ABSTRACT

Electricity is a basic infrastructural input which is critical for higher economic growth. Theoretically, the electricity industry was treated as a vertically integrated natural monopoly involving huge costs, which traditionally has been the responsibility of the government across the globe. However, the large integrated state monopolies were found to be inefficient in supplying electricity, which gave rise to major structural, institutional and regulatory changes in power sector. Karnataka also undertook power sector reforms, beginning mainly from the allowance of private sector participation in generation in 1991, the restructuring of the Karnataka Electricity Board (KEB) in 1999, and the Electricity Act, 2003, which aimed to increase competition and efficiency in the sector. However, the persisting issues of high energy and peak deficit, basic access to good quality power, subsidization, cross-subsidization, commercial losses and lack of adequate good quality power pose serious implications for the future growth of Karnataka. The present study aims to analyse the effect of the reforms on the electricity consumption, supply, investment and the overall performance of Karnataka power sector.

A critical review of the power sector reforms in Karnataka has revealed that although the reforms, policies and schemes at central and state level did address the fundamental problems of lack of universal electricity access, eliminating power deficit and financial turnaround of utilities, there were loopholes in the planning and implementation process of the policies and schemes, which led to considerable under achievement of targets. In addition, there were serious issues with the definition of "village electrification", accurate measurement of the transmission and distribution (T&D) loss and irrigation pump sets (IPS) consumption, and lack of data on important variables like private investment. The root cause of the measurement problem is considered to be the de-metering of the IPS in the 1970s, which is claimed to have been initiated to meet social and political goals. The issue of poor reliability and quality of power supply in rural areas has been addressed in policies and schemes like Niranthara Jyothi Yojana (NJY), nonetheless, the achievement has been meagre and inadequate.

The trends and patterns of electricity consumption by major consumer categories highlight that the agricultural electricity consumption is the highest, followed by the
'Industry HV'. The issues concerned with agricultural consumption are the inaccurate measurement of the IPS consumption, the inadequate and poor quality power supply, and the under pricing of IPS consumption, which has resulted in cross-subsidization and subsidy burden on state finances. The per capita electricity consumption (PCEC) in Karnataka has increased tremendously with a higher AAGR in the post-reform period, nonetheless, it is inadequate and lags behind other major Indian states. Given the state's huge potential for growth, there is a greater need for adequate and good quality power. The Granger causality test showed that there is no causality between electricity consumption and economic growth in Karnataka for the period 1980 - 2015 at the aggregate level, as well as at the disaggregate level for agriculture and industrial sectors. It is perhaps because of serious issues like erratic and inadequate power supply, over estimation of IPS consumption due to lack of meters, and increasing usage of captive power generation by industries. Further, in order to understand the future power consumption, electricity consumption in Karnataka is predicted till 2019-20, using the Holt-Winters exponential smoothing (no seasonal) method, to be around 69347GWh.

The total installed capacity (IC) has increased substantially after the reforms, increasingly contributed by the private sector. The trend break analysis using regression with dummy variables showed that the total IC significantly increased in 1998, revealing that reforms have brought in a positive change. However, the trend break for total electricity generation was in the year 2003, implying low capacity utilisation (CU) of the existing capacity. The low CU was attributed to technical reasons, like age of plants, technical efficiency, outdated technology, limitations of the inputs used, as well as lack of demand from distribution companies. The private sector contribution to IC and generation has increased tremendously, following the 1991 policy of allowing private sector in generation, however, at the cost of numerous incentives. The increasing IC is dominantly contributed by the thermal and renewable sources, as the hydro capacity has been stagnant in recent years. The rising thermal share has implications on increasing demand for scarce and costly fossil fuels, leading to environmental degradation. Karnataka has performed exceptionally well in reducing the T&D losses after the reform and vis-a-vis other major Indian states as well. Nonetheless, its inaccurate measurement is still a critical problem that requires immediate attention. The collection efficiencies and AT&C losses of the ESCOMs, in
general, have progressed well with time, although much improvement is still necessary for some ESCOMs, like CESCOM, which has the lowest CE and highest AT&C losses. Rural electrification in Karnataka is 99.9% by 2015, however, its definition is highly questionable and likely to underestimate the actual number of households electrified. The required growth rate of total generation was computed to be about 5.3% to adequately provide the future consumption by 2019-20.

Besides the supply side measures, Karnataka has initiated the Demand Side Management (DSM) program, including energy efficiency and conservation measures, to reduce power deficit. BESCOM has taken up some initiatives, such as, implementing the WENEXA scheme, installation of solar water heaters, installing timer switches for street lights, initiating the Surya Raitha scheme, and the Domestic Efficient Lighting Program (DELP). However, it is still in a very nascent stage in Karnataka, and constrained by many barriers, like paucity of technical know-how, lack of awareness, and insufficient capital, especially in the backdrop of the subsidised power supply to certain categories.

The outlay and expenditure on power sector by the state government as a percentage of the total outlay and expenditure have declined significantly over time, from Seventh plan to Twelfth plan. This was due to greater policy emphasis on private sector investment for electricity industry development, and the expectation that the utilities would function as commercial entities, which generate resources and incur expenditures. The power sector expenditures made by the Karnataka government was mainly towards revenue expenditures, while the expenditures on capital formation, through capital expenditures and loans and advances, declined tremendously since mid-1990s. A major proportion of the revenue expenditures goes to 'Assistance to Electricity Boards', which, in turn, primarily constitutes subsidy for IP sets and Bhagya Jyoti/Kutir Jyoti (BJ/KJ) consumers. Thus, much of the public spending is on account of the subsidy payment for agricultural electricity supply. Despite such budgetary support for the IPS consumption, the agricultural consumption was not found to have any causal relation with agricultural GSDP. Thus, it is time to reflect, evaluate and amend the subsidy policy, as the inadequate and poor quality power supply to agricultural has resulted in less contribution to agricultural growth. In addition, studies have revealed that subsidies rarely benefit the needy poor farmers.
The private sector installed capacity, which mirrors the private investment, grew at a fast pace since late 1990s. In addition, Karnataka Power Corporation Limited (KPCL), Karnataka Power Transmission Corporation Limited (KPTCL) and Electricity Supply Companies (ESCOMs) contributed to capital formation from their own revenue generation. The gross profit margin of KPCL and KPTCL have been positive, while that of ESCOMs, however, varied widely across the utilities during 2010-11 to 2015-16.

An index called Power sector Performance Index (PPI) has been calculated for pre- and post-reform periods for 17 major Indian states, in order to assess the overall power sector performance. The Index value for Karnataka increased substantially after reform, implying better power sector performance in the post-reform period. Its ranking also increased tremendously from twelfth rank to second rank in the post reform period, indicating large improvement relative to other states. It should also be noted that the performance reflected by the index is at best the relative performance as compared to the other states, and there are still crucial issues like low capacity utilisation, power deficit, poor quality power, and subsidization, which need immediate attention.

Some policy recommendations have been drawn from the study. There is a great need to redefine "village electrification" to capture the true progress of universal household electrification. Policy initiatives at the pilot levels, like the NJY, should be implemented fully after critical assessment of the results of the pilot programs, to reap the very purpose of the pilot testing. Future policies should also revise the overall concept of cross-subsidization, and gradually phase it out. Considerable focus should also be placed on technological upgradation, maintenance of the existing plants, and correcting the faulty measurement and pricing issues with agricultural electricity consumption, which could be resolved through insulation from political intervention in decision making. Although a few DSM measures have initiated in Karnataka, there is a great need to further strengthen the program by tackling the challenges and barriers like lack of capital, technical sophistication, awareness, and policy emphasis. Lastly, a grey area in power sector has been the lack of accurate data on important variables, like private investment, which needs to be resolved effectively, in order to advance the research and development in electricity industry that is extremely important for its future growth.