

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 circles⁷ 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

⁷ 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 six⁷ 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.

⁷ 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.

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.

Data backup was stored at main entrance.

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

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

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).

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.

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

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.

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

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

Waiver of minimum charges was in violation of rules.

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)[⚡] 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).

[⚡] 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.