Chapter-III

3. Reviews relating to Statutory corporation

Maharashtra State Electricity Board

3.1 Procurement, repairs and performance of energy meters

Highlights

Maharashtra State Electricity Board (Board) is required to install and maintain correct energy meter on each point of supply of energy to consumers for measuring the energy sold as per Section 26(2) of the Indian Electricity Act, 1910. At the end of March 2002, the Board had 18.79 lakh unmetered consumers.

(Paragraph 3.1.1)

The Board incurred extra expenditure of Rs.45.30 crore due to procurement of meters at higher rates despite availability of technically acceptable meters at lower rates.

(Paragraphs 3.1.7-3.1.11)

As per the Indian Electricity Rules, 1956 the Board has to check the consumers' installations including meters once in five years. Out of installations of 33.68 lakh low tension consumers (March 1998) in 40 divisions test checked in audit, the Board checked installations of 16.87 lakh consumers (50.09 *per cent)* during 1998-2003. Similarly, out of 30,099 high tension meters required to be test checked, the Board checked only 21,719 meters (72.16 *per cent*) during 1998-2003.

(Paragraphs 3.1.13-3.1.14)

Average utilisation of capacity of single phase and three phase meter testing benches in 95 out of 121 divisions worked out to 67 and 41 *per cent,* respectively. Non testing/recalibration of meters which slowed down with the passage of time resulted in underbilling of energy consumption to the extent of 118.61 million unit (MU) valuing at Rs.37.36 crore during first one year. Unrecorded consumption will further increase year after year till recalibration is done.

(Paragraphs 3.1.15-3.1.16)

As per commitments for power sector reform the Board installed meters on 6,098 distribution feeders and 14,134 distribution transformers at a cost of Rs.22.26 crore but energy accounting could not be done due to non identification of consumers feeder-wise/transformer-wise. This resulted in unproductive expenditure.

(Paragraphs 3.1.17-3.1.22)

Due to non procurement of meters in a staggered manner, 2.10 lakh three phase meters valuing Rs.41.08 crore procured for agricultural consumers remained idle (March 2003).

(Paragraph 3.1.23)

Time of Day metering resulted only in consumers already working during off peak hours getting the benefit of lower tariff leading to revenue loss of Rs.80.17 crore.

(Paragraph 3.1.24)

MOU stipulated reduction of transmission and distribution losses to 18 *per cent.* However, the Board could not achieve even the liberal target of 26.9 *per cent* set by Maharashtra Electricity Regulatory Commission. transmission and distribution losses in excess of 26.9 *per cent* worked out to 6,707 MU valuing Rs.2,113 crore during 2002-03.

(Paragraph 3.1.25)

Introduction

3.1.1 Energy meters are static/electromechanical equipment installed for recording the quantum of energy supplied to the consumer. Energy meters are of five types *viz.* single phase, poly phase low tension (LT), low tension current transformers (CT), high tension (HT) and feeder meters. Meters other than feeder meters are installed at the supply point for measuring the energy supplied to consumers. Feeder meters are installed at sub-stations for recording the electricity received/supplied.

The Maharashtra State Electricity Board (Board) is required to install and maintain correct energy meters at each point of supply of energy to consumers for measuring the energy sold as per Section 26(2) of the Indian Electricity Act, 1910. At the end of March 2002[❁], there were 111.64 lakh metered consumers (residential, commercial, industrial, public lighting, agricultural and public water works) and 18.79 lakh unmetered consumers.

❁ Figures at the end of March 2003 not available.

Organisational structure

3.1.2 Supply of electricity, installation, maintenance and reading of the energy meters are regulated by the respective Operation and Maintenance Divisions (divisions) headed by Executive Engineers working under Chief Engineer of respective Zonal Office. The Zonal Office places the annual indent for the quantity and type of energy meters with the Distribution Wing in Headquarters. The Distribution Wing consolidates indents received from respective Zones and forwards it to the Central Purchase Agency (CPA). CPA procures meters and equipment and arranges for supply thereof to various divisions through its stores centres. As of March 2003, there were 108 divisions working under 34 circles controlled by nine zonal offices*. Besides, there were two Urban Zones at Nagpur and Pune, which directly control 5 and 8 divisions, respectively.

Scope of Audit

3.1.3 The present review conducted during December 2002 to May 2003 covers procurement, repairs and performance of energy meters and meter testing equipment during 1999-2003. The review also covers the position of implementation of commitments for power sector reform made by the Government of Maharashtra in the Memorandum of Understanding (MOU) signed (March 2001) with the Government of India.

The audit findings as a result of checking of records relating to purchase of meters (26 tenders valued at Rs.669.71 crore) by CPA, performance of LT meters and metering system in 40 out of 121 divisions, performance of LT meter testing benches in 95 out of 121 divisions, review of unmetered and metered supply and T & D losses in all the 121 divisions were reported to Government/Board in June 2003 with the request for attending the meeting of Audit Review Committee for State Public Sector Enterprises (ARCPSE) so that the view points of Government/Board could be taken before finalising the review. The meeting of ARCPSE was held on 18 July 2003 which was attended among others by Technical Director (Distribution) of the Board and a representative of the administrative department of Government of Maharashtra. The review has been finalised after taking into consideration the view points/deliberation of ARCPSE.

* Nagpur Zone (5 circles, 15 divisions), Nasik Zone (4 circles, 19 divisions), Aurangabad Zone (4 circles, 8 divisions), Amaravati Zone (4 circles, 13 divisions), Kolhapur Zone (5 circles, 21 divisions), Kalyan Zone (3 circles, 9 divisions), Beed Zone (4 circles, 10 divisions), Konkon Zone (2 circles, 3 divisions) and Bhandup Urban Zone (3 circles, 10 divisions).

Procurement of meters

Requirement of meters

3.1.4 In order to implement power sector reform, a Memorandum of Understanding was signed between Government of India and State Government in March 2001. As per commitments in the MOU, the Board was to provide meters to all consumers by September 2002. As per the provisions of the Indian Electricity Act, 1910, the Board has to provide meters for measurement of energy supplied. LT consumers are provided with single phase meters, three phase meters and CT operated meters whereas HT consumers are provided with trivector meters.

As of March 1998, the Board had 101.79 lakh metered consumers (101.67 lakh LT consumers and 12,000 HT consumers) and 17.80 lakh unmetered consumers. During 1998-2002, the Board released 24.49 lakh new LT connections at the rate of 5 to 8 lakh connections per annum. The category-wise information in respect of metered and unmetered consumers during 1998-2002 is given in ***Annexures-15*** and ***16.***

Purchase procedure

No vendor rating has been done, as the Board did not compile make/supplier wise failure rate data.

3.1.5 Based on the requirement received from zonal offices for releasing new connections and replacement of old/faulty meters, Distribution wing places in the month of November, an indent for the next year commencing from April. CPA starts process of procurement of meters in December and the tender gets finalised in or around June. On the basis of indent, CPA invites tenders for procurement of meters under annual/biennial rate contract. The Board did not compile make/supplier-wise failure rate data. Consequently, vendor rating has not been done so far.

Finalisation of tenders

3.1.6 During 1998-2003, the Board procured 38.05 lakh HT and LT meters at a cost of Rs.481.17 crore as against indents for 83.58 lakh meters.

The details of meters indented and procured during 1998-2003 are given below:

(Number in lakh)

Year	No. of meters indented		No. of meters ordered		No. of meters actually received		No. of meters issued
	Total	Single/ Three phase LT meters	Total	Single/ Three phase LT meters	Total	Single/ Three phase LT meters	Single/ Three phase LT meters
1998-99	9.36	8.99	10.19 (72.76)	10.11 (65.41)	5.24 (31.54)	5.17 (24.99)	4.87 (23.18)
1999-2000	9.38	8.82	2.63 (34.57)	2.63 (34.57)	3.82 (34.20)	3.74 (29.27)	4.47 (29.46)
2000-01	20.76	20.37	4.66 (59.03)	4.50 (42.02)	4.20 (52.64)	4.14 (47.15)	3.84 (49.49)
2001-02	21.85	21.40	27.64 (308.59)	27.58 (302.18)	15.00 (216.25)	14.67 (186.26)	11.04 (144.46)
2002-03	22.23	21.66	0.06 (19.17)	-- --	9.79 (146.54)	9.68 (134.95)	12.78 (148.84)
Total	**83.58**	**81.24**	**45.18 (494.12)**	**44.82 (444.18)**	**38.05 (481.17)**	**37.40 (422.62)**	**37.00 (395.43)**

(Figures in brackets denote value in crore of rupees)

As against the norm for placement of indent in November of the previous financial year, placement of four annual indents for 1999-2000 to 2002-03 was delayed by one to two months due to delay in consolidation of requirement for all zones.

Due to delay in submission of breakup of types of meters and finalisation/revision of technical specifications for meters incorporating modifications after advertisement of tender, finalisation of seven (out of 13 tenders for 1998-2003) tenders during February 2000-October 2001 for 25.5 lakh single phase and 2.77 lakh three phase LT meters was delayed by two-13 months. Two tenders were cancelled in September and November 2000 due to revision of specifications and two tenders for five lakh three phase meters were in process of finalisation (May 2003) even after delay of 11 months from due date. Due to shortfall in procurement of new meters on account of the above delays, the Board released 3.26 lakh single phase connections by providing old/repaired meters during three years ending 2000-01.

During 1998-2003, nine tenders for purchase of LT meters were finalised. Scrutiny of these tenders revealed the following irregularities:

Procurement of LT meters at higher cost

3.1.7 In order to reduce its single phase meter inventory, the Board decided (October 1997) to procure meters having long range current rating of 5-30 ampere (A) capable of catering to a load ranging from 5-30 A instead of procuring meters of current rating of 5-10 A, 5-20 A and 5-30 A separately. In spite of this decision the Board purchased (August 1998-February 1999) one lakh meters having current rating of 5-20 A at Rs.886.40 per meter from VXL[☯].

The Board incurred extra expenditure of Rs.4.42 crore on purchase of one lakh meters.

The price of Rs.886.40 per meter was much higher than the price at which the Board purchased meters having rating of 5-30A in the same tender (Rs.444.82). Thus, purchase of one lakh meters at higher rate from VXL resulted in extra expenditure of Rs.4.42 crore when other tested and approved meters of current rating of 5-30A were available at a lower rate. In reply, the Board stated (May 2003) that the quality of meters was excellent and not a single complaint was received. The Board's reply was not tenable because purchase of 5-20A meters was not consistent with earlier decision of the Board (October 1997) that meters having current rating of 5-30A, capable of catering to a load ranging from 5 to 30A should only be procured instead of procuring meters of current rating of 5-10A, 5-20A and 5-30A separately.

Procurement of special type single phase electromechanical LT meters at higher cost

3.1.8 The Board received 11 technically acceptable offers at the rate of Rs.462.43 per meter in the tender for special type single phase electromechanical LT meters opened in June 1999. Three suppliers (VXL,

[☯] VXL-VXL Landys and Gyr Limited Joka.

CGS, TTL[*]) offered 3.40 lakh meters each at the rate of Rs.1,036.47, Rs.1,018.60 and Rs.1,019.38 per meter respectively, of specifications different from those mentioned in the tender. The Board cancelled the tender and called for (October 2000) fresh tender with revised specifications matching the specifications of those three suppliers. The Board placed orders on these three suppliers for 8 lakh meters at the net payable rate of Rs.932.90 as their offers were technically acceptable (VXL, CGS and SIL[*]). Thus, procurement of meters at a higher rate though there were 11 technically acceptable offers at lower rate resulted in avoidable expenditure of Rs.37.64 crore. The Board replied (July 2003) that these meters were purchased as they had consistent accuracy and long life. The Board's reply was not tenable as revision of specifications after opening of price bids violates the norm of transparency.

Purchase of 8 lakh meters at higher rate resulted in avoidable expenditure of Rs.37.64 crore.

Procurement of LT static three phase energy meter at higher rate

3.1.9 The Board procured 58,000 meters from seven suppliers who agreed to match the lowest acceptable rate of Rs.2,125 per meter quoted by Bharat Heavy Electricals Limited (BHEL). India Meters Limited (IML) and Larsen and Toubro Limited (L&T) did not agree to match their rates with BHEL's rate with the result that their offers were liable to be rejected. Despite this, the Board procured 10,000 meters at the rate of Rs.2,328.20 from IML and L&T and incurred extra expenditure of Rs.21.32 lakh during July-October 2001. The above quantity of 10,000 meters could have been procured from the seven suppliers at Rs.2,125 per meter and the extra expenditure could have been avoided.

Purchase of 10,000 meters at higher rate resulted in extra expenditure of Rs.21.32 lakh.

Extra expenditure due to revision of specifications

3.1.10 The Board also placed orders for 1,000 meters each with CGS and ABB[*] at Rs.5,340 and Rs.5,397.52 per meter, respectively. The Board purchased these meters on the grounds that the meters would be capable of continous operations and recording of energy consumption despite tampering. Not only were the meters supplied by these two firms different from those specified in tender but the Board also incurred extra expenditure of Rs.64.88 lakh on the purchase. Thus, revision of specifications after calling for tenders was another case of the Board not exhibiting transparency in procurement. The Board stated (July 2003) that these meters were procured for educational purpose and not considered for further extension orders. The performance of these meters had not been monitored (June 2003).

Procurement of 2,000 meters at higher rate resulted in extra expenditure of Rs.64.88 lakh.

Procurement of polycarbonate case LT meters

3.1.11 Between December 1998 and November 2002, the Board procured 11.68 lakh meters of assorted types having polycarbonate case at the rate of Rs.444.82, Rs.409.57, Rs.491.83, Rs.867.58 and Rs.866.37 and Rs.1,040.30 per meter and 11.41 lakh meters of the same types with

[*]CGS-C.G.Schlumberger Electricity Management Limited, Gurgaon, TTL-TTL Limited, Delhi and SIL-Seahorse Industries Limited.

[*] ABB-Asea Brown Boveri Limited.

conventional steel case at the corresponding rate of Rs.362.56, Rs.362.56, Rs.429.07, Rs.855.51, Rs.855.51 and Rs.842.64 per meter, respectively.

The Board purchased 11.68 lakh meters with polycarbonate case at extra cost of Rs.2.38 crore despite availability of meters with steel case at cheaper rate.

- Audit observed that procurement of 11.68 lakh meters with polycarbonate case resulted in extra expenditure of Rs.2.38 crore. The purchase of meters with polycarbonate case was made on the grounds that these meters had transparent covers which would enable the meter reader to know whether any tampering had been done with the internal mechanism of the meter and would facilitate their immediate replacement in order to avoid loss of revenue. There were no records to show that there was tangible benefit by way of early detection of tampered meters and their expeditious replacement.

- Transparency would demand that before calling for tenders, the allocation of quantities between the two categories of meters should have been done. This requirement was not met with in case of three out of four tenders finalised during July 1998-February 2001. In reply, the Board stated (May 2003) that whenever new developments come up, additional expenditure is inevitable which is outweighed by advantages in the long run. The Board further stated (June 2003) that gain in revenue due to early detection of tampering could not be exactly quantified.

The Board's reply was not acceptable as procurement of these meters should not have been made on such a large scale. Initial procurement should have been restricted to a trial lot and further purchases made only after ascertaining whether the high cost was commensurate with stated advantages.

Non recovery of liquidated damages

3.1.12 There were delays on the part of suppliers for which Rs.2.82 crore was recoverable from the suppliers as liquidated damages as per the terms of contract. The Board did not effect recovery to the extent of Rs.1.88 crore on the ground that it had delayed payments to suppliers. The Board stated (July 2003) that delay in payment was due to non availability of funds.

The reply is not tenable. As per the terms of purchase orders, payment was to be made to suppliers within 60 days from the receipt of meters in a lot. However, the Board delayed the payments by 5 to 126 days beyond the stipulated date. Audit observed that the placement of orders and delivery schedules had been fixed after ensuring the availability of funds. Due to delay in passing the bills by Stores billing section, the time limit of 60 days for payment could not be adhered to.

Performance, testing and repairs of meters

Checking of installation at the consumer's premises

LT consumers

3.1.13 As per Indian Electricity Rules, 1956, the Board has to check the consumers' installations including meters and metering equipment once in five years in order to have timely control over unauthorised extension or illegal use of electricity, tampering of meters and correctness of metering equipments. Scrutiny of records of 40 out of 121 divisions revealed that these divisions had 33.68 lakh LT consumers at the beginning of 1998-99. The Board should have checked installations of all these consumers by the end of 2002-03. However, the Board checked installations of only 16.87 lakh (50.09 *per cent*) LT consumers during 1998-2003.

Table below indicates the number of connections checked and number of theft cases/defective meters detected during1998-2003:

Year	No. of connections checked	Cases of theft/defective meters detected		Percentage of cases of theft/defective meters detected to No. of connections checked
		Number	Penalty recovered (Rupees in crore)	
1998-99	2,26,802	29,713	1.36	13.10
1999-2000	2,64,297	34,197	2.15	12.94
2000-01	3,53,502	39,605	3.66	11.20
2001-02	3,83,413	47,801	5.42	12.47
2002-03	4,59,202	54,294	3.75	11.82
Total	**16,87,216**	**2,05,610**	**16.34**	**12.19**

Given the alarmingly high proportion of cases of theft/defective meters, there was a compelling need to do complete checking to minimize pilferage/ non recording of energy. But there was shortfall in checking of meters year after year as indicated below:

Year	Shortfall in checking	
	Number	Percentage
1998-99	4,46,819	66.33
1999-2000	4,09,324	60.76
2000-01	3,20,119	47.52
2001-02	2,90,208	43.08
2002-03	2,14,419	31.83
Total	**16,80,889**	**49.91**

In respect of divisions at Dhule (Urban), Pachora, Dharangaon, Gondia and Sangli (Urban), the percentage of checking was as low as 4.4, 8.1, 13.4, 14.2 and 14.5 respectively during 1998-2003. The shortfall in checking was not justified. The Board replied (July 2003) that shortfall was due to shortage of manpower. The reply was not acceptable since the percentage of cases of theft/defective meters was more than 10 *per cent* and the Board recovered Rs.16.34 crore towards penalty during 1998-2003. As such complete checking should have been done.

HT consumers

3.1.14 The Board prescribed (July 1987) that for early and timely detection of faulty HT meters, testing of meters of HT consumers having contract demand up to 1,000 KVA, up to 3,000 KVA and above 3,000 KVA should be done once in a year, once in six months and once in three months, respectively.

Audit observed that out of 30,099 meters required to be tested, the Board carried out testing of only 21,719 meters (72.16 *per cent*) during 1998-2003 as given below:

Year	Number of HT consumers as per information available	No. of meters to be tested	No. of meters tested	Shortfall in testing of meters	Number of meters found faulty
1998-99	4,450	5,292	4,307	985	382
1999-2000	5,219	6,056	4,810	1,246	1,069
2000-01	5,382	6,226	4,571	1,655	1,257
2001-02	5,611	6,450	4,202	2,248	1,550
2002-03	6,180	6,075*	3,829	2,246	1,040
Total	**26,842**	**30,099**	**21,719**	**8,380**	**5,298**

There was a shortfall in testing of meters of 8,380 HT consumers.

Thus, there was a shortfall in testing of 8,380 HT meters during 1998-2003. The Board attributed (July 2003) shortfall in testing to insufficient staff, diversion of testing staff to other works, reluctance of consumers for shutdown of power supply for installation of testing equipment and problems in testing vehicles.

In the tests carried out, 5,298 meters were found faulty. Considering that these are HT consumers, 100 *per cent* check should have been done.

Utilisation of meter testing benches

3.1.15 Sub Rule (1) of Rule 46 of Indian Electricity Rules, 1956 provides that every connected installation should be periodically inspected and tested at intervals not exceeding five years by the Board. As per the Board's circular of August 1969, testing and recalibration of LT meters should be done once in three years. The Government of India also prescribed (November 2001)

*This includes 3/4th of the prescribed testing in respect of 3,585 consumers as per information available up to December 2002.

testing of single phase and three phase LT meters once in five and two years, respectively.

For the purpose of testing and calibration of single phase and three phase LT meters, the Board provided meter testing benches at division/sub-division levels. Scrutiny of data in respect of 95 divisions accounting for 88 lakh LT metered connections (March 2002) revealed that they were provided with 324 meter testing benches installed at a cost of Rs.154.08 lakh (March 2003).

Capacity utilisation of single phase/ three phase meter testing benches in 95 divisions was 67 and 41 *per cent* respectively.

- Against the aggregate capacity of testing and calibration of 41.58 lakh single phase meters and 10.55 lakh three phase meters during April 1997 to December 2002/March 2003*, utilisation of single phase and three phase meter testing benches in 95 out of 121 divisions worked out to 67 and 41 *per cent*, respectively (***Annexure-17***).

- Out of 88 lakh meters required to be tested and recalibrated as of March 2003, 55.63 lakh meters remained to be tested and recalibrated for want of meter testing benches (35.87 lakh meters) and under utilisation of meter testing benches (19.76 lakh meters).

The divisions attributed low percentage of utilisation to non-availability of meters for testing and replacement, shortage of manpower, benches being under repair and non-availability of sufficient quantity of three phase meters for testing. The reply was not tenable as testing of meters is an important activity and hence there could be no shortfall. Audit also noticed that despite having enough capacity, in 30 out of 95 divisions, testing of 0.66 lakh meters was outsourced resulting in extra expenditure of Rs.32.80 lakh. The Board accepted (July 2003) the fact.

Loss due to shortfall in recalibration of LT meters

3.1.16 As per Board's circular (August 1969), meters slow down by 0.5 *per cent* per annum. As per the laid down norms, all LT meters should be recalibrated and tested in a span of 5 years. Scrutiny of 56 divisions accounting for 57.10 lakh meters revealed that as on 31 March 2003, 42.05 lakh meters remained to be tested/recalibrated for more than five years. Non testing/recalibration of meters which slow down with the passage of time resulted in under billing of energy consumption to the extent of 118.61 MUs valuing at Rs.37.36 crore during first one year. The unrecorded consumption will increase year after year till recalibration is done. The Board replied (July 2003) that as all electromechanical meters would be replaced with static meters, testing of meters would not be required. The fact remains that non recalibration had resulted in under recorded consumption.

* In respect of 58 divisions information was available up to December 2002 and in respect of 37 divisions information was available up to March 2003.

Implementation of reforms programme under Memorandum of Understanding

3.1.17 In order to implement power sector reforms, a Memorandum of Understanding (MOU) was signed (16 March 2001) between the Government of Maharashtra and Government of India as a measure of joint commitment to undertake the reforms in a time bound manner. The MOU was valid for five years. As per MOU, the Board was to achieve breakeven in distribution operations by 31 March 2003 and generate positive returns thereafter. For this purpose, energy audit and energy accounting was to be undertaken at all levels to promote accountability and to reduce transmission and distribution losses to 18 *per cent.*

The Board was required to:

- install meters on all distribution feeders by 31 December 2001,
- provide 100 *per cent* metering on the LT side of distribution transformers by 31 December 2001,
- provide meters to all consumers by September 2002, and
- provide time of day (TOD) metering for HT consumers for demand side management and flattening of demand curve.

Installation of meters on distribution feeders

3.1.18 MOU stipulated that Board should install meters on all distribution feeders by December 2001 with a view to identify feeder-wise losses. However, as of March 2003, out of 7,128 feeders, panel meters were installed on 6,493[✪] feeders at a cost of Rs.7.14 crore.

- Prior to installation of meters on feeders, it was absolutely essential to identify consumers attached to each feeder for reconciliation of energy consumed/billed with energy recorded at the feeder meter. The installation of meters on 6,098 feeders without undertaking this exercise resulted in unproductive expenditure of Rs.6.71 crore as in the absence of this data, feeder-wise losses could not be ascertained.

[✪] Distribution feeders-6,098, express feeders-314 and MIDC feeders-81.

3.1.19 Table below gives details of express feeders:

	2001-02	**2002-03**
Number of express feeders	298	314
Number of express feeders for which energy accounting reports received	270	198
Number of express feeders for which no energy accounting reports received	28	116
Number of express feeders on which energy loss was more than 2 *per cent*	54	15
Number of express feeders on which energy loss was below (-) 0.5 *per cent*	67	34

Loss beyond permissible limit was Rs.3.58 crore during 2001-03.

As per Maharashtra Electricity Regulatory Commission (MERC) stipulation, energy loss on express feeders was to be in the range of (-) 0.5 to 2 *per cent*. Loss on 54 feeders in 2001-02 and 15 feeders in 2002-03 was in the range of 2 to 5.6 *per cent.* Loss beyond permissible limit on the 54 feeders in 2001-02 worked out to 7.82 MU and 3.54 MU valuing Rs.2.46 crore and Rs.1.12 crore, respectively. One 220 KV express feeder of Jejuri sub-station supplying power to one steel tube manufacturer (Indian Seamless) alone recorded loss over and above the limit of 2 *per cent* to the extent of (3.88 MU valued at Rs.1.22 crore) during 2001-03. The Board did not take any action to reduce the excessive loss.

3.1.20 The details of negative energy loss recorded at express feeders during 2001-02 and 2002-03 are given in ***Annexure–18***. During 2001-02 and 2002-03, 67 and 34 feeders, respectively, recorded negative loss of energy in the range of (-) 0.5 to (-) 16.45 *per cent*. The Board replied that variation of positive and negative errors was permissible. The Board's reply was not tenable as such high negative losses are attributable to faulty meters installed at HT consumers/feeders. The Board should have taken corrective action.

3.1.21 In 2001-02, no energy accounting report was received in respect of 28 express feeders. In 2002-03, the situation deteriorated when reports were not received in case of 116 feeders. There should not have been any shortfall in the case of express feeders as the effort involved is insignificant since only one consumer is served by a feeder.

Installation of meters on the LT side of distribution transformers

3.1.22 MOU also stipulated that the Board would install energy meters on the LT side of all distribution transformers by 31 December 2001. As of March 2003, there were 1.10 lakh distribution transformers in 11 distribution zones[*]. Instead of providing meters on each distribution transformer, the Board installed meters only on 14,134 distribution transformers (12.85 *per cent)*.

[*] Akola -19,356, Aurangabad -17,404, Beed -21,898, Bhandup Urban - 4,869, Kalyan -9,210, Kolhapur -46,648, Konkan - 4,935, Nagpur -17,473, Nagpur Urban - 2,154, Nashik - 48,449 and Pune Urban - 4,553.

Prior to installation of meters on distribution transformers, it was absolutely essential to identify consumers attached to each distribution transformer for reconciliation of energy consumed/billed with energy recorded at the distribution transformer meter. The installation of meters on 14,134 distribution transformers without undertaking this exercise resulted in unproductive expenditure of Rs.15.55 crore as transformer-wise losses could not be ascertained in the absence of required data.

Installation of meters at unmetered consumers

3.1.23 MOU had provided that 100 *per cent* metering of all consumers was to be achieved by 30 September 2002. MERC also directed in May 2000 that all consumers were required to pay tariff on metered consumption and the Board should ensure that all consumers would be metered within the next three years.

As per the Board's annual administrative report for 2001-02, there were 18.52 lakh agricultural consumers and 26,949 public water works (PWW), who were not provided with meters. The Board had resolved (January 2001) to provide meters to all unmetered agricultural and PWW consumers by December 2004. Accordingly 4.88 lakh meters were purchased during May 2001 to December 2002 at a cost of Rs. 95.68 crore. As on March 2003, 18.03 lakh agricultural consumers remained unmetered. In reply, the Board stated (March 2003) that agricultural consumers were reluctant to opt for metered tariff. Further, agricultural consumers did not pay their energy bills in anticipation of certain concessions from the Government which also intervened to prevent disconnection of their supply in the event of arrears. The reply was not tenable because the Board should not have procured such large number of meters. Procurement should have been done in a phased manner only after successful installation of meters in each lot. As a result, 2.10 lakh three phase meters costing Rs.41.08 crore purchased during February to December 2002 for agricultural consumers remained unutilised (March 2003).

Due to non-procurement of meters in a staggered manner, 2.10 lakh meters costing Rs.41.08 crore remained idle.

'Time of day' metering

3.1.24 For the purpose of shifting the energy consumption from peak hours to off peak hours, system of 'Time of day' (TOD) metering was introduced (May 2000). Tariff rules (May 2000) provide for lower tariff during 'off peak' hours and higher tariff during peak hours. As of September 2000, the Board provided TOD meters to all live 10,456 HT consumers. Scrutiny of records relating to billing of 8,167 HT consumers in HTP-I and II tariff category under TOD metering revealed that there was no shift in energy consumption from peak hours to off peak hours. Instead, the Board sustained loss of revenue of Rs.80.17 crore during June 2000 to March 2003 due to the concessional tariff. The revised tariff which provided for rebate during off peak hours and higher charges during peak hours resulted only in the consumers, already working during off peak hours, getting concessional tariff. In reply, the Board stated (July 2003) that it would approach MERC for revision in TOD tariff.

TOD metering resulted in concession of Rs.80.17 crore to consumers already working during off peak hours.

High T & D losses

3.1.25 MOU stipulated a target of reduction of T&D losses to 18 *per cent* by March 2003. The Board could not achieve even the liberal target of 26.9 *per cent* set by MERC.

Table below gives T&D losses during 1999-2003:

Year	Percentage of T & D losses
1999-2000	31.9
2000-01	39.4✡
2001-02	39.2✡
2002-03	36.8✡

Out of 34 circles and 2 urban zones, 25 circles/zones in 2001-02 and 27 circles/zones during 2002-03 recorded T&D losses above 26.9 *per cent* of energy input as shown below:

Range of T & D losses	Number of circles/urban zones and divisions during			
	2001-02		2002-03	
	Circles/ urban zones	Divisions	Circles/ urban zones	Divisions
Below 26.9 *per cent*	11	41	9	26
Between 27 and 39.9 *per cent*	13	48	14	44
Between 40 and 49.9 *per cent*	8	18	7	32
Above 50 *per cent*	4	14	6	19

Loss of energy in those circles/urban zones where T&D losses were more than 26.9 *per cent* worked out to 4,165 MU valued at Rs.1,312 crore in 2001-02 and 6,707 MU valued at Rs.2,113 crore in 2002-03.

Conclusion

Installation of meters on feeders, distribution transformers and consumers' premises was the key to achieving reduction of transmission and distribution losses to 18 *per cent.* Procurement of meters for installation at feeders and distribution transformers without identifying consumers did not yield the desired objective. Procurement was carried out in a non-transparent manner resulting in higher expenditure. There was a huge shortfall in calibration/testing of meters, which is very essential for accurate billing.

✡ The Board attributed higher T&D losses after the year 1999-2000 to better estimation based on improved level of energy audit.

The Board needs to procure adequate number of meters at economic rates, strictly implement the policies of monitoring of independent feeders and carry out required checking of installations to avoid revenue losses. There is need to speedily implement the reforms programme committed in the Memorandum of Understanding and take steps for effective energy audit and metering the consumers.

3.2 Performance of Khaperkheda Thermal Power Station including construction of Units 3 and 4

Highlights

Construction of unit 3 and 4 of 210 mega watt capacity each at Khaperkheda thermal power station was approved by the Planning Commission in June 1988, taken-up for implementation in September 1997 and commissioned in August 2000 and March 2001, respectively.

(Paragraph 3.2.1)

During implementation of civil works extra expenditure of Rs.1.03 crore was incurred due to improper estimates, issue of oversized steel and delay in revision of drawings.

(Paragraphs 3.2.9-3.2.12)

In the execution of electrical and mechanical works, excess payment of Rs.31.66 crore was made to Bharat Heavy Electricals Limited due to incorrect computation of price variation.

(Paragraph 3.2.14)

Due to defective performance of ash handling plant supplied and commissioned by Mahindra Ash Tech Limited, the Board incurred extra expenditure of Rs.1.11 crore and also suffered power generation loss of Rs.71.08 crore. Irregular payment of Rs.60 lakh was made to the contractor towards reimbursement of excise duty. Penalty of Rs.18 lakh leviable as per terms of contract was also not levied.

(Paragraphs 3.2.16-3.2.20)

Due to rejection of technically and commercially acceptable lowest offer, the Board incurred extra expenditure of Rs.86 lakh on installation of coal handling plant.

(Paragraph 3.2.21)

Excess consumption of coal by 17.43 lakh metric tonne over and above the standard laid down by the equipment supplier resulted in loss of Rs.165.70 crore during 1998-2003.

(Paragraph 3.2.27)

Extra expenditure of Rs.13.60 crore was incurred on transportation of coal from distant mines.

(Paragraph 3.2.30)

Steel worth Rs.2.21 crore was lying idle due to procurement in excess of requirement at the closing stage of the project.

(Paragraph 3.2.34)

Introduction

3.2.1 In order to meet the growing demand for power in the State, Maharashtra State Electricity Board (Board) set up stage-I of Khaperkheda thermal power station (KTPS) with two units of 210 mega watt (MW) capacity each. Prior to commissioning of stage-I units in 1990-91, the Planning Commission had approved (June 1988) two more units of 210 MW capacity each as stage-II of KTPS at an estimated cost of Rs.454.42 crore. The units were to be commissioned within a period of four years from the date of sanction of the project by the Planning Commission. However, the units 3 and 4 were taken up for implementation in September 1997 and commissioned in August 2000 and March 2001, respectively.

Organisational set up

3.2.2 The Chairman is the Chief Executive of the Board and is assisted by a Technical Member and an Accounts Member. The Technical Member is assisted by one Technical Director (Generation Projects and Generation, Operation and Maintenance). The Technical Director is assisted by four Chief Engineers who look after planning and implementation of Generation Projects. The Chief Engineer responsible for the Operation and Maintenance of KTPS is assisted by one Deputy Chief Engineer, four Superintending Engineers and one Deputy Chief Accounts Officer.

Scope of Audit

3.2.3 The execution of stage-I of KTPS comprising commissioning of unit-I in September 1990 and unit-2 in January 1991 was reviewed in the Report of Comptroller and Auditor General of India (Commercial) – Government of Maharashtra for the year ended 31 March 1993, which was discussed in July 1996 by the Committee on Public Undertakings (COPU). The recommendations of the COPU were given in its 4th Report of 1995-96 which was presented to the Legislature on 24 July 1996. The COPU recommended that all aspects of expenditure should be considered while preparing the estimates for the execution of work; the Board should utilise the expertise of its own engineers and technicians rather than outsourcing the works and the action taken report on the recommendations should be intimated to COPU within three months. Even after lapse of seven years, the action taken report on the recommendations of COPU was awaited (July 2003) from the State Government and the Board.

The present review covers the construction of unit 3 and 4 of the KTPS through test check of 45 major contracts (Rs.1,195.50 crore) out of 58 major contracts (Rs.1,229.25 crore) and review of operational performance of all the four units during 1998-2003.

The audit findings, as a result of test check of records, were reported to Government/Board in May 2003 with the request for attending the meeting of Audit Review Committee for State Public Sector Enterprises (ARCPSE) so that view points of Government/Board could be taken into account before finalising the review. The meeting of ARCPSE was held on 17 July 2003 which was attended by the officials of the State Government and Board and their view points had been duly incorporated in the review.

Project planning and implementation

Project planning

3.2.4 The project report of stage-II of KTPS consisting of two units of 210 MW capacity each, having estimated cost of Rs.454.42 crore was approved by the Planning Commission (June 1988) while the execution of stage-I was in progress. The Planning Commission gave in principle acceptance for implementation of the project in 1988-89.

There was delay in implementation of project.

Commissioning of units 3 and 4 of KTPS was to be completed within a period of 48 months (June 1992) and 54 months (December 1992), respectively from the date of approval of the project by the Planning Commission. The equipments were required to be procured from indigenous sources. Bharat Heavy Electricals Limited (BHEL) offered to finance the project and forwarded to the Board (July 1989), its proposal for supply of main plant and equipments and auxiliary packages on deferred payment basis.

However, it was decided by the Board to offer the project for private sector participation. Accordingly, the Board and Aranco Line Shipping Company Limited (Aranco) signed (January 1993) a Memorandum of Understanding (MOU) for implementation of the project. The progress of the project was not monitored effectively and the MOU was cancelled in December 1995 in view of the dismal progress shown by Aranco in implementing the project.

Subsequently, the Government of Maharashtra accorded (December 1995) approval for execution of Khaperkheda stage-II project departmentally. After a delay of 21 months from the date of Government's approval, the Board commenced (September 1997) implementation of the project departmentally. The project was completed in March 2001.

Project financing

3.2.5 On the basis of a proposal from BHEL for arranging lease finance of Rs.600-800 crore through Kotak Mahindra Finance Limited (KMFL), the Board issued a letter of mandate to KMFL and sought approval of the State

Government to obtain lease finance through KMFL. The Government, however, advised (March 1997) the Board to implement the project departmentally by arranging finance through other sources.

The project cost was revised (August 1997) to Rs.1,130 crore based on BHEL's offer (November 1995) of Rs.638 crore and it was decided (August 1997) that the financing of the Project would be met through plan outlay to the extent of Rs.705 crore and through loan (Rs.425 crore) from Power Finance Corporation Limited (PFC). The project cost was again revised (September 1997) to Rs.1,366 crore. The project was financed through loan from PFC (Rs.630 crore), loan from commercial banks (Rs.140 crore), issue of bonds (Rs.118 crore), lease arrangement with State Bank of India (Rs.37 crore), nonconvertible debentures with Industrial Finance Corporation of India (Rs.59.94 crore) and balance (Rs.381.06 crore) through internal sources.

Loss due to delay in availing subsidised loan

3.2.6 The Board borrowed Rs.630 crore from PFC. Pending sanction of loan by PFC, the Board incurred expenditure of Rs.130 crore (during August 1999 to March 2001) from funds borrowed from other commercial banks at an interest rate of 14.5 *per cent.* As per the terms and conditions of sanction, the rate of interest as on the date of sanction (February 2001) was 15 *per cent* per annum (subsequently reduced to 14.5 *per cent* per annum). Since the PFC loan was included under the accelerated generation and supply programme of Government of India (GOI), the Board was entitled to four *per cent* interest subsidy. Thus, the effective rate of interest payable to PFC was 10.5 *per cent*.

PFC sanctioned (February 2001) loan of Rs.130 crore to the Board. As per the agreement, the expenditure already incurred from August 1999 onward for payment to BHEL and other suppliers for civil, electrical and mechanical works was covered by this loan. To save on interest cost, there was an urgent need for availing of loan from PFC immediately after sanction (February 2001). However, the Board delayed the availing of loan by 121 to 302 days (delay worked out from May 2001 after allowing margin of about 12 weeks).

Due to delay in availment of loan from PFC, Board suffered loss of Rs.2.07 crore.

Thus, due to delay in availing the loan from PFC, the Board suffered loss of Rs.2.07 crore on account of higher interest rate.

The Board stated (July 2003) that it would be incorrect to attribute loss to delay in claiming reimbursement of expenditure; on the contrary, a postponement of drawal of loan would amount to saving in interest due to drawal of loan at a later stage. The reply was not tenable, as postponement of drawal of loan will not result in saving of interest as the loan was to be utilised to repay funds already used to finance the expenditure out of funds borrowed at a higher rate of interest.

Time overrun

Against the CEA's norms of 12 months, 20 months were taken for placement of orders despite dispensing with tendering process.

3.2.7 As against Central Electricity Authority (CEA) guidelines for finalisation of bids within twelve months from pre-project activities to zero date (date of placement of order), the time actually taken for placement of order was 20 months despite a conscious decision taken to procure equipment from BHEL and dispensing with the tendering process.

Due to delay in commissioning of unit-3 and 4, there was generation loss of 136.489 million units as tabulated below:

Particulars	Unit-3	Unit-4
Scheduled date for commissioning	9 June 2000	9 December 2000
Actual date of commissioning	20 August 2000	24 March 2001
Delays	72 days	105 days
Generation loss of power	55.521♦ million units	80.968 million units
Value (Rupees in crore)	14.64	21.34

Delay in commissioning was attributed to internal reasons such as delayed release of fronts in turbo generator house, primary air fan foundation, bunkers, electrostatic precipitators and control room *etc*. Out of total delay of 3.5 months in commissioning of Unit-4, delay of 2 months was attributable to BHEL on account of non-availability of oil pump, delay in supply of material, delay in carrying out insulation work by sub contractor and shortage of insulation material. There was delay of one month in supply of material by BHEL in respect of Unit No.3. Similarly, in respect of the erection contract, there was a delay of 2 months (8 weeks) on the part of BHEL in respect of Unit No.4. The total liquidated damages of Rs.7.73 crore were not recovered from BHEL as per the terms of contract.

Liquidated damages of Rs.7.73 crore were not recovered.

The Board stated (July 2003) that liquidated damages (LD) were not recovered as there was some delay by the Board in releasing payment to BHEL and no interest was paid to them on delayed payments. The Board further stated that Rs.2.92 crore were retained towards LD. The reply was not correct, as the payments should have been made in time and the full LD recovered as per the contract.

Civil works

3.2.8 The project cost of civil works was Rs.130 crore (September 1997) against which the Board incurred expenditure of Rs.139.37 crore (March 2003). The scrutiny of 12 civil contracts (Rs.109.57 crore) out of 14 (Rs.114.16 crore) major civil contracts revealed the following:

♦ Power generation loss is calculated based on the norm of plant load factor (PLF) of 15.3 *per cent* set by CEA.

Preparation of improper estimates

Estimates prepared without considering the site conditions resulted in avoidable expenditure of Rs.19.26 lakh.

3.2.9 As per the terms of contracts for civil works, the contractor was entitled to revise the rates if the quantities exceed 125 *per cent* of schedule-B quantities of the works order. Thus, to save extra expenditure on account of revision in rates, the estimates were required to be prepared on realistic basis. Further, the COPU had also recommended (1995-96) that estimates should be prepared realistically. The Board, however, prepared the estimates for civil works of main plant building by considering the actual quantities executed in unit-1 and 2 without giving weightage to site conditions. The Board had, therefore, to pay additional amount of Rs.19.26 lakh due to rate revision in respect of 20 items.

The Board stated (July 2003) that estimates were prepared on the basis of available data of unit-1 and 2 at KTPS and hence quantities differed. The fact remained that estimates were prepared without taking into account site conditions.

Issue of oversized steel

Issue of oversized steel led to extra expenditure of Rs.51 lakh.

3.2.10 The Board supplied steel of non-standard higher size to a civil contractor. The weight of the actual steel issued was more by 191.675 MT valuing Rs.51 lakh than that of theoretical weight of steel required to be issued to the contractor as per drawings. This resulted in extra expenditure of Rs.51 lakh.

The Board justified (July 2003) issue of excess steel by saying that excess weight of steel issued was within the tolerance limit prescribed in ISI standard. The reply was not correct as the excess has been worked out by audit with respect to the tolerance limit.

Revision in drawing after award of works

The Board incurred extra expenditure of Rs.32.87 lakh due to belated revision of drawings.

3.2.11 The contract for structural steel works for main plant building and adjacent structures was awarded (April 1998) to R. S. Avtarsingh and Company, New Delhi. As per the terms of contract, the contractor was required to fabricate the columns, girders *etc*. as per specifications and drawings approved by the Board. The Board approved the drawings in September 1998. After a period of seven months from approval of original drawings, the Board revised (April 1999) the drawings. In the meantime, the contractor had fabricated and erected columns of 385.87 MT which had to be dismantled and re-erected in accordance with revised drawings resulting in extra expenditure Rs.27.17 lakh.

3.2.12 The contract for structural steel works in bunker bay and miscellaneous structures was awarded (October 1998) to Sunil Engineering Works. The contractor had erected the columns of 184.955 MT based on drawings received during September 1998 of which 124.839 MT were dismantled and re-erected as per revised drawings received during June 1999 resulting in extra expenditure of Rs.5.70 lakh.

The Board stated (July 2003) that the work was started with primary drawings. The floor framing plan was revised and additional brackets could not be fixed on erected position and necessitated dismantling of already erected column. The fabrication work was not stopped for want of detailed drawings. The reply of the Board was not acceptable as the revision of drawings after seven months of award of work and failure to stop the fabrication work resulted in dismantling and consequent extra expenditure.

Electrical and mechanical works

3.2.13 Expenditure of Rs.1115.09 crore on electrical and mechanical works constituted 82 *per cent* of total estimated project cost of Rs.1366 crore. Audit scrutiny of 33 major contracts (Rs.1,085.93 crore) out of 44 contracts (Rs.1,115.09 crore) revealed the following:

Excess payment on account of improper computation of price variation

3.2.14 The prices for supply and erection of steam generator (SG), turbo generator (TG) and other manufactured equipments were negotiated (14 August 1997) with BHEL. The following negotiated conditions were accepted (9 September 1997) by the Board:

- The total price of BHEL supplies would be Rs.701 crore with base indices as prevailing on 1 October 1996.
- Price variation was not payable on advance payment and price variation formula for final payments would be similar to Khaperkheda stage-I.

The Board made excess payment of Rs.31.66 crore due to incorrect computation of price variation.

Although, price variation on advances to BHEL was not payable, the Board paid price variation of Rs.9.39 crore on advances (Rs.106.13 crore) to BHEL. Further, as per price variation formula, price variation was payable on indices prevailing on two-third of the period from the base date to the date of despatch of materials. However while making payment, the two-third period was reckoned from the zero date (date of placing the order) instead of base date. As a result, the Board paid excess price variation of Rs.22.27 crore.

The Board stated (July 2003) that BHEL disputed the price variation clause and hence the Board agreed (March 1998) for the revision as asked for by BHEL. The reply was not acceptable. Once the agreement was entered into after mutual discussion, it was incorrect to say that the price variation formula had been incorrectly incorporated in the agreement.

Award of contract for ash handling plant

3.2.15 The contract for design, engineering, manufacturing, shop testing, supply, receipt, handling and storage at site, erection, testing and commissioning of the dry fly ash collection and transportation (DFACT) and high concentrated slurry disposal (HCSD) system was awarded (April 1999) to Mahindra Ash Tech Limited, Mumbai (MATL) at a cost of Rs.36.77 crore.

At the tendering stage, the Board received an offer for fluidizing air system from Macawber Beekay at a total cost of Rs.35.50 lakh. MATL opined that this equipment was not required. The Board preferred not to opt for this additional equipment. Review of operation of AHP during December 2002 revealed the following:

3.2.16 The ash evacuation was not proper resulting in ash build up in electrostatic precipitator (ESP) leading to ESP failure. The Board incurred expenditure of Rs.94.96 lakh on rectification of ESP during June 2001 to February 2002.

Due to defective performance of AHP, the Board not only incurred extra expenditure of Rs.1.11 crore but also suffered generation loss of 433.773 MU valuing Rs.71.08 crore.

3.2.17 Due to choking of ash in conveying pipes, the ash was unloaded on the floor of AHP and was transported manually to ash disposal point by the Board by incurring expenditure of Rs.16.26 lakh.

3.2.18 Due to problem in ash evacuation from ESP hoppers, the load on the units was restricted to 100-170 MW in both units between January and September 2001 and May 2001 and February 2002 thereby causing a generation loss of 433.773 MU valued at Rs.71.08 crore.

There were problems in evacuation of ash. MATL could resolve these problems only after installing fluidizing air system (August 2001) at a cost of Rs.37.50 lakh.

The Board stated (July 2003) that the provision of fluidizing air system for ESP was not envisaged and the same was not specified in the bid documents. The reply was not acceptable as due to lack of proper appreciation of the need for fluidizing air system, the Board not only incurred extra expenditure of Rs.1.11 crore but also suffered power generation loss valuing Rs.71.08 crore.

3.2.19 As per the terms of contract, all taxes, duties and any variation thereof are to be borne by the contractor. This meant that if there was any downward revision in taxes, no benefit would be passed on to the Board. Similarly, in case of upward revision no additional payment would be made by the Board. Supply commenced from January 2000 and was completed by January 2002. On the grounds that excise duty was increased from 8 to 16 *per cent* with effect from 1 March 2000, the contractor sought reimbursement of Rs.1.20 crore from the Board. Despite the fact that Accounts Member of the Board expressed an opinion that contract does not envisage any such payment, the Board reimbursed 50 *per cent* of the increase in duty amounting to Rs.60 lakh to the contractor (February 2003).

Board made irregular reimbursement of excise duty amounting to Rs.60 lakh to MATL.

The Board replied (July 2003) that as per legal opinion, it was a new levy and the contractor was entitled to the benefit. The reply was not tenable. Any benefit in case of downward payment would not have been passed on to the Board. Similarly, the Board was not obliged to compensate the increase in duty. Hence, the payment was not in order.

3.2.20 As per the terms and conditions of the contract, penalty was to be levied for increase in power consumption by centrifugal fan in excess of the guaranteed limit of 4.5 KW per fan.

The AHP was commissioned in March 2001. The performance guarantee test was conducted during 24 to 28 May 2002. The actual power consumption of the pressurization fans No.1 and 2 measured during performance guarantee (PG) test was 17.60 and 15.20 KW, respectively *i.e.* much higher than limit of 4.5 KW. There was excess auxillary consumption of 26.99 MU due to higher consumption of power by fans during August 2000 to March 2003.

Board failed to levy penalty of Rs.18 lakh as per agreement.

As per terms of the contract, penalty of Rs.18 lakh was recoverable from the contractor. The Board did not recover the penalty stating (July 2003) that the total power consumption of all the auxillaries clubbed together had remained within total guaranteed power consumption. The reply was unacceptable as power consumption limit for each auxillary unit and penalty for excess power consumption was specified in the contract, and hence, penalty was leviable.

Rejection of technically and commercially acceptable lowest offer

3.2.21 The Board invited (January 1998) tenders for design, engineering, manufacture, supply, erection, testing and commissioning of extension system for coal handling plant (CHP) with designed capacity of 1500 tonne per hour (TPH) of unit 3 and 4 at KTPS. Fenner (I) Limited, Kolkata (Fenner) was qualified as per tender condition that though the bidder had supplied smaller capacity CHP, he should have valid collaboration with reputed collaborator who independently fulfills qualifying criteria.

Out of 21 bids received, 7 bidders qualified as per the qualifying requirement (QR) stipulated by the Board. The offer of Fenner was assessed to be technically and commercially acceptable to the Board. Based on the prices quoted, the offer of Fenner (Rs.3.27 crore) was the lowest. However, after opening the price bid, the Board did not consider the offer of Fenner on the ground that Fenner had installed CHPs of lesser capacity and had no experience of design and supply of CHPs in a thermal power station. The order was placed (May 1999) on the second lowest bidder *viz.* Elecon for Rs.4.13 crore.

Rejection of lowest offer resulted in extra expenditure of Rs.86 lakh on commissioning of CHP.

Transparency demands that technical/commercial evaluation of offers should have been done before opening of price bids. The rejection of offer after opening of price bids was not in order. Further, the Board overlooked the fact that Elecon had delayed CHP works in other power stations of the Board. The rejection of the lowest technically and commercially acceptable offer resulted in extra expenditure of Rs.86 lakh (Rs.4.13 crore–Rs.3.27 crore).

The Board stated (July 2003) that delay in supply of CHP by Elecon had not caused any delay in commissioning of the unit and the firm had executed work of CHP having capacity of 360 tonne per hour (TPH). The reply was not acceptable since non-availability of CHP was one of the reasons for delay in commissioning of the unit 3 and 4.

Excess payment to the contractor

3.2.22 The contract for electrical installations was awarded (August 1999) to Ahmedabad Electricity Co. The prices were inclusive of works contract tax

(WCT). The contract stipulated that price would vary with any variation in the rate of WCT (four *per cent*). Though the rate of WCT was reduced from four to two *per cent* with effect from 1 January 2000, the Board did not regulate payment accordingly resulting in excess payment of Rs.5.05 lakh to the contractor. The Board stated (February 2003) that the matter had been taken up with the agency for recovery. However, the amount had not been recovered so far (July 2003).

Non-recovery of liquidated damages

Liquidated damages of Rs.4.13 crore were not recovered.

3.2.23 The table below gives details of cases where contractors (other than BHEL) were liable to pay liquidated damages at the rate of half *per cent* of the contract price per week of delay or part thereof subject to a maximum of 10 *per cent* of the contract price. Despite delay in execution of works, liquidated damages of Rs.4.13 crore were not levied as tabulated below:

Name of the work	Name of the contractor	Scheduled date of completion	Actual date of completion	Delay in months	Liquidated damages recoverable (Rupees in crore)
Ash handling system (AHP)	Mahindra Ash Tech Limited, Mumbai	May 2000 October 2000	August 2000 March 2001	3 5	3.68
Fire protection system (FPS)	Speck Turnkey Projects (P) Limited, New Delhi	February 2001	Not completed (July 2003)	29	0.31
115/25 MT EOT crane	ACME Manufacturing Company Limited, Mumbai	April 1999	November 2000	19	0.14
				Total	**4.13**

The Board stated (July 2003) that coal firing activities were not held up at all due to incomplete AHP and there was no delay in commissioning the units for want of AHP; in case of supply of FPS, the matter was being pursued with the contractor for early commissioning; in case of EOT crane, the liquidated damages were not levied considering the serious financial position of the contractor. The reply was not acceptable as non-availability of AHP was one of the reasons for delay in commissioning the unit and the reasons cited for non-recovery were not justifiable in terms of the contracts.

Operational performance

Generation

3.2.24 Generation performance of the plant during 1998-2003 is given in ***Annexure-19***.

Plant outages

3.2.25 The table below indicates total hours available, actual hours operated and outages during 1998-2003:

Sl. No.	Particulars	Unit No.	1998-99	1999-2000	2000-01	2001-02	2002-03
1	Total available hours	1&2	17,520	17,568	17,520	17,520	17,520
		3&4	-	-	5,088	17,520	17,520
2	Actual hours operated	1&2	15,386	12,981	15,144	16,001	15,822
		3&4	-	-	3,668	14,456	16,035
3	**Shutdown (hours):**						
	Planned	1&2	1,107	3,868	1,311	354	1,081
		3&4	-	-	856	1,961	1,081
	Forced	1&2	1,027	719	1,065	1,165	617
		3&4	-	-	564	1,103	404
4	**Percentage of:**						
	Planned shutdown hours to available hours	1&2	6.32	22.02	7.48	2.02	6.17
		3&4	-	-	16.82	11.19	6.17
	Forced shutdown hours to available hours	1&2	5.86	4.09	6.08	6.65	3.52
		3&4	-	-	11.08	6.29	2.31
	Total shut down hours to available hours	**1&2**	**12.18**	**26.11**	**13.56**	**8.67**	**9.69**
		3&4	**-**	**-**	**27.9**	**19.48**	**8.51**

It would be seen from above table that the percentage of shutdown to available hours ranged from 8.67 to 26.11 in respect of unit 1 and 2 and 8.51 to 27.90 in respect of unit 3 and 4 during 1998-2003. As per norms fixed by Central Electricity Authority, the planned outages of the plant should not exceed 10 *per cent* of available hours. It would be seen from the above table that the planned outages in respect of unit 1 and 2 during 1999-2000 was 22 *per cent* and in respect of unit 3 and 4 during 2000-01 and 2001-02 was 16.82 and 11.19 *per cent,* respectively.

The Board stated (July 2003) that the increase in planned outages was due to certain defects and deficiencies in equipment which were rectified during this period. The fact remained that planned outages were in excess of norms fixed by CEA.

Cost of generation

3.2.26 The cost of generation per kilo watt hour (KWH) during 1998-2002 is given in ***Annexure-20***. It would be seen from the ***Annexure*** that generation cost increased from 128.66 paise per unit in 1998-99 to 155.69 paise per unit in 2001-02.

Excess consumption of coal

3.2.27 Equipment supplier's specifications provide that heat rate required to generate one unit of power is 1,970 Kilo calorie (K.cal)/ kilo watt hour (KWH) with boiler efficiency at 86.61 *per cent* for unit No 1 and 2 and 1,939 Kcal/KWH with boiler efficiency at 86.80 *per cent* for unit No.3 and 4. The details of consumption of coal as per standards adopted for actual generation, coal actually consumed *vis-à-vis* excess consumption of coal are given in ***Annexure-21***. It would be seen from the ***Annexure*** that during 1998-2003, there was excess consumption of coal of 17.43 lakh MT valued at Rs.165.70 crore as compared to equipment supplier's specifications. The excess consumption also resulted in excess auxiliary consumption of 941.513 MUs valued at Rs.137.71 crore due to additional operation of coal mills for 51,874 hours.

Coal valued at Rs.165.70 crore was consumed in excess of standard norm.

The Board stated that the "designed heat rate" could not be considered to calculate coal consumption because it was under ideal test conditions. Reply was not tenable on the grounds that the excess consumption of coal was worked out on the basis of calorific value in coal received and technical specifications stipulated by the manufacturer.

Excess expenditure due to delay in commissioning of coal mills

3.2.28 As per the technical specifications, the unit-4 was to be commissioned by BHEL by installing six coal mills (four in operation *plus* two standby). However, the unit-4 was commissioned (24 March 2001) with two coal mills only. In absence of coal mills, the Board had to feed furnace oil (15,370 KL) into the boiler instead of coal (48,916 MT) resulting in extra expenditure of Rs.14.09 crore.

Use of furnace oil instead of coal resulted in excess expenditure of Rs.14.09 crore.

The Board accepted (July 2003) the fact of commissioning of unit with only two coal mills. However, the fact remained that extra expenditure on furnace oil had to be incurred by the Board due to non availability of required coal mills.

Low performance of coal mills

3.2.29 Based on the guaranteed performance of 78 *per cent* of installed capacity of coal mills, coal to the extent of 28.66 lakh and 22.29 lakh MT should have been pulverised• in unit 3 and 4, respectively since commissioning (August 2000, March 2001). As against this, the actual quantity of coal pulverised was 24.69 lakh and 20.13 lakh MT only which was 67 and 70 *per cent* of installed capacity. Thus, there was shortfall of 3.97 lakh and 2.16 lakh MT which required additional 16,650 coal mill hours and consequent excess consumption of energy to the extent of 302.197 MU valuing Rs.49.52 crore. In addition, the pulverisation of coal was not to the required level of fineness (75 to 85 *per cent*).

Poor performance of coal mills resulted in excess consumption of energy valuing Rs.49.52 crore.

• Pulverisation of coal means powdering of coal.

The Board stated (July 2003) that the calorific value of coal received was 3,217 to 3,757 Kcal/Kg whereas boiler is designed for calorific value of 3,500 Kcal/Kg. The quality of coal received from Mahanandi Coal Field Limited (MCL) was very poor and hence additional coal mill was required. The reply was not tenable as four coal mills were sufficient as per technical specifications taking into account the calorific value of actual coal received. Due to inefficient performance of the coal mills, additional coal mill had to be run.

Transportation of coal from long distance

3.2.30 The Board lifts coal from various coal mines under South Eastern Coal Fields Limited (SECL), MCL and Western Coal Fields Limited (WCL) based on quantity allotted by Standing Linkage Committee. The mines of WCL are nearer and quality of coal is also better than that of SECL and MCL. Though the Board was allotted 27 lakh MT of coal from WCL by the standing linkage committee, it failed to lift 6.9 lakh MT. The Board stated that WCL failed to deliver the linkage quantity. The reply was not acceptable since the Board should have prevailed on WCL to release quantity as per linkage by vigorous pursuance with linkage committee. By not doing so, it incurred additional transportation cost of Rs.13.60 crore.

Extra expenditure of Rs.13.60 crore was incurred on transportation of coal.

Procurement of material

Purchase of cable

3.2.31 Based on Guaranteed Technical Specification (GTS), the central purchase agency of the Board procured (August 1999), 3 kms. of IC x 400 sq.mm M. S. armoured cable and 1.5 kms of IC x 400 sq. mm copper armoured cables.

Audit observed as follows:

3.2.32 The excess cable lying in Chandrapur thermal power station was transferred to KTPS for utilisation. The Board without considering the quantity transferred and ascertaining the proper requirement of cable procured (August 1999) 3.819 kms. cable valuing Rs.48 lakh which remained idle since its receipt (March 2000) resulting in interest loss of Rs.22 lakh during March 2000 to July 2003.

3.2.33 As per the technical specification given alongwith purchase order, the total weight of the quantity supplied ought to have been 78.941 and 40.075 MT in respect of M.S. and copper cable respectively. However, the actual weight of the cable received in major stores was 22.053 and 11.782 MT, respectively. Though there was major weight variation in cable received, the short receipt was not pointed out by stores authorities while accepting the material and entire payment was released to the supplier. The excess payment made to the supplier worked out to Rs.41.53 lakh.

The Board stated (July 2003) that the weight of cable mentioned by various tenderers was within the range of 7,000 - 7,500 kgs. and the weight received was within the range. Moreover, the quantity ordered was placed considering the stock position of TPS Chandrapur. The reply was not acceptable as the weight of cable received was far less than GTS. The Board had also not considered the stock of 3.58 kms. of cables transferred from TPS Chandrapur while placing the order.

Locking up of funds due to procurement of steel in excess of requirement

3.2.34 At the closing stages of the project when almost all civil works were over and without assessing the actual requirement of steel required for balance work left to be executed, the Board placed orders (May 1999 to January 2000) of 1,731.160 MT steel on various firms for supply of mild and structural steel. Of this, 70 *per cent i.e.*1,210.170 MT steel valued at Rs.2.21 crore remained unused (March 2003). Consequently, the Board incurred interest loss (at the borrowed interest rate) of Rs.1.12 crore. The Board stated (July 2003) that the quantity of steel was assessed on the basis of consumption pattern of unit 1 and 2. This material would be utilised for works at Khaperkheda and balance would be transferred to other projects. The reply was not tenable as there was no need to procure such large quantity of steel at the closing stage of civil works.

Steel valuing Rs.2.21 crore was lying idle due to procurement at closing stage of project.

Conclusion

Due to improper preparation of estimates, consumption of oversized steel, defective drawings and incorrect application of price variation clause, the Board incurred extra expenditure on construction of unit 3 and 4.

Defective performance of ash handling plant and high pressure heater tubes contributed to generation loss. Consumption of coal at the plant was in excess of the standards laid down by the equipment supplier. Besides, extra expenditure was incurred due to transportation of coal from distant mines.

The Board should take effective steps in preparing realistic estimates for projects, improve efficiency for brining the coal consumption within the prescribed norms and lift the coal from nearby mines as per linkage.

3.3 Implementation of information technology in the high tension billing system of Maharashtra State Electricity Board

Highlights

The computerised high tension (HT) billing system of Maharashtra State Electricity Board (Board) was initially implemented in 1981 and re-engineered during 1997-2000. Considering that about 58 *per cent* of the total revenue is generated from HT consumers, the system handling HT billing and revenue realisation is 'mission critical' in nature.

(Paragraph 3.3.1)

In the absence of a formal information technology (IT) policy and long term strategy, the IT center sites prepared during April 1999 to August 2002 at a cost of Rs.1.40 crore were not made operational due to delay in procurement of hardware. The Board incurred expenditure of Rs.1.54 crore on outsourcing of billing due to delayed commissioning of IT centre at Bhandup.

(Paragraph 3.3.5)

No policy regarding physical and logical security of IT assets including software and data existed. Insufficient security features with respect to access control, passwords and login control rendered the system vulnerable to unauthorized access and data manipulation.

(Paragraphs 3.3.7-3.3.9)

The disaster recovery and business continuity plan was not documented. The data backup was not periodically checked to ensure recovery of data.

(Paragraphs 3.3.10-3.3.11)

In the absence of undertaking by Price Waterhouse Associates for passing on intellectual property rights to the Board, the system design, source codes of IT billing system developed are vulnerable to misuse.

(Paragraph 3.3.17)

There was waiver of minimum charges of Rs.7.13 crore and non levy of charges of Rs.1.54 crore in violation of rules.

(Paragraph 3.3.22)

Delay in issue of bills to HT consumers (Rs.868.44 crore) resulted in loss of interest of Rs.1.15 crore.

(Paragraphs 3.3.20 and 3.3.27)

Excess bulk discount of Rs.3.19 crore was granted to ineligible HT consumers and incorrect calculation of power factor incentive resulted in excess rebate of Rs.5.58 crore.

(Paragraphs 3.3.23-3.3.25)

Introduction

3.3.1 Maharashtra State Electricity Board (Board) was incorporated under section 5(1) of the Electricity (Supply) Act, 1948 in 1960 with the main objective of generating, transmitting and distributing electricity power in the State of Maharashtra. The consumers of power were mainly divided into the category of high tension (HT) consumers and low tension (LT) consumers. Based on the provisional accounts of the Board for 2002-03, the HT consumers contributed Rs.7,201 crore(58 *per cent*) revenue as against the total revenue of Rs.12,436 crore. The computerised HT billing system was initially implemented in 1981 in COBOL[•] on Unix[♦] platform and after considering the sensitivity of the application and ever increasing need for changes, the above system was re-engineered using a RDBMS[#] platform (Oracle-Developer 2000) by Price Waterhouse Associates (PWA) during 1997-2000 at a total cost of Rs.32.85 lakh. Considering that 58 *per cent* of the total revenue is generated from HT consumers, the system handling HT billing and revenue realisation is "mission critical" in nature.

Organisational set up

3.3.2 The IT needs of the Board are overseen by the Department of Information Technology (DIT), with 26 IT centers, functioning under the Accounts Member. DIT is headed by one Director who is assisted by Additional Director, Joint Directors, System Analysts and Programmers. The DIT is responsible for monitoring the implementation and maintenance of HT Billing system implemented during 1997-2000 using Oracle RDBMS and Developer 2000 front-end tool.

Scope and methodology of Audit

3.3.3 The audit covered the evaluation of general IT controls that establish a framework for controlling the design, security and use of computer programs in the Board. The scope of audit also included the evaluation of IT application controls specific to computerised HT billing system and the effectiveness of this IT system in achieving organisational objectives.

[•] COBOL-Common business oriented language.

[♦] Operating system developed by Unix.

[#] Relational data base management system.

The data of HT billing pertaining to April 1998-March 2003 which was extended to earlier period wherever required in respect of ten Board circles was chosen for substantial checking of data completeness, regularity and consistency. The selected 10 circles• contributed 49 *per cent* of the total HT revenue of the Board.

Based on the various policy guidelines, circulars of the Board and tariff rules of Maharashtra Electricity Regulatory Commission (MERC) relating to the HT billing, audit developed queries which were run on the live data of the HT billing and collection system with the assistance of the Board personnel at the Department of Information Technology (DIT) at Mistry Bhavan, Mumbai, Nerul, Navi Mumbai, Bhandup, Pune, Nasik, Kolhapur and Nagpur. The reports so generated were further verified and based on the results, audit identified the areas concerning lack of controls, which either caused loss of revenue to the Board or directly impacted its revenue earning capacity. The findings of audit are discussed in the succeeding paragraphs.

Salient features of HT billing system

3.3.4 The HT billing system which was earlier on the Unix-COBOL platform was re-engineered during 1997-2000. The objectives of the re-engineered HT billing system were to:

- increase the efficiency and provide an upgraded and faster platform for billing which would result in timely generation of bills;
- quickly re-organise the required changes in the HT billing system for the frequent changes in the business rules regulated by MERC;
- aid the Board in decision-making by timely generation of reports based on data analysis and generation of various management information system (MIS) reports for taking decisions aimed at reducing arrears in revenue realisation ;and
- provide HT consumers with information relating to billing.

General IT controls

Lack of formulated and documented IT policy

3.3.5 Though the Board has over the years developed substantial IT applications it is yet to formulate and document a formal IT policy and a long-term/medium-term IT strategy incorporating the time frame, key performance indicators and cost benefit analysis for developing and integration of various systems. No planning/steering committee with clear

• Bhandup, Kalyan, Kolhapur, Pen, Pune (Rural), Pune (Urban), Nagpur, Nasik, Vasai, Vashi.

roles and responsibilities exists to monitor the development of software for each functional area in a systematic manner.

Six IT centers costing Rs.1.40 crore were not commissioned due to delay in procurement of hardware.

This lack of co-ordinated strategy is reflected in the manner in which Board decentralized the bill processing system and created IT infrastructure at six[ϕ] IT centers. During April 1999-August 2002, Board incurred Rs.1.40 crore on development of infrastructure at these six IT centers, but these centers were not operational (January 2003) as the order for the procurement of hardware worth Rs.3.98 crore was issued only in August 2002. The placement of the order could have been so co-ordinated with the creation of IT infrastructure that hardware should have been made available on completion of the civil/electrical work at the IT centers.

Board incurred expenditure of Rs.1.54 crore on outsourcing due to delay in commissioning of Bhandup IT center.

Audit also observed that since Bhandup IT center could not be commissioned by April 1999 mainly due to unavailability of necessary hardware equipment, the Board incurred expenditure of Rs.1.54 crore during April 1999-March 2003, as the processing and generation of consumer bills (including LT) were still being outsourced to Bombay Suburban Electric Supply in respect of Mulund, Bhandup and Thane divisions of Bhandup circle. There was a need for timely completion of project to avoid expenditure on outsourcing of billing.

Lack of segregation of duties

Roles of DIT and MIS had not been clearly defined and documented.

3.3.6 Audit observed that apart from DIT functioning under Accounts Member, another department namely Management Information System (MIS) Department functioning under Secretary to the Board was also involved in the acquisition and monitoring the development and implementation of various IT Applications' requirements of the Board. However, the roles of DIT and MIS departments had not been clearly defined and documented.

Segregations of duties within DIT were incompatible.

Although the roles and responsibilities of all personnel within the DIT were documented, it was observed that there was no segregation of duties amongst the systems analysts, programmers and assistant programmers within DIT as all were having direct access to live data and programs relating to HT Billing system.

When pointed out in audit, the Board stated (December 2002) that such problems existed due to shortage of manpower. The reply is untenable as the applications running under the control of the DIT including the HT billing system account for a substantial part of Board's revenue and is too critical to suffer from manpower shortage.

Audit also noticed that the DIT did not maintain any record indicating the allotment of work among system analysts/programmers, assistant programmers, computer operators, *etc;* the time limit for performance of each task, actual date of completion were also not maintained. Moreover, role of DIT *vis-a-vis* its relationship with other departments was not formally established or documented.

[ϕ] Bhandup, Kalyan, Amaravati, Buldhana, Sangli and Yavatmal.

IT security policy

3.3.7 The Board had not formulated and documented an IT security policy regarding the security of IT assets and software and data security. When pointed out in audit, the Board stated (December 2002) that formal IT security policy would be formulated.

Non identification/classification of critical and sensitive data/programs

Critical, sensitive database programs were not identified.

3.3.8 Audit observed that there was no policy regarding the identification and classification of the data/programs of the HT billing into critical, sensitive and confidential categories based on risk analysis and risk mitigation methodology. In the absence of such identification and classification of data/programs, the accessibility to these at various levels of hierarchy had not been defined resulting in risk of unauthorised access and manipulation of data/program. When pointed out in audit, the Board stated (December 2002) that necessary steps would be taken while formulating the IT security policy.

Inadequate access control mechanism

Mandatory access controls were not maintained.

3.3.9 Audit further noticed that "Mandatory access controls" were not maintained by granting of privileges to individuals based on "need to know" or "least privilege" basis. Majority of the access controls were of a discretionary nature, which permitted system staff to have access to database and vice versa. Further, the number of system administrators was too large ranging from four to nine with full access rights in respect of five circles. The Board replied (December 2002) that necessary steps would be taken while formulating the IT security policy.

User account management system was not adequate.

Audit scrutiny further revealed that there was no well-defined and documented password policy. Normal password control procedures like restriction on unsuccessful login attempts by the users or automatic lapse of password after a predefined period and periodical change of passwords after certain period were non-existent. The system did not generate any logs to record the number of failed login attempts. The tables containing the list of usernames, passwords were not encrypted and the information was retained in text form thus rendering it vulnerable to misuse.

Non-existence of such basic controls regarding data security in a mission critical system with huge revenue implication posed a serious threat to both the application and the data. The Board stated (December 2002) that necessary steps would be taken to improve the situation.

Lack of adequate 'disaster recovery and business continuity plan'

Board had not documented disaster recovery and business continuity plan.

3.3.10 The HT billing system is a critical system. If there is disaster and the HT consumers bills are not generated on time, revenue earning capacity of the Board will be substantially affected. The Board, however, had not documented disaster recovery and business continuity plan, outlining the action to be undertaken immediately after a disaster and to effectively ensure that information processing capability can be resumed at the earliest. The identities

of personnel to be notified immediately, their roles/responsibilities had also not been outlined. The plan/procedure laid down to support such critical IT system in the event of a failure had also not been formally documented. No emergency hot sites, correct/current version of system software, *etc*., which are important for recovery from disaster, were identified and documented.

Inadequacies in data backup

3.3.11 Although backups of HT billing data were being taken at periodical intervals, there was no formal policy regarding the frequency of test checking the backups for recovery. Neither the backups so obtained were tested periodically nor any logs maintained in support of such test checks. The Board replied (December 2002) that necessary steps would be taken to rectify the situation.

Inadequate physical security controls

3.3.12 Although the HT billing system is mission critical to the Board, no physical security arrangement, like fire/water detectors, was made to control the physical threats to IT assets/system.

Highly combustible supplies were stored within the main server room.

Audit observed that paper stocks of HT bills/reports and combustible supplies such as printer cartridges, toners, cleaners, high speed printers producing paper dust were stored within the main server room. There was neither any documentation *viz*. circulars/guidelines to computer operations staff detailing the fire fighting techniques nor any individuals were identified who could be assigned the responsibilities to take preliminary emergency action to control the fire before the arrival of professional fire fighters.

Data backup was stored at main entrance.

Audit observed that there were only three fire extinguishers which were not adequate compared to the size of IT center (Mistry Bhavan); no logs were maintained to ensure periodical inspection and maintenance of the fire extinguishers by the authority concerned. Moreover, there was no documentation detailing the tested emergency plans, fire or evacuation drills conducted in the computer center for human safety and protection of mission critical system like the HT billing system. Also the data backup was stored at the front of main entrance and separated only by a fiberglass partition, which makes it vulnerable to theft. When pointed out in audit, the Board stated (December 2002) that necessary steps would be taken to address the above lacunae.

Inadequate change management controls

3.3.13 Any information system of this scale requires a sound change management procedure covering control of the ongoing maintenance of system, standard methodology for recording and performing changes. An appropriate level of administration should authorise changes to the programs.

Audit scrutiny revealed that the Board had no documented formal policy relating to change management controls, testing standards, quality assurance standards, and documentation standards. Audit also observed that DIT

interpreted the tariff orders issued by the Maharashtra Electricity Regulatory Commission and various circulars issued by the Chief Engineer (Commercial) and incorporated the required changes in the HT billing system without involving the Chief Engineer (Commercial) who was responsible for the implementation of the Board's directives. Instead, sample bills in case of major changes were sent to the Chief Engineer (Commercial), but there was no system of formal certification from the Chief Engineer (Commercial).

Formal certification from Chief Engineer (Commercial) was not obtained for change management controls resulting in loss of Rs.12.12 lakh.

Audit observed that due to misinterpretation of Commercial Circular No.646 dated 17 June 2000 the current transformer/potential transformer (CT/PT) rent amounting to Rs.1.37 crore was not charged in time from HT consumers during May-December 2000 in 10 circles resulting in loss of interest computed to Rs.12.12 lakh at 15 *per cent* interest rate.

It was further observed that the program changes in the HT billing system were sent to the various IT centers as version patches through e-mail. However, no formal acknowledgements were being obtained by DIT from all IT centers that all the patches had been correctly received and uploaded in a timely manner.

Data/programs transmitted in clear text instead of encrypted form entailed high risk of interception and manipulation.

Audit observed that as per amended business rules, the HTP-II consumers in specified areas whose contract demand is above 500 KVA should be charged HTP-I tariff, and HTP-II consumers in specified areas whose recorded maximum demand is more than 500 KVA should be charged HTP-I tariff for six months in succession from the month in which their maximum demand exceeded 500 KVA. However, audit scrutiny revealed that the above business rules were not adhered to by the HT billing system in two circles (Pune rural circle and Pen circle). In respect of Pen circle and Pune rural circle, eight HTP-II consumers whose contract demand were greater than 500 KVA and recorded maximum demand was more than 500 KVA, respectively during August 2000-April 2002 were not charged HTP-I tariff for 6 months resulting in loss of revenue of Rs.5.80 lakh and Rs.0.58 lakh respectively.

It was evident from the above that the latest version patches were not uploaded in respect of the above two circles. Moreover sending the patches through internet without proper encryption also entailed high risk of interception and manipulation of tariff parameters. When pointed out in Audit, the Board stated (December 2002) that a separate register would be maintained to record the details of patches, acknowledgements *etc* at all the IT centers immediately and this register would be verified by the head of the department at periodic intervals.

Software development for HT billing system

Incorrect evaluation of bids

3.3.14 To develop the reengineered HT billing system, the Board called (April 1997) limited quotations on a turnkey basis, from eight selected software developers. Only five firms submitted (May 1997) their proposals

There was erroneous award of points in technical evaluation of bids.

and the evaluation of proposals was done in two parts *viz.,* technical and financial. The Board devised a point formula for technical evaluation with a clause stating that vendors scoring less than 85 *points* on this formula would not be considered for financial bidding. After technical evaluation, four out of five vendors scored below the 85-point benchmark and only Price Waterhouse Associates (PWA) qualified for financial bidding. Audit noticed that the Board, while evaluating the technical proposals, awarded six points to PWA for "Billing experience of the project team", and zero point to the rest of the four vendors. Audit scrutiny revealed the awarding of points was erroneous as only two members of PWA had such billing experience and accordingly PWA should have been awarded only two points under this category. Thus, PWA was awarded 4 extra points, which resulted in PWA scoring 87 points making it the only firm scoring above the minimum benchmark of 85 points. Eventually, the contract was awarded to PWA at Rs.32.85 lakh (July 1997). Due to such erroneous award of points, the financial bids of the other firms were not even considered.

Lack of system documentation

Critical system documentation was not obtained.

3.3.15 As per terms of contract, the PWA was to finalise and give a system design document (SDD) detailing the process design, data design within 14 weeks from commencement of project (*i.e.* 31 October 1997). However, Audit observed that PWA gave no such SDD to the Board. The Board stated (December 2002) that the system manual furnished by PWA represented the SDD. The management's reply is not tenable in view of the fact that in terms of clause 8.2, "Deliverables of the terms of contract" - SDD would be given on completion of system design while the "System Manual" would be given after acceptance testing of the HT billing system, which reflects that SDD and system manual are different from each other. Further, the PWA also failed to give as per terms of contract a 'quality plan' by 31 October 1997, in the absence of which it was not possible for audit to verify whether the quality standards were achieved/maintained for the software developed.

The contract also empowered the Board to conduct inspection/quality audit of facility and quality practice of PWA as detailed in technical bid. However, the Board did not give documents to audit to establish that such quality audit was ever conducted by the Board**.**

Phase wise system testing not done

Phase wise system testing was not done, certification from competent authority was not obtained.

3.3.16 The development of software was to be subjected to "system testing" in various phases such as module testing, system testing on test data and system testing on live data, which was to be completed by 6 February 1998. But Audit findings indicated that no systematic phase-wise testing was done to properly evaluate each stage of system development. Similarly, no phase wise certification regarding satisfactory performance of the system was obtained from the competent authority.

The consultancy charges which were essentially charges for development of the application were to be paid in four stages (25 *per cent* each) *i.e.* at the stage of requirement study; system design; coding and testing and;

implementation. Clause 8.4 of terms and conditions in the technical proposal clearly envisaged that review of deliverables would be conducted at various stages wherein the deliverables would be submitted to the Board by PWA and the work on ensuing phases cannot be started without the acceptance of the deliverables of the previous phases by the Board. Audit observed that there was no documentation available, which showed that the PWA submitted the phase wise deliverables and phase wise testing/acceptance by competent authority of the Board was carried out. However, phase-wise payment was made to PWA without the above documentation.

Ownership of exclusive intellectual property rights (IPR)

3.3.17 As per contract, the IPR of the developed software package with algorithms, design, source codes, documentation shall rest with the Board. The PWA had to give an undertaking that it would not retain any copy of the software including documentation and would not use the software or design for any commercial gain without obtaining prior permission of the Board. However, audit observed that PWA did not give such undertaking which was not only in violation of the contract, but also not in the interest of the Board as the system design, algorithm, source codes of such critical system was vulnerable to misuse. This assumes importance in view of the deficiencies in the access control system as detailed in paragraph 3.3.9.

HT billing system was vulnerable to misuse.

Data migration from COBOL to ORACLE

3.3.18 The PWA designed a strategy to migrate the Board's HT billing and collection data from COBOL based system to the new Oracle based system by populating the various tables required for the application to run properly. Some data, which was not available in the legacy system, was captured manually. Data cleansing of the legacy system and capturing of data not available in the legacy system was the responsibility of the Board.

Data was not properly checked during data migration.

However, a test check by audit revealed that critical data fields in the concerned database table were incorrectly migrated; date of migration was accepted as date of permanent disconnection thus affecting the integrity of the data. In reply, the management agreed to suitably modify the field values to remove the deficiency. Similarly, for HT consumers having registered office in Mumbai and factory outside Mumbai, the meter address and the mailing address were the same. Thus, data was not properly checked during data migration.

Audit trails not properly maintained

3.3.19 Although the initial system designed by PWA did incorporate audit trails with fields like 'updated by', 'updated on', and 'updated from', a test check by audit revealed that such audit trails were not available for seven tables designed by PWA and for 48 tables created later by DIT. In test check of documentation of another 145 tables it was noticed that information regarding audit trails was not maintained/updated in nine tables and the data stored in the audit trail data fields of 136 tables were incomplete and

inaccurate. When pointed out in audit, the Board stated (December 2002) that necessary steps would be taken to maintain the audit trails.

Analytical review of data

Delay in issue of first bill to HT consumers

3.3.20 Clause 6.4.1 of Chapter VI of the Code of Commercial Instructions, 1996 of the Board stipulated that the first energy bill in respect of new connected HT consumers was to be issued within one month from the date of connection.

Audit scrutiny, however, revealed that 1,623 newly connected HT consumers of 10 circles were issued first bill amounting to Rs.29.06 crore after a delay ranging from two to 203 days from the date of new connection, which resulted in loss of interest of Rs.35.22 lakh to the Board.

It was also observed that no checks were incorporated in the HT billing system to ensure that in respect of newly connected HT consumers the first energy bill was issued within one month from the date of connection.

Irregular time limit for payment of bills

3.3.21 As per clause 27 of Conditions and Miscellaneous Charges for Supply of Electrical Energy amended up to 31 July 1998, the time limit for payment of bills for HT consumers was 15 days from the date of the bill inclusive of the date of the bill. For the purpose of computation of time limit of 15 days, the date of bill is required to be included as per Note below Clause 27 (a), but it was not included.

As a result, one to four days in excess of time limit were given for payment in respect of 2.76 lakh HT bills amounting to Rs.12,623.58 crore during 1999-2003.

The Board stated (December 2002) that as per Commercial Circular No.523 dated 4 December 1993, the date of bill was to be excluded while computing the time limit of 15 days. The reply is not tenable as the above circular was superceded by clause 27 of Conditions and Miscellaneous Charges for Supply of Electrical Energy as amended on 31 July 1998.

Waiver and non levy of minimum charges from temporarily disconnected HT consumers

Waiver of minimum charges was in violation of rules.

3.3.22 Clause 9.19.1 of Chapter IX of the Code of Commercial Instructions, 1996 read with clause 10(a) and 11 of the agreement with HT consumers, stipulated that permanent disconnections should be made on the expiry of six months from the date of temporary disconnection and minimum charges are required to be charged for the period of six months during the period between the dates of temporary disconnection and permanent disconnection. Audit

Tables containing temporary disconnection details were not maintained/ updated.

scrutiny of data for 1998-2003 revealed that 51 HT consumers of six circles were initially charged minimum and other charges for six months to the tune of Rs.7.13 crore from the date of temporary disconnection but the charges were later withdrawn by way of credit adjustments in subsequent HT energy bills. Further, it was also observed that 52 HT consumers of five circles who were temporarily disconnected, had not been charged minimum charges for six months to the tune of Rs.1.54 crore from the date of temporary disconnection. It was observed that tables containing temporary disconnection details were not maintained/updated in time.

The Board stated (December 2002) that minimum charges from temporary disconnection to permanent disconnection were waived to reduce the fictitious arrears of the circle. The reply is not tenable as waiver of charges of Rs.7.13 crore and non levy of minimum charges of Rs.1.54 crore was in violation of business rules.

Bulk discount granted to ineligible HT consumers

3.3.23 As per para 49.2.2 of Part III of Maharashtra Electricity Regularity Commission's order of 2000, if the consumption of an industrial consumer availing Time of Day (ToD) tariff and having no disputed arrears with Board exceeded one million units per month, the consumer will get a rebate of one *per cent* on his energy bill (excluding fuel adjustment charges, demand charges, electricity duty *etc*.) for every one million units consumption above one million unit subject to maximum of five *per cent*. The rebate will be allowed only if the bill was paid within seven days (including the date of bill) from the date of the bill.

Audit scrutiny for 2000-03 revealed that 18 HT consumers of six circles were given bulk discount to the tune of Rs.45 lakh despite the fact that they had paid their bills with delays ranging from one to four days in excess of admissible time of seven days. This irregular discount was due to wrong coding of parameters and non incorporation of proper validation check in the HT billing system.

The Board stated (December 2002) that since November 2000 the date of issue of bill was being included in the seven days period for considering bulk discount and prior to November 2000, the date of issue of bill was excluded. The reply is not tenable as the date of issue of bill was to be included from May 2000 and not November 2000. Further, audit observed that bulk discount was granted to the ineligible HT consumers in question even after November 2000.

Irregular bulk discount to HT consumers

3.3.24 Para 49.2.2 of Part III of MERC order of 2000 (page 154/155) on "Bulk Discount" and Para 33.1.2 of MERC's order 2002 (Page 184) on "Incentive and Disincentives" stipulated that any industrial consumer (availing TOD tariff and having no arrears with Board) whose consumption exceeds one million units per month, will get a rebate of one *per cent* of his energy bill restricted to a maximum of five *per cent*.

Bulk discount of Rs.2.74 crore was given to HT consumers despite having arrears of additional security deposits.

Audit scrutiny revealed that seven HT consumers in four circles had arrears of additional security deposit (ASD) to the tune of Rs.3.53 crore. However, these HT consumers were given bulk discount to the tune of Rs.2.74 crore despite payment of ASD being in arrears. Evidently, no proper application controls, validation checks were programmed in the HT billing system incorporating the above business rules. This resulted in loss of Rs.2.74 crore to the Board, as the same had not been recovered from such ineligible consumers.

The Board stated (December 2002) that arrears of ASD was not in the scope of the above scheme. This reply is not tenable as MERC order of 2002 categorically specified that consumer availing bulk discount should have no arrears with the Board. The ASD has a direct relationship with the energy consumption and ASD arrears are within the scope of the scheme formulated by MERC.

Incorrect calculation of power factor (PF) incentive

3.3.25 Prior to January 2002, as per MERC's order, whenever the average power factor (PF) was more than 0.95, an incentive at the rate of one *per cent* of the amount of the monthly energy bills (excluding T&D loss charges, fuel and cost adjustment charges, demand charges, electricity duty) would be given for each one *per cent* increase in the power factor above 0.95 being equivalent to average of one month's consumption.

Audit observed that due to incorrect calculation method adopted while coding the parameters in the HT billing system, excess incentive amounting to Rs.5.58 crore was given in consumer bills as detailed below:

Incorrect calculation of power factor incentive resulted in loss of revenue of Rs.5.58 crore.

P.F.	No. of consumer bills	Rebate due *(per cent)*	Rebate given *(per cent)*	Excess PF incentive (Rupees in crore)
0.96	11,111	1.00	1.053	0.19
0.97	14,145	2.00	2.105	0.58
0.98	20,070	3.00	3.158	1.58
0.99	17,232	4.00	4.210	2.00
1.00	11,909	5.00	5.263	1.23
Total	**74,467**			**5.58**

The Board stated that 0.95 was taken as the base for calculating PF incentive. This reply is not tenable. If 0.95 is used as base, the PF range limits would be 0.9595 for one *per cent* rebate, 0.9690 for two *per cent* rebate, 0.9785 for three *per cent* rebate, 0.9880 for four *per cent* rebate and 0.9975 for five *per cent* rebate. Since the PF values are restricted to 0.96, 0.97, 0.98, 0.99 and 1.00 the adoption of the above base of 0.95 is incorrect. Moreover, as per the incentive scheme an incentive at the rate of one *per cent* of the amount of the monthly energy bills for each one *per cent* increase in the power factor is to be given. The incentive system is therefore based on slabs. Hence, the incentives can be only one *per cent*, two *per cent*, three *per cent*, four *per cent* and five *per cent* and no intermediate values are envisaged.

Lack of utilisation of the application as a tool for management information system (MIS)

3.3.26 One of the major advantages envisaged of the reengineered billing system was its ability to aid the Board in decision-making by timely generation of reports based on data analysis and generation of various management information system (MIS) reports for taking decision aimed at reducing arrears in revenue realisation. Audit noticed that the Board failed to utilise the full potential of the system as seen from the cases illustrated below:

Delay in issue of bills to HT consumers

3.3.27 Clause 4.2.2 of chapter-IV - Meter Reading of Code of Commercial Instructions, 1996 (page 60) provided that the meter reading of HT consumers having contract demand up to 3 MVA and above 3 MVA should be recorded by A.E.[•]/ Dy.E.E. (O&M)[❖] and E.E. (O&M)[ↄ] respectively; and energy bills based on such readings must be generated and issued to HT consumers on a monthly basis.

Delay in issue of bills to HT consumers resulted in loss of interest of Rs.79.74 lakh.

Audit verification of HT consumers revealed that in respect of 16,123 HT consumer bills of Rs.839.38 crore, there was a delay in meter reading and consequent delay in issue of bills ranging from one-106 days during 1999-2003. The delay in issue of bills resulted in loss of interest of Rs.79.74 lakh.

The Board stated that necessary instructions were being issued to concerned, for timely recording of meter readings and issue of energy bills. Audit observed that there were no application controls incorporated in the HT billing system to generate list of consumers whose previous meter reading date/previous bill date exceeded 31 days. Such timely reporting to the circle office would facilitate the officials concerned to take immediate action for taking timely meter readings and generation of bills. Such reporting would also facilitate in identification of reasons *viz*. controllable/uncontrollable delay and for taking corrective action and fixing responsibility.

Non initiation of legal action for recovery of arrears

3.3.28 Clause 7.4.3 of chapter-VII - Legal Matters of the Code of Commercial Instructions, 1996 stipulated that in the event no payments were received from the consumers within six months from the date of temporary disconnection, it was necessary to verify the financial status of the HT consumers and initiate immediate legal action such as filing recovery suit, so as to safeguard the Board's dues.

[•] A.E. – Assistant Engineer.

[❖] Dy.E.E. (O&M) – Deputy Executive Engineer (Operation and maintenance).

[ↄ] E.E. (O&M) – Executive Engineer (Operation and maintenance).

Arrears to the tune of Rs. 38.71 crore were pending for more than three years.

Audit scrutiny of HT consumers whose arrears were more than Rs.50,000 revealed that there were 186 HT consumers in eight circles, whose arrears to the tune of Rs.38.71 crore as on 31 March 2003 were pending for more than three years. Since there was no system of periodic report generation of such cases in the HT billing system, there was no effective follow-up.

In reply, the Board stated (December 2002) that necessary action would be taken in due course. Despite clear directions by the Board no proper implementation of the directives through follow-up/feed-back was maintained at various levels of hierarchy in the Board.

Receivables

3.3.29 Para 22.2 "Provision for Bad Debts" (page 56) of Part II of MERC's order of May 2000 stipulated that the Board shall ensure that its receivables at any point of time, shall not exceed 75 days. If the money was not recovered from the unit holder, immediate disconnection should be resorted to and steps to recover it legally should also be set in motion.

The Board had neither disconnected the supply of defaulters nor had taken legal action to recover the same.

In January 2002, the MERC found that the Board had defaulted in complying with the above directives of May 2000 order and imposed a penalty of Rs.1 crore. The MERC further directed the Board to comply with tariff order of May 2000 by March 2002. The Board had neither disconnected the supply of defaulters (July 2003) nor had taken legal action to recover the same. As a result, the defaulters were not inclined to pay arrears. There were arrears to the tune of Rs.36.82 crore in respect of 135 HT consumers of seven circles (March 2003).

Top defaulters

3.3.30 Through clause no.14 of MERC order of January 2002 (page no.8), the Commission had directed the Board to disconnect power supply of all consumers whose names appeared in the defaulters' list for the second time and submit the details of the same to the Commission along with the copy of the defaulters' list.

Audit verification of HT consumers in order of highest arrears revealed that there were 159 HT consumers of four circles who were in arrears to the tune of Rs.39.87 crore and their names appeared in the defaulters' list for the second time yet their connections were not disconnected as of July 2003.

Majority of top defaulters were Government departments.

The Board stated (December 2002) that majority of the top defaulters were Government departments. The reply is not tenable, as the Board did not take action to disconnect the power supply of the Government departments who showed no inclination to pay the arrears.

HT consumer bills not checked by competent authority

3.3.31 Clause 4.2.2 of chapter-IV (Page No.60) of Code of Commercial Instructions, 1996 clearly stipulated that "Meter reading of HT consumers having contract demand of 3 MVA and above should be recorded by the

Executive Engineer (O&M) and the HT meter reading bills of the above consumers should be checked/cross-checked by the Superintending Engineer/Chief Engineer".

Critical source documents were not checked by competent authority.

Audit verification revealed that during 2000-03, 154 HT consumers of 10 circles had a contract demand ranging from three to 135 MVA and their bills to the tune of Rs.4,937.62 crore were not checked/cross-checked either at the Superintending Engineer or Chief Engineer level, which was in contravention of the provisions stated above. Adhering to the prescribed process is important as it ensures that the source documents are properly prepared, complete in all respects, authorised by competent authority and there is adequate segregation of duties for ensuring integrity and reliability of data from the origin to the approval of the source document.

Non maintenance of register for reconciliation

3.3.32 The various testing divisions in the Board are responsible for recording the meter readings and also the multiplying factor (MF) in case of change of type of main / CTPT• meter. The information thus collected is sent to the concerned billing section, which after processing and verifying, in turn sends the data to concerned computer center for generation of bills.

In order to maintain proper co-ordination amongst testing divisions, billing sections and computer centers for noting the changes in MF, the Chairman of the Board instructed (1996) that registers must be kept by testing divisions, billing sections, and computer centers indicating clearly the name of consumer, consumer number, MF, date of advice by concerned testing division/billing section, and acknowledgement by the billing section/ computer center for updating the change in MF. The Chairman of the Board had also directed that the Superintending Engineer must inspect this register and non-observance of the above instruction should be dealt with severely.

As per clause 4.9.3 of Chapter-IV of Code of Commercial Instructions (1996) reconciliation between the testing divisions, billing sections and the computer centers should be done and a certificate be recorded to that effect in the register.

Audit scrutiny revealed that during 1999-2003, main/CTPT meters were replaced 10,628 times in respect of 6,931 HT consumers of ten circles. However, the testing divisions, billing sections, and computer centers did not maintain the registers as required under above provisions and no reconciliation was carried out between the testing divisions, billing sections and the computer centers. The Superintending Engineer had also not carried out inspection of the register.

In the HT billing system implementation, there are no inbuilt input controls for reconciling the updated MF in master data of HT consumers. In reply, the Board stated (December 2002) that the requisite registers would be maintained.

• Current Transformer / Potential Transformer.

The matter was reported to the Government (December 2002); the reply has not been received (November 2003).

Conclusion

The billing system has poor general information technology controls especially regarding the security features such as access controls, passwords, login attempts and security breach reports. Thus the system was vulnerable to unauthorised access and data manipulation.

The business rules in many cases were found to be improperly incorporated into the system along with insufficient application controls and validation checks resulting in revenue loss to the Board. Use of the system as an input to the management information system was virtually absent and there was poor coordination between the department of information technology/management information system and the user department.

There is an urgent need to incorporate security controls and proper application controls through validation checks in the software. The Board should formulate and document an information technology policy to delineate the responsibilities and interaction between the department of information technology and the user departments.