Chapter II

2. Performance Reviews relating to Government Companies

2.1 Transmission Corporation of Andhra Pradesh Limited

Executive Summary

The Transmission Corporation of Andhra Pradesh Limited (Company) is engaged in the business of transmission of electricity and Grid operations. The activities of Company include construction of Extra High Tension (EHT) transmission network, i.e., 400 kV to 132 kV level Sub-stations (SS) and lines. To the end of March 2010 the Company had 383 numbers SSs with installed capacity of 44,542 Mega Volt Ampere (MVA) and transmission lines of 30,970 Circuit Kilo Meters (CKM). The performance audit of the Company for the period from 2005-06 to 2009-10 was conducted to assess the economy, efficiency and effectiveness of its operations and ability to meet the objectives of its establishment.

Financial position

The Company's profit before tax decreased from ₹ 190.85 crore in 2005-06 to ₹ 146.81 crore in 2009-10 and Company created reserves and surplus amounting to ₹ 962.07 crore as at the end of 31 March 2010. The Company's borrowings stood at ₹ 2,185.51 crore as at 31 March 2010.

Capacity Additions

The Company could add 73 EHT SSs and 4,124 CKM EHT lines during the five year period (achievement of 56 per cent and 61 per cent respectively) from 2005-06 to 2009-10 as against its actual planned capacity addition of 130 numbers EHT SSs and laying of 6,730 CKM of EHT lines. The shortfall was attributed to delay in execution of projects beyond the scheduled dates due to delay in getting the forest clearances, delay in civil works, frequent break downs in newly erected equipments etc.

Project Management

The Company could not complete its projects as per the original schedule. The time overrun ranged between one to 62 months. The mismatch between the completion of generation capacity and evacuation system in three out of the four cases resulted in the Company evacuating the power under alternate systems which were already overloaded. The Company constructed Sub-stations and lines without assessing the load requirements.

Operation and Maintenance

The Company's capacity of the SSs at different voltage levels exceeded the norms fixed. The Company had installed inadequate number of Capacitor Banks in its Sub-stations resulting in additional expenditure of ₹ 4.09 crore by way of Reactive energy compensation charges.

Grid Management

The frequency violation of the Grid resulted in increase in receipt of type C messages in the current year.

Shortage of power supply in the State increased from 0.42 in 2005-06 to 5.48 per cent in 2009-10 leading to payment of unscheduled interchange (UI) charges of ₹ 1,236.87 crore.

Transmission Losses and Disaster Management

The Company could not control the transmission losses as it increased from 4.43 per cent in 2005-06 to 5.57 per cent during 2009-10 as against the targeted reduction from 4.97 per cent in 2005-06 to 4.16 per cent in 2009-10. Consequently transmission losses in monetary terms (excess of norms) also increased from Nil in 2005-06 to ₹ 12.34 crore in 2009-10. The Company's disaster management system is inadequate to meet the unforeseen contingencies.

Monitoring and Control

The monitoring system is inadequate as it is not maintained for all key aspects of the Company. The Company's Internal Audit system was outsourced and it was not effective either. The periodicity of Audit Committee meetings was not in tune with the Terms of Reference as adopted by the Board of Directors.

Introduction

2.1.1 With a view to supply reliable and quality power to all by 2012, the Government of India (GoI) prepared the National Electricity Policy (NEP) in February 2005 which *inter alia,* recognized the need for development of National and State Grid with the coordination of Central/State Transmission Utilities. Transmission of electricity and Grid operations in the State are managed and controlled by Transmission Corporation of Andhra Pradesh Limited (Company) which is mandated to provide an efficient, adequate and properly coordinated Grid management and transmission of energy. The Company was incorporated in February 1999 to undertake transmission activities including power trading. However, the Company ceased to do power trading from June 2005 onwards.

Organisational set up

The Management of the Company is vested in a Board of Directors comprising Chairman and Managing Director, two Joint Managing Directors (one holding charge of HRD, Commercial etc., and other Vigilance and Security) and one Additional Managing Director (Distribution) and four Directors holding charges of Transmission, Grid Management, Project and Revenue and Finance. The Directors are assisted by six Chief Engineers at Zonal level who are further assisted by Superintending Engineers, Transmission Line Constructions (TLC) dealing exclusively with construction of lines and Sub-stations (SSs) and Superintending Engineers Transmission Lines and Sub-stations (TL&SS) dealing exclusively with maintenance of lines and SSs.

Audit Scope and Methodology

2.1.2 The review conducted between March and June 2010 covered the performance of the Company during the period from 2005-06 to 2009-10. Audit examination involved scrutiny of records at the Head Office and four♣ out of six zones♦ each consisting of Superintending Engineer (TLC) and Superintending Engineer (TL&SS). The Company constructed 73 SSs and 132 lines during the review period and out of these 40 SSs and 68 lines were examined.

Audit methodology consisted of scrutiny of records at Head Office and selected units, analysis of data with reference to audit criteria, raising of audit queries and discussion of audit findings with the Management.

♣ Vijayawada, Hyderabad (Metro), Kadapa and Visakhapatnam.

♦ Vijayawada, Hyderabad (Rural), Hyderabad (Metro), Kadapa, Warangal and Visakapatnam.

Audit Objectives

2.1.3 The performance audit was conducted in order to assess whether the Company:

Planning and Development

- prepared a Prospective Plan in accordance with the guidelines of the National Electricity Policy/Plan and Andhra Pradesh Electricity Regulatory Commission (APERC) and assess the impact of failure to plan, if any.

Operation and Maintenance of Transmission System

- carried out operation and maintenance of transmission system in an economical, efficient and effective manner.
- developed and commissioned the transmission system in an economical, efficient and effective manner.
- set up a Disaster Management System to safeguard its operations against unforeseen disruptions.
- set up an effective failure analysis system, and
- established an efficient and effective Energy Audit System.

Financial Management

- managed the finances in an efficient and effective manner.
- raised and recovered the Transmission/SLDC bills in an efficient manner.

Material Management

- carried out the procurement process in an economical, efficient and effective manner.
- established an effective system for stock management and disposal of obsolete stores, and

Monitoring and control

- established an efficient and effective monitoring system and internal control framework.

Audit Criteria

2.1.4 The audit objectives were benchmarked against the following audit criteria:

- National Electricity Policy / Plan and National Tariff Policy,
- Prospective Plan and Project Reports of the Company,
- Agreements with financial institutions and contractors,

- Aggregate Revenue Requirements (ARR) filed with APERC for tariff fixation,
- Circulars, Manuals and MIS reports,
- Manual of Transmission Planning Criteria (MTPC),
- Code of Technical Interface (CTI)/Grid Code consisting of planning, operation, connection codes,
- Directions from Government of Andhra Pradesh (GoAP)/Ministry of Power (MoP),
- Norms/Guidelines issued by Andhra Pradesh Electricity Regulatory Commission (APERC)/Central Electricity Authority (CEA),
- Report of the Committee constituted by the Ministry of Power recommending the "Best Practices in Transmission", and
- Report of the Task force constituted by the Ministry of Power to analyse critical elements in transmission project implementation and to recommend ways to curtail delays in transmission projects.

Brief description of transmission process

2.1.5 Transmission of electricity is defined as bulk transfer of power over a long distance at high voltages, generally of 132 kV and above. Electric power generated at relatively low voltages in power plants is stepped up to high voltage power before it is transmitted to reduce the loss in transmission and to increase efficiency in the Grid. Sub-stations are facilities for the high voltage electric system used for changing voltage from one level to another, connecting electric systems and switching equipment in and out of the system. The step up transmission SSs in the generating stations use transformers to increase the voltages for transmission over long distances.

Transmission lines carry high voltage electric power. The step down transmission SSs thereafter decreases voltages to sub transmission voltage levels for distribution to consumers. The distribution system includes lines, poles, transformers and other equipment needed to deliver electricity at specific voltages.

Electric energy cannot be stored; hence it must be generated as it is needed. Therefore, transmission system requires a sophisticated system of control called Grid management to ensure generation of power closely matches demand. A pictorial presentation of the transmission system is given below:

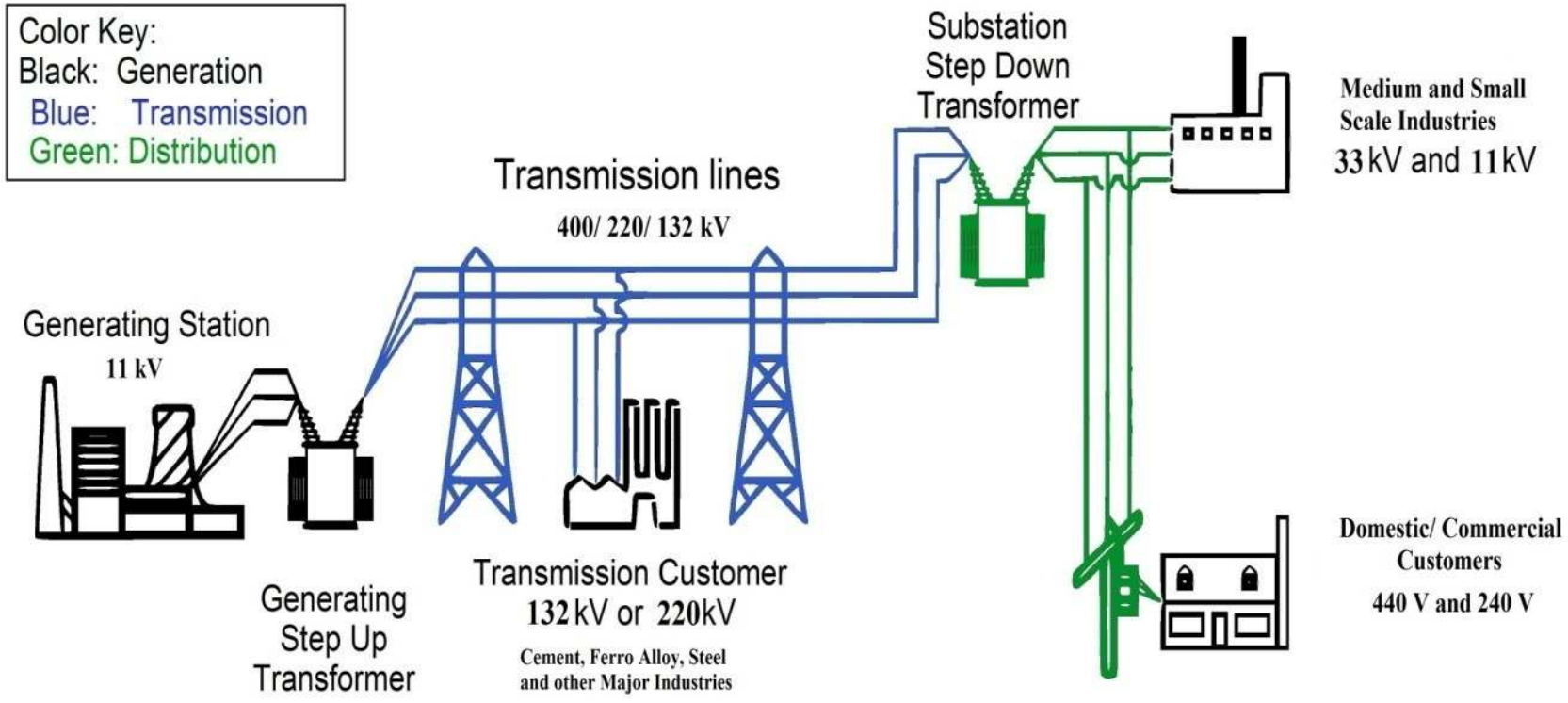


Chart: Schematic depiction of transmission process

Financial position and working results

2.1.6 The financial position of the Company for the five years ending 2009-10 is given below:

(₹ in crore)

Particulars	2005-06	2006-07	2007-08	2008-09	2009-10
A. Liabilities					
Paid up Capital	779.22	779.22	779.22	779.22	779.22
Reserves & Surplus (including Capital Grants but excluding Depreciation Reserve)	271.14	424.99	532.71	838.09	962.07
Deferred Tax	-	103.32	129.12	167.45	218.37
Borrowings (Loan Funds)	1748.39	1901.41	1974.49	1924.64	2185.51
Current Liabilities & Provisions (CL)	1092.87	1598.37	2471.67	2821.44	2257.71
Total	**3891.62**	**4807.31**	**5887.21**	**6530.84**	**6402.88**
B. Assets					
Gross Block	4493.08	4923.54	5495.36	5967.49	6547.43
Less: Depreciation	1743.13	1985.56	2251.67	2543.44	2860.37
Net Fixed Assets (NFA)	**2749.95**	**2937.98**	**3243.69**	**3424.05**	**3687.06**
Capital works-in-progress (CWIP)	451.55	520.55	430.79	511.59	838.56
Investments	364.16	110.64	137.57	100.22	91.92
Current Assets, Loans and Advances (CA)	325.70	1237.88	2074.90	2494.98	1785.34
Assets not in use	0.26	0.26	0.26	0.00	0.00
Total	**3891.62**	**4807.31**	**5887.21**	**6530.84**	**6402.88**
Debt equity ratio	**2.24**	**2.44**	**2.53**	**2.47**	**2.80**
Profit before tax	**190.85**	**65.85**	**71.69**	**113.10**	**146.81**
Interest (net of IDC* capitalised)	**136.66**	**132.71**	**141.49**	**156.20**	**160.66**
Total return	**327.51**	**198.56**	**213.18**	**269.30**	**307.47**
Capital employed (NFA+CWIP+CA-CL)	**2434.33**	**3098.04**	**3277.71**	**3609.18**	**4053.25**
% Return on capital employed†	**13.45**	**6.41**	**6.50**	**7.46**	**7.59**

The Company's profit before tax decreased from ₹ 190.85 crore in 2005-06 to ₹ 146.81 crore in 2009-10 and Company created reserves and surplus amounting to ₹ 962.07 crore as at the end of 31 March 2010. The Company's borrowings stood at ₹ 2,185.51 crore as at 31 March 2010. Debt Equity Ratio increased from 2.24 (2005-06) to 2.80 (2009-10) due to increase in borrowings from ₹ 1,748.39 crore (2005-06) to ₹ 2,185.51 crore (2009-10). Percentage of Return on Capital decreased from 13.45 (2005-06) to 7.59 (2009-10) due to increase in Capital work-in-progress from ₹ 451.55 crore (2005-06) to ₹ 838.56 crore (2009-10) and increase in Current Liabilities from ₹ 1,092.87 crore (2005-06) to ₹ 2,257.71 crore (2009-10).

* Interest during construction.

† Return on capital employed was worked out by adding profit and interest charged to P&L account.

2.1.7 The details of working results like, revenue realisation, net surplus/loss and earnings and cost *per* unit of transmission are given below:

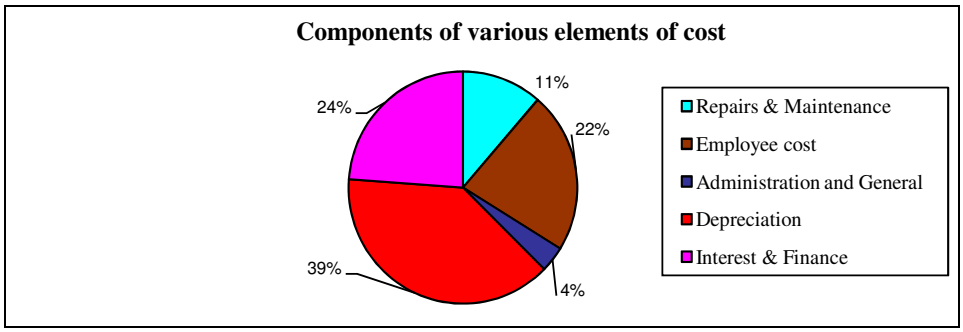
(₹ in crore)

Sl.No	Description	2005-06	2006-07	2007-08	2008-09	2009-10
1	**Income**					
	Revenue (transmission and SLDC charges)	791.46‡♣	619.50	672.42	742.57	816.59
	Other income including interest/subsidy§	88.57	52.26	25.12	60.90	68.70
	Total Income	**880.03**	**671.76**	**697.54**	**803.47**	**885.29**
2	**Transmission**					
(a)	Installed capacity (MVA)	32486	35135	38200	41341	44542
(b)	Power received from generation units (MUs)	26706.63	29309.91	30851.38	31019.43	58222.42**
(c)	Power purchased (MUs)	25150.53	28154.09	30357.30	37726.77	14813.68
	Total	**51857.16**	**57464.00**	**61208.68**	**68746.20**	**73036.10**
(d)	Loss in transmission (MUs)	2299.46	2756.08	2914.89	4106.29	4066.53
	Net power transmitted (b)+(c)-(d) in MUs	**49557.70**	**54707.92**	**58293.79**	**64639.91**	**68969.57**
3	**Expenditure**					
(a)	**Fixed cost**					
(i)	Employees cost	146.71	133.64	144.91	171.58	183.88
(ii)	Administrative and General expenses	21.30	24.18	23.92	28.40	29.56
(iii)	Depreciation	223.00	242.43	263.44	291.78	317.50
(iv)	Interest and finance charges (net after capitalisation)	139.87	134.41	142.38	157.42	162.74
	Total fixed cost	**530.88**	**534.66**	**574.65**	**649.18**	**693.68**
(b)	**Variable cost -** Repairs & Maintenance	105.77	106.12	91.47	86.13	93.10
(c)	**Total cost 3 (a) + (b)**	**636.65**	**640.78**	**666.12**	**735.31**	**786.78**
4	Realisation (₹ per unit)	0.17	0.12	0.11	0.12	0.12
5	Fixed cost (₹ per unit)	0.10	0.09	0.09	0.09	0.09
6	Variable cost (₹ per unit)	0.02	0.02	0.01	0.01	0.01
7	Total cost (₹ per unit) (5+6)	0.12	0.11	0.10	0.10	0.10
8	Contribution (₹ per unit) (4-6)	0.15	0.10	0.10	0.11	0.11
9	**Profit (+)/Loss(-) (4-7) (₹ per unit)**	0.05	0.01	0.01	0.02	0.02

‡♣Does not include revenue from sale of power ₹ 1,816.12 crore for which power purchase cost was ₹ 1,899.70 crore for the period from 1 April to 9 June 2005.
§ Other income is also considered for calculation of per unit cost under rows 4-9.
** Including private generation.

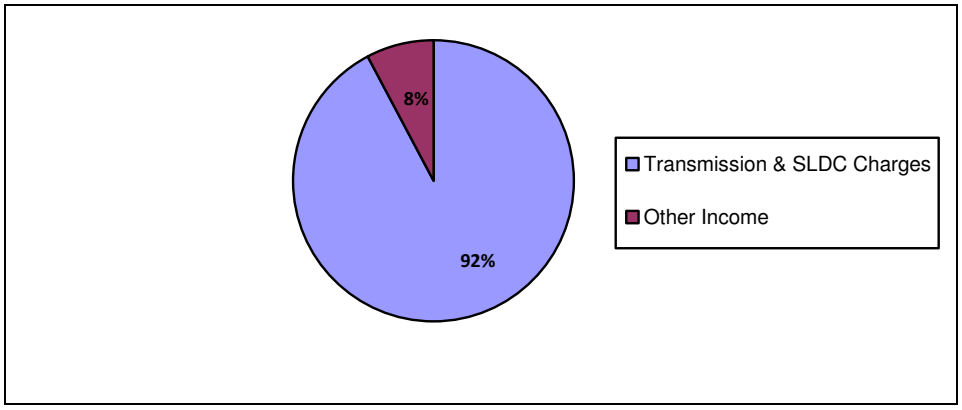
Elements of Cost

2.1.8 The percentage break-up of major elements of costs for 2009-10 is given below:



Elements of revenue

2.1.9 Transmission and SLDC charges constitute the major elements of revenue. The percentage break-up of revenue for 2009-10 is given below in the pie chart**.**



Audit Findings

2.1.10 The audit findings were reported to the Company and the Government in July 2010 and discussed in the exit conference held on 9 September 2010 which was attended by the Additional Secretary, Officer on Special Duty to the GoAP, Chairman and the Managing Director and the functional Directors of the Company. The Company replied to the audit findings in August/September 2010 and were considered while finalising the review. The audit findings are discussed below:

Planning and Development

National Electricity Policy/Plan

2.1.11 The Central Transmission Utility (CTU) and State Transmission Utilities (STUs) have the key responsibility of network planning and development based on the National Electricity Plan in coordination with all concerned agencies. At the beginning of 2005-06, the transmission system in the country at 800/HVDC/400/230/220/132/110/90 kV stood at 294 thousand circuit kilometres (CKM) of transmission lines. The National Electricity Plan assessed the total inter-regional transmission capacity at the beginning of 2005-06 as 9,450 MW and further planned to add 7,000 MW during the years 2005-06 and 2006-07, making the total transmission capacity to 16,450 MW. The NEP also envisaged adding another 20,700 MW by the end of 2011-12, bringing the total inter-regional capacity to 37,150 MW.

Similarly, the Company's transmission network at the beginning of 2005-06 consisted of 310 EHT SSs with a transmission capacity of 28,886 MVA and 26,846 CKM of EHT transmission lines. The transmission network as on 31 March 2010 consisted of 383 EHT SSs with a transformation capacity of 44,542 MVA and 30,970 CKM of EHT transmission lines.

The STU is responsible for planning and development of the intra-state transmission system. Assessment of demand is an important pre-requisite for planning capacity addition. The Andhra Pradesh Electricity Regulatory Commission (APERC) authorised (December 2006) the Company to prepare a State Electricity Plan (SEP) on behalf of all stakeholders, but the same was not prepared and got approved by APERC as the forecasts sent to APERC were returned with a request (December 2008) to revise the Load Forecast, Generation Plan and Transmission Plan by considering the revised load forecasts of APDISCOMs as well as total power requirement of the proposed Lift Irrigation Schemes. The Company, however, delayed preparation of revised forecasts, due to which the necessary approval of APERC could not be obtained. As SEP requires to be based on approved load forecasts, there is abnormal delay in preparation and submission of SEP to APERC.

In the absence of a plan in accordance with the guidelines indicated in the NEP and the instructions of APERC, the Company continued to plan their activities in adhoc manner which was not commensurate with the actual requirement. The impact of such adhocism is discussed in detail under 'Project Management of Transmission System' of the report.

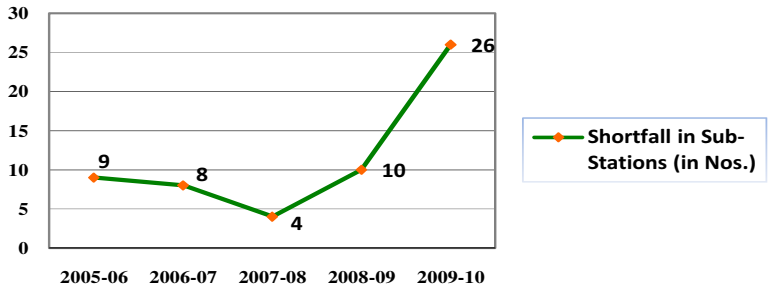
Management stated that it filed Multi Year Tariff for the Second Control Period containing the details of proposed SSs and lines for the period from 2009-10 to 2013-14 which was based on anticipated load growth, capacity to be evacuated and the needed system strengthening. The reply is not tenable as the ARR submitted by the Company is for Multi Year Tariff and cannot be treated as a plan and the Company is yet to commence the process of preparing SEP.

Transmission network and its growth

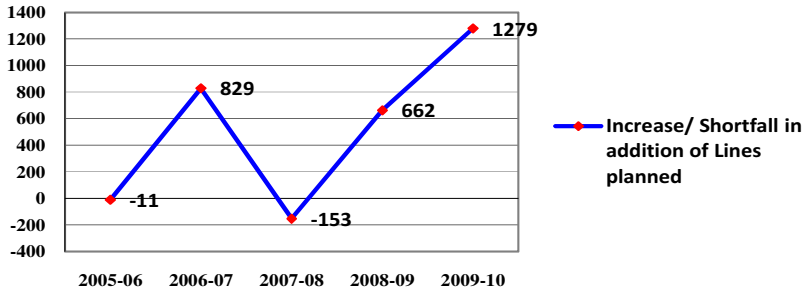
2.1.12 The transmission capacity of the Company at EHT level during 2005-06 to 2009-10 is given below:

Sl. No.	Description	2005-06	2006-07	2007-08	2008-09	2009-10	Total
I.	**Number of Sub-stations (Numbers)**						
1	At the beginning of the year	310	330	346	363	372	-
2	Additions Planned for the year	29	24	21	19	37	130
3	Added during the year	20	16	17	9	11	73
4	At the end of the year **(1+3)**	330	346	363	372	383	-
5	Shortfall in Additions **(2-3)**	9	8	4	10	26	57
II.	**Transformers capacity (MVA)**						
1	Capacity at the beginning of the year	28886	32486	35135	38200	41341	-
2	Capacity added during the year	3600	2649	3065	3141	3201	15656
3	Capacity at the end of the year **(1+2)**	32486	35135	38200	41341	44542	-
III.	**Transmission lines (CKM)**						
1	At the beginning of the year	26846	28151	28914	29930	30450	-
2	Additions Planned for the year	1294	1592	863	1182	1799	6730
3	Added during the year	1305	763	1016	520	520	4124
4	Total lines at the end of the year **(1+3)**	28151	28914	29930	30450	30970	-
5	Shortfall in Additions **(2-3)**	-11	829	-153	662	1279	2606

Line Graph: Increasing trend in shortfall in addition of Sub-stations in numbers



Line Graph: Increasing trend in shortfall in addition of lines in Circuit Kilo Meters



Against the targeted construction of 130 EHT SSs and laying of 6,730 CKM of EHT lines, the Company constructed 73 EHT SSs and 4,124 CKM EHT lines during the five year period (achievement of 56 *per cent* and 61 *per cent* respectively). The transmission capacity added was 15,656 MVA for the five year period ending 2009-10.

The particulars of voltage-wise capacity additions planned, actual additions, shortfall in capacity, etc., during review period are given in the **Annexure –7.**

The shortfall in capacity addition and slippages in achieving the target by the Company was mainly due to time overruns as discussed in ***Para 2.1.14.***

Project Management of Transmission System

2.1.13 A transmission project involves various activities from concept to commissioning. Major activities in a transmission project are (i) Project formulation and approval phase and (ii) Project Execution Phase. For reduction in project implementation period, the Ministry of Power, Government of India constituted a Task Force on transmission projects (February 2005) with a view to:

- ❖ analyze the critical elements in transmission project implementation,
- ❖ recommend ways to curtail delays in transmission project,
- ❖ implementation from the best practices of CTU and STUs, and
- ❖ suggest a model transmission project schedule for 24 months duration.

The task force suggested and recommended (July 2005) the following remedial action to accelerate the completion of Transmission systems.

- ❖ Undertake various preparatory activities such as surveys, design & testing, processing for forest & other statutory clearances, tendering activities etc. in advance/parallel to project appraisal and approval phase and go ahead with construction activities once Transmission Line Project sanction/approval is received.

- ❖ Break-down the transmission projects into clearly defined packages such that the packages could be procured & implemented requiring least coordination & interfacing and at same time it attracts competition facilitating cost effective procurement.
- ❖ Standardise designs of tower fabrication so that 6-12 months could be saved in project execution.

2.1.14 The Company failed to undertake various preparatory activities such as surveys, design and testing, processing for forest & other statutory clearances, tendering activities etc. in advance/parallel to project appraisal and approval phase as recommended by the Task Force Committee. Further, though transmission projects were broken down into packages, the Company did not allot the packages to different contractors ***(Para No. 2.1.17(v,vii,viii))***, which culminated in abnormal delays in execution of the projects. Notwithstanding the elaborate guidelines given by the Task Force Committee for timely completion of the projects, the Company failed to execute several SSs and Lines during 2005-10 as detailed below:

Capacity in kV	Total No. constructed		No. test checked by Audit		Delay in construction (Numbers)		Time overrun* (range in months)	
	SSs	Lines	SSs	Lines	SSs	Lines	SSs	Lines
400	6	15	6 (100%)	15 (100%)	6	15	13 to 30	2 to 23
220	18	32	10 (56%)	23 (72%)	8	21	4 to 42	5 to 56
132	49	85	24 (49%)	30 (35%)	17	19	2 to 25	1 to 62
Total	**73**	**132**	**40**	**68**	**31**	**55**		
* As test checked by Audit, against the scheduled dates of completion								

The main reasons attributed for these delays were delay in acquisition of land and handing over of site, Right Of Way (ROW) problems and delay in obtaining clearances from Ministry of Environment, Forest and Railways and delays by the Contractors in executing the works as discussed in ***Para 2.1.17*.**

Mismatch between Generation Capacity and Transmission facilities

2.1.15 National Electricity Policy envisaged augmenting transmission capacity taking into account the planning of new generation capacities, to avoid mismatch between generation capacity and transmission facilities. The transmission facilities to be provided by Company to match with the APGENCO's†† generation plans could not be provided in time due to delay in execution of transmission evacuation works, which ultimately resulted in mismatch between generation capacities and transmission facilities and consequent evacuation of the power with an existing and already overloaded transmission lines.

†† Andhra Pradesh Power Generation Corporation Limited.

We observed that in the following three out of the four projects test checked, the Company failed to complete the transmission network to match with the generation plans of APGENCO.

Following table summarises the result of mismatch discussed in detail:

Sl.No.	Project	APGENCO's Plan	Company's Plan	Result of Mismatch
1.	Dr. Narla Tata Rao Thermal Power Station - VII Unit	Synchronisation of 500 MW capacity unit by May 2008, which was belatedly synchronised on 6 April 2009.	LILO of Nunna-Srisailam was scheduled to be completed by September 2008, but belatedly synchronised on 26/27 July 2009. Other works such as 400 kV Suryapet–Malkaram, bays etc are yet to be completed.	The Company was compelled to evacuate power through the existing 220 kV line for 108 days between 6 April 2009 and 26/27 July 2009.
2.	Priyadarshini Jurala Hydro Electric Project (Three units)	Programmed to commission three units (3 x 39MW) in March, June and September 2007 but belatedly commissioned in March 2008, August 2008 and May 2009.	Original scheduled date of completion of all the works by March 2007 was revised to October 2009 but not completed till date.	The Company was compelled to evacuate power through the existing 220 kV DC line from Jurala to Veltoor without completing the SS work.
3.	Rayalaseema Thermal Power Project (RTPP – Stage II)	Constructed two units (2 x 210MW) which were synchronised on 25 January 2007 and 20 November 2007.	Pulivendala SS and RTPP-Pulivendala line was commissioned in November 2009. While other works like 220 kV line from Pulivendala-Hindupur were yet to be completed.	The Company utilised the transmission facilities of Stage I to evacuate power from Stage II till the completion of Pulivendala SS works which also put a question mark on the need for Stage-II.

The cases are discussed below:

2.1.15(1) ***Dr. Narla Tata Rao Thermal Power Station (Dr.NTTPS) (Vijayawada Thermal Power Station-VTPS)***

APGENCO took up construction of a 500 MW thermal power unit (Unit-VII) Dr.NTTPS in August 2005 with scheduled date of synchronization of the plant as May 2008. However, the unit was belatedly synchronized on 6 April 2009.

The Company sanctioned (May 2007) the work of evacuation system (cost ₹ 551.54 crore), which *inter alia* included erection of 400 kV Line In Line Out (LILO) Nunna-Srisailam DC line (2X5 Kms) to VTPS (Stage IV),VTPS-Suryapet (141 Kms) and Suryapet-Malkaram (127 Kms), construction of two numbers Bay extensions at Malkaram 400/220 kV SS and two numbers at

Suryapet 220 kV SS. Revised Administrative Approval for ₹ 428.06 crore was issued (June 2008), due to reduction in the cost of the project by APERC. As per the revised Administrative Approval, all the works were programmed to be completed by March 2010.

The Company concluded contract agreement for part of a work viz. LILO of Nunna-Srisailam in March 2008 at ₹ 13.76 crore including material with September 2008 as date of completion. However, the LILO works of evacuation lines were completed only on 26/27 July 2009. The delay in completion of works was on account of ROW problem and non availability of clearance from Railway authorities due to which the scope of work was changed from Double Circuit Towers to Multi-Circuit Towers. Due to non-synchronization of evacuation system by the Company at par with the date of completion of generation project by APGENCO, i.e., 06 April 2009, the Company was compelled to evacuate power through the existing 220 kV lines till 26/27 July 2009, the date on which Company synchronised its transmission lines. This resulted in mismatch between generation capacity and transmission facilities. Out of 268 Kms of the proposed line from VTPS to Malkaram, execution of 400 kV DC line from Suryapet to Malkaram (141 Km) was awarded only in May 2010 and balance works from VTPS to Suryapet (127 Km) including Bay extension works are yet to be awarded. Thus none of the works were completed.

The Company stated that APGENCO produced only 13.541 MUs as against the expected 1,296 MUs between 09 April 2009 and 26/27 July 2009, which was evacuated through the existing 220 kV lines. The fact remains that the transmission facilities were not ready for synchronisation.

2.1.15(2) ***Priyadarshini Jurala Hydro Electric Project***

APGENCO programmed to commission three units of Priyadarshini Jurala Hydro Electric Project (Priyadarshini Jurala HEP) (3X39 MW) in Mahaboobnagar District in March, June and September 2007 and accordingly intimated (November 2005) the Company. These three units were commissioned by APGENCO in March, August 2008 and May 2009 respectively.

The Company accorded (December 2005) Administrative Approval at a cost of ₹ 43.69 crore for the transmission works (220/132 kV SS at Jurala and 220 kV DC line for 31 CKM, 132 kV LILO line for 6.5 CKM and two numbers 220 kV Bay extension at Veltoor SS) with scheduled date of commissioning as March 2007. The Company however did not complete evacuation system till date (August 2010) due to following reasons:

- The Company took one year to conclude contract of erection of 220 kV SS at Jurala and the contract was awarded in December 2006.
- The contract so concluded also was cancelled (December 2007) as the Company did not ensure availability of site for erection of SS.
- Award of fresh contract was further delayed upto December 2008.

Against the due date of October 2009, the works were still under progress (October 2010), except the 220 kV DC line from Jurala to Veltoor which was charged in March 2008 with a cost of ₹ 0.93 crore. Thus, due to delay in taking decisions for acquisition and handing over of the site resulted in delay of three years for completion of the work of evacuation system.

Management stated that power generated from the Jurala Project was being evacuated through the 220 kV DC line with effect from March 2008 and the 220 kV Sub-station works would be completed by October 2010. It was further stated that though the completion period stipulated was nine months (October 2009), there was delay due to local site problems. The Management further stated that the power generated from Jurala project was being evacuated through the newly constructed 220 kV DC line from Veltoor to Jurala.

The reply is not acceptable as SS works were awarded without acquiring the land and there was abnormal delay in completing the SS works even after acquiring the land (June 2009). Further, the erection of LILO line and Bay extension works at Veltoor are yet to be completed. This resulted in evacuation of power by 220 kV DC line from Jurala to Veltoor, without completing the SS works, which is against the general practices followed in transmission.

2.1.15 (3) ***Rayalaseema Thermal Power Project (RTPP)***

APGENCO intimated (November 2005) its intention to construct two generation units (2 X 210 MW) under Stage-II at RTPP. The two units were synchronized on 25 January 2007 and 20 November 2007 respectively.

For evacuation of power from RTPP Stage-II (excluding downstream) the Company accorded (September 2007) revised administrative approval for constructing one SS and erection of two numbers 220 kV DC lines from RTPP to Pulivendala and Pulivendala to Hindupur SS and two numbers 220 kV Bay extensions at a cost of ₹ 98.37 crore.

Originally, sanction for the transmission facilities was accorded (February 2006) without considering the downstream evacuation works (two LILO lines). Later, revised sanction was accorded (September 2007) by including the downstream evacuation works, which accounted for the delay of 19 months.

The Company, however, placed orders in March 2008 for erection of RTPP-Pulivendala line and May 2008 for SS at Pulivendala and commissioned the SS and the line only in November 2009. The Company could however award the work for erection of 220 KV DC lines from Pulivendala to Hindupur SS only in June 2010 due to delay in obtaining forest clearance. The work was expected to be completed by June 2011.

Management stated that the transmission capacity of RTPP Stage-I was sufficient to evacuate power from RTPP Stage-I and II without any interruption in the loading capacity and there was no loss of generation.

This puts a question mark on the need for Stage-II since the entire evacuation could be managed through Stage-I.

Construction of SSs without assessing load requirements

2.1.16 For construction of a SS, the load growth and anticipated increase of demand in future along with permissible limits of voltage regulations are necessarily to be considered, prior to taking up the project, so that unnecessary expenditure would be avoided. The load forecasts for the proposed new schemes should also consider the anticipated physical and financial benefit to be derived.

In the following two instances, SSs were constructed without assessing the load requirements.

132/33 kV SS at Srisailam: Based on the request of APCPDCL•, Administrative Approval was accorded by the Company (July 2004) with an estimated cost of ₹ 4.22 crore for establishment of a 132/33 kV SS with one 16 MVA Power Transformer (PTR) at Srisailam in Kurnool District and associated LILO line. The works were completed/commissioned in October 2009 at a cost of ₹ 3.55 crore. It was observed that peak demand from November 2009 to April 2010 was only 0.88 MVA and as such construction of 132/33 kV SS was much more than the requirement. Establishment of SS/LILO was justified only from reliability point of view and economic viability of the SS/LILO was not assessed based on load flow studies. Thus, the SS constructed at a cost of ₹ 3.55 crore is being grossly underutilised.

Management stated that 132/33 kV SS is erected from reliability point of view without conducting any load flow studies. It was further stated that after completion of the 33 kV SS and line works by APCPDCL the 132/33 kV SS would be utilised.

The 132 kV SS remained underutilised at present.

220 kV SS at Brandix Apparel Park: Based on the requirement (August 2005) of Brandix for HT supply of power at a CMD of 222 MVA at Apparel Export Park at Achutapuram in Visakhapatnam District, the Company decided to construct 220/132/33 kV SS to meet the demand. Administrative Approval for the proposed SS and related line works was accorded (March 2006) at a total cost of ₹ 110 crore. All the works were completed (except commercial charging of 220 kV lines and SS) and the 132 kV SS was charged in November 2007 initially with 16 MVA Power Transformer (PTR). Later 50 MVA PTR was installed in June 2008 keeping the 16 MVA PTR idle.

It was observed that the scheme work was neither covered under National Electricity Plan nor under the Company's plan (ARR). Further, the maximum load so far reached at 132 kV Brandix SS was 34.90 MVA only from the date of charging (November 2007 to March 2010). As such, construction of 132/33 kV SS would have sufficed the total power requirement of the Export Park. The imprudent decision resulted in idling of 220/132 kV SS and lines for over

• Central Power Distribution Company of Andhra Pradesh Limited.

two and half years; hence the expenditure of ₹ 21.83 crore, being the cost of works was avoidable.

Management stated that apart from the power requirement of 222 MVA CMD for Brandix Apparel Park, there was a future load growth of about 500 MVA as per the information received from Andhra Pradesh Industrial Infrastructure Corporation Limited (APIIC). It was further stated that important loads such as Bhabha Atomic Research Centre (BARC) and Director General Naval Projects (DGNP) of Indian Navy are to be fed from this SS in near future.

The reply is not convincing as the future load growth of 500 MVA was assessed in August 2005, however, the maximum load reached so far is only 34.90 MVA which indicated that there was over assessment. Moreover, the stated proposals aimed at using the capacity in future but did not address the issue of as to why 220 kV was planned in advance.

Delay in construction of SSs and Lines

2.1.17 A test check of the various works undertaken by the Company during the five year period (2005-10) revealed several instances of delay in completion of the projects which had a significant impact on the physical and financial objectives as detailed below:

Sl.No.	Project	Impact of Delay	
		Physical	**Financial**
(i)	400 kV Ring Mains around twin-cities	Non-achievement of 400 kV interconnectivity for system strengthening.	Non-achievement of anticipated benefit of ₹ 54.74 crore for 17 months.
(ii)	220 kV SS at Nagari in Chittoor district	Non-achievement of reduction of loads and system losses.	Non-achievement of anticipated benefit of ₹ 17.82 crore for two years.
(iii)	Mismatch in line configuration between GVK and Vemagiri SS	Non-achievement of symmetrical configuration of lines.	Blocking up of funds to the extent of ₹ 14.18 crore.
(iv)	220 kV SS at Palamaneru and 220 kV DC/SC line	Non-achievement of transmission System strengthening.	Non-achievement of anticipated benefit of ₹ 11.36 crore for 20 months.
(v)	220 kV SS at Tekkali and 220 kV Garividi-Tekkali Line with Bay extension	Non-achievement of system improvement of increased voltage by 18 KVA.	Blocking of funds of ₹ 8.62 crore and consequent loss of interest of ₹ 0.78 crore.
(vi)	Providing alternative source of supply to selected SSs	Failure to improve reliability of supply and to decrease breakdowns/interruptions.	Non-achievement of anticipated benefit of ₹ 8.44 crore for four years.
(vii)	VTPS-Tallapally DC line	Non-achievement of voltage improvement and reduction in transmission losses by 53.8 MW.	Cost escalation of ₹ 2.55 crore due to deviations in agreement values.
(viii)	Execution of Power transmission system to Gangavaram Port.	Power supply to the Port could not be provided upto the boundary and the obstacles could not be removed within the Port area.	The work of 33 kV line constructed at a cost of ₹ 76.33 lakh was solely necessitated due to delay in commissioning of the 220/33 kV SS at Port site which was an additional burden on GoAP.

The cases are discussed below:

2.1.17(i) ***400 kV Ring Mains around twin-cities:*** The Company formulated a transmission scheme to form a 400 kV Ring Main around twin-cities of Hyderabad & Secunderabad and Rangareddy districts to facilitate 400 kV inter connectivity among different 400 kV lines and 400/220 kV SSs for system strengthening, security and reliability. The scheme envisaged construction of two 400/220 kV SSs at Yeddumailaram and Malkaram with 1,575 MVA capacity and erection of 236 Kms of 400 kV DC line in four routes and two 400 kV Bays at two places.

Administrative approval and technical sanction were accorded (October 2005) for ₹ 437.73 crore for execution of the project. As per the Detailed Project Report (DPR) the scheme had the physical benefits such as reduction in transmission losses by 30.6 MW valued ₹ 38.64 crore per annum along with improvement in voltage and reliability of supply.

Against the schedule of completion of all the works by October 2008, the Company completed construction of 400 kV SS at Malkaram only by March 2010 with an expenditure of ₹ 52.16 crore and completed (May 2010) another line work (400 kV DC line for LILO from Ramagundam-Ghanapur 400 kV S/C Line of Power Grid to Malkaram 400 kV SS) with an expenditure of ₹ 23.53 crore (upto March 2010). The Company is yet (June 2010) to take up other works such as construction of SS at Yeddumailaram and erection of lines connected thereto.

We observed that the Administrative Approval given in October 2005 mentioned that the entire project was scheduled to be completed by October 2008, whereas the Company could complete Malkaram SS (May 2010) and one LILO line (March 2010) with abnormal delay. The Company also failed to acquire the land in advance and in line with the Task Force Committee recommendations. Thus, failure to acquire land, settle ROW problems within reasonable time and ineffective implementation of the scheme compelled the Company to fix the revised time schedule for completion of all the works upto March 2012, defeating the intended objectives.

Management stated that it could not anticipate delay in acquisition of land for 400 kV SS and ROW problems at the time of finalisation of DPR. The reply is not tenable as even after acquiring land from the Government for the proposed SS at Yeddumailaram, there was a delay of 14 months in finalising the agreement, besides there was delay in conducting detailed survey, preparation of contour maps in the allotted land and working out detailed quantities etc. Consequently, tenders were belatedly called for in January 2010 followed by opening of technical bids in April 2010, which indicated that Task Force recommendations were not followed.

2.1.17(ii) ***220/132 kV SS at Nagari in Chittoor district:*** In order to improve the voltage profile/regulation of the system, enhance security/reliability of power supply and to have an alternate power supply in case of any outage the Company proposed erection of 220/132 kV SS at Nagari along with 220 kV LILO line from the 220 kV Renigunta-Chittoor DC line to the proposed 220

kV SS at Nagari. Administrative approval for construction of 220/132 kV SS at Nagari including related line works was accorded in July 2007 at an estimated cost of ₹ 37.38 crore, but technical sanction was belatedly given in June 2008. There were also delays (i) in finalisation and fixing up of funding agency, (ii) approval of electrical layouts, drawings and designs and (iii) delay in sanction of working estimates for the items as per technical sanction, which shows that the Company did not follow recommendations of Task Force. The works were awarded (July 2009) to GVPR Engineers Limited, Hyderabad for ₹ 22.24 crore with a delay of two years due to delay in tendering process. As per the agreement, all the works were to be completed by July 2010. It was however noticed (May 2010) that levelling work of yard was still under progress even 10 months after commencement of work. The inordinate delay resulted in foregoing the envisaged benefits of System Improvement (reducing the loads and system losses) on the existing 132 kV SSs (Puttur, Nagari, Nagalapuram and Kothapallimitta) thereby foregoing the anticipated benefit of ₹ 8.91 crore per annum.

Management stated that though Administrative Approval was accorded in July 2007 there was delay in obtaining APERC approval (May 2009), hence the contract was awarded in July 2009. Further, it was stated that all the works would be completed by December 2010. Reply is not tenable as there were delays at every stage• resulting in adverse effect on the loads and system losses on the existing 132 kV SSs and denial of the envisaged benefits.

2.1.17(iii) Mismatch in line configuration between GVK and Vemagiri SS:

For evacuation of power from gas based generation project of GVK, the Company awarded (February 2009) work of supply, erection, testing and commissioning of two numbers 400 kV feeder bays at Vemagiri 400 kV SS on turnkey basis to Areva (T&D) India Limited, Chennai for an amount of ₹ 15.03 crore. The work was commenced in February 2009 and the equipment was test charged in December 2009. Actual cost incurred was ₹ 14.18 crore. Take off arrangement could not be made for want of line clearance on GVK I & II feeders which could not be arranged, as configuration of two lines at GVK end was reverse to the configuration at 400 kV Vemagiri SS viz. GVK I will become GVK II and GVK II will become GVK I. The line configuration should be symmetrical at both GVK end and Company end so that scope for human errors leading to fatal accidents could be avoided. The Company's request (October 2009) to GVK authorities to change the line configuration did not fructify. GVK contended that they made necessary arrangements and its lines were configured as per the State Load Dispatch approved in 2005 itself. It was further contended that if it had to change the line configuration at project switchyard end, it required modification in the plant panel Ω, which required a lot of re-engineering and plant shutdown for one week. Thus, due to mismatch in line configuration, feeder bays completed could not be put to use since December 2009 to till date. In the absence of the evacuation system the

• getting approval from APERC, according administrative approval, issue of technical sanction, finalising the funding agency and delay in approval of layouts etc.

Ω supervisory control and data acquisition panel and remote terminal unit panel.

power produced by GVK is being evacuated through an alternate feeder (Konaseema II).

Management stated that GVK was requested to change the line configuration at their end because the line configuration at Vemagiri SS cannot be taken up due to difficulties under shutdown conditions which leads to fatal accidents. Management further stated that the issue was resolved and an alternate arrangement was being made by GVK at their end to commission both the bays as per Company's requirement. The reply is not convincing as GVK erected switchyard during 2005 and intimated the Company in advance to match their configuration. The Company should have objected to GVK configuration in 2005 itself prior to taking up the works by GVK.

2.1.17(iv) ***220 kV SS at Palamaneru and 220 kV DC/SC line:*** The Company proposed (January 2005) construction of 220/132 kV SS at Palamaneru and associated 220 kV DC/SC lines from Palamaneru to 400 kV Chittoor SS at a total cost of ₹ 37.32 crore. The total benefit to the Transmission and Distribution Sector in the first five years was estimated at ₹ 34.08 crore on implementation of the scheme. As per the Transmission Project Report, the works were proposed to be taken up during 2005-06 and were scheduled to be completed by March 2007.

The Company accorded sanction in January 2005 (cost of ₹ 36.37 crore) and revised sanction in November 2007 (cost of ₹ 37.32 crore). Construction of 220 / 132 kV SS at Palamaneru was awarded (November 2007) to Sri Venkaiah Swamy Constructions, Tirupathi and were completed (October 2008) in time at a total cost of ₹ 2.95 crore (including cost of equipment and material supplied by the Company). Erection works of 220 kV DC/SC Line was awarded (July 2008) to Maytas Infra Limited, Hyderabad on turnkey basis (excluding Tower parts), at a cost of ₹ 10.15 crore. The site was handed over in June 2008 with a request to complete the works on priority basis within 12 months (by June 2009) as against 18 months provided in the agreement as 220 kV SS work was nearing completion. The line erection work was yet to be completed (June 2010).

Management stated that obtaining forest clearance caused the delay in completion of 220 kV line and all efforts were being made to complete the works.

Reply of the Management is not tenable as even after the expiry of 12 months after the due date, the percentage of work completed was only 45, 72, 60 and NIL in respect of excavation works, foundations works, tower erections and stringing respectively (May/June 2010). Further, the Company failed to get forest/railway clearance till date indicating non-adherence to the Task Force recommendations, which resulted in non-completion of line works. Construction of SS was completed (October 2008) at a cost of ₹ 2.95 crore, however, the same was un-utilized so far, thereby foregoing the anticipated benefits to the tune of ₹ 11.36 crore for 20 months till June 2010.

2.1.17(v) ***220 kV SS at Tekkali and 220 kV Garividi - Tekkali Line with Bay extension:*** In order to stabilize the voltage of the transmission lines and to

maintain the voltage level at 18 KVA, the Company accorded sanction (March 2003) for erection of 220/132 kV SS at Tekkali and 220 kV Garividi–Tekkali Lines in Srikakulam District & 220 kV Bay extensions at Garividi at a cost of ₹ 7.60 crore under System Improvement Scheme. However, the work was awarded in November 2004 to Annapurna Constructions and Transmissions, Hyderabad at a cost of ₹ 1.46 crore (excluding equipment & material supplied by the Company) with date of completion as 12 months from the date of handing over of the site/copy of approved layout. The Company however handed over the site to the contractor only in August 2005, due to demolition of existing quarters and cutting of trees for site clearance. The SS however was test charged only in December 2007 with a delay of 16 months at a cost of ₹ 8.62 crore (including equipment & material). Line works (in two reaches) were awarded (November 2004) at a total cost of ₹ 4.15 crore to K. Ramachandra Rao, Hyderabad and Annapurna Construction & Transmissions, Hyderabad and were to be completed within 12 months from the date of handing over of the site / copy of approved layout. There was delay in completion of 220 kV line due to ROW problems and the line was commissioned in June 2009.

Thus, the works were completed with a delay of 45 months depriving the Company of the envisaged benefits of increase in voltage. We further observed that as against the envisaged achievement of voltage of 18 KVA, the Company could achieve 4.5 KVA on commissioning of the SS. As such the Company also could not achieve the envisaged benefits.

Management stated that the initial delay in handing over of site for SS was due to site constraints such as demolishing of the quarters and removal of trees etc. Further, it was stated that Boddepallipeta-Tekkali line (one reach) could not be completed in time due to ROW problems and other difficulties faced during the execution.

The constraints cited were the facts known to the Management at planning stage which should have been addressed appropriately without impacting the projects.

2.1.17(vi) Inordinate delay in providing alternative source of supply to selected SSs: The Board of Directors of the Company (May 2004) in its 55th Meeting approved to provide alternative source of supply to 26 numbers important 132 kV SSs by laying new DC/SC lines where existing lines (23 numbers) were on single circuit towers and by stringing 2nd circuits. The work envisaged was to improve reliability of supply as these SSs were being fed by radial 132 kV lines. These SSs were overloaded and in the case of breakdowns there would be total interruption of Power Supply due to non-availability of alternative source. Administrative Approval was issued (June 2004) for ₹ 78.50 crore for the said works. Out of these 26 SSs, 23 numbers had DC/SC lines where 2nd circuit was to be strung and the remaining three needed erection of additional DC/SC lines from other SSs as existing supply to these SSs was on single circuit towers.

The Annual Revenue Return (ARR) for the project due to reduction in line losses was estimated at 12.33 *per cent*. The estimated total cost of these seven

lines was ₹ 17.12 crore. Review of records revealed that the aforementioned three numbers DC/SC lines have not been erected so far and of the remaining 23 lines selected for 2nd circuit stringing, four numbers works have not been completed/initiated so far. Thus, due to non-stringing/non-erection of 2nd circuit / DC/SC lines as envisaged, the Company lost ₹ 8.44 crore for four years due to non-reduction in line losses at 12.33 *per cent* per annum (₹ 2.11 crore per annum) in respect of the lines not constructed.

Management replied that the delays were due to non-availability of line clearances, poor response to tenders and ROW problems. The reply is not acceptable as the Company failed to adhere to the recommendations made by the Task Force Committee.

2.1.17(vii) VTPS–Tallapally DC Line: The Company awarded (December 2004) the work of erection of 220 kV VTPS-Tallapally Double Circuit (DC) line of 130 CKM (two lots) to Silpha Electrification Engineers & Contractors, Hyderabad at a cost of ₹ 4.63 crore with the object of easing load on the existing 220 kV VTPS-Tallapally line. The works were to be completed by December 2005 (lot I & II). However the works were completed only to the extent of 93 and 41 *per cent* of tower erection works and 93 and two *per cent* in respect of stringing works for lots I and II (June 2010) respectively. The progress of work in respect of lot II was abnormally slow as major works like tower earthing (209 numbers) was not taken up and stringing of power conductor was meagre. Thus, there was a delay of over four years from the scheduled dates of completion for both the lots. To the end of March 2010 an amount of ₹ 39.91 crore was incurred towards material and labour, as against ₹ 46.95 crore sanctioned under Administrative Approval (March 2003).

The abnormal delay in execution of works was due to ROW problems with the private parties and slow progress of execution of JC towers across Krishna River. The delays and resultant deviations caused escalation in agreement values by ₹ 2.55 crore, thereby increasing the agreement value to ₹ 7.18 crore. Due to the delays in obtaining approval/rights before issue of sanction compelled the Company to evacuate the power from the existing lines for over four years which were already overloaded, resulting thereby in defeating the very purpose of erection of these lines. These indicate that planning and execution of works were undertaken without ensuring receipt of relevant approvals/rights.

Management stated that the works were delayed abnormally due to release of Nagarjuna Sagar water to the areas where the line was to be erected, ROW problems and passing of lines through standing crops etc. Management further stated that all the works on lot-I and II have been completed except one number of JC-5 river crossing which was envisaged to be completed in October 2010.

The fact however remains that the cited issues for delay form part of issues to be considered at planning stage and the ongoing delays put a question mark on the effectiveness of planning. Moreover, the reasons for delay for more than four years indicate defective planning and execution and also failure to adhere to the recommendations of Task Force Committee. The reasons cited for delay

were within the control of the Company as necessary approvals were not obtained in advance prior to grounding of the project. Major deviations in the original plans and also slow progress of the works, especially in respect of Lot- II could have been avoided.

2.1.17(viii) Execution of Power transmission system to Gangavaram Port:

Based on the proposal of GoAP (January 2005), Administrative Approval for construction of 220/33 kV SS at Gangavaram Port and 220 kV DC line from Gajuwaka was accorded (March 2005) for ₹ 16.04 crore which was subsequently revised (February 2007) to ₹ 30.17 crore. Technical sanction was accorded (April 2007) for ₹ 28 crore. Erection of SS and connected 220 kV LILO line works were awarded (August 2007) to Bodapati Control Systems Private Limited, Hyderabad (contractor) for ₹ 5.90 crore (excluding material cost).

Site was also handed over to the contractor in August 2007 and all the works were to be completed within 8 months i.e. by April 2008. The works, however, were completed and commissioned in May 2009, with a delay of 13 months at a cost of ₹ 16.29 crore due to delay in execution of works by the contractor. On request of the Port authorities (October 2007), the Company made an alternative arrangement during construction time (January to March 2008) for power supply of 5 MVA by paying (January 2008) ₹ 76.33 lakh towards Service Line Charges and Development Charges to APEPDCL‡‡ which was avoidable.

Management stated that temporary supply of 33kV line was urgently required for construction activity. The fact remains that there was delay in commissioning of the 220/33 kV SS at Port site.

Operation and Maintenance (O&M)

2.1.18 The performance of the Company mainly depends on efficient maintenance of its EHT transmission network for supply of quality power with minimum interruptions. The performance of the Company with regard to O&M of the system is discussed in the succeeding paragraphs.

Idle transmission capacity

2.1.19 The Company in order to evacuate the power from the Generating Stations and to meet the load growth in different areas of the State constructs lines and SSs at different EHT voltages. A Transformer converts AC voltage and current to a different voltage and current at a very high efficiency. The voltage levels can be stepped up or down to obtain an increase or decrease of AC voltage with minimum loss in the process. The evacuation is normally done at 220 kV SSs. The transmission capacity (220 kV) created vis-à-vis the transmitted capacity (peak demand met) at the end of each year by the Company during the 5 years ending March 2010 are as follows:

‡‡ Eastern Power Distribution Company of Andhra Pradesh Limited.

Transmission capacity at 220 kV (in MVA)				
Year	**Installed**	**After leaving 30 *per cent* towards margin**	**Peak demand including non-coincident demand**	**Excess (3-4)**
1	**2**	**3**	**4**	**5**
2005-06	17501	12250	10400	1850
2006-07	18546	12982	10907	2075
2007-08	20125	14087	11832	2255
2008-09	21382	14967	12619	2348
2009-10	22978	16085	13074	3011

From the above table it could be observed that the overall transmission capacity was in excess of the requirement for every year. The existing transmission capacity excluding 30 *per cent* towards redundancy worked out to an excess of 3011 MVA to the end of March 2010 which worked out to ₹ 116.83 crore (₹ 3.88 crore per 100 MVA PTR) which was a burden passed on to the consumer. Existence of extra/idle capacity in the transmission network and prevalence of overloads, high voltages on certain places reflects unscientific planning in creation of transmission network.

Management in its reply stated that as per planning norms SSs can only be loaded upto 60 *per cent* of its capacity and the excess capacity worked out at 40 *per cent* was only 210 MVA which is negligible. However, the reply is in deviation to the recommendations of working group on power for 11th Plan stipulating 30 *per cent* margin of transmission capacity.

Operation

Burden on Sub-stations

2.1.20 Manual on Transmission Planning Criteria (MTPC) stipulates the permissible maximum capacity for different SSs i.e., 320 MVA for 220 kV and 150 MVA for 132 kV SSs. Scrutiny of the maximum capacity levels of SSs revealed 7 numbers of 220 kV and 4 numbers of 132 kV SSs exceeded the permitted levels. It was also observed that every SS of capacity 132 kV and above should have at least two transformers. Further, the Transmission Planning and Security Standards issued by APERC indicated that the size and number of transformers in the SS shall be planned in such a way that in the event of outage of any single transformer the remaining transformer(s) could still supply 80 *per cent* of the load.

We observed that 16 numbers of 132 kV SS had only one transformer as against the norm of at least two transformers and the said transformers were also loaded to 100 *per cent* of their capacity.

Management replied that the SSs exceeding the capacities were located in densely loaded areas and new SSs were being proposed to take care of increased load conditions. In case of single PTR it was stated that based on the load growth the 2nd PTR would be commissioned.

Fluctuations in Voltage profiles

2.1.21 As per MTPC the 132 kV transmission network is required to maintain voltages between 145 to 122 kV. A review of the 132 kV bus voltages in Gajwel and Yeddumailaram divisions of the Hyderabad Zone for the period September 2009 to March 2010 revealed that in 20 SSs the voltages recorded ranged between 144 to 104 kV while in 12 SSs at Kadapa voltage recorded ranged between 116 to 107 kV.

Thus, to provide quality power and reduce the transmission losses the Company should ensure that the maximum and minimum voltages are maintained as per the norms.

Management replied that steps were being taken to maintain voltage profiles as per standards.

Lines

Overloading of EHT lines

2.1.22 As per MTPC permissible line loading cannot normally be more than the Thermal Loading Limit (TLL). The TLL limits the temperature attained by the energized conductors and restricts sag and loss of tensile strength of the lines. The TLL limits the maximum power flow of the lines. As per MTPC the TLL of 132 kV line with ACSR[§§] Panther 210 sq. mm. conductor was 366 amps. Scrutiny of the line loadings on the 132 kV feeders revealed that, 42 numbers of feeders out of 167 numbers of feeders in Hyderabad Zone were loaded above 366 amps. Loading of the lines beyond capacity resulted in voltage fluctuations, higher transmission losses and frequent interruptions/breakdowns.

Management in its reply stated that certain overloaded 132 kV lines were identified in and around twin cities and steps were being taken for replacement of existing conductor with high capacity conductor.

Delay in installation of Bus Bar Protection Panel (BBPP)

2.1.23 Bus bar is used as an application for interconnection of the incoming and outgoing transmission lines and transformers at an electrical Sub-station. BBPP limits the impact of the bus bar faults on the entire power network which prevents unnecessary tripping and selective to trip only those breakers necessary to clear the bus bar fault. As per Grid norms and Best Practices in Transmission System, BBPP is to be kept in service for all 220 kV SSs to maintain system stability during Grid disturbances and to provide faster clearance of faults on 220 kV buses. We observed that out of 92 numbers 220 kV SSs (60 numbers single bus SSs and 32 numbers double bus SSs) where BBPP is required to be installed, Company provided the panel at 75 SSs and in the remaining 17 SSs the BBPP was not yet provided. It was observed that out of 75 SSs where BBPP is available; only 52 numbers are in service and remaining 23 numbers were not in working condition and out of 23 numbers,

§§ Aluminium Conductor Steel Reinforced.

13 numbers had become old and obsolete, not repairable/yet to be repaired and at 10 SSs though panels were installed, they were yet to be commissioned.

Management stated that it could not install BBPP in all the 220 kV SSs due to on-going works of 220 kV lines, augmentation of 100 MVA PTRs and delay in attending the commissioning works by Service Engineers etc. The reply is not acceptable as the Company failed to arrange for funds amounting to ₹ 3.80 crore required for BBPP in 30 SSs inspite of having reserves and surplus funds of ₹ 962.07 crore and a profit of ₹ 146.81 crore during the year putting the system stability at risk.

Inadequate number of Capacitor Banks

2.1.24 To reduce transmission losses, to improve power factor and for proper utilization of capacity of transformers, shunt capacitors and shunt reactors commonly known as capacitor banks (Banks) of required capacity have to be installed at 132, 220 and 400 kV SSs for providing necessary reactive energy♦ measured in Million Volt Ampere Reactive (MVAR).

Transmission Planning and Security Standards stipulate that reactive compensation shall be provided as far as possible in high voltage systems with a view to meet the reactive power requirement of load close to the load points in 220/132 kV SSs. Switchable/fixed, shunt/line reactors shall be provided at 400 kV SSs/lines for controlling voltages within limits specified. The details of energy transmitted, reactive energy required (in MVAR) at 50 *per cent* of energy transmitted and shortfall in MVAR for the period from 2005-06 to 2009-10 are given below:

Year	Total transmitted energy (in MW)	Required Reactive energy at 50 *per cent* (in MVAR)	Actual reactive energy available (in MVAR)	Short fall in reactive energy (in MVAR)
2005-06	6578	3289	3125	164
2006-07	7289	3644	3285	359
2007-08	7764	3882	3300	582
2008-09	8720	4360	3305	1055
2009-10	9264	4632	3305	1327

The shortage in reactive energy ranged between 164 to 1327 MVAR. It is observed that there were no shunt reactors or line reactors at 400/220 kV level. Further, even out of 424 Banks available with a total capacity of 3305 MVAR for 132 kV and 33 kV level network as on 31 March 2010, 38 Banks (January 2010) were not in working condition.

Thus, due to non-provision of reactive energy compensation in transmission network the Company was put to an additional expenditure of ₹ 4.09 crore by way of reactive energy compensation charges paid to the PGCIL*** for the

♦ Reactive energy/power is the portion of electricity that establishes and sustains the electric and magnetic fields of alternating-current equipment.
*** Power Grid Corporation of India Limited.

period from 2005-06 to 2009-10 apart from foregoing additional revenue by way of reduction in transmission losses.

Management stated that out of 424 capacitor banks 38 numbers Banks are not in service for want of spares and the procurement action was initiated and purchase orders for procurement of 32 banks at a cost of ₹ 0.06 crore per Bank were placed at a cost of ₹ 1.97 crore. The fact remains that the company had delayed the procurement (₹ 1.97 crore) of the Banks/spares in time resulting in the reactive energy charges (₹ 4.09 crore).

Maintenance

Un-satisfactory performance of Current Transformers (CT)

2.1.25 Current Transformers are one of the most important and cost-intensive components of electrical energy supply networks, thus it is of special interest to prolong their life duration while reducing their maintenance expenditure. In order to gather detailed information about the operation conditions of CTs, various kinds of oil analysis like the standard oil Dissolved Gas Analysis (DGA) tests are generally conducted. For CT insulation a combination of an insulating liquid and a solid insulation impregnated therewith are used. For an evaluation of the actual condition of this insulating system usually a DGA is used, as failures inside the CT lead to a degradation of the liquid insulation in such a way that the compound of the gases enables an identification of the failure cause.

The Company purchased (2002) 72 numbers of 400 kV CTs from AREVA T&D Limited, Bangalore at a cost of ₹ 2.33 crore and installed at 400 kV SS at Kalapaka in Visakhapatnam district. Due to accumulation of high DGA values, seven CTs blasted (between September 2006 and February 2010) and they were removed. Out of the balance 65 CTs, the Company removed (2007-09) and repaired/reinstalled 25 CTs by incurring an expenditure of ₹ 1.18 crore.

During the joint inspection (October 2007) by the Company and the manufacturer, the main cause for blasts of CTs was attributed to high DGA values in the CTs. In the Failure Report (October 2007) it was contended that MS material was used for CT domes and tanks without any galvanization due to which CT domes and tanks were getting corroded. Thus, by not insisting upon galvanization in MS material used for CT domes and tanks as per the specifications of the purchase order, the Company incurred an avoidable expenditure of ₹ 1.18 crore towards repair of the 25 CTs. Further, 40 more (14 removed for repairs and 26 in use) CTs were yet to be repaired.

Management stated that as per the specifications all the CTs were tested/commissioned and painting was accordingly done. It was further stated that the NTPC-TPP[√] is using sea water for cooling purpose and the vapour/gases emanating from this cooling tower affected the CTs. The reply is not tenable as testing is done on the performance of CT only and galvanising

√ National Thermal Power Corporation-Thermal Power Plant.

does not fall under part of testing. However, the Company should have insisted on testing of galvanisation of the CT domes as per the purchase order specifications.

Working of hot lines division/sub divisions

2.1.26 Regular and periodic maintenance of transmission system is of utmost importance for its un-interrupted operation. Apart from scheduled patrolling of lines following techniques are prescribed in the Report of the Committee for updating the Best practices of Transmission in the country for maintenance of lines:

- Hot Line Maintenance.
- Hot Line Washing.
- Hot line Puncture Detection of Insulators.
- Preventive Maintenance by using portable earthing hot line tools.
- Vibration Measurement of the line.
- Thermo-scanning.
- Pollution Measurement of the equipment.

The hot line technique (HLT) envisages attending to maintenance works like hot spots, tightening of nut and bolts, damages to the conductor, replacement of insulators etc., of SSs and lines without switching off. This includes thermo scanning of all the lines and SSs towards preventive maintenance. HLT was introduced in India in 1958.

As on 31 March 2010, the Company had 2 hotline divisions and 10 sub divisions with manpower strength of 88. We observed that the Company did not prepare any manual/guidelines nor did it fix any targets for maintenance of lines/SSs. Further, the Thermo Vision Scanning Cameras provided at Gajuwaka and Vemagiri were not in working condition.

Grid Management

Maintenance of Grid/SLDC

2.1.27 Transmission and Grid Management are essential functions for smooth evacuation of power from generating stations to the APDISCOMs/consumers. Grid Management ensures moment-to-moment power balance in the interconnected power system to take care of reliability, security, economy and efficiency of the power system. The Grid management in India is carried out in accordance with the standards/directions given in the Grid Code issued by CEA. National Grid consists of five regions viz., Northern, Eastern, Western, North Eastern and Southern Grids, each of these having a Regional Load Despatch Centre (RLDC), an apex body to ensure integrated operation of the power system in the concerned region. The Andhra Pradesh State Load Despatch Centre (SLDC), a constituent of Southern Regional Load Despatch Centre (SRLDC), Bangalore, ensures integrated operation of power system in the State. The Government of Andhra Pradesh notified (January 2004) that the SLDC shall be operated by the Company. The SLDC is assisted by four

Area Load Despatch Centres* (ALDCs) for data acquisition and transfer to SLDC and supervisory control of 132 kV and 33 kV equipment.

Infrastructure for load monitoring

2.1.28 Remote Terminal Units/Sub-station Management Systems (RTUs/SMSs) are essential for monitoring the efficiency of the transmission system and the loads during emergency in load dispatch centres as per the Grid norms for all SSs. We observed that there were 383 numbers of 400/220/132 kV SSs and 24 generators, out of which 94 numbers (24.5 *per cent*) of 400/220/132 kV SSs and 18 numbers (75 *per cent*) of generators only were provided with RTUs for recording real time data for efficient Energy Management System. Further, the ALDCs were not integrated among themselves and the ALDCs did not have any data storing or back up facilities thus reducing them to observation centres.

Management replied that software configuration at RTU level was pending with Independent Power Producers (IPPs) for full integration. It was further stated that the 132 kV SSs were not integrated to the SLDC/ALDC through RTUs/SMSs as ALDCs did not have data storage facilities and there was no such need as 132 kV SSs were not covered in the architecture scheme and the data of these SSs were being recorded manually.

The reply is not acceptable as ALDCs should acquire and transfer data to SLDC and have supervisory control of 132 kV as per the Grid Code.

Thus, the SLDC is connected with RTUs/SMSs only to the extent of 24.54 *per cent* of its SSs and 75 *per cent* of the generators restricting its capacity to monitor efficiency of transmission system and load monitoring on real time basis.

Grid Discipline

2.1.29 As per Grid Code, the transmission utilities are required to maintain Grid discipline for efficient functioning of the Grid. All the constituent members of the Grid are expected to maintain a system frequency between 49 and 50.5 Hertz (Hz) (49.2 and 50.3 Hz with effect from 01 April 2009). However, due to various reasons such as shortages in generating capacities, high demand, Grid indiscipline in maintaining load generation balance, inadequate load monitoring and management, Grid frequency goes below or above the permitted frequency levels. To enforce the Grid discipline, the SRLDC issues three types of messages (A,B,C). Message A is issued when the frequency is less than 49.2 Hz and over-drawl is more than 50 MW or 10 *per cent* of schedule whichever is less. Violation B message is issued when frequency is less than 49.2 Hz and over-drawl is between 50 and 200 MWs for more than ten minutes or 200 MW for more than five minutes. Message C (serious nature) is issued 15 minutes after the issue of message B when frequency continues to be less than 49.2 Hz and over drawl is more than 100 MW or ten *per cent* of the schedule whichever is less. We observed that type

* Vijayawada, Warangal, Kadapa and Mamidipally.

C messages received were nil in 2007-08, it had increased to 29 numbers during the period from March 2009 to March 2010.

Thus, increase in the receipt of type C messages which puts a question mark on the Grid discipline led to levy of penalty by CERC as detailed below:

Penalty due to violation of Grid discipline

2.1.30 For maintenance of Grid discipline the CERC takes up *suo-motu* petition on over drawl of power from the Grid at a lower frequency thus putting the Grid to the risk. The Company had violated the Grid discipline resulting in payment of penalty as detailed below:

Sl.No.	Month and Year of violation	Number of occasions of violation	Penalty levied (₹ in lakh)
1.	July 2008	369	1.00
2.	April 2009	122	122.00

The Company did not put in place MIS system of apprising the Board of Directors regarding yearly performance of the Grid/number of messages received or the fines/penalties levied, paid or filing of cases in this regard in CERC/other Courts. The Company had filed a case in respect of ₹ 1.22 crore penalty levied by CERC in the Honourable High Court of Andhra Pradesh and the matter is pending in the Court.

Management replied that CERC narrowed down the frequency band during February 2009 while the Company submitted that the proposed revision of frequency was non-achievable since the targeted capacity addition commensurate with load growth had not taken place.

Non adherence to Backing Down Instructions (BDI)

2.1.31 When the frequency exceeds the ideal limits i.e. situation where generation is more and drawl is less (at a frequency above 50 Hz) SLDC takes action by issuing BDI to the Generators to reduce the generation for ensuring the integrated Grid operations and for achieving maximum economy and efficiency in the operation of the power system in the State. Failure of the generators to follow the SLDC instructions would constitute violation of the Grid code and would entail penalties not exceeding ₹ 5 lakh. The Company issued BDI for 5872.932 MUs for compliance against which generators failed to comply for 203.225 MUs during the period under review. The percentage of non-compliance of backing down was on high side which worked out to 3.46 *per cent.*

An amount of ₹ 2.97 crore was recovered by APDISCOMs from APGENCO towards excess energy pumped into the Grid. Further, in order to make good the losses suffered to the Transmission and Distribution network due to non-adherence to BDI (for the period from 2004-05 to 2006-07) by seven generators including APGENCO, the Company along with APDISCOMs filed (May 2007) a petition before the APERC for recovery of ₹ 25.78 crore including the Company's share of ₹ 9.02 crore. APERC however, dismissed (May 2007) the petition indicating that the instructions issued for backing

down and normalization could not be undertaken instantaneously as the generators should be allowed time for ramping. Further, a test check of notices issued to the different generators indicated that the Company did not evolve a system to issue BDI excluding the machine ramp down time as available to the Central Generating Units.

Management replied that in case of State generators the Availability Based Tariff (ABT) was not in place for backing down the units allowing the time for ramping down their generation. The fact remains that the Management had still not evolved a system for enforcing the BDI as available in case of ABT for Central Generating Units.

Planning for power procurement

2.1.32 The Company draws long term supply plan taking into account the contracted generation capacity, allocation from central sector and future committed projects and evolve net additional requirement of power in consultation with the APDISCOMs. It also draws day ahead plan for assessing its day to day power requirement. The details of total requirement of the State, total power supplied and shortage of power for the five years upto 2009-10 are given below:

(Figures in MUs)

Sl.No.	Details	2005-06	2006-07	2007-08	2008-09	2009-10
1	Total power requirement	52629	59808	63629	70756	79201
2	Total power supplied∗	52407	58137	62135	67622	74859
3	Power short supplied	222	1671	1494	3134	4342
4	Percentage of shortage	0.42	2.79	2.35	4.43	5.48

It could be seen from the above that the percentage of shortage of power is on the increasing trend i.e., from 0.42 in 2005-06 to 5.48 *per cent* by 2009-10.

The gap in demand supply position also leads to variation between actual generation or actual drawl and scheduled generation or scheduled drawl which is accounted through Unscheduled Interchange (UI) charges, worked out by SRLDC for each 15 minutes time block. UI charges are levied for the supply and consumption of energy in variation from the pre-committed daily schedule. This charge varies inversely with the system frequency prevailing at the time of supply/consumption. Hence it reflects the marginal value of energy at the time of supply. The levying of UI charges acts as a commercial deterrent to curb over drawls from CGS$^{\pi}$ during low frequency conditions. We observed that during the period under review the APDISCOMs have over drawn power from CGS during low frequency which ultimately resulted in high power purchase cost by way of UI charges amounting ₹ 1,236.87 crore (net of UI receipts).

∗Including generation, short and long term purchases and drawl from Central Generating Stations.

π Central Generating Stations.

Management stated that due to deficit power situation the Company was forced to purchase additional power under short term basis with the approval of the GoAP.

Disaster Management

2.1.33 Disaster Management (DM) aims at mitigating the impact of a major break down on the system and restoring it in the shortest possible time. As per the Best Practices, DM should be set up by all power utilities for immediate restoration of transmission system in the event of a major failure. It is carried out by deploying Emergency Restoration System, DG sets, vehicles, fire fighting equipment, skilled and specialized manpower.

Disaster Management Centre, National Load Dispatch Centre, New Delhi will act as a Central Control Room in case of disasters. As a part of DM programme mock drill for starting up generating stations during black start♣ operations was being carried out by the Company every 6 months.

Inadequate facilities for DM

2.1.34 The SRLDC identified 21 major generating stations in the State out of which black start facilities were available in 5 generating stations only indicating the inadequacy in the preparedness for DM.

Diesel generating (DG) sets and synchronoscopes form part of DM facilities at EHT SSs connecting major generating stations. The Company identified (September 2009) that out of 93 numbers 220 kV SSs DG sets were available only in 39 SSs (28 numbers DG sets in working condition and 11 numbers not in working condition) while only 25 synchronoscopes were available. Further, the Company did not identify vulnerable installations for provision of metal detectors and handing over the security of the sites to the Central Industrial Security Force (CISF) to meet crisis arising due to terrorist attacks, sabotage and bomb threats.

Further, we observed during the test check of 15 SSs in Hyderabad Metro and Rural Zones that fire extinguishers were not timely recharged and no sand buckets were maintained. This reflects that the DM system in the Company needs to be strengthened.

Management replied that the steps were being taken for procurement of 72 numbers DG sets with synchronoscopes, keeping the fire extinguishers recharged and handover 10 numbers EHT SSs to SPF¥ authorities in order to meet the crisis.

Transmission Losses

2.1.35 While energy is carried from the generating station to the consumers through the Transmission & Distribution (T&D) network, some energy is lost which is termed as T&D loss. Transmission loss is the difference between energy received from the generating station/Grid and energy sent to

♣ The procedure necessary to recover from partial or a total black out.
¥ Special Protection Force.

APDISCOMs. The details of transmission losses from 2005-06 to 2009-10 are given below:

Particulars	Unit	Year				
		2005-06	**2006-07**	**2007-08**	**2008-09**	**2009-10**
Power received for transmission	MUs	51857.16	57464.00	61208.68	68746.20	73036.10
Net power transmitted	MUs	49557.70	54707.92	58293.79	64639.91	68969.57
Actual Transmission loss	MUs	2299.46	2756.08	2914.89	4106.29	4066.53
	percentage	4.43	4.80	4.76	5.97	5.57
Target Transmission loss as per the CEA norm	percentage	4.00	4.00	4.00	4.00	4.00
Target Transmission loss as per APERC norms	percentage	4.97	4.45	4.30	4.20	4.16
Transmission loss in excess of APERC norm (valued at realisation per unit as at para 2.1.7 row 4).	MUs	**Nil**	**198.93**	**282.92**	**1218.95**	**1028.23**
	Rate per unit in ₹.	**0.17**	**0.12**	**0.11**	**0.12**	**0.12**
	₹ in crore	**Nil**	**2.39**	**3.11**	**14.63**	**12.34**

It could be seen from the above that the transmission losses were on increasing trend and exceeded the CEA norm of four *per cent* in all the five years as also the yearly norm fixed by the APERC in four years upto 2009-10. The value of transmission loss suffered by the Company with reference to the norm fixed by the APERC for the period 2006-07 to 2009-10 was ₹ 32.47 crore.

Management replied that excluding the PGCIL losses the transmission losses were within the permissible limits and the network losses depend on hydel and thermal mix. It was further stated that when hydel generation was less, losses would increase.

The reply is not tenable as transmission losses fixed by the Regulatory Commission include PGCIL losses also. Thus, the fact remains that the Company could not achieve the norm fixed by the APERC in four out of five years.

Energy Accounting and Energy Audit

2.1.36 Energy accounting and audit is necessary to assess and reduce the transmission losses. The transmission losses are calculated from the Meter Reading Instrument (MRI) readings obtained from Generation to Transmission (GT) and Transmission to Distribution (TD) Boundary metering points. As on 31 March 2010 there were 1,293 interface Boundary metering points between TD (1,098) and GT (195). While all the GT points were provided with 0.2 class meters, 634 TD points were provided with 0.2 class meters and balance 464 points were of 0.5 class meters.

Further, analysis of data for three months period from July 2009 to September 2009 of 5 divisions® with 322 No. of feeders indicated existence of high percentage of losses in 9 feeders ranging between 4.65 to 100 *per cent*, 26 feeders had no meters and negative losses ranging between (-) 0.10 to (-) 100 *per cent* in 108 feeders were noticed. It was also noticed that the negative losses were due to usage of different class of meters at input and output points and replacement of meters without compatibility to CTs and PT•s consequently making energy accounting and transmission losses worked out un-realistic.

Management in its reply stated that procurement of 0.2 class ABT compatible meters would be taken up for all interface T/D points. All the field engineers were instructed to test the meters for their healthiness and replace defective equipment.

Under utilisation of VSAT (Very Small Aperture Terminals) facility

2.1.37 VSAT is a satellite communication system used for business. It was meant for digital/voice communication between SSs and SLDC and backhaul link (back up) between central site/SLDC and shared hub located at Noida for timely, reliable online metering and remote data acquisition/transfer. The Company hired the services from HCL Comnet Limited, Noida, Uttar Pradesh. Total VSAT services include (a) bandwidth usage charges, (b) bandwidth charges for leased line, (c) bandwidth charges for backhaul link, (d) Annual Maintenance charges and (e) Department of Telecommunication charges. It was commissioned/integrated and maintained (including Annual Maintenance Contract) by HCL Comnet Limited with effect from August 2004/July 2007 at 321 SSs/locations by incurring an expenditure of ₹ 6.27 crore (upto July 2009).

It was observed that the facility was not used for digital communication during the five years upto July 2009 but was utilised for collection of digital data from 20 EHT SSs covering 230 feeder meters, communication purposes and transmitting data to APDISCOMs corporate offices from load despatch centre for monitoring purposes which resulted in under-utilisation of inbound and outbound capacities and leased line backhaul links installed between central site and shared hub.

Management stated that the required meters could not be installed due to technical problems as a result the VSAT usage was not as expected. It further added that the bandwidth charges over a period of time were on a decline and assured to utilise them for monitoring purposes.

Financial Management

2.1.38 As per the Regulation 5 of 2005, terms and conditions for determination of tariff for transmission activity, the Company files an ARR with the APERC for the revenue required to meet the cost pertaining to the

® Erragadda, Moulali, Nalgonda, Visakhapatnam and Kadapa.

• Potential transformer.

transmission business for each financial year which would be permitted to be recovered through tariffs and charges by the Commission. Thus, the main source of revenue of the Company is the transmission and SLDC charges.

The ARR proposals made by the Company and approved by the Commission are given below:

Transmission Tariff						
Year	APTRANSCO			APERC		
	Total capacity for transmission (MW)	Revenue Requirement (₹ in crore)	Tariff, ₹/kW/ Month	Total capacity for trans-mission (MW)	Revenue Requirement (₹ in crore)	Tariff (₹/kW/ Month)
2005-06	The ARR includes the sale and purchase of power hence the bifurcation towards the transmission and SLDC could not be done.					
2006-07	12036	712.01	49.30	12036	615.29	42.60
2007-08	12402	909.14	61.09	12402	664.09	44.62
2008-09	15376	1113.03	60.32	15376	717.99	38.91
2009-10	13973	1044.06	62.27	13744	788.13	47.79

Further, as per the Regulation, whenever there is a gain or loss (excess/short) in the controllable items (O&M, Return on capital employed, Depreciation and non tariff income) the Company shall file before the Commission, which would review the same and make appropriate adjustments wherever required.

Though the expenditure incurred was more than the approvals of the Commission, the Company did not go for claiming the excess expenditure. This resulted in meeting the excess expenditure from their own sources and under realisation of transmission and SLDC charges. Further, as per the clause 6.2 (i) and 10.7 of Regulation 5 of APERC the proposals for sharing of gains and losses with the users had to be filed by the Company which did not take place in these cases.

Management replied that though the expenditure incurred was more than the allocated expenditure, the return on equity/profit was also much more than the allocation made by APERC.

Non-collection of SLDC charges

2.1.39 The SLDC charges were introduced from 2005-06 onwards and the Company did not levy these charges amounting to ₹ 2.87 crore on 53 numbers private generators/Open Access (OA) users upto 2006-07 on the ground that the case on wheeling charges was pending in the Court which had no relevance to levy of SLDC charges. Thereafter, the Company levied and collected the SLDC charges amounting to ₹ 2.87 crore through DISCOMs. Thus, delay in raising demand resulted in delayed realization of revenue of ₹ 2.87 crore with a consequential loss of interest of ₹ 0.34 crore.

Management replied that after issue of the Regulation 1 of 2006 the Company sought for legal opinion for more clarity for raising SLDC charges on OA

users. The reply of the Management is not acceptable as the legal opinion should have been taken in 2005 itself on the introduction of SLDC charges.

Non-collection of surcharge from APDISCOMs

2.1.40 The Company raises monthly transmission bills on APDISCOMs on the allocated capacities at the rates specified in the Tariff Orders. The bills are to be paid within 30 days from the date of issue. The transmission agreement between the Company and APDISCOMs provided for opening of irrevocable revolving Letter of Credit (LC) in favour of the Company. In the event of failure to make payment within 15 days from the due date the Company should invoke the LC. It was observed that no such LC was opened by any of the APDISCOMs till date (June 2010) nor the provision for levy of penalty was included in the agreement.

We observed that, the demand notices served on APDISCOMs contained the provision for levy of surcharge at 2 *per cent* per month if the bills are not realized by the due date. Scrutiny of the bills from 2005-06 to 2009-10 revealed delayed realization of the bills ranging from 4 to 75 days but the Company did not levy surcharge as provided in the bills due to non provision of the penalty clause in the agreement resulting in a loss of revenue of ₹ 31.75 crore.

Management stated that as there was no surcharge clause in the long term agreement with the APDISCOMs, the surcharge was not levied.

Avoidable payment of compensation

2.1.41 The Company awarded (July/August 1999) ten contracts valued ₹ 57.01 crore to Tata Projects Limited, Hyderabad to execute the distribution system improvement works under Adaptable Programme Lending Scheme. The works were to be completed by December 2001. The contractor requested (August 2001) for foreclosure and the Company foreclosed the contracts in December 2001. Subsequently, the contractor preferred (November 2003) a claim for ₹ 12.02 crore as compensation towards the delay in making available of free issue materials, delayed approval of plans for execution of works etc., by the Company. After prolonged discussions the parties agreed to the compensation of ₹ 5 crore which was approved (February 2007) by the Board of Directors of the Company and an amount of ₹ 5 crore was paid (March 2007). Efforts of the Company to claim the same from the APDISCOMs were not fruitful so far (August 2010).

Management replied that vigorous pursuance is being made with APDISCOMs to accept the expenditure.

Material Management

2.1.42 The key functions in material management are laying down inventory control policy, programming for materials, procurement of materials and disposal of obsolete inventory. Scrutiny of the records of the Company revealed the following:

The details of Opening stock, purchases, issues and closing stocks for the period from 2005-06 to 2009-10 are detailed below:

(₹ in crore)

Year	Consumption (per annum)	Consumption (per month)	Net Closing stock (as per Balance sheet)	Closing stock in terms of months to consumption
2005-06	371.97	31.00	213.07	6.87
2006-07	514.43	42.87	252.81	5.90
2007-08	469.89	39.16	211.21	5.39
2008-09	546.55	45.55	220.17	4.83
2009-10	997.90	83.16	269.21	3.24

Though the Company had limited its closing stock to 3 months consumption it had neither made any ABC analysis, nor fixed any standard minimum level or reorder level of their material requirement.

Non-conducting of Physical verification of stocks in the Stores

2.1.43 There are 11 Area Stores under the control of the Company. The Physical Verification (PV) of the stores was not being conducted annually. The PV was last conducted in one store in 2005, four stores in 2006 and six stores in 2009.

The value of non-moving, surplus, obsolete, unserviceable and scrap material as per the ERP statements in the last five years is given below:

(₹ in crore)

Particulars	2005-06	2006-07	2007-08	2008-09	2009-10
Surplus/obsolete/unserviceable/scrap	2.08	3.34	11.39	1.94	2.78
Non-moving	8.16	13.23	21.55	40.19	35.78
Total	10.24	16.57	32.94	42.13	38.56

From the above, it was observed that the value of the scrap, obsolete and non-moving stock was on increasing trend during 2005-2009 and the reconciliation of the above stock could not be made as the PV of all the stores are not being done annually. The Company had not taken action to conduct survey reports and dispose off the scrap/obsolete material, which could have earned revenue and resulted in creation of space for stocking of other materials.

Management replied that the annual verification of stores was done in chronological order with latest stores verified placed last in the order to ensure that all the stores were covered in the year. This practice was followed except when the same was not possible due to administrative reason.

Advance procurement of conductor

2.1.44 The Company awarded (July 2008) two contracts to Maytas Infra Limited at cost of ₹ 20.84 crore, (supply, erection, testing and commissioning of LILO to Gajwel 400 kV SS at a cost of ₹ 10.46 crore and from Malkaram - Minpur and Medchal - Minpur DC lines ₹ 10.38 crore) and the works were to be completed in 12 months. As per clause 12 of the agreement 100 *per cent* payment was to be made on supply of material by the contractor.

Accordingly, the Company paid (March 2009 and June 2010) ₹ 10.88 crore towards 490 km conductor received (September 2008 and April 2010) for both the works.

We observed that the contractor could not complete the foundations and erection of the tower works till date and the material received since September 2008 is lying idle at the site. Thus, non inclusion of a clause in the agreement correlating the release of payments for materials received with the progress of the works resulted in advance procurement of material and blocking of funds to the tune of ₹ 10.88 crore with a consequential loss of interest of ₹ 0.26 crore (on ₹ 2.92 crore at the rate of 9 *per cent* from March 2009 to March 2010) indicating poor material management.

Management replied that the contractor could not complete the works due to bankruptcy and resumed the works now and accepted to include a clause for release of 70 *per cent* payment of material supplied and remaining 30 *per cent* on erection of materials in future agreements.

Monitoring and Control

2.1.45 The performance of the SSs and lines of 400/220/132 kV on various parameters like Maximum and Minimum voltage levels, breakdowns, voltage profiles should be recorded /maintained as per the Grid code standards. We noted that the year-wise cumulative performance of the SSs and lines were neither being maintained nor consolidated for evaluation of annual performance of the SSs and lines. However, the field Divisions of TL&SS units compile the monthly MIS reports indicating the performance of the units as well as equipments installed. Though, these booklets are forwarded to the Corporate Office, they are not being kept month-wise and year-wise for verification. Further, verification of MIS reports of TL&SS, Hyderabad Metro and Rural Zones revealed that details regarding programmed overhauls of equipments like PTRs, CB[√]s, due dates of next oil change, OLTC[*] operations, dates of maintenance works, performance of SS batteries, performance of relays, cause-wise analysis of feeder breakdowns were not being furnished. The performance of lines and SSs and steps taken for further improvement of the system was not being apprised to the Board of Directors of the Company either annually/quarterly/monthly reflecting that minimal importance is being given to the MIS reports.

Non-review of the envisaged benefits of T&D schemes

2.1.46 The Company executed and commissioned 73 numbers EHT SSs and erected a total length of 4,124 CKM of EHT lines during review period. While approving the T&D schemes, the Company envisaged benefits in terms of reduction in line losses, improvement in voltage levels and the load growth to be achieved by the new schemes. It was, however, observed that the Company did not evolve any mechanism/system to assess the benefits actually derived on implementation of the T&D schemes after commissioning of the new

√ Circuit Breaker.

∗ On Load Tap Changer.

projects as required feedback was not received from the concerned field officers/APDISCOMs.

Internal Controls and Internal Audit

2.1.47 Internal control is a process designed for providing reasonable assurance for efficiency of operations, reliability of financial reporting and compliance with applicable laws and statutes which is designed to ensure proper functioning as well as effectiveness of the internal control system and detection of errors and frauds.

The Company outsourced the Internal Audit function to Private Chartered Accountants (PCAs) with effect from October 2003. The statutory auditors of the Company commented in the accounts for the five years upto 2009-10 that the Internal Audit System was to be strengthened to commensurate with the size and nature of the business. Scrutiny of the internal audit reports revealed that the comments focus only on the establishment matters rather than the core activities of the Company. Further, the Company did not have its own Internal Audit Manual prescribing the scope, coverage, periodicity etc., of Internal Audit and they continued to follow a manual prepared by Andhra Pradesh State Electricity Board (APSEB) during the Board's regime which did not have provisions for auditing the later issues like Transmission and SLDC charges, filing of ARR and compliance to directions of APERC etc.

Audit Committee

2.1.48 The Company constituted an Audit Committee (AC) as required under Section 292A of the Companies Act, 1956. As per the Terms of Reference of the AC, the AC should meet four times in a year. Thus, in a span of five years, the AC should have met for a minimum number of 20 times. However, the AC met only on five occasions. As per Section 292A (5) the internal auditors should also attend all the meetings, but the same was not complied with, in any of the five meetings.

Despite reporting of inadequacy of internal audit by the statutory auditors and non-attendance of internal auditors, the AC did not take any action indicating that the AC did not discharge its duties properly.

Management replied that the Companies Act did not specify the periodicity of the Audit Committee meetings, but periodicity was incorporated based on the mandatory provision under Clause 49 of the Listing Agreement.

Conclusions

- ***The State Government failed to prepare its own plan of the capacity addition as per National Electricity Plan approved by Regulatory Commission. The Company also failed to complete the projects as planned during the five year period.***
- ***There were abnormal delays in execution of major projects on evacuation system due to deficient planning and project management***

as there was a time overrun ranging between one to sixty two months.

- ***Despite existence of clear recommendations of Task force on Transmission Projects giving guidelines for reduction in delays for effective execution of transmission system, ineffective and improper contract management led to delay in execution of civil works.***
- ***Sub-stations and lines were constructed without proper load flow studies resulting in underutilization of Sub-stations and lines.***
- ***There were cases of abnormal overloading of transformers and transmission lines than prescribed, bus bar protection systems were not in place to maintain system stability and there were shortfall in installation of capacitor banks in the Sub-stations to provide necessary reactive power to the Sub-stations.***
- ***Lack of financial prudence led to delay in raising transmission bills and non levy of penalty for late remittance of transmission and SLDC Charges.***
- ***Inadequate safety measures and the infrastructure for disaster management.***

Recommendations

The Company should

- ***prepare capacity addition plan which is in line with the National Electricity Plan,***
- ***ensure that plan for evacuation system is synchronised with that of the generation system so that stop gap arrangement of evacuating through alternate system which would eventually be overloaded is avoided,***
- ***ensure that the recommendations of Task Force on Transmission Projects are followed scrupulously so as to avoid time overrun of the projects,***
- ***introduce an effective monitoring system to ensure that there are no delays in completion of projects by ensuring that all the required approvals are obtained before commencement of project works,***
- ***ensure adherence to the standards/norms fixed in MTPC/Grid Code for effective functioning and maintenance of transmission network,***
- ***ensure installation of adequate number of capacitor banks, bus bar protection systems to protect the lines and SSs,***
- ***ensure reduction of transmission losses by enforcing stricter energy audit,***
- ***maintain SLDC as per Grid Code and ensure that all generators and SSs are connected to SLDC through RTUs on real time basis for***

safety and security of the Grid. The frequency levels should be adhered to avoid payment of penalties for Grid indiscipline, and

- ***frame an inventory management policy and ensure regular physical verification of stocks and prompt disposal of the obsolete items.***

2.2 Andhra Pradesh Power Generation Corporation Limited

Executive Summary

The Andhra Pradesh Power Generation Corporation Limited (Company) contributes about half of the total energy requirement of Andhra Pradesh. In view of phenomenal growth in the demand of power since 2005-06, effective capacity addition was not adequate to meet the requirement leaving a deficit of 1,167 MW. 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 to 2009-10. The audit findings are discussed below:

Capacity Additions

During 2005-10, the peak demand for power had increased by 2,389 MW in the State, but the Company increased capacity addition up to 1,037 MW against its actual planned capacity addition of 2,204 MW. Due to shortage in capacity additions as per planning, the State is perennially in power shortage and unlikely to attain the National objective of power for all on demand by 2012.

Execution of Projects

Lack of proper monitoring and effective planning resulted in time overrun of 4 to 25 months with cost overrun of ₹ 935.76 crore due to non-obtaining of forest clearance, non-mobilisation of skilled manpower, delays in providing work fronts, drawings and abnormal delay in acquisition of required land.

The failure of the State to maintain pace with the demand for power was inter alia due to lack of co-ordination in taking decisions, inter-departmental disputes, abnormal delays in completion of projects within the scheduled periods, failure to undertake annual repair and maintenance and renovation/ modernisation works of the power plants in time.

Operational Performance

Performance of the existing generation stations depends on efficient use of material, manpower 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:

Dependence on imported coal

The Company's total linkage of coal for its thermal power was 835.80 lakh MTs during 2005-06 to 2009-10 but it could receive only 739.38 lakh MTs. The Company met the shortfall by procuring coal by way of import and e-auction.

Consumption of Coal

Due to use of coal having less gross calorific value (GCV) and consumption of excess heat than the designed heat rate due to leakages of steam in the aging units of power plants on account of delay in taking up of the life extension programmes, there was excess consumption of coal to the tune of 323.77 lakh MTs (₹ 4,845.29 crore) on account of use of low GCV coal and 74.41 lakh MTs (₹ 1,099.53 crore) on account of high heat rate.

Availability of coal stock

Due to failure to keep the adequate stock of coal for generation of power, there was a loss of generation of 73.50 MUs *valued*

at ₹ 15.07 crore in two thermal units. Non-lifting of washed coal from the site of washing plant resulted in procurement of coal through e-auction by incurring an extra expenditure of ₹15.42 crore.

Plant Load Factor

The PLF of A, B and C plants of Kothagudem Thermal Power Station had not achieved the National average (79.54 per cent in 2007-08 and 70.75 per cent in 2008-09) due to coal feeding problems, major shutdowns and delays in repairs and maintenance works. In other units, National average was achieved.

Outages

In Thermal Power Stations the total number of hours lost due to planned outages increased from 10,509 hours in 2005-06 to 13,592 hours in 2009-10 i.e., from 6.31 per cent to 7.39 per cent of the total available hours in the respective years. The forced outages in thermal power generating stations decreased from 4,754 hours in 2005-06 to 3,667 hours in 2009-10 i.e., from 2.86 to 1.99 per cent of the total available hours in the respective years The forced outages in respect of thermal stations were within the norm of 10 per cent fixed by CEA in all the units except Unit 7 & 8 of KTPS (2006-07), which were mainly due to LPT blade failure (Unit 7) and turbine failure (Unit 8).

In Hydel Stations, major part of the hours were lost due to water and grid constraints (ranged between 56.63 per cent and 65.08 per cent).

Auxiliary Consumption

Auxiliary consumption of power in respect of Thermal Power Stations was higher than the APERC norm of 8.5 per cent and 9 per cent without cooling towers and with cooling towers respectively. This resulted in excess consumption of 554.54 MUs *valuing ₹89.94 crore during review period.*

Financial Management

The borrowings increased from ₹ 10,102.01 crore in 2005-06 to ₹ 14,639.89 crore in 2009-10 for execution of new projects and renovation & modernisation works during the period under audit. As a result, the Company incurred ₹ 3,433.52 crore towards payment of interest on borrowings during review period, which rose from ₹ 778.81 crore in 2005-06 to ₹ 1,469.12 crore in 2009-10 leading to increase in the operating cost of the Company.

The Company held stock of stores and spares in excess of norms per MW resulting in locking up of funds to the extent of ₹168.96 crore.

The Company was to receive ₹ 2,552.99 crore from APDISCOMs towards sale of power and it failed to levy the penalty of ₹1,254.95 crore as per norms of APERC.

Environmental issues

Air and Noise pollution were not kept at the levels prescribed by the Andhra Pradesh Pollution Control Board.

Introduction

2.2.1 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 conducive to development of the Power Sector, promote transparency and 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 in February 2005 in consultation with the State Governments and Central Electricity Authority (CEA) for development of the Power Sector based on optimal utilisation of resources like coal, gas, nuclear material, hydro and renewable sources of energy. The Policy aims at, *inter alia*, laying guidelines for accelerated development of the Power Sector. It also requires CEA to frame National Electricity Plan (NEP) once in five years. The Plan would be short term framework of five years and give a 15 years' perspective.

During 2005-06, electricity peak load requirement in the State of Andhra Pradesh was assessed as 52,629 Million Units (MUs), of which only 52,407 MUs were available leaving a shortfall of 222 MUs, which works out to 0.42 *per cent* of the requirement. The total installed power generation capacity in the State of Andhra Pradesh at the beginning of 2005-06 was 11,106 Mega Watt (MW) and effective available capacity was 8,239 MW against the peak demand of 8,990 MW resulting in deficit of 751 MW. As on 31 March 2010 the comparative figures of requirement and availability were 71,180 MUs and 67,615 MUs with deficit of 3,565 MUs which worked out to 5.01 *per cent*. The total installed and available power generation capacity in the State was 14,138 MW and 10,447 MW respectively. Thus, there was a growth in demand of 18,551 MUs whereas the capacity addition was only 2,208 MW (effective).

In Andhra Pradesh, generation of power is carried out by Andhra Pradesh Power Generation Corporation Limited (Company), incorporated on 01 February 1999 under the Companies Act, 1956 as a wholly owned Company as per the Andhra Pradesh Electricity Reforms Act, 1998 under the administrative control of Department of Energy, Government of Andhra Pradesh (GoAP). The Company contributes about half of the total energy requirement of the State. The Management of the Company is vested with the Board of Directors (BoD) comprising of Chairman, Managing Director and six Directors appointed by the State Government. The day to day operations are carried out by the Managing Director, who is the Chief Executive of the Company, with the assistance of Chief Engineers (CEs) at Headquarters and at each Generating Station. The Company has six™ thermal generating stations,

™ 1. Dr.Narla Tatarao Thermal Power Project (Dr.NTTPP), 2. Kothagudem Thermal Power Station (KTPS-O&M), 3. Rayalaseema Thermal Power Project (RTPP), 4. Dr.NTTPP Stage-IV, 5. Kothagudem Thermal Power Station –Stage V (KTPS-V) and 6. Ramagundam Thermal Station (RTS).

17* hydel generating stations, including one mini hydel and one renewable energy station (Wind mills at Ramagiri) with the installed capacity of 3,883 MW, 3,703 MW and 2 MW respectively. The turnover of the Company was ₹ 6,434.22 crore in 2009-10, which was equal to 12.18 *per cent* and 1.56 *per cent* of the turnover of State PSUs (₹ 52,822.45 crore) and State Gross Domestic Product (₹ 4,11,349 crore) respectively. It employed 10,683 employees as on 31 March 2010.

Reviews on the performance of Rayalaseema Thermal Power Project (RTPP) and Kothagudem Thermal Power Station (KTPS) were included in the Report of the Comptroller and Auditor General of India for the years 2008 and 2009 (Commercial), Government of Andhra Pradesh, respectively. The Reports are yet to be discussed by COPU (September 2010).

Scope and methodology of audit

2.2.2 The present review conducted during February 2010 to May 2010 covers the performance of the Company during the period from 2005-06 to 2009-10. The review mainly deals with Planning, Project Management, Financial Management, Operational Performance, Environmental Issues and Monitoring by Top Management. Audit examination involved scrutiny of records at the Head Office and six″ out of 24 generating stations. The generating stations were selected based on the installed capacity.

The methodology adopted for attaining the audit objectives with reference to audit criteria consisted of explaining audit objectives to top management in an Entry Conference held on 4 March 2010, scrutiny of records at Head Office and selected units, interaction with the auditee personnel, analysis of data with reference to audit criteria, raising of audit queries. For discussion of audit findings with the Management, an Exit Conference was held on 09 September 2010 after issue of draft review to the Management for comments.

* 1. Machkund Power House, 2. Tungabhadra Dam Power House, 3. Hampi Power House, 4. Upper Sileru Power House, 5. Donkarayi Canal Power House, 6. Lower Sileru Power House, 7. Srisailam Right Bank Power House (SRBPH), 8. Srisailam Left Bank Power House (SLBPH), 9. Nagarjunasagar Power House (NSPH), 10.Nagarjunasagar Right Canal Power House (NSRCPH), 11. Nagarjunasagar Left Canal Power House (NSLCPH), 12.Priyadarshini Jurala Hydro Electric Project, 13. Pochampadu Power House, 14. Nizamsagar Power House, 15. Pena Ahobilam Hydro Power Station, 16. Singur Hydro Station and 17. Mini Hydro stations.

″ Thermal: Dr.NTTPP, Vijayawada (1,760 MW), Hydel: SLBPH, Srisailam (900 MW), SRBPH, Srisailam (770 MW) and NSPH, NSRCPH & NSLCPH, Nagarjunasagar (960 MW).

Audit objectives

2.2.3 The objectives of the performance audit were:

Planning and Project Management

- To assess whether capacity addition programme taken up / to be taken up to meet the shortage of power in the State was in line with the National Policy of Power for all by 2012;
- To assess whether a plan of action was in place for optimization of generation from the existing capacity;
- To ascertain whether the contracts were awarded with due regard to economy and in transparent manner;
- To ascertain whether the execution of projects were managed economically, effectively and efficiently; and
- To ascertain whether hydel projects were planned and formulated after taking into consideration the optimum design to get the maximum power, dam design and safety aspects.

Financial Management

- To assess whether energy bills were properly raised and recovered in an efficient manner; and
- To assess the soundness of financial health of the Company**.**

Operational Performance

- To assess whether the power plants were operated efficiently and preventive maintenance, as prescribed was carried out minimizing the forced outages;
- To assess whether requirements of each category of fuel worked out realistically, procured economically and utilized efficiently;
- To assess whether the manpower requirement was realistic and its utilization optimal;
- To assess whether the Life Extension (LE) (renovation and modernization) programmes were ascertained and carried out in an economic, effective and efficient manner; and
- To assess the impact of Renovation & Modernisation (R&M)/LE activity on the operational performance of the Units.

Environmental Issues

- To assess whether the various types of pollutants (air, water, noise, hazardous waste) in power generating stations were within the prescribed norms and complied with the required statutory requirements; and
- To assess the adequacy of waste management system and its implementation**.**

Monitoring and Evaluation

- To ascertain whether adequate MIS existed in the entity to monitor and assess the impact and utilize the feedback for preparation of future schemes.

Audit criteria

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

- NEP, norms/guidelines of 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 (PLF) etc;
- performance of best generating units;
- all India averages;
- prescribed norms for planned outages; and
- Acts relating to Environmental laws**.**

Financial position and working results

2.2.5 The financial position of the Company for the five years ending 2009-10 is given below:

(₹ in crore)

Particulars	2005-06	2006-07	2007-08	2008-09	2009-10
A. Liabilities					
Paid up Capital	2106.80	2106.80	2106.80	2106.80	2106.80
Reserve & Surplus (including Capital Grants but excluding Depreciation Reserve)	0.00	10.19	197.64	444.09	740.52
Borrowings (Loan Funds)	10102.01	10301.79	11301.18	13165.80	14639.89
(i) Secured	2404.55	2949.58	4813.25	7186.41	8891.58
(ii) Unsecured	7697.46	7352.21	6487.93	5979.39	5748.31
Current Liabilities and Provisions	1157.11	1561.54	2192.42	3121.49	3511.51
Total	**13365.92**	**13980.32**	**15798.04**	**18838.18**	**20998.72**
B. Assets					
Gross Block	14076.24	14168.21	16062.00	16404.40	18741.25
Less: Depreciation	5879.80	6565.55	7256.48	8028.78	8831.98
Net Fixed Assets	8196.44	7602.66	8805.52	8375.62	9909.27
Capital works-in-progress	1493.00	3175.75	4036.92	6989.12	6958.06
Investments	766.34	594.03	62.03	83.03	0.51
Current Assets, Loans and Advances	2769.32	2607.88	2893.57	3390.41	4130.88
Accumulated losses	140.82	---	---	---	---
Total	**13365.92**	**13980.32**	**15798.04**	**18838.18**	**20998.72**
Debt equity ratio	**83:17**	**83:17**	**84:16**	**86:14**	**87:13**

As against accumulated losses of ₹ 140.82 crore as at the end of 31 March 2006, there was turnaround and as such, the Company had accumulated

reserves and surplus amounting to ₹ 740.52 crore as at the end of 31 March 2010. However, the Company's financial position did not improve as the borrowed funds (both secured and unsecured) had gone up from ₹ 10,102.01 crore in 2005-06 to ₹ 14,639.89 crore in 2009-10 and as a result, payment of interest on borrowings (including capital works borrowings) rose from ₹ 778.81 crore in 2005-06 to ₹ 1,469.12 crore in 2009-10. The debt-equity ratio had increased from 83:17 (2005-06) to 87:13 (2009-10) as against Andhra Pradesh Electricity Regulatory Commission (APERC) norms of 70:30, considered for determination of tariff. The main reason for adverse debt-equity ratio as observed in audit was non-realisation of dues from APDISCOMs as discussed in *Paragraph 2.2.43*.

2.2.6 The details of working results like cost of generation of electricity, revenue realisation, net surplus/loss and earnings and cost per unit of generation are given below:

(₹ in crore)

Sl.No.	Description	2005-06	2006-07	2007-08	2008-09	2009-10
1.	**Income**					
	Generation Revenue	3888.68	4200.00	4617.30	6229.99	6434.22
	Other income including subsidy	120.76	124.76	578.25	138.84	153.48
	Total Income	**4009.44**	**4324.76**	**5195.55**	**6368.83**	**6587.70**
2.	**Generation**					
	Total generation (In MUs)	28751	31419	33289	33502	32100
	Less: Auxiliary consumption (In MUs)	2004	2071	2217	2398	2332
	Total generation available for Transmission and Distribution (In MUs)	**26747**	**29348**	**31072**	**31104**	**29768**
3.	**Expenditure**					
(a)	**Fixed cost**					
(i)	Employees cost	224.99	373.41	884.89	510.18	520.34
(ii)	Administrative and General expenses	46.74	53.97	47.11	49.83	80.16
(iii)	Depreciation	714.14	708.39	690.96	772.96	806.90
(iv)	Interest and finance charges†††	721.94	580.71	657.52	671.65	801.70
(v)	Lease rentals	16.72	15.75	0.00	0.00	0.00
	Total fixed cost	**1724.53**	**1732.23**	**2280.48**	**2004.62**	**2209.10**
(b)	**Variable cost**					
(i)	Fuel consumption					
	(a) Coal + Coal related costs – Expenditure capitalised	1956.60	2072.24	2329.70	3544.91	3493.34
	(b) Oil	22.10	34.64	68.77	72.58	105.53
	(c) Other fuel related cost including shortages/surplus	0.24	0.41	0.32	0.38	0.24
(ii)	Cost of water (hydel/thermal/gas/others)	40.90	49.27	48.86	57.72	43.68
(iii)	Lubricants and consumables	22.25	25.91	26.03	37.25	37.55
(iv)	Repairs and maintenance	94.90	102.36	92.52	134.38	147.72
(v)	Share of power	14.32	19.68	17.37	18.07	40.46
	Total variable cost	**2151.31**	**2304.51**	**2583.57**	**3865.29**	**3868.52**
(c)	**Total cost 3(a) + (b)**	**3875.84**	**4036.74**	**4864.05**	**5869.91**	**6077.62**
(d)	**Profit**	**133.60**	**288.02**	**331.50**	**498.92**	**510.08**
4.	**Realisation (₹ per unit)**	**1.50**	**1.47**	**1.67**	**2.05**	**2.21**
5.	**Fixed cost (₹ per unit)**	**0.64**	**0.59**	**0.73**	**0.64**	**0.74**
6.	**Variable cost (₹ per unit)**	**0.80**	**0.79**	**0.83**	**1.24**	**1.30**
7.	**Total cost per unit (5 + 6) (₹ per unit)**	**1.44**	**1.38**	**1.56**	**1.88**	**2.04**
8.	**Contribution (4 – 6) (₹ per unit)**	**0.70**	**0.68**	**0.84**	**0.81**	**0.91**
9.	**Profit (+)/Loss (-) (4 – 7) (₹ per unit)**	**0.06**	**0.09**	**0.11**	**0.17**	**0.17**

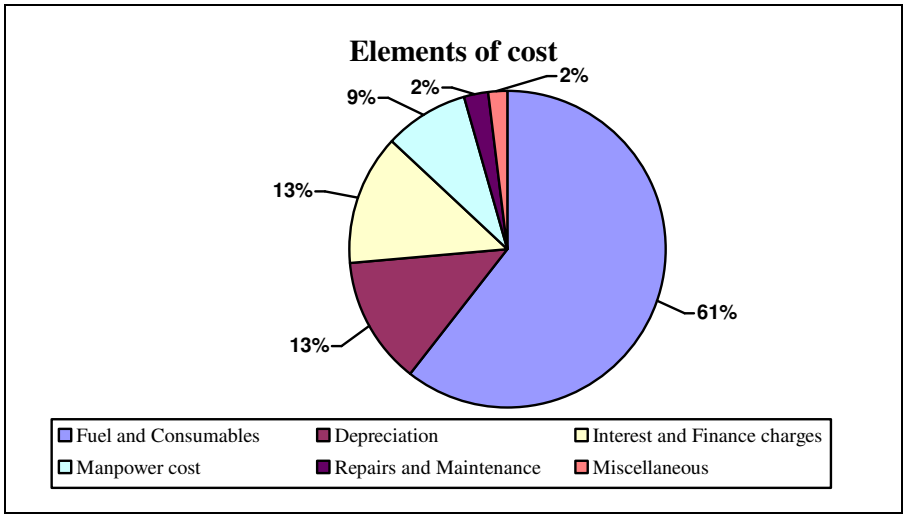
Source: Generation figures adopted from MIS of Planning department of the Company.

††† Excluding interest capitalized.

The realization towards sale of power per unit increased from ₹ 1.50 to ₹ 2.21 while the cost of generation of power per unit also increased from ₹ 1.44 to ₹ 2.04 during the period from 2005-06 to 2009-10. The profit margin increased from paise 06 per unit in 2005-06 to paise 17 per unit in 2009-10.

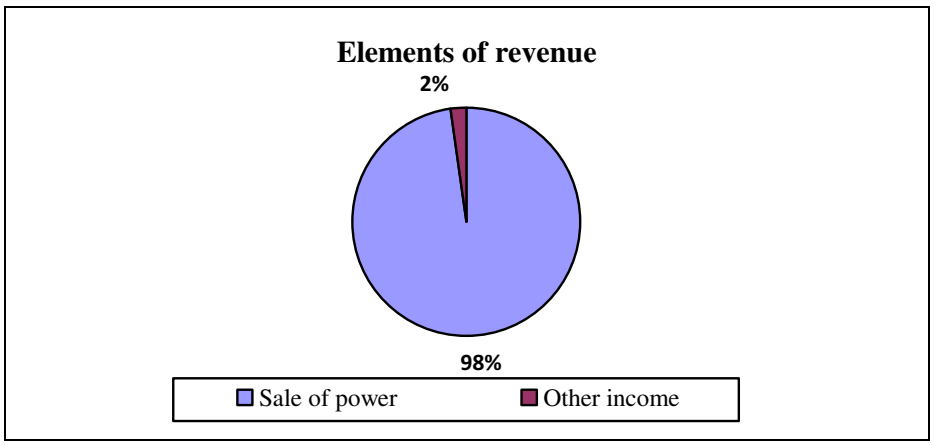
Elements of Cost

2.2.7 Fuel & Consumables and Depreciation constitute the major elements of cost. The percentage break-up of cost for 2009-10 is shown in the pie chart given below:



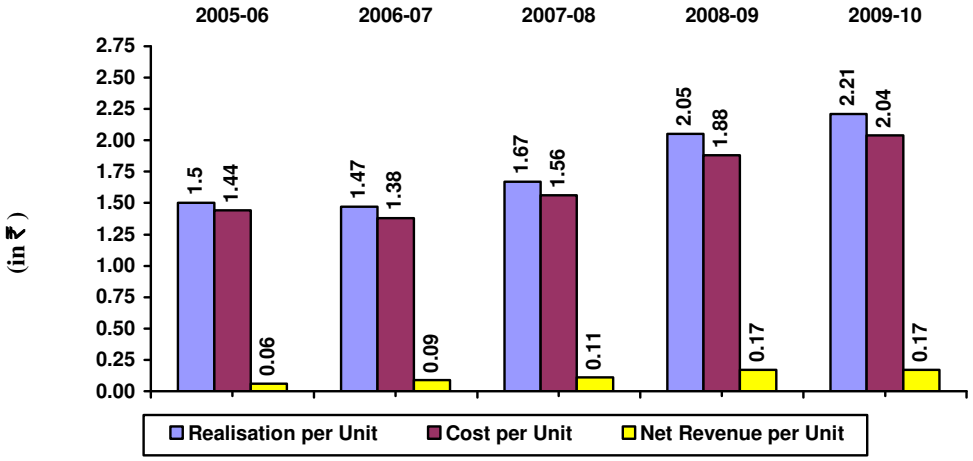
Elements of Revenue

2.2.8 Sale of Power constitutes the major element of revenue. The percentage break-up of revenue for 2009-10 is shown in the pie chart given below:



Recovery of cost of operations

2.2.9 The total cost per unit *vis-a-vis* realization per unit during the last five years ended 2009-10 is given in the bar chart given below**:**



The realization towards sale of power per unit increased from ₹ 1.50 in 2005-06 to ₹ 2.21 in 2009-10 and consequently the net revenue also increased from paise 06 per unit in 2005-06 to paise 17 per unit in 2009-10.

Audit findings

2.2.10 Audit explained the audit objectives to the Company during an 'Entry Conference' held on 04 March 2010. Subsequently, audit findings were reported to the Company and the State Government in June 2010. The Company replied to audit findings in August 2010 and the State Government endorsed the Company's replies in September 2010. Audit findings were also discussed in an 'Exit Conference' held on 9 September 2010, which was attended by the Additional Secretary to Energy Department of Government of Andhra Pradesh and Managing Director of the Company. The views expressed by them have been considered while finalising this review. The audit findings are discussed below:

Operational performance

2.2.11 The operational performance of the Company for the five years ended 2009-10 is given in **Annexure–8**. The operational performance of the Company was evaluated on various operational parameters as described below. It was also seen whether the Company was able to maintain pace in terms of capacity addition with the growing demand for power in the State. Audit findings in this regard are discussed in the subsequent paragraphs. These audit findings show that there was a scope for improvement in performance**.**

Planning

2.2.12 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. The Central Government has 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.

This section deals with capacity additions and optimal utilisation of existing facilities. Environmental aspects have been discussed in subsequent paragraphs at later stage.

2.2.13 During the period 2005-06 to 2009-10, the actual generation was substantially lesser than the peak as well as average demand as shown below:

Year	Actual Generation (MW)	Peak Demand (MW)	Average Demand (MW)	Percentage of actual generation to Peak Demand	Percentage of actual generation to Average Demand
2005-06	4663	8990	8274	51.87	56.36
2006-07	4675	9841	8889	47.51	52.59
2007-08	4550	9862	9382	46.14	48.50
2008-09	5104	10866	10460	46.97	48.80
2009-10	4837	11379	10998	42.51	43.98

It may be seen from the above that the actual generation was only 43.98 to 56.36 *per cent* of the average demand and 42.51 to 51.87 *per cent* of the peak demand. However, the total supply even after import was not sufficient to meet the peak demand, as shown below:

Year	Peak Demand (MW)	Peak Demand met (MW)	Sources of meeting peak demand		Peak Deficit (Percentage to Peak Demand)
			Own (MW)	Import (MW)	
2005-06	8990	8239	4663	3576	8.35
2006-07	9841	8641	4675	3966	12.19
2007-08	9862	9162	4550	4612	7.10
2008-09	10866	9997	5104	4893	8.00
2009-10	11379	10447	4837	5610	8.19

Source: Records of APTRANSCO.

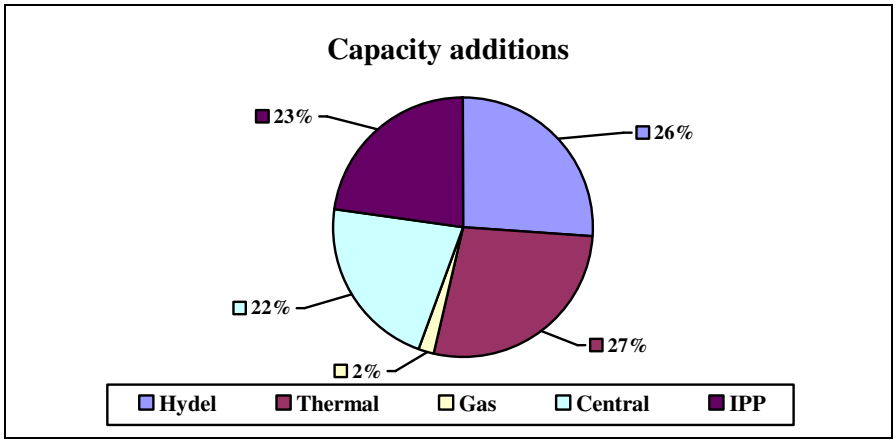
Shortfall of power ranged from 7.10 *per cent* to 12.19 *per cent* to the peak demand.

There was a shortfall of 700 MW to 1,200 MW (about 7.10 *per cent* to 12.19 *per cent* of the peak demand) even after import. Consequently, rotational load shedding was forced on the populace**.**

The Company stated that steps would be taken for improving the generation in the thermal power stations of the Company**.**

Capacity Additions

2.2.14 The State had total installed capacity of 11,106 MW at the beginning of 2005-06 which increased to 14,138 MW at the end of 2009-10. The break-up of generating capacities, as on 31 March 2010 under Thermal, Hydel, Gas♣, Central and Independent Power Producers (IPP) was 3,883 MW, 3,703 MW, 274 MW, 3,048 MW and 3,230 MW respectively. The percentage break-up is shown in the pie chart given below:



The particulars of generating capacity of the State as a whole as on 01 April 2005, added/deleted during review period and as on 31 March 2010 are given in **Annexure-9**.

2.2.15 To meet the projected energy requirement of 71,180 MUs in the State by the end of 2009-10, a capacity addition of about 10,499.25 MW was required during 2005-06 to 2009-10 as per Andhra Pradesh Electricity Regulatory Commission projection. The projects categorised in respect of State sector as 'Projects Under Construction' (PUC) and 'Committed Projects∞'(CP) for capacity addition during the review period, according to NEP, are detailed below:

(In MW)

Sector	Thermal	Hydel	Gas/Nuclear	Total
PUC	**1810**	**536**	**1600**	**3946**
CP	**7600**	**--**	**4282•**	**11882**
Total	**9410**	**536**	**5882**	**15828**

Source: MIS of Planning Department of the Company.

♣Includes 2 MW of Wind power.

∞ NEP defines Committed Projects as Projects for which the formal approval to take up the same has been granted by the CEA.

• Includes 2000 MW Kadapa Nuclear Power Plant, a Joint Venture between APGENCO and Nuclear Power Corporation of India Limited (NPCIL). NPCIL has agreed in principle to form a Joint Venture with APGENCO to set up the plant at Pulivendula in Dr. YSR District.

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

Sl. No.	Description	2005-06	2006-07	2007-08	2008-09	2009-10
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.	Capacity at the beginning of the year - total for state (MW)	11106	11151	11996	12381	12427
2	Additions planned i) by the State (MW)	1308	940	1850	720	3733
	ii) by the Company (MW)	--	459	78	617	1050
3.	Actual Additions i) in the State (MW)	45	845	385	46	1711
	ii) by the Company	--	210	249	39	539
4.	Capacity at the end of the year total of the state (MW) (1+3(i))	11151	11996	12381	12427	14138
5.	Shortfall (-) in capacity addition i) State (MW)	-1263	-95	-1465	-674	-2022
	ii) Company (MW)	--	-249	171	-578	-511
6.	Peak demand (MUs)	52629	59808	63629	70756	71180
7.	Energy supplied (MUs)					
	a) Energy produced (MUs)	52404	57718	60764	63610	65854
	b) Energy Purchased (MUs)	3	419	1371	4012	1761
8.	**Surplus/ Shortfall in demand (MUs) (6 – 7)**	**222**	**1671**	**1494**	**3134**	**3565**

Source: Reply of the Company.

Against the planned capacity of 2,204 MW, the actual capacity addition was 1,037 MW only during the review period.

From the above, it may be seen that the Company could achieve capacity additions of 1,037 MW against its planned capacity addition of 2,204 MW during the period under review. The shortfall of 1,167 MW in capacity addition and slippages in achieving the target by the Company was mainly attributable to:

- Delay in commissioning and achieving date of commercial operation (COD) of Dr. Narla Tata Rao Thermal Power Project (Dr.NTTPP) Stage-IV (500 MW) as discussed in *paragraph 2.2.19.1.*
- Delay in completion and achieving COD in respect of Kakatiya Thermal Power Project (KTPP) Stage-I of 500 MW capacity due to delay in approval of drawings, Balance of Plant (BOP) work as discussed in *paragraph 2.2.19.2.*
- Delay in completion of Nagarjunasagar Tail Pond Dam (NSTPD) (2 x 25 MW) Project due to ineffective monitoring in execution of civil works as discussed in *paragraph 2.2.19.3.*
- Delay in civil works of three Units of 39 MW each of Priyadarshini Jurala HEP (6 x 39 MW) and subsequent commissioning of equipments.

The delay in completion of the above projects compelled the State to purchase power to the extent of 7,566 MUs during the period under review. Out of this, 4,012 MUs were purchased during 2008-09 as capacity could not be added as planned by the State.

The Company stated that the shortfall in capacity was only 667 MW since KTPP Stage-I (500 MW) was synchronised on 31 March 2010 though COD is yet to be achieved.

Optimum utilisation of existing facilities

2.2.17 In order to cope up with the rising demand for power, not only the additional capacity needs to be created as discussed above, the plan needs to be in place for optimal utilisation of existing facilities and also undertaking life extension programme/ replacement of the existing facilities, which are nearing completion of their age besides timely repair/ maintenance. The details of the power generating units, which were to be taken up for R&M/LE programmes (25 years as per CEA norms) during the five years ended 2009-10 vis-à-vis actually taken are indicated in the table given below:

Sl No.	Name of the Plant	Unit No.	Installed Capacity	Due Date (as per CEA norms)	Year when actually taken up
1.	Dr.NTTPP Stage I	1 & 2	2 x 210 MW	October 2005	2006-07 (under progress)
2.	Ramagundam TPS (RTS-B)		62.5 MW	October 2006	2007-08 (under progress)
3.	Srisailam Right Bank power house	1 to 4	4 x110 MW	Between August 2007 and March 2010	Not yet taken up

The R&M/LE programme of the units of Stage I of Dr.NTTPP has been discussed in detail at *Paragraph 2.2.38.* In respect of RTS-B, the administrative approval to carry out 37 R&M activities was accorded in November 2004 at an estimated cost of ₹ 52.82 crore and a loan amount of ₹ 50.20 crore was sanctioned (September 2005) by PFC. We observed that R&M works on TG set only were taken up and completed till date by incurring ₹ 33.21 crore (June 2010). The purchase orders for taking up other activities on Boiler and balance critical items were issued only in August 2010 and the works are yet to be completed. Thus, due to delay in finalisation and issue of purchase orders the R&M activities could not be completed in toto.

Project management

2.2.18 Preparation of an accurate and realistic Draft Project Report (DPR) after feasibility study, considering factors like creation of infrastructure facility, addressing bottlenecks likely to be encountered in various stages of project planning are critical activities in planning stage of the project.

Project management includes timely acquisition of land, effective actions to resolve bottlenecks, obtain necessary clearances from Ministry of Environment and Forest (MoEF), GoI and other authorities, rehabilitation of displaced families, proper scheduling of various activities using PERT/ CPM

technique, adequate budget provisions, etc. We noticed time and cost overruns, which were due to absence of coordinating mechanism throughout the implementation of the projects during review period as discussed in succeeding paragraphs.

The following table indicates the time overrun in respect of various projects implemented during review period.

Sl.No.	Phase-wise name of the Unit	Details	As per DPR	Actual Date	Time overrun (in months)
1	2	3	4	5	6
Thermal					
1.	RTPP Stage-II Unit -3	Date of completion of unit	31.03.2007	12.08.2007	4
		Date of start of transmission	31.03.2007	12.08.2007	4
		Date of commercial operation/ commissioning of unit	31.03.2007	12.08.2007	4
	RTPP Stage-II Unit- 4	Date of completion of unit	30.06.2007	20.11.2007	5
		Date of start of transmission	30.06.2007	20.11.2007	5
		Date of commercial operation/ commissioning of unit	30.06.2007	29.03.2008	9
2.	Dr.NTTPP Stage-IV	Date of completion of unit	05.08.2008	06.04.2009	8
		Date of start of transmission	05.08.2008	06.04.2009	8
		Date of commercial operation/ commissioning of unit	05.11.2008	28.01.2010	15
3.	KTPP Stage-I	Date of completion of unit	09.04.2009	31.03.2010	12
		Date of start of transmission	09.04.2009	31.03.2010	12
		Date of commercial operation/ commissioning of unit	09.04.2009	Not done (August 2010)	17
Hydel					
4.	Priyadarshini Jurala Hydel Project (6 units @ 39 MW each)	Date of completion of unit	Between October 2006 and June 2008	3 out of 6 units completed during March 2008 to May 2009	17 to 25 and balance 3 units are yet to be completed
		Date of start of transmission	Between October 2006 and June 2008	Three units in March, August 2008 and May 2009	17 to 25 and balance 3 units are yet to be completed
		Date of commercial operation/ commissioning of unit	Between October 2006 and June 2008	Three units in March, August 2008 and May 2009	17 to 25 and balance 3 units are yet to be completed
5.	Nagarjunasagar Tail Pond Project (2 X 25 MW)	Date of completion of unit	June 2008	Yet to be completed	25 (up to July 2010)
		Date of start of transmission	June 2008	Yet to be completed	25 (up to July 2010)
		Date of commercial operation/ commissioning of unit	June 2008	Yet to be completed	25 (up to July 2010)

Source: Reply of the Management.

It may be seen from above that out of five projects implemented during the period under review, none was completed as per schedule resulting in time overrun ranging between 4 months and 15 months in thermal and 17 and 25 months in hydel projects. The projects mentioned at Sl.Nos.2, 3 and 5 have been discussed in subsequent *Paragraphs 2.2.19.1 to 2.2.19.3.*

The Company attributed the time overrun to failure of equipments, rework, teething problem during stabilisation (Dr.NTTPP), site specific disturbances, non-availability of work fronts, non-availability of skilled and unskilled manpower (KTPP-I), delay in civil works, non-availability of long term visas to Chinese engineers (Priyadarshini Jurala HEP).

The reply is not convincing as the stated reasons could have been overcome by better project planning and management.

2.2.19 The particulars of estimated cost of various power generating projects discussed in previous paragraph vis-à-vis actual expenditure and cost escalation etc., are tabulated below:

Sl. No.	Phase-wise name of the Unit	Estimated cost as per DPR	Awarded Cost	Actual expenditure as on 31 March 2010	Expenditure over and above estimate (5-3)	Percentage increase as compared to DPR (6/3*100)
		(₹ in crore)				
1.	RTPP- Stage II Units 3 & 4 (2 x 210 MW)	1640.00	1948.00	1948.00	308.00	18.78
2.	Dr .NTTPP Stage IV Unit 7 (1 x 500 MW)	2100.29	2450.30	2099.00	--	--
3.	KTPP-I (1 x 500 MW)	2077.18	1957.35	2632.66	555.48	26.74
4.	Priyadarshini Jurala HEP (6 x 39 MW)	547.00	547.00	619.28	72.28	13.21
5.	Nagarjunasagar Tail Pond Project (2x25 MW)	464.73	520.00 (approx)	452.33	--	--
	Total				**935.76**	

Source: Actual expenditure as per accounts of respective projects.

Lack of effective control over execution of various projects resulted in time overrun of 4 to 25 months and cost overrun ranged from 13.21 to 26.74 *per cent.*

It may be seen from above that cost overrun based on the actual expenditure incurred up to 31 March 2010 ranged from 13.21 *per cent* to 26.74 *per cent*. The projects suffered cost overrun of ₹ 935.76 crore resulting in increase in the cost per MW from the envisaged ₹ 3.70 crore to ₹ 4.51 crore in respect of RTPP-II, KTPP-I and Priyadarshini Jurala HEP.

The above increase was mainly on account of delay in completion of projects due to lack of effective control over various executing agencies. We observed that of the above, an amount of ₹ 670.48 crore towards cost overrun was avoidable by proper control/coordination in executing the projects as discussed in the subsequent paragraphs.

2.2.19.1 The Company awarded (August 2005) the Boiler, Turbine and Generator (BTG) contract to Bharat Heavy Electricals Limited (BHEL) for ₹ 1,054.24 crore and BOP contract to BGR Energy Systems Limited (BGR) for ₹ 578.79 crore in May 2006 to set up the Unit 7 (Stage IV) of Dr.NTTPP (500 MW). The works were to be completed within 39 months and 26 months respectively. The Unit was synchronised in April 2009 against schedule date of August 2008 due to delays in completion of civil works and execution of erection by BGR and BHEL. However, the COD could be achieved only in January 2010 due to frequent failures of Boiler, Generator Transformer and Electrical equipments. The delay resulted in time overrun of 15 months and

cost overrun by ₹ 115 crore, due to increase in quantum of works, additional works and interest during construction period. In addition, the Company suffered loss of generation of 4,162 MUs.

The Company, however, recovered a meagre amount of ₹ 1.23 crore towards penalty for the delay by the contractor (BGR), as against the recoverable penalty of ₹ 18.97 crore. The Company also did not recover ₹ 8.01 crore, being the value of deviations from the specifications and works executed on behalf of BGR.

The Company stated that it had retained 15 *per cent* of total value of contract and the value of deviations and penalties, if levied, would be recovered from the retention money.

2.2.19.2 The Kakatiya Thermal Power Project (KTPP) Stage-I of 500 MW (at an estimated cost of ₹ 2,077.18 crore) was scheduled to be synchronised and achieve COD by February 2009 and April 2009 respectively. The BOP contractor (BGR) was to complete all works under their scope and hand over the same to the Company to make available to BTG contractor (BHEL) for erection and commissioning of the main plant. We observed that there were delays in providing the work fronts, approved drawings/documents/technical inputs by the Company by eight to 17 months. Completion of BOP works were also delayed ranging from 2 to 17 months by the contractor. Due to the delays, the unit could be synchronised in March 2010 after 13 months of the due date. Due to non-stabilization of the plant the COD has not been achieved so far (September 2010). The delay in completion resulted in cost overrun of ₹ 555.48 crore which included excess use of inputs (₹ 250 crore) and increase in IDC by ₹ 116 crore. Besides, there was loss of saleable energy to the extent of 4,051.25 MUs valuing ₹ 789.99 crore (for 15 Months up to 31-07-2010). We observed that the Company failed to recover the penalty of ₹ 17.96 crore from the BOP contractor for the delays in completion of the civil works.

The Company stated that the delay in commissioning of the project was due to site specific disturbances, non-availability of work fronts due to occupation of space by other agencies, non-availability of skilled and unskilled manpower. The reply is not convincing since the site specific disturbances from land losers were for a period of two months only. Further, availability of work fronts could have been managed by better coordination amongst various agencies.

2.2.19.3 The Company proposed (2004) to construct NSTPD for storing 29.55 M.cum of water and to install 2 x 25 MW capacity power generating unit at an estimated amount of ₹ 464.73 crore. The NSTPD project was scheduled for completion by June 2009 and commissioning of power generating Unit I and II by June 2009 and October 2009 respectively. The works were not completed till August 2010. We observed that the contractor (Maytas-SNC Company) could complete only 70 *per cent* of works by March 2010 mainly due to lack of required men and material in time. Further, due to stoppage of Gate works (September 2007) by AIPPL•, the Company short

• Aarthi Infrastructure Power Purchase Limited.

closed the contract and took 16 months to award (May 2009) the remaining works. The completion time was extended up to December 2011. We observed that against the penalty of ₹ 15.32 crore as per terms of agreement, only ₹ 3.71 crore was recovered from the contractor.

Contract management

2.2.20 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 machines and ancillary works.

During the period under review, contracts valued at ₹ 8,000 crore were executed. Of this, contracts valued at ₹ 6,000 crore were reviewed in audit. Important audit findings on lack of requisite forest clearance and non-availing of reduction in sales tax are discussed below:

Lack of forest clearance

Not obtaining forest clearance resulted in extra expenditure of ₹ 37.08 crore.

2.2.20.1 The Company has 6x150 MW hydel units with reversible pump mode facility at SLBPH. The Company awarded (April 2004) the contract for construction work of weir, including laying of approach road to the weir to Patel Engineering Company (Contractor) at a total cost of ₹ 26.83 crore without obtaining the requisite forest clearance for approach road. The work was to be completed by December 2005. However, the contractor stopped (July 2005) the work for the reason that approach road for the site could not be laid as Company failed to obtain forest clearance for laying of road. Accordingly, the Company applied (May 2009) for forest clearance which was obtained in April 2010 resulting in total delay of five years. Meanwhile, the contract period was over and the same was short-closed (August 2006). The balance works of ₹ 24.51 crore were awarded (June 2009) for ₹ 55.44 crore. This resulted in time overrun of five years and cost overrun of ₹ 30.93 crore.

The Company stated that it approached (January 2004) Forest Department for permission to execute weir works but the same was not accepted (July 2004) by the Forest Department on the ground that the area falls under Tiger Reserve Sanctuary and hence permission could not be given.

Thus, the Company on its own awarded the works in April 2004 without ensuring the prior permission from the Forest Department.

Similarly, in another case, the Company issued (between February 2007 & March 2007) three Letters of Intent (LOI) for execution of the work of providing and laying of raw water pipe line from head works near Kaleswaram to the proposed intermediate booster pumping station at KTPP at a value of ₹ 38.32 crore, ₹ 20.83 crore and ₹ 20.79 crore respectively at firm prices without acquiring necessary forest clearance for 4.60 ha of forest land required for execution of said work. The MoEF, GoI conveyed its final approval in February 2008. The land was handed over to the contractors in March 2008. The works were completed with a delay of 12 to 15 months from the

scheduled completion date, during which the steel prices increased abnormally and the contractors were paid price escalations of ₹ 6.15 crore, which could have been avoided by taking timely action in obtaining required statutory clearances.

Undue favour to a contractor

2.2.20.2 As a part of execution of 1x500 MW Unit 7 at Dr.NTTPP, the Company awarded (May 2006) BOP works to BGR (contractor) for ₹ 389.10 crore. As per terms and conditions of the agreements, the prices were firm during the contract execution period and inclusive of all taxes. In case of decrease in such taxes, duties, levies etc., benefits were to be passed on to the Company. The contractor was given extension up to March 2009.

We noticed that there were downward reductions in sales tax from time to time during April 2008 to February 2009. Against the above, an amount of ₹ 2.25 crore was due against which only an amount of ₹ 17.64 lakh was recovered from the contractor thus extending undue favour.

Operational performance

2.2.21 Operations of Company is dependent on input efficiency consisting of material and manpower and output efficiency in connection with PLF, plant availability, capacity utilization, outages and auxiliary consumption. These aspects have been discussed below:

Input efficiency

Procedure for procurement of coal

2.2.22 CEA fixes power generation targets for Thermal Power Stations (TPS) considering capacity of plant, average PLF and past performance. The Company works 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 Power (MoP), GoI, which decides the source and quantity of coal supply to TPSs on quarterly basis. On the basis of linkage source approved by SLC, the Company enters into Coal Supply Agreements with collieries.

The position of coal linkages fixed, coal received, generation targets fixed and actual generation achieved during the period from 2005-06 to 2009-10

covering all the TPSs of the Company was as under:

Sl. No.	Particulars	2005-06	2006-07	2007-08	2008-09	2009-10	Total
1.	Coal Linkage fixed (lakh MTs)	156.30	166.60	178.90	179.70	154.30	**835.80**
2.	Quantity of coal received (lakh MTs)	135.20	142.70	162.30	160.08	139.10	**739.38**
3.	Short fall (lakh MTs)	21.10	23.90	16.60	19.62	15.20	**96.42**
4.	Percentage in shortfall	13.49	14.35	9.28	10.92	9.85	**11.53**
5.	Thermal Generation targets (MUs)	22455	23156	23156	26126	29220	**124113**
6.	Actual generation (thermal) achieved (MUs)	20745	22067	23686	25678	26565	**118741**
7.	Shortfall in generation targets (MUs)	1710	1089	(-)530	448	2655	**5372**
8.	Cost of Generation (₹ per unit)	1.44	1.38	1.56	1.88	2.04	**--**
9.	Value of short fall generation (₹ in crore)	246.24	150.28	(-)82.68	84.22	541.62	**939.68**

Source: Records of Planning Department of the Company.

It may be seen from the above that the total linkage of coal during the five years was 835.80 lakh MTs. Against this, only 739.38 lakh MTs of coal was received, resulting in short receipt of 96.42 lakh MTs (11.53 *per cent*) of coal, which eventually resulted in procurement of imported/ e-auction coal. Even after procurement of imported coal, the Company could not achieve the targets resulting in shortfall of 5,372 MUs in all the TPSs valued at ₹ 939.68 crore (at the rate of cost of generation per unit of respective years) during period from 2005-06 to 2009-10.

Fuel supply arrangement

2.2.23 Coal is classified into different grades. The price of the coal depends on the grade of coal. The Company entered (February 2002/ February 2005, August 2008 and June 2009) into a Coal Supply Agreement (CSA) with Mahanadi Coal Fields (MCL) and The Singareni Collieries Company Limited (SCCL) (July 2006) for supply of coal to its TPSs at different places. A review of CSA in the selected TPS revealed the following:

Non- lifting of washed coal valuing ₹ 2.97 crore from the work site of BOO contractor forced the Company to procure e-auction coal at higher rate by incurring additional expenditure of ₹ 15.42 crore.

2.2.23.1 In order to establish washed coal plant of 11 MTs capacity, the Company entered (May 2004) into a Build, Own and Operate (BOO) contract with Spectrum Coal and Power Limited (Contractor). The agreement provided for supply of raw coal to the Contractor, who will charge a beneficiation charge of ₹ 57.65 per MT of raw coal for conversion into washed coal. The Contractor was to construct a separate railway siding on equal sharing basis with the Company at the site purchased from the MCL and the contractor was to run a trial production of 1,00,000 MTs of washed coal. Accordingly, the Company supplied 50,000 MTs of raw coal to the Contractor (₹ 2.97 crore) in June 2008, who converted it as washed coal (37,000 MTs) by October 2008. However, as the railway siding was not ready, the Company approached (January 2009 to February 2010) MCL for providing railway siding. MCL agreed (March 2010) to the proposal for a lease rent of ₹ 61.24

lakh and the Company in turn requested (March 2010) the Contractor to deposit the amount to MCL. However, the Contractor did not agree (April 2010) to the proposal.

Thus, washed coal of 37,000 MTs was lying without transport from October 2008. In the absence of lifting of the washed coal, the Company had to procure washed coal through e-auction (at an average cost of ₹ 4,167 per MT) resulting in purchase of 37,000 MTs of washed coal at a higher cost of ₹ 15.42 crore.

The Company stated that the coal was purchased and issued to the BOO contractor for converting into washed coal. The Railway siding was not yet completed to lift the washed coal from the site of BOO contractor. However, efforts are being made to lift the coal. However, the Company should not have issued 50,000 MTs coal to the contractor pending completion of railway siding. Having done so the washed coal (37,000 MTs) should have been transported by alternate means.

The Company agreed that Railway siding was not available to lift the washed coal from the site of BOO contractor. When the Company was fully aware that there was no transportation facility, early action to purchase raw coal from MCL at an amount of ₹ 2.97 crore was an imprudent decision which led to not only blockage of funds in idle inventory but also forced the Company to procure washed coal through e-auction at higher amount of ₹ 15.42 crore.

2.2.23.2 The Company was to transport coal through rail as per the allowed quantity in each rake depending upon the capacity/size of wagons. In case of excess or short-loading, Railways levy over-loading and under-loading charges as penalty. A review of records of Dr.NTTPP (selected unit) revealed that the Company paid ₹ 12.03 crore on over-loading of 58,410.20 MTs and ₹ 9.50 crore on under-loading of 2,53,047.20 MTs of coal during the period under review. Thus, lack of effective monitoring of loading of coal resulted in payment of penal charges of ₹ 21.53 crore. The Company had also not taken action to recover the same from the agents appointed at the loading points.

The Company stated that as per present agreements, the over-loading charges would be borne by the purchaser while under-loading charges would be borne by the seller throughout the Country.

Loss of generation due to inadequate fuel stock

2.2.24 The minimum fuel stock (coal) was not maintained at Rayalaseema and Kothagudem TPSs and the Company faced problems of shortage of fuel, particularly during 2008-09. Test check of records relating to outages of plants revealed that these two TPSs fell under forced shutdown during the year 2008-09, due to shortage of coal and non-availability of coal in coal bunkers, resulting in loss of generation aggregating to 73.50 MUs valued at ₹ 15.07 crore. The shortage was mainly on account of non-receipt of coal as per linkage. However, the Company failed to make alternative arrangements by way of procuring imported coal, e-procurement etc. This indicated defective planning in arranging adequate coal to the TPSs.

The Company stated that during August 2008 due to heavy rains and flooding of open cast mines there was less production by SCCL. Further the wet coal jammed in coal crushers and conveyers which led to frequent interruption of coal feeding resulting in loss of generation.

However, loss of generation due to non-maintenance of required stock of coal could have been avoided by effective planning.

Excess consumption of coal

2.2.25 The consumption of coal depends upon its calorific value. We noticed that except KTPS (O&M) Stage B and KTPS Stage-V, the coal consumption remained higher than the norms in all the years under review. The consumption beyond the designed values was to the extent of 323.77 lakh MTs due to receipt of low GCV coal and 74.41 lakh MTs due to excess heat rate. The value of excess consumption of coal due to usage of coal with low GCV and consumption of excess heat than the designed heat rate for generation of per unit of power worked out in audit as ₹ 4,845.29 crore and ₹ 1,099.53 crore respectively as detailed below:

Sl.No.	Particulars	2005-06	2006-07	2007-08	2008-09	2009-10	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1.	Units generated by Thermal Plants (MUs)	20745	22067	23686	25678	26565	118741
2.	Coal required as per designed GCV (lakh MTs)	91.53	99.08	110.50	120.49	119.08	540.68
3.	Coal required as per designed Heat rate (lakh MTs)	138.72	136.40	160.64	178.31	175.98	790.05
4.	Coal consumed (lakh MTs)	146.34	158.31	176.17	192.91	190.73	864.46
5.	Excess consumption due to low GCV (lakh MTs) (4 - 2)	54.81	59.23	65.67	72.42	71.64	323.77
6.	Excess consumption due to excess heat rate (4 - 3) (lakh MTs)	7.62	21.91	15.53	14.60	14.75	74.41
7.	Average Rate per MT (₹)	1369.08	1332.42	1390.79	1719.21	1601.52	--
8.	Coal consumed per Unit (Kg.) [(4 x 1000) / 1]	0.71	0.72	0.74	0.75	0.75	--
9.	Value of excess coal due to low GCV (₹ in crore) (7x5)	750.39	789.19	913.33	1245.05	1147.33	4845.29
10.	Value of excess coal due to high heat rate (₹ in crore) (7x6)	104.35	291.88	215.93	251.09	236.28	1099.53

Source: MIS Reports of Planning Department of the Company.

The Company stated that the consumption of coal depends upon the station heat rate and GCV of coal. The amount incurred towards procurement of coal was for the grade it received and no extra amount was incurred towards procurement of low grade coal in place of designed grade of coal.

Excess heat rate led to excess consumption of coal valued ₹ 1,099.53 crore as compared to designed heat rate.

We observed that due to excess heat rate than the designed heat rate, the excess consumption of coal was 74.41 lakh MTs valuing ₹ 1,099.53 crore as the Company had not operated the plants as per the designed heat rate. Though the Company did not pay any differential amount towards receipt of low GCV coal, on account of consumption of low GCV coal than the designed GCV coal, it consumed excess quantity of coal of 323.77 lakh MTs valuing ₹ 4,845.29 crore.

Loss of coal

2.2.26 There was a difference in quantity between the quantity indicated in invoices and the actual quantity received at the unloading points of respective thermal stations treating the difference as transit losses. As the Company was responsible for such short receipt of coal, the Company incurred ₹ 140.37 crore towards the cost of coal lost in transit during the four years period ended 2009-10. In addition, the Company had lost coal worth ₹ 37.35 crore on account of windage, compression of coal etc., during the same period. The year wise details of transit loss and windage loss are given below:

(₹ in crore)

Year	Transit loss	Windage/ compression	Total loss
2005-06	--	--	38.50‡‡‡
2006-07	31.73	8.32	40.05
2007-08	47.19	7.71	54.90
2008-09	48.84	4.51	53.35
2009-10	12.61	16.81	29.42
Total			216.22

Source: Certified annual accounts. Break up details for 2005-06 not available.

A review of coal records of Dr. NTTPP (Selected unit) revealed that the Company suffered transit loss ranged between 2.05 *per cent* and 3.13 *per cent* against the norm of 0.8 *per cent* fixed by CERC during the period under review. The plant during the review period, had transit loss of 7.65 lakh MTs valuing ₹ 108.48 crore contributing 77 *per cent* of total transit loss suffered by the Company during the same period.

The company stated that steps have been taken to minimise the transit loss, which is, at present below one *per cent*.

Manpower management

2.2.27 Consequent upon the unbundling of the erstwhile Andhra Pradesh State Electricity Board (February 1999) and the Company coming into existence (February 1999), the staff strength available in the power generating stations on the date was to be taken as their respective sanctioned strengths. As per NEP, the Company could engage 1.15 person (technical) and 0.61 person (non-technical) in respect of TPSs and 1.53 person (technical) and 0.26 person (non-technical) in respect of hydel projects, per MW of installed capacity.

‡‡‡ Break-up into transit and windage loss not available.

Sl. No.	Particulars	2005-06	2006-07	2007-08	2008-09	2009-10
1.	Sanctioned strength	13875	13812	13727	13713	15683
2.	Manpower as per CEA norm	11634	12003	11181	11244	12089
3.	Actual manpower	11023	10872	10885	10823	10683
4.	Expenditure on salaries (₹ in crore)	178.43	230.71	241.25	255.79	232.50

The actual manpower deployed was lesser than the sanctioned strength and also within the norms of CEA during the period under review. The Company, however, outsourced the function of annual maintenance of both thermal and hydel power plants at various power generating stations by implementing the minimum wage system as per the conditions prevailing in the Contract and Labour laws.

Output efficiency

Shortfall in generation

2.2.28 The targets for generation of power (Thermal and Hydel) for each year are fixed and approved by CEA. It was observed that the Company was able to generate a total of 1,59,061 MUs of power during 2005-06 to 2009-10 against a target of 1,65,933 MUs. This had resulted in a net shortfall of 7,816 MUs during the last three years ended 2009-10 while there was excess generation of 944 MUs during first two years period as shown in the following table:

(In MUs)

Year	Target	Actual	Shortfall
2005-06	28495	28751	(+)256
2006-07	30731	31419	(+)688
2007-08	35013	33289	(-)1724
2008-09	34186	33502	(-)684
2009-10	37508	32100	(-)5408
Total	165933	159061	(-)6872

Source: MIS of Planning Department of the Company.

It is evident from the above that the shortfall during 2009-10 was highest at 5,408 MUs. This was mainly on account of stoppage of hydel units at SRBPH and SLBPH due to heavy floods and non-operation of Unit 6 of Dr.NTTPP Stage III from 23 December 2009 due to major break down on account of generator failure.

The year-wise details of power to be generated as per design, actual generation, PLF as per design and actual PLF in respect of the power projects commissioned up to March 2010 are given in **Annexure-10**.

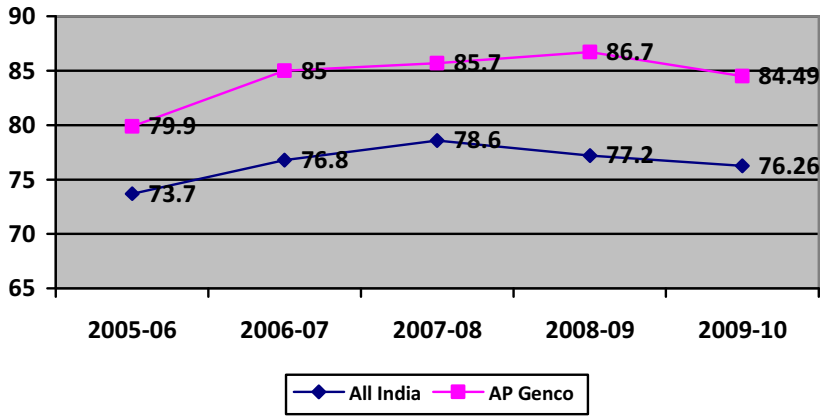
Further, against the total designed generation of 2,51,877 MUs of energy during the five years ended 2009-10, the actual generation was 1,59,061 MUs leading to shortfall of 92,816 MUs, which could have been technically produced. We observed that the loss of generation was on account of

suboptimal use of resources and capacity due to design deficiencies, frequent breakdown of units and delay in timely rectification of defects as discussed subsequently.

Plant Load Factor

2.2.29 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 Central Electricity Regulatory Commission (CERC), the PLF for thermal power generating stations should be 80 *per cent.* The National Average PLF ranged between 73.7 *per cent* and 78.6 *per cent.* The PLF achieved by the Company during the period under review was 79.9, 85, 85.7, 86.7 and 84.5 *per cent* as indicated in the line chart:

Unit 6 of Kota TPS of RRVUNL achieved PLF of 101.01 *per cent* which was highest among all the state sector units.
(Source: Performance Review of Thermal Power Stations by CEA)



2.2.30 The details of average realization vis-a-vis average cost per unit, PLF achieved, average realization at National PLF and PLF at which average cost would be recovered are given in the following table:

Sl.No.	Description	2005-06	2006-07	2007-08	2008-09	2009-10
1.	Average Realisation (₹ per Unit)	1.50	1.47	1.67	2.05	2.21
2.	Average Cost (₹ per Unit)	1.44	1.38	1.56	1.88	2.04
3.	Actual PLF (*per cent*)	79.9	85.0	85.7	86.7	84.5
4.	National Average PLF	73.7	76.8	78.6	77.2	76.3
5.	PLF at which average cost stands recovered (*per cent*) (2/1 X 3)	76.70	78.80	80.06	79.51	78.00

It could be seen from the above that the actual PLF achieved by the Company was higher than the CERC norms and National Average PLF during 2005-06 to 2009-10. The highest PLF achieved by Dr.NTTPP (2008-09) was 93.69 *per cent* against the best PLF of 95.99 *per cent* achieved by GHTPS at Lehra Mohabbat among state sector power generating stations. Among the units, the highest PLF achieved was 98.84 (Unit 5 of Dr.NTTPP – 2009-10) as against

101.01 *per cent* achieved by Unit 6 of Kota TPS of Rajasthan Rastra Vidyut Utpadan Nigam Limited (RRVUNL).

The PLF in respect of KTPS A, B and C stations was between 70.75 *per cent* (2008-09) to 79.54 *per cent* (2007-08) which was less than PLF at which average cost stands recovered.

The details of maximum possible generation at installed capacity, actual generation and corresponding PLF achieved in respect of each generating unit for the five years up to 2009-10 are given in **Annexure –10.** As seen from the *Annexure*, the PLF in respect of KTPS A, B and C stations was between 70.75 *per cent* (2008-09) to 79.54 *per cent* (2007-08). The main reasons for the low PLF, as observed in audit were poor quality of coal, coal feeding problem, major shut downs and delays in repairs and maintenance. These are discussed in the following paragraphs.

Plant Availability

2.2.31 Plant availability means the ratio of actual hours operated to 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 2010-14, the average plant availability in respect of thermal power plants was between 88 *per cent* (2006-07) and 93 *per cent* (2008-09), while the same in respect of hydel power plants was between 22 *per cent* (2009-10) and 44 *per cent* (2006-07) as against the norm of 85 *per cent* during the five years up to 2009-10.

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

Thermal

Sl.No.	Particulars	2005-06	2006-07	2007-08	2008-09	2009-10
1.	Total hours available	166440	166440	172560	183960	183960
2.	Operated hours	151177	146649	154391	170760	166701
3.	Planned outages (in hours)	10509	13642	10220	7379	13592
4.	Forced outages (in hours)	4754	6149	7949	5821	3667
5.	Plant availability (*per cent*)	91	88	89	93	91

Hydel

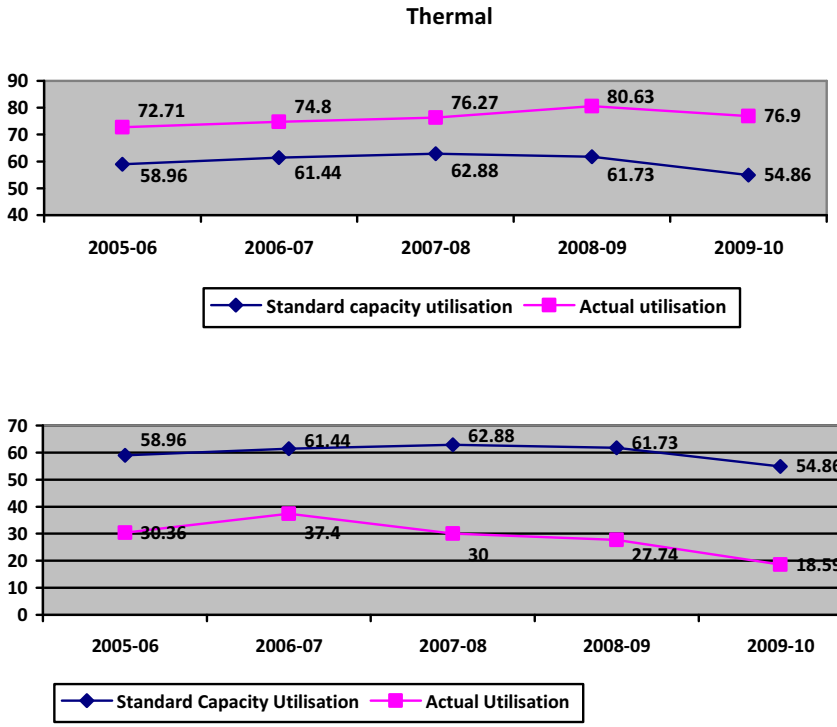
Sl.No.	Particulars	2005-06	2006-07	2007-08	2008-09	2009-10
1.	Total hours available	148920	148920	149328	157680	157680
2.	Operated hours	56405	64992	51651	50340	34315
3.	Planned outages (in hours)	4488	5606	4303	3649	5508
4.	Forced outages (in hours)	3701	3591	6381	9833	15240
5.	Water and Grid constraints (in hours)	84326	74731	86993	93858	102617
6.	Plant availability (*per cent*)	38	44	35	32	22

Source: Planning Department of the Company.

The low availability of Hydel power plants during 2009-10 was due to longer duration of outages caused by unprecedented floods occurred in October 2009. Apart from this, Unit 5 & 6 of the Machkund Power House were under shut down for more than 5 months due to failure of thrust bearings and thrust runner discs and the three Units of Priyadarshini Jurala HEP were kept under shut down due to generator winding problems.

Low Capacity Utilization

2.2.32 Capacity utilization means the ratio of actual generation to possible generation during actual hours of operation. Based on National Average PLF during period under review and plant availability at 80 *per cent (*up to 2008-09) and 85 *per cent* (from 2009-10), the standard capacity utilization factor ranged between 54.86 and 62.88 *per cent* while the actual capacity utilization ranged between 72.71 and 80.63 *per cent* for thermal power plants during the period under review. Though the standard capacity utilization factor for hydel power plants was same as that of thermal power plants, the actual capacity utilization ranged between 18.59 and 37.40 *per cent*. The actual capacity utilization factors with reference to standard capacity utilization in respect of thermal and hydel projects during review period is indicated in the line charts below:



The low utilization of hydel units was mainly on account of non-availability of adequate water and grid constraints.

Outages

2.2.33 Outages refer to the period for which the plant remains closed for attending planned/forced maintenance. Audit observed the following deficiencies in planned and forced outages:

- The total number of hours lost due to planned outages increased from *10,509* hours in 2005-06 to 13,592 hours in 2009-10 i.e. from 6.31 *per cent* to 7.39 *per cent* of the total available hours in respect of thermal plants while in respect of hydel plants the same increased from 4,488

hours to 5,508 hours during 2005-06 to 2009-10 with 3.01 *per cent* to 3.49 *per cent.*

- The forced outages in thermal power generating stations decreased from 4,754 hours in 2005-06 to 3,667 hours in 2009-10 i.e., from 2.86 to 1.99 *per cent* of the total available hours in the respective years which were within the norm of 10 *per cent* fixed by CEA in all the units except Unit 7 & 8 of KTPS (2006-07), which were mainly due to LPT blade failure (Unit 7) and turbine failure (Unit 8). In respect of hydel stations, the forced outages increased from 3,701 hours in 2005-06 to 15,240 hours in 2009-10 i.e., 2.49 *per cent* to 9.67 *per cent*. The high rate of forced outages in 2009-10 was due to shut down of all the units of SLBPH on account of submerging of units in the flood water from October 2009 to March 2010 i.e., till the units were brought into operation. The low rate of operating hours was also due to stoppage of hydel generating stations on account of water and grid constraints as the same increased from 84,326 hours in 2005-06 to 1,02,617 hours in 2009-10 i.e., from 56.63 *per cent* to 65.08 *per cent*.

The Company stated that necessary action is being taken to reduce the planned outages and the forced outages in the course of time and would be brought to minimum.

Auxiliary consumption of power

2.2.34 Power consumed by power generating stations themselves for running their equipments and common services is called Auxiliary Consumption. APERC allowed (June 2003) 8.5 *per cent* and 9 *per cent* of the power generated to be used as auxiliary consumption in respect of TPSs without cooling towers and with cooling towers respectively. However, the actual auxiliary consumption of power generating stations not having cooling towers ranged between 8.57 *per cent* and 9.49 *per cent* while the same in respect of power generating stations having cooling towers ranged between 7.74 *per cent* and 10.53 *per cent*. This resulted in excess consumption of 554.54 MUs valuing ₹ 89.94* crore during the review period.

Wanakbari Thermal Power Station of Gujarat State Electricity Company Limited (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.

Excess auxiliary consumption was 554.54 MUs valued ₹ 89.94 crore during review period.

The Company stated that APERC has allowed auxiliary consumption ranging from 8.84 *per cent* to 9.43 *per cent* and that the auxiliary consumption was within norms during the period under review except during 2009-10. The reply is not based on facts since the norms prescribed by APERC is 8.5 & 9 *per cent*.

* Worked out based on cost of generation per unit of the respective years.

Repairs and maintenance

2.2.35 To ensure long term sustainable levels of performance, it is important to adhere to periodic maintenance schedules. Non-adherence to schedule carry a risk of the equipment consuming more coal, fuel oil and a higher risk of forced outages, which necessitate undertaking repairs and maintenance. These factors lead to increase in the cost of power generation due to reduced availability of equipments, which affect the total power generated.

The Company, as per its overhauling practices, has to take up annual overhauls (AOH) with duration of 15 days and capital overhaul (COH) with maximum duration of 45 days, once in five years for each unit.

We observed that as against a total of 97 annual overhauls due during the review period, only 66 overhauls were done by deferring 31 overhauls in respect of 18 units out of total 21 units. The annual overhauls were done with delays up to 543 days from the originally planned period. The capital overhauls of 19 Units were due during the period under review. However, capital overhaul works for 11 units only were done.

The Company stated that every year annual/capital overhauls were planned in advance for all units but the actual implementation depends on the grid condition and APTRANSCO consent to stop the unit. AOH/COH of some of the units were deferred or delayed due to the state grid high demand. The fact remains that in the absence of periodical maintenance, defects in the plants could not be identified in time to take advance corrective action to avoid/minimise prolonged breakdowns.

2.2.36 During test check, we observed that the annual overhaul of Unit 6 of Dr.NTTPP was deferred during 2008-09 and 2009-10 due to state grid high demand. The unit is, however, not in service from 23 December 2009 till date (August 2010) due to major technical problem developed in Generator. The delayed maintenance and deferring annual overhaul continuously for two years caused continuous deterioration in the condition of generator, which ultimately led to prolonged breakdown (252 days) of the unit resulting in loss of generation of 834.62 MUs♣

Non-rectification of defects of plants by the foreign contractor resulted in loss of generation of ₹ 48.18 crore.

2.2.36.1 Similarly, all the three units of Priyadarshini Jurala HEP developed severe technical defects (November 2009 to January 2010) and are out of service, though the units were under guarantee. Till the units are rectified and put to use, the Company may lose power generation of 221 MUs valued at ₹ 48.18 crore apart from non-recovery of fixed charges of ₹ 87.49 crore. We observed that there was no provision in the agreement entered into with China National Machinery and Equipment Import and Export Corporation (CMEC) for furnishing of Bank Guarantee or any other surety against the guaranteed performance of the equipments, in the absence of which the Company was not in a position to enforce the guarantee condition and get early rectification of the defects.

♣ Calculated for 207 days after deducting allowed 45 days (210MW/1000 x 80 *per cent* x 24 hours x 207 days).

The Company stated that due to visa problems, the Chinese engineers left the site in September 2009 and finally deputed an expert team in March 2010 to investigate the root cause of the problem and all the units are planned to be rectified by May 2011. The Company further stated that Bank Guarantees (BG) valued at ₹ 53.96 crore are available with the Company.

We observed that the BGs available are towards contract performance of balance three units which are yet to be commissioned. There is no specific BG/surety against the guarantee condition. In order to avoid further delay, the Company should have solved the visa problems by taking up the matter with the GoI through the State Government.

Renovation and Modernization

2.2.37 Renovation and Modernisation (R&M) and refurbishment activities involve identification of the problems of units of TPS, preparation of techno economic viability reports, preparation of DPR to lay down benefits to be achieved from these works.

Refurbishment activities are aimed at extending economic life of the units by 15 to 20 years, which have served for more than 25 years or operating at PLF below 40 *per cent*. 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 State Government and rest of the fund is met through internal sources or loan from State Government.

During the period under review, the following units were taken up for R&M and LE programme.

Sl.No.	Name of the Unit	Date of commissioning	Due month	Actually taken up	Remarks
1.	Dr. NTTPP Unit 1	01-11-1979	October 2004	R & M taken up during 2006-07	Major activities of the R & M are yet to be completed and expected to be completed by September 2010.
2.	Dr. NTTPP Unit 2	10-10-1980	October 2005		
3.	Srisailam RBPH Units 1 to 4	August 1982 to March 1987	August 2007 to March 2010	- -	No action for R&M work was initiated.
4.	RTS-B	October 1971	1996	2006-07 taken up	Under progress.

There were delays in completion of R&M works of RTS-B. The Company appointed a consultant in September 2002 and the Residual Life Assessment (RLA) study was conducted in December 2002. As per CEA guidelines, the work should have been completed by June 2007. However, the work is still under progress due to delay in placement of orders for critical equipments. Further, the R&M work of SRBPH, though due during the period 2007 to 2010, was not taken up on the ground that major capital overhauls were done

during this period. R&M activity of Dr.NTTPP Units 1 and 2 was examined in audit and is discussed below:

2.2.38 PFC sanctioned a loan of ₹ 155 crore (80 *per cent*) for R&M programme of Unit 1 and Unit 2 of Dr.NTTPP at concessional rate of interest under their Accelerated Power Generation and Supply Programme (APG&SP) in October 2005. As per CEA guidelines, all the R&M schemes sanctioned by PFC under above programme during 10th plan were eligible for 2.35 *per cent* rebate on interest on the amount spent up to 31 March 2007. If any amount is left unutilized, no subsidy on interest on balance undrawn amount was available after 31 March 2007. The concessional rate of interest, however, was restricted to 12 years.

Non utilisation of loan amount in time due to delay in taking up of the R&M works resulted in non- availing of rebate of ₹ 12.78 crore.

The Company appointed (June 2002) Power Utility Tech, Noida as consultant for conducting RLA study of Boiler, Turbine and Generator and Auxiliaries of Unit-1. The RLA study was conducted during August 2004. As per the programme submitted to PFC, all the critical activities involving an expenditure of ₹ 124.91 crore were to be completed by March 2007. We observed that the Company could utilize only ₹ 20.59 crore till March 2007. Thus, due to delay in completion of the R&M activity and resultant non-utilisation of the loan, the Company was not able to avail the rebate of ₹ 12.78 crore♦ on interest.

The Company stated that all the equipments ordered were not received in time to complete the R&M during 10th Five Year Plan and in turn led to non-availment of rebate amount. However, we observed that considering 20 months period for placement of orders after RLA study as per CEA guidelines, placement of all the supply orders should have been completed by April 2006. Though the RLA study was conducted in August 2004 and loan was sanctioned in October 2005, there were delays in raising indents for critical equipments by more than three years from the date of RLA studies. Further, purchase orders were placed on suppliers with delays ranging from six to 21 months. This led to delay in receipt of equipments, which could have been avoided by timely raising of indents, finalisation and placing of purchase orders.

Post R&M/Refurbishment performance evaluation

2.2.39 R&M/Refurbishment Scheme envisaged norms for the consumption of auxiliary, heat rate, oil, coal, PLF and generation cost in the TPSs. DPR generally fixes norms for post R&M period in respect of the above input/output efficiencies. The norms are detailed below:

Sl. No.	Name of TPS	Norms for				
		Auxiliary consumption (in *Per cent*)	Heat rate (in Kcal/Kwh)	Oil (Ml/Kwh)	Coal (Kg/Kwh)	PLF (in *per cent*)
1	Dr.NTTPP Stage-I	**8.5**	**2500**	**2**	**0.75**	**90**
2	RTS-B	**9.0**	**2616**	**2**	**0.64**	**88**

Source: Reply of the Company.

♦ Available rebate ₹ 15.86 crore; Rebate availed ₹ 3.08 crore.

We observed that the performance of the units taken up for R&M were improved and the heat rate, PLF and auxiliary consumption are within the norms.

Operation and maintenance

2.2.40 The Operation and Maintenance (O&M) cost includes expenditure on employees cost, repairs & maintenance including stores and consumables, consumption of capital spares not part of capital cost, security expenses, administrative expenses etc., of the generating stations besides corporate expenses apportioned to each generating station, etc., but excludes the expenditure on fuel.

CERC, in its Regulation 2009, fixed O&M norm for 2009-10 as ₹ 18.20 lakh, ₹ 16 lakh, ₹ 13 lakh and ₹ 11 lakh per MW in respect of 200-250 MW, 300-350 MW, 500 MW and 600 MW and above capacity TPS respectively. The overall average cost per MW, on weighted average method, would work out to ₹ 17.55 lakh. The year wise details of thermal capacity (200 – 250 MW) vis-à-vis O&M norm, actual expenditure are given in the table below:

Year	Total Capacity of all the Generating Stations (MW)*	O&M Expenses (₹ in crore)			Weighted average O&M cost per MW (₹ in lakh)	
		As per CERC norm	Actual	Difference	As per CERC norm	Actual
2005-06	2962.50	320.54	349.14	28.60	10.82	11.79
2006-07	3172.50	356.91	507.72	150.81	11.25	16.00
2007-08	3382.50	395.75	860.54	464.79	11.70	25.44
2008-09	3382.50	411.65	662.11	250.46	12.17	19.57
2009-10	3382.50♣	615.61	505.12	-110.49	18.20	14.96
Total		2100.46	2884.63	784.17		

(*) The individual capacity of Thermal Units included were between 200-250 MW.
Source: CERC norms and Annual accounts.

We observed that O&M expenses in respect of TPSs were more than the norms fixed by CERC. Consequently, O&M expenses amounting to ₹ 784.17 crore were incurred over and above the norm during the review period, which has adversely impacted on the profitability of the Company, as this amount may not be considered by APERC in tariff fixation. It can be seen from the above that there was steep increase in O&M expenses during 2007-08, which was due to additional provision made for employee benefits in compliance with AS-15.

In respect of Hydel power generating stations, norm for O&M expenses per MW for 2009-10 was fixed at ₹ 38.45 lakh. Against the above norms, the total O&M cost per MW incurred by the Company was ₹ 2.25 lakh, ₹ 3.11 lakh, ₹ 6.63 lakh, ₹ 3.89 lakh and ₹ 3.12 lakh from 2005-06 to 2009-10.

The Company stated that the old power stations and small power stations require higher O&M cost.

♣ This does not include 500 MW of Dr. NTTPP Stage IV (Unit 7) for which COD was declared on 28-01-2010. (Fixed charges: ₹ 56.92 crore claimed).

We observed that the Company had only one small thermal plant i.e., RTS with 63 MW capacity and the O&M cost of the unit was not on high side. In respect of old plants, the Company is regularly taking up the refurbishment works of old plants. Hence, the O&M cost should have been minimized in this norm.

Financial management

2.2.41 Efficient fund management is the need of the hour in any organization. This also serves as a tool for decision making, for optimum utilization of available resources and borrowings at favourable terms at appropriate time.

The power sector companies should, therefore, streamline their systems and procedures to ensure that funds in idle inventory are not invested and outstanding advances are adjusted/recovered promptly.

The main sources of funds were realization from sale of power, loans from State Government/Banks/Financial Institutions etc. These funds were mainly utilized to meet payment of generating costs, debt servicing, employee and administrative costs and system improvement works of capital and revenue nature.

Details of sources and utilization of resources on actual basis 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
Cash Inflow						
1.	Net Profit/(loss)	133.96	288.01	331.50	498.92	510.08
2.	Add: Adjustments	1345.14	1222.22	1326.28	1444.45	1505.65
	Operation profit before working capital changes	1479.10	1510.23	1657.78	1943.37	2015.73
3.	Operating activities	62.36	690.03	867.85	701.25	691.09
4.	Investing activities	320.42	265.29	667.61	69.18	85.25
5.	Financing activities	719.55	842.71	2179.20	2671.53	1988.53
	Total	2581.43	3308.26	5372.44	5385.33	4780.60
Cash Outflow						
6.	Operating activities	322.17	322.04	657.53	584.05	1121.62
7.	Investing activities	901.62	1805.91	2813.07	2921.78	2309.83
8.	Financing activities	1303.73	1213.97	1899.10	1849.58	1299.57
	Total	2527.52	3341.92	5369.70	5355.41	4731.02
Net increase in cash and cash equivalents		53.91	(33.64)	2.74	29.92	49.58

Source: Annual accounts of the Company.

Due to increase in borrowings without adequate returns on account of belated execution of projects, the Company incurred interest payment of ₹ 3,433.52 crore on borrowed funds.

The cash deficit was overcome mainly by increased borrowings in the form of cash credit/loans from commercial banks/financial institutions. The reason for cash deficit in 2006-07 was due to heavy capital expenditure without adequate returns on account of belated execution of planned project works. As already discussed in *paragraph 2.2.5* and *2.2.6,* dependence on borrowed funds had gone up during the period under review as evident from the fact that the borrowings increased from ₹ 10,102.01 crore in 2005-06 to ₹ 14,639.89 crore in 2009-10. As a result, the Company incurred ₹ 3,433.52 crore towards payment of interest on borrowings during the period under review, which rose from ₹ 778.81 crore in 2005-06 to ₹ 1,469.12 crore in 2009-10 leading to increase in the operating cost of the Company.

The Company stated that it has taken up capacity addition with a capital cost of ₹ 9,487 crore and to meet the funds requirement, there was no other alternative except to borrow from banks and financial institutions.

However, the fact remains that the dues from APDISCOMs were not realised in time and there were huge outstanding dues of ₹ 2,060.11 crore as at 31 July 2010. By timely realisation of these dues, the Company could have minimised the borrowings and avoided payment of huge amount of interest.

2.2.42.1 As per the guidelines of CERC, TPSs have to maintain spares of value ₹ 4 lakh for each MW of installed capacity. As worked out by the Company, the value of spares to be maintained by the TPS on the basis of CERC guidelines was ₹ 155.30 crore whereas the actual stock held in TPSs at the end of 2009-10 was ₹ 324.26 crore. Thus, inventory valued at ₹ 168.96 crore was held in excess of norm.

This had resulted in locking up of funds and corresponding loss of interest (at 12 *per cent*) of ₹ 20.28 crore for one year alone.

2.2.42.2 In July 2003, GoAP extended the facility of obtaining mobilization advance by the contractors up to 10 *per cent* of contract value of more than ₹ one crore against Bank Guarantee which will attract suitable rate of interest. Despite such provision of charging interest on mobilization advance, the Company extended the facility of interest free mobilization advance of ₹ 91.67 crore to BHEL in November 2005 and ₹ 69.48 crore to BGR in November 2006 for execution of works pertaining to KTPP-I. The advance was to be adjusted against the bills submitted by the supplier/contractor. However, due to abnormal delay in completion of the work, an amount of ₹ 20.97 crore (₹ 15.48 crore BGR + ₹ 5.49 crore BHEL) was yet to be adjusted. In the absence of any clause in the agreement for adjustment/recovery of the mobilisation advance in a specified period and for levying interest on unadjusted advance beyond the schedule date of completion, the Company could not recover interest loss suffered to the extent of ₹ 2.29 crore[§§§].

The Company, while accepting the above facts, stated that it could not recover interest in view of the payment terms of interest free advance.

§§§ Calculated at 10.50 *per cent* interest rate prevailing during the extended period.

Claims and dues

2.2.43 The Company sells power to APDISCOMs at the rates specified by APERC from time to time. APERC fixes the tariff after considering various economic and other factors. Generally sale price does not cover total input costs. The differential input cost is absorbed by the Company. The power bills are raised on APDISCOMs. It was observed that dues were not realized regularly. We observed that there were defaults by the Company in payment of bills of Coal Companies for supply of coal. The table below gives the details of power bills raised and realised there against for the review period.

(₹ in crore)

Sl.No.	Details	2005-06	2006-07	2007-08	2008-09	2009-10	Total
1.	Energy bills	4188.61	4560.38	5121.38	6334.49	6353.54	26558.40
2.	Amounts received	3987.05	4047.68	4817.50	5506.83	5646.35	24005.41
3.	Difference	201.56	512.70	303.88	827.66	707.19	2552.99

It can be seen from the above that APDISCOMs were not paying the complete amounts raised in the bills. Further, certain amounts were disallowed on the grounds of disputes in case of SLBPH energy charges, hydel incentive, hydel secondary energy charges, fixed charges. The Company referred the same to APERC and final orders are awaited (August 2010). Apart from this, APDISCOMs have not paid even undisputed demand amounting to ₹ 1,201.36 crore as at the end of November 2009. As per the regulations of APERC (Terms and Conditions for determination of Tariff), in case the payment of bills is delayed beyond a period of one/two months, a late payment surcharge at the rate of 1.25 *per cent* per month shall be levied by the Generating Company. Accordingly, the Company levied surcharge amounting to ₹ 803.01 crore for belated payments up to 2006-07. However, this was not recovered and subsequently the Company stopped levying the surcharge from 2007 onwards on its own without any recorded reasons. The matter was not brought to the notice of the Board of Directors either. The last bill for surcharge was raised in July 2007. The surcharge on the balance undisputed amount from 2007 onwards worked out to ₹ 372.04 crore up to November 2009 when the Company agreed to withdraw the surcharge claim at the time of signing PPA. We observed that there were no recorded reasons for withdrawing the surcharge claims. It was also observed that even after signing PPA in December 2009, APDISCOMs were not regular in payment of power bills and the total outstanding amount stood at ₹ 2,060.11 crore as at 31 July 2010. However, the company has not made any claim towards penal interest amounting to ₹ 79.90 crore for belated payment so far despite being provided for in PPA. Thus, due to not insisting of surcharge amounting to ₹ 1,254.95 crore♠ in accordance with the Regulations/PPA, APDISCOMs were never under any compulsion to adhere to payment schedule and pay the bills in full. This has ultimately resulted in huge accumulation of outstanding dues.

The Company did not raise the claim for penal interest of ₹ 79.90 crore on outstanding dues as per PPA.

♠ ₹ 803.01 crore + ₹ 372.04 crore and ₹ 79.90 crore.

The Company stated that during the meeting on finalisation of PPA, APDISCOMs expressed their inability to accept the belated payment surcharge for the past period on the ground that it is a non tariff component and could not be loaded to the public, and if they accepted the surcharge, it would be burden to the Government in the form of additional subsidy. In view of this, the Company agreed for withdrawal of surcharge claims. The reply is not convincing since APDISCOMs are levying surcharge from the consumers for belated payments and the State Government also insisted (April 2005) that on the same lines, APDISCOMs shall also pay the surcharge to the Company.

Tariff fixation

2.2.44 The Company is required to file the application with APERC 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 the Commission. The Commission accepts the application filed by Company with such modifications /conditions as may be deemed just and appropriate and after considering all suggestions and objections from public and other stakeholders, issues an order containing targets for controllable items and the generation tariff for the year within 120 days of the receipt of the application.

The tariff application for the control period 2006 to 2009, which was to be filed by 30 November 2005 was filed only on 10 February 2006 i.e., with a delay of 72 days. The tariff application for the five years control period 2009-2014 was filed on 3 February 2009. Though, as per the Regulation, tariff order shall be issued within 120 days, APERC has not issued the tariff order till date (August 2010). Pending disposal of the Company's tariff petitions by APERC, provisional bills are being raised based on interim tariff orders issued by APERC for respective years and are subject to revision upon the outcome of the tariff petition filed by the Company/issuance of final tariff order by APERC.

The Company stated that it prepared tariff application for the Company as a single entity but APERC directed to file the application station wise due to which there was delay of two months in filing the application.

Environment issues

2.2.45 In order to minimize the adverse impact on the environment, the GoI had enacted various Acts and Statutes. At the State level, Andhra Pradesh Pollution Control Board (APPCB) is the regulating agency to ensure compliance with the provisions of these Acts and Statutes. MoEF, GoI and Central Pollution Control Board (CPCB) are also vested with powers under various Statutes. The Company has an Environmental Wing at the Corporate office.

Audit scrutiny relating to compliance with the provisions of various Acts in this regard revealed the following:

The power generating stations of the Company are being operated duly complying with the statutory requirements and there were no instances where the Company was warned for closure of the stations due to non-compliance with the conditions set by the APPCB.

Air pollution

2.2.46.1 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 thermal power stations. Electrostatic Precipitator (ESP) is used to reduce dust concentration in flue gases. Control of dust level is dependent on effective and efficient functioning of ESPs. We observed that against the norm of SPM level of 115 mg/Nm^3 fixed by APPCB, Dr.NTTPP, KTPS and RTS-B, the SPM levels were higher. However, SPM levels of RTPS and KTPS-V remained within norm during the review period.

Use of high ash content coal

2.2.46.2 As per MoEF notification (July 2003) coal based power generating plants located at 1,000 KM away from the coal mine or located in urban, sensitive and critically polluted areas were required to use coal having less than 34 *per cent* ash content on an annual weighted average basis. We observed that RTPP Stage-II used coal obtained from MCL, Talcher which is located 1452 KMs away. During the period under review, RTPP received 74.11 lakh MTs of coal, in which the weighted average of ash content ranged from 41.14 to 42.33 *per cent*. The ash content could have been brought down by using washed coal to meet the laid down norms. However, no action was taken in this regard.

Ash disposal

2.2.46.3 Annual generation of fly ash from five TPSs of the Company had increased from 56.18 lakh MTs in 2005-06 to 85.11 lakh MTs in 2009-10. MoEF issued a notification (September 1999) which provided that every thermal plant should supply fly ash to building material manufacturing units free of cost atleast for 10 years. Audit scrutiny of generation and disposal of fly ash for the period under review revealed that against the total fly ash of 351.74 lakh MTs generated in the Company, only 158.96 lakh MTs was disposed/utilized.

The Company stated that efforts are being made to improve disposal of fly ash.

Noise Pollution

The Company did not adhere to the environmental safe guards in respect of air and noise pollutions as per the prescribed limits of APPCB.

2.2.46.4 Noise Pollution (Regulation and Control) Rules, 2000 aim to regulate and control noise producing and generating sources with the objective of maintaining ambient air quality. To achieve the above, 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**.**

During test check, we observed that noise levels recorded by Dr.NTTPP ranged from 83 to 99 decibels (dbs) against the APPCB prescribed level of *75* dbs for plant area. Similarly, KTPS (O&M) also recorded the noise levels at more than 75 dbs at the locations of Turbine, Generator, Compressor, Mills and Crusher. At RTS-B power plant noise levels were not measured. In order to reduce the noise levels, the Company is required to provide acoustic enclosures and intake exhaust systems besides using damping material such as thin rubber/ led sheet at work places.

The Company stated that acoustic enclosures, damping material were already provided and other measures like provision for intake exhaust systems would be taken.

Water pollution

2.2.47 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 TPSs are required to obtain the consent of APPCB which, *inter-alia* contains the conditions and stipulations for water pollution to be complied with by the TPSs.

As per the norms prescribed by APPCB, total suspended solids (TSS), in effluents from the TPSs should not exceed 100 particles per million (ppm). We noticed that during the period under review except Dr. NTTPP and RTS-B, in other three TPSs the maximum TSS was recorded between 141 ppm and 808 ppm in the year 2005-06 and in respect of RTPP and KTPS-Stage –V, the same was recorded between 144 ppm and 595 ppm in the year 2006-07. Decantation system in the ash pond, which is a general method of filtering the ash from slurry was installed by the Company in all the plants to maintain the water pollution level within the prescribed norms and thus from 2007-08, all the five TPSs recorded ppm level below the prescribed 100 ppm.

Monitoring by top management

MIS data and monitoring of service parameters

2.2.48 The Company plays an important role in the State economy. For such a giant organisation 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. Audit review of the system existing in this regard revealed the following.

- The Company sets the targets for important operational parameters like generation of power, planned outages, holding of adequate stock of coal, undertaking annual maintenance of plants/units during off-season periods, procurement of coal by way of advance planning etc.
- The Company developed a MIS system on various operational parameters/targets. The requisite information reaches its headquarters on a monthly basis. However, the BoD did not discuss the operational/ financial performance of the Company to initiate action in abnormal circumstances.
- The BoD did not evaluate the socio-economic parameters to analyse the impact, as the Company did not complete the capacity additions as per planning every year.
- The Aggregate Revenue Requirement (ARR) was filed belatedly by the Company with the APERC in February 2006 and February 2009.

The Company stated that meetings with Chief Minister were held and problems in construction of projects were brought to the notice of the State Government.

Conclusions

- ***The State Government failed to plan the capacity addition as per National Electricity Plan. The Company also failed to complete the projects as planned during the five year period.***
- ***There were abnormal delays in execution of major projects due to deficient planning and project management as there was a time overrun ranging between four months to 25 months while the cost overrun ranged between 13.21 per cent and 26.74 per cent.***
- ***Ineffective and improper contract management caused delay in construction of civil works as a result the Company incurred extra expenditure, unfruitful expenditure, non-levy of penalty and non-recovery of reduced amount of statutory dues.***
- ***Due to low calorific value in coal used for generation purpose, there was excess consumption of coal. Inadequate fuel stock at thermal stations led to generation loss.***
- ***Auxiliary consumption was more than the norms in respect of power stations with cooling and without cooling towers. The Company could not take up the capital overhaul works timely.***
- ***Lack of financial prudence led to delay in recovery of mobilization advance along with the interest beyond the scheduled date, non-availing of rebate in interest rates offered by financial institutions for***

commissioning the units within the scheduled time as specified in loan agreements.

- ***Dues from APDISCOMs were not pursued vigorously and realized promptly to improve financial health.***
- ***Dry fly ash was not disposed off as per the guidelines of Government of India/ State Regulatory commission and failed to maintain the air and noise levels within the norms prescribed by Pollution Control Board.***
- ***There was lack of adequate monitoring at top management level.***

Recommendations

The Company needs to

- ***intensify the capacity addition programmes by exploiting all conventional and non-conventional potential resources of energy by involving private entrepreneurs and by close monitoring the programmes for timely execution so as to attain the National objective of power for all by 2012,***
- ***proper planning should be in place to get all the required approvals before commencement of project works and bring more professionalism in decision making and execution of works,***
- ***improve operational performance of the stations by containing the breakdowns and auxiliary consumption of power within the prescribed limits,***
- ***achieve the performance parameters set by APERC failing which accountability should be fixed against the persons concerned in the Company,***
- ***ensure timely preventive maintenance and up-keep of the equipment to avoid forced outages of the generating units by undertaking renovation and modernisation of the power plants in time,***
- ***avoid delays, extra / additional expenditures and avail the available financial benefits by timely completion of projects, and***
- ***ensure the timely realisation of dues on sale of power.***

Andhra Pradesh Tourism Development Corporation Limited

2.3 IT Audit of e-Commerce Project

Executive Summary

The Andhra Pradesh Tourism Development Corporation Limited, Hyderabad (Company) was incorporated in February 1976 as a wholly owned Government Company with the main objective to start, operate and promote establishments and activities which are likely to facilitate the development of travel, tourist coach services to promote development of tourism in general.

The Company felt that the then application software VISTA for online reservation through their counters only, was not adequate to meet the requirements of the Company. In order to facilitate online reservation for tours and hotels for tourists, and for better MIS reports, the Company intended to develop another application software 'e-Commerce'.

It was observed that in absence of User Requirement Specification (URS), the extent to which intended benefits could be achieved were not verifiable.

Application Software

The web-based application software was developed with client-server architecture with POSTGRES as back end and Java as front end. The operating system in use was Red Hat Linux.

Control Deficiencies

Input controls were not robust to validate the correctness of the data fed.

Project Management

The Company did not follow the accepted principles and procedure like feasibility study etc., for software development life cycle. The Company had entered (September 2006) into an agreement with Ram Informatics Limited (RIL) without any time limit which was significant for software development.

Investment and Finance

Against an estimated cost of ₹ 1.50 crore the Company had invested an amount of ₹ 1.67 crore. The Company also incurred an unwarranted expenditure of ₹ 9.16 lakh in re-designing the Website developed by RIL.

Absence of policies, strategy and planning

The Company had neither formulated any IT Policy nor drawn up any IT strategy for preparation of long term and short term plans for automation of activities. It did not formulate any formal Security policy and Change management policy. The Company did not develop a Business Continuity and Disaster recovery plan for continuing the operations in the event of a disaster. Further, the Company had no strategic plans to utilise the Website for promotion of tourism in the State.

Inordinate delay

The software developers had so far partially developed six modules only

out of eleven modules. Because of delay, the Company's main objective of providing the facility of online reservation to the general public was defeated.

Incomplete data

The database was incomplete, inaccurate and lacked integrity and thus could not be relied upon. Neither the application software itself nor the data residing in the database was ever subjected to Internal Audit.

Inadequacies

The software did not provide for adequate logical and input controls. Extant Business Rules were also not incorporated in the application software. A test check revealed a revenue loss on account of the above to the extent of ₹ 2.68 lakh in transportation and ₹ 0.36 lakh in hotels. As a result of not making available the online reservation facility to the general public/agents, deficiencies in the software for generation of bills and non-incorporation of business rules, utilisation of software was only to the extent of 15.56 per cent. Meaningful MIS reports also could not be generated. This has resulted in excess payment of service tax of ₹ 1.54 lakh.

Recommendations

There is an urgent need to complete the development of application software in totality. The Company should draw up and document IT policy and Security policy, Change management policy, Business continuity plan with adequate validation checks. The Company should also utilise the Website optimally.

Introduction

2.3.1 The Andhra Pradesh Tourism Development Corporation Limited, Hyderabad (Company) was incorporated in February 1976 as a wholly owned Government Company with the main objective to start, operate and promote establishments and activities which are likely to facilitate the development of travel, tourist coach services to promote development of tourism in general. The Company owns and operates various hotels, water fleet, sound & light shows in many tourist locations in the State and also operates package tours and tourist coaches, including some inter-state package tours.

The Company was operating application software called VISTA* for online reservation facility for tours and hotels, which was being operated through the counters of the Company and Financial Accounting System (Head Office and Divisional Offices). To overcome the shortcomings of the existing software and to undertake a comprehensive computerization including online reservation system, tour operations and also to computerize its core activity, the Company initiated (September 2006) a web-based new application software.

Organisational set up

2.3.2 The management of the Company is vested in a Board of Directors (Board). As on June 2010, there were 9 Directors including a Chairman. The Vice Chairman & Managing Director is the Chief Executive who is assisted by one Executive Director (Projects), four General Managers (for Tour Operations, Hotels, Water Fleet & Sound and Light and Finance), one Superintending Engineer, one Estate Officer and one Vigilance Officer, at the Head Office. Day to day operations of the Company are managed through eight Divisional Offices (Hyderabad, Kurnool, Visakhapatnam, Warangal, Tirupati, Nagarjunasagar, Vijayawada and Transport Division at Hyderabad) each headed by a Divisional Manager.

Information systems set up

2.3.3 The web-based application software was developed on client-server architecture with POSTGRES† as back end and Java as front end. The operating system in use is Red Hat Linux.

Objectives of computerisation

2.3.4 The main objectives of switching over to computerised reservation (internet) from Central Reservation Office are to:

- decentralise the hotel reservation from the centralised booking;

* Versatile Information System for Tourist Attraction.

† An open source Relational Database Management System.

- ❖ provide easy access to the customers/tourists to know about the availability position of accommodation in the Company's hotels;
- ❖ keep proper track of reservation and cancellation made by the customers and to help them;
- ❖ facilitate online, real-time based transactions including hotel reservations and their e-payment;
- ❖ facilitate easy change management with changes in business rules;
- ❖ keep the data at central site as current as possible; and
- ❖ prepare online MIS Reports to facilitate efficient management of inventory, human resources, payroll processing, estates and property management and events management.

Scope of audit

2.3.5 The data/information relating to reservation of hotel rooms and tickets for package tours, cancellation etc., for the period from October 2008 to October 2009 in unit offices under three[‡] out of eight divisions and at Head Office were reviewed between November 2009 and July 2010.

Audit objectives

2.3.6 The IT Audit of the application software was conducted with a view to assess whether

- ❖ built-in input, process and output controls were adequate and the data captured in the system were accurate, complete and valid,
- ❖ adequate security exists to safeguard the physical and virtual assets,
- ❖ business rules were incorporated in the package and it serves the intended purpose,
- ❖ performance and utilisation of package is consistent,
- ❖ data captured in the system was complete, correct and reliable, and
- ❖ internal control framework and monitoring mechanism were adequate and effective.

Audit criteria

2.3.7 The Audit criteria used for IT Audit were:

- ❖ Tourism policies of the Government of Andhra Pradesh,
- ❖ Business rules formulated by the Company in respect of charging of fares of tours and room tariffs, and
- ❖ IT best practices.

[‡] Hyderabad, Vijayawada and Visakhaptnam.

Audit methodology

2.3.8 The Company's data/information was scrutinized using the Generalised Audit Software-IDEA[§]. The results of queries were compared with the physical records/documents available at the local offices and also as displayed on the Company's Website. Audit also involved in scrutiny of agenda and minutes of the meetings of the Board of Directors, other files/records relating to implementation of application software and discussions with staff and the concerned officers at the Head Office and unit offices, which were later documented.

At the outset, an Entry conference was held in June 2010 with the Managing Director and General Managers of the Company during which the Audit objectives of the review and Audit criteria were explained. For discussion of Audit findings with Management, an Exit conference was held on 22 October 2010.

Acknowledgement

2.3.9 The Indian Audit and Accounts Department acknowledges the co-operation of the Company in providing the necessary information and records to Audit.

Audit Findings

Need for IT policy

2.3.10 Though the Company decided to go for development of web-based software in 2006, it has not yet framed and documented policies relating to long term and short term planning, security policy, backup policy, business continuity plan etc. The Company may consider adopting a suitable plan (model plan enclosed – **Annexure-11**).

System development

2.3.11 The Board, in their meetings held decided on an *adhoc* basis the requirement of a new application software and freezed its requirement for identifying the hardware required to support the application software. They did not either consider the availability of the legacy database and its shortcomings or consider the existing hardware. Thus non-involvement of users at any stage of system development had resulted in improper designing of tables/modules of the software and problems in their execution as discussed in the succeeding paragraphs.

General controls

Physical access to cluster server - Off site storage thereof

2.3.12 Server room is the heart of any network and allowing an easy access to an unauthorized person to the servers, switches, routers, cables and other

[§] Interactive Data Extraction and Analysis.

devices in that room can expose these assets to damage. Therefore, if any cluster server is maintained, it should be kept in a location other than that of the main server. It was observed that the cluster server maintained by the Company is also in the same room as the main server.

The above fact reveals that the Company does not have in place any disaster recovery plan to protect the data from a disastrous incident.

The Company stated (July 2010) that the suggestions made in Audit would be incorporated.

Logical access controls

2.3.13 The Company has neither formulated any password policy nor issued any instructions to the users to follow the guidelines released by the Government of Andhra Pradesh in May 2006 with respect to Information Security. In spite of the fact that the software was being developed by the Company with the intention to provide online booking facility to general public through internet, basic password control procedures like minimum length, unique user name and password, periodical compulsory change, limiting the consecutive unsuccessful attempts to login, password protected screens, restricting multiple simultaneous login by the users, etc., were not being followed.

There was no IT policy and business continuity plan to ensure the security of the system and the data.

The password control procedures in vogue suffer from the following:

- The users had their numerical employee ID (staff number) as user ID which does not contain any alphabetic character and is easily accessible by anyone.
- The application software accepted a single digit as a password.
- The application software accepted the user ID as a password.
- The application software does not compel the users to change their password at periodical intervals.
- There was no limit on the number of unsuccessful attempts to login.

The Company stated (July 2010) that the policy would be framed and guidelines suggested by the Audit were already communicated to the software developer for incorporation.

Unauthorised/redundant users

2.3.14 As per the user list provided by the Company, there were 257 users. We noted that there was no practice of reviewing the authenticity of users to the system at periodical intervals or there was no formal intimation to the IT Manager about the users who resigned/retired/left the Company. As a result, there were 19 users who left the Organisation but their user profile status was active at the time of Audit (July 2010).

The Company stated (September 2010) that the same would be rectified.

Application controls

Input controls

There were no adequate input controls, because of which the application software could compromise on the issues relating to security aspects.

2.3.15 The database of any computerised system has to be correct and complete in all respects. To ensure this, the procedures and controls should guarantee that the data received for processing is genuine, complete, accurate and properly authorised. Security of the properties of the Company and of tourists is a major concern in Hospitality and Tourism Industry. For this purpose details of the tourists have to be recorded at the time of check-in. Audit observed that the application software lacked adequate input controls, which could compromise on the issues relating to security as indicated below:

- Out of 41,472 records at the end of October 2009, 17 records indicate that the gender of the tourist as male but with a title as Mrs., 40 records of male gender were shown as Ms., and 140 records of female tourists were shown with a title as Mr.
- Though in practice the rooms were allotted to a person aged 18 years or more, there were 8,167 records wherein the age of the tourist was recorded as less than 18 years. Out of 8,167 records, the age column was 'blank' in 8,160 records and in the remaining seven records tourists were shown as Minors.
- Though the field capturing the phone number and mobile number was made mandatory, it was observed that out of 41,472 records, in case of 5,860 records the field containing phone number and mobile number of the tourist was left blank and in 1,601 records same number was shown under phone number and mobile number.
- There was no provision to capture the nationality of the tourist, which would decide the type of ID proof to be sought from the tourist.
- For identification of tourists, PAN Card numbers/ passport numbers and driving license numbers were recorded as ID proof. In 781 cases of tourists who gave their passport numbers as ID proof, the numbers indicated in the field ranged between single digit and fifteen digits and in certain cases the number was either entirely numerical or alphabetical. This indicated that the numbers captured were not the passport numbers and the application software accepted any character in the field.
- The PAN card number has 10 digits with a typical alphanumerical combination. In case of 14,524 tourists who gave their PAN card number as their ID proof, the numbers so entered ranged between single digit (in most of the cases it was zero) and 20 digits and were numerical which cannot be true.
- In case of 23,775 tourists who gave their driving licence number as their ID proof, the numbers captured ranged between single digit and 20 digits, which cannot be true.

Thus the Company database, which was intended to be linked to the facility of online reservation to the public at large and in real-time, lacked input controls.

The Company stated (February 2010) that the validation controls would be incorporated as suggested in Audit.

Incomplete database

2.3.16 The database suffered from incompleteness because of non-inclusion of the following:

- ❖ The legacy data in the erstwhile database VISTA.
- ❖ The discounts offered to senior citizens and students.
- ❖ Details of complimentary breakfast offered on certain types of rooms.
- ❖ Certain package tours operated.
- ❖ Data on extra coaches provided to the tour promotion scheme (TPS) agents.
- ❖ Vehicles issued on Special Hire on different tariff.
- ❖ Details of other business activities such as cruises and pleasure trips.
- ❖ Business done by Agents for computation of commission payable to them.
- ❖ Capturing of data relating to issue of duplicate tickets.

The MIS reports on various activities were computed manually, which are open to the threat of being not correct because of human error.

Some interesting cases are discussed in the succeeding paragraphs.

Lack of business continuity and disaster management plan

2.3.17 The data residing in the server is critical to the business needs of the Company especially when it is embarking on a web-based application. The Company did not develop a documented business continuity and disaster recovery plan defining the roles, responsibilities, rules and structures for continuing the operations in the event of a disaster. The Company also did not have an alternative processing facility to be employed in case of a disaster. The backup media taken at regular intervals were kept in the same server room, which could prove fatal to the vital data in case of any unforeseen accident like fire and other calamities. Further, there was no system of testing recoveries from backup media in case of database servers.

The Company stated (July 2010) that the suggestions made by the Audit in respect of backup would be followed.

Defective agreement

The Company entered into an agreement without time frame clause which resulted in undue advantage to the developer to take own time for development of application software.

2.3.18 The Company entered into an agreement with Ram Informatics Limited, Hyderabad (RIL) in September 2006 for development of a comprehensive and integrated application software, for running the core activities. As per the agreement, RIL had to study the system, design, develop, test, implement and maintain the application software for 12 months. The Agreement Price of ₹ 43.00 lakh was payable as per the schedule indicated in the agreement. The Company, so far, had paid an amount of ₹ 20.68 lakh.

As per the agreement, if RIL failed to deliver any or all of the goods or perform the services within the time, the Company was empowered to deduct liquidated damages (LDs), at one *per cent* of the agreement price for the delayed Goods or unperformed Services for each week or part thereof of delay until actual delivery or performance, subject to a maximum of five *per cent*. Once a maximum was reached, the Company would consider termination of the agreement.

We observed that though the agreement provided for levy and recovery of LDs for delay in development of application software, it did not indicate any time frame for such development. Further, there was no clause specifying the time period within which the development should be completed. Because of this, the Company was unable to levy any LDs on RIL in spite of the delay in development of the application software.

We observed that under the agreement, RIL were to develop, test and integrate eleven** modules. Though a period of 3 years and 10 months has elapsed, RIL had not developed completely any of the modules so far (June 2010). RIL had partially developed six†† modules. Many of the tables under various modules were either empty or usage of these tables was discontinued indicating that there were no records in 40 *per cent* to 92 *per cent* of the tables.

Thus the declaration submitted to the Government of India that the project was completed as scheduled was not factually correct.

The Company had neither given any specific time schedule/revised time frame for completion of the work nor had insisted upon entering into any supplementary agreement wherein an exact time frame would be agreed upon.

The Company accepted (January 2010) that the time frame was not incorporated in the agreement and stated that a supplementary agreement would be entered into incorporating revised time schedule.

** 1. Website development and transformation into Portal, 2. Financial Accounting System, 3. Inventory Management System, 4. Integrated Hotel Management System (including KOT, F&B costing and Front office Management), 5. Web-based Reservation System/Payment Gateway Integration, 6. Transport Management System, 7. Project and Construction Management, 8. Event Management, 9. Property & Assets Management System, 10. Human Resource Management and Pay Roll Processing and 11. Financial Management System.

†† Financial Accounting System, Integrated Hotel Management System, Human Resource Management and Pay Roll Processing , Inventory Management System (MMS), Transport Management System WRS, Web-based Reservation System/Payment Gateway Integration.

Unwarranted expenditure on re-designing of Website

2.3.19 RIL who were developing the Company's portal, as a part of the agreement had also developed the Company's Website. The portal so developed did not, however, incorporate the facility for the tourist to customise his tour.

The Company incurred unwarranted expenditure of ₹ 9.16 lakh.

During August 2008, the Company felt that the Website "was not user friendly and did not have maximum information about tourism and services offered by the Company" and decided to change the portal, *inter alia*, involving optimisation for major search engines and inclusion of customized packages. Accordingly, the Company entrusted the work of re-designing its Website to another agency without inviting quotations/tenders, at a cost of ₹ 9.16 lakh without getting the deficiencies rectified by RIL.

Further, we observed that the Website did not provide for:

- displaying the names, addresses and phone numbers of the agents;
- display of images from the festivals held earlier under the menu "Events Calendar"; and
- promoting the facilities offered by the Company to attract tourists by announcing special events organised by various units of the Company.

The Company stated (January 2010) that there were no defects in the Website developed by RAM Informatics, but it was decided by the then Managing Director to assign the work to another agency.

Non-achievement of the objective

2.3.20 The primary objective of developing the application software was making "Online" reservation facility available to general public. But even as of June 2010, the facility was available only at counters of the Company. Further, this facility was also not made available to TPS agents some of whom operate certain packages/tours of the Company.

Thus the declared objectives of automation are yet (June 2010) to be achieved.

Sparse utilisation of the application software

The application software was used only to the extent of 15.56 *per cent*.

2.3.21 During the scrutiny of records available at Reservation Unit at Hyderabad, we observed that out of the total 2,69,145 transactions relating to booking of tours from October 2008 to October 2009, 1,90,718 transactions (70.86 *per cent*) were made by TPS agents and only 78,427 transactions (29.14 *per cent*) were made at counters of the Company. Even out of these 78,427 transactions, 36,532 transactions were made manually and 41,895 transactions were made through system. Thus, only 15.56 *per cent* of total transactions were made through system and the remaining manually. The application software developed for the purpose was thus utilised only sparsely, defeating the very purpose of developing it.

As majority of the data had not been captured, the Management did not have access to real-time information on the number of coaches run, packages operated, revenue earned etc., using the database.

A review of the records relating to hotel bookings in Vijayawada also revealed that transactions ranging between 56 and 67 *per cent* were made manually.

A reservation made manually in spite of developing and making available an Online Reservation System for the purpose, defeats the very purpose of developing the system.

An interaction with the users of the Online Reservation System revealed that the main reason for manual booking was breakdown of connectivity. But it was noticed that no record of downtime was maintained to take corrective steps. For the purpose of automation offering facility of real-time transactions, the Company should have opted for a dedicated line instead of depending on local Internet Service Providers.

Blocking of rooms

2.3.22 Guidelines for blocking of rooms under the policies framed for Online Reservation System were issued to Units during September 2008. As per the guidelines no rooms could be blocked for more than 7 days and also without receiving payment.

The facility of blocking of rooms without receiving any advance was given to Heads of Departments and Unit Heads. When a room is blocked, a user cannot book the same, as it does not appear in list of the rooms available for reservation.

The database revealed 25,347 records of blocking of rooms, out of which in case of 19,939 records it was seen that the rooms were unblocked after the period for which they were blocked. Out of this 4,045 records pertained to one of the Hotel Units at Visakhapatnam. Because of this, the rooms which were actually vacant after the blocking period, were not available for booking unless the customer visits the Hotel Units. This may lead to a probable loss of revenue to the Company from the customers who opt for online booking.

The following discrepancies were noticed in Audit:

- The blocked rooms were also allotted during the period of block, usually for shorter durations, both manually as well as through system to walk-in tourists.
- A tourist who had blocked a room was apparently treated as a walk-in tourist without routing the further process by first unblocking the room.
- There was no common field to integrate the tables relating to blocking and reservations. While allotting the guest code and registration number to the tourist, no regard was made for the fact that the tourist had blocked the room earlier.

Because of non-integration of data contained in different tables and following a non-standard practice, the application software allowed generation of a reservation number against the blocked room without its formal "Unblocking" from the blocking table.

In this connection the following observations are made:

- Though the rules designed for the software provided for payment for the blocked rooms, the table did not have provision to capture the details of receipt of such payment.
- There were 12,198 records indicating that rooms were blocked for more than seven days contrary to the guidelines issued.

Allowing the facility of blocking the rooms without collecting any advance would lead to problems for the Management under an automated scenario.

The Company stated (July 2010) that the blocking rule would be implemented once the access was given to the agents.

No previous history of tariffs

2.3.23 The database did not contain the details of all revisions made to tariffs to facilitate the Management to take appropriate decisions and instead contained only latest tariffs.

The Company stated (November 2009) that the problem would be rectified.

Non-incorporation of Business Rules

The application software of a business establishment, in order to be correct and complete should incorporate the Business Rules set out by the Board of Directors. In case of the Company, contemporary Business Rules, have to be incorporated in the application software.

Tariff tables not updated

2.3.24 It was observed that the contemporary tariff in respect of hotels was not incorporated in the application software. The tariff in respect of certain rooms of a unit at Visakhapatnam was revised with effect from 17 September 2009.

A query on the database revealed that the revised tariff was neither incorporated into the master tables nor was collected from tourists thereby resulting in short-levy of tariff amounting to ₹ 0.36 lakh.

The Company stated (July 2010) that the problem was reported to the software vendors and the same would be rectified.

Non-implementation of revised tariff

2.3.25 The core function of the Company is developing tourism in the State. To accomplish this, the Company operates package tours to various places of tourists' interest. The TPS Agents operate the tours subject to fulfilment of

minimum guarantee tickets. In case of a shortfall in minimum guaranteed tickets, the portion of transport cost of the tour would be realized from the TPS agent.

Non-revision of tariff resulted in short collection of ₹ 2.68 lakh.

An analysis of the data relating to various tours operated by the Company from Hyderabad revealed a total short collection of tariff amounting to ₹ 2.68 lakh.

The Company stated (July 2010) that the short-collection of tariff was due to non-incorporation of revised tariff for week days/weekends in the system. The reply of the Company is not tenable because the short-collection was noticed not only for week days/weekends tour packages but also daily package tours.

However, the Company stated that the suggestions of Audit would be considered.

Tickets booked manually

2.3.26 Apparently the users also were not vigilant while booking tickets manually to Bengaluru and Mumbai. A test check of physical records of bookings made manually for the months of December 2008 and January 2009 revealed that the enhanced tariff for certain days of the week applicable in respect of tours operated to Bengaluru and Mumbai was not collected resulting in short collection amounting to ₹ 31,350 from tourists towards fare and ₹ 2,800 from TPS agents towards shortfall in minimum guarantee.

Thus, the Company had forgone a total revenue of ₹ 34,150 which could have been avoided, if the business rules relating to the tariff revisions were incorporated in the application software.

The fact that the values in the master tables were not updated, tickets booked were charged at pre revised tariffs leading to unwarranted foregoing of revenue also revealed that the supervisory checks were not adequate.

Cancellation of tickets

Assigning a new number to fully cancelled ticket

2.3.27 The application software was so designed that cancellations could be made on the original ticket number. A new number was assigned to the original ticket number when the ticket was partially cancelled. No new ticket number was allotted in case of full cancellation.

A query on the database revealed 602 instances of cancellations of tour packages relating to reservation unit at Hyderabad during the period between October 2008 and October 2009, out of which 93 instances were of partial cancellations.

Further analysis of the database revealed that in respect of 250 cases of fully cancelled tickets also (out of 509 such cases) new number was assigned by the application software contrary to the design parameters. This is a lacuna in the design and needs to be corrected.

We also noticed an instance where two tourists travelled on a new ticket number generated by the application software for a ticket fully cancelled earlier.

The Company replied (June 2010) that the bug was rectified by the software developers and more security measures would be adopted in such cases.

Cancellation after journey

2.3.28 This apart, we also observed that because of deficiencies in design, the system allowed cancellation of tickets after the "journey date". A query on the database revealed that the system permitted cancellation of two tickets after the date of journey and also allowed a refund of ₹ 1,600.

In this connection the following observations are made:

- Permitting cancellation of tickets beyond the date of journey is a major threat and if the user is not vigilant it may result in loss of revenue.
- There existed a threat that the new ticket number, issued in case of a fully cancelled ticket, may also be eligible for cancellation again, which also may lead to avoidable loss of revenue.
- The database did not capture the time of cancellation of ticket, which is crucial to computation of charges to be levied as per the extant rules. If the user is not vigilant, there existed a threat of higher refunds being made upon cancellation.
- The field indicating percentage of deduction to be made upon cancellation did not have relation with the actual amount deducted.

The Company stated (June 2010) that the passengers chart would be verified for each ticket against the entry of the passenger. The Company further stated that more security measures would be adopted in such cases.

Incorrect bill upon check-out

2.3.29 It was seen that the final bill upon check-out was not generated through the system because the system-generated bill contained many inaccuracies.

- The stay in number of days was not displayed on the bill.
- Though the guest had not taken extra bed, and the bill details also indicated extra bed as "0", a charge for extra bed of ₹ 150 was included in the bill.
- 'Bill Details' exhibited the day total as ₹ (-) 300, which was irrelevant. The front office staff also could not explain this.

The Company stated (May 2010) that the problems would be rectified.

An interesting case was discussed in succeeding paragraph under 'Other points of interest'.

Actual check-out time not captured

2.3.30 During a cross verification of physical records with the database in the Unit at Visakhapatnam, we observed that the data lacked integrity, completeness and accuracy.

As per the tariff guidelines, the check-out time applicable for the Unit is 10.00 hrs everywhere. Thus, a tourist has to check-out at 10 a.m. of the day and in case of delay, has to pay an additional day's charge.

The details of check-in and check-out of the tourists were entered in the Occupancy Register maintained in the front office. An analysis of the data revealed that the duration of stay of tourist as entered in the database and as recorded in the Occupancy Register did not match. There were 1,643 records of tourists who stayed beyond 10.00 hrs. In spite of this, the application software did not compute additional day's tariff. This also pointed to the fact that business rules were not incorporated in the application software.

There was no internal control mechanism to ensure the real check-out time of the tourists or to verify the correctness of either the physical or electronic data. If a tourist had already checked-out and there was a delay in entering the details into the system, there was no mechanism to ensure that the checked-out room was available for online booking, from the time the tourist has actually vacated.

If in the case of these 1,643 records, tourists had in reality checked-out at the time recorded in the data base, the Company had incurred a loss to the extent of ₹ 51.85 lakh by way of non-collection of the extra day's tariff.

Charts for journeys not generated through the system

2.3.31 The charts indicating the details of passengers and ticket numbers carried along with the bus by the driver/guide were not generated through the system.

Computation of entry fee payable to Ramoji Film City not linked with system data

2.3.32 As per the agreement entered into with the Ramoji Film City, Hyderabad (RFC) from time to time, the Company acted as a promoter of RFC and at the end of the month, had to pay to them the entry fee at the specified rates for the aggregate number of tourists who visited RFC during the month.

Since the data on the number of tourists who visited RFC utilising the package tour were not available, the reservation unit at Hyderabad resorted to computation of the fees payable to them, only manually utilising various manual performance reports sent to Head Office, Outgoing Register and daily Reservation Charts. This short-fall made the process of computation of amounts payable cumbersome, outside the system and arbitrary. This also entailed performance of unwarranted and redundant manual work fraught with possible human errors.

Because of human intervention in the process, there was an error in computing the fees payable and the Company paid an excess fee amounting to ₹ 0.25 lakh during the two months December 2008 and October 2009 as test checked by Audit.

The above also pointed to the fact that the data reported through various reports based on which payment of entry fee was computed were at variance with each other and hence were not factual. In general the overall internal controls in this regard were non-existent.

Return Journey (Down) tickets issued manually

2.3.33 In respect of coaches operated through TPS agents to locations outside the state the tickets for the return journey were invariably issued manually and thus the data was not available in the database.

This, clubbed with the fact that the Company had no offices in these cities and had no consistent vigilance checks to authenticate the number of tickets issued and the number of passengers actually travelled, data furnished by the TPS agents in respect of return journeys was fraught with the threat of being incomplete/incorrect because of unintended errors creeping in.

The lack of reliable data also critically affected the process of computation of commission payable to TPS agents and penalties for shortfall in minimum guaranteed tickets recoverable from them.

Errors in computation of commission payable to agents

2.3.34 The commission payable to agents was computed manually due to non-availability of the relevant data in the database. Further it was observed that the partial data available in the database was also not utilised in the process.

A review of the commission paid to agents by the reservation unit at Hyderabad during the period between October 2008 and October 2009 revealed that in the months of December 2008 and August 2009 the tickets booked by agents was reckoned incorrectly without reconciling the data available with the reservation unit and the commission computed. This resulted in payment of excess commission to the agents in respect of five tickets.

Integration with other departments

2.3.35 The database was not integrated with that of other departments such as Transport Department, Police Department etc., for verifying the data furnished by the tourist in respect of driving license, passport, PAN card etc.

Other points of interest

Category of rooms not updated

2.3.36 In the hotel unit at Vijayawada one air-conditioned room was converted into non air-conditioned room and the non-air-conditioned room into air-conditioned one. Some rooms were damaged in flood and were not

available for booking for various periods of time. These facts were not incorporated in the Master tables.

Records relating to the (i) date of conversion of rooms and (ii) duration of period for which the rooms were unavailable to tourists because of renovation were not maintained.

Because of this, the veracity of the entries in the Occupation Register maintained at the Unit relating to the tariff charged for these rooms could not be vouchsafed in Audit.

Non-incorporation of the change of tariff of the two rooms in the Master table exposed the system to the threat of loss of revenue/unwarranted additional burden on the Tourists' budget if the user was not vigilant.

The Company stated (May 2010) that the facility was not available in the application software with regard to conversion of air-conditioned rooms to non-air-conditioned rooms and vice-versa. Now, the bug was fixed by the software developers.

Non-utilisation of database for generation of MIS Reports - Excess payment of service tax

2.3.36.1 The Company is a service provider and is registered as such under the following categories for the purpose of service tax as a tour operator, as a Mandap Keeper (Bouquet Halls), for renting of immovable properties and for business auxiliaries.

The net revenue from the transport activity reckoned for the purpose of payment of service tax was arrived at after deducting components like Darshan Tickets, Entry Fee, Hill Transport, Railway fare for Rail-cum-Road Tour, Refunds and Discounts, which are paid to respective agencies and thus are not the revenue of the Company (deductibles). The database contains a provision to capture the details of various deductibles.

The package tour to RFC contained a component of entry fee at specified rates, which was remitted to them and thus was not a part of revenue of the Company.

We observed that because of non-availability of the data on tourists visiting RFC in the database, while computing such revenue during the period from October 2008 to October 2009, the component of entry fee amounting to ₹ 55,42,300 was not deducted while computing the income for payment of service tax. This has resulted in excess payment of service tax amounting to ₹ 1.54 lakh for the above period.

The Company stated that the reports were being developed as suggested by the Audit.

The necessity to keep the data secured need not be over emphasized. The physical and virtual assets created by investing huge sums of money have to be protected. The best practices followed *inter alia*, included:

Internal Audit

2.3.37 The data contained in the database was not subjected to Internal Audit.

Discrepancies in check-out bills

2.3.38 It was seen that the final bill upon check-out was not generated through the system because the system-generated bill contained many inaccuracies.

It was also revealed that on many occasions, details of the guest and the check-in time could not be entered at the time of actual check-in because of unavailability of Internet.

The check-in time of a guest who had checked-in at 14.00 hrs for one day's stay on 12 May 2010 were entered later and the check-in time recorded by the system was real-time i.e., 19.48 hrs. As the actual check-in time of the guest was 14.00 hrs, the user entered the guest's probable check-out time as 14.00 hrs as one day would mean 24 hours from the actual check-in time. The guest actually checked-out at 14.00 hrs the next day. But, when a list of guests in the hotel who were "pending check-out" was generated at 15.29 hrs on 13 May 2010, it was noticed that a remark 'check-out pending' appeared against the above guest. When the guest was "checked-out" at 15.29 hrs on 13 May 2010 through the application software, it was observed that the bill details generated contained the following inaccuracies:

- The check-in time was printed as 19.48 hrs, which was the time when the details of the guest were entered in the system.
- The stay in number of days was not displayed on the bill.
- Though the guest had not taken extra bed, and the Bill details also indicated extra bed as "0", a charge for extra bed of ₹ 150 was included in the bill.
- 'Bill Details' exhibited the day total as ₹ (-) 300, which was irrelevant. The front office staff also could not explain this.
- Though the system reckoned another day after midnight, this logic was not employed while generating the final bill. Even as the application software adds up one day tariff after midnight, the bill computed was for one day only, though the guest had checked-in on 12 May 2010 at 14.00 hrs and was checked-out on 13 May 2010 at 19.48 hrs.

The user also admitted that the staff avoided generating the final bill through system because of exhibition of an amount of ₹ (-) 300, as it was on many occasions misunderstood by the guests as a discount offered by the Company not passed on to them by the staff.

The Company stated (May 2010) that the problem would be rectified.

Conclusion

The Company had neither formulated an IT Policy of its own nor followed the policy framed by the Government of Andhra Pradesh. It was observed that the Completion Certificate submitted to the

Government of India regarding completion of the development work of application software was not factually correct. While entering into an agreement for development of application software proper care regarding time limit for completion of development work was not taken by the Company. So far only few modules were partially developed and these modules also had many defects such as inadequate controls, non-incorporation of business rules and defective designing which do not give proper MIS reports for Managerial actions. Though more than two years have elapsed, no steps were taken by the Company to induce the developers for early completion of the development of the software. Further the Company had exhibited insufficient earnestness for optimum utilisation of Website by displaying corporate plans for promotion of tourism in the State.

Recommendations

The Company needs to

- ***complete the application software in all respects by a definite time frame to be set by the management,***
- ***incorporate all the business rules to prevent loss of revenue and to avoid discrepancies in the manual and system data,***
- ***frame information security policy on the lines indicated in the annexure,***
- ***adhere to the password standard,***
- ***initiate action to introduce capturing of the check-in and check-out time at all hotel units for higher security, and***
- ***ensure that all the required MIS reports are easily available through the application software for the use of Management.***