CHAPTER-III

REVIEWS RELATING TO STATUTORY CORPORATION

3 TAMIL NADU ELECTRICITY BOARD

3.1 PERFORMANCE AUDIT ON THE IMPLEMENTATION OF ACCELERATED POWER DEVELOPMENT AND REFORMS PROGRAMME

HIGHLIGHTS

The Ministry of Power (MOP) released funds to the State Government on lump sum basis without any reference to specific schemes. The State Government delayed release of funds to the Board resulting in liability of penal interest of Rs.4.39 crore. The Board incurred additional liability of Rs.2.60 crore towards penal interest due to delay in repayment of loan released by MOP.

(Paragraphs 3.1.8, 3.1.9 and 3.1.10)

Adoption of lesser percentage towards cost of overheads while preparing Detailed Project Reports resulted in lower claims of funds of Rs.80.80 crore from the MOP.

(Paragraph 3.1.14)

Even though funds were not the constraints, the Board has not been able to complete 23 out of 25 schemes even after a delay of three years.

(Paragraph 3.1.17)

The Board reported expenditure of Rs.104.70 crore to MOP in excess of the expenditure actually incurred on the execution of schemes.

(Paragraph 3.1.19)

Purchase of high quality meters instead of static electronic meters in contravention of the decision of MOP resulted in excess expenditure of Rs.13.41 crore.

(Paragraph 3.1.27)

The Board has not been able to reduce the gap between Average Revenue Realisation and Average Cost of Supply and Aggregate Transmission and Distribution losses in spite of implementation of APDRP schemes at a cost of Rs.799.86 crore.

(Paragraphs 3.1.34 and 3.1.35)

Introduction

3.1.1 The Union Ministry of Power (MOP) launched (2000-01) the Accelerated Power Development Programme which was later rechristened (2002-03) as the Accelerated Power Development and Reforms Programme (APDRP). It focused on upgradation of the sub-transmission and distribution systems in densely electrified zones in the urban and industrial areas and improvement in commercial viability of the State Electricity Boards (SEBs).

A Memorandum of Understanding (MOU) was signed (January 2002) by the MOP and the State Government to affirm the joint commitment to the power sector reforms in Tamil Nadu.

National Thermal Power Corporation Limited (NTPC) was to act as the lead Advisor-cum-consultant (AcC) and MECON as the sub-consultant to assist the State Government in formulation of the Detailed Project Reports (DPR) and oversee the implementation of the schemes under APDRP.

The Tamil Nadu Electricity Board (Board) had obtained sanction from MOP for 41 schemes (25 schemes in 2002-03 and 16 in April 2005) at an estimated cost of Rs.948.10 crore for implementation under APDRP. Memorandum of Agreements (MOA) have, however, been signed (between July 2002 and March 2003) by the Board and MOP for implementation of only 25 schemes at an estimated cost of Rs.929.21 crore. The schemes were to be implemented within two years from the date of approval (April to November 2002) of the DPRs *i.e.*, by April to November 2004. Out of 25 schemes, only two schemes have been completed after a delay of one to two years from scheduled date of completion and the remaining 23 schemes are yet (September 2007) to be completed and their implementation has been extended upto March 2008.

The Chief Engineer (Planning) is the nodal officer for implementation of the schemes at the Head office assisted by a Superintending Engineer (APDRP) and supporting staff. The Superintending Engineers of various Electricity Distribution Circles are the Chief Executive Officers (CEO) for implementation of the schemes at the Circle level, who are assisted by Executive Engineers designated as Nodal officers and Junior Engineers designated as Feeder Managers.

The main objectives of APDRP are to

- Reduce the Aggregate Technical and Commercial (AT&C) losses to around 15 *per cent*;

- Achieve commercial viability of the SEBs;
- Reduce the outages and interruptions in supply of power; and
- Increase consumer satisfaction.

Scope of Audit

3.1.2 The Performance review was conducted from December 2006 to March 2007 with a view to assess implementation of the programme during 2002-03 to 2006-07 by the Board with reference to the objectives set for and benefits expected from the programme. The records maintained by the Board at its Headquarters, ten Distribution circles and two construction circles relating to seven schemes selected out of 25 schemes were examined. The seven* schemes selected for the performance review estimated to cost Rs.534.09 crore (57.48 *per cent*) of the total estimated cost of Rs.929.21 crore for the 25 schemes.

Audit objectives

3.1.3 The performance review was conducted to ascertain whether:

- the DPRs of the APDRP schemes were prepared realistically to get maximum benefits and achieve the objectives of the programme;
- the required funds for the programme were assessed realistically and the funds were sanctioned, released and utilised efficiently, economically and effectively;
- the schemes were implemented efficiently, economically and effectively as per the guidelines of the programme for achievement of the objectives of the programme; and
- the programme provided for effective monitoring mechanism at all levels and monitoring was done accordingly.

Audit criteria

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

- Targets and benchmarks laid down in the MOUs and the MOAs and the guidelines issued by MOP and the State Government;
- Projections and targets set out in the DPRs;
- Terms and conditions of the loan agreements; and
- Terms and conditions stipulated in the purchase/work orders and contracts *etc*.

* 1.Chennai Metro consisting of Chennai North, Central, West and South, 2.Coimbatore Metro, 3.Salem Urban, 4.Chengleput, 5.Thiruvallur and Thiruthani, 6.Vridhachalam and 7.Panrutti.

Audit methodology

3.1.5 The methodology adopted for achieving the audit objectives with reference to audit criteria were examination of:

- Benchmark/conditions of the MOUs/MOAs and the guidelines issued by GOI/State Government;
- Policy formulated by the Board for implementation of the programme;
- DPRs, Tender files, Purchase Order files, Land Acquisition files and other records relating to the execution of the programme;
- Monthly progress reports on physical and financial performance;
- System of monitoring, Internal control and MIS reporting; and
- Issue of audit enquires and interaction with the Management.

Audit findings

Audit findings arising from the performance review were reported (June 2007) to the Chairman of the Board and to the State Government and also discussed (27 July 2007) in the meeting of Audit Review Committee for State Public Sector Enterprises (ARCPSE). The meeting was attended by the Secretary to the Government of Tamil Nadu, Energy Department and the Member (Accounts), Member (Distribution) and Chief Engineers of various disciplines of the Board. The views expressed by the representatives of the State Government/Board in the meeting have been taken into consideration while finalising the performance review. Audit findings are discussed in the succeeding paragraphs.

Funding pattern

3.1.6 GOI's funding under APDRP has the following two components:

- Investment component for strengthening and upgradation of the sub-transmission and distribution system with a view to reduce the Transmission and Distribution (T&D) losses; and
- Incentive component to encourage/motivate the SEBs to reduce the cash losses.

Investment component

3.1.7 As per the terms of MOA, 50 *per cent* of the project cost was to be provided by GOI through a combination of grant (25 *per cent*) and loan (25 *per cent*) to the State Government as an additional Central Plan Assistance. The remaining 50 *per cent* of the project cost was required to be arranged through counterpart funding from Rural Electrification Corporation (REC)/Power Finance Corporation (PFC)/other Financial Institutions. GOI withdrew (November 2005) the loan component under the Central assistance for APDRP and since then the Board had to arrange the funds for this component from the market.

Release of funds

3.1.8 The MOP released funds to the State Government on lump sum basis, without any reference to the specific scheme. The details of funds released by the GOI, the State Government and funds mobilised from REC during 2002-03 to 2006-07 and the expenditure reported by the Board to MOP (up to May 2007) are given in **Annexure-15**. It could be seen from Annexure-15 that the State Government had released Rs.4.78 crore over and above the amount released by the GOI. The Board had received Rs.839.37 crore against which expenditure of Rs.799.86 crore was incurred (up to May 2007) leaving a balance of Rs.39.51 crore (4.71 *per cent*) unutilised. The Board stated (July 2007) that some of the works were yet to be executed and the unutilised portion would be utilised on these works in 2007-08.

Delay in release of funds

Delayed release of funds by the State Government has attracted the penal interest of Rs.4.39 crore.

3.1.9 As per MOP guidelines (June 2003), the State Government would release the funds for APDRP to the State Power utility within a week, otherwise it would be treated as diversion of funds, and MOP would adjust 10 *per cent* penal interest from the next instalment of the Central Plan Assistance to be released to the State Government. It would be seen from the **Annexure-16** that there were substantial delays ranging between 22 to 201 days in release of funds by the State Government to the Board.

At the stipulated rate, the liability on account of penal interest for the delay in release of funds by the State Government to the Board worked out to Rs.4.39 crore (August 2007). The Board stated (July 2007) that the delay was necessitated due to procedural requirements for release of funds by the State Government. The reply is very casual as it shows that no action was being taken by the State Government to expedite the release of payment to the Board. Delays in release to the Board had a cascading effect as it delayed work execution in the Board. Further the loan portion attracted interest though the principal amount was not used by the Board.

Avoidable liability towards penal interest

Non-payment of loan dues to the State Government within the stipulated time resulted in additional liability of Rs.2.60 crore towards penal interest.

3.1.10 As per the terms of sanction of loans released by MOP under the programme, the Board had to make periodic repayment of the loan to the State Government as per the repayment schedule, together with interest. The Board, however, was not adhering to the repayment schedule. On account of non-payment of the dues to the State Government within the stipulated time, the Board had to bear additional liability of penal interest of Rs.2.60 crore till 31 March 2007.

The Board stated (July 2007) that the State Government was approached (June 2006) for waiver of the penal interest arising out of the delayed repayment of principal and interest. The State Government is yet (August 2007) to consider the request of the Board.

Non maintenance of separate bank account

The Board did not maintain separate bank accounts for operation of APDRP funds. In the absence of which, the utilisation of funds for APDRP schemes could not be vouchsafed in audit.

3.1.11 Apart from the separate bank account required to be opened at the Headquarters of the Board for operation of the APDRP funds, each Superintending Engineer designated as the CEO for implementation of the schemes had to open a separate bank account within a month of signing the MOUs, for depositing the revenue arising from implementation of the schemes. It was noticed that though the Board had opened (May 2003) an account with the Canara Bank for keeping the funds received for APDRP, it did not operate the same. Cheques received for APDRP schemes were deposited in the Board's regular cash credit account. Besides, no separate bank accounts were opened by the CEOs at the circle level. The Board stated (July 2007) that no such accounts were operated in order to avoid interest loss. The reply is not acceptable since the guidelines issued by MOP provided for opening of separate bank accounts. Further, in the absence of operation of separate bank accounts, appropriate utilisation of funds received for the schemes under APDRP could not be vouchsafed in audit.

Incentive component

3.1.12 In order to motivate the SEBs and to enable them to achieve commercial viability, an incentive component (grant) formed part of the APDRP funding by GOI. Under the scheme, the SEBs would be given cash incentive upto 50 *per cent* of the actual total cash loss reduced by the SEBs. The reduction of cash loss was to be calculated reckoning 2000-01 as the base year. By way of further clarification, MOP intimated (March 2006) that once cash loss reduction had been achieved in any year, that year would automatically be the base year for calculation of cash incentive for the subsequent year. MOP further reiterated that as long as there was no reduction in cash loss, the base year would remain as 2000-01 and would not be changed.

Failure to achieve reduction in cash loss resulted in denial of cash incentive of Rs.485.51 crore to the Board.

The claim of Rs.485.51 crore for the years 2002-03 and 2003-04 (considering 2001-02 and 2002-03 as base year respectively) towards the cash incentive lodged (July 2005 and September 2005) by the Board was rejected (March 2006) by MOP on the ground of non-reduction of cash loss as compared to the base year 2000-01.

The Board stated (September 2006) that on account of huge cost of purchase of power from Independent Power Projects they could not achieve reduction in cash loss and they had requested MOP for a change in the base year from 2000-01 to 2001-02. The reply of MOP is still awaited (August 2007).

Project formulation and planning

3.1.13 The Board submitted (December 2001 to November 2002) 25 DPRs to NTPC, which were approved (April 2002 to November 2002) by the MOP. The MOP revised (September 2002) the original estimates sanctioned for three schemes *viz.*, Coimbatore (South), Pudukottai and Villupuram from Rs.113.57 crore, Rs.81.89 crore and Rs.62.50 crore to Rs.70.26 crore, Rs.64.32 and

Rs.103.08 crore respectively based on the DPRs prepared by MECON. The Board, however, did not agree (December 2002) to the revised DPRs and requested MOP to approve the original DPRs. MOP has not replied so far (September 2007).

Deficiencies in the Detailed Project Reports

Adoption of lesser percentage towards cost of overheads while preparing DPRs in respect of APDRP schemes resulted in lesser claims of Rs.80.80 crore from MOP.

3.1.14 The Board has been adding 25 *per cent* of the value of works as overhead cost on account of establishment cost, interest charges *etc*., for accounting the expenditure in the accounts. However, while preparing the DPRs, the Board adopted only 15 *per cent* for such purpose. The adoption of a lower percentage in the DPRs resulted in under estimation of the expenses and in the process the Board lost an opportunity of claiming Rs.80.80 crore (including Rs.20.20 crore as grant) from GOI. The Board stated (July 2007) that additional charges would be included at the time of preparation of the completion reports. The reply is not tenable as the additional amount would not be allowed by MOP as the same was not included in the DPRs.

3.1.15 The Board, at the time of initial preparation (November 2002) of the DPRs, adopted lump sum value of Rs.42.75 crore for erection of 849 Distribution Transformers (DTs) in the Chennai Metro Circles. However, it was observed that the actual expenditure incurred on erection of these DTs was only Rs.23.81 crore, which indicates that the estimates in the DPRs were made on ad-hoc basis. On account of such ad-hoc preparation of the DPRs, funds to other deserving works could not be allocated. The Board stated (July 2007) that exact location of each DT could not be assessed and hence only tentative estimate was included in the DPRs. The reply is not tenable as inclusion of tentative estimates in the DPRs defeats the very purpose of its preparation.

The Board could not utilise funds of Rs.23.59 crore allocated for establishment of three sub stations due to non-acquisition of lands for the same.

3.1.16 The Board had prepared (November 2002) DPRs for the construction of three[∝] sub stations. In the case of first two[♣] sub-stations, it was indicated in the DPRs that land was available and no land cost was included in the estimate. In respect of the third one, the land cost was indicated as Rs.20 lakh in the estimate. It was, however, noticed that for all these three sub stations, the Board has yet to acquire the land (August 2007). This resulted in non utilisation of Rs.23.59 crore sanctioned (November 2002) and received (between March 2003 and July 2004) for construction of these sub-stations.

Project implementation and monitoring

3.1.17 As per MOP guidelines (June 2003), the State Government/State Power utilities were required to submit monthly report on the progress of execution of the schemes, utilisation of funds, *etc*. Implementation of the schemes was to be done as per the DPRs which specified the targets with respect to each item of work and overall objectives to be achieved. Accordingly, the Board had been reporting the physical and financial progress of the schemes under APDRP to MOP on monthly basis. The financial progress of the various

∝ Kilpauk Police Quarters, Lady Wellington and Teacher's Colony.
♣ Kilpauk Police Quarters and Lady Wellington.

schemes under APDRP as on 31 May 2007 is given in **Annexure-17**. As per Annexure-17, 25 schemes were to be completed by November 2004. The Board, could, however, complete only two schemes after a delay of one to two years. The remaining 23 schemes were yet (September 2007) to be completed even after a delay of three years though funds were not the constraint. These schemes are expected to be completed by March 2008.

3.1.18 Audit scrutiny of the financial and physical progress reports revealed that the data furnished by the Board to MOP differed from the actual figures. The physical progress reported was based on the number of work orders issued and the financial progress was based on the value of the estimates contained in the DPRs and not on the basis of value of work actually executed. A comparison of the physical and financial progress as on May 2007 with the work orders and completion reports for the selected schemes disclosed the following discrepancies:

The Board reported excess expenditure of Rs.88.14 crore, in respect of Chennai Metro scheme to the MOP, as against the expenditure actually incurred.

3.1.19 The Board reported excess expenditure of Rs.88.14 crore in respect of 24 sub stations (SS) constructed in Chennai Metro as detailed below:

Particulars	Chennai Metro Circles				
	North	South	West	Central	Total
No of SS targeted as per DPR	8	10	4	7	29
No of SS reported to have been completed as per the return sent to MOP (as on May 2007)	7	9	4	4	24
No of SS actually completed (May 2007)	7	9	4	4	24[♦]
Estimated cost as per the DPRs (Rupees in crore)	31.04	79.88	39.02	66.04	215.98
Expenditure reported to MOP (Rupees in crore)	22.55	84.62	32.87	28.60	168.64
Expenditure actually incurred upto May 2007 (Rupees in crore)	10.83	41.35	15.51	12.81	80.50[∝]
Excess expenditure reported to MOP (Rupees in crore)	11.72	43.27	17.36	15.79	88.14

Source: DPRs and Progress Reports.

♦ Padi and Thirumullaivoyal Sub-stations were commissioned with one power transformer against two power transformers contemplated in the DPR.

∝ Value arrived with reference to work order closing.

Similar discrepancies in respect of some other items of work are given in the table below:

The Board reported excess expenditure of Rs.16.56 crore on installation of Distribution Transformers and Distribution Transformer Meters

Sl. No.	Particulars	Chennai Metro Scheme		Vridhachalam Scheme	
		DT♣ Meters	DT♣	Single Phase meters	Three phase meters
1.	Quantity as per the DPR (Numbers)	1,118	849	4,435	1,901
2.	Quantity reported to MOP as completed up to May 2007 (Numbers)	1,118	849	4,435	1,901
3.	Quantity actually completed up to May 2007 (Numbers)	283	849	4,435	1,901
4.	Cost estimate as per the DPRs (Rupees in crore)	2.16	42.75	0.33	0.35
5.	Cost incurred as per the return sent to MOP (Rupees in crore)	2.16	39.12	0.33	0.35
6.	Expenditure actually incurred up to May 2007 (Rupees in crore)	0.91	23.81	*	*
7.	Expenditure reported in excess (Rupees in crore) (5-6)	1.25	15.31	----	---

Source: DPRs and Progress Reports.

It will be seen from the above that:

- as against the reported physical progress of work in installation of DT meters in Chennai Metro, the Board had actually achieved less number resulting in excess claim for 835 meters costing Rs.1.25 crore. Excess reporting of financial progress amounting to Rs.15.31 crore was also noticed in respect of installation of Distribution Transformers.
- the expenditure reported to MOP in the case of single phase and three phase meters in Vridhachalam scheme was exactly tallying with the DPR estimates, whereas the actual expenditure was yet to be finalised (August 2007).

3.1.20 The financial achievement in erection of 36 Power Transformers under the scheme of enhancement of the power transformers (Rs.20.01 crore) and establishment of 24 sub-stations (Rs.165.93 crore) in Chennai Metro was reported to MOP. Audit noticed that an amount of Rs.2.82 crore was stated to have been spent on use of 13 old Power Transformers (three at Rs.0.77 crore in the enhancement work and ten at Rs.2.05 crore in establishment of sub-stations). As there was no cash outgo on erection of the old Power Transformers, there was misreporting to the extent of Rs.2.82 crore.

Thus, there had been discrepancies in the data furnished to MOP and the administrative interventions to ensure correctness and accountability was

♣ Distribution Transformer.
* Not yet finalised.

absent in the Board. It can also not be ruled out that reporting of excess expenditure was resorted to, to prevent reduction in next year's grants and lapse of funds.

The Board while accepting the facts stated (July 2007) that the financial progress was based on the estimated rates contained in the DPRs as was being adopted for the REC and PFC funding schemes and there was no clear cut procedure/guideline for reporting the works under APDRP. The reply of the Board is admittance of the deficiencies in internal control to ensure correct reporting and control on the work.

Monitoring

3.1.21 In order to ensure proper implementation of the project, the Board was required to constitute a Distribution Reforms Committee (DRC) comprising the Secretary, Energy Department of the State Government, Chairman of the Board, a representative from NTPC and a representative from Central Electricity Authority or MOP.

It was noticed that ever since commencement (April 2002) of the scheme, only three DRC meetings were held (January 2003, July 2003 and December 2005), as against the required 30 meetings to be held between April 2002 and May 2007.

This resulted in poor monitoring of the progress of the work and consequently, the completion of schemes got delayed by more than three years. These schemes are now expected to be completed by March 2008.

Execution of work

Construction of sub-stations

3.1.22 The DPRs included construction of 72 sub-stations at a cost of Rs.292.29 crore (between April 2002 and November 2002). Out of these 72 sub stations, 65 sub stations were completed (September 2002 to June 2006) at a cost of Rs.234.88 crore. The work of two[≠] sub stations was under progress as on September 2007. Further, construction of three[•] sub stations in Chennai Metro Circles and two[϶] sub stations in Chengalpattu Distribution Circle could not be taken up (September 2007) due to non availability of land. Test check of records of construction of three sub stations in Chennai Metro Circles revealed the following deficiencies:

≠ Cooks Road and Sholinganallur.

• Kilpauk Police Quarters, Lady Wellington and Teachers Colony.

϶ Adayalacheri and Alathur.

Delay in handing over of its own site to the contractor led to enhancement in estimated cost on the construction of sub-station by Rs.0.26 crore.

3.1.23 There was delay of one year in handing over of its own site by the Board to the contractor for establishment of the sub station at Cooks Road. This resulted in revision (January 2005) of the estimated cost from Rs.21.94 crore to Rs.22.20 crore. The Board stated (July 2007) that the delay was due to re-locating of the central store existing on that site. The reply is not tenable as the site (Kannadasan Nagar 33/11 KV premises) to which the store was to be re-located also belonged to the Board and hence it could have avoided the delay. Thus delay in handing over the site to the contractor resulted in enhancement of the estimated cost on the construction of the sub-station by Rs.26 lakh.

Delay in acquisition of land for establishment of sub station led to cost overrun by Rs.11.33 crore in the land cost.

3.1.24 The Board estimated (November 2002) a cost of Rs.6.78 crore for establishing a 33/11 KV sub station at Sholinganallur. The land for this sub-station was to be acquired at a cost of Rs.50 lakh. It was noticed that the land was acquired (March 2006) for Rs.11.83 crore. The reasons for delay in acquiring the land are not on record. The work was yet to be completed (September 2007). The Board stated (July 2007) that due to urbanisation and declaration (2004-05) of Old Mahabalipuram Road (where the site is located) as IT Corridor, the cost of land increased manifold. The reply is not tenable as the Board delayed the acquisition of land by more than three years from the date of approval of DPR. Thus, delay in acquisition of land resulted in acquisition of land at an extra cost of Rs.11.33 crore. Further, the Board may not be able to recover the extra expenditure on the acquisition of land since the same was not covered under DPR.

3.1.25 The Board failed (November 2002) to include the following works in the DPR for schemes under APDRP and executed them under its normal capital programme. It, however, included them in the Progress Report of execution of APDRP schemes of May 2007 as sent to MOP.

(Rupees in crore)

Sl. No	Name of the work	Expenditure
(a)	Laying of 33 KV feeder (UG Cable) for back feeding between Sembiam and Paper Mill Road sub-stations	1.55
(b)	Laying of 33 KV feeder (UG Cable) from Chintadaripet to Spencer Plaza sub-station	1.22
(c)	Execution of three 11 KV feeders (Moolakadai, Andal Avenue and Jambuli) in India Piston sub-station	0.60
	TOTAL	**3.37**

Source: Progress Reports.

The Board stated (July 2007) that since mandatory items such as feeder metering, DT metering, ADLS computerised billing *etc*., had to be included in the APDRP schemes, some of the other items such as erection of new SS, laying of feeders *etc*., were not included in these DPRs. The reply is not tenable as the newly constructed sub stations required laying of direct feeders for ensuring the reliable supply of power, as such these items ought to have been included in DPRs for APDRP works. Further, the Board may not be able to recover the amount from the MOP since these were not included in the original DPR.

Procurement

3.1.26 The Board procured equipment required for the APDRP schemes under its normal process along with the items required for its other schemes. The Audit scrutiny revealed the following discrepancies in procurement of capital items.

Extra expenditure in procurement of meters

Purchase of high quality meters instead of static electronic meter in contravention of the decision of MOP resulted in extra expenditure of Rs.13.41 crore.

3.1.27 NTPC asked (July 2003) the Board to ensure that only Static/Electronic meters are procured under APDRP as per the decision of MOP. Instead the Board decided (February 2005) to procure 7,50,000 single phase High Quality Meters on the ground of meeting the urgent requirement for APDRP before 31 March 2005. The orders for the supply of the High Quality Meters were placed (February 2005) with 6 firms at an all-inclusive price of Rs.539.70 per meter for a total value of Rs.38.93 crore.

It was observed that the Board had already finalised (September 2004) purchase of 2,50,000 single phase Static Energy Meters to meet the requirement under APDRP for the year 2004-05 at all inclusive price ranging from Rs.343.73 to Rs.360.94 per meter for a total value of Rs.8.87 crore. Thus, the decision of the Board to purchase costly High Quality Meters, against the instructions of MOP was not justified. This resulted in avoidable extra expenditure of Rs.13.41 crore (Rs.539.70 –360.94 X 7,50,000).

The Board stated (July 2007) that revenue loss on purchase of Static Energy Meters would work out to Rs.15 crore at the failure rate of more than 10 *per cent* over a period of five years. The reply is an afterthought as no such reasoning was recorded at the time of procurement. Further, the Board has not furnished details of failure of the Static Energy Meters received from the field and in any case the warranty period for the Static Meters was five years.

Idling of Distribution Transformer meters

Distribution transformer meters valuing Rs.2.82 crore were lying idle for more than a year.

3.1.28 The Board purchased (December 2005) 20,000 Distribution Transformer (DT) meters at a cost of Rs.20.31 crore. On a test check it was observed that at the end of March 2007, 2,773 DT meters valuing Rs.2.82 crore remained idle for over a year in various stores in Chennai Metro Circles mainly due to technical problems and defective specifications. This resulted in blocking of funds of Rs.2.82 crore besides losing at least one year of guarantee period (DT meters are guaranteed for 60 months from the date of receipt of meters in good condition in the store). The Board accepted (April 2007) that difficulties were encountered in connecting the cables to the Current Transformers and alternate methods for installation of the DT meters were under study. The reply is not tenable as idling of the DT meters resulted from defective technical specifications which should have been taken care before procuring the DT meters.

Impact of the programme

Consumer metering

3.1.29 One of the important objectives of the programme was metering of all the electrical systems and service connections so as to ensure accurate billing and accounting of energy supplied in the network.

Audit scrutiny revealed that in respect of consumer metering, though the Board could achieve the target as envisaged in the APDRP, it failed to comply with the conditions of MOU of 100 *per cent* metering of all consumer services by 31 December 2003. Out of 185.82 lakh consumers of all categories, 28.58 lakh agricultural and hut services were yet to be provided meters as on 31 March 2007.

The Board stated (July 2007) that the shortfall in achievement was on account of huge expenditure to be incurred and had sought extension of time from the Tamil Nadu Electricity Regulatory Commission to complete the work by March 2009.

Due to non-achievement of 100 *per cent* metering of the system and service connections, the Board could not

- prepare energy accounts and audit at all levels to identify the system/feeder having huge/abnormal losses/theft of energy, *etc*.,
- achieve accurate billing of energy consumed as the Board continues to bill on ad-hoc basis for the unmetered agricultural and hut services and
- calculate accurately the T&D losses.

Energy accounting and Auditing

The Board did not comply with the conditions of MOA regarding energy accounting and auditing resulting in ineffective control on loss of energy.

3.1.30 Energy accounting and audit (EAA) of energy flowing through each 11KV feeder to the Distribution transformers and ultimately to the consumers end on actual meter reading basis has been made as one of the important parameters of APDRP. As per the commercial clause of Distribution Reforms and Performance conditions stipulated in the MOA and MOUs, the Board had to maintain reports of EAA as under:

- From the point of import up to 11KV outgoing feeder – substation wise accounting of input and output on monthly basis with immediate effect. Where metering of feeders was not completed, this had to be done on a normative basis. However, the meter based accounting had to be put into place within nine months of signing (January 2002) of the MOU.
- Individual feeder wise accounting and audit to cover all consumers on the feeder once in two months commencing within three months of the date of installation of feeder meters.

It was observed that the Board had not complied with the conditions of MOA regarding EAA. The Board while agreeing to the fact stated (July 2007) that installation of DT meters was under progress in Chennai and after the procurement of Automatic Data Loggers by March 2008, energy accounting and auditing upto the DT level for all HT feeders and upto the consumer level in urban feeders would be possible. The fact remains that as a result, the Board had lost an opportunity to focus its attention on effective control of loss of energy.

Reliability and quality of power supply

3.1.31 The performance parameters to ensure quality and reliability of power supply are:

- frequency of feeder tripping and average duration of feeder outages,
- failure rate of the Distribution Transformers,
- average Power Factor, and
- number of complaints from the consumers and disposal time of the same.

In the case of feeder trippings/outages, DT failure rates and consumer complaints, the following deficiencies were noticed:

Feeder trippings and outages

Increase in man hour/duration of tripping in feeder both in Chennai and in Mofussil areas.

3.1.32 Despite huge investment of Rs.799.86 crore, there had been no significant improvement in the reduction of feeder trippings during 2004-07 as compared to feeder trippings during the pre-APDRP level (2001-02) in the seven schemes reviewed in audit as detailed in **Annexure-18.** It may be observed from Annexure that the anticipated reduction in feeder trippings could not be achieved due to:

- non-implementation of Consumer Indexing and installation of Data loggers which could have helped in identification of overloading of equipment, better load management and maintenance of equipment, and
- slow pace of work in commissioning of the system upgradation.

The Board stated (July 2007) that except in 2005-06, when there was unprecedented rain and floods, there was generally a reduction in tripping of the HT feeders. It was, however observed that the number of trippings was still on the increase during 2006-2007 in all the areas.

DT failure rate

3.1.33 DT is a key component of the distribution network and its failure not only results in financial loss to the utility but also adversely affects consumer satisfaction due to interruption in power supply. The high failure rate of DTs is caused by a combination of factors *viz.* overloading of DTs, improper earthing and protection, improper fuses, inadequate preventive maintenance, *etc*. It was noticed that there had been increase in the DT failure rate in 13 out of 25 schemes between 2002-03 and 2006-07 as could be seen from the details given in **Annexure-19**. The failure rate ranged from 0.29 *per cent* to 17.19 *per cent* in 2006-07. In Villupuram, Pudukottai and Kurinjipady Town, it was more than 10 *per cent* in 2006-07. Thus, the consumers had to suffer the erratic power supply.

Gap between the Average Revenue Realisation (ARR) and Average Cost of Supply (ACS)

3.1.34 One of the central objectives of the APDRP was to achieve commercial viability of the SEBs. This could be achieved only by elimination of the gap between the cost of supply and the revenue realised per unit of power. The Board has not been able to determine circle-wise actual ACS as the distribution circles were not operating as real profit centers with adequate delegation of technical, financial and commercial powers. In the absence of circle-wise actual ACS, the revenue gap was worked out by the Board by taking the overall cost of the Board. The details of revenue gap between ARR and ACS for the years 2001-02 to 2006-07 of all the 25 schemes as worked out by the Board are given in **Annexure-20.** It could be seen from the Annexure that:

- The ARR of the circles did not match with the ACS in respect of 18 out of the 25 schemes.
- The revenue deficit showed an increasing trend in 15 schemes and it ranged from 5 paise to 206 paise for every unit of energy supplied.
- In five schemes, the revenue deficit was more than a rupee per unit of energy sold in 2006-07.
- In seven schemes, which had revenue surplus, the revenue surplus was coming down in four schemes.

Audit further observed that on account of increasing revenue gap year after year, the Board could not reduce its annual revenue deficit, which had remained at over Rs.1,000 crore per year since 2000-01. The deficit at the end of 2006-07 was Rs.1,896.48 crore (provisional). Thus, the APDRP scheme did not bring the expected reduction in revenue gap in the State. As such, the Board was not entitled to avail the incentive for reduction in losses as discussed in the paragraph.3.1.12 *ante*.

The Board stated (July 2007) that the uniform cost of Rs.2.40 per unit at grid level supply was adopted for all the 37 circles and other costs involved in the distribution were loaded for arriving at the ACS for each circle based on the assets and other infrastructure in the respective circle. It was, however, noticed that no such exercise was done by the Board and only uniform rate of ACS (Rs.2.40 per unit) was adopted for all the circles. The Board did not furnish reply to the observation about non reduction of the revenue gap.

Reduction in AT&C losses

3.1.35 AT&C losses include the Transmission and Distribution losses and the commercial loss resulting from non-billing of energy consumed and non-realisation of billed amount. In compliance to the benchmark parameters set to be achieved under the programme, the Board had furnished AT&C losses for the 25 schemes, which are given in **Annexure-21**.

On verification of the AT&C losses as reported by the Board, it was noticed that the transmission loss from the generation end to the sub-station end was not included in the computation. The transmission loss worked out to 11.70 *per cent* in 2006-07. If the same is taken into account, the actual AT&C losses in 2006-07 would be far more than the one reported by the Board. The AT&C losses in 2006-07 after inclusion of 11.70 *per cent* of transmission loss were ranging from 17.52 *per cent* to 78.47 *per cent* in the 25 schemes and thus the Board has not achieved the target of 15 *per cent* in any of the scheme.

Thus, the Board had not only failed to achieve the targeted loss but also adopted unrealistic figures in its account besides reporting wrongly to GOI. Notwithstanding the above, the accurate estimation of the losses could not be ensured in audit for the following reasons:

- Non-inclusion of the transmission loss in the computation made by the Board.
- Failure to carry out the energy accounting.
- Shortfall in 100 *per cent* metering at all levels in the system and consumer services, and
- Non completion of computerisation of the LT revenue billing.

Test check of benchmark parameters in respect of Chennai Electricity Distribution Circle (South) revealed that AT&C loss in the circle increased from 5.96 *per cent* (in 2001-02 pre-APDRP level) to 9.89 *per cent* (in 2006-07) in spite of investment of Rs.110.80 crore on implementation of APDRP schemes. This resulted in loss[*] of 121.77 million units (over the pre-APDRP level of 2001-02) valuing Rs.41.74 crore during 2002-03 to 2006-07.

The Board stated (July 2007) that State level benchmark of 15 *per cent* AT&C losses was targeted with the hope that funds would be available for all the Electricity Distribution Circles, whereas the area covered by APDRP was about 40 *per cent* of the total network. It was also stated that any further reduction of the loss would involve huge financial outlay. The reply is not acceptable as even in the circles where the Board had implemented the APDRP scheme at a cost of Rs.799.86 crore, it could not achieve the reduction in AT&C losses to the targeted 15 *per cent*.

[*] Worked out at Average Revenue Realisation per unit in the respective years

Prevention of theft

3.1.36 Theft of energy, in the form of unauthorised connections from the electricity supply system, willful tampering of meters, by-passing of meters *etc*., by the consumers, constitute a substantial part of commercial loss. Hence, vigilance and legal measures to prevent the theft are critical to reduce the non-technical/commercial loss. The "Guidelines for reduction of Transmission and Distribution Losses" issued (February 2001) by the CEA prescribe various measures for reducing the commercial/non-technical losses. One such measure was setting up of vigilance squads/anti power theft squad (APTS) for conducting surprise checks at the consumer premises to detect pilferage of energy and other malpractices.

Audit scrutiny revealed that as against 24 APTS functioning in the pre APDRP year, the Board was operating only 17 APTS since 2004 which had a direct impact on the effective outcome of the vigilance function. The table below indicates the position with regard to the functioning of the enforcement wing of the Board for the six years ending 2006-07:

S.No.	Details	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
1.	Total number of services (in lakh)	153.43	156.52	163.38	170.34	178.03	185.82
2.	Number of services inspected by the squads	98,427	1,03,626	1,11,772	1,16,966	1,16,730	1,19,049
3.	Percentage of services inspected	0.64	0.66	0.68	0.68	0.65	0.64
4.	Number of cases of energy thefts detected	1,841	1,903	2,342	2,589	2,715	2,910
5.	Percentage of detection of theft to that of services inspected	1.87	1.84	2.10	2.21	2.33	2.44
6.	Provisional assessment of theft cases (Rupees in crore)	21.22	9.65	27.05	8.18	7.32	11.87
7.	Collection (Rupees in crore)	7.52	6.11	8.16	7.88	6.39	7.99

Source: Data furnished by the Board.

The percentage of theft detected by the enforcement wing was a meagre two *per cent* of the service connections inspected.

It will be seen from the above that the number of services inspected to the total services during the five years ending 2006-07 was less than one *per cent*. The percentage of theft detection was a meagre two *per cent* of the total number of service connections inspected by the squads.

Conclusion

The Board has not been able to complete 23 out of 25 schemes under APDRP even after a delay of three years even though funds were not the constraint. There was delay in release of funds by the State Government to the Board. The Board reported to MOP expenditure in excess of the expenditure actually incurred. The Board did not comply with the conditions of MOA regarding energy accounting and auditing thereby losing an opportunity to focus attention on effective control of energy loss.

The Board has not been able to reduce the revenue gap between ARR and ACS and AT&C losses in spite of implementing APDRP schemes at a cost of Rs.799.86 crore.

Recommendations

- **The Board must ensure timely completion of schemes under APDRP by proper planning, monitoring and control, if full benefits under APDRP are to be achieved.**
- **The State Government should release all the funds under APDRP without any delay so that works are not delayed in the Board.**
- **The Board should send accurate reports to MOP to avoid misreporting of expenditure incurred under APDRP.**
- **The Board should put in place the effective energy accounting and auditing to avoid loss of energy.**
- **The Board should take concrete steps to reduce revenue gap and AT&C loss so as to ensure its commercial viability.**

The matter was referred to the Government in June 2007; and their reply is awaited (September 2007).

3.2 INFORMATION TECHNOLOGY AUDIT OF COMPUTERISATION OF LOW TENSION REVENUE BILLING

HIGHLIGHTS

The software in Hand Held Device was incomplete and the billing software in the regional server was deficient in various billing components like power factor penalty, Kilo Watt Hour penalty, average billing and billing of door lock cases.

(Paragraphs 3.2.11, 3.2.13 to 3.2.22)

Inaccurate master data relating to critical fields and absence of input controls rendered the assessments vulnerable to errors.

(Paragraphs 3.2.26 and 3.2.27)

The deficient software coupled with manual interventions led to scope for errors in assessments of Current Consumption charges. Audit observed discrepancies in the assessments in Chennai (North) region for the period April to December 2006.

(Paragraphs 3.2.29 and 3.2.30)

Weak password controls rendered the data vulnerable to unauthorised modifications.

(Paragraph 3.2.31)

Introduction

3.2.1 The main functions of the Tamil Nadu Electricity Board are to generate, transmit and distribute electricity in the State of Tamil Nadu. One of the major sources of revenue to the Board is from supply of electricity to the Low Tension (LT) consumers. A consumer who avails supply of electricity at a voltage ranging from 250 to 650 volts with a sanctioned load upto 112 KiloWatts (KW[1]) is called as a LT consumer. The consumers of LT are broadly classified into six categories *viz*, Domestic (Tariff-I); Street light, Public water supply, recognised educational institutions and temples (Tariff-II); Industry (Tariff-III); Agriculture (Tariff-IV); Commercial (Tariff-V) and Temporary supply (Tariff-VI).

3.2.2 The Board proposed (January 2005) to computerise LT revenue billing in the State covering 615 out of 2,420 section offices under phase-I at a cost of Rs.113.55 crore to be completed by March 2006. The project was, however, completed at a total cost of Rs.52.14 crore due to integration of wireless network into wired network and the computerised billing commenced in April 2006 in 615 section offices.

3.2.3 The main objectives of computerisation are to reduce the errors and mistakes in assessment of the LT services, to provide improved services to the consumers by having a real-time system, to improve productivity in the assessment work and to ensure ready availability of management information.

3.2.4 The computerised system consisted of hand held devices (HHD[2]) for calculating the current consumption charges (CC charges) on entering of the meter readings by the assessor[3], local servers at the section offices, a centralised server at the regional level (Chief Engineer's office), and computers for the various users including the Billing Assistants and Assistant Accounts officer in the revenue branch. The section offices, revenue branch and the regional server are linked through network. The processed data in the HHD is uploaded to the regional server through the local servers. Wherever HHD is not used for assessments, the Billing software installed in the regional server performs the assessment of CC charges on entering of the meter readings directly by the Billing Assistants.

3.2.5 The LT billing system was designed as a web-based application under three-tier architecture. The client tier provides user interface in PHP (Hypertext Preprocessor) which makes request to the middle tier *viz*., web server. The backend-tier containing the information in Oracle Database Management System is functioning on Linux operating system in the regional server.

3.2.6 The LT billing system contains five modules *viz* (i) assessment module (ii) collection module, (iii) application module, (iv) revenue accounting and

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1 A measure of power equal to 1,000 Watts.
2 A small pocket sized computing device.
3 An employee in the Section Office responsible for making assessment of CC charges.

(v) management information system. While the HHD was designed to handle the assessment module, the billing software installed in the regional server was designed to handle all the modules, including the assessments that could not be performed by the HHD.

Audit objectives

3.2.7 The audit objectives framed to evaluate computerisation of the LT revenue billing are:

- whether appropriate methodology for system development and implementation was adopted.
- whether the IT controls in place were adequate and effective.
- whether the business rules as stipulated by the Tamil Nadu Electricity Regulatory Commission and all the billing components have been embedded in the software.
- whether the computerised system ensured data integrity and security.
- whether the objectives of computerisation were achieved and
- whether the prescribed purchase procedures were complied with and the IT infrastructure created was reasonably utilised.

Audit scope and methodology

3.2.8 The IT audit conducted during December 2006 to June 2007 covered examination of the procurement contracts and records related to computerisation at the Board's Headquarters office, selected regional Chief Engineer's offices and in the section offices. Audit analysed data relating to three out of nine regions *viz*., Chennai (North), Chennai (South) and Coimbatore. The data analysis was made using Structured Query Language (SQL)[4] on the database for the period April 2006 to February 2007 provided to Audit. The audit methodology included:

- issue of questionnaire,
- discussions with the executives, and
- visit to the data centre for observing the physical and environmental security practices adopted by the Board.

Audit findings

The significant audit findings are discussed in the succeeding paragraphs.

General controls

Lack of IT policy and documentation

3.2.9 The Board is yet to formulate and document a formal IT policy defining the long term/medium term IT strategy incorporating the time frame,

4 An interactive programming language to create, maintain, and query relational databases.

key performance indicators and cost benefit analysis of the various applications and their integration. There was no comprehensive documentation for testing and acceptance of the software. The Board accepted (July 2007) absence of IT policy and expressed that the administrative approvals given from time to time were to be treated as the Board's policy. The Board's view is not acceptable as administrative approvals were specific to the scheme and its implementation and did not contain short-term and long-term goals and other essential components of computerisation like strategic plan. The Board also stated (July 2007) that documentation for software would be devised appropriately.

Inadequate data back-up procedures

3.2.10 The Board did not have Business Continuity and Disaster Recovery Plan[5] to ensure uninterrupted continuity of business in the event of any temporary or permanent disaster leading to loss of data. Audit observed that a copy of the back-up was not kept off-site to ensure business continuity in case of any catastrophe causing damage to the data. The Board stated (July 2007) that it would provide a backup server to secure data in the regional server.

Deficiencies in the software

3.2.11 The Board placed (January 2006) an order for development of the software for incorporation in the HHD on Signals and Systems (Private) Limited, Chennai at a cost of Rs.1.41 lakh. However, due to failure of the firm to supply the software, the HHD supplier, Analogic Technomatics Private Limited, Hyderabad, who was awarded the contract for supplying 2,600 HHDs at a cost of Rs.1.99 crore, agreed to develop and supply the HHD software also free of cost. Though, the Company supplied (April 2006) the software, it was noticed in audit that it was incomplete as it could not handle the assessments involving door lock cases, meter defective periods, penalty/rebate for power factor, penalty for exceeding the sanctioned load, tariff changes, change of sanctioned load, adjustment of credit/advance CC charges, billing of temporary services and billing based on previous month consumption *etc.*

The above mentioned deficiencies in the HHD software coupled with inadequacy of the billing software housed in the regional server to establish interface with the HHD resulted in poor utilisation of the HHDs for assessments to the extent of only 28.4 *per cent* of the total assessments in Coimbatore region and 20.9 *per cent* in Chennai (North) region during April 2006 to February 2007. Therefore, bulk of the assessments were carried out through the billing software in the regional server leading to scope for errors in data entry. While the software in the HHD was not a complete and error free one, the billing software embedded in the regional server also suffered from a number of deficiencies as discussed in paragraphs 3.2.13 to 3.2.22.

The Board stated (July 2007) that the usage of HHD had improved to 85 *per cent* since March 2007 as most of the deficiencies and defects were rectified and attributed the earlier poor utilisation of HHD to the teething problems

5 The plan of an organisation to continue to function even after a disastrous event.

encountered in the initial stages of the project. Audit, however, ascertained that while the utilisation of the HHD for the last seven months ending September 2007 was at 80 *per cent*, majority of the assessments involving door lock, meter defects, disconnected services *etc*., could not be handled through the device. More importantly, the device was utilised to the extent of 50 *per cent* only for assessing the industrial services as it was not capable of assessing such services which involved a number of billing components.

3.2.12 Audit observed certain program deficiencies including deficiency in mapping of the business rule in the billing software as discussed below:-

Rounding-off errors

3.2.13 Power factor, the ratio of the real power to apparent power has to be calculated to three decimal points and rounded off to two decimals for billing purpose. Incentive is allowed to the consumers, who maintain the power factor in excess of 0.90. Data analysis in Chennai (North) and Chennai (South) regions for the period April 2006 to February 2007 indicated that in 816 assessments and 1,210 assessments, respectively, the power factor in excess of 0.90 was not rounded off to the two decimal places for billing purpose resulting in payment of excess incentive of Rs.0.72 lakh and Rs.0.82 lakh respectively. Similarly, wherever the power factor was below 0.85, it was not rounded off to two decimals resulting in short levy of penalty amounting to Rs.0.60 lakh and Rs.0.24 lakh respectively in respect of 432 assessments and 453 assessments in these two regions.

3.2.14 Audit scrutiny in Chennai (North) region indicated that in respect of 1,70,866 assessments under the non-CT category (services with a sanctioned load upto 75 Horse Power), the last digit of the units consumed was not rounded off to multiple of ten units due to absence of provision in the software.

Incorrect levy of CC charges for the door lock cases

3.2.15 When the meter installed in the consumer's premises was inaccessible for meter reading, it was called a door lock case. Assessment of CC charges for such cases has to be made provisionally based on the consumption during the previous assessment period. An analysis of the door lock assessments (first door lock) in Chennai (North) and Chennai (South) regions indicated that in 1,402 and 2,086 assessments, provisional assessments were made at Rs.23.11 lakh and Rs.17.89 lakh as against the correct assessment of Rs.36.73 lakh and Rs.35.66 lakh respectively indicating short billing of provisional assessments by Rs.31.39 lakh. The program did not compute the assessments with reference to the previous assessments as per the business rule.

Error in computation of the belated payment surcharge

3.2.16 The consumers paying the CC charges within 15 days after the prescribed due date for payment had to pay Belated Payment Surcharge (BPSC) at the rate of 1.5 *per cent* per month for a minimum period of 15 days. Audit noticed that due to incorrect mapping of this business rule, BPSC charges from 5,297 domestic consumers in Chennai (North) region for six months period during 2006-07 were wrongly calculated by charging for the whole month instead of limiting to 15 days resulting in excess levy of Rs.0.34 lakh.

3.2.17 Also, the consumers, who defaulted payment of electricity charges within the due dates, were also liable to pay the reconnection charges along with BPSC. A review of the delayed payments collected in Chennai (North) region and Chennai (South) region indicated that the total amount collected was lower by Rs.0.06 lakh. This indicated that the program did not ensure correctness of the total dues.

Error in billing on 'bi-monthly minimum' basis for industrial services

3.2.18 For industrial services, the CC charges based on the units consumed or bi-monthly minimum charges at Rs.80 per KW of the sanctioned load or part thereof whichever higher has to be levied along with power factor penalty, if any. Data analysis in Chennai (North) region for the period April 2006 to February 2007 indicated that the power factor penalty of Rs.0.26 lakh was not levied in 94 assessments made on bi-monthly minimum basis. While assessing the services on bi-monthly minimum basis, the program computed the power factor incentive payable to the consumers, but it did not recognise the power factor penalty, if any, receivable from the consumers.

Absence of program to calculate Current Consumption Deposit

3.2.19 The consumer availing three phase service connection has to pay Current Consumption Deposit (CCD) at the rate of Rs.600 per KW or part thereof of the sanctioned load. Data analysis of the new services having three phase connections effected during April 2006 to April 2007 in Chennai (North) region indicated that in 15 cases, in the absence of a provision to calculate the CCD in the system, the same was manually computed on the sanctioned load without rounding off the fractions to the next whole number resulting in short collection of Rs.19,580.

Non-levy of penalty for exceeding the sanctioned load (KW penalty)

3.2.20 In the case of service connections of industrial, commercial and street light, public water supply, recognised educational institutions and temples having a sanctioned load exceeding 25 HP, when the recorded demand exceeds the sanctioned load, penalty at the prescribed rates was recoverable for the excess demand. Due to inadequate mapping of the relevant business rules manual intervention was resorted to. A test check in two section offices in Coimbatore region revealed that in five cases, where the actual demand exceeded the sanctioned demand, the penalty amounting to Rs.0.14 lakh was either not levied or incorrectly levied.

Non-closure of consumer ledgers

3.2.21 As the computer system did not provide for automatic closing of the consumer ledgers closing in the system was activated manually. A review of such closing of the ledgers in Chennai (North) region for the period April 2006 to March 2007 revealed that only in 82 out of 22,566 occasions, the ledgers were closed. In the absence of automatic closing of the ledgers by the system and failure to do the activated process regularly, the dues from the consumers could not be determined in time. In addition, there was mismatch between the list of consumers who failed to pay the CC charges in time (*i.e*., defaulters) and the list of defaulters as per the consumer ledger closing.

Deficiencies in the program in preparation of consumer's balance

3.2.22 Audit observed the following deficiencies in the program in arriving at the consumer balances:-

- The system should match CC charges collected from the consumers to the relevant bi-monthly assessments so that the demands and collections were duly matched. Audit observed that the program did not segregate the arrears billing cycle wise and did not match the collections from defaulters against the appropriate dues in chronological order instead showed the collections against the latest bill. For e.g., in one case, the consumer failed to pay the dues relating to March 2007 (Rs.6,062) and May 2007 (Rs.2,278). When the consumer paid the dues of March 2007 in June 2007, the same was appropriated against the dues of May 2007 (Rs.2,278) and thus the consumer ledger showed a credit balance of Rs.3,784. As a result the unmatched arrears continued to remain as unpaid in the database.
- Audit observed that the program did not consider the credit available against one consumer and instead included him in the defaulter's list for the month of May 2007.

The Board agreed (July 2007) to review the above issues to make necessary changes in the program.

Change management controls

A general review of the change management controls indicated the following:-

3.2.23 Since introduction of the software, for the changes made in the program, a formal procedure for receiving change requests from the users, operational staff, and developers and for approving the changes was not followed. The details of amendments made indicating the reasons for changes, nature of changes, details of testing conducted, and date of approval by the competent authority were not documented and maintained.

3.2.24 Audit observed that the necessary change in the program for free supply of 500 units of power to the power loom service connections with effect from 1 August 2006 was not made and the old business rule to charge at one rupee per unit for 500 units was continued (March 2007). A review of the bi-monthly assessments for the period October 2006 to March 2007 involving consumption of units up to 500 units by the power loom service connections in Chennai (North) region indicated that:

- the program worked out the CC charges at the old rate of rupee one per unit.
- fixed charges at Rs.60 itself was not collected in 24 cases, and
- bi-monthly minimum charges at Rs.120 and fixed charges at Rs.60 were levied and collected in 34 cases instead of billing the fixed charges alone in such cases.

Timely modification of the program could have avoided the above.

Application controls

Input controls

3.2.25 Input controls ensure that the data received for processing is authentic, complete, has not been previously processed, accurate and properly authorised and is entered accurately and without duplication.

3.2.26 The major deficiencies observed by Audit in the maintenance of master data in Chennai (North) region are given below:-

- Wrong entries were observed in critical fields like sanctioned load and names of the consumers. The sanctioned load in KW of 33,279 consumers was wrongly entered without decimal places and the names of 6,520 consumers were entered as '*, =, AAA, aa, XX and other single characters making the electronic record incomplete and illogical.
- The master data in respect of 7,38,442 customers did not have the date of service connection. Similarly, it did not contain the customer number for 16,096 services as on 30 April 2007 who were sanctioned new service connections/additional load.
- In respect of 9,22,368 services, the serial number of meters was indicated as '1' and for the balance 26,842 services, some arbitrary numbers were indicated making the information unusable in case of theft/unauthorised change of meters *etc*.
- A review of the LT database in Chennai (South) region for the period April 2006 to March 2007 revealed that though the tariff category in respect of 11,475 assessments was changed from commercial to domestic tariff as per the consumers' request and the billing was correctly made by manual process with reference to the domestic tariff, the change of tariff was not effected in the master database. It indicated the state of inconsistency between manual and computer data. As the change of tariff from commercial to domestic was not simultaneously updated in the computer system during the year 2006-07, the consumption as per the database was lower by 34.23 lakh units under domestic tariff in Chennai (South) region and 17.07 lakh units in Chennai (North) region. Such non-updation of master data as per periodical change in tariff has the risk of non-claiming of subsidy from the Government in proportion to the actual units consumed.

In the above mentioned instances though the assessments were corrected by manual interventions, the master data was not updated, which would lead to wrong MIS. The Board agreed (July 2007) to take action to correct the wrong values in the master data of the LT billing.

3.2.27 In the following cases Audit observed absence of input controls in the transaction data:-

- The tariff category in 34 and 198 assessments in Chennai (North) region and Chennai (South) region respectively was indicated as 'Null'.
- In Chennai (North) region, a review of meter reading of consumption exceeding 50,000 units in 2007 indicated incorrect consumption ranging from 50,960 to 10,15,100 units in 73 assessments. It indicated the presence of error in data entry/data transmission. Though the assessment of the CC charges was manually corrected based on the correct quantum of consumption, the consumption of units was not corrected in the database to ensure data integrity in the electronic records.
- When the assessments were modified, the original records got removed and stored separately in the database. Audit observed that out of 55,618 assessments which were modified in Chennai (North) region, 5,753 assessments did not have proper remarks and contained single characters, special characters and combination of characters leading to lack of audit trail. In 24,642 cases, the reasons for the modifications were recorded as "wrong entry" without mentioning the nature of wrong entry. Had a systematic supervisory review been in place and conducted, incomplete input could have been avoided.
- In Chennai (North) region, nine applications for single phase connections were wrongly indicated as three phase connections, though the charges/deposits applicable for single phase connections were collected.
- Meaningless values like null, zero, 1, 2, 12, 85, 3200, and 5006 were found against the year in which the receipt for payments was issued by the Inspector of Assessment.

The Board accepted (July 2007) the audit observations and agreed to make necessary corrections in the program to provide validation controls.

Validation controls

3.2.28 Audit observed absence of validation controls in the following cases:

- In respect of 1,232 services of industrial consumers, though the sanctioned load exceeded 4 KW and they were to be treated as three phase connections, the database accepted them as single phase connections indicating poor input validation controls.

- Certain industrial and commercial service connections may require welding set in them. While service connections with welding sets were not required/availed by the consumers of domestic category, in respect of 40 domestic services, the master data indicated that welding sets were installed in them. Though the billing was correctly done by manual interventions, the master data was not corrected.
- The fixed charges as per database in respect of 13 assessments and six assessments in Chennai (North) and Chennai (South) regions respectively contained unreasonable amounts exceeding Rs.1,000 as against the maximum possible fixed charge of Rs.60. The billing software did not validate the entry in this regard.

The Board accepted (July 2007) the audit observations and agreed to make necessary corrections in the program to provide validation controls.

Manual intervention and impact

3.2.29 The deficiencies in the HHD software and inadequacy of the billing software to establish interface with HHD *etc*., led to large scale manual assessments and entry of the data in the system manually. Even in such cases of entry of manual assessment data in the system, the latter performs assessments of CC charges and thus for each such transaction there are two figures in the database namely the system computed amount and manually assessed amount. To ensure correctness of the assessments, the system provides for reconciliation. However, the discrepancies between the two figures was not systematically analysed by the Sections to identify the deficiencies and to rectify them. On this being pointed out, the Board agreed (July 2007) to take action to reconcile such cases.

3.2.30 Audit analysed the assessments pertaining to the period April to December 2006 in Chennai (North) region with a view to ensure the accuracy of assessments and observed discrepancy between the Board's assessments and the assessments as worked out by Audit. The main reasons for discrepancies were:

- errors in data entry,
- errors and non-updation of the master data like sanctioned load, tariff classification, and
- software deficiencies.

Accordingly, five out of eight revenue branches in Chennai (North) region verified the discrepancies partially with respect to commercial and industrial tariff consumers and accepted a short levy of CC charges amounting to Rs.26.54 lakh. Verification in respect of other cases is awaited.

Inadequacy of the HHD software, and under utilisation of HHD, deficiencies in the billing software, errors in the master data, and existence of large scale un-reconciled discrepancies *etc*., therefore, do not give assurance that the

Board has achieved the objectives of reducing errors and mistakes in assessments and ensuring reliable MIS.

IT security

3.2.31 Protecting the information assets is a critical factor to ensure continued availability of information, data confidentiality and integrity. Audit observed the following weaknesses in security control:

- Though modifications made in the data relating to customer, services, meters and meter reading were maintained in the database separately, they were not subjected to supervisory review periodically to ensure that the changes were authorised.
- The database provides for capturing Internet Protocol (IP)[6] address of the computers for every assessment to identify the computer from which the data was entered. In Chennai (North) region, during the period April to October 2006, 2,91,894 assessments did not contain IP address of the computers for facilitating audit trails in such cases.
- A review of the database in Chennai (North) region for the period April 2006 to February 2007 indicated that officers who were empowered to add assessment records were also given powers to delete records. Such users deleted 33,190 records during the said period indicating improper and weak authorisation controls.
- The Board had not implemented comprehensive password control measures for periodical change of the passwords. Audit also observed that passwords were not changed periodically. It was noticed that the passwords of the AAO were shared with other users having lower access control privileges. For example, a review of the information in the database pertaining to 1 February 2007 indicated that 26 different users added 1,300 assessment records in one hour using the AAO user ID. It showed that the transaction authorisation on behalf of AAO was carried out by different users making the AAO accountable for the correctness and genuineness of the entries made indicating serious security concern. This also indicated that the software did not have provision to restrict multiple user login simultaneously.

The Board accepted (July 2007) to monitor change of passwords by the users periodically by reviewing the log maintained in the regional server. After the above being pointed out in audit, detailed instructions were issued by the Board to the field officers to ensure password security *etc*.

Other topics of interest

3.2.32 The contract was placed (January 2006) on Gemini Communications Limited, Chennai at a firm price of Rs.49.22 crore for hardware and related

6 The protocol used for routing and carriage of messages across the Internet.

infrastructure including maintenance of leased lines[7]. Audit observed the following points:

- Subsequent to the award of the contract, at the instance of the Board, Bharat Sanchar Nigam Ltd (BSNL) allowed (May 2006) a discount of 20 *per cent* on the two Mega Bytes Per Second (MBPS) leased lines availed for the LT billing project. The Board, however, did not ask the contractor to pass on the benefit of reduction in lease charges. The discount accrued at the current rate of lease charges in respect of five regions (Coimbatore, Trichy, Tirunelveli, Erode and Villupuram) alone worked out to Rs.46.18 lakh for the entire contract period of five years. The Board replied (July 2007) that the intricacies of discount had not been anticipated and stated that the same aspect would be considered in the future purchase orders. The Board's failure to get refund allowed by BSNL specific to the LT billing project resulted in potential loss of Rs.46.18 lakh.

- A comparison of the rates quoted by the said firm for 23 items revealed wide variations for three items *viz*., Storage Area Network switches, Printer and Ethernet switches between the rates quoted in Chennai (North) and Chennai (South) Regions. Though the contracts were finalised during the same time and the purchase orders were awarded to the single firm, the Board failed to negotiate and fix the rates at the lowest quoted rates, leading to an extra expenditure amounting to Rs.8.55 lakh. The Board stated (July 2007) that the lowest tender was selected based on the total contract value and attributed the differences in the quoted price from region to region to the pattern of expenditure to be incurred by the tenderer. The reply is not tenable as the nature of hardware items was one and same and the Board did not take into account the lowest rate quoted in a region.

Conclusion

The implementation of the project with incomplete software and absence of thorough testing indicated significant departure from the standard system development methodology at each stage of the project. Major deficiencies were observed in entering master data and changes thereto. Change in business rule was also not updated. Wrong data entry coupled with inadequate input controls in the system, inadequacy of the software and error in the software, *etc*., have led to large-scale manual interventions, disregard to the concept of computerisation. It resulted in differences between the Board's assessments and the assessments made by Audit. Security policies were not clearly defined and strict enforcement of the same were not ensured. Data back-up procedures for the main server as well as local server were not standardised.

7 A telephone line rented for exclusive use by an organisation.

Recommendations

- **The Board should rectify the deficiencies in the software of the hand held device as well as billing software so that the computerisation under Phase-II does not suffer from the software related problems.**
- **The deficiencies in the master data should be set right so that the developed software would generate the desired results as per the business rule.**
- **In the light of deficiencies observed in the software and implementation and un-reconciled discrepancies in assessments pointed in audit, the Board may consider reviewing the assessments already made in all the regions.**
- **The documentation relating to program, amendments to the program and modification of assessments *etc*., should be systematically maintained and reviewed.**
- **The IT policy including IT Security should be clearly laid down and strictly enforced.**

The matter was referred to the Government in August 2007; and their reply is awaited (September 2007).