CHAPTER VII

SUMMARY AND CONCLUSIONS

Electricity is considered to be the most convenient and versatile form of energy. It is classified as a secondary source of energy because anyone of the primary sources like coal, gas, petroleum, hydro-power, wind and solar energies may be used to produce electricity. Due to its more adaptable nature, it is a preferred source of energy at the consumer ends. However, energy being a scarce and valuable resource, great emphasis is laid on its optimal use. Per capita consumption of electricity is also considered as an indicator of economic prosperity. Therefore, to study the Economics of Electricity Supply is an important and critical issue for a student of Economics.

Power sector reforms in India were initiated in early 1990s. Initially, the reforms were taken at the electricity generation level. After the initiation of liberalization process as a part of the New Economic Policy of 1991, private as well as foreign direct investment was allowed in the power generation business. Consequently, the Dabhol Power Project promoted by the Enron Power Corporation with a generation capacity of 2184 MW (Phases I&II) was permitted to be established and started its operation in the
state of Maharashtra in 1999. However, the plant could not be proved as an economically viable source of energy for the Maharashtra State Electricity Board (MSEB). The operational and financial issues of the plant such a high cost of electricity generation, foreign exchange risks etc. were highly criticized at the national as well as international levels. Ultimately, the MSEB stopped purchasing electricity from this plant. At that stage it was realised that generation segment alone would be unable to attract adequate investment unless distribution section reforms were also undertaken simultaneously. Therefore, some of the states initiated the power restructuring process at the state level. Orissa was the first state in the country that implemented the power sector reforms in 1996 under the supervision of World Bank. After Orissa, some other states such as Haryana, Andhra Pradesh etc. adopted the power sector reforms at the state levels. The reforms included unbundling, corporatisation and privatization of the State Electricity Boards (SEBs). Moreover, various types of policy and structural changes such as establishment of independent regulatory authorities have been undertaken as a part of power sector reforms in the country. The state of Punjab was one of the states which also adjusted power sector reforms. This study critically examines the improvement, if any, in the technical and financial performance of the power sector in Punjab after
adoption of the reforms process. The main objectives of the study are as follows:

A comparative analysis of the technical as well financial performance has been undertaken between the pre-reforms and post reforms periods. The operational performance of the restructured power supply industry in Punjab has been compared with the selected power utilities of the country namely Andhra Pradesh, Karnataka, Maharashtra and West Bengal. The study targets to achieve the following objectives:

1. To compare the technical and financial performance of the Power Sector in Punjab State in the Pre-reform and Post-reform periods
2. To evaluate the regulatory performance outcomes of restructuring process in power sector in Punjab
3. To undertake a comparative analysis of the financial performance of Power utility of Punjab with selected best performing SEBs/utilities
4. To examine the pricing policy in relation to the cost of supply adopted in post-reforms process in Punjab
5. To make suggestions and recommendations to improve the financial performance of power sector in the state

The Punjab State Electricity Board (PSEB) was constituted on 01.02.1959. It was incorporated as an integrated power supply utility under
the provisions of the Electricity Supply Act 1948. In 1967, Punjab State Electricity Board was re-organised to create a separate Haryana State Electricity Board. In the development planning process, the growth of power sector was given a high priority. Large shares of the state Five Years Plan outlays were allocated to the development of power sector. The relative shares of the expenditure on power in total plan expenditure in the State were estimated between 25% to 30% during various Five Years Plans. Due to sustained efforts made by the Government of Punjab, the power sector exhibited a rapid growth in increasing the physical network. Consequently it helped in increasing the rural electrification and raising per capita consumption of electricity. Punjab was reported as one of the states in the country achieving fast rate of rural electrification. The generating capacity increased very significantly. Initially (in 1959, when PSEB incorporated), the state had an installed capacity of 62 MW. The installed capacity of the state increased to 4459 MW as on March 31, 2002. The current installed generation capacity of the state is estimated to be 7035 MW As on June 30, 2011. Because of rapid increase in the installed capacity, the per capita consumption of power increased from 43 KWH in 1950-51 to 1663 KWH in 2009-10. Within this period number of electricity consumers has also increased substantially. The number of electricity consumers increased from
9,55,234 in April 1971 to 75,49,219 in March 2011. In spite of impressive physical performance, PSEB showed poor technical and financial performance. Regarding operational performance, it suffered from the problems of low Plant Load Factor (PLF) and high Transmission & Distribution losses (T&D losses). The PLF of PSEB was reported to be 50% as compared to the national average of 57% in FY 1992-93.

In the pre-reforms period, PSEB showed poor performance in the revenue collection efficiency. The tariff was kept lower than the cost of supplying power to the various categories of consumers. The average revenue realised (from all consumer categories) as a percentage of average cost was reported to be 51% for the year 1990-91 (Table 4.6). In such a situation, the Board could not maintain its financial viability. It had to resort to borrowing even to meet its current expenditure needs. The Board was leading towards financial bankruptcy. It was in such a state of affairs that the State Government started reforms to overcome the technical as well as financial problems. The Government of Punjab (GoP) started reform process in 1999. At the outset, Punjab State Electricity Regulatory Commission (PSERC) was constituted to regulate the distribution, transmission and generation functions at the state level. Later, the Electricity Act 2003 was enacted by the central government. Hence, the functioning of power sector
as well as PSERC are now governed by various provision of the Electricity Act 2003. As per provisions of the Act, the regulator is required to strike a balance between the interests of the consumers and the electricity distribution company. Hence, the Commission is expected to act as an autonomous and independent authority for making fair and just decisions. The Commission has adopted Revenue Requirement methodology for approving the tariff payable. Under this method the tariff is approved for some specific period generally one financial year. Regulated company is required to submit projections of Annual Revenue Requirement (ARR) each year, three months before the commencement of the ensuing financial year i.e. by 31st of December of the current financial year. The tariff making process is expected to be completed within three months so that new tariff order could be implemented with effect from the 1st of April, (the first day) of the ensuring financial year. However, during most of the past years, the PSERC was not able to issue the Order within stipulated date and time.

After undertaking reforms, some serious efforts were made on part of the PSEB to improve the technical and financial performance. Improvement in the capacity utilisation of thermal plants was one important area where the PSEB showed a remarkable performance. Before the initiation of power sector reforms, the performance of thermal plants owned by state of Punjab
was not satisfactory. In 1980-81, the average PLF of Punjab’s Thermal Power Stations was just 34.6. It showed some improvements in the PLF and it increased to the level of 59% in 1985-86. However, it was not very satisfactory. From 1996-97 onwards, the thermal plants of the state have shown significant improvement in the rate of capacity utilization especially of the new generating plants and it was reported to be one of the best performing generation utilities in India. The PLF reported by PSEB increased from 66% in 1990 to 88% in 2009-10. Due attention was provided to the repair and maintenance work of the power plants. Consequently, the PLF of PSEB remained much above the all India average during most of the post reforms period. However, there were high variations in the PLF reported by various power plants of PSEB. The performance of GNDTP Bhatinda power station was not very much satisfactory in comparison to other plants. The PLF reported by GNDTP Bhatinda was 71% in comparison to 96% as reported by GHTP Lehra Mohabat in FY 2009-10. So, there is scope for further improvement in the overall Plant Load Factor (PLF) if proper renovation and modernization work is undertaken.

The auxiliary consumption of thermal power stations of Punjab was much lower than all India average. In the FY 2008-09, the auxiliary consumption of the power plants of PSEB was reported to be 6.18% while it
was estimated to be 8.36% for the national average. However, it showed an increasing trend in the auxiliary consumption. In the recent years, the auxiliary consumption has increased significantly. The auxiliary consumption in Punjab has increased from 4.49% in 1994-95 to 6.18% in 2008-09. The main reason for this is the old life of the power plants. Over the time, the plants are becoming older, requiring high auxiliary consumption of power. So, there is a need for taking proper maintenance of power plants so that the auxiliary consumption is reduced further.

Like other states, high Transmission and Distribution losses (T&D losses) were identified as one of the main reasons responsible for poor performance of the Punjab State Electricity Board (PSEB). It was reported in the range of 20% to 28% during the period of 1991-92 to 2008-09 where as the maximum acceptable limit is about 15% as per norms and standards laid down at the national as well as international levels. Though, some progress was reported on part of PSEB in reducing the Transmission and Distribution losses, however, there is further need to reduce the energy losses so that the commercial losses of the Company are reduced to acceptable levels.

Another major problem regarding T&D losses was the accurate estimation of the energy losses in agriculture sector where the supply was not metered. Therefore, it was not possible to make a reliable estimate of the
consumption made by the agricultural sector. At the same time, distribution companies have a tendency to overestimate the agricultural consumption to show better performance in terms of reduction in the transmission and distribution losses. The Punjab State Electricity Regulatory Commission (PSERC) has repeatedly questioned the estimates of the agricultural consumption and the energy losses projected in the Annual Revenue Requirements. It also used some alternative methodology to make an accurate estimation of the energy consumption made by agriculture sector. It was established that PSEB has been overstating the electricity consumption of the agriculture sector so that it can understate the energy losses.

It was observed in the tariff orders passed by the PSERC that the Commission has started questioning the estimates of agricultural consumption made by PSEB (Tariff Order Passed by the PSERC dated 06.09.2002). It was observed that the actual losses were much higher than the claims made by utilities. The PSERC has started lifting up the energy losses to make a reliable estimate of energy losses. That is why in the post 1999-2000 periods, estimates are much higher than what were earlier reported by the Board.

Recovery of electricity dues from consumers is also an important determinant of the financial position of the concerned utility. In the pre-
reforms period, under recovery of consumer dues was identified as one of the major factors responsible for the poor financial health of the Punjab State Electricity Board. This point was also highlighted in the report of Expert Group on Power constituted by Government of Punjab in 2003.

It was observed that in the recent times the recovery of dues has increased significantly. It has been reported to be about 100% during the period from FY 2004-05 to 2009-10 except FY 2008-09. It is an indicator of improving financial performance of the distribution company.

Aggregate Technical and Commercial losses (AT&C) losses was used as a composite aggregate measure to assess the efficiency level in reducing the energy losses and increasing collection efficiency of a distribution company. The AT&C losses were lower in Punjab than the all India Average. The A&C losses were reported to be 17% in Punjab in comparison to 23% for all India average in the FY 2009-10. It was observed that the most effective contributing factor towards the loss reduction is the improvement in the revenue recovery from consumers. Because of increase in the revenue recovery of dues, the AT&C losses have declined rapidly. However, there is still huge scope for the state to further reduce the energy losses.
Overall profitability of a utility depends upon its technical and financial performance. A utility is said to be financially viable if it is able to cover not only its operating expenses but also earn a reasonable rate of return on its capital base. Appreciating this, an amendment was made in the Electricity (Supply) Act, 1948 requiring respective SEBs to earn a minimum rate of return of 3 per cent on its average capital base after meeting all operating expenses. However, like most of the SEBs in the country, the financial performance of PSEB did not remain attractive over the period of time. Under the pressure of the state government, the tariff for some categories of consumers such as agriculture was very low in comparison to the cost of supplying power. Therefore the PSEB was not able to recover the total cost of supplying power in the state.

It was observed that increase in average cost of supply was more than the average revenue realized from the consumers. The average cost of supply increased from 107 paise per unit in 1990-91 to 332 paise per unit in 2009-10. During the same time period, the average tariff increased from 55 paise per unit in 1990-91 to 223 paise per unit in 2009-10. Consequently, the gap increased rapidly. The revenue gap (including the subsidy received from the state government) increased from 52 Paise per unit in 1990-91 to 109 Paise per unit in 2009-10. It shows that PSEB was unable to recover its cost
through tariff. It resulted in poor financial performance of the electricity Board. Hence, PSEB should undertake some effective remedial measures to increase the average revenue realisation and cut down the avoidable & wasteful expenses.

Moreover, the analysis of the realised average revenue shows that the cost recovery from various consumer categories did not have any relation to the cost of supplying electricity. The average tariff applicable to various consumer categories differs widely. The tariff payable by the Domestic and Agricultural consumer categories was very low. These consumer categories are charged below the average cost incurred for supplying electricity to them. For example in 1991-92, the Agriculture and Domestic consumer category were charged only 10 paise and 87 paise per unit respectively while the average cost of supply was 94 paise per unit. On the other hand some consumer categories such as Commercial & Industrial etc. were paying comparatively much higher tariff. The tariff for Commercial users was 161 paise per unit in 1991-92. It implies that the Commercial consumers were generating 67 paise per unit as surplus revenue to cross-subsidise the agriculture sector. It shows there was high cross subsidisation in the power sector. Industrial and Commercial consumers were generating surplus revenue to cross-subsidise the agriculture sector.
It was observed that in FY 2009-10 the average revenue realised from commercial sector was Rs. 4.93/Kwh. It was the highest tariff applicable to various categories of consumers. The average revenue realized from commercial consumers was higher than the average cost of supply for the period from 1991-92 to 2009-10 (Table 4.7). At the same time, Industrial consumers have also been paying higher tariff than the average cost of supply. The average revenue received from the domestic and agriculture consumers was lower than the average cost of supply of the system. Hence, we can say that cost recovery from commercial and industrial sector was above 100%. Cost recovery represents the ratio of revenue realized to the average cost of supply applicable to various consumers. However, in case of Domestic and Agriculture consumer categories, the cost recovery ratios were less than 100%. Moreover, from 2000-01 onwards, the cost recovery from agriculture sector was nil excluding the subsidy received from the state government.

In Punjab, the farm sector is being provided free power supply for the purpose of irrigation. Though the provision of free power supply has been criticized severely in the National Electricity Policy (2005) as well as Electricity Tariff Policy (2006). However, the State Government has been providing subsidy to compensate for the losses incurred by utility. It was
observed that most of the time the subsidy paid by the government was not adequate to compensate the full cost of supply on account of free power supply to agriculture sector. This results into huge financial losses to the distribution utility.

As a result of free power supply, the electricity consumption of farm sector has increased at a much higher rate. Consequently, the subsidy bill on the government has increased rapidly. The amount of agriculture subsidy payable by the state government has increased from Rs.499 crore in 1990-91 to Rs. 1313 crore in 1998-99, and to Rs. 3144 crore in 2009-10. Moreover, the subsidy as a percentage of total revenue received though tariff has also increased very rapidly. The percentage share of subsidy has increased from 15% in 2004-05 to 38% in 2009-10. It can be safely concluded that the ability of the distribution company to generate adequate revenue has declined significantly in the recent years. The high dependency on the public exchequer for the purpose of meeting current expenditure is not a good signal for the sound financial health of electricity distribution company.

Like the other SEBs, PSEB pursued the policy of cross subsidization to generate the surplus revenue to compensate for the losses on account of subsidized sale of electricity to Agricultural and Domestic consumer categories. However, the State Government was unable to pay full amount of
subsidy on account of free power supply to Agricultural sector and cheap power made available to some Domestic users. Therefore the Commercial and industrial users were required to generate surplus revenue to compensate for the losses of distribution company. The average recovery of cost was reported over 100% for commercial and industrial consumer categories.

Because of poor financial performance of the distribution company, the profitability of the company has been adversely affected. The utility was unable to recover the cost of supply. The commercial losses including subsidy received from the State Government, have increased from 580 crore in 1990-91 to 1585 crore in 2009-10 (Table 4.10).

**Issues in Tariff Regulation**

After its constitution, PSERC has issued twelve tariff orders on the Annual Revenue Requirements (ARR) filled by the Punjab State Electricity Board (PSEB) as well as Punjab State Power Corporation Limited (after its reconstitution in April 2010). The Commission has repeatedly observed that during most of the years, the data supplied by the utility was not reliable and up to date. There was a need to strengthen the quality of database available with the utility. However, certain directions were issued by the Commission in order to improve the technical and financial performance from time to time.
Like most of the Indian states, PSERC has used the rate of return method to assess the revenue requirement of the utility. Under this method, Annual revenue requirement is estimated on the basis of expected cost and a reasonable return on the capital invested in the business. Theoretically, there should be no significant difference between the cost approved by the Commission and the actual cost incurred by the utilities. However, this was not a reality for most of the times in power sector of Punjab. Many times, there were significant differences observed between the actual performance of PSEB and the targets fixed by the PSERC. Therefore, the Commission had to initiate true-up exercises almost every year to make adjustments between the approved amounts and actual performance made by the regulated company.

The cost of power purchase is a major cost item. It accounts for more than 70% of the total cost of power supply. Unsurprisingly, the Commission has very little discretionary power to control the cost of power purchased from outside sources. The rates of power purchase from Central Power Undertakings (CPUs) and the utilities shared with other states were approved by the Central Electricity Regulatory Commission (CERC).

As stated earlier, one remarkable achievement in the generation segment was the improvement in the Plant Load Factor. Because of the
pressure created by PSERC, there was significant improvement in the PLF. Consequently, three was a positive impact on the cost of power generation. Per unit cost of power purchase was minimum in Punjab among all the selected states (Table 5.9).

The employees cost is the second major item in the total cost of supplying power. The Commission has estimated that the PSEB was overstaffed and there was an urgent need to improve the productivity of the manpower. But the Board did not make any plan to make optimal use of available human resources.

It is observed that the share of terminal benefits was very high in the total employee cost. This is because of the deferred liability passed on by the erstwhile PSEB. As per the standard norms, the terminal benefits should be paid out of the financial contribution made towards provident fund, pension etc. during in-service period of the employees. However, it did not happen in case of PSEB. The Board utilized the contributions made by erstwhile employees for meeting its current expenses. For example the share of terminal benefit approved was reported to be 40% as per the tariff order issued for FY 2011-12.

The current pattern of consumption made by different categories was highly inefficient and costly. If this pattern was allowed to be continued in
the coming years, the requirement for additional generating capacity will be very high. It would require huge investment in establishing the generating capacity, transmission and distribution networks in the State. The consumption pattern for the FY-1980-81 to FY-2000-10 shows that the growth rates of consumption for various categories of Consumers were very high. The overall growth rate was reported to be 7% during this period. The growth rates were estimated to be 10%, 10%, 6% and 5% for the Domestic, Commercial, Agriculture and Industrial consumer categories respectively during the period FY-1980-81 to FY-2009-10 (Table 3.7). It shows that the high growth rates in the consumption of all the consumers contributed in increasing the energy demand in future.

The comparative analysis of the selected states shows that all the state governments (Punjab, Andhra Pradesh, Maharashtra, west Bengal & Karnataka) had provided major budgetary support to the development of the power sector. The relative shares of power sector in total plan expenditure were highest in all the selected states. On an average, about one third of the total plan expenditure was spent on the development of power sector. Consequently, the rapid growth rates were reported in the expansion of generating capacity and distribution networks. Due to sustain efforts made
on part of government, the per capita consumption of power has increased manifolds.

Punjab State Electricity Board (PSEB) showed significant performance in improving Plant Load Factor at the generation level. The reported PLF in Punjab was higher in Punjab among the selected states in FY 2009-10. It helped the PSEB in reducing the cost of energy as well as addressing the energy shortages in the state.

Auxiliary consumption in Punjab was reported less than other states except Karnataka in the FY 2009-10. The auxiliary consumption of West Bengal was higher among the selected states as well as national average. Therefore, the comparative position of Punjab is better among these states.

In the pre reform period, the reported T&D losses of power distribution utilities including Andhra Pradesh, Karnataka and West Bengal were very high. However, after the initiation of reforms process, significant improvements were reported in the reduction of T&D losses. One important reason for this was the enforcement of regulation and pressure made by respective regulatory commissions to reduce the energy losses.

AT&C losses were reported higher in Punjab the level achieved by Andhra Pradesh. However, PSEB has made remarkable performance in the
reduction of AT&C losses. Consequently, the AT&C losses level in Punjab was reported as one of the lowest in the country.

All the states had improved the revenue collection efficiency. Recently, the collection efficiency in Punjab as well as other states was reported to be approximately 100%. Full recovery of billed amount is an indicator of improved financial performance of the distribution business.

The position of the Utility in terms of quick ratio was better in pre reform period because quick ratio was in the range of 1.85:1 to 1.17:1 in that period. It satisfied the specified benchmark for the quick ratio is 1:1 but after the reform process it was less than1:1 and was reported in the range of 0.85:1 to 0.97:1 that was not acceptable for the financial health of the utility.

The position of the utility in term of cash ratio was better in pre reform period in spite of post reform period because cash ratio was equal to its benchmark (.05:1) in this period but in the post reform period in FY 2005-06 and 2006-07 it was 0.02:1 which was a worse position for the utility but after taken remedial measure by the utility it again reached 0.5:1 in 2007-08.

Current assets turn over ratio was in the better position in post reform period than pre reform period. It was 1.50 in pre reform period and after reform it was greater than 2.00.
Gross profit margin ratio showed decreasing trend in the pre reform period. It was 6% in 1996-97 reached 1% in 1997-98 but again increased and reached 5% in 1998-99, but after the reform process it became negative and there was a net loss of 23% in 2007-08 then the utility had taken remedial measure to control it but succeed only 5% and there was a loss of 18% in 2007-08 and 11% in 2008-09 but the loss again increased in 2009-10 and reached 16%.

Net profit showed a decreasing trend during the period under consideration. It was 4% in 1996-97 decreased and reached 2% in 1998-99. But after the reform process it became negative and there was a loss of 23% in 2006-07 which was a very dangerous position for the Utility. Then PSEB took remedial measures to control it and the loss has decreased in 2008-09 and reached 12% but it again increased in 2009-10 and reached 16%.

Interest and finance charges were between 12% to 28% in total sale and 18% in total expenditure. Net capital was negative in 2006-07 that is why Capital employed was decreased in that year. Return on capital employed was negative all over the period under consideration except 2009-10.

After evaluating the experience of reforms process in the state, it is concluded that after reforms process, the PSPCL has made some effort to
improve the technical as well as financial performance. However, the
distribution business of the company was making huge commercial losses.
Most of the power supply to agriculture was un-metered. The subsidy paid
by the government was not adequate to cover the losses. Hence, there is a
urgent need to take some effective steps to improve the technical and
financial performance of the utility. In order to make some improvement in
the performance of the Punjab power sector, the following suggestions are in
order:-

**Policy Suggestions**

- The utility should improve its information and database system. The un-
  metered supply should be stopped at the earliest possible time. All power
  supply including agriculture and others should be metered. Only the metered
  supply can ensure proper and efficient use of electricity by stopping the
  wastage of electricity and making the consumers accountable.

- Attempts may be made to make the system more transparent and
  accountable. There is still a lack of transparency and accountability in the
  system. The personal responsibility of the employees/ authorities should be
  fixed for the performance made along with appropriate incentives/
  disincentives for efficiency improvements.
• High T&D loss level was the main cause for the poor financial performance of the PSEB. The energy available should be monitored and audited at the circle/division levels of the utilities. Responsibilities of the authorities should be fixed to plug these high levels of technical and financial losses.

• The utility should monitor the system regularly at the consumer end regarding connected load, consumption, metering, billing and payments etc. to plug the energy and revenue losses. It will help the utility in reducing the commercial losses.

• The PSERC should force the PSPCL to ensure better financial management of the system. The loans may be approved only after making a proper Cost Benefit analysis of the projects under consideration. The State Government may be asked to share the burden of loans that were borrowed due to bad financial management of the erstwhile Punjab State Electricity Board (PSEB).

• State Government should issue policy directions only after consulting the Commission. The autonomous status of the Commission should be maintained by assisting the Commission in a proper and desired way. The State Government should be made to pay the full amount of subsidy in cash on account of free power supply to agriculture sector.