

2.2 Information Technology review on Computerisation of Bihar State Electricity Board

Highlights

In the absence of adequate IT skilled manpower, the Board continued to depend on NIC even after six years of computerisation.

(Paragraph 2.2.9)

The RF networking between divisions and headquarters, done at a cost of Rs. 21.09 lakh did not materialise.

(Paragraph 2.2.12)

Lack of input controls and validation checks resulted in incomplete, inaccurate and unreliable database.

(Paragraphs 2.2.18 to 2.2.22)

Non mapping of business rules led to short or non levy of shunt capacitor surcharge, additional Security Deposits, Fixed charges for three phase connection from customers.

(Paragraphs 2.2.23 to 2.2.25)

Due to manual interventions, the surcharge for delayed payments was collected incorrectly.

(Paragraph 2.2.27)

Poor monitoring and deficient controls over the outsourced agencies led to deficient data and possible irregularities in accounting for the receipts from the customers.

(Paragraphs 2.2.31 to 2.2.34)

Introduction

2.2.1 Bihar State Electricity Board (BSEB) was established in 1958 as a statutory corporation under the Electricity (Supply) Act, 1948. Its primary role is to generate, transmit and distribute electrical power throughout the State. The IT Vision Plan drawn up by BSEB envisages making the billing process as simple and efficient as possible. It would encourage the consumers to understand the bills received, simplify payment process and ensure successful realisation of revenue through computerised cash collection counters.

The billing system which was earlier on UNIX based FOXPRO was re-engineered in September 2000 with Windows based ORACLE 8i. The objectives of re-engineered billing system were (i) to establish dial-up connectivity and RF link (wireless audio video transmitter) for data transfer; (ii) to decentralise billing from division level to small sized computer centers; (iii) to introduce user friendly graphical user interface; (iv) to provide accessibility and MIS to top management in appropriate format.

Data regarding Meter reading, new connection, updation of existing data etc. was entered at the divisions by data entry operators and data regarding revenue collection was entered at the collection counter by the counter clerk. The re-engineered billing systems became operational during 2002-03.

Organisational set up

2.2.2 The computerised billing and collection of revenue is controlled by the Revenue Dept of the Board headed by Member (Revenue) who is assisted by the Financial Controller (Revenue) for all matters related to billing and revenue collection and Director, IT for Patna Electricity Supply Unit (For matters related to IT).

There are 16 Circle offices of the Board. Each of the Circles of the Board consists of three to five divisions. The collection counters have been connected with the division server through a modem. Every evening after the completion of cash collection, the counter clerks log into the division server and transfer the daily collection data and also get the billing details at the division on that day for future collection.

Scope of audit

2.2.3 The scope of audit included a review of planning, implementation and monitoring of the computerization process and an examination of the controls in the major IT application running in the Board.

The data generated by the application was analysed using computer assisted auditing tools (CAATS). Further, the existence and adequacy of IT General Controls and Application Controls at Data Centre was also assessed. Audit for the period 2003-04 to 2007-08 was conducted from March 2008 to August 2008 at Board headquarters, PESU and three other circles¹ which have been outsourced to various agencies.

Audit objectives

2.2.4 The IT review was conducted with a view to ascertain:

- the efficacy of the Board's IT planning and organization.
- economic acquisition and effective implementation of IT system.
- whether sufficient controls were in place to obtain reliable and accurate information from IT system.
- whether the system security measures were in place to ensure confidentiality, integrity and continued availability of IT assets.
- adequacy of internal controls in information systems.

Audit criteria

2.2.5 IT review was conducted with reference to:

- Circulars/Instructions regarding Boards operation and Inventory Management.

¹ Arrah, Muzaffarpur and Darbhanga circles

- Tariff of the Board and notification relating to the terms and conditions of the tariff and related rules/regulations.
- Agenda/minutes of the Board.
- Agreement between Board and outside agencies.
- Generally accepted best practices in IT.

Audit methodology

2.2.6 Following mix of methodology for achieving the objectives with reference to audit criteria was adopted:

- Entry Conference with the Board.
- Scrutiny of agenda, minutes of the Board.
- Scrutiny of records and analysis of data with CAATs.
- Sampling.
- Questionnaire.
- Interaction with Management.
- Audit Review Committee for State Public Sector Enterprises (ARCPSE) meeting.

Audit findings

2.2.7 Audit findings, arising from the review of Computerisation of BSEB for revenue billing in all ten divisions of Patna Electric Supply Undertaking (PESU) along with Arrah, Muzaffarpur and Darbhanga circles were issued to the Government (August 2008). The reply was received on 12 September 2008. These findings were further discussed in Audit Review Committee for State Public Sector Enterprises (ARCPSE) meeting held on 12 September 2008. The views expressed by the Management and members present in the meeting have been taken into consideration while finalising the review. The audit findings are as below:

Planning and Organisation

IT policy

2.2.8 Though BSEB had developed substantial IT applications over the years, it is yet to formulate and document a formal IT policy and a long/medium term IT strategy incorporating the time frame and key performance indicators for development and integration of various systems.

Training

2.2.9 During audit it was observed that documents relating to assessment of requirement of IT skilled manpower were not maintained.

Due to non assessment of requirement and appointment of IT skilled manpower, the Board, even after six years of computerization is fully dependant on the NIC.

It was further observed that only three days training to clerical staff etc. and four weeks training was organised for 19 officers during the year 2002. There

were several modifications in the software due to change in tariff in November 2006. However no refresher training to those trained earlier or training to a fresh set of staff was organised by the Board.

The Board did not furnish the reply.

IT system acquisition and its implementation

2.2.10 Absence of Agreement

The work was undertaken by the NIC without entering into an agreement with the Board or receiving any work order for the same. The Board released payment of Rs. 2.98 crore from November 99 to August 2001 on ad-hoc basis and the expenditure incurred thereon was not monitored by BSEB. The work was completed by NIC during 2001-02. NIC submitted bill for Rs. 2.82 crore and thus Rs. 0.16 crore remained recoverable from the NIC (August 2007). In this connection following points were observed in audit.

2.2.11 Works not undertaken

Though the project was said to be completed, the other parts of the project such as Document Management System, personal information system (PIS), pay rolls, pension and GPF etc were not taken up by NIC. The Board did not take any action for the same.

The Board accepted the Audit observation.

2.2.12 RF networking

The RF networking done at a cost of Rs. 21.09 lakh failed to work successfully. Due to failure of the networking, the major purposes of getting bills and depositing revenue for any division, from any division could not be achieved. The data were transferred from division to Board Headquarters through external devices, where in security of the data could also not be ensured. Thus, expenditure of Rs. 21.09 lakh incurred on RF networking remained fruitless.

While accepting the audit observation the Board stated that action is being taken up to rectify the defects in the RF link.

General Control

Information System Security

Logical Access Control

2.2.13 In order to have a sufficient control over IT system, duties to different functionaries should be defined and documented.

Regarding logs maintained in the system, it was observed that privileges granted on the basis of designation were not being followed in divisions and unauthorised officials up to the rank of AEE (Revenue) and Counter Clerks were doing the deletion and modification of data.

The Board stated that the officers who are authorised to modify/change as per Finance/Account code are doing the job and no unauthorised officers are allowed to modify/change data beyond power granted to them.

The reply is not acceptable as AEE (Revenue) and Counter Clerks were not authorised to delete or modify data.

2.2.14 Users once logged-in in the system must be logged-out at the end of each and every session, so as to minimise the risk of unauthorised access/manipulation to the data. However, on scrutiny of data regarding users logs maintained, it was observed that user logs were not maintained in all divisions of PESU.

Physical and Environmental Control

2.2.15 During verification of security measures of IT assets located at various divisional offices for billing and revenue collection, it was found that :

- The system was located in wrecked buildings. The ceilings of the buildings were not made water proof.
- No fire extinguishers were installed to safeguard against fire.
- The assets were not safeguarded against power fluctuations/failure as UPSs were poorly maintained and alternate power supply systems, i.e., generators were not installed.
- Cleaning of ceiling, walls, floors, storage cabinets and necessary equipments was inadequate. The dust generating activities like paper shredding, and foodstuffs were not avoided.
- There was no control on the physical access to the system to prevent unauthorised access.
- Latest anti viruses were also not installed to protect the system from viruses, spyware etc.

The Board accepted the audit observation.

Change Management

2.2.16 During scrutiny of application, it was found that it was modified whenever new tariff rate was fixed. The records for the modification made in software were not recorded or documented or approved by the Board.

The board stated that whenever required, software was upgraded / modified by NIC, either on request from BSEB or on their own to enhance the features of software. However, no reply regarding documentation of modification and approval of modification by the Board could be furnished.

Business Continuity Plan

Failure to adhere to stipulated backup procedure

2.2.17 For effective business continuity plan, the management should implement a proper strategy for backup and its restoration.

On scrutiny of data regarding back up taken, it was observed that the process of taking backup is not regular in all divisions of PESU where the backups were taken after gap of several days ranging from 123 to 880 days. The absence of regular back up enhanced the risk to the business continuity and unauthorised changes to the database.

The copies of application software were also not available with the Board to make computers operational well in time in case of failure.

The Board stated that the backup of database is being taken on daily as well as on monthly basis. The daily and monthly back up of the database is kept at the divisional offices. The copies of backups of database are also kept at Department of IT of Board Headquarters.

The reply is not acceptable as the back up once taken was recorded in the database with date and time. Audit scrutiny of the data regarding backups taken revealed that backups were taken after gap of several days.

Application Control

Input Controls

Adequate input controls ensure the correctness and completeness of data entered. The following deficiencies were noticed due to lack of input controls.

Completeness of database

2.2.18 All details of consumers who were given energy connections were maintained in the database of the divisions. During scrutiny of database regarding completeness following deficiencies were noticed:

- In 500 consumer records the name of the consumer was not entered or junk characters were entered in PESU where data entry is done by its own officials.
- In Darbhanga division where data was entered by outsourced agency, 11,316 bills pertaining to 234 consumers did not contain names of consumers due to which the bill could not be served to them and Rs. 21.10 lakh could not be recovered.
- Similarly in 4,485 consumer records, the addresses of the consumers were not entered or junk characters were entered in PESU. In Darbhanga division addresses of 208 consumers were not entered against whom Rs. 21.10 lakh was outstanding.

Gap in ID

2.2.19 Consumer ID is a unique field generated by the system to identify a consumer. These codes are to be protected against modification and deletion to ensure the integrity of the database. There were 54,184 numbers of gaps in the consumer ID ranging from 1 to 3,075 in PESU.

The Board in its reply stated that at the time of computerisation duplicate/erroneous data found were deleted creating gaps in Unique ID number of consumers. This has no adverse effect in billing.

The reply is not acceptable as the range of gap was very large (up to 3,075) and duplicate/erroneous data could not be entered continuously up to 3,075 times.

Sanctioned load

2.2.20 Before giving energy connection to the consumer, load is sanctioned according to need of the consumers. Rate of energy charge, fixed charge and category of the consumers varies according to the sanctioned load. Thus accurate entry of sanctioned load is pre-requisite for correct calculation of the energy charges, etc. During analysis of database the deficiencies found regarding connected load are as below:

- In eight (excluding Dakbunglow and Danapur) divisions of PESU sanctioned load was entered as zero for 1,817 consumers.
- In case of 202 consumers of PESU, sanctioned load of Low Tension Industrial Services LTIS consumers was entered in Kilo Watt (KW) instead of Horse Power (HP) in violation of the tariff rule.
- In case of 105 Domestic and Non domestic consumers of PESU sanctioned connected load was more than 60 KW in violation of tariff rule.
- For calculation of additional security deposit, initial security deposit collected from the consumers should be available in consumer database. However it was observed that out of 3,45,299 consumers of PESU Security Deposit was mentioned as zero in case of 2,64,620 consumers.
- Rs. 10.83 crore were pending realisation from 1,796 Government servants who had vacated their official quarters on transfer. Out of these, names of 728 Government Servants were not available. The Board accepted the audit observation.

Meter information

2.2.21 At the time of connection an energy meter is installed in the premises of the consumers. Details of meters such as meter number, meter type, make etc are entered in the database. Every consumer should have unique meter number and one meter should be installed for one consumer only. However, deficiencies noticed during scrutiny of data regarding Meter information are as follows:

- In 1,564 cases incorrect meter numbers (0, na, xx etc.) were entered.
- In 22,967 cases no meter number was provided in the database.
- In 36,302 cases duplicate meter number was entered in the database.
- In case of 1,910 consumers, ownership of the meters (Whether meter provided by the Board or owned by the consumers) was not entered in the database.

- In Madhubani Division and Jhanjharpur Division under outsourced Darbhanga circle, it was observed that no provision to capture information regarding Meter viz., Meter owner, Meter phase, Meter number etc was available in database, therefore meter rent charged could not be vouched.

Regarding duplicate meter number the Board stated that the meters installed are provided by different manufacturers, so duplicate meter numbers might be possible, but considering the large number of duplicate meter numbers, the Board agreed to form a team to correct the meter numbers.

Meter rent

2.2.22 Further, as per tariff, meter rent is to be charged at the rate of Rs. 20 and Rs. 50 for single and three phase respectively in case of consumers to whom meters were provided by the Board and the same is in running condition. However, during scrutiny of data, it was observed that due to delayed entry of information regarding installation of meter, Meter rent was not charged in 1,33,608 bills of 14,232 consumers of all divisions of PESU resulting in loss of Rs. 29.30 lakh.

Board in ARCPSC Meeting accepted the audit observation and replied that corrective action will be taken.

Validation checks

Validation checks ensure that the data entered is valid and conforms to the validation rule.

Calculation of consumption charges

2.2.23 The system has provision to capture present reading and previous reading. Present reading of previous month becomes previous reading of next month and present reading is printed in the spot bill. In case of door lock both present reading and previous reading will be the same. Audit scrutiny of the bill raised in all divisions of PESU revealed the following:

- Present reading was less than previous reading in 4,34,750 records without change in meter.
- Calculation of consumption was not equal to present reading minus previous reading in numbers of bills.
- While accepting the seriousness of the observation the Board in ARCPSE meeting stated that deficiencies in the software, if any, will be corrected with the help of NIC.

Business Rule Mapping

Shunt capacitor surcharge

2.2.24 According to tariff, every LTIS consumers having connected load of five HP and above had to install shunt capacitor of appropriate capacity to maintain power factor at 90 *per cent*. Surcharge was also leviable in case of power factor below 90 *per cent*. However, during analysis of data it was

noticed that there was no field for power factor in the consumer data base of the Board. As a result no surcharge was charged as required in the tariff against any short fall in power factor.

Further, In case of non-installation of shunt capacitor, five *per cent* surcharge was to be levied. Analysis of the data regarding LTIS consumers showed that surcharge leviable for non-installation of shunt capacitor of appropriate capacity was short/not charged according to the tariff in 88,600 out of 1,19,702 bills of 2,785 consumers of PESU amounting to Rs. 53.14 lakh.

The Board in ARCPSE meeting stated that the NIC would be asked to make the required modification in the software.

Regarding Shunt capacitor charge, the Board stated that there was no facility to record the power factor maintained by the consumer. The Board also stated that the short charging would be checked in detail and would be corrected.

The reply is not acceptable as the Board should have obtained facilities to record power factor as required in tariff rule.

Non-charging of additional Security Deposit

2.2.25 According to tariff, the consumers except Government department are required to pay security deposit equivalent to estimated energy charges including fixed/miscellaneous charges for a period of three months.

Further, the amount of Security Deposit is liable to be enhanced every year in April-May of the next year on the basis of average bill for the previous year. Analysis of data base revealed that:-

- The system did not have provision to compute the average energy charge on the basis of which additional security deposit was to be collected. As a result additional security deposit could not be recovered from consumers.
- No provision for calculation of interest was available in the system as required under tariff.

The Board accepted the observation and stated that efforts will be made to update the database. Board also stated that the efforts will be made with the help of NIC to modify the software and to recover the additional security deposit in future.

Fixed charges

2.2.26 According to tariff, for Domestic Services-II consumers single phase supply is applicable to the consumers having sanctioned load up to four KW. For consumer having sanctioned load above four KW, three phase supply is applicable and further, fixed charge was charged at the rate of Rs. 150 per month instead of Rs. 25 for single phase supply up to October 2006 and Rs. 180 per month instead of Rs. 30 for single phase supply with effect from November 2006.

In the absence of proper mapping of business rules, consumers having single phase were sanctioned load above four KW and fixed charge were continued

to be charged at the rate of single phase. This deprived Board a revenue of Rs. 94.96 lakh from 6,993 consumers on account of fixed charges during period covered under audit in respect of nine divisions of PESU.

The Board in ARCPSE meeting accepted the objection and stated that there were many practical difficulties to provide three phase connection to the consumers having sanctioned load more than four KW. The Board also stated that it involved expenditure in giving three phase connection, but considering the increase in revenue in case of three phase connection, the Board stated that it would be increased accordingly in future.

Manual Intervention

Delayed Payment Surcharge (DPS)

2.2.27 According to tariff, delayed payment surcharge (DPS) was to be levied at the rate of two *per cent* up to October 2006 (as per old tariff) and 1.5 *per cent* with effect from November 2006 (as per new tariff) on the arrear outstanding against consumers. Analysis of data regarding DPS charged revealed that in case of 4,37,459 bills in respect of 2,02,758 consumers of PESU, DPS charged was not correct. In case of 1,81,005 bills DPS was short charged by Rs. 76.90 lakh and in case of 2,56,454 bills DPS was charged excess by Rs. 174.97 lakh. As the system had provision to apply the DPS, it indicated manipulation in the database through manual intervention.

Short/Excess charging of Electricity Duty

2.2.28 Electricity Duty should be charged at the rate of six *per cent* of energy charge. On analysis of data of consumers of all divisions of PESU, it was observed that in case of 6,298 bills of 300 consumers (both Government and non Government consumers) Rs. 44.10 lakh was not charged against electricity duty. As the system had provision to charge the electricity duty at six *per cent*, it indicated manipulation in the database through manual intervention.

The Board in ARCPSE meeting stated that Electricity Duty was not charged in case of Government consumers. When pointed out by audit that Electricity Duty was to be charged from each and every consumer, Board assured to take corrective action. It was also observed during scrutiny of data that electricity duty was charged to 115 (from 2003 to 2008) government consumers, as well, in Guljarbagh division of PESU.

Other Points of Interest

Outstanding arrears of energy charges

2.2.29 During the analysis of the data regarding bills generated and revenue collected of Danapur Division, it was observed that due to spot billing being introduced, computerised billing of 1,116 consumers was done after a gap of nine months (i.e. from August 2006 to April 2007). Further, it was also observed that outstanding energy dues of August 2006 was not carried forward and thus, not included in the next bill of April 2007. This resulted in non-posting of outstanding amount of Rs. 45.51 lakh.

Board accepted the observation and stated that due to some problem in spot billing it was stopped and computerised billing was again started. Due to this switch over, arrear was not being carried over. Board also stated that a detailed enquiry would be conducted and corrective action would be taken.

Delay in billing

2.2.30 Bills were to be issued every month. Analysis of data in PESU, showed that 8,41,599 bills were issued at a delay of months ranging from 16 to 85 months. Reason as analysed in audit revealed that lack of coordination between divisions and subdivisions and inefficient process of billing led to inordinate delay in issue of bills to new consumer.

The Board stated that due to Hardware constraints / shortage of meter readers, the energy billing of few consumers could not be done on monthly basis. It was also stated that in case of new connection billing starts on receipt of reports in divisional offices.

The reply is not acceptable as the fact remained that there was delay in billing due to lack of coordination between subdivision and division offices for furnishing new connection report immediately after giving connection to start billing. Further, the system was not configured to capture the complete process from the application for a new connection which left scope for delays and manipulations.

Evaluation of work by outsourced agencies

2.2.31 Computerised billing in divisions other than PESU is done through the outsourced agencies from the period prior to 1999-2000. The guidelines issued by the Board to field offices regarding outsourcing of agencies for computerised billing was not made available to audit. Deficiencies noticed during IT audit of three selected circles (Arrah, Muzaffarpur and Darbhanga) are discussed below:

Agreement with the agencies

2.2.32 The clauses of agreement executed with the agencies for computerised billing were different in different circles. The clause regarding details of tables to be maintained, software, consistency of data, back up of data, log files, security of data, accuracy were either not mentioned in the agreement or were not being adhered to.

Back up of data

2.2.33 According to the agreement for computerised billing, the agencies had to submit the copy of ledger, bills, Daily Collection Register, etc. in compact disks (CD) along with hard copy every month. At the end of each year the agencies had to submit master data in CD in Circle/division.

During audit it was, however, observed that the agencies did not submit the monthly and yearly back ups in the division/circle and the Board did not take any action to obtain the back ups.

Defects in Database maintained by Outsourced agencies

2.2.34 During scrutiny of the database maintained by the Outsourced agencies following deficiencies were noticed.

- In absence of any guidelines at Board Headquarters level, there was no similarity in the structure of the database. Database structures of even the same agency were not similar.
- Security deposits of consumers were not being recorded in the database.
- In Madhubani Division data for arrear energy and arrear DPS was not segregated.
- In Muzaffarpur Division, there was no provision to capture information regarding present meter reading and details of revenue realised (receipt number and date).
- There was no provision to capture feeder from which the consumers were getting power in violation to the provisions of the tariff.
- There was no supervision over security of data as required in the agreement.

As regarding non-maintenance of present reading and details of money receipt at Muzaffarpur circle, Board in ARCPSE meeting, accepted the audit observation and decided to conduct detail audit. It was also decided that the payment to the agencies would also be stopped.

Duplicate money receipt

2.2.35 The computerised bills for consumption of energy are issued to the consumer and the amount of revenue from the consumers are collected manually through money receipt. The revenue collected are taken in the cash book and deposited in bank for onward transmission to the bank account of Board headquarters. The amount collected, daily, is entered in Daily collection register (DCR) which is sent to the outsourced agencies for data entry to give credit to the consumers.

In order to avoid irregularity in crediting the consumers, the system should have control to ensure entry of unique receipt number against the credits given along with checks for control totals. However, during analysis of data of two circles, duplicate entries of receipt numbers were noticed as detailed below:

Circle	Divisions/Subdivisions	No of duplicate money receipt.
Arrah	Buxar	238
	Arrah (E)	619
	Arrah (N)	320
	Arrah (R)	60
	Arrah (W)	1,116
	Arrah (H)	1,149
	Arrah (I)	216

Darbhanga	Jainagar	34
	Benipur	137
	Biroul	28
	Nirmali	2
	Madhubani	60
	Phulparas	44
	Sakri	54

It was observed that though the receipt numbers and date being the same, the amount of receipt was different in many cases. Due to large numbers of duplicate receipts the amount of irregular credit could not be quantified in audit.

There was no system in the Board to check such duplication and possible irregularity.

Board while accepting the audit observation in ARCPSE meeting stated that it may result in fraud. Board also stated that corrective action would be taken.

Conclusion

Though the Board envisaged computerisation of billing system (from giving energy connection to collection of revenue), it continued to depend on the NIC in PESU area and the outsourced agencies in other area. The arrangements for development and implementation of the billing system with NIC were *ad hoc* and not monitored over the years. However, they operated the system in PESU area but lack of adequate manpower and supervision led to manual interventions.

The billing system in PESU had deficient application controls resulting in non/less charging of meter rent, fix charges, shunt capacitor charges, delay payment surcharge and electricity duty etc. The system also had incomplete mapping of the business rules relating to tariff which led to non application of its provisions.

In outsourced areas, the BSEB did not have adequate monitoring and control over the outsourced agencies, which not only led to deficient system and data maintenance, but also possibility of irregularities.

The above led to manual interventions, both in PESU area and other areas with outsourced agencies, which led to manipulation of data. This combined with the inadequate logical access controls, physical access controls and inadequate business continuity plan made the system highly vulnerable where the reliability of the data in the systems could not be assured.

Computerisation could not be of much use for higher decision making, also, where the linkage of the divisions to the headquarters could not be established. This in turn led to deficient services for the consumers.

Absence of a definite IT policy, strategies for IT implementation and lack of adequate performance indicators along with deficient monitoring,

supervision and controls led to inefficient utilisation of the computerisation efforts by the Board.

Recommendations

The Board should initiate steps to:

- **Have a definite IT policy.**
- **Strengthen the capacity of its officials.**
- **Ensure adequate application controls are built into the application software.**
- **Monitor the terms of agreements with the outsourced agencies, its performance and ensure uniformity in the application software used by the agencies.**
- **Ensure business continuity through adequate back up plan which should be implemented scrupulously.**