

## Chapter III

### Performance review relating to a Statutory corporation

#### Punjab State Electricity Board

#### Performance audit of generation of power

##### Executive Summary

*The Punjab State Electricity Board was not able to recover its cost of operations. Due to phenomenal growth in the demand for power since 2005-06, the capacity addition was not adequate to meet the requirement leaving a deficit of 4232 MW at the end of 2009-10. In the background of chronic power shortage in the State, it was considered desirable to conduct performance audit to assess the status of power generation vis a vis requirement for power during the period 2005-06 and 2009-10. The audit findings are summarised below:*

##### *(I) Capacity additions*

*During 2005-10, the peak demand for power had increased by 2,078 MW, but the capacity addition was only 937 MW. Though 7,799 MW of power would have to be added by the end of 11<sup>th</sup> plan (2012), the Board had planned to add additional capacity of 4,986 MW only and the capacity likely to be added is 2,438 MW leaving a deficit of 5,361 MW. Thus, the State is perennially in power shortage and unlikely to meet the national objective of power for all on demand by 2012.*

*The failure of the State to maintain pace with the demand for power was interalia due to financial constraints of the Board, chronic delays and indecisiveness in taking decisions by the Board, failure to undertake annual repair and maintenance and renovation/modernization of the power plants in time.*

##### *(II) Operational Performance*

*Performance of the existing generation stations depends on efficient use of material, man power and capacity of the*

*plants so as to generate maximum energy possible without affecting the long term operation of the plants. Audit of operation of the power stations revealed the following:*

##### *a) Consumption of coal*

*Due to failure of the Board to provide the requisite certificate of calibration of weigh bridges, the coal companies did not allow compensation of ₹ 3.76 crore towards shortage of coal supplied by them. Due to use of coal having less gross calorific value, high heat rate and leakages of steam in the aging units of power plants, there was excess consumption of coal to the tune of 75.48 lakh MT (₹ 1,808.98 crore) in two plants during 2005-10.*

##### *b) Deployment of man power*

*The Board had 64,308 employees as on 31 March 2010 and the employee cost was 16.32 to 19.55 percent of the total expenditure during 2005-10. The actual manpower was more than the norms of CEA in all the power generating stations except GHTP, Lehra Mohabbat during 2005-10. In respect of GNDTP Bathinda and GGSSTP Ropar, the manpower reduced from 2751 and 3585 to 2237 and 3239 respectively during review period. Hydel Power Stations had surplus manpower of 203 in 2005-06 and reduced to norm at the end of 2009-10.*

##### *c) Plant load factor*

*The average PLF of thermal power plants of the Board as a whole (79.18 per cent, 82.94 per cent, 87.42 per cent, 86.33 per cent and 88.96 per cent) was above the national average (73.71 per cent, 77.03 per cent, 78.75 per cent, 77.22 per cent and 77.48 per cent) throughout the*

review period. But the PLF of GNDTP, Bathinda was lower than the national average due to delay in taking up the renovation work of the plant.

#### **d) Outages**

Planned outages and forced outages in thermal power stations decreased from 13971 hours (13.29 per cent) in 2005-06 to 7507 hours (6.50 per cent) in 2009-10 and forced outages from 5,035 hours (4.79 per cent) in 2005-06 to 3,419 hours (2.96 per cent) in 2009-10

In the case of hydel power plants, the planned outages increased from 25,724 hours (9.47 per cent) in 2005-06 to 29,437 hours (10.84 per cent) in 2009-10 of the total available hours and they were more than the All India Average of 5.66 per cent (2007-08). Similarly, the forced outages in the hydel plants increased from 46,675 hours (17.18 per cent) in 2005-06 to 72,400 hours (26.66 per cent) in 2009-10 as compared to the All India Average of 2.34 percent (2007-08) due to non carrying out of renovation and modernization of the power plants as per plan.

#### **e) Auxiliary Consumption**

Auxiliary consumption of power was higher than the PSERC norm of 11 per cent in the case of GNDTP Bathinda resulting in excess consumption of 78.86 million units valuing ₹ 26.89 crore during 2005-06 to 2009-10. In the case of Shanan hydel power station, it was very high ranging from 1.19 per cent to 1.79 percent against the norm of 0.50 per cent fixed by PSERC.

#### **(III) Renovation & Modernisation**

Annual maintenance of majority of the thermal and hydel power stations in the State was carried out after delays ranging from six to 36 months adding to the deterioration of the plants.

In the case of GNDTP, Bathinda there were delays in the renovation and modernization of the generation units leading to loss of 1,775 million units of power. After renovation, some of the

envisaged norms of performance had not been realised. The R&M work of UBDC hydro electric project scheduled during the 10<sup>th</sup> five year plan (2003-04 to 2006-07) had not been carried out due to delayed approval of financial plan.

#### **(IV) Environmental issues**

All the thermal plants of PSEB were running without consent of the Punjab Pollution Control Board. The levels of suspended particulate matters in GGSSTP stage I and GNDTP stage I ranged from 65 to 161 mg/Nm<sup>3</sup> and 101 to 149 mg/ Nm<sup>3</sup> respectively as against the designed level of 100 mg/ Nm<sup>3</sup>. At GGSSTP, Ropar, waste water from the plant was discharged without any treatment into natural rivulet which ultimately enters the river Sutlej. GNDTP, Bathinda and GGSSTP, Ropar stations failed to bring down the pollution to specified levels and as a result the Board made avoidable payment of water cess of ₹ 16.83 crore during 2005-06 to 2009-10.

#### **(V) Conclusion and Recommendations**

The Punjab State Electricity Board had been initiating projects from time to time for augmenting power generation in the State. However, there are many projects which had been delayed badly and remained to be commissioned. While the Board has been running its thermal stations satisfactorily meeting the performance parameters, the performance of its hydel stations was below the standards.

We have made eight recommendations to improve the power scenario in the State. Vigorous pursuance of capacity addition programs by exploiting all conventional and non conventional potential resources of energy so as to meet the national objective of power for all by 2012, rational deployment of the manpower and carry out the renovation & modernisation activity in time are some of these recommendations.

## Introduction

**3.1** Power is an essential requirement for all facets of life and has been recognized as a basic human need. The availability of reliable and quality power at competitive rates is very crucial to sustain growth of all sectors of the economy. The Electricity Act, 2003 provides a framework to develop the power sector, promote transparency and competition and protect the interest of the consumers. In compliance with Section 3 of the Act, the Government of India, in consultation with the State Governments and the Central Electricity Authority, prepared the National Electricity Policy in February 2005 for development of the power sector by optimal utilisation of resources like coal, gas, nuclear fuel, hydro and renewable sources of energy.

At the beginning of the year 2005-06, the total installed capacity of power generation in the State of Punjab was 5,964 Mega Watt (MW) and the effective peak available capacity was 4,834 MW against the peak demand of 7,708 MW during the year 2005-06, leaving peak time deficit of 2,874 MW. Electricity requirement in terms of units was assessed as 35,935 million units (MU) against which 33,651 MU were available leaving a shortfall of 2,284 MU. As on 31 March 2010, the total installed capacity of power generation increased to 6,901 MW and the effective peak available capacity was 5,554 MW against the peak demand of 9,786 MW during the year 2009-10, leaving a gap of 4,232 MW. Electricity requirement in terms of units was assessed as 46,426 MU against which 40,741 MU were available leaving a shortfall of 5,685 MU. Thus, there was a phenomenal growth in peak demand by 2,078 MW, whereas the capacity addition was only 937 MW during 2005-10. To bridge the gap, the Punjab State Electricity Board resorted to heavy purchase of power and cyclic load sheddings.

In the back ground of chronic power shortage in the State and the Government of India's policy to provide power for all by 2012, it was considered necessary to undertake performance audit of power generation in the State.

## Organisational set up

**3.2** In Punjab, generation of power is primarily carried out by the Punjab State Electricity Board (Board), which was incorporated in May 1967 under the administrative control of the Power Department of the Government of Punjab. The Management of the Board was vested with a Board of Members comprising of seven members appointed by the State Government. Six members, including the Chairman, were the whole time members and one Ex-officio member was representative of the Punjab Government. The day-to-day operations were monitored by the Chairman, with the assistance of regular five members.

The turnover of the Board was ₹ 11,833.82\* crore in 2009-10, which was equal to 56.85 per cent and 6.15 per cent of the turnover of the State Public Sector Undertakings and State Gross Domestic Product, respectively. The

---

\* Including tariff compensation from the State Government ₹ 3,144.25 crore.

Board employed 64,308 employees as on 31 March 2010, of which 8,052 were engaged in generation activity. The Board has been unbundled (16 April 2010) into two companies namely the Punjab State Power Corporation Limited (Powercom) for generation, trading and distribution of power and the Punjab State Transmission Corporation Limited (Transco) for transmission of power in the State. It is, however, observed that functions of the generation and distribution wings are diverse and inherent problems of the latter dilute the prospects of the former. As such the present arrangement of keeping the functions of generation and distribution with one company (Powercom) may not be conducive to have focused and effective arrangement and to achieve the generation targets. The Board may consider setting up of a separate company for generation on the lines of practices followed in the other States.

### Scope and methodology of audit

**3.3** The performance audit conducted during December 2009 to May 2010 covered the activities relating to generation of power by the Board during the period from 2005-06 to 2009-10. The performance audit mainly deals with planning, project management, financial management, operational performance, environmental issues and monitoring by the top management. The audit examination involved scrutiny of records at the Board's Head Office and three thermal and eight hydel power generating stations having installed capacity of 2369 MW \* out of the 14 stations having total installed capacity of 3630 MW of the Board.

The audit methodology consisted of explaining the audit objectives to the top management during an entry conference held on 14 January 2010, scrutiny of records at the Head Office and selected power generating stations, interaction with the auditee personnel, analysis of data with reference to the audit criteria, raising of audit queries, discussion of the audit findings with the management and issue of draft performance audit report to the Management for comments.

### Audit Objectives

**3.4** The following were the objectives of the performance audit.

#### *Planning and Project Management*

- To assess whether the capacity addition programmes taken up / to be taken up in the State were in line with the National policy of power for all by 2012;
- To assess whether there was optimization of generation of power in the existing generation stations; and

---

\* Two coal based thermal stations – Guru Nanak Dev Thermal Plant, Bathinda (440 MW) and Guru Gobind Singh Super Thermal Plant Ropar (1,260 MW); three hydro stations- Ranjit Sagar Dam Shahpur Kandi (600 MW-Punjab share: 452.4 MW), Shanan Power House Joginder Nagar (110 MW), Uppar Bari Doab Canal Hydro Power Station Malikpur (91.35 MW) and five micro hydel stations (5.6 MW) at Nadampur, Rohti, Thuhi, Daudhar and Ropar and one rice straw based thermal station at Jalkheri (10 MW).

- To ascertain whether the award of contracts and execution of projects were managed economically, efficiently and effectively.

#### ***Financial Management***

- To assess the soundness of financial health of the Board and
- To ascertain whether the funding for the new projects and upgradation of the existing generating units were adequate.

#### ***Operational Performance***

- To assess whether requirements of fuels were worked out realistically, procured economically and utilised efficiently;
- To assess whether the manpower requirement was realistic and utilised effectively;
- To assess whether the prescribed preventive maintenance was carried out in time to minimise the forced outages; and
- To assess whether the life extension (renovation and modernization) programmes were identified in time and carried out in economic, effective and efficient manner.

#### ***Environmental Issues***

- To assess whether the various types of pollutants in the power stations were within the prescribed norms and whether the power stations complied with the statutory requirements.

#### ***Monitoring and Evaluation***

- To ascertain whether adequate Management Information System (MIS) existed in the Board to monitor and assess the impact of various schemes and utilize the feedback for future plans.

### **Audit Criteria**

3.5 The audit criteria adopted for assessing the achievement of the audit objectives were:

- National Electricity Plan, norms and guidelines of the Central Electricity Authority (CEA) regarding planning and implementation of the projects;
- Standard procedures for award of contract with reference to principles of economy, efficiency and effectiveness;
- Targets fixed for generation of power;
- Parameters fixed for plant availability, plant load factor etc;
- Performance of the best units in the regions/all India levels;
- Prescribed norms for planned outages; and
- Acts relating to environmental issues.

### Financial Position and Working Results

3.6.1 The financial position of the Board for the five years ending 2009-10 is given below.

Particulars	(₹ in crore)				
	2005-06	2006-07	2007-08	2008-09	2009-10 (Provisional)
<b>A. Liabilities</b>					
Paid up Capital	2,946.11	2,946.11	2,946.11	2,946.11	2,946.11
Reserve & Surplus (including Capital Grants but excluding Depreciation Reserve)	3,980.00	4,307.41	4,705.05	5,146.64	5,681.58
Borrowings	8,887.02	11,285.24	13,246.13	15,815.54	17,346.69
Current Liabilities & Provisions	2,350.87	2,590.28	3,497.89	3,390.41	4,026.88
<b>Total</b>	<b>18,164.00</b>	<b>21,129.04</b>	<b>24,395.18</b>	<b>27,298.70</b>	<b>30,001.26</b>
<b>B. Assets</b>					
Gross Block	14,778.82	15,413.59	16,420.74	18,431.77	20,438.00
Less: Depreciation	6,085.68	6,770.84	7,414.33	8,092.43	8,883.06
Net Fixed Assets	8,693.14	8,642.75	9,006.41	10,339.34	11,554.94
Capital works-in-progress	2,035.95	3,281.49	3,784.79	3,264.57	2,931.29
Investments	253.79	278.08	709.54	1,233.25	1,867.34
Current Assets, Loans and Advances	2,826.98	2,946.20	3,524.31	4,050.31	4,017.12
Accumulated losses	4,354.14	5,980.52	7,370.13	8,411.23	9,630.57
<b>Total</b>	<b>18,164.00</b>	<b>21,129.04</b>	<b>24,395.18</b>	<b>27,298.70</b>	<b>30,001.26</b>

The accumulated losses of the Board increased year after year and the entire capital including reserves had been eroded at the end of 2008-09. The main reasons for this state of affairs was the Board's failure to achieve the performance parameters and targets set by the Punjab State Electricity Regulatory Commission as discussed in paragraph-3.18 and over-dependence on purchase of power.

3.6.2 The details of working results like cost of generation of electricity, realisation of revenue and cost *per* unit of power sold are given below.

(₹ in crore)

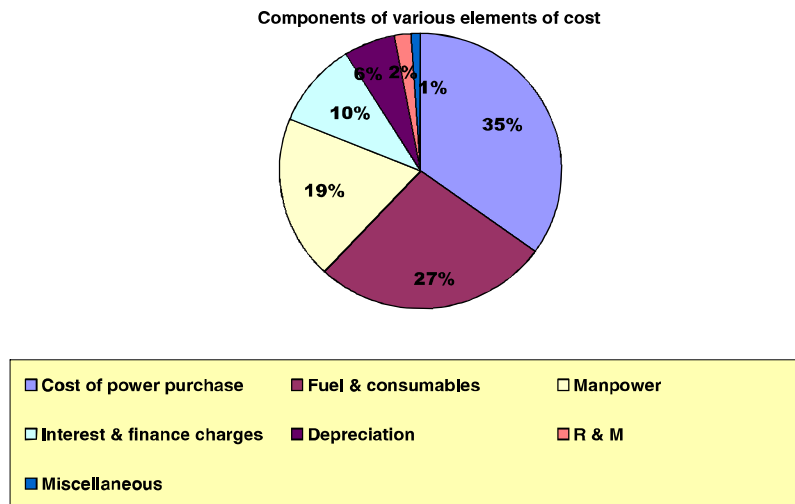
Sl. No.	Description	2005-06	2006-07	2007-08	2008-09	2009-10 Provisional
<b>1.</b>	<b>Income</b>					
	Revenue from sale of power	6,701.08	7,030.96	7,913.14	9,010.34	8,689.57
	Other income including interest/subsidy	1,635.16	1,677.84	3,169.75	2,904.85	3,501.90
	<b>Total income</b>	<b>8,336.24</b>	<b>8,708.80</b>	<b>11,082.89</b>	<b>11,915.19</b>	<b>12,191.47</b>
<b>2.</b>	<b>Generation</b>					
	Total generation (MUs)	24,642.59	23,964.70	25,500.34	26,851.12	27,662.17
	Less: Auxiliary consumption (MUs)	1,438.70	1,427.92	1,556.01	1,658.32	1,760.44
	Net generation	23,203.89	22,536.78	23,944.33	25,192.80	25,901.73
	Power Purchased (MUs)	10,447.21	13,726.53	16,973.77	14,850.50	14,838.92
	Total power available (MUs)	33,651.10	36,263.31	40,918.10	40,043.30	40,740.65
	Less: Transmission and Distribution Losses (MUs)	8,187.48	8,367.09	8,796.27	7,416.02	8,042.85
	<b>Total power sold (MUs)</b>	<b>25,463.62</b>	<b>27,896.22</b>	<b>32,121.83</b>	<b>32,627.28</b>	<b>32,697.80</b>
<b>3.</b>	<b>Expenditure</b>					
<b>(a)</b>	<b>Fixed cost</b>					
(i)	Employees cost	1,627.36	1,751.48	2,035.28	2,202.04	2,495.48
(ii)	Administrative and General expenses	58.01	59.20	69.70	70.97	75.51
(iii)	Depreciation	583.86	603.79	665.15	693.73	796.85
(iv)	Interest and finance charges	952.63	884.29	863.62	1,194.59	1,309.55
	<b>Total fixed cost</b>	<b>3,221.86</b>	<b>3,298.76</b>	<b>3,633.75</b>	<b>4,161.33</b>	<b>4,677.39</b>
<b>(b)</b>	<b>Variable cost</b>					
(i)	Fuel consumption					
(a)	Coal	2,258.42	2,333.90	2,496.89	2,933.99	3,485.59
(b)	Oil	18.36	19.19	38.33	130.66	50.65
(c)	Other fuel related cost including shortages/surplus	111.11	79.26	92.77	87.76	85.80
(ii)	Cost of water	12.44	12.37	13.49	13.18	13.83
(iii)	Lubricants and consumables	3.08	3.81	4.08	5.91	6.93
(iv)	Repair and maintenance	223.00	267.66	274.14	317.37	358.94
(v)	Miscellaneous expenses	70.16	(-) 6.77*	(-) 101.33*	122.05	80.67
(vi)	Cost of power purchased	2,404.92	4,327.01	6,020.37	5,184.05	4,651.02
	<b>Total variable cost</b>	<b>5,101.49</b>	<b>7,036.43</b>	<b>8,838.74</b>	<b>8,794.97</b>	<b>8,733.43</b>
	<b>Total cost 3(a) + (b)</b>	<b>8,323.35</b>	<b>10,335.19</b>	<b>12,472.49</b>	<b>12,956.30</b>	<b>13,410.82</b>
4.	Realisation (₹ per unit)	3.27	3.12	3.45	3.65	3.73
5.	Fixed cost (₹ per unit)	1.27	1.18	1.13	1.27	1.43
6.	Variable cost (₹ per unit)	2.00	2.52	2.75	2.70	2.67
7.	Total cost (₹ per unit) (5+6)	3.27	3.70	3.88	3.97	4.10
8.	Contribution (Paise per unit) (4-6)	1.27	0.60	0.70	0.95	1.06
9.	<b>Profit (+)/Loss(-) (Paise per unit) (4-7)</b>	<b>0</b>	<b>(-) 0.58</b>	<b>(-) 0.43</b>	<b>(-) 0.32</b>	<b>(-) 0.37</b>

The Board always incurred loss per unit of energy sold except during 2005-06.

### Elements of Cost

3.6.3 Power purchase, fuel and manpower constituted the major elements of costs. The break-up of costs for 2009-10 is given below in the pie-Chart.

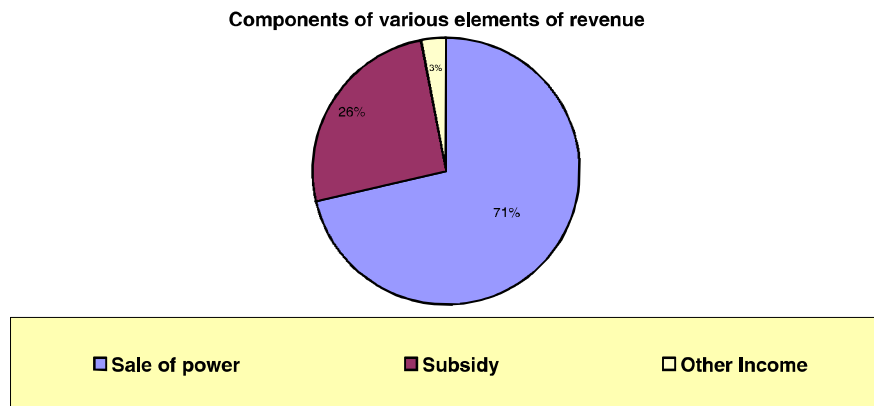
\* The figures are negative due to prior period adjustments



We observed that due to inadequate capacity addition, the Board’s dependence on power purchase increased progressively and the cost of power purchase increased from 29 per cent (10447 MUs valuing ₹ 2,405 crore) in 2005-06 to 35 per cent (14839 MUs valuing ₹ 4,651 crore) in 2009-10.

**Elements of revenue**

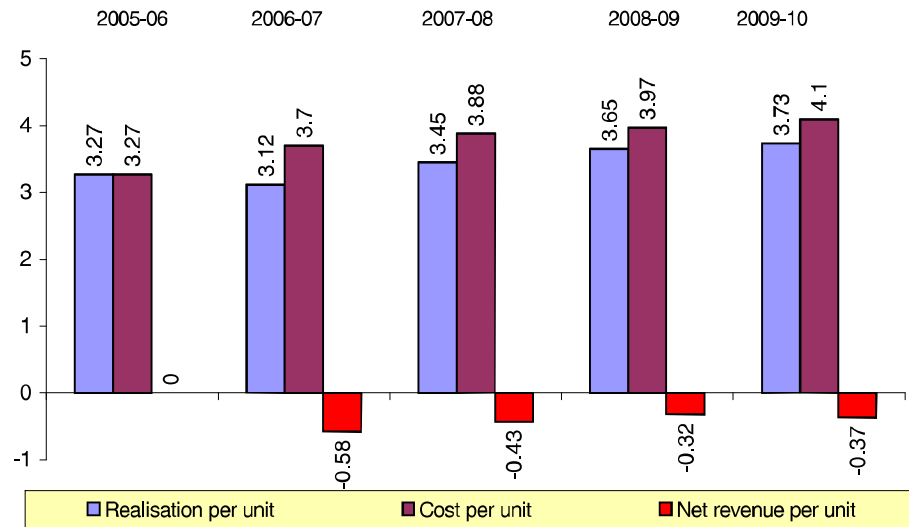
**3.6.4** Sale of power constituted the major elements of revenue. The break-up of revenue for 2009-10 is given below in the pie-chart.



**Recovery of cost of operations**

**3.6.5** The Board was not able to recover its cost of operations during the review period (except 2005-06) as given in the chart below:





Had the total revenue earned by the Board been sufficient to cover the cost during 2006-07 to 2009-10, an additional amount of ₹ 5,276 crore would have been available for capacity addition/ life extension of the power stations and other programmes. The main reasons for high cost of supply of power were excess consumption of coal (paragraph-3.12.2), over staffing (paragraph-3.13), high interest cost (paragraph-3.17) and high expenses on power purchases (paragraph-3.8).

### Audit Findings

3.7 Audit explained the audit objectives to the Board's Management during an entry conference held on 14 January 2010. Subsequently, the audit findings were reported to the Board during February 2010 and May 2010 and discussed in an exit conference held on 28 July 2010. The views expressed by the Board have been considered while finalising this report. The audit findings are presented below:

### Planning

3.8 The National Electricity Policy aims to provide over 1,000 units of electricity per capita by 2012, for which it was estimated that capacity addition of more than 1,00,000 MW would be required during 2002-2012 in the country. The Government laid emphasis on the full development of hydro potential being cheaper source of energy as compared to thermal. Besides, environmental concerns would have to be suitably addressed through appropriate advance actions.

Details of installed capacity and generation are given in the **Annexure 12**. The power availability in the State indicating the Board's own generation, peak demand and deficit is given below.

Year	Average generation (MW)	Peak demand (MW)	Average demand (MW)	Percentage of average generation to average demand	Percentage of average generation to Peak demand
2005-06	2,467	7,708	5,910	41.74	32.01
2006-07	2,497	8,917	6,373	39.18	28.00
2007-08	3,188	8,672	6,547	48.69	36.76
2008-09	3,416	8,773	6,753	50.58	38.94
2009-10	3,572	9,786	7,393	48.32	36.50

During 2005-10, the actual generation was substantially less than the peak as well as the average demand. The actual generation was only 39.18 to 50.58 *per cent* of the average demand and 28.00 to 38.94 *per cent* of the peak demand. The total supply even after purchase of power from elsewhere was not sufficient to meet the peak demand, as shown below:

Year	Peak demand (MW)	Peak demand met (MW)	Sources of meeting Peak demand (MW)		Peak deficit	
			Own*	Purchase	MW	Percentage
2005-06	7,708	6,092	2,798	3,294	1,616	20.97
2006-07	8,917	6,558	2,895	3,663	2,359	26.46
2007-08	8,672	7,340	3,656	3,684	1,332	15.36
2008-09	8,773	7,428	3,895	3,533	1,345	15.33
2009-10	9,786	7,407	4,145	3,262	2,379	24.31

There remained a shortfall of 1,332 to 2,379 MW (15 to 26 *per cent* of the peak demand) even after purchase of power. Consequently, the Board had to resort to rotational load sheddings to the extent of 0.44 to 3.30 hours per day during 2006-07 to 2009-10.

Purchase of power included overdrawl from the grid and short term purchase at high cost. The details of power purchased through long term/short term power purchase agreements, overdrawl from the grid and the extra expenditure incurred on account thereof are given below:

---

\* Own sources include generation of power by the Board's generating stations and share from BBMB projects. The figures here would not match with the figures indicated in the previous table and Annexure 12 as it reflects generation at a point of peak time

Sl. No.	Particulars	2005-06	2006-07	2007-08	2008-09	2009-10	Total
1	Power purchase through long term power purchase agreements and inter state banking arrangements (MU)	8,835	9,954	12,621	12,547	11,474	55,431
2	Overdrawls from the grid and Short term power purchases (MU)	1,612	3,773	4,353	2,304	3,365	15,407
3	Total Power Purchase (MU) (1+2)	10,447	13,727	16,974	14,851	14,839	70,838
4	Cost of power purchase through long term power purchase agreements and inter state banking arrangements (₹ in crore)	1,898.56	2,312.26	3,605.12	3,623.14	2,853.04	14292.12
5	Average cost per unit of power purchase through long term power purchase agreements and inter state banking arrangements (₹) [(4÷1) X 10]	2.15	2.32	2.86	2.89	2.49	2.58
6	Cost of overdrawls from the grid and short term power purchases (₹ in crore)	506.36	2,014.75	2,415.25	1,560.91	1,797.98	8,295.25
7	Average cost per unit of overdrawls from the grid and short term power purchases (₹) [(6÷2)X10]	3.14	5.34	5.55	6.77	5.34	5.38
8	Extra cost per unit on account of overdrawls from the grid and short term power purchases as compared to long term arrangement (₹) (7-5)	0.99	3.02	2.69	3.88	2.85	2.80
9	Extra expenditure incurred on account of overdrawls from the grid and short term power purchases (₹ in crore) [(2x8) ÷ 10]	159.59	1139.45	1,170.96	893.95	959.03	4322.98

**To meet the chronic deficit of power, the Board resorted to unplanned purchase of power through short term and panic measures at exorbitant cost of power resulting in avoidable extra expenditure of ₹ 4,322.98 crore during 2005-10.**

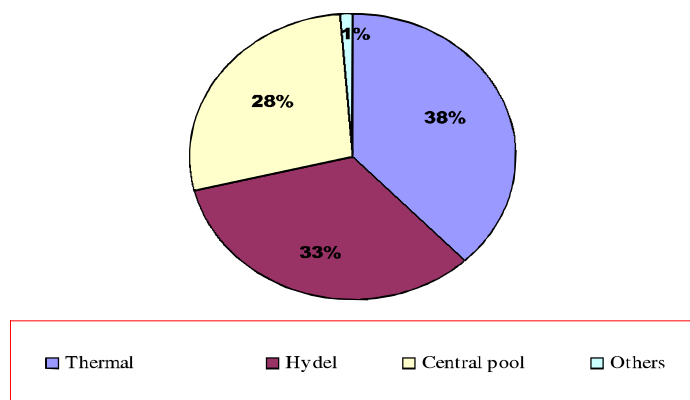
To meet the chronic deficit of power, the Board resorted to unplanned purchase of power through short term and panic measures at exorbitant cost at an average of ₹ 5.38 per unit, when its average realization of revenue was ₹ 3.46 per unit of energy sold during review period. It could be seen from the above table that out of 70,838 MU power purchased during 2005-10, 15,407 MU (21.75 per cent) was in the form of overdrawl from the grid and short term power purchase at higher rates. This resulted in avoidable extra expenditure of ₹ 4,322.98 crore during 2005-10.

Had the Board implemented the capacity addition programmes seriously and resorted to well planned long term arrangements of power purchase, the short term purchase of power at high cost could have been reduced considerably.

The Management stated (July 2010) that short term purchases though could not be dispensed with fully, but needed to be resorted to judiciously.

### Capacity addition

**3.9** The State had total installed capacity of 5,964 MW at the beginning of 2005-06 which increased to 6,901 MW at the end of 2009-10. The break up of generation capacity as on 31 March 2010 under thermal, hydel, central allocation and others is shown in the pie chart below.



To meet the peak demand of 11,000 MW by end of 2011-12 projected for the State by CEA in its 17th Electric Power Survey, the Board assessed (May 2007) the requirement of capacity as 14,000 MW. Thus 7,799 MW (14,000 MW less 6,201 MW as on 31 March 2007) of capacity was required to be added by the end of 11th Plan (March 2012). The planning by the Board was deficient to the extent that it had fixed a target for capacity addition of 4,986 MW only against the projected additional requirement of 7,799 MW during the 11th Five Year Plan. Further, considering the commissioning schedule of the planned and projects under execution, likely capacity addition of only 2,438 MW would be feasible by the end of 11th Plan, thereby leaving a deficit of 5,361 MW. Thus, the State would not be able to meet the objective of National Electricity Policy “Power for all on demand by 2012”.

The particulars of capacity additions envisaged, actual additions and peak demand vis-à-vis energy supplied during the review period are given below.

Sl. No.	Description	2005-06	2006-07	2007-08	2008-09	2009-10
1.	Capacity at the beginning of the year (MW)	5,964	5,919	6,201	6,359	6,591
2.	Additions Planned in NEP (MW)	-	1,268	-	-	75
3.	Additions planned by the Board (MW)		2	713	387	670
4.	Actual additions (MW)	(-) 45 <sup>▲</sup>	282	158	232	310
5.	Capacity at the end of the year (MW) (1 + 4)	5,919	6,201	6,359	6,591	6,901
6.	Shortfall in capacity addition (MW) (3 – 4)	45	(-) 280	555	155	360
7.	Peak demand (MUs)	35,935	38,784	43,015	41,659	46,426
8.	Net power available for sale in the State.*	32,658	34,984	39,039	37,226	39,977
9.	Shortfall in energy availability (MUs) (7 – 8)	3,277	3,800	3,976	4,433	6,449

The particulars of the projects at the beginning of 2005-06, additions/deletions during the review period and total capacities at the end of 2009-10 are given in

▲ Due to derating of BBMB units.

\* These figures would not match with the figures given in the working results and Annexure-13 as these do not include common pool supply.

Actual capacity addition was only 937 MW against 1,772 MW planned by the State during 2005-10, leaving a shortfall of 835 MW.

the *Annexure 13*. It may be observed from the above table that during the review period of five years, the actual capacity addition was only 937 MW against 1,772 MW planned by the State leaving a shortfall of 835 MW. The State failed to maintain pace in terms of capacity addition with the growing demand. Some of the reasons for shortfall in capacity addition were:

- failure of the Board in providing escrow cover to the developer of Goindwal Sahib Thermal Power Project (540 MW);
- delay in investment decision, financial constraints and inter departmental dispute regarding cost sharing in Shahpurkandi (168 MW); and
- non-finalisation of the power purchase agreement due to ambiguity in the bidding term in respect of Upper Bari Doab Canal (UBDC)-III project (75 MW).

These are discussed in the paragraph 3.10.1 to 3.10.5.

#### ***Failure to take up modernisation***

**3.9.1** In order to cope up with the rising demand for power, not only the additional capacity need to be created, but also plan needs to be in place for better utilisation of the existing facilities and for undertaking life extension programme of the existing facilities which are near completion of their age, besides timely repair/ maintenance. The details of the thermal power generating units due for Renovation and Modernisation (R&M)/ Life Extension programmes (LE) during the five years ending 2009-10 vis-à-vis actually taken up are discussed in paragraph 3.16.

### **Project Management**

**3.10** Project management includes timely acquisition of land, effective actions to resolve bottlenecks, obtain necessary clearances from the Ministry of Forest and Environment and other authorities, rehabilitation of the displaced families, proper scheduling of various activities, adequate budget provisions, etc. We noticed time and cost overruns due to inefficiency and absence of coordination with various agencies as discussed in the succeeding paragraphs.

The following table indicates the scheduled/actual dates of completion, commissioning of the power stations and the time overrun in respect of two projects completed during the review period.

**Time overrun**

Sl. No.	Name of the Project	Details		Due date as per Work order	Actual date of completion	Time overrun (In months)	
1.	GHTP Stage-II Lehra Mohabbat (Unit-III and IV of 250 MW each)	Date of completion of unit		Unit III	30 September 2006	5 February 2008	16
				Unit IV	31 December, 2006	2 August 2008	19
		Date of commercial operation/commissioning of unit		Unit III	31 December 2006	16 October 2008	21
				Unit IV	31 March 2007	25 January 2010	33
2.	Micro Hydel Power Project at GGSSTP, Ropar (1.7 MW)	Date of completion of unit			30 June 2005	22 February 2006	7
		Date of commercial operation/commissioning of unit			-	27 May 2007	-

It could be seen from the above that none of the two projects was completed in time and the time overrun varied from 16 to 33 months in execution of GHTP Stage II Lehra Mohabbat at various stages. The particulars of cost overrun of the above projects are given in the following table.

**Cost overrun**

(₹ in crore)

Sl. No.	Name of the Unit	Estimated cost as per DPR	Awarded Cost	Actual expenditure as on 31 March 2010	Expenditure over and above the estimate (4 – 2)	Percentage increase as compared to DPR (5)/(2)
	(1)	(2)	(3)	(4)	(5)	(6)
1.	GHTP Stage-II, Lehra Mohabbat	1,789.67	1,673.87	2547.56	757.89	42.35
2.	Micro Hydel Power Project at GGSSTP, Ropar (1.7 MW) (Hydel Channel)	14.79	Departmental work	15.71	0.92	6.22

Many instances of administrative delay, inefficiencies and non seriousness in decision making leading to time/cost overrun of the projects and non-generation of power are discussed in the paragraphs 3.10.1 to 3.10.6.

***GHTP Stage-II, Lehra Mohabbat***

**3.10.1** Cost and time overrun in the construction and commissioning of Stage-II (Unit III and IV) of GHTP, Lehra Mohabbat had been discussed in paragraph 3A of the Report of the Comptroller and Auditor General of India for the year ended 31 March 2009 (Commercial) - Government of Punjab. The Report is yet to be discussed by COPU (September 2010).

***Micro Hydel Power Project at GGSSTP, Ropar***

**3.10.2** The Board approved (September 2000) the project for construction of 4.4 kilometres long hydel channel and a 1.7 MW micro hydel power house at the tail end of GGSSTP Ropar at an estimated cost of ₹ 25 crore. Though the execution of project was taken up in April 2002 and completed in February 2006, the project was commissioned only in May 2007. We observed that the main reason for delay of 14 months in commissioning of the project was breach of the hydel channel on account of existence of embedded wire crates below the bed of channel, the removal of which though initially provided in

the work order was ignored while reallocating the left over work. This lapse was avoidable. The breach of the hydel channel resulted in generation loss of 10.92 MUs\* and extra expenditure of ₹ 62.76 lakh on plugging the breach in channel. The Committee formed to investigate the breach observed (August 2007) in its report that it occurred due to under piping caused by excessive seepage from Ash dykes coupled with normal seepage from the channel and the importance of removal of wire stone crates lying below the channel section had been overlooked by the engineers. The Board, however, did not fix any responsibility for the lapse.

### ***Shahpurkandi Hydro Electric Project***

**3.10.3** Planning Commission/ CEA cleared the Shahpurkandi project (168 MW) in 1992 at a cost of ₹ 895 crore. The project also aimed to act as a balancing reservoir to enable the Ranjit Sagar Dam (RSD) project to generate power during peak hours and to ensure uniform release of water to the canal system off-taking from the Madhopur Headworks. It was decided to take up the work departmentally since global tenders invited in 1996 could not be finalized on the ground that the price quoted by the successful bidder was almost three times of the estimated departmental cost.

The Planning Commission accorded investment clearance in 2001 at a revised cost of ₹ 1,324.18 crore with cost sharing between the Irrigation Department, Punjab at the rate of 12.61 *per cent* (irrigation component) and the Board at the rate of 87.39 *per cent* (power component). Due to inability of the Board to generate funds, the work taken up departmentally by the Irrigation Department was stopped in October 2003. Later, the State Government decided (May 2006) to take up the project departmentally by outsourcing. For financial assistance in respect of power component, the Board submitted a loan application to Power Finance Corporation (PFC). The irrigation component was revised from 12.61 *per cent* to 20.90 *per cent* and finally to 28.61 *per cent* (August 2009) by the State Government. The PFC agreed (July / September 2009) to sanction loan of ₹ 1,681.47 crore. However, the final sanction/disbursement of loan by PFC was awaited (July 2010) for want of bank guarantee from the State Government.

**Due to indecisiveness in deciding the mode of execution of the project and cost sharing, there was time overrun of 18 years and cost overrun of ₹ 1,391 crore at the estimate stage itself.**

Thus, the inability of the Board to raise funds and indecisiveness in deciding the mode of execution of the project and proportion of cost sharing resulted in time and cost overrun of 18 years (1992-2010) and ₹ 1,391 crore (₹ 2,286 crore - ₹ 895 crore), respectively so far at the estimate stage itself. This led to additional cost of ₹ 993.03 crore which would be borne by the Board. Resultantly, the envisaged power generation of 168 MW could not be achieved. Further, due to non commencement of this project, another linked project (Shahpurkandi extension project) could not be taken up to generate the envisaged 55.5 MW of power.

The Management stated that there was no delay in taking decision for implementation of the project which required a comprehensive approach and time was taken for processing only.

\* Estimated on the basis of generation data.

The reply is not based on the facts as the delay was on account of Board's indecisiveness as regards cost components and mode of implementation of the project.

### ***Goindwal Sahib Thermal Power Station***

**3.10.4** The Board signed (17 April 2000) a Power Purchase Agreement (PPA) with GVK Power Limited, Secunderabad (developer) for construction of Goindwal Sahib Thermal Power project of 2x270 MW on build, own and operate basis. The project was envisaged to be executed during the 10<sup>th</sup> plan period (2002-07). The project was not implemented due to inability of the Board in providing escrow cover to the developer and non-finalisation of the coal price by the developer. Subsequently, the State Government decided (July 2005) to revive the project and the Board entered into (February 2006) an MOU with the developer for signing a revised power purchase agreement in line with the standard PPA.

The revised PPA (March 2007), however, had substantial deviations from the standard PPA with regard to provisions for performance guarantee, liquidated damages, performance tests etc. and it was held up. The revised PPA was signed in May 2009 at the instance of Punjab State Electricity Regulatory Commission. The generating Units are scheduled to be commissioned in January/July 2013. Thus, formulation of the revised PPA in deviation from the Standard PPA in March 2007 delayed starting of the project for more than two years.

The Management stated that the standard PPA was issued by the Ministry of power in September 2007. The Reply is not supported by the facts as the Board and the developer had agreed (February 2006) to adopt the terms and conditions of the draft standard PPA published by the Ministry of Power in January 2006.

### ***UBDC (Stage III) Hydroelectric Project***

**3.10.5** The State Government decided (May 2002) to execute the UBDC (Stage III) Hydroelectric Project(75 MW) through private participation. Accordingly, the Board after inviting international competitive bids forwarded (May 2004) the proposal of Malana Power Company Limited (MPCL) for execution of the project on Build, Own, Operate and Transfer basis to the State Government. Subsequently, the Board issued (February 2006) the letter of intent (LOI) to MPCL prescribing the completion period as 82 months from the date of signing of the power purchase agreement (PPA). We observed that the delay of 15 months in issue of the LOI was on account of preparation of bid document on inaccurate and unreliable hydrological data and non considering various vital aspects. The execution of the project had not been commenced (July 2010) due to non finalisation of PPA in time.

The Management stated that all the factors were taken into consideration while finalizing the documents. The reply is not based on the facts as the bid document did not include the vital aspects like proposed water discharge to the



J&K State, indents of irrigation department, correct design discharge, carbon credit, hydrological risk etc.

### Contract Management

**3.11** Contract management is the process of managing the contract (including inviting bids and award of work) and execution of work in an effective and economic manner.

During the review period, contracts relating to generation works valuing ₹ 2,338.60 crore were executed. The agreements relating to civil works, supply of equipments and other miscellaneous works valued at ₹ 664.73 crore\* were examined by us and an instance of undue favour to a contractor is given below:

#### *Favour to a contractor*

**3.11.1** Work order for the Renovation and Modernisation of Stage-I (Unit-I&II) of GNDTP Bathinda was placed (May 2003) on NTPC Alstom Power Services Private Limited (NASL). After commissioning of the Unit-II, shutdown of Unit-I was taken on 10 March 2006. As per the terms of the contract, after renovation, the Unit-I was scheduled to be commissioned on 9 November 2006. The Unit was, however, commissioned on 31 May 2007 after a delay of 203 days.

As per terms and conditions of the contract, the firm was liable to pay liquidated damages (LD) of ₹ 4.93 crore for the delay, which was condoned by the Board (January 2008) on the ground that fixing the problem of direct firing was beyond the expected and planned means of the firm. We observed that the Chief Engineer/Thermal, GNDTP, Bathinda had pointed out (May 2007) that the problem of direct firing was due to mistake made by APIL, a subcontractor of NASL which was not brought to the notice of the Board of Members which condoned the LD. Thus, all facts were not placed before the Board.

### Input Efficiency

**3.12** Performance of the generation stations is dependent on efficiency of input such as material and manpower and output efficiency in terms of plant load factor, plant availability, capacity utilization, outages and auxiliary consumption. These aspects are discussed below:

### Procurement of coal

#### *Procedure for procurement of coal*

**3.12.1** The CEA fixes power generation targets for Thermal Power Stations (TPS) considering capacity of plant, average PLF and past performance. The

---

\* Other than the agreement valuing ₹ 1,673.87 crore related to GHTP Lehra Mohabbat Stage-II mentioned in paragraph 3.10.1.

Board works out coal requirement on the basis of targets so fixed and past coal consumption trends. The coal requirement so assessed was conveyed to the Standing Linkage Committee (SLC) of the Ministry of Energy (MOE), Government of India, which decided the source and quantity of coal supply to TPSs on quarterly basis. On the basis of linkage source approved by SLC, the Board was to enter into Coal Supply Agreements (CSA) with collieries. However, the Board did not enter into CSA during 2003-09 due to lack of consensus among coal companies, CEA and power generation utilities. Since April 2009, the utilities have been permitted to enter into dedicated CSA with coal companies for their coal requirement.

The position of coal linkages fixed, coal received, generation targets prescribed and actual generation achieved by the Board during the period from 2005-06 to 2009-10 was as under:

Particulars	2005-06	2006-07	2007-08	2008-09	2009-10	Total
Coal Linkage fixed (Lakh MT)	107.00	98.31	113.12	137.88	124.00	580.31
Quantity of coal received (Lakh MT)	98.40	95.73	109.85	118.89	124.19	547.06
Generation targets (MU)	14,130	15,125	15,641	17,951	18,109	80,956
Actual generation achieved (MU)	14,835	15,435	16,457	18,066	20,296	85,089
Excess / Shortfall (-) in generation targets (MU)	705	310	816	115	2,187	4,133

It would be seen from the above that the total linkage of coal during the five years fixed by the SLC was 580.31 lakh MT for the Board. Against this, 547.06 lakh MT of coal was received, resulting in short receipt of 33.25 lakh MT (5.73 *per cent*) of coal. In the absence of any agreement during 2005-09 with the coal companies, the Management failed to procure allotted quantity of coal.

#### ***Unjustified payment to a supplier of coal***

**3.12.2** The terms and conditions of Fuel Supply Agreement entered (August 2006) with PANEM\* for supply of coal to the Board's thermal power stations, *interalia*, provided that PANEM would endeavor to supply C and D grade coal to the Board. The Board might accept F grade coal with a discount of 19 *per cent* in price, provided the number of rakes of F grade coal would not exceed five per cent of the total rakes delivered during a quarter. No payment for the coal and freight was to be made for the F grade coal if it was in excess of five *per cent* of the total supply on quarterly basis. The rejected F grade coal would be unloaded and burnt in the boiler to clear the blockade.

During July 2007 to September 2007, the Board received 188 rakes at the three thermal power stations, of which 18 rakes (9.57 *per cent* of total rakes) were of F grade. As envisaged in the agreement, the Board did not release the

---

\* To develop and operate the captive coal mine in Jharkhand, the Board entered (March 2001) into an agreement with M/s Eastern Minerals & Trading Agency, Kolkata and formed a joint venture company called Panem Coal Mines Limited (PANEM)

payment of ₹12.21 crore for the F grade coal. PANEM represented (January 2008) that continuous unprecedented heavy rains in the mining area resulted in inadvertent contamination of coal loaded in wagons and requested for the release of payment by relaxing the five per cent limit. The Board decided (December 2008) that no payment should be made for the coal cost, however, the freight of ₹ 9.31 crore already paid by PANEM to the Railways might be reimbursed as a one time measure.

PANEM again represented (February 2009 and October 2009) for review of the decision. The Board while considering (November 2009) the request of PANEM, observed that PANEM had supplied excellent quality of coal except during the second quarter of 2007. Against the permissible limit of five percent F grade coal on quarterly basis, PANEM had supplied only 0.6 per cent of F grade coal till date and the Board had gainfully consumed the F grade coal supplied by PANEM. The Board, accordingly, allowed the cost of ₹ 2.90 crore for the F grade coal supplied by PANEM.

**Payment of ₹ 12.21 crore to the supplier of coal by the Board in violation of terms of agreement lacked justification**

We observed that consideration of the entire supply of coal from 2006-07 onwards for the purpose of working out the quantum of F grade coal was against the explicit provisions in the agreement whereunder only the quarterly supplies were to be considered. Further, the Board had not considered the fact that it had suffered a loss of ₹ 1.55 crore on account of excess consumption of coal due to lower useful heat value (UHV). Thus, payment of ₹ 12.21 crore in violation of the terms of agreement lacked justification.

#### ***Non recovery against shortages of coal***

**3.12.3** The cost of shortage in unweighed rakes at the loading end was recoverable from the coal companies, provided weigh bridges at the receiving end were calibrated in terms of the provisions of Weights and Measures Act. A sum of ₹ 7.53 crore towards coal shortage in unweighed rakes at the loading end for the period from March 1999 to March 2007 was recoverable from the coal companies. In a meeting held on 28 January 2008 between the coal companies and the Board, the coal companies allowed an amount of ₹ 3.77 crore, being 50 per cent of the claim and the balance of ₹ 3.76 crore was not allowed as the Board could not make available the requisite certificates of calibration for some of the periods from the Weights and Measures department. We observed that the plant authorities failed to provide the record of calibration of weigh bridges for over one year (April 1999 to September 2000) to the coal companies. Responsibility for not making available the requisite certificates in support of the claim had not been fixed so far.

The Management assured that responsibility would be fixed.

#### ***Excess consumption of coal***

**3.12.4** The consumption of coal depends upon its calorific value. The norms are fixed in the project report for various power generation stations for production of one unit of power. Year-wise details of units generated, coal

required as per norms of project reports, coal consumed and excess consumption of coal with respect to norms of project reports are given below:

Sl. No.	Particulars	2005-06	2006-07	2007-08	2008-09	2009-10	Total
1.	<b>Unit generated (MUs)</b>						
	GNDTP Bathinda	2,359.17	2,221.12	3,008.00	2,845.59	2,723.35	13,157.23
	GGSSSTP Ropar	9,329.31	9,770.34	9,806.16	9,610.67	10,056.35	48,572.83
	GHTP Lehra Mohabbat	3,145.92	3,443.17	3,508.59	4,441.92	6,042.26	20,581.86
	<b>Total</b>	14,834.40	15,434.63	16,322.75	16,898.18	18,821.96	82,311.92
2.	<b>Coal required as per norms (MT)</b>						
	GNDTP Bathinda•	11,25,324	10,59,474	14,34,816	13,57,346	12,99,038	62,75,998
	GGSSSTP Ropar♣	54,66,976	57,25,419	57,46,410	56,31,853	58,93,021	284,63,679
	GHTP Lehra Mohabbat♥	19,37,887	21,20,993	21,61,291	26,19,713	33,97,556	122,37,440
	<b>Total</b>	85,30,187	89,05,886	93,42,517	96,08,912	105,89,615	469,77,117
3.	<b>Coal consumed (MT)</b>						
	GNDTP Bathinda	17,50,439	15,98,939	21,84,720	21,01,362	20,14,417	96,49,877
	GGSSSTP Ropar	61,11,300	65,00,845	66,59,874	63,90,772	66,88,917	323,51,708
	GHTP Lehra Mohabbat	18,20,387	18,97,070	20,64,811	26,71,124	36,31,810	120,85,202
	<b>Total</b>	96,82,126	99,96,854	109,09,405	111,63,258	123,35,144	540,86,787
4.	<b>Excess consumption (MT) (3 – 2)</b>						
	GNDTP Bathinda	6,25,115	5,39,465	7,49,904	7,44,016	7,15,379	33,73,879
	GGSSSTP Ropar	6,44,324	7,75,426	9,13,464	7,58,919	7,95,896	38,88,029
	GHTP Lehra Mohabbat	Nil	Nil	Nil	51,411	2,34,254	2,85,665
	<b>Total</b>	12,69,439	13,14,891	16,63,368	15,54,346	17,45,529	75,47,573
5.	<b>Rate per MT (₹)</b>						
	GNDTP Bathinda	2,346.31	2,321.73	2,270.00	2,414.50	2,471.00	
	GGSSSTP Ropar	2,301.52	2,312.87	2,339.00	2,462.00	2,633.00	
	GHTP Lehra Mohabbat	2618.95	2570.80	2,319.00	2,488.20	2,558.00	
	<b>Total</b>						
6.	<b>Coal consumed per Unit (Kg.) [3 ÷ (1 x 1000)]</b>						
	GNDTP Bathinda	0.742	0.720	0.726	0.738	0.740	0.733
	GGSSSTP Ropar	0.655	0.665	0.679	0.665	0.665	0.666
	GHTP Lehra Mohabbat	0.579	0.551	0.589	0.601	0.601	0.587
	<b>Total</b>						
7.	<b>Value of excess coal (₹ in crore)(4 x 5)</b>						
	GNDTP Bathinda	146.67	125.25	170.23	179.64	176.77	798.56
	GGSSSTP Ropar	148.29	179.35	213.66	186.85	209.56	937.71
	GHTP Lehra Mohabbat	Nil	Nil	Nil	12.79	59.92	72.71
	<b>Total</b>	294.96	304.60	383.89	379.28	446.25	1808.98

75.48 lakh MT of coal valuing ₹ 1,808.98 crore was consumed in excess of norms at the thermal power stations of the Board during 2005-10.

Above table shows that consumption of coal remained higher than the norms in all the years under review. Excess consumption of coal was to the tune of 75.48 lakh MT, the money value of which was worked out to ₹ 1,808.98 crore.

- The gross calorific value (GCV) of coal used in the power plants was lower than the designed GCV implying poor quality of coal used;

• 0.477 kilograms per unit.

♣ 0.586 kilograms per unit.

♥ 0.616 kilograms per unit for Stage-I and 0.488 kilograms per unit for Stage-II.

- Higher station heat rate\* due to deteriorated condition of the boiler furnaces on account of ageing of the units and
- Steam leakages (59 instances during 2005-10).

Out of the total excess consumption of 75.48 lakh MT, 24.33 lakh MT valuing ₹ 453.96 crore (GNDTP Bathinda- 4.26 lakh MT valuing ₹ 75.36 crore and GGSSTP Ropar- 20.07 lakh MT valuing ₹ 378.60 crore) was on account of higher station heat rate. Had the Board procured and fed proper grade of coal as designed and taken up the R&M works in time, the excess consumption of coal could have been minimised. The Management accepted the facts.

We suggest that the R&M works due for the plants be taken up without further delay and efforts be made to procure coal of proper grade.

### Manpower Management

**3.13** As mentioned in paragraph 3.2, the Board employed 64,308 employees as of 31 March 2010 and during 2005-10 the employee cost accounted for 16.32 to 19.55 *per cent* of the total expenditure, which is one of the highest in the country. As per National Electricity Policy released by the CEA in April 2007, the man power norm in 10<sup>th</sup> and 11<sup>th</sup> Five year plans was 1.76 and 1.58 persons per MW of the installed capacity in respect of thermal power stations and 1.79 and 1.61 persons in respect of hydel power stations. The year-wise details of sanctioned strength, manpower required as per the CEA norms and actual manpower in respect of thermal power stations and hydel power stations upto March 2010 are given in the *Annexure 14*.

It would be seen from the annexure that manpower was within norm at GHTP Lehra Mohabbat. In respect of GNDTP Bathinda and GGSSTP Ropar, the manpower reduced from 2751 and 3585 to 2237 and 3239 respectively during review period. Excess expenditure on manpower with reference to norm at GNDTP Bathinda and GGSSTP Ropar worked out to ₹ 437.76 crore during review period. Hydel Power Stations had surplus manpower of 203 in 2005-06 and reduced to norm at the end of 2009-10. Pricewaterhouse Coopers Private Limited was awarded (August 2007) with the work of conducting detailed study on manpower requirement across the different business groups of the Board. The consultant was required to complete the study and suggest action plan to rationalise the manpower within seven months of award of the assignment i.e. by April 2008. However, the consultant has not submitted the final report so far (September 2010), even after lapse of more than two years. The Board neither could enforce the consultant to submit the report within the scheduled time nor foreclose the contract in the absence of enabling provision for non performance.

We suggest that the Board should contain the employee cost by optimising the deployment of manpower.

---

\* It is the heat energy input in kilo calorie for generating one unit of electric energy at generator terminals.

## Output Efficiency

### Generation of power

**3.14.1** The targets for generation of power for each year are fixed by the Board. It was observed that the Board generated a total of 1,06,945 MU of power during 2005-06 to 2009-10 against the target of 1,00,417 MU as shown in the following table:

Year	Thermal power Stations (MUs)		Hydel power Stations (MUs)		Total Generation (MUs)	
	Target	Actual	Target	Actual	Target	Actual
2005-06	14,130	14,835	3,894	5,049	18,024	19,884
2006-07	15,125	15,435	3,668	4,430	18,793	19,865
2007-08	15,641	16,457	3,707	4,644	19,348	21,101
2008-09	17,951	18,066	4,080	4,232	22,031	22,298
2009-10	18,109	20,296	4,112	3,502	22,221	23,798
<b>Total</b>	<b>80,956</b>	<b>85,089</b>	<b>19,461</b>	<b>21,857</b>	<b>100,417</b>	<b>106,946</b>

It was noticed that during 2005-10, generation of power by the Boards' own hydel and thermal power stations was consistently more than the targets fixed (except hydel generation in 2009-10). This was appreciable performance. However, we observed that the targets for the hydel power stations were fixed without keeping in view the designed capacity, hydrology and anticipated discharge of water. For example in the case of Ranjit Sagar Project, the targets had been fixed (1,150 MUs in 2006-07 and 1,500 MUs in 2008-09) much lower than the firm power generation of 1,813 MUs as envisaged in the project report.

Year-wise details of energy to be generated as per design, actual generation, plant load factor as per design and actual plant load factor in respect of the hydel power projects commissioned upto March 2010 are given in the *Annexure 16*.

### Low Plant Load Factor (PLF)

**3.14.2** Plant load factor (PLF) refers to the ratio between the actual generation and the maximum possible generation at installed capacity. According to norms fixed by CERC, the PLF for thermal power generating stations should be 80 per cent, against which the national average was 73.71 per cent, 77.03 per cent, 78.75 per cent, 77.22 per cent and 77.48 per cent during 2005 -06 to 2009-10 respectively. Year wise and plant wise PLF of thermal power stations is given in *Annexure 15* which revealed that the PLF of thermal power plants of the Board as a whole was 79.18 per cent, 82.94 per cent, 87.42 per cent, 86.33 per cent and 88.96 per cent during 2005-06 to 2009-10 respectively. The PLF of Stage-I of

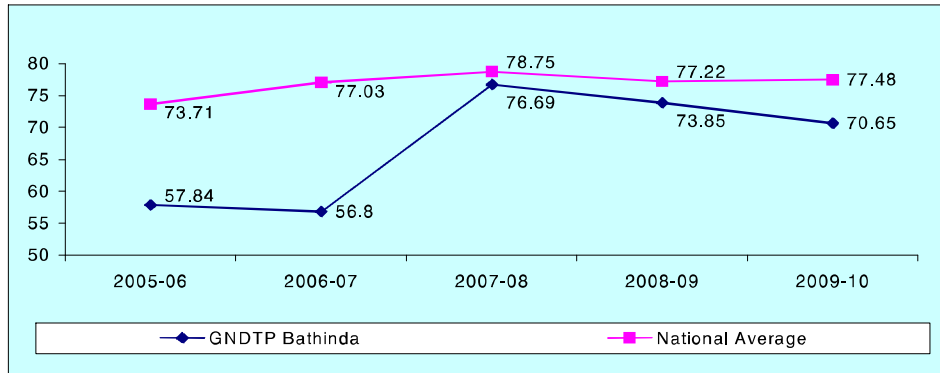
**Unit No. 6 of Kota TPS of PRVUNL achieved PLF of 101.10 per cent which was highest among all the State sector units.**

**Source: Performance Review of Thermal Power Stations 2008-09 by CEA.**

**The PLF of Stage-I of GHTP, Lehra Mohabbat was maximum at 96 per cent among all the State Sector power Stations during the year 2008-09.**

GHTP, Lehra Mohabbat was maximum at 96 *per cent* among all the State Sector power Stations during the year 2008-09. The PLF of GNDTP Bathinda was, however, lower than the national average due to delay in taking up the R&M works of the plant as discussed in paragraph-3.16.

The PLF of the GNDTP Bathinda is depicted in the following line graph:



The PLF in the hydel power stations decreased from 50.39 *per cent* in 2005-06 to 34.97 *per cent* in 2009-10. The main reasons for the low PLF, as observed by us, were low plant availability, decrease in capacity utilization and major shut downs and delays in repairs and maintenance of the stations.

#### **Low plant availability**

**3.14.3** Plant availability means the ratio of actual hours of operation of the plant to the maximum possible hours available during certain period. As against the CERC norm of 80 *per cent* plant availability during 2004-09 and 85 *per cent* during 2010, the average plant availability of thermal power stations was 87.41 *per cent* during the five years up to 2009-10.

Year wise plant availability of thermal power stations is given in **Annexure 15** which revealed that plant availability at GGSSTP Ropar and GHTP Lehra Mohabbat was above the CERC norms during the review period, however, plant availability at GNDTP, Bathinda was lower than the CERC norm during 2005-06 (68.37 *per cent*), 2006-07 (64.93 *per cent*) and 2009-10 (83.94 *per cent*). This was due to longer duration of outages caused by inordinate delays in renovation and modernisation works.

The details of total hours available, total hours operated, planned outages, forced outages and overall plant availability in respect of the hydel power stations of the State as a whole are shown below:

Sl. No.	Particulars	2005-06	2006-07	2007-08	2008-09	2009-10
1.	Total hours available	2,71,560	2,71,560	2,72,304	2,71,560	2,71,560
2.	Operated hours	1,99,161	1,79,539	1,99,103	1,74,890	1,69,723
3.	Planned outages (in hours)	25,724	32,724	28,034	28,592	29,437
4.	Forced outages (in hours)					
	(a)Due to non-availability of water etc.	42,629	55,142	43,038	65,439	69,639
	(b)Other reasons	4,046	4,155	2,129	2,639	2,761
	<b>Total</b>	<b>46,675</b>	<b>59,297</b>	<b>45,167</b>	<b>68,078</b>	<b>72,400</b>
5.	Plant availability (per cent)	73.34	66.11	73.12	64.40	62.50

It is evident from the above table that the plant availability in hydro projects ranged between 73.34 per cent in 2005-06 and 62.50 per cent in 2009-10 which was less than the All India Average of 92 per cent (2007-08). The low plant availability was due to excess hours of planned and forced outages.

#### ***Decrease in Capacity Utilisation***

**3.14.4** Capacity utilisation means the ratio of actual generation to possible generation of power during the actual hours of operation. Year wise and plant wise capacity utilisation factor of thermal power stations are given in **Annexure 15** which revealed that capacity utilisation factor of GNDTP Bathinda was lower as compared to GGSSTP Ropar and GHTP Lehra Mohabbat during the review period. Capacity utilisation at GNDTP Bathinda ranged between 82.85 and 87.63 per cent whereas capacity utilisation at GGSSTP Ropar ranged between 95.03 and 98.94 per cent and at GHTP Lehra Mohabbat, it ranged between 97.24 and 100.54 per cent. We observed that the main reasons for the low utilisation of available capacity at GNDTP Bathinda during 2005-10, were:

- Operation of units at partial load due to non availability of equipments like ID Fans, Vapour Fans, Coal Mills etc.and
- Breakdowns due to delay in execution of R&M works.

The capacity utilisation of the State owned hydel projects decreased from 86.05 per cent in 2005-06 to 77.15 per cent in 2009-10. The main reasons for the low utilisation of the available capacity during 2005-10, as analysed in audit, were:

- In Uppar Bari Doab Canal project, the available capacity was not utilised fully due to non optimal utilization of water discharges available at Madhopur headworks due to diversion of the water to Madhopur-Beas link and non carrying of desilting and timely removal of trash of the hydel channel. This resulted in generation loss of 52.71 MUs during rainy seasons of 2005-06 to 2009-10.
- One of the reasons for low capacity utilization of Ranjit Sagar Dam Project was non-completion of the barrage at ShahpurKandi Dam Project as the same was aimed to act as a balancing reservoir to enable RSD project to function as peaking station for optimum power generation during peak hours (paragraph 3.10.4).



## Outages

### 3.14.5 Outages

Outages refer to the period for which the plant remained closed for attending to planned/ forced maintenance. Year wise and plant wise planned and forced outages are given in **Annexure 15**, which revealed that:

- The total number of hours lost due to planned outages in thermal power stations decreased from 13971 hours in 2005-06 to 7507 hours in 2009-10 i.e. from 13.29 *per cent* to 6.50 *per cent* of the total available hours in the respective years
- The forced outages in thermal power stations decreased from 5,035 hours in 2005-06 to 3,419 hours in 2009-10 i.e. from 4.79 to 2.96 *per cent* of the total available hours in the respective years. The forced outages remained less than the norm of 10 *per cent* fixed by CEA in all the five years ending 31 March 2010.

In respect of hydel power stations, the position of planned and forced outages is given in the table under paragraph 3.14.3. We observed the following deficiencies in planned and forced outages:

- In the case of Hydel Power Projects, the total number of hours lost due to planned outages increased from 25,724 hours in 2005-06 to 29,437 hours in 2009-10 i.e. from 9.47 *per cent* to 10.84 *per cent* of the total available hours in the respective years. The planned outages were more than the All India Average (AIA) of 5.66 *per cent* (2007-08) in all the years. The main reason for excess planned outages were intermittent capital overhauling and prolonged capital maintenance in Mukerian and UBDC projects and frequent replacement of runner and old parts in Shanan project.
- The forced outages (including hours lost due to non-availability of water) in the hydel power stations increased from 46,675 hours in 2005-06 to 72,400 hours in 2009-10 i.e. from 17.18 *per cent* to 26.66 *per cent* of the total available hours in the respective years. The forced outages were far in excess of the AIA (including hours lost due to non-availability of water) of 2.34 *per cent* (2007-08) in all the years. The AIA of forced outages, excluding hours lost due to non-availability of water was 0.95 *per cent*. Against this, percentage of forced outages of hydel power stations ranged between 0.97 *per cent* and 1.53 *per cent* during four years and was 0.78 *per cent* during 2007-08. The main reason for excess forced outages in UBDC project was non carrying out of renovation and modernisation as per approved plan as discussed in Paragraph 3.16.3.

### **Auxiliary consumption of power**

**3.14.6** Energy consumed by power stations themselves for running their equipments and common services is called Auxiliary Consumption. PSERC

**Wanakbari Thermal Power Station of GSECL achieved the lowest auxiliary power consumption at 7.05 per cent during 2008-09.  
Source: Performance Review of Thermal Power Stations 2008-09 by CEA.**

fixes norm for auxiliary consumption at the time of tariff fixation. The PSERC norm varied from 8.50 per cent to 11 per cent during review period. Auxiliary consumption was fixed at 8.50 per cent for GGSSTP, Ropar, 9.00 per

cent for GHTP, Lehra Mohabbat and 11.00 per cent for GNDTP, Bathinda. The auxiliary consumption of thermal power plants of the Board as a whole was 9.20, 8.91, 9.11, 8.93 and 8.47 per cent during 2005-06 to 2009-10 respectively.

We observed that percentage of auxiliary consumption of GNDTP Bathinda was higher than the norms prescribed by PSERC and it ranged between 11.36 and 12.22 per cent during the review period. This resulted in excess consumption of 78.86 MU valuing ₹ 26.89 crore which could not be dispatched to the grid. Auxiliary consumption was higher due to frequent trippings and operation of the units on partial load, which was caused due to delay in carrying out the renovation and modernisation works. In other projects the auxiliary consumption was within norm.

**Auxiliary consumption was in excess of norms at GNDTP, Bathinda by 78.86 MUs valued at ₹ 26.89 crore during 2005-10.**

Similarly, the auxiliary consumption at Shanan hydel power project was very high due to non replacement of the old power transformer and ranged between 1.79 per cent (2006-07) and 1.19 per cent (2009-10) against the norm of 0.5 per cent fixed by PSERC. In other projects the auxiliary consumption was within norm.

### **Performance of the Micro Hydel Projects**

**3.14.7** The Board had installed (1985-89) four micro hydel power projects having total capacity of 3.9 MW\*. The operation and maintenance (O&M) of the projects was carried out by the Board itself upto 10 July 2005 and thereafter, these projects were handed over to DSL Powers (P) Limited for O&M for ten years.

The generation of power from these micro hydel projects during 2005-10 was 5.96, 7.96, 6.99, 4.32 and 2.97 MUs respectively, which was far less than the annual targets of 10 MUs and designed capacity of 24.29 MUs. The reasons for low generation of power as analysed by us were stoppage of generation of power by Rohti project (since 11 July 2005) and Thuhi project (since 30 November 2008) due to break down of gear boxes and the less generation of power in Nidampur and Dhudhar projects due to excessive time taken in removing technical defects by the O&M contractor. Besides, the Board did not ensure preventive/ routine maintenance of these power houses by the O&M contractor. Further, the Board did not maintain records of forced and planned outages in these power houses.

\* Nidampur (0.8 MW), Rohti (0.8 MW), Thuhi (0.8 MW) and Daudhar (1.5 MW)

### Repairs & Maintenance

**3.15** To ensure long term sustainable levels of performance, it is important to adhere to periodic maintenance schedules. The efficiency and availability of the equipment is dependent on the strict adherence to annual maintenance and equipment overhauling schedules. Non adherence to the schedules carry a risk of the power plant consuming more coal, fuel oil and a higher risk of forced outages which necessitate further R&M works, besides loss of generation.

We observed that annual maintenance of units of majority of the thermal and hydel power Stations in the State was done after a delay ranging from six to 36 months (details given in the **Annexure 17**). The delayed maintenance caused continuous deterioration in the condition of machines causing increased consumption of coal and increase in outages.

### Renovation and Modernisation

**3.16.1** The R&M activities are aimed at overcoming problems in the operating units caused due to generic defects, design deficiency and ageing by re-equipping, modifying and augmenting them with latest technology/systems. The R&M activities are undertaken in the thermal power plants operating at Plant Load Factor of 40 *per cent* and above after assessing the performance and requirement of the units. Refurbishment activities are aimed at extending economic life of the units (by 15 to 20 years) which have served for more than 20 years or operating at PLF below 40 *per cent*. The CEA guidelines provide time frame for implementing the life extension & uprating schemes: six months for preparation of DPR and placement of order and shut down of unit:six to eight months each. Audit findings on R&M of two plants are discussed in the following paragraphs.

**Guru Nanak Dev Thermal Plant, Bathinda**

**3.16.2** The sequential events of R&M activities of Stage-I & II are detailed below:

Sl. No.	Particulars	Stage-I		Stage-II	
		Unit-I	Unit-II	Unit-III	Unit-IV
1	Month/year of commissioning of Units	September 1974	May 1975	May 1978	January 1979
2	Due month/year for taking up the RLA & LE Study	September 1994	May 1995	May 1998	January 1999
3	Month/year of taking up the RLA & LE Study	Not conducted	December 1999	February 2001	December 2001
4	Month/year of preparation of DPR and estimated cost of the R&M Scheme	February 2001 ₹ 229.00 crore		April 2003 ₹ 290.20 crore	
5	Month/year of inviting tenders	April 2001		April 2005	
6	Name of the contractor	NTPC Alstom Power Services Private Limited (NASL)		Bharat Heavy Electricals Limited (BHEL)	
7	Month/year of award of work and cost of the work awarded	May 2003 ₹ 179.56 crore		November 2006 ₹ 465.36 crore	
8	Due dates for commissioning of Units after R&M	9 November 2006	8 November 2004	21 August 2008	21 July 2009
9	Actual dates of commissioning of the Units after R&M	31 May 2007	20 January 2006	Not yet completed	Not yet completed
10	Delay in commissioning of units (Up to 31 July 2010)	203 days	438 days	709 days	375 days

**There were large scale delays in commissioning of the units of GNDTP, Bathinda, after renovation, which resulted in generation loss of 1,775 MU.**

It may be observed from the above that there were large scale delays in commissioning of the units after renovation. Some of the causes for the delay which resulted in generation loss of 1,775 MU are given below:

**Stage-I**

There was abnormal delay of 19 months (after allowing six months as per CEA norms) due to delay in finalising the technical specifications and commercial terms and conditions of the work order and delay in taking decision on modifications of certain clauses of the contract. The Management stated that one of the participant bidders got stay order on 18 January 2002 from the Punjab and Haryana High court, Chandigarh and the case was ultimately decided by the court in favour of PSEB on 17 December 2003. The reply is not based on facts as stay order of 18 January 2002 was vacated by the Punjab and Haryana High Court on 7 February 2002 and on this account, there was a delay of 20 days only. The loss of generation was 1,117 MUs for delay of 203 days and 438 days in respect of Unit-I and II respectively after adjusting 152 MUs generated during operation of Unit-I on partial load from 8 February 2007 to 31 May 2007.

The post R&M achievements vis-à-vis the envisaged parameters are given below:

- Auxiliary consumption of power in the Units-I & II during 2006-07 to 2009-10 was 10.02, 10.07, 10.09 and 10.34 *per cent* against the envisaged auxiliary consumption of 9.10 *per cent*.
- Heat rate of the Unit-I ranged between 2860 and 3104 Kcal/Kwh during 2007-08 to 2009-10, whereas in the Unit-II it ranged between 2841 and 3144 Kcal/Kwh during 2006-07 to 2009-10 against the envisaged norm of 2460 Kcal/Kwh.

Thus, even after the R&M works, the envisaged norms of performance have not been realised. Performance guarantee tests to prove the guaranteed technical parameters required to be conducted in accordance with the terms and conditions of the contract have not been conducted so far (May 2010). No penalty could be imposed on the contractor for poor workmanship, if any, in the absence of performance guarantee tests.

The Management accepted the facts and stated that ten *per cent* amount of the total value of the work order had been withheld and would be released only after successful completion of the performance guarantee tests.

### **Stage-II**

There was abnormal delay of 31 months in respect of R&M works due to delay in finalising the technical specifications and commercial terms and conditions of the work order. The R&M works of both the units of Stage-II were to be completed within a maximum period of 31 months from the effective date of contract i.e. by 21 July 2009. However, BHEL started the R&M works of Unit-III with effect from 14 January 2010 and the R&M works of Unit-IV had not been taken up so far (April 2010). We observed that though BHEL was badly lagging behind the stipulated milestones, the Management did not take up the matter at Board/Government level even after the lapse of scheduled dates of the completion of R&M works. The loss of generation of power upto March 2010 worked out to 658 MUs.

### ***UBDC Hydro Electric Project***

**3.16.3** The Board accorded its approval (March 2003) to carry out R&M of both the stages of the UBDC Hydro electric project (91.35MW) during the 10<sup>th</sup> five year plan (2003-04 to 2006-07) period at an estimated cost of ₹ 7.89 crore.

We observed that the R&M activities had not been carried out as per the approved schedule due to delayed approval (July 2007) of financial plan by the Board and were yet to be completed (April 2010), even after a lapse of more than three years of the scheduled date of completion. Out of the estimated approved cost of ₹ 7.89 crore, only ₹ 3.20 crore has been spent so far.

## **Financial Management**

**3.17** Efficient fund management serves as a tool for decision making, optimum utilisation of available resources and economical borrowings at favourable terms at appropriate time. The power sector companies should streamline their systems and procedures to ensure that funds in idle inventory are not invested, outstanding advances are adjusted/recovered promptly and funds are not borrowed in advance of actual requirement.

The details of sources and utilisation of resources of the Board for the years 2005-06 to 2009-10 are given below:

(₹ in crore)

Sl. No.	Particulars	2005-06	2006-07	2007-08	2008-09	2009-10
<b>Sources</b>						
1.	Net Profit/(loss)	12.89	(1,626.39)	(1,389.60)	(1,041.10)	(1,219.35)
2.	Add: adjustments	788.08	913.30	993.20	1,005.66	1,198.78
3.	Funds from operations (1+2)	800.97	(713.09)	(396.40)	(35.44)	(20.57)
4.	Cash deficit	1,209.29	1,623.38	1,409.26	1,901.12	3,455.10
5.	Total (3+4)	2,010.26	910.29	1,012.86	1,865.68	3,434.53
<b>Utilisation</b>						
6.	Capital expenditure	130.76	1,885.45	1,520.75	1,536.59	1,654.74
7(a).	Increase in working capital	(341.51)	(1,645.77)	(2,491.03)	(961.32)	(760.69)
7(b).	Repayment of capital liabilities	2,221.01	670.61	1,983.14	1,290.41	2,540.48
8.	Cash surplus	Nil	Nil	Nil	Nil	Nil
9.	Total	2,010.26	910.29	1,012.86	1,865.68	3,434.53

The Board had no cash surplus at all and the capital expenditure was stagnated at about ₹ 1,500 crore per annum. In the absence of cash surplus, the Board was constrained to limit the capital expenditure affecting capacity addition, R&M works etc. The cash deficit was overcome mainly by borrowings in the form of cash credit/loans from the commercial banks/financial institutions. Some of the reasons for cash deficit were poor/delay in recovery of power supply bills, high employee cost, over dependence on power purchase and high interest commitment on loans. We observed that dependence of the Board on borrowed funds increased from ₹ 8,887.02 crore in 2005-06 to ₹ 17,346.69 crore at the end of 2009-10. This being a huge liability resulted in heavy interest burden of ₹ 5,204.68 crore during the review period ultimately increasing the operating cost of the Board. Therefore, there is an urgent need for containing the borrowings of the Board. In the context of strained financial condition of the Board and large scale inefficiencies in implementation of the projects, it is necessary for the Board to encourage private participation in capacity addition programmes.

### Tariff Fixation

**3.18** The Board is required to file its application for approval of tariff for each year 120 days before commencement of the respective year. The Electricity Regulatory Commission accepts the application filed by the Board with such modifications /conditions as may be deemed just and appropriate after considering all suggestions and objections from the public and other stakeholders and issues order containing targets for performance parameters and the tariffs for the year.

The Aggregate Revenue Requirement (ARR) and Tariff Application were filed belatedly by the Board with the PSERC for all the years except 2006-07. Non-filing of ARR and Tariff Application for the year 2007-08 by the stipulated date resulted in rejection of a claim (lodged in ARR and Tariff Application for the Year 2008-09) for ₹ 115.19 crore as interest payment on non/delayed receipt of subsidy from the Government during 2007-08. PSERC rejected the claim on the ground that the Tariff Order for 2007-08 was issued on September 17, 2007 on suo-moto basis. The subsidy or any other amount

due from the Government could be quantified and became payable to the Board only after the issue of Tariff Order and the Board was, in part, responsible for the delay in issue of the Tariff Order for 2007-08.

**Due to failure of the Board to achieve various performance parameters and targets, PSERC did not allow expenditure of ₹ 2,751.36 crore during 2005-09.**

The Commission sets performance targets for each year for parameters that are deemed to be controllable which include: station heat rate, Plant availability, auxiliary energy consumption, secondary fuel oil consumption, Operation and Maintenance expenses, Plant load factor and financing cost. Any financial loss on account of underperformance of the targets for the above mentioned parameters is not recoverable through tariffs. We noticed that the Board has consistently not been able to achieve the performance parameters and targets set by PSERC, which led to disallowances of expenditure of ₹ 2,751.36 crore; on account of station heat rate (₹ 462.30 crore), operation and maintenance expenses (₹ 1,242.68 crore) and interest and finance charges (₹ 1,046.38 crore) during the last four years ending 2008-09.

The Board had not contained the expenditure disallowed by the Commission by improving its performance. As a result, it affected the financial health of the Board adversely. It is necessary that the Board achieves the performance parameters set by the Commission failing which accountability should be fixed against the persons concerned in the Board.

### Environment Issues

**3.19** In order to minimize the adverse impact on the environment, the GOI had enacted various Acts and statutes. At the State level, the Punjab Pollution Control Board (PPCB) is the regulating agency to ensure compliance with the provisions of Acts and statutes. The Ministry of Environment and Forests (MoE&F), GOI and Central Pollution Control Board (CPCB) are also vested with powers under the various statutes. The Board has an environmental wing at each of its thermal power station. Audit scrutiny relating to compliance with the provisions of various Acts revealed the following:

#### *Operation of the plants without consent of PPCB*

**3.19.1** As per Section 25 of the Water (Prevention and control of Pollution) Act, 1974 and Section 21 of Air (Prevention and control of Pollution) Act, 1981, the Board was required to obtain consent of PPCB to operate the thermal plants in the State. However, all the thermal plants of PSEB were running without the consent of PPCB.

The Management stated that most of the observations of PPCB had been complied with and it was expected that consent to operate the plant would be received in near future.

### Air Pollution

**3.20** Coal ash, being a fine particulate matter, is a pollutant under certain conditions when it is airborne and its concentration in a given volume of atmosphere is high. Control of dust levels (Suspended Particulate Matters –

SPM) in flue gas is an important responsibility of the thermal power stations. Electrostatic Precipitator (ESP) is used to reduce the dust concentration in flue gases. Control of dust level is dependant on effective and efficient functioning of the ESPs.

#### ***Non-achievement of specified SPM levels***

**3.20.1** Central Electricity Authority fixed (June 2003) a norm that all the new/extension/ existing thermal power stations would comply with the revised norm of suspended particulate matters of 100 mg/Nm<sup>3</sup>. The ESPs installed at GNDTP Bathinda and GGSSTP Ropar were designed to the achieve SPM of 200 mg/Nm<sup>3</sup>. In order to reduce the SPM level, the ESPs of GGSSTP Stage-I and GNDTP Stage-I were upgraded/installed (June 2006) at a total cost of ₹1.46 crore and ₹ 12.00 crore (including cost of civil works and other related equipment) respectively. We observed that even after up-gradation, the recorded SPM levels of GGSSTP Stage-I and GNDTP Stage-I for the years under review ranged from 65 mg/Nm<sup>3</sup> to 161 mg/Nm<sup>3</sup> and 101 mg/Nm<sup>3</sup> to 149 mg/Nm<sup>3</sup> respectively, as against the designed level of 100 mg/Nm<sup>3</sup>. In 23 out of 44 months, the norm was not achieved.

The Management stated (May 2010) that the ESPs of Stage-II & III of GGSSTP Ropar and Stage-II of GNDTP Bathinda would be upgraded during the forthcoming R&M programmes of the units.

#### ***Failure to install on-line monitoring equipment***

**3.20.2** As per the provisions of the Environment (Protection) Act, 1986, thermal power stations should have on-line monitoring systems to record the SPM levels. GGSSTP Ropar incurred an expenditure of ₹ 44.14 lakh on procurement and installation of the on-line monitoring and other equipments. We observed that these equipment were not functioning effectively and SPM data was being collected manually. It was further noticed that the on-line monitoring equipment was not installed at critical areas like coal handling plants of GNDTP, Bathinda where four generating units were in operation. Thus, non-functioning/non-installation of the on-line monitoring equipment defeated the purpose of their procurement.

#### ***Clean Development Mechanism***

**3.20.3** To save the Earth from green house gases (GHG) a number of countries including India signed the 'Kyoto Protocol' (Protocol) in December 1997. Article 3 of the Protocol targeted reduction of emission of GHG by five per cent in the developed countries. Only those power plants that meet the UNFCCC norms and take up new technologies will be entitled to sell these credits. If the developed countries were unable to reduce their own carbon emissions, they could book the savings of GHG in developing countries in their account by paying some money to the concerned country. This whole system is named Clean Development Mechanism (CDM). In India the Ministry of Environment and Forest (MOEF), Government of India is the nodal agency under KYOTO protocol.



We noticed that Board has not developed any system to calculate and realise the benefits, if any, admissible under CDM.

### Water pollution

**3.21** The waste water of the power plant is the source of water pollution. As per the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the thermal power plants were required to obtain consent of the PPCB.

We observed that waste water from different sections at GGSSTP, Ropar was discharged without any treatment through several outlets to either natural rivulet or local drain or ash dykes which ultimately enter the river Sutlej. Effluent Treatment Plant or Sedimentation tanks were not provided. The difference between intake and outfall temperature of water used for cooling purposes was beyond the permissible limit of 10° C. As Light Density Polythene sheets had not been laid at the base of ash dykes of Stage-I & II, there was continuous seepage of water from these ash dykes. Further, effluents from the Oxidation Ponds provided in each of the colonies at GGSSTP were having Biochemical Oxygen Demand (BOD) of 40 to 63 mg/litre against the permissible limit of 30 mg/litre. We further observed that though no effluent was discharged from GNDTP to public area/canal/drain etc. and the surplus effluent was taken back in raw water lake number 2 from where it was again utilized in the plant, no measuring device had been installed at the outlet point and reports of effluent discharged were not being submitted to the PPCB. Sewage treatment plant in C-compound area has not been installed so far (April 2010). Further, effluents from the Oxidation pond/Sedimentation tank provided in the power colony were having BOD of 31 to 98 mg/litre against permissible limit of 30 mg/litre. Due to failure of the Board to bring down the pollution to specified levels, water cess was being paid at higher rates at GNDTP Bathinda and GGSSTP Ropar, resulting in extra payment of ₹16.83 crore (₹ 0.56 crore for GNDTP Bathinda and ₹ 16.27 crore for GGSSTP Ropar) during 2005-10.

**Due to failure of the Board to bring down the pollution to specified levels, water cess was being paid at higher rates resulting in extra payment of ₹ 16.83 crore during 2005-10.**

The main reasons for water pollution were non-construction/ineffective functioning of the oxidation ponds, sedimentation tanks and effluent treatment plants. As all the factors contributing to water pollution were controllable, the Board should take effective and time bound steps to avoid the non-repairable damage caused to the water bodies.

The Management stated that remedial measures like installation of sewage treatment plants, sedimentation tanks, etc. had been initiated.

### Monitoring by top Management

**3.22** The Board plays an important role in the State economy. For such an organisation to succeed in operating economically, efficiently and effectively, there should be adequate documented management systems of operations, service standards and targets. Further, there has to be a Management Information System (MIS) to report on the achievement of targets and norms. The achievements need to be reviewed to address deficiencies and also to set

targets for subsequent years. Audit of the system existing in this regard revealed the following:

- The Board did not devise a proper management information system to evaluate power demand and supply position in the State to take timely policy decision regarding capacity addition programme, long term power purchase agreements and demand side management measures to overcome energy/peak shortages.
- The Board did not have effective system to minimize the delay in decision making process and for monitoring adherence to its plan in implementation of the projects.
- The Board did not evolve a proper system for monitoring the adherence to performance parameters and targets.
- The Board did not evolve an effective monitoring system to address the environmental issues at the power generating stations.

## Conclusion

**Performance audit of generation of power by the Punjab State Electricity Board disclosed the following:**

- **The accumulated losses of the Board increased year after year and the entire capital including reserves had been eroded by 2008-09. Due to its poor financial position, the Board was constrained to limit the capital expenditure affecting capacity addition and R&M works etc.**
- **The Board failed to meet the growth in peak demand by 2,078 MW, as the capacity addition was only 937 MW during 2005-10 due to delay in planning and implementation of capacity addition programmes.**
- **To meet the chronic deficit of power in the State, the Board resorted to unplanned purchases of power through short term agreements at exorbitant rates.**
- **The Board failed to contain the consumption of coal within the norms. There was excess consumption of coal of 75.48 lakh MT due to use of coal of less calorific value, high station heat rate and frequent leakages of steam.**
- **The Board failed to contain the employee cost which is one of the highest in the country.**

- **The existing generating units were ageing and there were abnormal delays in taking up/ execution of the renovation and modernisation works of these units.**
- **The Board has consistently not been able to achieve the performance parameters and targets set by PSERC, which led to disallowance of expenses of ₹ 2,751.36 crore which could not be realised through tariff.**
- **The Board failed to address the environmental issues at the power generating stations.**

### **Recommendations**

**The Board need to:**

- **intensify its capacity addition programs by exploiting all conventional and non conventional potential resources of energy by involving private entrepreneurs and by close monitoring of the programmes for timely execution so as to meet the national objective of power for all by 2012,**
- **bring more professionalism in decision making and execution of the projects,**
- **further rationalising the deployment of manpower,**
- **improve operational performance of the stations by containing the break downs and auxiliary consumption of power,**
- **carry out the scheduled maintenance of the thermal and hydel power stations and undertake renovation & modernisation of the power plants in time,**
- **achieve the performance parameters set by the Commission failing which accountability should be fixed against the persons concerned in the Board,**
- **address the environmental issues and**
- **consider setting up of a separate company for generation on the lines of practice followed in the other States.**

We referred the matter to the Government in May 2010, reply is awaited (September 2010).