

**Compendium on
Performance Audit of
Power Generation Utilities
in the State Sector**

2009-10

***OFFICE OF
THE COMPTROLLER & AUDITOR GENERAL OF INDIA
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FOREWORD

Power is one of the key drivers of economic growth and is an essential requirement for all facets of our life. National Electricity Policy aims at providing reliable and adequate power to all, at reasonable rates, by 2012. The Performance Audit of all power generation companies across the country brought into focus the inadequacy of planning efforts for capacity addition, project execution and operation of existing plants. While comprehensive audit findings are contained in the respective Audit Reports, this compendium brought out by the Commercial States Wing presents an all India macro level picture on the issues relating to generation of power.

I am sure that this compendium will act as a tool in the hands of various stake holders such as Planning Commission, Ministry of Power, State Governments and management of Power Generation Companies to further analyse the issues identified and take appropriate action to improve the delivery system so as to meet the avowed objective of power for all by 2012.



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Preface

Power Sector occupies the most prominent position in the State Public Sector Undertakings (PSUs). The Electricity Act, 2003 (the Act) aims to provide a framework conducive to development of Power Sector, promote transparency and competition besides protecting the interest of the consumers. In compliance with the provisions of the Act, the erstwhile Electricity Boards had been unbundled in majority of the States and generation activity is carried out by a separate Undertaking established under Companies Act, 1956. In seven states, Electricity Boards still continue to function as generation, transmission and distribution entity. In smaller states, generation of power is managed by Department of Power in the absence of GENCOs. The present Compendium brings out the important audit findings emerged as a result of performance audit of State Power Generation Undertakings (GENCOs) conducted across the country for a period of five years from 2005-06 to 2009-10 for inclusion in the respective State Audit Reports of the Comptroller & Auditor General of India for the year ended 31 March 2010. This compilation deals with the functioning of GENCOs which includes their financial position, operational performance, tariff fixation, environment issues and monitoring by top management. The idea of bringing out this Compendium is to present the macro picture of the power generation in India by State GENCOs and provide a platform for the policy makers to analyse their performance and infuse desired improvements in the Power Generation sector.

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Summary of recommendations

- *States which carry on power generation as a part of State Electricity Boards/ Power Departments' activity, may consider unbundling them and form separate company for generation activity to bring in more autonomy and quick decision making process.*
- *GENCOs should formulate plans for adequate capacity addition to meet the energy requirement in the states*
- *GENCOs should intensify the capacity addition programmes by closely monitoring the same for timely execution so as to meet the national objective of power for all by 2012.*
- *GENCOs should adequately plan for new projects and obtain necessary clearance before commencement of project works so as to avoid time and cost overrun.*
- *GENCOs should bring more professionalism in decision making and execution of works.*
- *GENCOs should monitor physical and financial progress of 'on- going projects' and develop strategic mechanism for timely completion of projects.*
- *GENCOs should take up R&M/ LE programmes as per schedule to ensure envisaged benefits from the existing units and decide about closing down the unviable units*
- *GENCOs should ensure adherence to scheduled maintenance of the plants/ equipment to avoid forced outages of the generating units.*
- *GENCOs should enhance fuel efficiencies through improved technology to ensure consumption of coal within the norms.*
- *GENCOs should make concrete efforts in achieving plant load factor, plant availability and capacity utilization as per norms to augment power generation by minimizing outages and auxiliary consumption.*
- *GENCOs should ensure timely preventive maintenance and upkeep of the equipments to minimize forced outages.*
- *GENCOs should rationalize their manpower deployment to ensure optimum utilization*

- *GENCOs should take effective measures to achieve the performance parameters set by SERCs*
- *GENCOs should ensure submission of Annual Revenue Requirement (ARR) in time for tariff fixation so as to avoid non recovery of cost during intervening period.*
- *GENCOs should ensure strict adherence to environmental laws thereby minimizing the adverse impact on environment.*
- *GENCOs should undertake the study to explore the feasibility of measuring carbon credit benefits.*
- *GENCOs should evolve an adequate MIS for evaluating the performance of the generating stations and ensuring periodical analysis/ review by top management for corrective action*

Executive summary

Introduction

Power is an essential requirement for all facets of life and has been recognized as a basic requirement. The generation of power in states is managed by Power Generating Undertakings (GENCOs). As at the end of 31 March 2010, generation of power is managed by 26 Government Companies, seven State Electricity Boards and five Departments of electricity in 29 States. Power Performance Reviews on the working of 22 Companies, seven SEBs and one Power Department in 24 states for the period from 2005-06 to 2009-10 were conducted.

The results of performance reviews have appeared in Audit Reports of the respective states. The performance reviews assessed GENCOs with regard to efficiency and economy of operations, achievement of performance parameters set by CEA/ CERC/ SERC and effectiveness of the top management in monitoring the affairs of GENCOs.

Capacity Addition

The aggregate position of 30 GENCOs indicated that against the envisaged capacity addition of 36,637 MW to meet the energy generation requirement during 2005-10, the actual addition was 21,047 MW.

Project Management

Out of 88 projects, time over run ranging upto 204 months was noticed in all 65 projects completed during review period. The slippage in time schedule was mainly due to delay in acquisition of land/ obtaining clearance from various authorities/ supply of material to contractors and delayed commencement of

work etc, with cascading effect on cost of the projects. During review period 44 projects were completed at a cost overrun of ₹11074.21 crore. The cost over-run was mainly due to lack of effective control over implementation of the projects, delay in awarding the work, overpayment to the contractors and additional work not envisaged in DPR.

Renovation & Modernisation

Inordinate delay in taking up/ completion of R&M by GENCOs resulted in time overrun/ cost overrun with resultant generation loss. As there was no appreciable improvement in PLF, R&M carried out by TNEB in ETPS and TTPS at cost of ₹373.63 crore remained unfruitful

Repairs and maintenance

Annual maintenance of majority of the units was undertaken after delay ranging even upto 7 years. This delay led to increase in forced outage, increase consumption of inputs and loss of generation.

Procurement of coal

During 2005-10, against the coal linkage of 9299.14 lakh MT fixed by SLC, GENCOs received 8136.71 lakh MT of coal. The short receipt of coal during 2005-10 ranged from 9.22 per cent to 14.86 per cent.

Consumption of coal

The consumption of coal by GENCOs during the review period was higher than the norms which resulted in excess consumption of coal of 876.56 lakh MT valued at ₹16178.37 crore.

Plant Load Factor

During 2005-10, 7 GENCOs were able to achieve CERC norm of PLF. Remaining GENCOs could not achieve CERC norm mainly due to low plant availability and its utilization, major shut downs/ delays in repairs and maintenance etc. TNEB (BBGTPS) was far away from the norm where PLF ranged between 3.80 per cent to 17.07 during 2005-10.

Outages

The forced outages remained more than the norm of 10 per cent fixed by CEA in all the five years ending 31 March 2010 which would otherwise have entailed availability of plant for additional operational hours with consequent generation of power.

Auxiliary Consumption

The actual auxiliary consumption in majority of GENCOs was more than the norms during review period resulting in lesser availability of power by 6320.21 MUs valued at ₹ 1198.52 crore. In respect of JKSPDCL and MSEB, auxiliary consumption was within norms.

Deployment of Manpower

GENCOs had 93324 employees as on 31 March 2010. The actual manpower was more than the norms of CEA resulting in extra expenditure of ₹ 2842.68 crore during 2005-10. The position of manpower has improved during the review period. During 2009-10, though manpower was in excess in 11 GENCOs, overall manpower was within norms fixed by CEA.

Tariff fixation

Delay in filing tariff petition resulted in loss of ₹ 433.90 crore to five GENCOs. Further 10 GENCOs suffered a loss of ₹ 2801.32 crore during 2005-10 due to underperformance against the parameters fixed by the respective SERCs.

Environmental Issues

APGCL lost potential revenue of ₹ 69.32 crore in the form of carbon credit in Lakwa Waste Heat Recovery Project. To reduce SPM level, UPRVUNL incurred ₹ 209.68 crore for installation of ESPs but it could not be installed so far. Due to failure in bringing the water pollution to the specified limits, GENCOs had to pay extra water cess.

Inadequate monitoring

Though MIS system exists in most of the GENCOs, it is not free from errors and omissions. OPGC has effective management systems of operations, service standards and targets. The performance reports are evaluated by Board of Directors on quarterly basis and remedial actions for arresting operational deficiencies, if any, are suggested.

Recommendations

The compendium contains 17 recommendations which includes effective planning and monitoring, enhancing fuel efficiencies, rationalizing manpower, minimizing outages and auxiliary consumption, achieving various parameters set by respective SERCs, adhering to environmental laws and developing MIS for evaluating the performance of GENCOs etc.

Chapter I

Introduction

1.1 Power is an essential requirement for all facets of life and has been recognised 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 conducive to development of the Power Sector, promote competition and protect the interest of the consumers. In compliance with Section 3 of the *ibid* Act, the Government of India (GOI) prepared the National Electricity Policy (NEP) in February 2005 in consultation with the State Governments and Central Electricity Authority (CEA) for accelerated development of the Power Sector. CEA has been entrusted to frame National Electricity Plan once in five years giving a 15 years' perspective.

1.2 Progress of reforms initiative in the State Sector

With the enactment of Electricity Act, 2003, 17 States unbundled their State Electricity Boards/ Power Departments into various Companies for carrying out the task of generation, transmission and distribution of electricity as distinct activity under the form of Company Management with devolution of adequate power and responsibility. Most of the States have appointed State Electricity Regulatory Commission for systematic regulation of power sector. Though many States formed separate Companies since 2003, still the States such as Bihar, Himachal Pradesh, Jharkhand, Kerala, Punjab and Tamil Nadu continued to operate under State Electricity Board system and yet to unbundle their Boards into various Companies on functional specialization basis. There are also States such as Arunachal Pradesh, Manipur, Mizoram, Nagaland and Sikkim, who are still managing the Electricity Sector as Department of their respective State Governments.

1.3 Performance Audit of Generation Activity

The Performance Audits of Power Generation Companies including SEBs and Power Departments (hereinafter referred to as GENCOs) were conducted covering their functioning for a period of five years from 2005-06 to 2009-10 and were included in the State Audit Reports of the Comptroller & Auditor

General of India for the year ended 31 March 2010. Out of 38 GENCOs in 29 States, performances of 30 GENCOs in 24 states (leaving Manipur, Mizoram, Nagaland, Puducherry and Sikkim) were reviewed in Performance Audits (details given in *Annexure – I*).

1.4 The results of performance audits have been consolidated as a compendium to facilitate overall picture of State owned GENCOs. The present compendium contains information/ data in respect of State owned GENCOs across the country and includes audit findings and observations on Planning, Project Management, Input Efficiency, Manpower Management, Output Efficiency, Repairs & Maintenance, Renovation & Modernisation, Tariff Fixation, Environmental Issues and Monitoring by Top Management.

1.5 Audit Objectives

The audit objectives of the performance audit were as follows:

- whether capacity addition was planned adequately;
- whether projects undertaken were implemented efficiently, economically and effectively;
- whether requirements of fuel were assessed realistically, procured economically and utilised efficiently;
- whether the manpower requirement was realistic and its utilisation optimal;
- whether the GENCOs operated efficiently to maximize the output;
- whether GENCOs complied with the various environmental laws; and
- whether top management exercised adequate control over the functioning of the GENCOs

1.6 Audit Criteria

- National Electricity Plan, norms/ guidelines of 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;

- norms fixed by CEA/ allowed by respective State Electricity Regulatory Commissions for consumption of fuel;
- targets fixed for generation of power ;
- parameters fixed for plant availability, Plant Load Factor (PLF) etc;
- prescribed norms for planned outages; and
- Acts relating to Environmental laws.

1.7 The Compendium highlights best and poor performing GENCOs under various operational parameters. For detailed audit findings the Performance Audit Reports appeared in the respective State Audit Reports for the year 2009-10 may be referred to.

Recommendations:

- *States which carry on power generation as a part of State Electricity Boards/ Power Departments' activity, may consider unbundling them and form separate company for generation activity to bring in more autonomy and quick decision making process.*

Chapter II

Financial Position and Working Results

2.1 The financial position and working results of individual GENCOs are given in the Reports of the Comptroller & Auditor General of India for the year ended 31 March 2010 of the respective States.

2.2 The aggregate financial position of 18 GENCOs (except seven SEBs, four Companies¹ and Power Department of Arunachal Pradesh) for the five years ending 2009-10 is given below².

| (₹ in crore) | | | | | |
|------------------------------------|-----------------|-----------------|------------------|------------------|------------------|
| Particulars | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 |
| A. Liabilities | | | | | |
| Paid up Capital | 18715.34 | 21386.21 | 26821.45 | 29831.24 | 26583.36 |
| Reserve & Surplus | 5443.25 | 7328.28 | 9054.35 | 11851.31 | 12891.63 |
| Borrowings | | | | | |
| Secured | 17481.81 | 18989.15 | 26037.08 | 36574.15 | 34044.13 |
| Unsecured | 30729.60 | 33022.11 | 32972.79 | 33496.58 | 32297.41 |
| Current Liabilities & Provisions | 12072.01 | 15355.78 | 21257.94 | 26910.16 | 27392.47 |
| Others | 39.56 | 135.91 | 550.61 | 564.32 | 608.18 |
| Total | 84481.57 | 96217.44 | 116694.22 | 139227.76 | 133817.18 |
| B. Assets | | | | | |
| Gross Block | 72587.29 | 76039.36 | 86765.82 | 98835.43 | 94611.17 |
| Less: Depreciation | 31534.39 | 34795.68 | 37912.08 | 41526.70 | 41588.36 |
| Net Fixed Assets | 41052.90 | 41243.68 | 48853.74 | 57308.73 | 53022.81 |
| Capital works-in-progress | 13392.47 | 23887.03 | 28643.49 | 35889.14 | 33902.71 |
| Investments | 1806.22 | 808.37 | 743.98 | 772.44 | 600.06 |
| Current Assets, Loans and Advances | 26650.50 | 28754.59 | 36802.36 | 42401.79 | 43186.58 |
| Accumulated losses | 1291.84 | 1267.53 | 1396.24 | 2609.42 | 3095.89 |
| Others | 287.64 | 256.24 | 254.41 | 246.24 | 9.13 |
| Total | 84481.57 | 96217.44 | 116694.22 | 139227.76 | 133817.18 |

¹ CSPGCL, DPL (West Bengal), WBSEDCL and TSECL.

² The above does not include data in respect of HPGCL and RRVUNL for 2009-10 as account were in arrears.

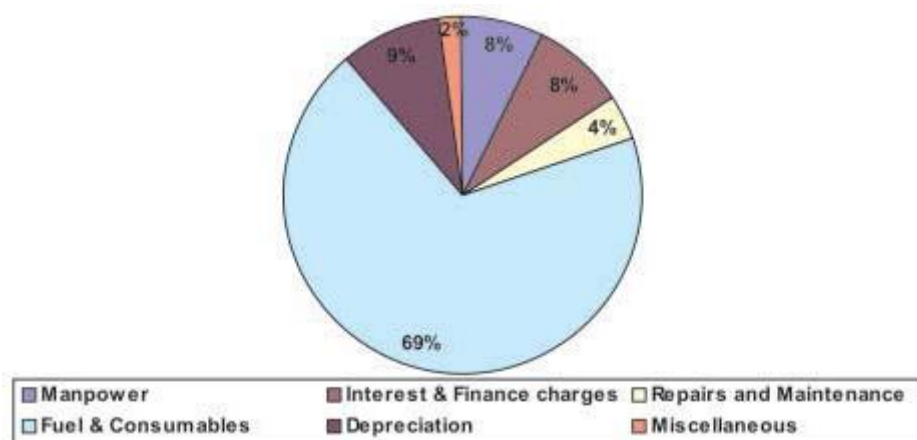
2.3 It would be seen from the above table that the borrowings have increased from ₹ 48211.41 crore to ₹ 66341.54 crore over a period of five years, which is indicative of increased dependence on the borrowings and lack of generation of funds from internal sources. The aggregate accumulated losses increased from ₹ 1291.84 crore at the end of 31 March 2006 to ₹ 3095.89 crore at the end of 31 March 2010 registering an increase of 139.65 *per cent*. During 2009-10, the major contributors to the accumulated losses were MPPGCL (₹ 1048.25 crore), UPRVUNL (₹ 970.14 crore) and TVNL, Jharkhand (₹ 493.88 crore), which constituted 81.15 *per cent* of the total accumulated losses. The heavy losses rendered many GENCOs unviable.

2.4 The details of working results of the same 18 GENCOs like cost of generation of electricity, revenue realisation, net surplus/ loss and earnings and cost *per unit* of operation are given below:

| (₹ in crore) | | | | | | |
|--------------|--------------------------------------|------------------|------------------|------------------|------------------|------------------|
| Sl. No. | Description | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1. | Income | | | | | |
| (a) | Generation Revenue | 31719.19 | 37440.76 | 40310.21 | 49080.72 | 46061.12 |
| (b) | Other income | 725.69 | 897.97 | 1602.76 | 1283.61 | 1229.08 |
| | Total Income | 32444.88 | 38338.73 | 41912.97 | 50364.33 | 47290.20 |
| 2. | Generation | | | | | |
| | Total generation (In MUs) | 208445.64 | 236390.85 | 242049.41 | 248606.66 | 217974.96 |
| | Less: Auxiliary consumption (In MUs) | 16949.53 | 18778.73 | 19421.50 | 20739.81 | 17740.90 |
| | Net generation (In MUs) | 191496.11 | 217612.12 | 222627.91 | 227866.85 | 200234.06 |
| 3. | Expenditure | | | | | |
| (a) | Fixed cost | | | | | |
| (i) | Employees cost | 1857.74 | 2468.28 | 3488.39 | 3761.00 | 3505.97 |
| (ii) | Administrative and General expenses | 433.48 | 841.70 | 862.77 | 814.43 | 853.34 |
| (iii) | Depreciation | 3017.15 | 3063.14 | 3133.00 | 3662.15 | 4267.20 |
| (iv) | Interest and finance charges | 2920.54 | 2728.14 | 2702.15 | 3923.70 | 3822.84 |
| | Total fixed cost | 8228.91 | 9101.26 | 10186.31 | 12161.28 | 12449.35 |
| (b) | Variable cost | | | | | |
| (i) | Fuel consumption | | | | | |
| a) | Coal & other fuel | 21459.38 | 25044.19 | 27327.08 | 34586.99 | 30865.67 |
| b) | Other fuel related costs | 554.57 | 384.69 | 245.52 | 343.54 | 148.30 |
| (ii) | Cost of water & chemicals | 191.18 | 308.84 | 344.61 | 415.62 | 417.01 |
| (iii) | Lubricants and consumables | 255.25 | 235.49 | 343.31 | 336.68 | 346.00 |
| (iv) | Repair and maintenance | 975.86 | 1385.63 | 1593.10 | 1744.22 | 1861.02 |
| (v) | Purchase of Power | 14.32 | 19.68 | 17.37 | 18.07 | 40.46 |
| | Total variable cost | 23450.56 | 27378.52 | 29870.99 | 37445.12 | 33678.46 |
| C. | Total cost 3(a) + (b) | 31679.47 | 36479.78 | 40057.30 | 49606.40 | 46127.81 |

| | | | | | | |
|----|--|-------------|-------------|-------------|---------------|-------------|
| 4. | Realisation (₹ per unit) (1(a)/2) | 1.66 | 1.72 | 1.81 | 2.15 | 2.30 |
| 5. | Fixed cost (₹ per unit) (3(a)/2) | 0.43 | 0.42 | 0.46 | 0.53 | 0.62 |
| 6. | Variable cost (₹ per unit) (3(b)/2) | 1.22 | 1.26 | 1.34 | 1.64 | 1.68 |
| 7. | Total cost (₹ per unit) (5+6) | 1.65 | 1.68 | 1.80 | 2.17 | 2.30 |
| 8. | Contribution (₹ per unit) (4-6) | 0.44 | 0.46 | 0.47 | 0.51 | 0.62 |
| 9. | Profit (+)/Loss(-) (₹ per unit) (4-7) | 0.01 | 0.04 | 0.00 | - 0.02 | 0.00 |

2.5 It is evident from the above table that Fuel & Consumables and Depreciation constituted the major elements of costs in 2009-10 followed by Interest and Finance Charges and Employees Cost.



2.6 Recovery of cost of operations

It appears from the above table of Working Results that the 18 GENCOs in consolidation were able to recover their cost of operations almost at the break-even level. However, the detailed analysis of the individual performance audits appearing in the Reports reveal that PPCL (Delhi), OPGCL and APPGCL were the best performers with the profit per unit being recorded at ₹ 0.42, ₹ 0.28 and ₹ 0.17 during 2009-10 respectively. In addition to these three GENCOs, MSPGCL continuously reflected profit per unit during all the five years under review. On the other hand, BSHPCCL, MPPGCL and TVNL (Jharkhand) continuously reflected loss per unit during all the years under review. In addition to the above, IPGCL (Delhi) made a turn around by breaking even during the review period and registering profit per unit in the

last two years of review period against the loss per unit registered in the preceding three years. Contrary to this, the position of UPRVUNL deteriorated from profit per unit to loss per unit during the review period.

Chapter III

Planning

3.1 National Electricity Policy aims to provide availability of over 1,000 Units of per Capita electricity by 2012, for which it was estimated that need based capacity addition of more than 1,00,000 MW would be required during 2002-2012 in the country. In order to meet the increased demand in consumption, various generation companies need to plan their addition to the existing capacities adequately, plan the projects and implement the same efficiently. To fully meet both energy and peak demand by 2012, there was a need to create adequate reserve capacity margin. In addition to enhancing the overall availability of installed capacity to 85 *per cent*, a spinning reserve of at least five *per cent* would need to be created. Besides, environmental concerns would have to be suitably addressed through appropriate advance actions.

3.2 The details of capacity additions planned and actual additions during review period are given below.

| (in MW) | | | | | | |
|---------|---------------------------------------|----------|----------|-----------|-----------|-----------|
| S.No. | Description | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 |
| 1. | Capacity at the beginning of the year | 91034.62 | 92630.17 | 98259.61 | 103233.05 | 107032.80 |
| 2. | Additions planned | 4311.70 | 7131.81 | 7761.47 | 3879.76 | 13552.65 |
| 3. | Actual Additions (net) ³ | 1595.55 | 5629.44 | 4973.44 | 3800.34 | 5047.92 |
| 4. | Capacity at the end of the year | 92630.17 | 98259.61 | 103233.05 | 107032.80 | 112080.72 |
| 5. | Shortfall in planned capacity | 2716.15 | 1097.28 | 2733.06 | -103.88 | 7357.42 |

3.2.1 As may be seen from the above table that envisaged addition of capacity planned during 2005-06 and 2009-10 could not be made. As against the projected additions of 36637 MW during 2005-10, the capacity addition could be made only to the extent of 21047 MW, working out 57% of the targeted addition.

³ Actual additions (net) have been arrived at after considering reduction in installed capacity reduction in rating by CEA/de-closure of generation units.

3.2.2 Among the states, very poor planning was noticed in case of Orissa and Tamil Nadu which envisaged an addition of 165 MW and 241 MW to the existing capacity during the last five years ending 2009-10.

3.2.3 Six states could not add the anticipated capacity addition to the generation capacity. The shortfall in addition and the percentage of shortfall to the targeted addition are as follows:

| Name of state | Shortfall in Capacity addition (in MW) | Shortfall in Capacity addition (in per cent of target) |
|----------------|--|--|
| Andhra Pradesh | 5519 | 65 |
| Uttar Pradesh | 3788 | 58 |
| Haryana | 3117 | 84 |
| Rajasthan | 1000 | 66 |
| Punjab | 835 | 47 |
| Kerala | 490 | 86 |

3.2.4 While there were states which could not achieve the targeted capacity addition, there were also states which could excel in their achievement and added more capacity than what was envisaged during the five year period ending 2009-10. Creditable additions were made by the following three states:

| Name of state | Excess Capacity addition (in MW) | Excess Capacity addition (in per cent of target) |
|----------------|----------------------------------|--|
| Gujarat | 1594 | 92 |
| Madhya Pradesh | 470 | 59 |
| Tamil Nadu | 442 | 183 |

3.3 To achieve one lakh MW addition during the ten year period of 2002-2012, states look up their share of capacity addition of 36,637 MW, but could add only 21,047 MW, leaving a short fall of 15,590 MW. The major reasons for failure to add up the anticipated capacity were delayed completion of the projects. The bottlenecks in implementation of the projects are discussed in the subsequent chapters.

Recommendations:

- *GENCOs should formulate plans for adequate capacity addition to meet the energy requirement in the states.*
- *GENCOs should intensify the capacity addition programmes by closely monitoring the same for timely execution so as to meet the national objective of power for all by 2012.*

Chapter IV

Project Management

4.1 In order to reap the benefits of projects, it needs to be implemented efficiently avoiding both Cost Overrun and Time Overrun. Inefficient implementation of the projects delay the delivery of intended benefits of the scheme and the cost gets escalated at the same time. Such delayed implementation makes the functioning of the project unviable.

4.2 All GENCOs completed around 65 projects during 2005-06 to 2009-10. Another 23 projects, taken up for implementation during the same period, did not get completed and was ongoing by March 2010. Among the projects completed, WBPDCCL was found to be the one which could complete five out of six projects with the delay ranging from 16 to 24 months. Another GENCO which did excellently well was RRVUNL which could complete six out of nine projects with the delay ranging from 12 to 18 months. Though TNEB and KSEB completed five and four projects respectively, the projects underwent the respective delay of around 109 months and 204 months. Among the four projects undertaken by JKSPDCL, delay to the extent of 192 months was also noticed. The projects by HPSEB also suffered a delay upto 125 months.

4.2.1 Among the ongoing 23 projects which were expected to be completed by March 2010, the two projects undertaken by HPSEB was suffering from 54 and 36 months delay, three projects by RRVUNL by upto 48 months and one project by BSHPCCL by 49 months.

4.2.2 Details of time over-run in execution of Power projects are given in *Annexure – 2*.

4.3 The main reasons for time over-run were poor control/ monitoring of the works, delay in acquisition of land and handing over the site, delay in supply of material to contractor, delay in obtaining clearance/ sanctions from various authorities, change in scope of work, delay in taking up construction work etc. with cascading effect on the cost of the projects. The slippages in time schedule were avoidable at various stages of implementation.

4.4 In addition to denial of envisaged benefits from the projects due to delay in implementation, the delay has added substantial cost escalation to the projects.

4.5 During the review period there were 43 projects which were completed at a cost of ₹ 36570.02 crore against the estimated cost of ₹ 25497.17 crore resulting in a cost overrun of ₹ 11072.85 crore (43.43 *per cent*). Details of cost over-run in execution of Power projects are given in **Annexure – 3**. Details of some projects with high cost over-run are given below:

| Project | Estimated Cost (₹ in crore) | Actual Cost (₹ in crore) | Cost over-run (₹ in crore) |
|---------------------------------|--------------------------------|-----------------------------|-------------------------------|
| Baglihar HEP-I (JKSPDCL) | 3899.00 | 5510.09 | 1611.09 |
| Larji Project (HPSEB). | 342.97 | 1293.69 | 1124.84 |
| Maneri Bhali (MB-II) (UJVNL) | 1249.18 | 2323.33 | 1074.15 |
| PPSP (WBSEDCL) | 1178.00 | 2214.85 | 1036.85 |

4.6 The main reasons for cost over run were lack of effective control over implementation of various packages, additional work not envisaged in DPR, delay in awarding works leading to placement at higher costs, additional payment towards interest, delay in completion of various elements of awarded work, overpayment to contractors due to late taking up of construction work etc.

4.7 Contract management is one of the important factors influencing the implementation of the projects. Contract management is the process of efficiently managing contract (including inviting bids and award of work) and execution of work in an effective and economic manner. The works are generally awarded on turn key (Composite) basis to a single party involving civil construction, supply of machinery and ancillary works. Below are some of the cases where GENCOs incurred losses due to avoidable reasons.

4.7.1 Due to non correlation of delay in individual contracts with overall delay in commissioning of CTPP Unit- I & II, SSTPS unit- VI, KSTPS Unit- VII, DCCPP, GLTPP Unit-II projects, RRVUNL short levied penalty of ₹ 97.67 crore, ₹ 50.74 crore, ₹38.11 crore, ₹ 19.29 crore and ₹ 16.53 crore respectively on the contractors.

4.7.2 TNEB became ineligible for duty exemption of ₹ 133.26 crore due to award of work for Unit-II to BHEL project valuing ₹ 2175.00 crore on nomination basis.

4.7.3 Due to tardy progress of work, WBPDC and DPL had to forego subsidy of ₹ 84.26 crore and ₹ 4.47 crore respectively under Accelerated Generation and Supply Programme Scheme.

4.7.4 UJVNL failed to recover liquidated damages of ₹ 18.40 crore from the contractor being the penalty for delay in execution of Maneri Bhali (MB-II) project.

Recommendations:

- *GENCOs should adequately plan for new projects and obtain necessary clearance before commencement of project works so as to avoid time and cost overrun.*
- *GENCOs should bring more professionalism in decision making and execution of works.*
- *GENCOs should monitor physical and financial progress of 'on-going projects' and develop strategic mechanism for timely completion of projects.*

Chapter V

Renovation & Modernisation

5.1 In order to bridge the gap between demand and supply of power, especially in the context of limited financial resources available, it is imperative for GENCOs to look for other options which are not as capital intensive as new capacity addition and which could be implemented comparatively in a shorter time frame. Optimum utilization of existing installed capacity to maximize generation through various Renovation & Modernisation (R&M) programmes is considered to be the most cost effective option.

5.1.1 R&M activities are aimed at overcoming problems in operating units caused due to generic defects, design deficiency and ageing by re-equipping, modifying, augmenting them with latest technology/systems. R&M activities are undertaken in TPS operating at Plant Load Factor (PLF) of 40 *per cent* and above after assessing the performance and requirement of the units.

5.1.2 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 were operating at PLF below 40 *per cent*. Residual Life Assessment (RLA) studies are also conducted for all Refurbishment activities and in major R&M works.

5.1.3 For Refurbishment and R&M activities Power Finance Corporation (PFC) sanctions loan equal to 70 *per cent* of the estimated cost of the activity against guarantee furnished by the respective State Governments and rest of the fund is met through internal sources or loan from the State Government concerned.

5.2 The major irregularities noticed in execution of R&M works are discussed below:

5.2.1 The renovation and modernization carried out in ETPS during 1999-2007 and TTPS during 2005-10 by TNEB at a total cost of ₹ 322.71 crore and ₹ 50.92 crore respectively remained largely unfruitful as there was no appreciable improvement in PLF, auxiliary consumption and heat rate etc.

5.2.2 Incomplete refurbishment at Unit VI of DPL led to increase in the incidence of tube leakages due to which unit suffered a break down (October 2006) and could not be re-commissioned in March 2008. This resulted in generation loss of 604.83 MU valuing ₹ 152.81 crore.

5.2.3 Due to non completion of R&M works of Anpara A TPS within scheduled time frame of June 2005, units operated at PLF lower than the norms resulting in loss of 681.57 MU valued at ₹88.57 crore to UPRVUNL.

5.2.4 Delay in taking up renovation scheme in BPGS resulted in cost overrun of ₹ 77.61 crore to HPSEB.

5.2.5 R&M works at KTPS were stopped by WBPDCCL after incurring an expenditure of ₹ 56.42 crore. This also resulted in generation loss of 363.51 MU valued at ₹ 61.08 crore.

5.2.6 Due to delay in completion of R&M works at Dr. NTTPP and resultant non utilization of the loan, APPGCL could not avail rebate of ₹ 12.78 crore on interest.

5.2.7 Due to not taking up R&M and Life Extension (LE) works in respect of Pathri Hydro power plant in time, UJVNL incurred extra expenditure of ₹ 11.58 crore.

Recommendations:

- *GENCOs should take up R&M/ LE programmes as per schedule to ensure envisaged benefits from the existing units and decide about closing down the unviable units.*

Chapter VI

Repairs & Maintenance

6.1 To ensure long term sustainable levels of performance, it is important to adhere to periodic maintenance schedules. The efficiency and availability of equipment is dependent on the strict adherence to annual maintenance and overhauling schedules. Non adherence to schedule carries a risk of the equipment consuming more coal, fuel oil and a higher risk of forced outages. These factors increase the cost of power generation due to reduced availability of equipments which affect the total power generated.

6.2 Annual maintenance of units of majority of TPS was done after a delay ranging even upto 84 months. The delayed maintenance caused continuous deterioration in the condition of machines causing forced outages⁴ besides increased consumption of oil, coal and loss of generation of power as discussed in the input performance. Some of the serious observations noticed during the review period are as follows:

6.2.1 Annual maintenance of units of BTPS was not done regularly by BSEB. In case of two units of BTPS, first and last capital maintenance was done during October 1998 to November 1999 and July 1992 to May 1993.

6.2.2 Capital maintenance of some of the unit of PTPS was not carried out for 8 to 15 years by JSEB though the unit had already outlived their normal life. Further shut down of two units in the absence of preventive maintenance resulted in generation loss of 582.38 MU valued at ₹ 104.60 crore.

6.2.3 In case of APGCL, DHPD and MSEB, no advance maintenance schedule was prepared. Instead, repairs and maintenance are undertaken as and when the necessity arises.

Recommendations:

- *GENCOs should ensure adherence to scheduled maintenance of the plants/ equipments to avoid forced outages of the generating units.*

⁴ Forced outages is closure of plant in excess of prescribed limit due to break down in the system.

Chapter VII

Input Efficiency

7.1 Operations of GENCOs are dependent on input efficiency consisting of material and manpower and output efficiency in connection with Plant Load Factor, plant availability, capacity utilization, outages and auxiliary consumption.

7.2 Input efficiency

7.2.1 Procedure for procurement of coal

The Central Electricity Authority (CEA) fixes power generation targets for thermal power stations (TPS) considering capacity of plant, average plant load factor (PLF) and past performance. GENCOs work out coal requirement on the basis of targets so fixed and past coal consumption trends. The coal requirement so assessed is conveyed to the Standing Linkage Committee (SLC) of the Ministry of Energy (MOE), Government of India, which decides the source and quantity of coal supply to TPSs on quarterly basis. On the basis of linkage source approved by SLC, GENCOs enter into Coal Supply Agreements with collieries. However, from 2009-10, the above concept of SLC was discontinued by notification of New Coal Distribution Policy (October 2007). The GENCOs now directly enter into a fuel supply agreement with the coal companies.

7.3 The position of coal linkages fixed and coal received during the period from 2005-06 to 2009-10 covering 16 GENCOs⁵ is as under. State-wise position of coal linkage fixed vis-à-vis actually received is depicted in *Annexure – 4*.

⁵ Excluding 12 GENCOs where gas, diesel or water is being used as input source for power generation instead of coal and MPPGCL & CSPGCL in respect of which the information was not available.

(in Lakh MTs)

| Particulars | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | Total |
|-----------------------------|---------|---------|---------|---------|---------|---------|
| Coal Linkage fixed | 1579.25 | 1639.74 | 1800.60 | 1894.00 | 1629.85 | 8543.44 |
| Quantity of coal received | 1388.89 | 1459.91 | 1546.05 | 1626.95 | 1478.83 | 7500.63 |
| Shortfall in coal receipt | 190.36 | 179.83 | 254.55 | 267.05 | 151.02 | 1042.81 |
| Percentage of short receipt | 12.05 | 10.97 | 14.14 | 14.10 | 9.27 | 12.21 |

It would be seen from the above table that the total linkage of coal during the five years fixed by the SLC was 8543.44 lakh MT. Against this, only 7500.63 lakh MT of coal was received, resulting in short receipt of 1042.81 lakh MT of coal during audit period. However, after execution of CSA with Coal Companies during 2009-10, the supply of coal has improved significantly with a shortfall of 9.27 *per cent*.

7.4 Quality of Coal

Coal is classified into different grades. The price of the coal depends on the grade of coal. Each thermal station is designed for usage of particular grade of coal. Usage of envisaged grade of coal ensures optimizing generation of power and economizing cost of generation. During 2005-10, GENCOs entered into various CSA with the coal supplying companies for supply of different grades of coal to its power stations at different places. However, the grade of coal received from collieries was not always of the specified grade required by the thermal stations and was either inferior or ungraded coal as well.

7.4.1 Due to receipt of 132.64 lakh MT of inferior grade coal during audit period, West Bengal GENCOs sustained loss of ₹ 374.51 crore

7.5 Thermal efficiency

The Thermal efficiency of a power station is an index, which measures the efficiency of conversion of thermal energy to electrical energy denoted as a percentage of heat energy contained in the fuel used in generation. The heat rates as recommended by respective SERCs were used to arrive at excess heat consumed in terms of coal due to non achievement of guaranteed thermal efficiency. The consumption of coal can be controlled by improving thermal efficiency of the plant to achieve economy in cost of generation

7.6 Excess consumption of coal

The consumption of coal depends upon its calorific value. Some of the reasons contributing to excess consumption of coal are low calorific value, excessive forced outages, non-adherence to maintenance schedule, delayed execution of R & M works, poor quality of coal, transit losses and windage losses. The consumption above norms by GENCOs resulted in excess consumption of coal to the tune of 2159.23 lakh MT valued at ₹ 16178.38 crore during the review period as detailed below.

| S.No. | Particulars | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 |
|-------|--|-----------|-----------|-----------|-----------|-----------|
| 1. | Unit generated (in MUs) | 167624.23 | 178668.91 | 183968.31 | 186987.64 | 190090.60 |
| 2. | Coal required as per norms (in lakh MT) | 1047.38 | 1105.08 | 1159.70 | 1211.04 | 1228.84 |
| 3. | Coal consumed (in lakh MT) | 1168.44 | 1271.50 | 2638.39 | 1403.76 | 1429.18 |
| 4. | Excess consumption (in lakh MT) ⁶ | 121.06 | 166.42 | 1478.69 | 192.72 | 200.34 |
| 5. | Value of excess coal (₹ in crore) ⁶ | 2065.10 | 2886.30 | 3322.71 | 3674.99 | 4229.28 |

Recommendations:

- *GENCOs should enhance fuel efficiencies through improved technology to ensure consumption of coal within the norms.*

⁶ The quantity and value of excess consumption of coal have not been reduced by quantity less consumed by some GENCOs.

Chapter VIII

Output Efficiency

8.1 Availability of power is not only influenced by the timely completion of the projects, but also by the operation of the existing plants efficiently. The targets for generation of power for each year are approved by the Central Electricity Authority. The table below contains the targets and achievement for generation of power in respect of 28 GENCOs for the five year period ending 2009-10. State wise details are given in *Annexure – 5*.

(In MUs)

| Year | Target | Actual | Shortfall |
|--------------|----------------|----------------|--------------|
| 2005-06 | 283897 | 265820 | 18077 |
| 2006-07 | 295672 | 291512 | 4160 |
| 2007-08 | 307098 | 301297 | 5801 |
| 2008-09 | 329518 | 312220 | 17298 |
| 2009-10 | 344468 | 317387 | 27081 |
| Total | 1560653 | 1488236 | 72417 |

8.1.1 As may be seen from the above table that GENCOs could not achieve the target in any year under review period and were able to generate a total of 14,88,236 MUs (net off after compensating for excess generation in respect of individual generation plants/ units) of power during 2005-10 against a target of 15,60,653 MUs leaving a shortfall of 72,417 MUs (4.64 *per cent*).

8.1.2 Though the overall achievement of target is around 95 *per cent*, the generation plants in West Bengal, Uttar Pradesh, Maharashtra and Madhya Pradesh achieved only 93 *per cent*, 93 *per cent*, 90 *per cent* and 85 *per cent* of the targets respectively during the last five years ending 2009-10.

8.2 Plant Load Factor (PLF)

PLF refers to the ratio between the actual generation and the maximum

Unit No. 6 of Kota TPS of RRVUNL 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).

possible generation at installed capacity. According to CERC norms, the PLF for thermal power generating stations should be 80 *per cent*. State-wise PLF is given in *Annexure – 6*. As may be seen from

the annexure, CERC norms have been achieved by APPGCL, CSPGCL, PPCL, OPGCL, PSEB, RRVUNL and TNEB (TTPS, MTPS and ACTPS) during the review period. HPGCL was also able to achieve the norm during 2009-10. On the other side, DHPD, BSEB, BSHPCCL, JSEB, KSEB, and TNEB (BBGTPS) were far away from the norm where PLF ranged from 3.80 *per cent* to 38.98 *per cent* during review period. TNEB (BBGTPS) was the worst performer where PLF was 3.80 *per cent*, 5.38 *per cent*, 6.00 *per cent*, 17.07 *per cent* and 8.30 *per cent* during 2005-06 to 2009-10 respectively.

8.2.1 The main reasons for low PLF, as observed in audit, were low plant availability and its utilization, major shut downs/ delays in repairs and maintenance etc.

8.3 Plant availability

Plant availability means the ratio of actual hours operated to maximum possible hours available during the period. As against CERC norm of 80 *per cent* plant availability during 2004–2009 and 85 *per cent* during 2010–2014, the average plant availability of GENCOs decreased from 64.89 *per cent* in 2005-06 to 60.38 *per cent* in 2009-10.

8.3.1 The details of total hours available, total hours operated, planned outages, forced outages, reserved outages and overall plant availability in respect of 26 GENCOs are shown below:

| | | (in lakh hours) | | | | |
|--------|--|-----------------|---------|---------|---------|---------|
| S. No. | Particulars | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 |
| 1. | Total hours available | 50.44 | 57.96 | 59.82 | 60.87 | 60.68 |
| 2. | Operated hours | 32.73 | 35.55 | 36.54 | 37.88 | 36.64 |
| 3. | Planned outages ⁷ hours | 4.88 | 5.75 | 5.65 | 5.26 | 5.80 |
| 4. | Forced outages hours | 9.88 | 13.89 | 14.85 | 14.68 | 14.82 |
| 5. | Reserved Outages/ Idle hours | 2.95 | 2.77 | 2.78 | 3.05 | 3.42 |
| 6. | Plant availability (<i>per cent</i>) | 64.89 | 61.34 | 61.08 | 62.23 | 60.38 |

8.3.2 As may be seen from the above table, while the planned outages increased by 18.85 *per cent* from 4.88 lakh hours to 5.80 lakh hours, forced outages increased by 50.00 *per cent* from 9.88 lakh hours to 14.82 lakh hours

⁷ Outages refer to the period for which the plant remained closed for attending planned/ forced maintenance.

during 2005-06 to 2009-10. This indicated lack of adequate preventive maintenance.

8.3.3 The forced outages remained more than CEA norm of 10 *per cent* in all the five years ending 31 March 2010. Compliance of the CEA norms would have entailed availability of plant for additional operational hours with consequent generation of power.

8.3.4 The low availability of Power plants was due to longer duration of outages caused by inordinate delays in repair and maintenance

8.4 Capacity utilisation

Capacity utilisation means the ratio of actual generation to possible generation during actual hours of operation. State-wise capacity utilization is given in *Annexure – 7*. As may be seen from the annexure, during the review period PSEB was the best performer where capacity utilisation increased to 100.54 *per cent*, 98.94 *per cent* and 84.17 *per cent* in respect of GHTP lehra Mohabbat, GGSSTP Ropar and GNDTP Bathinda respectively in 2009-10. In case of TNEB (Thermal), OPGCL and TVNL, capacity utilization during review period ranged from 93.04 *per cent* to 98.02 *per cent*, 93 *per cent* to 96 *per cent* and 84.12 *per cent* to 94.23 *per cent* respectively. On the other side, the capacity utilization ranged from 10.73 *per cent* to 17.39 *per cent* and 27.81 *per cent* to 57.51 *per cent* in respect of MSEB and BSEB (BTPS) respectively.

8.4.1 The main reasons for the low utilisation of available capacity during 2005-10, as analysed by audit were reduced capacity of old generating unit, frequent shutdown due to excessive forced outages, delayed R&M, running of units with partial load/without load, non availability of adequate inputs, Constraints on transmission capacity etc.

8.5 Auxiliary Consumption

Energy consumed by power stations themselves for running their equipments

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).

and common services is called Auxiliary Consumption. The actual auxiliary consumption was in excess of the CERC norm of 10 *per cent* during review period resulting in

excess consumption of 6320.21 MU of electricity valuing ₹ 1198.52 crore

which could not be dispatched to the grid. Auxiliary consumption in case of BSEB, UPRVUNL and TVNL ranged between 12.87 *per cent* to 28.59 *per cent*, 7.61 *per cent* to 19.15 *per cent* and 8.66 *per cent* to 14.67 *per cent* during 2005-10. Excess auxiliary consumption could be reduced by timely overhauling and implementing R&M and life extension activities of old TPSs.

Recommendations:

- *GENCOs should make concrete efforts in achieving plant load factor, plant availability and capacity utilization as per norms to augment power generation by minimizing outages and auxiliary consumption.*
- *GENCOs should ensure timely preventive maintenance and upkeep of the equipment to minimize forced outages.*

Chapter IX

Manpower Management

9.1 Consequent upon the unbundling of erstwhile State Electricity Boards and GENCOs coming into existence, State Governments decided that the staff strength available in the power stations on the date would be taken as their respective sanctioned strengths. In National Electricity Plan, the CEA has fixed norms of manpower per MW of the installed capacity. The position of manpower requirement as per CEA norms vis-a-vis actual manpower in respect of 23 GENCOs⁸ is given below. State wise details of recommended manpower and actual manpower have been given in *Annexure – 8*.

| Sl. No. | Particulars ⁹ | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 |
|---------|---|---------|---------|---------|---------|---------------|
| 1 | Manpower as per the CEA norms | 87850 | 92793 | 95113 | 97799 | 97801 |
| 2 | Actual manpower | 101438 | 100314 | 98890 | 98307 | 93324 |
| 3 | Manpower in excess of norms | 13588 | 7521 | 3777 | 508 | Not in excess |
| 4 | Expenditure on excess manpower (₹ in crore) | 486.41 | 523.45 | 598.57 | 686.87 | 547.40 |

9.1.1 As may be seen from the above table that actual manpower was more than CEA norms during 2005-06 to 2008-09. During 2009-10, though overall manpower was not in excess of CEA norms, the same was in excess of the norms in 11 GENCOs resulting in extra expenditure on salaries. Excess manpower resulted in extra expenditure of ₹ 2842.68 crore during 2005-10. Thus, the position of manpower management has improved during audit period and was overall within the norms in 2009-10.

9.2 Despite having excessive manpower, GENCOs were regularly employing temporary/ contract staff for regular jobs. During 2005-10 eight GENCOs deployed temporary employees for such jobs by incurring an

⁸ It does not include information in respect of DHPD, PPCL, JKSPDCL, JSEB (SRHP), TSECL, DPL, WBPDC and WBSEDCL.

⁹ It does not include information in respect of KSEB (2005-06) and HPGCL (2009-10) and expenditure details in respect of KSEB and RRVUNL for 2009-10.

expenditure of 91.83 crore. Besides, overtime has also been paid to the regular staff. During 2005-10, a sum of ₹ 346.28 crore has been paid by nine GENCOs as overtime wages. However, no action has been taken to rationalise the staff strength or explore ways to utilise them optimally.

Recommendations:

- *GENCOs should rationalize their manpower deployment to ensure optimum utilization.*

Chapter X

Tariff Fixation

10.1 The GENCOs are required to file the application for approval of Generation Tariff for each year 120 days before the commencement of the respective year or such other date as may be directed by respective SERCs. The respective SERCs accept the application filed by GENCOs with such modifications/ conditions as may be deemed just and appropriate. After considering all suggestions and objections from public and other stakeholders, SERCs issue an order containing generation tariff and targets for controllable items within 120 days of the receipt of the application. Some GENCOs are not adhering to the time limit prescribed by the respective SERCs for filing the tariff petition. During review period delay in filing tariff petition resulted in revenue loss of ₹ 433.90 crore to five GENCOS¹⁰ during the intervening period as SERCs made the revised tariff effective from a later date.

10.2 The Commission sets performance targets for each year of the Control Period for the items or parameters that are deemed to be “controllable” and which include:

- (a) Station Heat Rate;
- (b) Availability;
- (c) Auxiliary Energy Consumption;
- (d) Secondary Fuel Oil Consumption;
- (e) Operation and Maintenance Expenses;
- (f) Plant Load Factor
- (g) Financing Cost which includes cost of debt (interest), cost of equity (return); and
- (h) Depreciation.

10.2.1 Any financial loss on account of under-performance on targets for parameters deemed to be controllable is not recoverable through tariffs thereby reducing the profits or increasing the loss of GENCOs, as the case may be.

¹⁰ CSPGCL, GSECL, BSHPL, TVNL and TSECL.

10.2.2 During the review period, the respective SERCs did not allow expenditure of ₹ 2801.32 crore to 10 GENCOs¹¹ on account of under performance by them for reasons deemed to be controllable. Hence, this avoidable expenditure adversely impacted the financial viability of GENCOs.

Recommendations:

- *GENCOs should take effective measures to achieve the performance parameters set by SERCs.*
- *GENCOs should ensure submission of Annual Revenue Requirement (ARR) in time for tariff fixation so as to avoid non recovery of cost during intervening period.*

¹¹ APGCL, CSPGCL, IPGCL, JKSPDCL, PPCL, HPGCL, MPPGCL, OPGCL, RRUVNL and UJVNL.

Chapter XI

Environmental Issues

11.1 In order to minimize the adverse impact on the environment, the GOI had enacted various Acts and statutes. At the State level, State Pollution Control Boards (SPCBs) are the regulating agencies to ensure compliance with the provisions of these Acts and statutes. Ministry of Environment and Forests (MoE&F), GOI and Central Pollution Control Board (CPCB) are also vested with powers under various statutes.

11.2 Types of Pollution

11.2.1 Air Pollution

Coal ash, being a fine particle 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 in flue gas is an important responsibility of thermal power stations. Electrostatic Precipitator (ESP) is used to reduce dust concentration in flue gases. As per MoE&F notification (September 1999) every thermal plant should supply fly ash to building material manufacturing units free of cost at least for 10 years.

11.2.2 Noise Pollution

Noise Pollution (Regulation and Control) Rules 2000 aim to regulate and control noise. For noise emission from equipment be controlled at source, adequate silencing equipment should be provided at various noise sources and a green belt should be developed around the plant area to diffuse noise dispersion. The TPSs are required to record sound levels in all the areas stipulated in the rules referred to above.

11.2.3 Water Pollution

The waste water of the power plant is the source of water pollution. As per the provisions of the Water (Prevention & Control of Pollution) Cess Act, 1977 water cess at rates specified is collected from the consumers for water utilised for the purposes specified in the Act *ibid*. Compliance with the standards laid down by GOI under Environment (Protection) Act, 1986 makes the consumer eligible for concessional rate of water cess and also rebate in payment of cess.

11.3 Some of the important observations noticed on the issue are described below:

11.3.1 Due to non-completion of work of upgradation/ installation of ESPs even after incurring an expenditure of ₹ 209.68 crore by UPRVUNL, the objective of reduction of SPM level could not be achieved.

11.3.2 Due to failure in bringing down the water pollution to specified levels, PSEB made avoidable payment of water cess of ₹ 16.83 crore during 2005-10.

11.3.3 Due to non compliance of the directions of SPCB, KPCL could not avail concessional rates of water cess resulting in foregoing savings of ₹ 1.16 crore.

11.3.4 Failure to arrest water pollutant within prescribed norms resulted in avoidable payment of water cess of ₹ 1.19 crore and ₹ 0.77 crore by WBPDC and DPL respectively.

11.4 To save the Earth from green house gases (GHG) a number of countries including India signed the 'Kyoto Protocol', which targeted reduction of emission of GHG by five per cent in the developed countries. The extent to which an entity is emitting less carbon than the standard fixed in this regard gets credited for the same.

11.4.1 Due to non registration of the project as Clean Development Project at the DPR stage, APGCL lost potential revenue of ₹ 69.32 crore in the form of carbon credit in Lakwa Waste Heat Recovery Project respectively.

Recommendations:

- *GENCOs should ensure strict adherence to environmental laws thereby minimizing the adverse impact on environment.*
- *GENCOs should undertake the study to explore the feasibility of measuring carbon credit benefits.*

Chapter XII

Monitoring by top management

12.1 GENCOs play an important role in the States' economies. For such giant organisations to succeed in operating economically, efficiently and effectively, there should be documented management systems of operations, service standards and targets. Further, there has to be a Management Information System (MIS) to report on achievement of targets and norms. The achievements need to be reviewed to address deficiencies and also to set targets for subsequent years. The targets should generally be such that the achievement of which would make an organisation self-reliant. The GENCOs generally have a MIS Cell which prepares monthly reports on the basis of information received from TPSs regarding the status of generation, auxiliary consumption, fuel consumption etc. GENCOs submit these reports to BOD/ MOP/ BPE/ State Governments etc. Though MIS system exists in most of the GENCOs, it is not free from errors and omissions.

12.1.1 OPGC has effective management systems of operations, service standards and targets. The performance reports are evaluated by Board of Directors on quarterly basis and remedial actions are suggested.

Recommendations:

- *GENCOs should evolve an adequate MIS for evaluating the performance of the generating stations and ensuring periodical analysis/ review by top management for corrective action.*

ANNEXURES

Annexure - 1

List of Power Generating Utilities

(Reference Para No. 1.3)

Generation Companies

- 1 Andhra Pradesh Power Generation Corporation Limited (APPGCL)
- 2 Assam Power Generation Corporation Limited (APGCL)
- 3 Bihar State Hydro-electric Power Corporation Limited (BSHPCL)
- 4 Chhattisgarh State Power Generation Company Limited (CSPGCL)
- 5 Durgapur Projects Limited, West Bengal (DPL)
- 6 Gujarat State Electricity Corporation Limited (GSECL)
- 7 Haryana Power Generation Corporation Limited (HPGCL)
- 8 Haryana Vidyut Prasaran Nigam Limited ** (HVPNL)
- 9 Indraprastha Power Generation Company Limited, Delhi (IPGCL)
- 10 Jammu & Kashmir State Power Development Corporation Limited (JKSPDCL)
- 11 Karnataka Power Corporation Limited (KPCL)
- 12 Madhya Pradesh Power Generating Company Limited (MPPGCL)
- 13 Maharashtra State Power Generation Company Limited (MSPGCL)
- 14 Orissa Hydro Power Corporation Limited ** (OHPCL)
- 15 Orissa Power Generation Corporation Limited (OPGCL)
- 16 Pragati Power Corporation Limited, Delhi (PPCL)
- 17 Puducherry Power Corporation Limited ** (PuPCL)
- 18 Rajasthan Rajya Vidyut Prasaran Nigam Limited ** (RRVPNL)
- 19 Rajasthan Rajya Vidyut Utpadan Nigam Limited (RRVUNL)
- 20 Tenughat Vidyut Nigam Limited, Jharkhand (TVNL)
- 21 Tripura State Electricity Corporation Limited (TSECL)
- 22 Uttar Pradesh Jal Vidyut Nigam Limited (UPJVNL)
- 23 Uttar Pradesh Rajya Vidyut Utpadan Nigam Limited (UPRVUNL)
- 24 Uttarakhand Jal Vidyut Nigam Limited (UJVNL)
- 25 West Bengal Power Development Corporation Limited (WBPDCCL)
- 26 West Bengal State Electricity Distribution Company Limited (WBSEDCL)

Annexure - 1 (Contd.)

List of Power Generating Utilities

(Reference Para No. 1.3)

Electricity Boards

- 27 Bihar State Electricity Board (BSEB)
- 28 Himachal Pradesh State Electricity Board (HPSEB)
- 29 Jharkhand State Electricity Board (JSEB)
- 30 Kerala State Electricity Board (KSEB)
- 31 Meghalaya State Electricity Board (MSEB)
- 32 Punjab State Electricity Board (PSEB)
- 33 Tamil Nadu Electricity Board (TNEB)

Government Departments

- 34 Department of Hydro Power Development, Arunachal Pradesh (DHPD)
- 35 Manipur Power Department **
- 36 Mizoram Power Department **
- 37 Nagaland Power Department **
- 38 Sikkim Power Department **

** These Power Generation Utilities (PGUs) were not covered in Performance Audit Reviews

Annexure - 2

Time Over-run in respect of Commissioning of Projects completed during 2005-10

(Reference Para No. 4.2.2)

| S.No. | Unit Details | As per DPR/ Work Order | Actual Time Taken | Time overrun (In months) |
|--|------------------------------------|---------------------------------------|--------------------------|-----------------------------|
| Andhra Pradesh Power Generation Corporation Ltd. | | | | |
| 1 (a) | RTPP Stage II Unit 3 | Mar-07 | Aug-07 | 4 |
| 1 (b) | RTPP Stage II Unit 4 | Jun-07 | Mar-08 | 9 |
| 2 | Dr.NTTPP Stage IV | Nov-08 | Jan-10 | 15 |
| 3 | KTPP Stage I | Apr-09 | In progress (March 2010) | |
| 4 | Priyadarshini Jurala Hydel Project | Between October 2006 and June 2008 | In progress (March 2010) | |
| 5 | Nagarjunasagar Tail Pond Project | Jun-08 | In progress (March 2010) | |
| Assam Power Generation Corporation Ltd. | | | | |
| 6 | Lakwa WHRP(37.5 MW) | Jun-08 | In progress (March 2010) | |
| Bihar State Hydro-electric Power Corporation Limited | | | | |
| 7 | Agnoor SHP | 18 | 86 | 68 |
| 8 | Dhelabagh SHP | 24 | 49 | 25 |
| 9 | Nasariganj SHP | 24 | 62 | 38 |
| 10 | Jainagra SHP | 24 | 31 | 7 |
| 11 | Triveni SHP | 48 | 87 | 39 |
| 12 | Shirkhinda SHP | 24 | 51 | 27 |
| 13 | Sebari SHP | 24 | In progress (March 2010) | |
| Chhattisgarh State Power Generation Company Limited | | | | |
| 14 (a) | Unit No. 1 DSPM TPS | Sep-06 | Jan-08 | 16 |
| 14 (b) | Unit No. 2 DSPM TPS | Jan-07 | Nov-08 | 22 |
| 15 | Cogeneration Plant at Kawardha | Sep-04 | Aug-06 | 23 |
| 16 | Sikasar Hydro Electric Project | Sep-05 | Oct-08 | 23 |
| 17 | Mini Hydel Plant at Korba West | Sep-08 | May-09 | 8 |
| Gujarat State Electricity Corporation Limited | | | | |
| 18 | 113 MW DCCPP-II | Jan-06 | Nov-07 | 22 |
| 19 | 75 MW KLTPS.IV | Nov-06 | Dec-09 | 37 |
| 20 | 374 MW UCCPP.II | Aug-09 | Nov-09 | 3 |
| Haryana Power Generation Corporation Limited | | | | |
| 21 | RGTPP, Hisar Unit-I | Dec-09 | In progress (March 2010) | |
| 22 | RGTPP, Hisar Unit-II | Mar-10 | In progress (March 2010) | |

Annexure - 2 (Contd.)

Time Over-run in respect of Commissioning of Projects completed during 2005-10

(Reference Para No. 4.2.2)

| S.No. | Unit Details | As per DPR/ Work Order | Actual Time Taken | Time overrun (In months) |
|---|---|---------------------------|--------------------------|-----------------------------|
| HPSEB Ltd. | | | | |
| 23 | Larji | Mar-96 | Sep-06 | 125 |
| 24 | Khauli | Sep-03 | Mar-07 | 41 |
| 25 | Bhaba Augmentation Project | Sep-05 | In progress (March 2010) | |
| 26 | Ganvi Phase-II | Mar-07 | In progress (March 2010) | |
| J&K Power Development Corporation Limited | | | | |
| 27 | Haftal(1 MW) | Aug-90 | Aug-06 | 16 |
| 28 | Marpachoo (0.75 MW) | 1990 | Jun-06 | 15 |
| 29 | Igo mercellong | Sep-97 | Aug-05 | 8 |
| 30 | Baglihar-I | Dec-04 | Apr-09 | 4 |
| Karnataka Power Corporation Limited | | | | |
| 31 (a) | Almatti Dam Power House Unit 5 | May-05 | Jul-05 | 2 |
| 31 (b) | Almatti Dam Power House Unit 6 | Jun-05 | Aug-05 | 2 |
| 32 | Nagjhari Power House Unit 4 (15MW) | Apr-05 | Apr-08 | 36 |
| 33 | BTPS Unit 1 (500 MW) | Mar-07 | Jul-08 | 16 |
| 34 (a) | Varahi Underground Power House Stage 2 Unit 3 | Oct-08 | Jan-09 | 2 |
| 34 (b) | Varahi Underground Power House Stage 2 Unit 4 | Nov-08 | Jan-09 | 2 |
| Kerala State Electricity Board | | | | |
| 35 | MALANKARA | Dec-01 | Oct-05 | 47 |
| 36 | LOWER MEEN MUTTY | Feb-05 | Mar-06 | 14 |
| 37 | NERIAMANGALAM EXTN | Jul-05 | May-08 | 35 |
| 38 | KUTTIADY TAIL RACE | Nov-92 | Oct-09 | 204 |
| Maharashtra State Power Generation Company Limited | | | | |
| 39 | Parli Unit - 6 | Sep-06 | Nov-07 | 13 |
| 40 | Paras Unit - 3 | Jan-07 | Mar-08 | 14 |
| Madhya Pradesh Power Generating Company Limited | | | | |
| 41 | SGTPS (Unit 5) | Dec-06 | Aug-08 | 20 |
| 42 | ATPS Extension Unit-5 | Feb-07 | Sep-09 | 30 |

Annexure - 2 (Contd.)

Time Over-run in respect of Commissioning of Projects completed during 2005-10

(Reference Para No. 4.2.2)

| S.No. | Unit Details | As per DPR/ Work Order | Actual Time Taken | Time overrun (In months) |
|--|---|---------------------------|--------------------------|-----------------------------|
| Meghalaya State Electricity Board (MeSEB) | | | | |
| 43 (a) | Myntdu Leshka Hydel Project (Unit I&II) | Aug-04 | In progress (March 2010) | |
| 43 (b) | Myntdu Leshka Hydel Project (Unit III) | Jun-09 | In progress (March 2010) | |
| 44 | Sonapani Mini Hydel Project | Feb-03 | Oct-09 | 78 |
| 45 | Lakroh Mini Hydel Project | Aug-03 | In progress (March 2010) | |
| Punjab State Electricity Board | | | | |
| 46 | Unit-III of GHTP, Lehra Mohabbat | Dec-06 | Oct-08 | 21 |
| 47 | Unit-IV of GHTP, Lehra Mohabbat | Mar-07 | Jan-10 | 33 |
| 48 | Micro Hydel at GGSSTP, Ropar | Feb-06 | May-07 | 14 |
| Rajasthan Rajya Vidyut Utpadan Nigam Limited | | | | |
| 49 | DCCPP Unit-I | Dec-06 | Mar-08 | 14 |
| 50 | DCCPP Unit-II | Dec-06 | Mar-08 | 14 |
| 51 | DCCPP (STG) | Dec-06 | Mar-08 | 14 |
| 52 | GLTPP Unit-I | Aug-06 | In progress (March 2010) | |
| 53 | GLTPP Unit-II | Jul-08 | In progress (March 2010) | |
| 54 | KSTPS Unit-VII | Jun-08 | Dec-09 | 18 |
| 55 | CTPP Unit-I | Nov-08 | Jun-10 | 18 |
| 56 | CTPP Unit-II | Dec-08 | In progress (March 2010) | |
| 57 | SSTPS Unit-VI | Dec-08 | Dec-09 | 13 |
| TNEB (completed projects) | | | | |
| 58 (a) | BHAVANI KATTALAI BARRAGE - I | Jul-03 | Aug-06 | 37 |
| 58 (b) | BHAVANI KATTALAI BARRAGE - I | Oct-03 | Sep-06 | 35 |
| 59 (a) | PERUNCHANI MINI | Jan-97 | Mar-06 | 110 |
| 59 (b) | PERUNCHANI MINI | Jan-99 | Mar-06 | 86 |
| 60 (a) | AMARAVATHI MINI | Jan-02 | Jul-06 | 54 |
| 60 (b) | AMARAVATHI MINI | Jan-02 | Sep-06 | 56 |
| 61 | PYKARA ULTIMATE STAGE HEP | Aug-96 | Sep-05 | 109 |
| 62 | VALUTHUR PHASE 2 | Feb-08 | Feb-09 | 11 |

Annexure - 2 (Contd.)

Time Over-run in respect of Commissioning of Projects completed during 2005-10

(Reference Para No. 4.2.2)

| S.No. | Unit Details | As per DPR/ Work Order | Actual Time Taken | Time overrun (In months) |
|---|---|---------------------------|--------------------------|-----------------------------|
| TNEB (On going projects) | | | | |
| 63 | Bhavani Kattalai Barrage – II | Feb-09 | In progress (March 2010) | |
| 64 | Bhavani Kattalai Barrage.III | Feb-09 | In progress (March 2010) | |
| 65 | Bhavani Barrage – II | Feb-10 | In progress (March 2010) | |
| 66 | Periyar Vaigai Mini PH – I | Dec-09 | In progress (March 2010) | |
| 67 | Periyar Vaigai Mini PH – II | Feb-09 | In progress (March 2010) | |
| 68 | Periyar Vaigai Mini PH – III | Jan-10 | In progress (March 2010) | |
| 69 | Periyar Vaigai Mini PH – IV | Jan-09 | In progress (March 2010) | |
| Tripura State Electricity Corporation Ltd. | | | | |
| 70 | Rokhia Gas Thermal Project Unit No. 8 | Nov-05 | Apr-06 | 5 |
| 71 | Baramura Gas Thermal Project Unit No. 5 | Nov-09 | In progress (March 2010) | |
| Uttarkhand Jal Vidyut Nigam Limited | | | | |
| 72 | Maneri Bhali-II Unit-1 | Oct-05 | Mar-08 | 28 |
| 73 | Maneri Bhali-II Unit -2 | Nov-05 | Mar-08 | 27 |
| 74 | Maneri Bhali-II Unit-3 | Dec-05 | Mar-08 | 26 |
| 75 | Maneri Bhali-II Unit 4 | Jan-06 | Mar-08 | 25 |
| Uttar Pradesh Rajya Vidyut Utpadan Nigam Limited | | | | |
| 76 | Parichha Ext. Unit-1 | Feb-05 | Nov-06 | 21 |
| 77 | Parichha Ext. Unit- 2 | Aug-05 | Dec-07 | 27 |
| West Bengal Power Development Corporation Limited | | | | |
| 78 | BkTPP, Unit 4 | Apr-07 | Mar-09 | 23 |
| 79 | BkTPP, Unit 5 | Jul-07 | Jun-09 | 23 |
| 80 | SgTPP, Unit 1 | Apr-07 | Sep-08 | 17 |
| 81 | SgTPP, Unit 2 | Jul-07 | Nov-08 | 16 |
| 82 | STPS Extension Unit 5 | Apr-07 | Apr-09 | 24 |
| 83 | STPS Extension Unit 6 | Sep-09 | In progress (March 2010) | |
| Durgapur Projects Limited | | | | |
| 84 | DPL, Unit 7 | Apr-07 | Apr-08 | 12 |
| West Bengal State Electricity Distribution Company Limited | | | | |
| 85 | PPSP Unit 1 | Sep-00 | Oct-07 | 85 |
| 86 | PPSP Unit II | Sep-00 | Nov-07 | 86 |
| 87 | PPSP Unit III | Jan-01 | Feb-08 | 85 |
| 88 | PPSP Unit IV | Jan-01 | Jan-08 | 84 |

Annexure - 3

Cost Over-run in case of power projects completed under the State Sector during the period 2005-10

(Reference Para No. 4.5)

| (₹ in crore) | | | | | | |
|------------------|------------------------------|---------------------------|--------------|--|-------------------------------------|---|
| S.No. | Unit Details | Estimated cost as per DPR | Awarded Cost | Actual expenditure as on 31 March 2010 | Expenditure over and above estimate | Percentage of increase as compared to DPR |
| Andhra Pradesh | | | | | | |
| 1 | RTPP- Stage II Units 3 & 4 | 1640.00 | 1948.00 | 1948.00 | 308.00 | 18.78 |
| 2 | KTPP-I | 2077.18 | 1957.35 | 2632.66 | 555.48 | 26.74 |
| 3 | Priyadarshini Jurala HES | 547.00 | 547.00 | 619.28 | 72.28 | 13.21 |
| Bihar | | | | | | |
| 4 | Agnoor SHP | 2.47 | 7.97 | 19.60 | 17.13 | 693.52 |
| 5 | Dhelabagh SHP | 6.87 | 6.70 | 11.33 | 4.46 | 64.92 |
| 6 | Nasariganj SHP | 5.44 | 5.68 | 9.94 | 4.50 | 82.72 |
| 7 | Jainagra SHP | 5.31 | 5.30 | 9.45 | 4.14 | 77.97 |
| 8 | Triveni SHP | 9.15 | 13.47 | 19.38 | 10.23 | 111.80 |
| 9 | Shirkhinda SHP | 4.87 | 4.97 | 6.51 | 1.64 | 33.68 |
| Chhattisgarh | | | | | | |
| 10 | DSPM TPS | 1918.01 | 1572.62 | 2095.16 | 177.15 | 9.24 |
| 11 | Sikasar HEP | 24.14 | 29.50 | 34.71 | 10.57 | 43.79 |
| Gujarat | | | | | | |
| 12 | KLTPS IV | 304.69 | 540.00 | 674.97 | 370.28 | 121.53 |
| Himachal Pradesh | | | | | | |
| 13 | Larji | 168.85 | 342.97 | 1293.69 | 1124.84 | 666.18 |
| 14 | Khauli | 66.08 | 29.82 | 134.99 | 68.91 | 104.28 |
| 15 | Bhaba (Augmentation Project) | 35.60 | 24.27 | 51.01 | 15.41 | 43.29 |

Annexure - 3 (Contd.)

Cost Over-run in case of power projects completed under the State Sector during the period 2005-10

(Reference Para No. 4.5)

| (₹ in crore) | | | | | | |
|-----------------|--------------------------------------|---------------------------|--------------|--|-------------------------------------|---|
| S.No. | Unit Details | Estimated cost as per DPR | Awarded Cost | Actual expenditure as on 31 March 2010 | Expenditure over and above estimate | Percentage of increase as compared to DPR |
| Jammu & Kashmir | | | | | | |
| 16 | Pahalgam | 16.70 | 16.70 | 55.20 | 38.50 | 230.54 |
| 17 | Bhadarwah | 2.39 | 2.39 | 10.60 | 8.21 | 343.51 |
| 18 | Igo mercellong | 21.63 | 21.63 | 49.42 | 27.79 | 128.48 |
| 19 | Marpacho | 1.63 | 1.63 | 12.84 | 11.21 | 687.73 |
| 20 | Haftal | 3.95 | 3.95 | 16.12 | 12.17 | 308.10 |
| 21 | Baglihar | 3899.00 | 3899.00 | 5510.09 | 1611.09 | 41.32 |
| Karnataka | | | | | | |
| 22 | Nagjhari Power House Unit 4 | 15.66 | 13.83 | 15.98 | 0.32 | 2.04 |
| Kerala | | | | | | |
| 23 | Lower Meen Mutty | 11.26 | 12.38 | 21.33 | 10.07 | 89.43 |
| Maharashtra | | | | | | |
| 24 | Parli Unit - 6 | 1155.00 | 1155.00 | 1462.00 | 307.00 | 26.58 |
| 25 | Paras Unit - 3 | 1122.00 | 1122.00 | 1508.00 | 386.00 | 34.40 |
| Meghalaya | | | | | | |
| 26 | Sonapani Mini Hyder Project | 9.02 | 9.89 | 9.60 | 0.58 | 6.43 |
| Punjab | | | | | | |
| 27 | GHTP Stage-II, Lehra Mohabbat | 1789.67 | 1673.87 | 2547.56 | 757.89 | 42.35 |
| 28 | Micro Hydel Power Project at GGSSTP, | 14.79 | | 15.71 | 0.92 | 6.22 |

Annexure - 3 (Contd.)

Cost Over-run in case of power projects completed under the State Sector during the period 2005-10

(Reference Para No. 4.5)

| (₹ in crore) | | | | | | |
|--------------|-----------------------------|---------------------------|-----------------|--|-------------------------------------|---|
| S.No. | Unit Details | Estimated cost as per DPR | Awarded Cost | Actual expenditure as on 31 March 2010 | Expenditure over and above estimate | Percentage of increase as compared to DPR |
| Rajasthan | | | | | | |
| 29 | GLTPP Unit-II | 618.00 | 695.97 | 759.87 | 141.87 | 22.96 |
| 30 | KSTPS Unit-VII | 690.00 | 794.52 | 897.74 | 207.74 | 30.11 |
| 31 | SSTPS Unit –VI | 750.00 | 883.30 | 1031.12 | 281.12 | 37.48 |
| Tamil Nadu | | | | | | |
| 32 | Bhavani Kattalai Barrage I | 90.62 | 216.05 | 216.05 | 125.43 | 138.41 |
| 33 | Perunchani Mini Power House | 3.09 | 6.23 | 13.06 | 9.97 | 322.65 |
| 34 | Amaravathi Mini Power House | 5.19 | 20.13 | 20.13 | 14.94 | 287.86 |
| 35 | Pykara Ultimate stage HEP | 70.16 | 312.19 | 312.19 | 242.03 | 344.97 |
| Tripura | | | | | | |
| 36 | Rokhia GTPS Unit No. 08 | 73.65 | 79.50 | 92.68 | 19.03 | 25.84 |
| Uttarakhand | | | | | | |
| 37 | Maneri Bhali (MB-II) | 1249.18 | 1249.18 | 2323.33 | 1074.15 | 85.99 |
| 38 | Jummagad | 3.12 | 3.12 | 7.50 | 4.38 | 140.38 |
| West Bengal | | | | | | |
| 39 | BkTPP (Unit 4 & 5) | 1479.00 | 1132.78 | 2020.32 | 541.32 | 36.60 |
| 40 | SgTPP (Unit1&2) | 2101.00 | 1958.06 | 2887.72 | 786.72 | 37.45 |
| 41 | STPS Extension Unit-5 | 1061.00 | 1103.09 | 1603.33 | 542.33 | 51.11 |
| 42 | DPL Unit 7 | 1246.80 | 844.00 | 1375.00 | 128.20 | 10.28 |
| 43 | PPSP | 1178.00 | 2952.65 | 2214.85 | 1036.85 | 88.02 |
| | Total | 25497.17 | 27218.66 | 36570.02 | 11072.85 | 43.43 |

Annexure - 4

Statement showing GENCO-wise coal linkages fixed vis-à-vis actual receipt thereagainst during 2005-10

(Reference Para No. 7.3)

| S.No. | Particulars | (in Lakh MTs) | | | |
|-------|---|----------------|----------------|----------------|-----------------------------|
| | | Coal Linkages | Coal Receipts | Short Receipt | Percentage of short receipt |
| 1 | Andhra Pradesh Power Generation Corporation Limited | 835.80 | 739.38 | 96.42 | 11.54 |
| 2 | Bihar State Electricity Board | 17.95 | 7.08 | 10.87 | 60.56 |
| 3 | Delhi - Indraprastha Power Generation Company Limited | 41.10 | 31.88 | 9.22 | 22.43 |
| 4 | Gujarat State Electricity Corporation Limited | 745.83 | 726.16 | 19.67 | 2.64 |
| 5 | Haryana Power Generation Corporation Limited | 489.90 | 401.73 | 88.17 | 18.00 |
| 6 | Jharkhand (including both JSEB and TVNL) | 185.91 | 136.63 | 49.28 | 26.51 |
| 7 | Karnataka Power Corporation Limited | 434.62 | 368.44 | 66.18 | 15.23 |
| 8 | Maharashtra State Power Generation Company Limited | 1874.22 | 1726.12 | 148.10 | 7.90 |
| 9 | Orissa Power Generation Corporation Limited | 151.05 | 135.24 | 15.81 | 10.47 |
| 10 | Punjab State Electricity Board | 580.31 | 547.06 | 33.25 | 5.73 |
| 11 | Rajasthan Rajya Vidyut Utpadan Nigam Limited | 560.55 | 476.95 | 83.60 | 14.91 |
| 12 | Tamil Nadu Electricity Board | 782.70 | 658.70 | 124.00 | 15.84 |
| 13 | Uttar Pradesh Rajya Vidyut Utpadan Nigam Limited | 947.45 | 844.27 | 103.18 | 10.89 |
| 14 | West Bengal - Durgapur Projects Limited | 131.10 | 91.88 | 39.22 | 29.92 |
| 15 | West Bengal Power Development Corporation Limited | 764.95 | 609.11 | 155.84 | 20.37 |
| | Total | 8543.44 | 7500.63 | 1042.81 | 12.21 |

Annexure - 5

State-wise targetted generation fixed by CEA vis-a-vis Actual generation over the period 2005-10

(Reference Para No. 8.1)

| S.No. | Particulars | 2005-06 | | 2006-07 | | 2007-08 | | 2008-09 | | 2009-10 | |
|-------|---|---------|--------|---------|--------|---------|--------|---------|--------|---------|--------|
| | | Target | Actual | Target | Actual | Target | Actual | Target | Actual | Target | Actual |
| 1 | Andhra Pradesh Power Generation Corporation Limited | 28495 | 28751 | 30731 | 31419 | 35013 | 33289 | 34186 | 33502 | 37508 | 32100 |
| 2 | Assam Power Generation Corporation Limited | 940 | 808 | 1113 | 868 | 1380 | 1540 | 1601 | 1683 | 1756 | 1712 |
| 3 | Bihar (including State Electricity Board and Bihar State Hydro-electric Power Corporation Limited) | 483 | 194 | 274 | 106 | 388 | 194 | 380 | 163 | 431 | 299 |
| 4 | Chhattisgarh State Power Generation Company Limited | 8400 | 8944 | 9070 | 9227 | 10810 | 10065 | 12380 | 13210 | 11580 | 13293 |
| 5 | Delhi (including Indraprastha Power Generation Company Limited and Pragati Power Corporation Limited) | 5920 | 5606 | 5700 | 5254 | 5750 | 5572 | 5778 | 5514 | 5361 | 5045 |
| 6 | Gujarat State Electricity Corporation Limited | 30193 | 27130 | 30013 | 27533 | 30208 | 29241 | 28967 | 28388 | 29136 | 28314 |
| 7 | Haryana Power Generation Corporation Limited | 10112 | 9181 | 10261 | 10780 | 10631 | 10845 | 15051 | 13519 | 15713 | 15102 |
| 8 | Himachal Pradesh State Electricity Board | 1324 | 1332 | 1939 | 1432 | 1930 | 1865 | 1822 | 2075 | 1966 | 1804 |
| 9 | Jharkhand (including State Electricity Board and Tenughat Vidyut Nigam Limited) | 3960 | 2375 | 4848 | 3330 | 3580 | 2492 | 4110 | 3236 | 4385 | 3180 |
| 10 | Karnataka Power Corporation Limited | 10330 | 9165 | 10330 | 11483 | 10329 | 10875 | 13212 | 11717 | 14216 | 13263 |
| 11 | Kerala State Electricity Board | 5444 | 7413 | 6292 | 7497 | 6749 | 8327 | 7008 | 5839 | 6769 | 6646 |
| 12 | Madhya Pradesh Power Generating Company Limited | 16873 | 12849 | 17031 | 16314 | 17159 | 15808 | 19323 | 16927 | 21917 | 16522 |

Annexure - 5 (Contd.)

State-wise targetted generation fixed by CEA vis-a-vis Actual generation over the period 2005-10

(Reference Para No. 8.1)

| S.No. | Particulars | 2005-06 | | 2006-07 | | 2007-08 | | 2008-09 | | 2009-10 | |
|-------|--|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| | | Target | Actual | Target | Actual | Target | Actual | Target | Actual | Target | Actual |
| 13 | Maharashtra State Power Generation Company Limited | 49596 | 40382 | 53821 | 50357 | 55723 | 52294 | 55658 | 50398 | 57557 | 50875 |
| 14 | Meghalaya State Electricity Board | 560 | 517 | 569 | 391 | 571 | 665 | 568 | 554 | 530 | 535 |
| 15 | Orissa Power Generation Corporation Limited | 2980 | 3095 | 3040 | 3318 | 3034 | 3047 | 3256 | 3191 | 3127 | 2961 |
| 16 | Punjab State Electricity Board | 18024 | 19884 | 18793 | 19865 | 19348 | 21101 | 22031 | 22298 | 22221 | 23798 |
| 17 | Rajasthan Rajya Vidyut Utpadan Nigam Limited | 18289 | 18901 | 18258 | 19041 | 18905 | 19543 | 21186 | 21175 | 21811 | 20620 |
| 18 | Tamil Nadu Electricity Board | 26907 | 26915 | 27925 | 29481 | 27837 | 29241 | 28733 | 28983 | 29804 | 27860 |
| 19 | Tripura State Electricity Corporation Ltd. | 456 | 429 | 584 | 520 | 490 | 584 | 474 | 608 | 524 | 612 |
| 20 | Uttar Pradesh Rajya Vidyut Utpadan Nigam Limited | 21810 | 19370 | 21770 | 20741 | 22887 | 21041 | 23437 | 22383 | 22963 | 22912 |
| 21 | Uttar Pradesh Jal Vidyut Nigam Limited | 1307 | 1282 | 1551 | 1431 | 1470 | 925 | 1470 | 1097 | 1470 | 945 |
| 22 | Uttarakhand Jal Vidyut Nigam Limited | 3440 | 3544 | 3335 | 3317 | 3435 | 3603 | 4511 | 4613 | 4437 | 4127 |
| 23 | West Bengal (including all three Companies) | 18054 | 17753 | 18424 | 17808 | 19471 | 19139 | 24376 | 21146 | 29286 | 24861 |
| | Total | 283897 | 265820 | 295672 | 291512 | 307098 | 301297 | 329518 | 312220 | 344468 | 317387 |

Annexure - 6

Statement showing Plant Load Factor achieved over the period 2005-10

(Reference Para No.8.2)

| S.No. | Particulars | (In per cent) | | | | |
|-------|---|---------------|---------|---------|---------|---------|
| | | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 |
| 1 | Andhra Pradesh Power Generation Corporation Limited | 79.90 | 85.00 | 85.70 | 86.70 | 84.49 |
| 2 | Arunachal Pradesh - Department of Hydropower Development | 15.96 | 18.00 | 17.67 | 13.39 | 11.04 |
| 3 | Assam Power Generation Corporation Limited | 36.17 | 38.67 | 49.00 | 59.51 | 61.02 |
| 4 | Bihar State Electricity Board | 6.27 | 3.86 | 13.77 | 10.68 | 27.47 |
| 5 | Bihar State Hydro-electric Power Corporation Limited | 29.86 | 27.56 | 23.24 | 21.60 | 11.60 |
| 6 | Chhattisgarh State Power Generation Company Limited | 79.77 | 82.29 | 82.40 | 86.08 | 85.25 |
| 7 | Delhi - Indraprastha Power Generation Company Limited | 56.81 | 51.53 | 54.92 | 53.99 | 50.02 |
| 8 | Delhi - Pragati Power Corporation Limited | 79.53 | 77.79 | 81.65 | 83.07 | 84.85 |
| 9 | Gujarat State Electricity Corporation Limited | 68.01 | 67.53 | 76.20 | 75.32 | 72.48 |
| 10 | Haryana Power Generation Corporation Limited | 67.00 | 78.78 | 78.94 | 75.01 | 82.93 |
| 11 | Himachal Pradesh State Electricity Board | 46.24 | 42.55 | 45.59 | 50.73 | 44.11 |
| 12 | Jammu & Kashmir State Power Development Corporation Limited | 41.00 | 44.00 | 40.00 | 50.00 | 56.00 |
| 13 | Jharkhand - Tenughat Vidyut Nigam Limited | 41.69 | 73.92 | 48.47 | 60.31 | 55.52 |
| 14 | Jharkhand State Electricity Board - PTPS | 12.55 | 9.31 | 10.45 | 16.00 | 14.20 |
| 15 | Jharkhand State Electricity Board - SRHP | 7.68 | 30.35 | 22.62 | 22.55 | 12.81 |
| 16 | Karnataka Power Corporation Limited | 71.17 | 89.18 | 84.22 | 77.22 | 76.65 |
| 17 | Kerala State Electricity Board - Brahmapuram Diesel Power Plant | 5.97 | 9.14 | 10.25 | 23.18 | 24.93 |
| 18 | Kerala State Electricity Board - Kozhikode Diesel Power Plant | 8.32 | 14.41 | 24.83 | 38.98 | 32.08 |
| 19 | Madhya Pradesh Power Generating Company Limited | 68.02 | 70.54 | 68.91 | 67.21 | 62.86 |
| 20 | Maharashtra State Power Generation Company Limited | 73.05 | 73.64 | 76.99 | 70.61 | 69.71 |
| 21 | Meghalaya State Electricity Board | 31.85 | 29.00 | 40.87 | 34.15 | 37.80 |
| 22 | Orissa Power Generation Corporation Limited | 84.10 | 90.16 | 82.57 | 86.71 | 80.46 |

Annexure - 6 (Contd.)

Statement showing Plant Load Factor achieved over the period 2005-10

(Reference Para No.8.2)

| S.No. | Particulars | (In per cent) | | | | | | |
|-------|---|---------------|---------|---------|---------|---------|--|--|
| | | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | | |
| 23 | Punjab State Electricity Board | 79.18 | 82.94 | 87.42 | 86.33 | 88.96 | | |
| 24 | Rajasthan Rajya Vidyut Utpadan Nigam Limited | 89.69 | 90.34 | 91.24 | 89.41 | 85.40 | | |
| 25 | Tamil Nadu Electricity Board - BBGTPS | 3.80 | 5.38 | 6.00 | 17.07 | 8.30 | | |
| 26 | Tamil Nadu Electricity Board - ETPS | 15.20 | 36.20 | 51.40 | 49.20 | 38.00 | | |
| 27 | Tamil Nadu Electricity Board - Hydel Stations | 39.30 | 39.00 | 38.30 | 34.90 | 38.00 | | |
| 28 | Tamil Nadu Electricity Board - TGTPS, KGYPs, VGTPS I and II | 72.31 | 70.92 | 50.80 | 80.24 | 64.54 | | |
| 29 | Tamil Nadu Electricity Board - TTPS, MTPS AND NCTPS | 82.40 | 89.70 | 87.30 | 86.40 | 83.30 | | |
| 30 | Tripura State Electricity Corporation Limited | 63.50 | 58.74 | 64.19 | 68.35 | 68.32 | | |
| 31 | Uttar Pradesh Rajya Vidyut Utpadan Nigam Limited | 56.94 | 60.15 | 59.04 | 62.45 | 64.14 | | |
| 32 | Uttarakhand Jal Vidyut Nigam Limited | 40.59 | 37.85 | 39.25 | 40.34 | 36.37 | | |
| 33 | West Bengal - Durgapur Projects Limited | 61.94 | 52.13 | 41.57 | 49.67 | 46.63 | | |
| 34 | West Bengal Power Development Corporation Limited | 59.48 | 67.15 | 67.84 | 62.62 | 64.31 | | |

Annexure - 7

Statement showing Capacity Utilisation over the period 2005-10

(Reference Para No. 8.4)

| S.No. | Particulars | (In per cent) | | | | | | | |
|-------|---|---------------|---------|---------|---------|---------|--|--|--|
| | | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | | | |
| 1 | Andhra Pradesh Power Generation Corporation Limited - Thermal | 72.71 | 74.80 | 76.27 | 80.63 | 76.90 | | | |
| 2 | Andhra Pradesh Power Generation Corporation Limited - Hydro | 30.36 | 37.40 | 30.00 | 27.74 | 18.59 | | | |
| 3 | Arunachal Pradesh - Department of Hydropower Development | 15.96 | 18.00 | 17.67 | 13.39 | 11.04 | | | |
| 4 | Assam Power Generation Corporation Limited | 27.75 | 32.42 | 47.38 | 66.85 | 73.17 | | | |
| 5 | Bihar State Electricity Board - BTPS | 28.86 | 27.81 | 49.10 | 57.51 | 48.94 | | | |
| 6 | Bihar State Hydro-electric Power Corporation Limited | 57.55 | 53.84 | 52.97 | 51.63 | 45.57 | | | |
| 7 | Gujarat State Electricity Corporation Limited | 83.55 | 88.39 | 87.19 | 89.99 | 88.82 | | | |
| 8 | Jammu & Kashmir State Power Development Corporation Limited | 82.00 | 68.00 | 66.00 | 83.00 | 90.00 | | | |
| 9 | Jharkhand - Tenughat Vidyut Nigam Limited | 85.08 | 90.15 | 93.21 | 94.23 | 84.12 | | | |
| 10 | Jharkhand State Electricity Board - PTPS | 49.11 | 58.05 | 80.94 | 89.02 | 69.97 | | | |
| 11 | Kerala State Electricity Board - Hydel | 76.62 | 76.54 | 79.01 | 74.15 | 73.92 | | | |
| 12 | Kerala State Electricity Board - Brahmapuram Diesel Power Plant | 87.60 | 88.50 | 86.95 | 82.35 | 85.49 | | | |
| 13 | Kerala State Electricity Board - Kozhikode Diesel Power Plant | 82.46 | 80.59 | 79.72 | 83.05 | 79.94 | | | |
| 14 | Meghalaya State Electricity Board | 14.65 | 10.73 | 21.66 | 15.03 | 17.39 | | | |
| 15 | Punjab State Electricity Board - GNDTP Bathinda | 84.60 | 87.48 | 87.63 | 82.85 | 84.17 | | | |
| 16 | Punjab State Electricity Board - GGSSTP Ropar | 95.03 | 98.09 | 96.68 | 97.42 | 98.94 | | | |
| 17 | Punjab State Electricity Board - GHTP Lehra Mohabbat | 97.24 | 99.20 | 100.33 | 98.86 | 100.54 | | | |
| 18 | Rajasthan Rajya Vidyut Utpadan Nigam Limited | 78.98 | 78.18 | 81.57 | 77.51 | 72.79 | | | |
| 19 | Tamil Nadu Electricity Board - Thermal | 96.84 | 98.02 | 97.53 | 96.59 | 93.04 | | | |
| 20 | Tamil Nadu Electricity Board - Gas | 79.46 | 83.43 | 84.67 | 81.88 | 71.71 | | | |
| 21 | Tamil Nadu Electricity Board - Hydel Stations | 51.46 | 50.44 | 53.12 | 46.14 | 48.90 | | | |
| 22 | Tripura State Electricity Corporation Limited | 89.48 | 81.29 | 75.80 | 73.23 | 73.17 | | | |

Annexure - 7 (Contd.)

Statement showing Capacity Utilisation over the period 2005-10

(Reference Para No. 8.4)

| S.No. | Particulars | (In per cent) | | | | |
|-------|---|---------------|--------------------------------|---------|---------|---------|
| | | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 |
| 23 | Uttar Pradesh Rajya Vidyut Utpadan Nigam Limited | 33.09 | 34.75 | 33.27 | 47.21 | 48.65 |
| 24 | Uttarakhand Jal Vidyut Nigam Limited | 40.59 | 37.85 | 39.25 | 40.34 | 36.37 |
| 25 | West Bengal - Durgapur Projects Limited | 47.70 | 36.66 | 27.68 | 30.08 | 24.81 |
| 26 | West Bengal Power Development Corporation Limited - BkTPP | 71.20 | 85.77 | 86.03 | 84.65 | 67.70 |
| 27 | West Bengal Power Development Corporation Limited - KTPS | 57.62 | 62.22 | 64.92 | 50.41 | 57.96 |
| 28 | Haryana - PTPS - I | | ranged between 40.48 and 56.17 | | | |
| 29 | Haryana - PTPS - II | | ranged between 55.98 and 85.92 | | | |
| 30 | Himachal Pradesh State electricity Board Limited | | ranged between 41.76 and 48.94 | | | |
| 31 | Maharashtra State Power Generation Company Limited | | ranged between 78.86 and 89.99 | | | |
| 32 | Orissa Power Generation Corporation Limited | | ranged between 93 and 96 | | | |

Annexure - 8

Statement showing State-wise Manpower as per CEA recommendations vi-a-vis Actual over the period 2005-10

(Reference Para No. 9.1)

| S.No. | Particulars | 2005-06 | | 2006-07 | | 2007-08 | | 2008-09 | | 2009-10 | |
|-------|---|---------------------------|--------|-------------|--------|-------------|--------|-------------|--------|---------------------------|--------|
| | | Recommended | Actual | Recommended | Actual | Recommended | Actual | Recommended | Actual | Recommended | Actual |
| 1 | Andhra Pradesh Power Generation Corporation Limited | 11634 | 11023 | 12003 | 10872 | 11181 | 10885 | 11244 | 10823 | 12089 | 10683 |
| 2 | Assam Power Generation Corporation Limited | 135 | 1640 | 135 | 1541 | 314 | 1575 | 314 | 1510 | 314 | 1386 |
| 3 | Bihar State Electricity Board | 564 | 729 | 564 | 777 | 506 | 643 | 506 | 635 | 506 | 586 |
| 4 | Bihar State Hydro-electric Power Corporation Limited | 79 | 134 | 83 | 124 | 76 | 118 | 83 | 116 | 85 | 107 |
| 5 | Chhattisgarh State Power Generation Company Limited | 2252 | 4253 | 2252 | 4104 | 3132 | 3989 | 3132 | 3967 | 3132 | 4110 |
| 6 | Delhi - Indraprastha Power Generation Company Limited | 1330 | 2124 | 1330 | 2006 | 1330 | 1838 | 1330 | 1800 | 1330 | 1323 |
| 7 | Gujarat State Electricity Corporation Limited | 8745 | 8232 | 8745 | 8229 | 8086 | 8274 | 8086 | 8050 | 8416 | 8284 |
| 8 | Haryana Power Generation Corporation Limited | 2796 | 4479 | 2796 | 4299 | 2796 | 4234 | 3769 | 4579 | Information not available | |
| 9 | Himachal Pradesh State Electricity Board | 589 | 1824 | 836 | 1858 | 836 | 1806 | 836 | 1852 | 836 | 1883 |
| 10 | Jharkhand - Tenughat Vidyut Nigam Limited | 739 | 651 | 739 | 651 | 667 | 654 | 667 | 651 | 667 | 651 |
| 11 | Jharkhand State Electricity Board - PTPS | 1356 | 2008 | 1356 | 1737 | 1217 | 1567 | 1217 | 1540 | 1217 | 1459 |
| 12 | Karnataka Power Corporation Limited | 8263 | 5340 | 8893 | 5693 | 7994 | 5472 | 8523 | 5749 | 8903 | 5705 |
| 13 | Kerala State Electricity Board | Information not available | | 3434 | 921 | 3443 | 893 | 3501 | 965 | 3506 | 1038 |
| 14 | Madhya Pradesh Power Generating Company Limited | 5469 | 6962 | 5602 | 6787 | 5822 | 6610 | 5854 | 6432 | 6111 | 6055 |

Annexure - 8 (Contd.)

Statement showing State-wise Manpower as per CEA recommendations vi-a-vis Actual over the period 2005-10

(Reference Para No. 9.1)

| S.No. | Particulars | 2005-06 | | 2006-07 | | 2007-08 | | 2008-09 | | 2009-10 | |
|-------|--|--------------|---------------|--------------|---------------|--------------|--------------|--------------|--------------|--------------|--------------|
| | | Recommended | Actual | Recommended | Actual | Recommended | Actual | Recommended | Actual | Recommended | Actual |
| 15 | Maharashtra State Power Generation Company Limited | 14441 | 14102 | 14927 | 14010 | 18787 | 14735 | 19667 | 14780 | 20787 | 15642 |
| 16 | Meghalaya State Electricity Board | 332 | 188 | 332 | 190 | 332 | 190 | 332 | 190 | 332 | 190 |
| 17 | Orissa Power Generation Corporation Limited | 739 | 599 | 739 | 587 | 663 | 560 | 663 | 490 | 663 | 490 |
| 18 | Punjab State Electricity Board | 5783 | 9288 | 5783 | 8945 | 5199 | 8619 | 5594 | 8412 | 5989 | 8052 |
| 19 | Rajasthan Rajya Vidyut Utpadan Nigam Limited | 4392 | 3289 | 4392 | 3397 | 4097 | 3327 | 4097 | 3478 | 4406 | 3492 |
| 20 | Tamil Nadu Electricity Board | 9309 | 10963 | 9363 | 10564 | 9368 | 10187 | 9368 | 9813 | 9417 | 9734 |
| 21 | Uttar Pradesh Rajya Vidyut Utpadan Nigam Limited | 6184 | 10113 | 5762 | 9560 | 6091 | 9335 | 5832 | 9211 | 5910 | 9327 |
| 22 | Uttar Pradesh Jal Vidyut Nigam Limited | 935 | 737 | 942 | 720 | 847 | 720 | 847 | 702 | 847 | 648 |
| 23 | Uttarakhand Jal Vidyut Nigam Limited | 1784 | 2760 | 1785 | 2742 | 2329 | 2659 | 2337 | 2562 | 2338 | 2479 |
| | Total | 87850 | 101438 | 92793 | 100314 | 95113 | 98890 | 97799 | 98307 | 97801 | 93324 |