

## Chapter - II

### Performance audit relating to Government Companies

#### Andhra Pradesh Power Generation Corporation Limited

#### 2.1 Operational performance of Kothagudem Thermal Power Station

##### Executive Summary

*Kothagudem Thermal Power Station (KTPS) located at Paloncha in Khammam District, consists of 10 Units in two plants (Operation & Maintenance Complex and Stage V) having a generation capacity of 1,220 MW and is one of the five thermal stations under Andhra Pradesh Power Generation Corporation Limited (Company). The performance review was conducted to ascertain whether the generation was at optimum of installed capacity, effective preventive maintenance was carried out, auxiliary consumption was within norms, material management was efficient and environment control measures were implemented.*

##### **Operational Performance**

*The norm fixed by CEA/ APERC for generation of power was achieved during the period under review. Net generation of power by these Units during the five year period 2004-09 was 39,386 MUs at an aggregate cost of Rs 5,768 crore. There was a shortfall of 4,586 MUs in the possible generation.*

##### **Auxiliary consumption**

*The auxiliary consumption was in excess of norms due to inherent design constraints in Units V and VI, partial load operations and deferring of overhauls in Units IX and X and use of power for construction loads for Unit XI resulting in excess consumption of 84.18 MUs valuing Rs 12.14 crore.*

##### **Energy audit**

*Energy audit was not conducted for Units IX and X. The recommendations made by Energy Auditors in respect of Units I to VIII were not implemented there by expected savings of power valuing Rs 5.63 crore per annum was not achieved.*

##### **Inputs management**

*Consumption of inputs was in excess of norms to the extent of Rs 44.94 crore in Coal (Rs 35.11 crore) due to non-inclusion of boilers in refurbishment works, Grinding media (Rs 5.66 crore) due to inefficient operations and Fuel oil (Rs 4.17 crore) due to frequent trippings during the period 2004-09.*

##### **Inventory management**

*Holding of stock of stores & spares in excess of norms of 12 months consumption and Fuel oil in excess of two months consumption led to loss of interest of Rs 9.57 crore during 2004-09.*

##### **Environmental safeguards**

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

##### **Safety measures**

*Insufficient manpower, non-existence of hydrant system, smoke detection system and portable fire extinguishing equipment in the coal handling plant and non-installation of equipment bought for Units I to IV made the safety measures inadequate to the requirement.*

##### **Conclusion and Recommendations**

*The KTPS achieved the norm of generation prescribed by the CEA but none of the Units generated the possible power during the actual hours of operation. There were deficiencies in control of input costs and auxiliary consumption. The review contains five recommendations which include undertaking timely preventive maintenance and efficient utilization of inputs.*

*(Chapter 2.1)*

**Introduction**

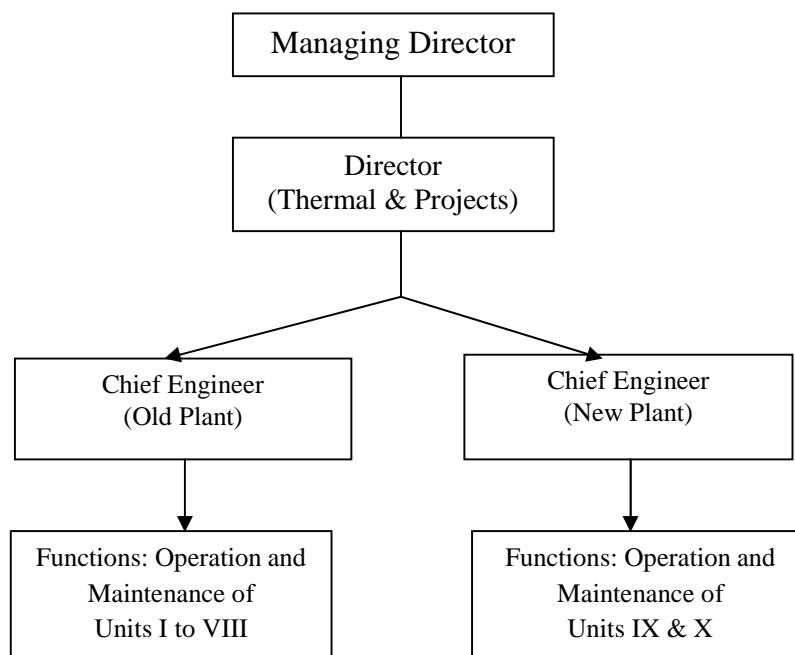
**2.1.1** Andhra Pradesh Power Generation Corporation Limited (Company) has five thermal generation stations. Out of these, two stations with a total installed generating capacity of 1,220 MW power from 10 generating Units are located in Paloncha of Khammam District of Andhra Pradesh. While Units I to VIII (Stages I to IV) with the generating capacity of 720 MW are known as Kothagudem Thermal Power Station (KTPS) (Operation and Maintenance complex) (old plant), Units IX and X with generating capacity of 500 MW are known as Stage V (new plant). The Unit-wise details of installed capacity and year of commissioning were as follows:

Stage	Units	Installed capacity (MW)		Commissioned during
		Unit	Stage	
I	I and II	60	120	1966
II	III and IV	60	120	1967
III	V and VI	120	240	1974
IV	VII and VIII	120	240	1977-78
V	IX and X	250	500	1997-98
<b>Total</b>	<b>10</b>		<b>1220</b>	

In pursuance of the policy of Government of India to optimize power generation, the residual life extension / refurbishment work of the Units I to IV was done between 1998-2000 at a cost of Rs 175 crore and Units V to VIII during 2000-04 at a cost of Rs 372 crore.

Net generation of power by these Units during the five year period 2004-09 was 39,386 MUs at an aggregate cost of Rs 5,768 crore. The power generated was transferred to Distribution Companies for onward transmission to consumers.

Organisational set up relating to operation and maintenance of generating Units of KTPS is given below:



A review of expansion of installed capacity from 680 to 1,180 MW of KTPS was last conducted during 1998-99 and same has not been discussed by COPU so far (September 2009).

### Scope of audit

**2.1.2** The present review conducted between March 2009 and June 2009 covers operational performance and maintenance of all the 10 Units during the years 2004-09. Audit scrutinised the records maintained by respective Chief Engineers besides scrutinising the records at the Corporate Office of the Company.

### Audit objectives

**2.1.3** The audit objectives were to ascertain whether:

- ❖ the generation of power was in line with the plant capacities and as envisaged in refurbishment plan;
- ❖ installed capacity of the generating Units was optimally utilized as per norms fixed by Central Electricity Regulatory Commission (CERC)/Andhra Pradesh Electricity Regulatory Commission (APERC);
- ❖ time allowed for preventive maintenance/capital maintenance of boilers and turbines of the Units was as per norms;
- ❖ auxiliary consumption of generating Units was as per norms fixed by CERC/APERC;
- ❖ consumption of inputs was managed efficiently so as to achieve low cost of generation;
- ❖ principles of material management were followed;
- ❖ environment control measures were undertaken effectively; and
- ❖ adequate safety measures were taken.

### Audit criteria

**2.1.4** The following audit criteria were adopted:

- ❖ norms for operational performance fixed by CERC/APERC;
- ❖ norms fixed by Central Electricity Authority (CEA) for energy audit to reduce consumption of various inputs;
- ❖ specifications prescribed by Andhra Pradesh Pollution Control Board (APPCB) in respect of stack emissions and utilisation of ash generated by the Units;

- ❖ company's set standards for Annual/Capital Overhauls; and
- ❖ Electricity Act, 2003.

### **Audit methodology**

**2.1.5** Audit followed the following mix of methodologies:

- ❖ analysis of project reports, works awarded for execution of Repairs and Maintenance (R&M) works;
- ❖ analysis of operational performance data, MIS reports;
- ❖ analysis of data relating to consumption of inputs for generation of power;
- ❖ analysis of APPCB reports; and
- ❖ interaction with Management at different levels.

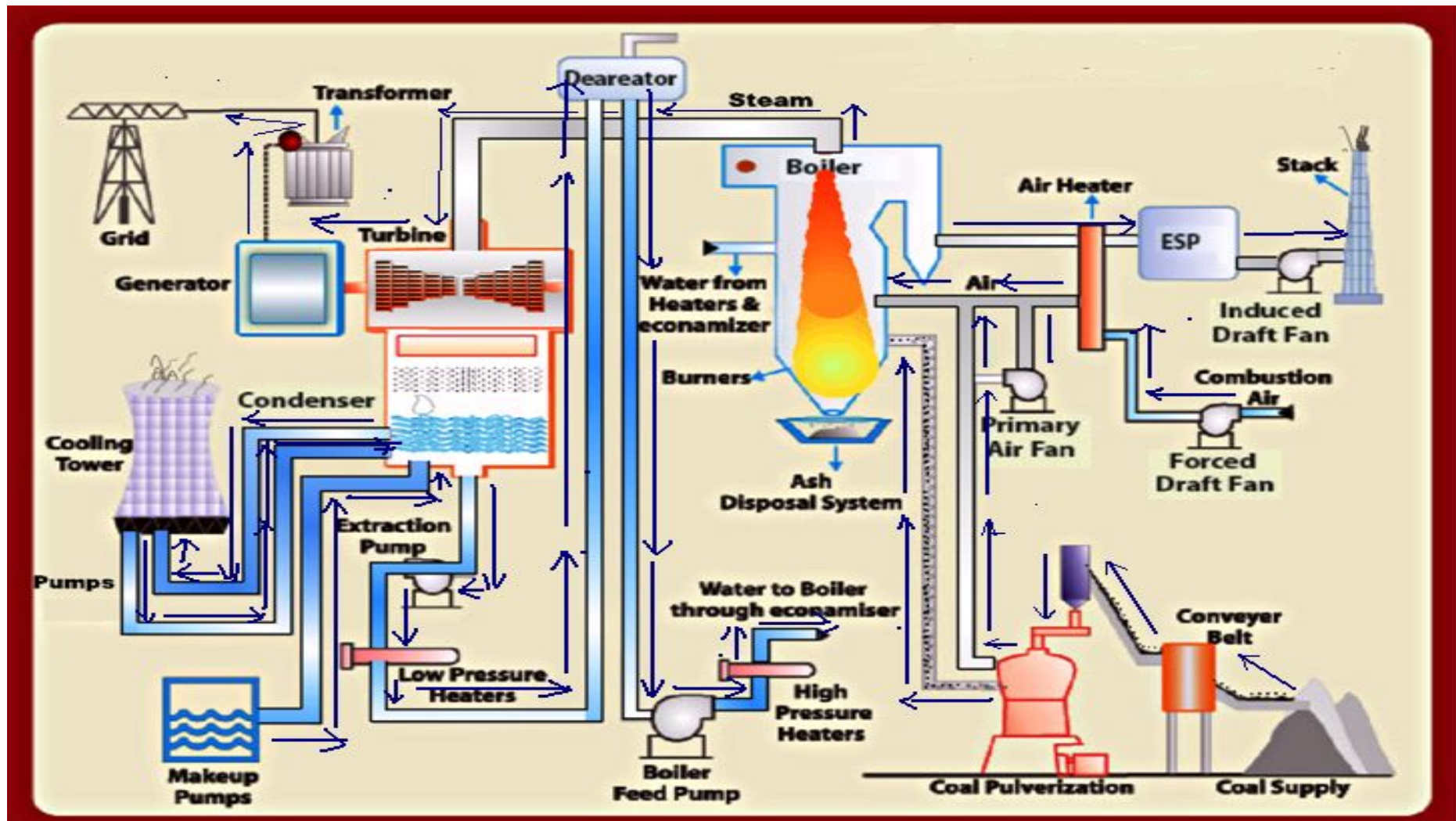
### **Audit findings**

**2.1.6** The audit findings were reported (6 August 2009) to the State Government/Management and discussed (18 September 2009) in the Exit Conference where the Management was represented by the Managing Director of the Company.

The review was finalized after considering the replies of the Government and Management. The audit findings are discussed in succeeding paragraphs.

### **Brief description of generation process**

**2.1.7** A machine called pulverizer (coal mill) grinds the coal into fine powder. The coal powder mixed with hot air, moves to the furnace. The burning coal heats water in a boiler, creating steam. Steam released from the boiler powers an engine called Turbine, transforming heat energy from burning coal into mechanical energy that spins the turbine engine. The spinning turbine is used to power a generator, a machine that turns mechanical energy into electric energy. This happens when magnets inside a copper coil in the generator spin. A condenser cools the steam moving through the turbine. As the steam is condensed, it turns back into water. The water returns to the boiler and the cycle begins again. Pictorial presentation of generation process of coal fired power plant is placed opposite.



Generation process of coal fired power plant

**Operational performance**

**2.1.8** Operational performance profile of Units I to X for the five years ending 2008-09 is given in **Annexure-7**. A scrutiny of performance profile revealed the following:

**Generation as compared to CERC/APERC norms**

**2.1.9** As per CERC/APERC norms, generation of energy per kilowatt (KW) of installed capacity during a year should not be lower than 7,008 kilowatt hours (units) considering the availability of plant at 80 *per cent* of available working hours in a year. Table below indicates the actual generation of power by the 10 Units and deficit/surplus power generated as compared to targeted generation during 2004-09:

(figures in MUs)

Particulars	Old plant								New plant		Total
	Unit I	Unit II	Unit III	Unit IV	Unit V	Unit VI	Unit VII	Unit VIII	Unit IX	Unit X	
Power to be generated as per CERC / APERC norms	2103.55	2103.55	2103.55	2103.55	4207.10	4207.10	4207.10	4207.10	8764.80	8764.80	42772.20
Actual Generation	2102.78	2110.52	2090.50	2100.29	3982.96	4023.41	4022.67	3942.98	9997.37	8939.65	43313.13
Deficit (-) / Surplus power generated with reference to CERC / APERC norms	-0.77	6.97	-13.05	-3.26	-224.14	-183.69	-184.43	-264.12	1232.57	174.85	540.93
Percentage of Deficit	0.04	-	0.62	0.15	5.33	4.37	4.38	6.28	-	-	-

As can be seen from above, the KTPS with 1220 MW capacity achieved the CERC/APERC norm by generating 43,313 MUs as against the norm of 42,772 MUs. Though overall norm was achieved due to surplus in new plant, all the Units of old plant except Unit II failed to achieve the norms.

The table indicates the units generated, cost incurred, cost recovered and surplus by these Units during the period under review.

Particulars	2004-05	2005-06	2006-07	2007-08	2008-09	Total
Net Generation (MUs)	8688.45	7467.64	7698.12	8193.60	7338.16	39385.97
Cost of Generation (Rs in crore)	1381.55	1083.78	1060.26	1182.99	1059.48	5768.06
Recovery of cost per unit (Paise)	162.25	150.13	147.55	151.85	151.85 <sup>1</sup>	
Total Recovery (Rs in crore)	1409.70	1121.12	1135.86	1244.20	1114.30	6025.18
Surplus (Rs in crore)	28.15	37.34	75.60	61.21	54.82	257.12

<sup>1</sup> Cost of 2007-08 adopted as cost accounts for 2008-09 are not yet finalised.

The shortfall in excess of five *per cent* of the targeted generation during review period worked out to 782.69 MUs. Unit-wise and year-wise details are as follows:

(figures in MUs)

Unit	2005-06	2006-07	2007-08	2008-09	Total
II	52.79	-	-	-	52.79
III	0.23	14.32	-	6.33	20.88
IV	-	4.72	-	2.87	7.59
V	-	-	26.41	135.61	162.02
VI	36.93	-	19.09	51.76	107.78
VII	36.59	33.58	-	43.07	113.24
VIII	22.22	85.50	-	101.91	209.63
X	68.35	40.41	-	-	108.76
<b>Total</b>	<b>217.11</b>	<b>178.53</b>	<b>45.50</b>	<b>341.55</b>	<b>782.69</b>

Note: In 2004-05 shortfall in all the Units was below five *per cent*.

The shortfall is attributable to backing down in all the Units during 2005-06, forced outages (Paragraph 2.1.17), poor performance of boiler and its auxiliaries (Paragraph 2.1.17) and operation of Units at partial loads due to poor quality of coal (Paragraph 2.1.12).

The Government stated (September 2009) that the shortfall in generation was due to failure of boiler pressure parts for which no major R & M was done since inception, operational limitation such as ageing of equipment like air pre-heaters, pressure parts etc., and shortage / poor quality of coal.

As accepted by Government, the shortfall in generation is due to non-inclusion of boiler and its auxiliary units while undertaking refurbishment.

Had these Units also achieved the generation as per norms the performance would have further improved.

### **Possible generation**

**2.1.10** The Unit wise possible generation for the actual hours worked during the five year period 2004-09 is indicated in **Annexure-7**. Table below indicates consolidated generation of power required for the actual hours worked and actual power generated during the years 2004-09.

Short fall in possible generation was 4,586 MUs implying loss of margin of Rs 31.96 crore.

(figures in MUs)

Particulars	2004-05	2005-06	2006-07	2007-08	2008-09	Total
Possible generation in hours actually worked	9876.08	9188.43	9182.07	9991.09	9661.10	47898.77
Actual Generation	9504.34	8214.36	8468.00	9001.16	8125.27	43313.13
Deficit (-)/Surplus power generated with reference to possible generation	-371.74	-974.07	-714.07	-989.93	-1535.83	-4585.64
Percentage of Deficit with reference to possible generation	3.76	10.60	7.78	9.91	15.90	9.57

Performances of individual Units indicated that none of the Units achieved the possible generation in all the five years i.e., 2004-09 except Unit IX in one year 2004-05. The cumulative shortfall in possible generation in hours actually worked was 4,586 MUs implying loss of margin Rs 31.96 crore.

The Government in reply attributed (September 2009) the failure in achieving the possible generation to deterioration in boiler pressure parts. Had the Management included boiler and its auxiliaries of old plant while undertaking refurbishment, it could have generated the possible power.

### ***Low plant load factor***

Shortfall of generation due to low PLF was 1,143 MUs.

**2.1.11** Plant Load Factor (PLF) represents percentage of units generated and sent out to generating capacity reduced by normative auxiliary consumption. APERC fixed PLF norm at 80 *per cent*. The targeted net generation of power by the 10 Units as per APERC norms, actual net generation and deficit/surplus in net power generation during 2004-09 is indicated in **Annexure-8**. Year-wise details of Units not achieving PLF and loss of generation are indicated below:

Year	Units not achieving PLF	Loss of generation (MUs)
2004-05	NIL	NIL
2005-06	I,II, III,IV,V,VI,VII,VIII,IX & X	269.90
2006-07	V,VI,VII & VIII	232.08
2007-08	V & VI	126.91
2008-09	I,II, III,IV,V,VI,VII & VIII	514.32
<b>Total</b>		<b>1143.21</b>

The aggregate shortfall of generation due to non-achievement of PLF worked out to 1,143 MUs which was 2.64 *per cent* of energy generated during 2004-09.

The Government attributed (September 2009) the reasons for non-achievement of PLF to age of the plant.

The reply does not consider the fact that the Units were refurbished during 1998- 2004 which extended their life by another 20 years.

### ***Partial load operations***

**2.1.12** The Management in times of short supply/inferior quality of coal, other coal handling failures, failure of boiler and auxiliary equipment and other miscellaneous problems operate the Units at partial loads. Due to such operations, the shortfall in generation was 4,604.75 MUs (**Annexure-9**). Shortage of coal and receipt of inferior coal alone resulted in operation of the Units at partial load thereby resulting in shortfall of 2,251.45 MUs. However, the Management of KTPS never took up the matter of receipt of inferior quality of coal with the coal suppliers.

In addition, absence of proper and effective joint sampling mechanism to ensure receipt of quality coal and insufficient infrastructure at coal handling plant also resulted in partial load operation.



The Government accepted (September 2009) that partial load operations were due to receipt of poor quality of coal from the coal suppliers.

### Repairs and maintenance

#### Outages

**2.1.13** Outages represent the period during which the generating Unit is not available for power generation. Thermal stations have outages, which may be “planned” and/or “forced”. While planned outages are necessary for maintenance work on boilers, turbo generators (TG) etc., forced outages are due to unforeseen factors such as lack of adequate and timely preventive maintenance, shortage of coal etc.

#### Planned outages

**2.1.14** The Management as per its overhauling practices has to take up annual overhauls of boilers with duration of 15 days and capital overhaul with maximum duration of 45 days, once in every five years for each Unit.

The details of overhauls due and done during the period 2004-09 are indicated below:

Unit	Annual Overhaul		Capital Overhaul	
	To be done	Actually done	To be done	Actually done
<b>I</b>	5	5	1	0
<b>II</b>	5	4	1	1
<b>III</b>	5	5	1	1
<b>IV</b>	5	5	1	1
<b>V</b>	5	5	1	0
<b>VI</b>	5	5	1	0
<b>VII</b>	4	4	0	0
<b>VIII</b>	4	3	1	0
<b>IX</b>	5	4	1	0
<b>X</b>	5	4	1	1
<b>Total</b>	<b>48</b>	<b>44</b>	<b>9</b>	<b>4</b>

It could be seen from the above that Annual overhaul was deferred in Unit II (2006-07), Unit VIII (2004-05), Unit IX (2008-09) and Unit X (2007-08). Due to this deferment, outages were more in Units II and VIII and auxiliary consumption was more in Unit X. Similarly, Capital overhaul was delayed in Unit I (2005-06), Unit V (2006-07), Unit VI (2007-08), Unit VIII (2008-09) and Unit IX (2006-07). Due to this delay, outage was more in Unit I and auxiliary consumption was more in Unit IX.

The reason for deferment/delay was attributed to non-clearance for shutdown from Transmission Corporation of Andhra Pradesh Limited (APTRANSCO) due to Andhra Pradesh Grid conditions.

The Government stated (September 2009) that the Company was taking up with APTRANSCO to permit shutdowns to carry out scheduled overhauls as required.

***Excess time taken for overhauling and maintenance of boilers and turbo generators***

Excess time taken for overhauling led to loss of generation of 659.93 MUs.

**2.1.15** Annual shutdowns and capital overhauling of the 10 Units are tabulated in **Annexure-10**. The plant took 246 days in excess of norms for overhauling and maintenance of boilers and TGs resulting in generation loss of 659.93 MUs (loss of margin Rs 5.33 crore). Despite carrying out such overhauls, audit noticed that as against 15 days required, annual overhaul of Unit IV was carried out in 57 days (19 September 2006 to 14 November 2006). Audit analysis further revealed that capital overhaul of Unit III was also released on the same dates when Unit IV was under annual overhaul (19 September 2006 to 14 November 2006).

The Government in reply as well as in exit conference stated (September 2009) that the prolonged overhauls in Units III and IV (September–November 2006) was due to failure of coal feeding mechanism i.e. the collapse of the Coal Handling Plant (CHP) structural.

Had the preventive maintenance and renovation works of CHP were taken up along with the refurbishment of Units I to IV, these problems could have been avoided.

***Forced outages***

**2.1.16** Despite planned maintenance, there were forced shutdowns for 14,617 hours during 2004-09 in Units I to X (**Annexure-7**).

Forced outages led to generation loss of 1,542 MUs.

The forced shutdowns included 230 shutdowns exceeding 24 hours at a time (12,865 hours) due to troubles in boilers and related equipment (6,620 hours), fault in generator and its auxiliaries (3,285 hours), fault in turbines (601 hours), fault in electric equipment (1,224 hours), shortage of coal (160 hours), and other miscellaneous reasons (975 hours). The generation loss due to total forced outages was 1,542 MUs and the loss of margin was Rs 10.90 crore.

Audit analysis of forced outages revealed that:

- ❖ troubles in boiler and related equipment accounted for 51 *per cent* of the forced outages exceeding 24 hours at a time, which was mainly due to leakages in various tubes on account of non-replacement of weak tubes during shutdowns for overhauling.
- ❖ troubles in turbines and generators accounted for 30 *per cent* of the forced outages exceeding 24 hours at a time despite annual overhauling/capital overhauling indicating that not all the defects were attended to during overhauling.

The Government attributed (September 2009) forced outages to non-replacement of tubes in the boilers during annual overhauls and inherent design constraints of the equipment etc.

The reply is not convincing since the boiler and its auxiliaries were not refurbished while refurbishing the old plant in 1998-2004.

***Inadequate overhauling of Units***

**2.1.17** Audit noticed the following cases of inadequate overhauling of Units.

- ❖ Despite taking 709 hours in September 2004 against recommended 360 hours (15 days X 24 hrs) for annual overhaul in Unit I, the leaks in super heater tube continued for four times during September 2004 to March 2005 with total outages for 134 hours and generation loss of 8.2 MUs.
- ❖ Despite taking 1,295 hours from December 2005 to February 2006 against recommended 1080 hours (45 days X 24 hrs) for capital overhaul, Unit II encountered problems in economizers (boiler related equipment), turbines and primary super heaters and had tripped for 164 hours between May 2006 and October 2006 resulting in generation loss of 7.17 MUs.
- ❖ Unit IV was under frequent tripping between February 2007 and July 2007 due to super heater and economizer tube leaks involving outages for 177 hours resulting in generation loss of 8.49 MUs.
- ❖ Due to Management failure to take up the capital overhaul due in 2007, Unit VI tripped for 1,088 hours between February 2008 and May 2008 resulting in loss of generation of 105 MUs.

The Government stated (September 2009) that the capital overhaul could not be taken up due to grid constraints and the tests on generator transformer were done during annual overhauls. Hence there is no relation between generator transformers failure and non-conducting of the capital overhaul.

The reply is not correct as the generator transformer could not be tested as no periodical due overhaul was taken up.

- ❖ Though Unit VII was refurbished to achieve 120 MW generation and synchronized in May 2004 it tripped 12 times between May 2004 and October 2004 due to problems in boiler and auxiliary equipment and generator. Thereafter in November 2004, the Unit was tripped for conducting Performance Guarantee (PG) tests for 199 hours.
- ❖ Further, the economizer of Unit VII gave frequent troubles resulting in frequent tripping of the Unit and operation of the Unit with partial load. The Unit was tripped for 1,448 hours due to boiler and its auxiliaries' problems during 2004-09 and the generation loss on this account was 174 MUs.

- ❖ Though Unit VIII was refurbished (March 2004) to achieve 120 MW generation, the Unit tripped for 2,113 hours during 2004-09 due to problems in boiler and its auxiliaries and the generation loss was 254 MUs. This loss could be attributed to non-refurbishment of boilers at the time of R&M works.
- ❖ Unit X tripped in October 2006 due to fault in stator earth at generator, damage in rotor blades, guide blade carriers and damage in turbine side blades. The same was repaired at a cost of Rs 5.26 crore and synchronized in December 2006. The reasons for the failure were so far not analysed by Bharat Heavy Electricals Limited (BHEL) who was the original equipment supplier. Due to this major breakdown, the Unit was tripped for 700 hours resulting in loss of generation of 175 MUs.

### **Auxiliary consumption**

Auxiliary consumption in excess of norms was 84.18 MUs.

**2.1.18** The quantum of power consumed by auxiliary equipment of the generating station and transformer losses within the generating station is called auxiliary consumption. Further, the Government of India in line with the Electricity Act, 2003 clarified (June 2005) that auxiliary consumption shall include the power consumed at the residential colonies of the respective generating stations. As per APERC norms, the auxiliary consumption should be limited to 9.5 *per cent* of the gross energy generated. The details of power generated, power sent out and auxiliary consumption are indicated in **Annexure-11**. The auxiliary consumption in respect of Units V & VI during 2004-09 was 10.24 *per cent* which exceeded the norm by 0.74 *per cent*, in respect of Units IX and X was 9.81 *per cent* which exceeded the norm by 0.31 *per cent* during 2005-06, 2007-08 & 2008-09. This resulted in excess consumption of 84.18 MUs of energy costing Rs 12.14 crore.

The Government while accepting the audit contention stated (September 2009) that there was excess auxiliary consumption due to inherent design constraints in Units V and VI, partial load operations in Units IX and X and deferring of overhauls and use of power for construction loads in Unit XI.

The fact remains that Management failed to rectify the inherent design constraints in Units V and VI while undertaking refurbishment, make efforts to avoid partial load operations and carry out overhauls on time in Units IX and X.

### **Energy Audit**

#### ***Non-implementation of energy audit recommendations***

Due to non-implementation of energy audit recommendations, power valuing Rs 5.63 crore per annum was continued to be consumed for auxiliary purposes.

**2.1.19** As per the provisions of Energy Conservation Act, 2001, all energy intensive industries should get their Units audited by accredited energy auditor. Energy Audit is meant for verification, monitoring and analysis of use of energy, which includes submission of technical report containing recommendations for improving energy efficiency with cost benefit analysis and an action plan to reduce energy consumption.

As per the directions of CERC, NTPC Limited conducted Energy Audit of old plant between July 2006 and October 2006 and identified certain areas in Units I to VIII where energy savings could be achieved to the extent of Rs 5.63 crore per annum in the auxiliary consumption provided the stations carry out Polymer Coating for Circulating Water Pump (CWP) internals and install on-line energy monitoring system at a cost of Rs 1.51 crore. However, the Management is yet to implement the recommendations.

Further, mandatory energy audit due for Units IX and X is yet to be taken up (September 2009).

The Government, while accepting non-implementation of recommendations, stated (September 2009) that major works were proposed to be taken up in old plant during the ensuing overhauls. It was also stated that in respect of new plant, they are negotiating the rates with NTPC for conducting Energy Audit.

### Inputs management

#### *Procurement and consumption of coal*

**2.1.20** Coal is the major input for generation of thermal power. Out of the total generation cost of Rs 5,768.06 crore in KTPS, coal cost constitutes Rs 3,444.38 crore which represents 59.71 per cent of generation cost during the review period.

#### *Linkage*

**2.1.21** The KTPS for its coal requirement entered into Fuel Supply Agreement (FSA) with The Singareni Collieries Company Limited (SCCL) from 2005-06 to 2007-08, for the supply of coal to the tune of 59 lakh MTs per annum. The actual receipts of coal from SCCL during the period were 61.97 lakh MTs, 63.06 lakh MTs and 69.98 lakh MTs respectively. The plants also procured 66.58 lakh MTs in 2008-09 pending finalisation of FSA.

CEA and Ministry of Coal gave clear directions (September/October 2007) to have long term linkage for supply of coal. The Company obtained long term linkage for new plants. However, it failed to obtain the same for old plants. There was no record to show that the Company had taken up the matter with coal company for having long term coal linkage.

During 2008-09, to meet the gap between supplies pending FSA and actual requirement, Management of plants procured (September 2008 to November 2008) 1,77,276 MTs of coal through e-auction from SCCL at a premium cost of Rs 59.38 crore. The average landed cost of coal supplied under FSA was Rs 1,523 per MT whereas the coal procured under e-auction was at Rs 4,271 per MT. Thus, due to failure of the Management to assess the requirement of coal for generation and get themselves linked with a Colliery for long term supply of coal resulted in procurement of coal through e-auction resulting in the excess expenditure Rs 48.72 crore in 2008-09 (1,77,276 MTs X Rs 2,748).

There was no long term linkage for supply of coal for old plant.

Lack of efforts to renew FSA led to procurement through e-auction resulting in extra expenditure of Rs 48.72 crore.

The Government stated (September 2009) that existing long term linkages were found to be inadequate and the enhancement of the linkage quantities was taken up with CEA in May 2005. However, the fact remains that since May 2005 there was no progress despite reminders from CEA/ Ministry of Coal in September/ October 2007.

***Excessive transit and handling loss of coal***

**2.1.22** The percentage of transit losses of coal suffered by the plants ranged between 0.95 and 2.71 (**Annexure-12**) during the years 2004-09 which was in excess of the norm of 0.8 *per cent* fixed by CERC (March 2004). The cumulative quantity of transit and handling loss in excess of the CERC norm was 2.43 lakh MTs valued at Rs 25.36 crore. APERC, however, approved the transit loss of coal at three *per cent* uniformly throughout the years 2004-09. This may have resulted in the issue not getting adequate attention of Management.

The Government while admitting above fact stated (September 2009) that the transit losses and windage and shrinkages were on high side and attributed the excess losses to calibration problems of weighbridges, differences between the invoiced and actually received quantity and vastness of stock yard area.

***Excess consumption of coal***

**2.1.23** APERC, while approving generating tariff for 2004-05 onwards, stipulated heat rate for various Units of old and new plants. Details of average calorific value of coal, stipulated heat rate, standard consumption of coal per unit of generation, actual generation, standard and actual consumption of coal on the power generated and extra expenditure on coal consumption are tabulated in **Annexure-13**. It could be seen from the Annexure that consumption of coal was more than the norms prescribed by the APERC in Units I to IV to the tune of 3.33 lakh MTs valued at Rs 35.11 crore during the years 2006-09.

The Government stated (September 2009) that the excess consumption of coal in Units I and II was due to poor quality of coal and the age of boilers. However, the Management did not include boilers while undertaking refurbishment works to arrest frequent tube leakages and ensure proper functioning of pressure parts and air heating mechanism so that heat rate is sustained thereby coal consumption is controlled.

***Non-Synchronization of coal shed at old station***

**2.1.24** The CHP of old station was refurbished during the period from 2003-08 at a total cost of Rs 10.03 crore. While the refurbishment works were in progress, it was proposed (2006) to construct a coal storage shed of 50,000 MTs capacity at an estimated cost of Rs four crore with the justifications:

- ❖ to stack surplus daily receipts of coal over daily consumption, and

- ❖ to stack wet coal received during rainy season which cannot be fed to the Unit bunkers directly for generation due to handling problems.

Management's efforts to construct the coal storage shed did not fructify for want of funds.

The proposal was later approved in September 2008 at a revised cost of Rs six crore, but the tenders received have not yet been finalized (September 2009). In the absence of a proper coal storage shed coal was being stored in open yard and consequently it becomes wet. The wet coal was directly fed into the bunkers resulting in loss of 455 MUs generation (taking an average rate of 65 MUs per year) besides escalation of the cost of shed by Rs two crore.

The Government stated (September 2009) that the existing coal shed available at the integrated coal handling plant of the old plant is meeting the present needs and the dry coal feeding was not affected due to non-existence of proposed shed.

The reply is not correct since Management itself blamed wetting of coal as one of the reasons for shortfall of generation.

### *Consumption of grinding media*

Grinding media consumed in excess of norms was valued at Rs 5.66 crore.

**2.1.25** In the process of pulverization of coal Grinding Media (GM) balls are being used. The designer of the plant recommended the life of GM as 0.2 kg per tonne of coal consumed, where Gross Calorific Value (GCV) of coal was 3,000 Kcal. It was seen that Units I to IV (2004-09), IX & X (2004-08) utilized (**Annexure-14**) 5,496.09 MTs of GM as against 3,566.67 MTs to be utilized as per the standard. The GM consumed in excess of standards was 1,929.42 MTs valued at Rs 5.66 crore.

The Government stated (September 2009) that excess consumption of GM was due to poor quality of coal. The reply is not convincing as the GCV of the coal utilized ranged between 3,087 and 3,658 Kcal which was more than the GCV specified by the designer.

### *Consumption of fuel oil in excess of norms*

Fuel oil consumed in excess of norms was valued at Rs 4.17 crore.

**2.1.26** As per the APERC norms consumption of fuel oil is two ml per unit of power generated. The details indicating norms of oil consumption fixed by CERC/APERC, actual units generated, standard requirement of oil, oil actually consumed and excess oil consumed during the five year period 2004-09 is given in **Annexure-15**. Audit analysis revealed that all the Units in 2004-09 achieved the norms except four Units (V, VI, VII and VIII) which consumed fuel oil 1,230.42 KL valued at Rs 4.17 crore (assuming the rate of fuel oil at Rs 33,910 per kilolitre) in excess of the norms during the year 2008-09.

Further analysis of coal and fuel oil consumption during the period 2004-09 indicated as under.

Particulars	2004-05	2005-06	2006-07	2007-08	2008-09
<b>Old plant</b>					
Coal consumption (MTs)	3799197	3635858	3802038	4122779	3971057
Fuel Oil Consumption (KLs)	5543.00	5022.00	6207.00	4721.00	8832.00
Actual Generation (MUs)	5364.14	4732.26	4787.31	5030.28	4462.12
<b>New plant</b>					
Coal consumption (MTs)	2573440	2386213	2635610	2931169	3002195
Fuel Oil Consumption (KLs)	1781.32	2054.09	1324.11	1465.42	3824.67
Actual Generation (MUs)	4140.20	3482.10	3680.69	3970.88	3663.15

From the above it was observed that despite an increase in consumption of both coal and fuel oils in KTPS during 2008-09 generation of power was very less as compared to the earlier four years (excepting coal consumption in old station during 2007-08) i.e., 2004-08. This indicates the efficiency in utilisation of fuels during 2008-09 was very poor.

The Government stated (September 2009) that the excess consumption was due to poor quality and shortage of coal and frequent trippings of the Units.

The reply is not convincing since the average GCV of the coal received was 3,687 KCal in old plant and 2,804 KCal in new plant during 2008-09 indicating that the coal received was of desired quality as per FSA. Further, the Management failed to take up proper preventive maintenance of the plants leading to consequential frequent trippings.

#### **Residual life assessment, life extension (Refurbishment)**

Comprehensive refurbishment was not taken up for old plant

**2.1.27** Units I to IV of old plant were installed in 1966-67 and Units V to VIII were installed during 1974-78 and these were more than 30 - 40 years old. Hence, these Units were taken up for refurbishment during 1997 to 2004, in pursuance of the policy of Government of India to optimize power generation. The refurbishment work of the Units I to IV was awarded during 1998-2000 at a cost of Rs 175 crore. Though the refurbishment should be comprehensive to include both turbine and boiler, the work was restricted only to turbine and related works thereby leaving out refurbishment of boiler related works. Due to the partial refurbishment these Units were operating at an average load of 52 MW against its installed capacity of 60 MW each. Therefore, another life extension and modernization proposal at an estimated cost of Rs 117.27 crore involving 59 activities on boiler area was approved and the works are yet to be taken up (September 2009).

Thus failure of the Management to take up comprehensive refurbishment of both boilers and TGs necessitated fresh refurbishment of both boiler and turbines within seven years of partial refurbishment.



**2.1.28** The Units V to VIII in old station, which were having 110 MW capacity each, were refurbished during June 2000 and May 2004 at a total cost of Rs 372 crore resulting in the up-gradation of these Units to 120 MW capacity. BHEL which carried out such refurbishment, guaranteed the achievement of enhanced capacity of 120 MW and an assured PLF of 80 *per cent* of these Units for another 20 years.

However Units V and VI could achieve the PLF of 76.70 *per cent*, 77.11 *per cent* and 73.84 *per cent* only in the years 2005-06, 2006-07 and 2007-08 respectively and availability of Unit for generation was also reduced to 87.08 *per cent* in 2005-06 besides steep increase in auxiliary consumption up to 10.27 *per cent* in 2006-07 as against norm of 9.5 *per cent*. Further the air heaters replaced during refurbishment works in 2000-01 had to be replaced once again at a cost of Rs 11.48 crore due to severe erosion. In addition another proposal for R&M works to Units V and VI were taken up in December 2008 at an estimated cost of Rs 58.15 crore. Thus failure of the Management to enforce contractual obligations of BHEL, led to non-achievement of guaranteed life extension, besides incurring expenditure of Rs 11.48 crore on replacements of air heaters.

**2.1.29** As regards Units VII and VIII, audit observed that economizer and air pre heaters were replaced during the refurbishment carried out during 2000-2004. However, the economizers and air pre heaters so replaced got eroded due to flue gases resulting in deterioration in the performance of these Units from 2005-06 thereby necessitating a fresh proposal for another renovation at an estimated cost of Rs 163.20 crore which is still under approval.

Audit analysis of refurbishment works also revealed that:

- ❖ in Units VII and VIII refurbishment work was carried out between 10 and 12 months as against the agreed time of five months.
- ❖ the defective HP heater replaced is yet to be erected.
- ❖ third primary air fan has not been erected so far (September 2009).
- ❖ Two crore rupees relating to the buyback arrangement of surplus spares is yet to be recovered.

The Government confirmed (September 2009) that during the refurbishment boiler and its auxiliary parts were not taken up, even though certain major spares in boiler area were replaced. The air pre-heaters and economizers were replaced after completion of their life of six to seven years i.e. during 2008.

The reply is not convincing since replacement of economizers and air pre-heaters was done in May 2008, the performance of the Units has steeply fallen down within 24 months after completion of the refurbishment works which indicates that failure to include the boilers in the refurbishment

works resulted in non achieving the performance levels as envisaged in the refurbishment plan.

### **Inventory management**

#### **Stores and spares**

**2.1.30** APERC fixed a norm of 12 months' consumption for inventory holding for the purpose of reimbursement of interest on working capital. The table given below indicates the opening balance, receipts, issues, and closing stocks of stores and spares (other than fuel oil) during 2004-09:

**(Rupees in crore)**

Year	Opening Balance	Purchases	Consumption	Closing Balance	Closing Balance equivalent to months consumption
<b>Old Plant</b>					
2004-05	74.22	39.26	17.92	95.56	64
2005-06	95.56	19.77	22.73	92.60	49
2006-07	92.60	6.88	20.29	79.19	47
2007-08	79.19	32.70	25.25	86.64	41
2008-09	86.64	Cost Accounts are yet to be finalized			
<b>New Plant</b>					
2004-05	14.13	19.62	14.17	19.58	17
2005-06	19.58	26.52	23.60	22.50	11
2006-07	22.50	22.31	20.90	23.91	14
2007-08	23.91	32.32	14.50	41.73	35
2008-09	41.73	Cost Accounts are yet to be finalized			

It could be seen from the table that the inventory holding of old plant ranged between 41 and 64 months of consumption while it ranged between 11 and 35 months of consumption during the period from 2004-08 in respect of new plant. The value of inventory held on 31 March 2008 stood at Rs 128.37 crore (86.64 crore + 41.73 crore) is in excess by Rs 88.62 crore than 12 months' consumption (Rs 39.75 crore allowed by APERC). The carrying cost incurred on such excess holding worked out to Rs 8.86 crore per annum (calculated at minimum borrowing rate of 10 *per cent* per annum). Further the Company had not classified its stores as vital, essential and desirable (VED) categories indicating lacunae in inventory management.

Analysis of slow-moving (Rs 68.37 crore) and non-moving (Rs 24.88 crore) items valued at Rs 93.25 crore lying in stores were as follows.

- ❖ twenty five items (old plant) valued at Rs 0.98 crore and two items (new plant) valued at Rs 0.06 crore are in stock for more than 10 years.
- ❖ forty seven items (old plant) valued at Rs 4.42 crore and 224 items (new plant) valued at Rs 10.90 crore were lying in stock between five years to 10 years.

- ❖ nine hundred fifty two items (old plant) valued at Rs 54.19 crore and four hundred and fifty four items (new plant) valued at Rs 22.70 crore are held in stock for less than five years.

Audit further noticed that:

- ❖ the stock of non-moving stores increased from Rs 2.44 crore in March 2005 to Rs 6.78 crore in March 2009 (new plant);
- ❖ the construction material purchased in excess of requirement was Rs 1.92 crore which was lying in stores for more than 10 years;
- ❖ five hundred and one items of stores were not assigned with any value;
- ❖ despite having two instant standby motors in CWP, Management procured (May 2005) one more motor at a cost of Rs 70.06 lakh without justification which is still lying in stock without utilisation.

Thus improper inventory management led to unwarranted holding of spares and stores for longer periods and incurring of interest on carrying cost every month.

The Government attributed (September 2009) accumulation of inventories to availability of spares that were supplied with original equipment and due to enhancing of the capacities of Units V to VIII etc., and assured to introduce the inventory control techniques like categorization of material as VED and computerization of inventory management etc. It was also stated that accumulation is due to vital importance of the power sector and to the huge lead time in procurement.

The reply is not convincing since all the above factors were taken into consideration by the APERC while fixing the limits for inventory holding and consequent reimbursement of cost of working capital. Hence, necessary efforts should be made to maintain the inventory levels within norms.

### ***Fuel oil***

**2.1.31** Furnace Oil (FO) and High Speed Diesel are used as secondary fuel in old plant while FO and Light Diesel Oil are used in new plant. APERC fixed a norm of 2 months' consumption for stock holding for the purpose of reimbursement of interest on working capital. The table given below indicates

**Holding of Fuel Oil stock in excess of norms led to extra carrying cost of Rs 5.89 lakh per month.**

the value of opening balance, receipts, issues and closing stocks of fuel oil during 2004-09:

**(Rupees in crore)**

Year	Opening Balance	Purchases	Consumption	Closing Balance	Closing Balance in months consumption
<b>Old Plant</b>					
2004-05	5.02	8.19	9.28	3.93	5
2005-06	3.93	10.82	9.81	4.94	6
2006-07	4.94	14.59	14.04	5.49	5
2007-08	5.49	11.84	10.93	6.40	7
2008-09	6.40	Cost Accounts are yet to be finalized			
<b>New Plant</b>					
2004-05	0.86	3.27	2.79	1.34	6
2005-06	1.34	3.33	3.57	1.10	4
2006-07	1.10	3.95	2.77	2.28	10
2007-08	2.28	3.97	3.21	3.04	11
2008-09	3.04	Cost Accounts are yet to be finalized			

It could be seen from the table that the stock holding of fuel oil ranged between five and 11 months' consumption during 2004-08. The value of stock held on 31 March 2008 stood at Rs 9.44 crore (Rs 6.40 crore + Rs 3.04 crore) is in excess by Rs 7.08 crore than 2 months' consumption (Rs 2.36 crore) allowed by APERC. The carrying cost on such excess holding worked out to Rs 5.89 lakh per month (calculated at minimum borrowing rate of 10 *per cent* per annum).

The excess holding was attributed (September 2009) to shortage / poor quality of coal receipts, coal feeding problems due to wetness, partial load operations etc. and was stated to be unavoidable.

Since APERC is admitting only two months consumption for working capital calculation purpose, excessive holding is leading to extra financial burden on the Company.

### **Environmental safeguards**

#### ***Utilisation/disposal of fly ash***

**2.1.32** Ash is the principal waste product of combustion of coal in the boilers. Ministry of Environment and Forests (MoEF) issued a notification in September 1999 mandating all coal and lignite based thermal power stations to utilize 100 *per cent* fly ash so that disposing of the same in ash pond could be gradually phased out.

In order to abide by the notification, Management of old plant proposed to install "SILO", a system in which the dry fly ash will be blown through pipe lines with the help of blower fans to be collected at a storage tank for further disposal. Accordingly, two contracts were awarded (October 2007) viz. (i) for design and engineering, manufacture, testing of equipment of fly ash system at a cost of Rs 60.05 crore and (ii) complete civil and structural works for fly ash system at a cost of Rs 24.61 crore. These works were scheduled to be completed by November 2008 (Units I, V & VII), January 2009 (Units II, VI &

Equipment for dry fly ash disposal valued at Rs 50.50 crore could not be installed due to dispute over responsibility for site clearance.

VIII), March 2009 (Unit III) and May 2009 (Unit IV). After abnormal delay, KTPS received (March 2009) the equipment so designed and manufactured valuing Rs 50.50 crore. However, the same could not be installed till June 2009 due to a dispute as to who would clear the dumps, underground cables and other obstacles in the site. It was also observed that KTPS failed to synchronize the receipt of equipment with site clearance and required civil works resulting in delay in providing fly ash system besides non-implementation of Government of India orders.

**2.1.33** The Management of new plant prepared (September 1999) an action plan for 100 *per cent* utilisation of fly ash generated from Units IX and X by 2007-08. Accordingly, it entered (May 2005) into Memorandum of Understanding (MoU) with four cement manufacturing and other industries for disposal of fly ash. However, the actual utilisation achieved by 2008-09 was only 49 *per cent* resulting in disposal of balance fly ash in the form of slurry to ash pond. Thus, failure of the Management to insist compliance of MoU led to non-achievement of targets as per action plan besides failure to adhere to notification of MoEF.

The Government stated (September 2009) that the implementation of the project is in progress and attributed the delays to non-availability of skilled manpower and un-expected site related problems.

The reply belies the fact that the Company failed to take advance action for making the site ready in all respects before placing orders for the equipments. The delay in installation of the equipment also leads to loss of interest on borrowed funds besides losing benefit of performance guarantee.

### *Air pollution*

**2.1.34** Andhra Pradesh Pollution Control Board (APPCB) prescribed a maximum of 115 milligram per cubic meter (mg/Nm<sup>3</sup>) of Suspended Particulate Matter (SPM) in the flue gas emissions of the plant. Table below indicates the actual SPM levels for the period 2004-09 for both the old and new plants:

**(Figures in mg/Nm<sup>3</sup>)**

Unit	2004-05		2005-06		2006-07		2007-08		2008-09	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
I	228	75	112	98	140	102	115	90	110	82
II	332	138	402	304	312	112	321	96	114	74
III	378	168	398	172	352	98	189	109	186	138
IV	104	81	104	65	110	95	112	83	96	74
V	114	66	130	80	118	108	127	84	98	68
VI	72	44	105	62	120	90	122	92	108	72
VII	163	82	120	105	148	80	290	99	136	90
VIII	123	81	138	108	126	110	132	108	118	96
IX	NA	NA	86	76	95	80	98	90	118	96
X	NA	NA	105	79	95	80	99	90	112	92

Audit observed that in respect of Unit II, during 2004-09 the SPM readings exceeded the norm in maximum readings during the period 2004-08. In Unit

III, maximum readings exceeded the norms in all the five years. In Unit V, the maximum readings exceeded during 2005-06, 2006-07, and 2007-08. In respect of Units VII and VIII, the maximum readings were on high side during the entire five-year period.

Though APPCB was issuing continuous notices to the Management of old plant from January 2008 to maintain on-line continuous stack dust monitoring equipment in Units III, V and VI the same were not installed due to non-availability of Units for shutdown. Thus, the failure of the Management to install the monitoring equipment resulted in continuous air pollution.

The Government stated (September 2009) that shutdowns for installation of the equipment could not be permitted due to shortage of power.

The reply is not convincing as it is also the responsibility of the Government to give credence to environmental issues.

### **Noise pollution**

**2.1.35** As per the APPCB, day time and night time noise pollution has to be restricted to 75 decibels (dbs) and 70 dbs respectively. Table below indicates noise pollution achieved by old and new plants.

(Figures in dbs)

Area	Units	2005-06		2006-07		2007-08		2008-09	
		Max	Min	Max	Min	Max	Min	Max	Min
Turbine	Old Plant	89.5	58.8	91.9	75.6	99.1	80	98.2	77.2
	New Plant	85	71	86	72	85	70	87	74
Generator	Old Plant	89.8	84.0	91.7	75.5	97.5	83.1	98.2	77.2
	New Plant	86	70	87	71	86	70	87	72
Mills	Old Plant	99.6	88.9	99.8	72.4	103.6	80.1	102.8	67.4
	New Plant	87	77	86	76	87	75	88	76
Crusher	Old Plant	98.5	83.0	93.8	81.3	101.3	88.5	98.5	77.4
	New Plant	89	86	88	85	87	85	86	85
UCB	Old Plant	71.3	65.0	84.7	61.3	89.7	60.1	89.2	60.7
	New Plant	55	50	54	50	50	48	50	49

In turbine area in old plant, noise levels were above the norms in both maximum and minimum readings in the four-year period from 2005-06 to 2008-09 except the minimum readings in 2005-06. In respect of new plant, the maximum readings were on high side in the above said period. In mills area and in crusher area, both the plants exceeded the norms both in maximum and minimum readings. In Unit Control Board area, in respect of old plant, the maximum readings crossed the norms of noise levels.

The Company is required to provide acoustic enclosures and the intake exhaust system has to be provided with silencers besides using damping material such as thin rubber/led sheet at work places to reduce vibrations.

The Government, while accepting that noise levels at the equipment are slightly higher occasionally, stated (September 2009) that necessary steps are being taken to achieve the levels as per norms.

### ***Water pollution***

**2.1.36** As per the APPCB guidelines water pollution should be in the range of 6.5-8.5 (pH). However, the pH level (a unit of Hydrogen Ion concentration) of both sedimentation tank effluent water and ash pond effluent water ranged between pH 6.8 – 8.96 for old plant, while new plant was maintaining water pollution level during 2004-09. Audit observed that despite directions (August 2008) by APPCB to take measures to arrest leakages in pipelines to prevent discharge of ash slurry into the nearby water sources (Karakavagu/Kinnersani River), no remedial action has so far (September 2009) been taken.

Similarly as per APPCB norms the Total Suspended Solids (TSS) should be 100 milligrams (mg) / litre of water. However, TSS in old plant was upto 300 mg / litre in 2004-05 and 115 mg / litre in 2005-06. In new plant, TSS was upto 505 mg/litre in 2005-06 in ash pond effluent water and 880 mg/litre in 2005-06 in Sediment Tank Effluent water.

The Government stated (September 2009) that various measures are being taken to minimize the water pollution.

### **Safety measures**

#### ***Lack of adequate safety measures***

**2.1.37** The following inadequacies were noticed in safety measures taken by the Company.

#### ***Coal handling plant (CHP)***

**2.1.38** The CHP of old plant was not having integrated fire-fighting system. An audit analysis of the effectiveness of the fire fighting system revealed the following:

- ❖ The existing system was not optimally utilized due to non-existence of proper water resources required to meet fire exigencies.
- ❖ No hydrant system, smoke detection system and portable fire extinguishing equipment exist in the plant.
- ❖ No sufficient manpower for the operation of the existing fire fighting equipment in the safety division was available with the plant. As against the 32 personnel sanctioned for the safety division only 13 were on rolls as at February 2009. The fire station was not provided with sufficient infrastructure to shelter the men and machinery of the fire fighting system.

The Government stated (September 2009) that steps were being taken to establish the integrated fire fighting system for the coal handling plant.

***Inordinate delay in carrying out the improvements to fire fighting system***

**2.1.39** Management of old plant placed two Purchase Orders (PO) (March 2003) for:

- ❖ supplying material required for making improvement of the fire protection system for a total value of Rs 56.53 lakh, and
- ❖ service part of the system at a cost of Rs 7.17 lakh.

The Purchase order stipulated that supplies should be completed within four-five months from the date of PO i.e., by the end of December 2004. The firm supplied the material valued Rs 56.53 lakh by August 2005 but did not commission the system so far (September 2009) for want of additional material valued Rs 15.26 lakh required for erection of the system. The Management however did not take (September 2009) any decision regarding the procurement of additional items resulting in a vulnerable situation of not providing required fire protection system since 2003.

The Government stated (September 2009) that additional items required for installation of the equipment are being procured for completion of the work.

***Failure to carry out the improvements to fire fighting system***

**2.1.40** The existing fire fighting system in Units I to IV of old plant became ineffective and inefficient due to long service and wear and tear. Though an order for Design, Manufacture and supply of fire protection system including augmentation of existing system was placed (February 2003) for Rs 45 lakh, neither the firm supplied the system nor did the Management pursue the supplier resulting in continued dependence on old and ineffective system.

The Government stated (September 2009) that the supplier had backed out from the execution of the contract and there was no coordination between the field and corporate office of the Company and alternate arrangements were made.

The reply is not convincing as it is the responsibility of the Company to ensure performance of contract by the suppliers and coordination among staff.

**Acknowledgement**

Audit acknowledges the co-operation and assistance extended by the staff and the Management of the Company at various stages of conducting the Performance Audit.



## Conclusion

*The KTPS achieved the norm of generation prescribed by CEA. However, the operation of KTPS by Company did not meet the expectations as follows:*

- ❖ Though refurbishment works were carried out for eight Units, only three out of ten Units could achieve the generation as per norms fixed by CERC/APERC.*
- ❖ None of the Units generated the possible power during the actual hours of operation.*
- ❖ Despite taking time in excess of standards set by the Company for overhauls, there were forced shutdowns for 14,617 hours.*
- ❖ Recommendations of energy audit were not implemented leading to continued excess auxiliary consumption in old plant. Energy audit was not conducted for new plant.*
- ❖ Long term linkage for coal supply was not obtained. Failure to enter into Fuel Supply Agreement beyond 2007-08 led to procurement of coal in e-auction incurring additional expenditure of Rs 48.72 crore.*
- ❖ Dry Fly Ash was not disposed as per guidelines of Government of India/APPCB and norms for noise and air pollution controls were not maintained.*
- ❖ Safety measures taken were inadequate.*

## Recommendations

*The Company needs to:*

- ❖ ensure that refurbishment/renovation works are taken up comprehensively to achieve the desired capacity enhancement;*
- ❖ ensure timely preventive maintenance and up-keep of the plant and equipment to avoid forced shutdowns of the generating Units;*
- ❖ ensure uninterrupted and timely supply of coal to avoid shutdowns and partial load operations;*
- ❖ implement environment safeguards to bring various parameters of pollution control within prescribed limits.*
- ❖ ensure adequacy of safety measures.*

## Andhra Pradesh State Housing Corporation Limited

### 2.2 IT Audit Report on INDIRAMMA Housing Project Management and MIS

#### Executive Summary

*The A.P. State Housing Corporation Limited was incorporated in July 1979 with the main objective to formulate, promote and execute various housing schemes on behalf of State and Central Government for the benefit of weaker sections. The Government of A.P. launched (May 2006) a new housing programme under INDIRAMMA and to monitor the financial and physical progress of the scheme, the Company developed a web-based application software.*

#### **Application Software**

*The application software was developed (January 2007) with client server technology with POSTGRE SQL as database, Java as front end and Redhat Linux as Operating System.*

#### **Investment and Finance**

*The Company procured Laptops, Digital Cameras, Printers and other hardware at a total cost of Rs 7.38 crore and incurred an expenditure of Rs 1.57 crore (March 2009) towards software development. The Company also incurs a monthly expenditure of Rs 5.34 lakh towards maintenance.*

#### **Project Management**

*The Company did not follow the accepted software development life cycle. There was no feasibility study. The Company did not enter into an agreement with Centre for Good Governance (CGG). System design documents, process control specification documents and test documents were not provided by CGG.*

#### **Absence of policy, strategy and planning**

*The Company has not formulated any IT policy or drawn up any IT strategy for preparation of long term and short term plans*

*for computerisation. 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.*

#### **Incomplete data**

*The database developed was not complete or accurate 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. The data entry was also not supervised.*

#### **Inadequacies**

*The application did not provide for adequate Input controls. The security for online transactions was inadequate. Business Rules were also not incorporated in the application software. Inadequacy of such controls led to disbursement of Rs 479.55 crore to multiple beneficiaries under one ration card and Rs 4.15 crore to the same beneficiaries under different IDs in contravention of the Scheme guidelines. Non-incorporation of business rules also resulted in allotment of houses under SPR Scheme to beneficiaries other than STs, short-recovery of administrative charges and issue of cement in excess of norms fixed. Lack of security in seamless transfer of files also led to fraudulent payment of Rs 2.29 crore to persons other than beneficiaries.*

#### **Recommendations**

*The Company should draw up and document IT Policy and Security Policy, Change Management Policy, Business continuity plan with adequate validation checks.*

(Chapter 2.2)

## **Introduction**

**2.2.1** Andhra Pradesh State Housing Corporation Limited, Hyderabad (Company) was incorporated in July 1979 as a wholly owned Government Company with the main objective to formulate, promote and execute housing schemes for the benefit of people in general and the weaker sections in particular.

The Company implements various housing schemes for the homeless families below poverty line (BPL) in the State belonging to different occupational groups with Central/State assistance by arranging financial, material and technical assistance. In place of the existing Rural and Urban Housing Schemes, the Government launched (May 2006) a new programme, named “Integrated Novel Development in Rural and Model Municipal Areas” (INDIRAMMA) with a goal to develop all the villages and municipal towns in the state in a phased manner. This goal was planned to be achieved in a phased manner over a period of three years with a saturation approach.

Under the above scheme, the Government sanctioned 21,77,069, 25,71,161 and 25,16,059 houses (both in Rural and in Urban areas) between 2006-07 and 2008-09, under Phase I, II and III respectively. The basic unit cost of a house in Rural Areas was Rs 25,000 and of that in Urban areas was Rs 40,000. The unit cost consists of three elements viz., Subsidy, Loan and Beneficiary Contribution. The beneficiaries construct individual houses on self-help/mutual help basis and payment/material is released to them at various stages viz., Basement Level (BL), Lintel Level (LL), Roof Level (RL) and Roof Cast (RC). Apart from the Beneficiary Contribution, Admission Fees and Administrative Charges are recovered from the beneficiary. These are adjusted at the time of making payment to the beneficiary.

To monitor the financial and physical progress of the scheme, the Company developed a web-based application software.

## **Organisational set up**

**2.2.2** The management of the company is vested in a Board of Directors (Board). As on 31 March 2009, there were 12 Directors including a Chairman. The Managing Director is the Chief Executive and is assisted by an Executive Director, one Chief General Manager (Finance), one General Manager (Finance), one Chief Engineer and three Superintending Engineers at the Head Office. The Company has set up offices in all the Districts headed by District Manager, assisted by Deputy Executive Engineers (DEE) (at Divisional Level) Assistance Engineers (AEs)/ Mandal In Charge (MIC) and Work Inspectors (at Mandal Level).

### Information systems set up

2.2.3 The web-based application software for monitoring the implementation of various housing schemes was developed with POSTGRE as back end and Java as front end. The operating system in use is Red hat Linux. The IT system architecture was client server.

### Criticality of the database

2.2.4 The details of the beneficiaries under various housing schemes <sup>1</sup> like beneficiary ID number, ration card number, names, photographs, addresses and the stage of the house constructed, along with value of cement issued and the amount disbursed are captured in the database. The database is thus critical and is vital for monitoring the stage-wise progress of the houses under construction, amounts to be disbursed, and recovery of Admission Fees, Beneficiary Contribution and administrative charges. Further, the above data would also be useful to arrest double payments.

### Audit Objectives

- 2.2.5 The IT Audit of the application software was conducted with a view to
- ❖ Ensure that the process of software development was consistent with the accepted industry standards.
  - ❖ Ensure that the application software supports various systems of procedure, guidelines issued relating to various housing schemes.
  - ❖ Ensure that business rules were incorporated in the application software.
  - ❖ Ensure that adequate input, process and output controls exist in the application software and the data captured in the system were accurate, complete and valid.
  - ❖ Ensure that the application software has achieved the objectives with which it was developed.

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<sup>1</sup> INDIRAMMA Rural and Urban Housing Schemes, Indira Awaas Yojana (IAY), Weavers Housing Programme, Fishermen Housing Programme, Beedi Workers Housing Programme, Jawaharlal Nehru National Urban Renewal Mission (JNNURM) and Integrated Housing and Slum Development Programme (IHSDP).

### **Scope and methodology of audit**

**2.2.6** All matters relating to development of the application software and its utilisation in monitoring the implementation of various housing schemes covering the transactions in four<sup>2</sup> out of 23 District offices and at Head Office were reviewed.

The data, covering transactions up to the end of March 2009, furnished by the Company was scrutinised using the Generalised Audit Software –IDEA. The results of queries were compared with the physical records/documents available at the Head Office and District Offices and also as displayed on the Company’s website.

The methodology adopted also included

- ❖ Scrutiny of Agenda and Minutes of the Meetings of the Board of Directors, other files/records relating to implementation of application software.
- ❖ Discussions with staff and Officers of the Company at Head Office and District Offices which were later documented.

### **The process of making payments to beneficiary**

**2.2.7** Before the introduction of the application software, the progress in the construction of the house by the beneficiary was inspected by the Work Inspector and was reported to the AE. The AE would then inspect the progress, update it in the Measurement Book, prepare the bill and present it to the DEE. The DEE would inspect *ten percent* of the physical progress and pass the bill for payment.

After the introduction of the application software, the entire process from entering the master data to making payment of the Unit Cost to the beneficiary is automated. The initial master data relating to beneficiaries is entered in the database by the Data Entry Operator (DEO) at the Mandal Level. The services of DEOs were specially outsourced for the purpose. The progress of the construction of the house is supervised by the Work Inspectors. One AE, now designated as Mandal In charge (MIC), was made in charge of one Mandal and as the strength of the existing AEs was not adequate, services of private persons as MICs were also outsourced. The MIC updates the stage of the house, uploads the image of the latest phase of construction and then generates Cement Release Order for issue of cement, or Payment Release Order for releasing payment online to the bank account of the beneficiary. Under Phase II and Phase III, the payments are released to the bank accounts of Village

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<sup>2</sup> Sangareddy, Kurnool, Warangal and Visakhapatnam.

Organisations/Self Help Groups (VOs/SHGs) of which the beneficiary is a member. The VOs then make payment to the beneficiary.

For this purpose, the Company procured Laptops, Digital Cameras, Printers and other hardware at a total cost of Rs 7.38 crore.

### Constraints faced by Audit

**2.2.8** The size of the Data dump covering the transactions between 2006-07 and 2008-09 was large and was about 10 GB in size. The data for images was found to be around 3 TB, and there was no Magnetic Media, which could be used to import and analyse the images. Depending upon the requirement, Audit looked up/ viewed the images on the website of the Company. Though certain cases of duplicate images were detected in audit, help of any specialised software could not be taken because of lack of storage space.

Further, when the Audit party queried the database for existence of duplicate ration cards, or more than one beneficiary on one ration card, it was seen that the field “Ration Card Number” contained irrelevant characters. The ration card issued to a family should contain three alphabets followed by 12 numbers-a total length of 15 characters. There were 14,90,632 (out of 22,41,412), 2,64,741(out of 24,08,011) and 1,036 (out of 17,97,591) records in Phases I, II and III respectively without a proper Ration Card Number. These cases could not be analysed in a meaningful way to detect existence of more than one beneficiary on one ration card. Only the records containing a proper ration card number were considered for the purpose of analysis.

Because of this, not only the database depicted an incorrect picture but also any report generated on matters relating to Ration Card from the database for the use of the Management or the Government was not true and transparent.

### Audit findings

**2.2.9** The Audit findings were reported (17 September 2009) to the State Government/Management and discussed (7 October 2009) in the exit conference which was attended by the Principal Secretary, the Managing Director, the Executive Director and the representative of the Centre for Good Governance (CGG). In the exit conference the Government and Management accepted the observations and explained the changes made in the application software. The audit findings are discussed below.

#### *Lack of IT Policy*

**2.2.10** The Company has not formulated and documented Information Technology (IT) Policy for automation of various activities/ branches of

operation or Long Term and Short Term Information Technology Plans appropriate to the needs of the Company.

### ***Development of application software***

**2.2.11** During the year 2006-07 when the Government of Andhra Pradesh launched the programme INDIRAMMA, the Company decided to monitor the implementation of the programme through a web-based application software.

The development of application software was initially entrusted (January 2007) to the Institute of Electronic Governance (IEG), Hyderabad, under the administrative control of the Department of Information Technology and Communication, Government of Andhra Pradesh. From December 2007, the task of database maintenance and further development of/making changes to application software was entrusted to another State Government agency viz., Centre for Good Governance (CGG) without entering into any agreement/Memorandum of Understanding.

Up to March 2009, the Company had incurred an expenditure of Rs 1.57 crore towards development of the application software and changes to the software. (IEG Rs 12.42 lakh and CGG Rs 1.45 crore). The Company incurs a monthly expenditure of Rs 5.34 lakh towards maintenance of servers and administration of database.

Since the Company did not have an IT Policy, it was observed that

- ❖ For the purpose of automation of activities, the Company initiates development on ad-hoc basis considering the requirements in each functional area
- ❖ The development of application software did not follow the accepted development cycle. The processes of feasibility study, finalisation of User and System requirement, testing, and post implementation review were not followed
- ❖ The intellectual property rights of the application software still rest with the CGG.

Though the Government of Andhra Pradesh formulated (August 2001) IT standards, guidelines and best practices and made them mandatory to be implemented in all IT Projects including the projects in the pipeline, the Company did not advise the agencies entrusted with the task of development of application software to follow these standards.

### ***Absence of Security Policy***

**2.2.12** The Company has not formulated any security policy of its own. Absence of security features exposes the data to the threat of accidental or intentional errors, which would lead to payment to unauthorised persons. In spite of this threat, it was seen that the data was not encrypted during online transactions. It was observed that the Company had not implemented Secure Sockets Layer (SSL) and thus, tacitly compromised Security of the system and data.

### ***Absence of user name and password control policy***

**2.2.13** Though the Company's website was accessed by about 2500 users regularly to update the data and for releasing payments to the beneficiaries by using their user ids and passwords, the Company neither formulated any password policy nor issued any instructions to the users to follow the guidelines released by the Government in May 2006 with respect to Information Security. 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, idle time per session, restricting multiple simultaneous login by the users, etc. were also not followed.

### ***No Change management controls were in place***

**2.2.14** For the purpose of recording and performing changes in the software in the post implementation stage, a well-defined and documented Change Management Policy is essential. The Company had no such policy. The changes sought by the Company and carried out by the developer were not documented. Even the changes actually made were not compared with the changes sought to be made. The changes were also not tested before implementation.

Lack of change management policies exposed the system to the risk of unauthorised/uncalled for changes being made and may render the system difficult and expensive for correction and improvement.

### ***No business continuity and disaster management plan***

**2.2.15** The data residing in the server is critical to the business needs of the Company. 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.



In the absence of a business continuity and disaster recovery plan, a disaster impacting the servers and other systems could paralyse the normal operations of the Company and result in loss of vital data. Absence of such a plan could also result in loss of goodwill, unwarranted expenditure, duplicate payments and processing delays.

***Legacy data entered without verification***

**2.2.16** At the time of introducing the online method of payment through the web based application software, though the data relating to the existing beneficiaries was entered in the database, its comprehensiveness, correctness, and completeness was not verified, with the result that the data is incomplete, incorrect and irrelevant.

A test check at Warangal District Office revealed that the data pertaining to 414 out of total 689 beneficiaries under Beedi Workers Housing Programme was not entered in the database. The payment made to these beneficiaries up to the end of July 2009 was Rs 68.43 lakh.

***Non achievement of primary objective of automation***

**2.2.17** One of the major constraints resulting in delay in completion of houses by beneficiaries was delay in stage wise release of funds to the beneficiaries. The system in vogue before automation was time consuming and the beneficiaries were put to a lot of hardship because of delay in release of funds for the work done by them. Under the automated system, the payments were released online and directly to the bank account of the beneficiary/VO thereby reducing the time between work done and release of funds. Thus one of the objectives of introduction of automation was to complete a higher number of houses.

A review of the houses sanctioned and completed during the five years ended 2008-09 revealed that the percentage of houses completed after introduction of automation actually decreased. The details are given below:

<b>Sl. No.</b>	<b>Year</b>	<b>Number of houses sanctioned under various schemes</b>	<b>Number of houses completed</b>	<b>Percentage of houses completed to sanctioned</b>
1	2004-05	6,88,943	5,28,552	76.72
2	2005-06	8,15,816	6,83,243	83.75
3	2006-07	21,77,069	5,73,840	26.36
4	2007-08	25,71,161	8,81,101	34.27
5	2008-09	25,16,059	12,20,783	48.52

It may be seen that the percentage of houses completed to sanctioned came down from 83.75 in 2005-06 to 26.36 in 2006-07, during which year automation was introduced. Though the percentage increased during the year

2008-09, it was far less than what was achieved before introduction of automation.

Thus the primary objective of introduction of automation was not achieved even after three years of introduction of the application software.

## Input controls

### *Incomplete database of Phase I*

Data entered by outsourced personnel was incomplete and inaccurate.

**2.2.18** In view of the situation explained in paragraphs from **2.2.10 to 2.2.16**, the database developed over the years was not complete or accurate and lacked integrity and thus could not be relied upon. The Master Data entered by the DEOs and MICs, who were employed on contract basis, was not authorised by any higher authority and thus the database was updated without any supervisory control. This exposed the database to the risk of unrestricted data manipulation. Neither the application software itself nor the data residing in the database were ever subjected to Internal Audit.

Not only the business rules relating to various parameters of the housing schemes were not incorporated, but also fields capturing vital and critical data were not marked mandatory. Further, whereas certain crucial data was not captured, input controls restricting the total payments to the beneficiaries to the Unit Cost of the house were not incorporated. It was also seen that beneficiaries under different housing schemes were grouped under housing schemes having identification numbers not present in the Scheme Master.

### *Multiple beneficiaries on one Ration Card*

**2.2.19** The fields capturing the Ration Card number, annual income of the beneficiary, the scheme id number, the patta number etc were not made unique and mandatory.

Non-existence of input validation controls led to sanction of multiple houses on same ration card contrary to the scheme guidelines.

The guidelines issued under various Housing Schemes envisaged, *inter alia*, that only one member should be considered for sanction of a house from a BPL Family. A ration card typically represents the unit "Family".

Since, the objective of the housing schemes was to facilitate maximum number of "families"- as opposed to maximum number of "beneficiaries"- to own a house, the process of identification and selection of beneficiaries also stipulated that only one member of a family should be considered for sanction of a house from each of the families.

Guidelines issued by the Government of Andhra Pradesh in May 2006, while launching housing programme under INDIRAMMA in 2006-07 also stipulated

that only one member should be considered for sanction of a house from a family.

Guidelines also stipulated that the AEs concerned should ensure that no beneficiary covered under any other earlier housing scheme either on his name/name of the spouse, be covered under the above scheme and the policy of “one house to one family” should be adhered to strictly. The intention of the Government was clear that there should not exist more than one beneficiary on a ration card. This implied that a ration card number should appear only once in any one of the three phases irrespective of the Scheme.

A query on the database revealed the presence of multiple beneficiaries on one ration card not only in Phase I and Phase II simultaneously, but also in certain instances, in all the three phases. This not only defeated the intentions of the scheme but also deprived other deserving families of the benefit of the scheme.

The details of the result of the query is as follows:

<b>Phase</b>	<b>Number of records (more than one beneficiary per ration card)</b>	<b>Amount disbursed to these beneficiaries (Rs in crore)</b>
Phase I	22,355	200.86
Phase II	63,906	265.85
Phase III	Nil	Nil
Same Ration Card appearing in more than one Phase	3,365	12.84
<b>Total</b>	<b>89,626</b>	<b>479.55</b>

Following are further observations:

- ❖ As the orders of the Government clearly indicated that only one member should be considered for sanction of a house from a family, presence of more than one member from a family as a beneficiary resulted not only in violation of the guidelines of the Government but also in denial of benefit to other eligible families
- ❖ The presence of a ration card more than once in the database points to the fact that the application software did not have input controls restricting the entry of the same ration card in the master database

***Double payment to the same beneficiary***

**2.2.20** The objective of developing the application software and building up the database of the beneficiaries was also to ensure that the payments were made only to a genuine beneficiary and were released directly to him/her.

A query on the database on similar names/spouse names in the same district, same Mandal and same panchayat (village) of Kurnool District revealed that in respect of 1,971, cases payment was made to the same beneficiary twice. A total amount of Rs 4.15 crore was paid to these beneficiaries as detailed below.

Phase	Number of beneficiaries with similar names/spouse names	Amount paid to these beneficiaries (Rs in crore)
Phase-I	1,389	3.04
Phase-II	518	1.03
Phase-III	64	0.08
<b>TOTAL</b>	<b>1,971</b>	<b>4.15</b>

The beneficiary details available on the website of the Company confirmed that the beneficiary was the same and was registered under a different beneficiary identity number.

A view of the beneficiary details of certain cases from out of the above 1,971 records also confirmed that the photographs were also same. Such beneficiaries were not only admitted in the scheme but payment was also made to these beneficiaries without verifying the identity of these beneficiaries.

The following further observations emerge:

- ❖ Presence of such records in the database reveals that the software does not prescribe any validation checks in respect of the fields capturing the above data, or the validations prescribed were inadequate in preventing entry of similar names, father/spouse names, etc. in identifying the genuineness of the beneficiary
- ❖ Lack of adequate validation checks and non-supervision of the data entered resulted in payment to the same persons under different IDs.

***Issue of cement in excess of norms fixed - Passing on of excess subsidy to the beneficiary***

**2.2.21** Cement is issued to a beneficiary at a subsidised price at various stages of construction. The maximum number of cement bags that could be issued to a beneficiary, under any of the housing schemes, for completing the house is 50.

A query on the database revealed that cement issued at various stages of construction was in excess of the norms fixed for the relevant phase.

It was seen that a total of 9,07,659 bags of cement was issued to 78,818 beneficiaries under three Phases in excess of the norms. The value of cement

issued in excess of the norm was Rs 13.62 crore. The details are indicated in **Annexure-16**.

The following observations emerge:

- ❖ Issue of cement in excess of the norms was possible apparently because there were no validation checks to monitor the issue of cement.
- ❖ Though the value of cement issued to the beneficiary was a part of the final unit cost of the house, issue of cement in excess of 50 bags tantamounts to passing on of excess subsidy to the beneficiary than intended.

### ***Other than ST beneficiaries under SPR***

Non-incorporation of business rules led to allotment of houses under SPR Scheme to other than ST beneficiaries.

**2.2.22** Semi Permanent Rural Housing Scheme (SPR) implemented by the Company was meant exclusively for the members of ST. This Scheme was implemented in Phase I only.

A query on the database revealed that a total number of 13 beneficiaries not belonging to the ST category were allotted houses under this Scheme. An amount of Rs 1.03 lakh was also disbursed to these beneficiaries whose houses were under different stages of completion.

This was not only against the guidelines of the Scheme but also deprived the deserving ST members of the benefit.

### ***Houses under Urban Housing Schemes classified under Rural Area***

**2.2.23** In Visakhapatnam District, under Phase I, 247 beneficiaries were sanctioned houses under Urban housing scheme in Pedagantyada Mandal, though this Mandal falls under Rural area. These beneficiaries were at various stages of construction and a total amount of Rs 97.20 lakh was paid to them. It was seen that 243 out of the above 247 beneficiaries who have completed the construction were paid in excess of the unit cost (Rs 34,250 under Rural Housing Scheme) of the house and such excess payment amounted to Rs 13.97 lakh.

Similarly under Phase II, 107 beneficiaries were sanctioned houses under Urban Housing Scheme in that Mandal. These beneficiaries were at various stages of construction and a total amount of Rs 18.11 lakh was paid to them. It was seen that 18 beneficiaries who had completed the construction were paid in excess of the unit cost of the house and such excess payment amounted to Rs 0.98 lakh.

This was apparently a result of not properly mapping the Mandals into Rural and Urban areas and listing them in the Mandal Master. As the Unit Cost in an Urban area was different from that of one in Rural Area, such

misclassification could lead to either payment of higher unit cost to a beneficiary of Rural areas being included in an Urban area or otherwise denial of the total unit cost to a beneficiary.

### *Transfer of completed houses from one scheme to another*

**2.2.24** It was also noticed that completed houses under Rural Housing schemes were transferred to Indira Awaas Yojana (IAY). The software did not have provision to capture the dates on which such transfers were made.

Because of not making necessary changes in database and in books of account the database depicted an incorrect picture.

Further, it was noticed that beneficiaries under both these schemes were also grouped under a single "Scheme ID number", which made the data analysis irrelevant.

The Rural Housing Schemes were sponsored by the State Government and the Unit Cost contained an element of Loan. The Unit Cost under the IAY was entirely subsidised and did not contain a loan component. The subsidy was shared by the State and Central Governments in the ratio of 25 per cent and 75 per cent respectively. No rectification entries were however made either in the books of account or the database in cases where such transfer was affected.

Also, since the Unit Cost under IAY was lower than that of Rural Housing schemes, upon transfer of beneficiaries to IAY, the actual payments made appeared as payment in excess of unit cost and the component of Loan would cease to exist. Because of the BPL status of the beneficiary, this was rendered unrecoverable.

This also tantamounts to tacit misrepresentation of the actual number of houses completed under these schemes and accounting of funds received thereunder. The process and quantum of recovery of Interest on the Loans advanced also gets adversely affected.

Because of this, not only the database depicted an incorrect picture but also any report generated from the database for the use of the Management or the Government was not true.

## **Process controls**

### *Non-incorporation of business rules in procedure for making payments to the beneficiaries*

Non-incorporation of business rules resulted in non-verification of payments authorised by MICs.

**2.2.25** After the implementation of the application software facilitating on-line payment to the beneficiaries, it was observed that the MICs were authorised to generate the Payment Release Order (PRO) by updating the stage of construction. There were no checks on the data updated by an MIC, as

were available in the erstwhile procedure. The DEE was not provided with a login ID.

The data fed by the MICs was updated in the database, without being authorised by any higher authority, nor any M-Books were created in the database, to be checked by the DEE. In these circumstances money was disbursed to beneficiaries by an outsourced MIC without any check by a higher authority, which was contrary to the procedure so far followed by the Company.

In Mandals, where the payments were to be made to beneficiaries/ VOs having an account with a bank not equipped with core banking facility, the MIC manually issued a Funds Transfer Requisition (FTR) enclosing all PROs generated online, to bank concerned. The PROs generated were in PDF format. The FTR contained the total amount of all PROs to be paid to the beneficiaries who held an account in that Bank. The local Banks released the amount as per the details available in PROs enclosed with the FTR and claimed the amount from their designated Branch in Hyderabad, which in turn claim the amount from the Company by providing the details of FTRs on which the payment was made.

As per the Memorandum of Understanding signed between Company and Nodal Banks in November 2007, the Banks would submit a daily statement to the Company, showing the receipts/ drawals on their account, Mandal-wise/ FTR wise for reconciliation.

PROs generated by MICs in respect of non-core banking facility, could be altered by altering the beneficiary name/account number manually, before handing over to the local banks.

Though there was necessity for manual intervention in such cases, no internal control mechanism like, say, the FTRs countersigned by a higher authority before they were presented to the bank, or issue of advices to the bank to allow only system generated PROs, was built in.

It was observed that in the Warangal District Office the details of daily disbursements were not obtained and the daily payments by the Banks were not reconciled. During the period between April 2008 and January 2009 the Regonda and Kothapally Branches of Andhra Pradesh Grameena Vikas Bank disbursed payments amounting to Rs 1.84 crore and Rs 1.22 crore respectively. These payments could not be verified by the Mandal Office because of lack of availability of any supporting records with them.

### ***Lack of security in online payment to beneficiaries***

Lack of provision for seamless transfer in application software resulted in fraudulent disbursement of Rs 2.29 crore.

**2.2.26** Where a beneficiary/VO holds an account in a bank having a core-banking facility, the payment is released from the Head Office using net banking facility offered by the banks. The PROs generated during the earlier

working day in respect of banks having core-banking facility, were e-mailed by the central server to the designated officers in Head Office. The details of bank wise PROs so received were in the form of Comma Separated Value (CSV) files. The officers using their user ID and password logged on to the net banking and uploaded the file received from the server for making payment. The threat in this transaction lied in the fact that the CSV files could be edited and could be uploaded more than once. The account number values could be altered before making payment through the net banking facility. Payment gateways should have been sought from the banks to curb this threat.

Lack of provision of any kind of seamless transfer of the file received from the server resulted in payment of Rs 2.29 crore to bank accounts other than those of the beneficiaries. This occurred because the excel sheet was edited and account numbers of beneficiaries were replaced fraudulently with account numbers other than those of beneficiaries, before uploading the sheet for release of payment.

***Short-recovery of administrative charges***

**2.2.27** The Administrative Charges recoverable from Rural and Urban beneficiaries were fixed at Rs 1,350 and Rs 3,300 respectively.

A query on the database revealed that there was a short-recovery of Administrative Charges in respect of Rural and Urban beneficiaries amounting to Rs 1.78 crore as shown below:

<b>Number of beneficiaries who have reached RC stage</b>	<b>Administration Charges recoverable (Rupees)</b>	<b>Administration charges actually recovered (Rupees)</b>	<b>Short recovery of Admn. Charges (Rupees in crore)</b>
19,914	2,68,83,900 (@Rs 1,350)	1,00,01,489	1.69
631	20,82,300 (@Rs 3,300)	11,29,750	0.09
<b>Total</b>			<b>1.78</b>

It is evident from the above that the application software was not designed to recover the Administrative Charges as specified under the schemes.

As Administrative Charges were recovered mainly to absorb the administrative expenses incurred by the Company in implementation of housing schemes, short recovery thereof had a direct and negative impact on the Receipt and Payment Account.

***Presence of a look-alike website owned by a third party***

**2.2.28** The Company had registered a domain name styled “apshcl.gov.in” in April 2005. But instead of hosting their website on their own domain name, it



was seen that the company had hosted its site on the site of the software developers as a sub-domain “housing.cgg.gov.in”.

Incidentally, another website identical and with similar properties to the Company’s website owned by a third party also existed. The Emblems And Names (Prevention Of Improper Use) Act, 1950 prevents the improper use of certain emblems and names for professional and commercial purposes. Further, Section 14 of the Information Technology Act, 2000 (21 of 2000) also states that the information/data compiled must remain confidential, secure and retaining its integrity. Computer programmes and databases cannot be copied or downloaded without the owner’s permission. Audit observed that so far. (August 2009) no action had been initiated to block the look-alike web site.

Audit did not have requisite tools to vouchsafe that the look-alike website was not capturing personal and confidential information of the users and putting it to illegal use, in the event of a user accidentally accessing the said website.

#### **Inadequacies in application software**

#### ***Generation of a Cement Release Order (CRO)***

**2.2.29** A CRO could be generated on-line, when the details of the stage of construction are updated in the database. Against the CRO, cement is issued to the beneficiary from the cement godowns in the Mandal.

An examination of the process of on-line generation of CRO, revealed that:

- ❖ A CRO could be generated for (a) a quantity more than the available stock or (b) even when there was no stock in the godown. This was possible because the CRO was not integrated with the stocks in the godowns
- ❖ Some beneficiaries opt for Asbestos Cement (AC) sheets for roof in place of RCC slab. In such cases also a CRO could be generated. In such cases, the MIC generated the CRO, printed it and recorded thereon the fact that the beneficiary had opted for AC sheets for roof and hence, cement would not be issued to him. There was a threat of misappropriation/misuse of a CRO in such cases

The option of the beneficiary could be taken in the initial stage itself. The process of generation of CRO for the roof in such cases could be disabled *ab initio*. Later when the beneficiary opts for RCC roof, the option could be enabled by the District Manager/Superintending Engineer.

Alternatively, as the Work Inspectors and the MICs are in frequent contact with the beneficiary, when it is known that the beneficiary is opting for AC sheets, the generation of CRO could be disabled in such case.

### ***Inadequate capture of data***

**2.2.30** It was observed that the following vital information was not captured in the database, making the database incomplete and unreliable.

- ❖ After completion of the house, the beneficiaries would repay the Loan by way of EMIs. The software did not have provision to capture the EMIs actually paid by a beneficiary and the amount of Loan and Interest outstanding. As a result, the software was not capable of indicating the total outstanding dues, for the Management to monitor the recovery process
- ❖ The beneficiaries lodge their documents relating to allotment/ownership of land on which the house is constructed. After the loan is fully repaid, these are returned to the beneficiaries. Though there was a provision in the database to capture the date of lodging of documents there was no provision to capture the details of returning the documents to beneficiaries
- ❖ The VOs/SHGs were entitled to a commission of 0.5 *per cent* of the amount disbursed to the beneficiaries. Amount due/paid to them on account of commission is also not ascertainable from the database

### ***Amounts disbursed not accounted until the house is complete***

**2.2.31** The unit cost of a house, under most of the housing schemes, consisted of three components of finance viz., (a) Beneficiary Contribution, (b) Grant/Subsidy from Government and (c) Loan.

It was seen that the payments released to the beneficiaries were not captured in the Module Online Financial Management System. The software was redundant to this extent.

It was also seen that there was no order in which the funds released were accounted for in the books of account. The amounts paid to the beneficiaries were segregated into the three components only after the construction of the house was completed. It was seen that the value of houses yet to be completed stood at Rs 6,360.56 crore as at 31 March 2008 (as per Provisional Accounts) and the components under which these funds were disbursed were not known.

***Presence of out of place images***

**2.2.32** The MICs were required to upload the stage wise photograph/image of the beneficiary standing in front of the house, depicting the progress made and thus qualifying for release of cement/payment. It was noticed that in many instances the images other than the ones prescribed were uploaded, as was seen from the page showing Beneficiary Details on the company's website. Such images included the images of gods, screen savers and other irrelevant images. Even same images were uploaded more than once.

***Missing Records and Records deleted from database***

**2.2.33** A beneficiary in Warangal (Urban) Mandal was paid a total amount of Rs 0.39 lakh during July, August and September 2008, but these details did not find place in the data dump (table indicating payments to beneficiaries) provided to Audit which was up to March 2009.

Upon a verbal enquiry with CGG it was informed that though the payments were entered as above, they were really made "off line", i.e., before implementation of application software, but were entered in the database only in April 2009.

It was seen that the data available on the website (Report on Details of Beedi workers' Schemes), indicates no change in the number of beneficiaries as at the end of March 2009 and as at July 2009 in the Warangal (Urban) Mandal. Also, the dates of payment entered in the details (Report on beneficiary Details) did not reflect in the Table detailing the Payment Release Orders. Hence it could be concluded that they were not correct. If the payments were in reality made earlier to the implementation of the application software the legacy data (backlog data) said to have been entered in April 2009 should not have allowed the option of entering "dates of payment", instead an option of entering only "off-line payment" should have been allowed. The addition in the Warangal (Urban) Mandal does not show in the Report generated from the website. This could be because the addition of one beneficiary would have been compensated by deletion of yet another one. The Report generated in the instant case, is obviously incorrect. It was also seen that though one beneficiary was added in the District, the addition was shown in Cherial Mandal and not in Warangal (Urban) Mandal. The officials concerned in the District Office could not confirm the addition in either of the Mandals. In the absence of communication to the District Office, it is not known how the Management ensured that the number of beneficiaries was in conformity with the number sanctioned by the Government. Circumstances under which the beneficiary was added was not made clear by the officials of the District Office. This also indicated that the data was incomplete, could not be relied upon and the veracity of the data could not be vouchsafed in Audit.

In another instance, in the Visakhapatnam District, records relating to two beneficiaries under Phase I/Spill Over Schemes were found to be deleted from

the Beneficiary Details on the website. An amount of Rs 0.26 lakh and Rs 0.23 lakh respectively was paid to these beneficiaries.

It was also noticed in the tables “public\_pro”, “public\_cro”, “public\_mro” and “public\_payments”, that there were gaps in the serial number of the release order. This indicates that these records were deleted from the database.

Records were thus deleted in violation of the principles of RDBMS. Any reports generated from such a database would not be true.

### Spill over housing schemes

#### *Observation on the database relating to Housing Scheme for Beedi Workers*

**2.2.34** Government of India, Ministry of Labour & Employment issued (May 2005) guidelines in respect of “The Revised Integrated Housing Scheme 2005 for Beedi Workers etc.”. As per the guidelines, the minimum cost of construction of a house was Rs 45,000, out of which the Central subsidy was Rs 40,000 and Beedi Worker’s contribution Rs 5,000. The guidelines stipulated, *inter alia*, that the house would be completed within a period of 18 months failing which the amount of subsidy should be forfeited and should be recovered along with penal interest to be determined by Government of India. The subsidy and such penal interest were to be recovered as arrears of land revenue.

The details of number of houses sanctioned/allotted for the Warangal District are as follows:

Year	Original sanction by GOI	Finally Taken up	Already completed	Balance no. of Houses at various stages
Up to 1996-97				31
2003-04	906	430	48	382
2005-06	2,561	2,561	1,231	1,330
2007-08	480	480	0	480
<b>Total</b>	<b>3,947</b>	<b>3,471</b>	<b>1,279</b>	<b>2,223</b>

A query on the database relating to the beneficiaries of the above Scheme revealed presence of many shortcomings, which rendered monitoring the progress of work and of expenditure impracticable. The observations are as follows:

#### *a) Different identifying numbers for the same scheme under two tables*

The database revealed that the Scheme ID assigned to the Scheme of the Beedi Workers housing programme was ‘69’ (as per the table “public\_beneficiary

details”) at 31 March 2009, which was different from that of Online ID (Nomenclature of Scheme ID as visible on the Company’s website) which was “1C”.

Further, in the table indicating the details of payment to beneficiaries the ID of the Scheme was not captured. Normally, the payments to be made to a beneficiary should be monitored with reference to the scheme. The ID of the scheme was however captured in the table indicating details of the beneficiaries but not in the table indicating details of payment. As the unit cost and phase-wise payment varies depending upon the Scheme, capturing the ID of the Scheme in the table indicating payment would help in keeping a check on the total payment made/to be made. Because of this there existed a threat that the payments could not be monitored, if the user was not vigilant.

As the Scheme ID is different from Online ID, there is a possibility of confusion and the varying Scheme ID would make it difficult for user to identify the scheme and trace the beneficiary. In the absence of a common Scheme ID number, the MIS reports generated on this scheme would also be incorrect.

***b) Discrepancy in the number of beneficiaries***

A query on the database revealed that there was also discrepancy in the total number of beneficiaries under the above Scheme. It was seen that the number of beneficiaries as per the database was 1,210 (as per the table indicating beneficiary details under Phase I) and the number of houses (as per the table indicating details of payment) was 2,223. The number of beneficiaries under this scheme as at the end of March 2009 available on the Company’s website and available on the IT Manager’s login, was 1,718, which does not agree with either of the above two tables.

The difference in the number of beneficiaries under two different tables in the database indicates that the database was incongruous, lacked integrity and thus was unreliable.

***c) Non-recovery of subsidy from the Tenements not completed within the stipulated period***

A query on the database of Warangal District revealed that 650 beneficiaries had not completed the construction within the stipulated time. The delays (represented by the time lapse between date of last update and date of documentation) ranged between 549 days and 1618 days. Query also revealed that in case of 84 beneficiaries out of the above 549, either of the two date fields was blank. This indicates that the validation checks were not adequate to aid watching the progress of the scheme.

**Non-monitoring of the progress of the Scheme defeating one of the objectives for the development of software.**

Further, there was no provision to capture the delays in order to compute the quantum of penal Interest to help commence the process of recovery of penal Interest.

As per the database, the total amount paid to these 650 beneficiaries and recoverable from them was Rs 2.38 crore. This was neither forfeited nor exemption orders obtained from the Government of India. This amount was locked up in the shape of houses under various stages of construction without attaining the objective for which they were advanced.

Thus, the application software did not help the Management in monitoring the implementation of the housing schemes.

***d) Short-payment to beneficiaries:***

A query on the database revealed that as many as 413 (out of 992) beneficiaries who had reached the RC level, were paid less than the unit cost. As per the database, such short-payment was Rs 12.57 lakh.

It was evident that the validation checks to monitor the quantum of money to be paid upon reaching a level of construction were also inadequate, in as much as the beneficiaries were deprived of the legitimate benefits available to them under the housing scheme.

**Miscellaneous**

**2.2.35** A query on the database relating to the various housing schemes of the Warangal District in Phase I revealed the following:

***a. Same Scheme IDs for different Schemes:***

All the data relating to the various housing schemes implemented by the Company throughout the State is also displayed on the Company's website. On the website the scheme is also assigned an identification number. It was seen that the Scheme ID number assigned to a housing scheme in the data dump was at variance with that assigned on the website.

A query on the database also revealed various other inconsistencies. It was observed that in the data dump, the beneficiaries who were sanctioned houses under two different schemes were grouped under one Scheme ID number. Thus, the data contained therein was incorrect and unreliable.

The results of the query are detailed in **Annexure-17**.

***b. Inclusion of certain Schemes not implemented in Warangal District***

A query on the database revealed that some beneficiaries were included in schemes, not executed by the Warangal District so far. The details are as hereunder.

<b>Name of the Scheme</b>	<b>Scheme ID assigned as per Dump</b>	<b>Number Of beneficiaries</b>	<b>Amount Paid (Rs in lakh)</b>
IHSDP	15	6	1.05
JNNURM	16	4	0.10
<b>Total</b>			<b>1.15</b>

It is not known how these beneficiaries were grouped under the Scheme.

***c. Some beneficiaries not grouped under any of the Schemes***

It was seen that a total number of 51,743 beneficiaries through out the State as at the end of March 2009 were not grouped under any of the Schemes. These were grouped under “Other Schemes”. The payment made to these beneficiaries as at July 2009 was Rs 96.06 crore.

Not grouping these beneficiaries under any of the Schemes rendered them unbound by any of the guidelines and thus not susceptible to any checks regarding quantum and time of payments.

In the absence of any details, it could not be verified in Audit whether the payments made to these beneficiaries was regular and within the unit cost.

It is apparent that at no stage the Management reviewed the database. A review would have either prevented or helped detection of presence of such irrelevant data.

**General Controls**

***No Login ID for the District Manager***

**2.2.36** The District Manager/Superintending Engineer is overall in-charge of the District and supervises the work done by the EEs, Dy. EEs and AEs/MICs. He is responsible for the operation of housing schemes in the District.

After introduction of the application software the progress of all the activities in the District were updated in the database by the MIC/IT Manager, through their Login Id. The post of the IT Manager was created after implementation of the application software and was occupied by an out-sourced person.

The District Manager has not been provided with a Login Id. He has to depend on the IT Manager for getting the online reports. In the absence of the IT Manager, the District Manager cannot obtain the required reports online.

The District Manager also conducts/attends periodical review meetings in the District/villages and also conducts surprise checks of the housing programme in the District. Provision of a Lap top with Internet facility and Login Id would go a long way in better discharge of his duties and would also eliminate his dependence on the IT Manager and Mandal in-charge who are provided with a Login Id.

### ***Back up of Data/Images at the District Offices***

**2.2.37** The MICs/IT Managers usually store data/images pertaining to beneficiaries/houses on their Laptops/machines before uploading/ updating them in the database. It was seen that no regular back-ups were taken of these data. Further, no instructions have been issued by the Head Office to the MICs/IT Manager to take backups at regular intervals.

In the event of crash/malfunction/loss of images/laptops provided to the MICs/machines at the District Office the data/images stored would be permanently lost as there is no back up available to restore the system. The back up of the data not yet uploaded by the MICs was also not available with the IT Manager in the District Office.

## **Redundancy of Module, Records and Work**

### ***Cement logistics and payment***

**2.2.38** There exists a provision in the application software under the module “Cement logistics and payment” which facilitates the District Offices to place indent on the cement manufacturers whenever the stocks were low. The cement manufacturers also could upload the details of despatches of cement made. The module would also facilitate Head Office in allocation of cement to various Districts/Mandals/Godowns and making payment to the cement manufacturers for the supplies affected by them. It was seen that because of lack of integration with the cement godowns, this facility was not being used. The software, to this extent, was redundant.

### ***Replacing the system of maintenance of physical records***

**2.2.39** Before implementation of the application software, the following records were being maintained manually in the various Field Offices of the Company (i.e., by the Assistant Engineers, DEEs, Executive Engineers and at District Offices) for monitoring the implementation of Housing Schemes:



1. Register of Houses sanctioned – G.O.-wise/ Proceeding-wise/ Year-wise/ Scheme-wise
2. Register/Statement showing Beneficiary Contribution and Admission Fees
3. Statement of Loan Recoveries with details of Principal and Interest
4. Loan Ledgers
5. Bank Subsidy Ledger (Form 17)
6. Completed Houses/ Colony Register (Form 23)
7. Schemes in Progress (Form 24)
8. Individual Beneficiary Ledger/Beneficiary Payment Register (Form 30)
9. Stock Register (Cement/ Nirmiti Kendra Material) Form 31

Automation is normally aimed at dispensing with maintenance of records and should, in the normal course, result in reduction of number of records maintained manually.

A review of the records maintained in the Field Offices of Warangal District after implementation of the application software revealed the following:

**a. Records continued to be maintained manually, though information is available in the database**

The maintenance of the following two records was not discontinued though the information is available on the website of the Company.

1. Form 24 Register (Schemes in Progress)
2. Form 30 (Individual Beneficiary Ledger/ Beneficiary Payment Register)

**b. Records discontinued to be maintained though the information is not available online**

The information relating to the amount of Loan disbursed to beneficiaries, the amount of Interest to be recovered from them and the amount actually recovered with details of Principal and Interest was not being captured in the database and hence not displayed online. But it was seen that the maintenance of the following three registers, dealing with the above was discontinued, resulting in loss of valuable data.

1. Statement of Loan Recoveries with details of Principal and Interest
2. Loan Ledgers
3. Loan Recovery Statement

**c. Redundant records additionally maintained manually, in spite of automation**

The field offices were instructed to maintain the following records/ registers, though the information is available online and can be easily accessed.

1. The information available online was to be compared with the records maintained manually and if any discrepancy is noticed it has to be brought to the notice of higher authorities so that can be resolved without any delay.
2. Preparation of abstract of the PROs, CROs and MPROs and the Statement "Schemes in Progress" scheme-wise/ year-wise.
3. Preparation of bank-wise statements indicating drawals.
4. Maintenance of separate bank book for the houses taken up departmentally.
5. Maintenance of physical progress reports scheme-wise/year-wise on weekly basis by taking prints from online records.

Preparation and maintenance of these records resulted in redundancy of work as well as redundancy of records.

**Other observations**

***Computation of loans to the beneficiaries under Current Assets, Loans and Advances***

**2.2.40** The recovery of the Loan component of the unit cost commences in the form of Equated Monthly Instalments, from the month following the completion of the house. The Loan recovery was one of the important functions of the Company.

Though the Interest on loans due from beneficiaries is accounted for on cash basis in the Books of the Account, the amount of Interest actually recovered is brought to the Income and Expenditure Account. The Loans to beneficiaries is accounted under Loans and Advances.

The Company converted many completed houses from RPH schemes to IAY. The unit cost of the house under IAY had no loan component and consisted entirely of subsidy. No corresponding changes were being made either in the database or in the accounts, thereby the figures of number of houses completed under various housing schemes, the loan disbursed to and interest thereon due from beneficiaries as shown in the website were not correct.

As a result, Current Assets, Loans and Advances, under Schemes in Progress as exhibited in the Balance Sheet were not true.

It was also observed that the District Offices furnish their progress report showing the loan and interest due thereon in respect of completed houses under various schemes. To furnish the above figures, the District Offices took out a report from the Company's website in respect of various schemes and based on the report, arrived at the quantum of loan component by multiplying the number of houses with the loan component available under the scheme. But as no changes were made in database upon transfer of completed houses to IAY, the report so prepared was also not true.

All the above factors have impact on the compilation of the value of Loans to beneficiaries under Current Assets, Loans and Advances.

### ***Physical verification of IT related Inventory***

**2.2.41** All the field offices were provided with desktops, laptops, and other hardware. It was seen that no periodical physical verification of these stocks was conducted.

### ***Non-integration with other Departments***

**2.2.42** The critical data relating to the Ration Card, door/house number, patta possession certificate number etc., were captured while entering the master data of the beneficiary. As these certificates were issued by various state government departments and the database is available with them, sharing that database or looking up that database, for ensuring that the applicant is genuine would help at least in reducing the instances of duplicate beneficiaries in the same names/spouse names.

The observations were issued to the Management and the Government in September 2009. The replies from them have not been received so far (October 2009).

## **Acknowledgement**

Audit acknowledges the co-operation and assistance extended by the staff and the Management of the Company at various stages of conducting the Information Technology Audit.

## **Conclusion**

- ❖ ***Since the Company did not have an IT Policy, the development of application software did not follow the accepted development cycle. It was observed that the Company did not also advise the agencies entrusted with the task of development of application software to follow these standards formulated by the Government in August 2001.***

- ❖ *The processes of feasibility study, finalisation of User and System requirement, testing, and post implementation review were not followed. The application software was not tested before putting it into operation.*
- ❖ *The data relating to the existing beneficiaries before automation though entered in the database, the entry of such data was not supervised or authorised by any higher authority. Data relating to some beneficiaries is yet to be entered in the database, rendering the database incomplete and un-reliable.*
- ❖ *Although the database of the beneficiaries was built up and application software was developed with an objective to monitor the progress of housing programme and timely payment to the beneficiaries, because of incorrect, irrelevant records and payment to beneficiaries through Village Organisations/Self Help Groups, these objectives were not achieved.*
- ❖ *Because of inadequacy of input controls more than one beneficiary was admitted on one ration card in violation of the scheme guidelines and cement was issued to beneficiaries in excess of norms fixed.*
- ❖ *Because of lack of security in the application software, and non-incorporation of business rules, payments were made to bank accounts other than those of the beneficiaries.*
- ❖ *Though completed houses were transferred from one scheme to another, no correcting entries were passed in the books of account and no changes were made in the database, rendering the database incorrect. Because of this the figures as exhibited in the annual accounts of the Company under Current Assets, Loans and Advances were not true.*
- ❖ *Contrary to the norms of the RDBMS, records were deleted from the database, rendering the database incomplete.*
- ❖ *Vital data on repayment of loans by the beneficiaries, the dates of return of their original documents etc., were not captured in the database.*
- ❖ *The module on cement logistics and payment was not fully developed and was not being used. The payment made to the beneficiaries was not being captured in the module online finance management system.*
- ❖ *Certain physical records maintained prior to automation continued to be maintained though the information is available on the Company's website, whereas certain others were discontinued though data relating thereto is not captured in the database.*

## Recommendations

- ❖ *There is an urgent need for formulating IT Policy and Security Policy*
- ❖ *The threats present in the application software are to be urgently removed*
- ❖ *The Company has to formulate a change management policy and record all changes made in the application software*
- ❖ *All the modules of the application have to be completely developed and utilised*
- ❖ *The Company has to document business continuity and disaster recovery plan*
- ❖ *The data relating to beneficiaries which is not yet updated is to be updated making the database complete*
- ❖ *The data entered in the database is to be authorised by a higher authority preventing entry of incorrect and irrelevant data*
- ❖ *Adequate validation controls are to be built in preventing presence of blank fields, entry of irrelevant and incorrect data*
- ❖ *Business Rules are to be incorporated in the application software*
- ❖ *Steps are to be taken to disable multiple beneficiaries on one ration card so as to ensure that only one beneficiary on one ration card exists*
- ❖ *When completed houses are transferred from one scheme to another, correcting entries are to be passed in the Books of accounts and the database, so that the database exhibits the true picture*
- ❖ *While entering the data relating to the Ration Card, door/house number, patta possession certificate number etc., sharing that database or looking up that database would ensure that the applicant is genuine and would help at least in reducing the instances of duplicate beneficiaries in the same names/spouse names.*