to NJY feeders, however, there was no improvement in quality of power, with continued interruptions. In addition, the KERC's directive to assess the IP consumption based on meter readings in IP feeders had not been complied with (Government of Karnataka, 2016). It reflects poor implementation of NJY from the initial stage of planning to execution stage, although some progress was observed by 2015.
In terms of adequacy of power, which is indicated by the per capita electricity consumption (PCEC) and energy deficit, Karnataka fares well with PCEC of 1211 kWh in 2014-15, which is higher than all-India level of 1010 kWh, nonetheless, less than other major states like Gujarat (2105 kWh), Tamil Nadu (1616 kWh), Haryana (1909 kWh) (Central Electricity Authority, 2016). However, it should be reiterated that PCEC is itself constrained by inadequate availability, poor quality power along with forced outages, which are more predominant in the rural areas. Similarly, Karnataka still suffers from energy and peak deficit of 5.2% and 6.8% respectively in 2015-16, which are much higher than other major Indian states, as discussed in Chapter 6. Thus, there are pressing issues persisting in the Karnataka power sector.

In addition to availability and adequacy, power supply should be reliable, which is strongly indicated by uninterrupted availability of power. KERC developed a Feeder Reliability Index\textsuperscript{6} (RI) of the five ESCOMs in Karnataka, which are shown in Table 2.3.

\begin{table}[h]
\centering
\begin{tabular}{|l|c|c|c|}
\hline
ESCOMs & District Headquarters & Towns and Cities & Rural areas \\
\hline
BESCOM & 97.3 & 96.9 & 94.5 \\
MESCOM & 97.9 & 94.9 & 90.8 \\
CESC & 96.4 & 92.1 & 71.0 \\
HESCOM & 97.3 & 95.9 & 65.9 \\
GESCOM & 93.3 & 84.9 & 84.4 \\
\hline
\end{tabular}
\caption{Reliability Index of power supply in 2014-15 (\%)}
\end{table}

\textit{Source: CSTEP and SELCO Foundation, 2016}

It is observed that rural areas experience more unreliable power supply compared to urban areas. For instance, the RI in district headquarters under CESC is about 96% while that in rural areas is merely 71% in 2014-15. The index is as low as 65.9\% in the HESCOM rural areas, while the rural areas under BESCOM have the highest RI of 94%.

Another critical problem which hindered the power sector development was the differential tariff determination for certain consumers, led by political and social

\textsuperscript{6}Reliability Index = [(Total number of 11kV feeder * 24 hours* number of days)-(outage duration of all 11kV feeders in a month in hours)] *100 / [total number of 11kV feeders * 24 hours * number of days]
considerations. The subsidisation of agriculture and domestic consumption led to increasing cross-subsidization by other categories, which led the latter group to resort to expensive captive generation, and large drain from government coffers as subsidy. To resolve this issue, the Tariff Policy, 2006 aimed:

- To provide electricity to consumers at reasonable and competitive rates
- To achieve financial viability of the power sector and attract investments
- To introduce transparency, consistency and predictability in regulatory practices
- To enhance competition, efficiency and quality of power supply

To enhance competition, it mandated all future electricity procurement by the distribution licensees to be done through tariff-based competitive bidding, except for public sector projects, which was later relaxed after five years. For the competitive bidding process, the Standard Bidding Documents (SBDs) comprise of Request for Quotation (RfQ), Request for Proposal (RfP), and Power Purchase Agreement (PPA). There are two main types of bidding, namely, Case 1 and Case 2. In Case 1 bidding, the generating company participates based on new proposed stations, or, existing stations, which could be for any duration. In Case 2, the producers provide a specific location and optionally a fuel source for the project, which could be done only for long term period (more than 7 years), and with a 2-stage bidding process. Competitive bidding for power procurement instead of the MoU route indicates a shift and emphasis towards more competition, transparency and efficiency in the sector.

The Tariff Policy was first amended in 2008 March, where the cost-plus tariff setting was allowed for hydro projects in the private sector, if the at least 60 percent of the Power Purchase Agreement (PPA) was signed for at the end of 2010. The deadline was later extended to 31st December 2015 in the third amendment. The second amendment in 2011 January primarily provided for solar-specific Renewable Purchase Obligation (RPO) and recognised Renewable Energy Certificate (REC)\(^7\) for RPO.

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\(^7\)Renewable Energy Certificate (REC) was introduced in India in 2010, to promote renewable sources of energy and development of electricity market, by addressing the dispersed availability of RE across different geographical areas. It represents 1 MWh of electricity generated from RE, which can be traded through Power Exchanges, approved by CERC.
Bhattacharya and Patel (2008) analysed the efficacy of power sector reform in India by measuring the change in commercial orientation of the utilities. By calculating an Index of Revenue Orientation (IRO)\(^8\) for 2001-02 and 2004-05, they found that the sector is still not financially viable, and the AT&C losses are still high. There was immense variability of commercial orientation of the utilities across states and even between utilities within states.

For financial turnaround of the distribution companies (DISCOMs), the Central government also introduced a scheme called Ujwal DISCOM Assurance Yojana (UDAY) in 2015 November, after consultation with the various stakeholders, to ensure a sustainable solution to the huge debt of about Rs 4.3 lakh crore, to make ESCOMs break even in the next 2 to 3 years, to improve operational efficiency through compulsory smart metering, upgrading transformers, energy efficiency measures to reduce the average AT&C losses from 22% to 15%. Under this scheme, the state governments would take over 50% of the debt in 2015-16 and 25% in 2016-17 and reduce the interest on debt from 14-15% to 8-9%.

In the last decade, there have been growing emphasis and new initiatives to develop renewable energy sources (RES) of generation to augment the power supply and reduce energy deficit. In Karnataka, such an initiative is the 'Karnataka Renewable Energy Policy 2009-14\(^*,\) which targeted for overall 'development, propagation and promotion' of RES and technologies, as well as energy conservation and efficiency. According to this policy, it is mandatory to sell the power generated from the RE projects to the respective ESCOMs in which the projects are located, at the tariff set by KERC under a long term Power purchase agreement. Its target capacity addition was 4326 MW from 2009-10 to 2013-14 (Government of Karnataka, 2010). The installed capacity by RES in Karnataka has increased manifold from about 34 MW in 1999-00 to 3985 MW in 2014-15, however, the addition falls short of the target amount (4326 MW) in the policy.

The Central government initiated the Jawaharlal Nehru National Solar Mission (JNNSM) in 2010, with the target to add 34152 MW of solar power capacity by 2022,

\[^8\] IRO = (1 - ATC loss) + (Collection efficiency) + (ARR – ACS) – (Industry ARR - ACS) + Ratio of subsidizing to subsidized segments \{where, ATC = Aggregate Technical & Commercial, ARR = Average realisation rate, ACS = Average cost of supply\}
which constituted around 3% of the total energy consumption from solar. Along the same line, Karnataka launched the Solar Policy 2011-2016', which was later revised to 'Solar Policy 2014-2021'. It aimed to add at least 2000MW of solar generation by 2021 in a phased manner to achieve a minimum of 3% solar energy from the total projected consumption, and for overall development of solar power generation in the state (Government of Karnataka, 2014).

2.4 Conclusion

The policies, schemes and reforms at central and state level addressed the fundamental problems of lack of universal electricity access, huge power deficit and financial turnaround of utilities through encouragement of private sector participation in 1991, restructuring of vertically integrated SEBs, creation of independent regulatory commissions in 1999, and introduction of competition and efficiency measures in 2003. Notwithstanding, there were loopholes in planning and implementation process of the policies and schemes, which led to considerable under achievement of targets.

Numerous policies, such as National Electricity Policy 2005, Rural Electrification Policy 2006 have stated in their objectives to provide universal electricity access and good quality, reliable power to all households by 2012. However, till date there are a number of households in Karnataka which still do not have electricity access, partly due to lack of implementation of electrification schemes, and partly because of the fault in definition of 'village electrification', which mandates merely a minimum of 10% of households in the village to electrified. In terms of availability, the per capita electricity consumption in the state is higher than the all-India level. However it is lower than many major Indian states, suggesting room for improvement. The reliability of the power supply is also lower in rural areas, as compared to urban areas.

New initiatives were undertaken to improve rural power supply, like the feeder separation between agricultural and non-agricultural consumers, as endeavoured in Niranthara Jyothi Yojana. The performance audit of NJY in Karnataka by CAG highlighted flaws in planning as well as implementation process, due to which the targets of feeder bifurcation were not met within the scheduled time. There were also other central government schemes, like the R-APDRP, and UDAY, to improve the
financial health of the utilities, by relieving their debt burden and giving time to recover losses in a phased manner.

It is observed that most of the policies and schemes are mostly curative and in the direction of relieving debt burden, without providing solutions to the underlying cause of the issues. The root cause of most of the financial hurdles is the heavy subsidization of certain consumer groups, which leads to cross-subsidization by other consumers, and large subsidy burden on government, both of which have substantial negative spill-over effects, like revenue-generating industrial and commercial consumers resorting to more costly captive power generation, which also reduces their competitiveness. The Tariff policy and EA 2003 address the issue of rationalizing tariffs, however, the implementation has not been completely effective, since the revenue realisation as percentage of cost from agricultural and domestic consumers are still much lower than 100%, implying existence of tariff differential.

There are also serious concerns with measurements of T&D losses and IPS consumption as the IPS consumption was de-metered in the 1980s with the political motive of acquiring vote banks. These concerns, which are the cause of numerous problems, have not been explicitly addressed in the policy paradigm. One of the critical loopholes in power sector is the lack of accurate and continuous data availability on all the important variables in the sector, most importantly, the total private sector investment, the amount of incentives accruing to private sector, accurate agricultural consumption, and the T&D loss. Such data is very essential for critical analysis, which can subsequently indicate the true progress of power sector development and how the reforms have succeeded or failed in their endeavour to make it competitive, efficient and profitable.