Ajmer Vidyut Vitran Nigam Limited

2.2 IT Audit on Computerisation of revenue billing system by Ajmer Vidyut Vitran Nigam Limited

Executive summary

Ajmer Vidyut Vitran Nigam Limited (Company) outsourced (May 2005) the work of design, development and maintenance of billing software, data processing of billing data, printing of bills and preparation of various management reports in respect of various circles to two service providers viz; Business Information and Processing Services (BIPS) and Aditi Computers. An Information Technology Audit on billing system of the Company was attempted to ascertain that the Company, before awarding the work of its core activity of revenue realisation, has adequately addressed the associated risks of outsourcing. Further, the audit was also conducted to examine, analyse and to assess adequacy and effectiveness of billing process and revenue realisation.

Computerisation of revenue billing of the Company was assessed against the Tariff for supply of electricity-2004, and Terms and Conditions of Supply (TCOS) - 2004, Rules, notifications, directions issued by the Rajasthan Electricity Regulatory Commission (Commission) and orders and circulars issued by the Company. The data available with the Company was analysed with the help of Computer Assisted Audit Techniques.

Though the system developed by both the service providers was adequate as regards to processing of billing data and generation of electricity bills yet there were many shortcomings leading to incorrect billing as well as not achieving full potential of IT applications. In a broader way, observations of audit have been categorised as deficiencies of general controls, system design deficiencies, deficient mapping of business rules, application controls such as deficient input controls and validation checks etc. Besides, some contractual deficiencies, non-reconciliation of data available in the system with financial statements of the Company were also noticed. Need to establish an effective internal control mechanism as regards to IT applications was also felt.

Introduction

2.2.1 Ajmer Vidyut Vitran Nigam Limited (Company) was incorporated on 20 July 2000 after unbundling of erstwhile Rajasthan State Electricity Board (RSEB). The activity of the Company is spread over nine circles. The Company is distributing electricity to different categories of consumers and collecting revenue from them for the electricity supplied as per tariff orders issued by the Rajasthan Electricity Regulatory Commission (Commission). The Company outsourced (May 2005) the work of generation of electricity bills of all High Tension (HT) consumers and seven[**] circles in respect of Low Tension (LT) consumers to Business Information Processing Services (BIPS). The work of remaining two circles *i.e.* Sikar and Jhunjhunu was outsourced to Aditi Computers for LT consumers. Aditi Computers developed the software using Oracle 9i as RDBMS and UNIX & LINUX as operating system while BIPS developed and maintained the data of the HT consumers in Visual Basic and data of the LT consumers in FOXPRO.

As on 31 March 2008, the Company had 21,61,861 consumers comprising of domestic, non-domestic, agricultural and industrial consumers. During 2007-08, the total revenue realised by the Company from all categories of the consumers was Rs. 2,569.37 crore as given in the **Annexure-9**.

Scope and methodology of audit

2.2.2 The entire billing system pertaining to HT and LT consumers of the Company was reviewed by the Audit during the period from February to August 2009. The data as maintained by the billing agencies *i.e.* by BIPS and Aditi Computers for the period 2007-08 in respect of all HT consumers and data relating to LT consumers of two circles[#] was analysed using Interactive Data Extraction and Analysis (IDEA), a Computer Assisted Audit Technique (CAAT) . However, the payment details of LT consumers of Jhunjhunu circle could not be reviewed as the same were not made available to audit.

Audit methodologies comprising issue of questionnaire and Management's response/clarification there upon, scrutiny and verification of manual records, collection of data and analysis thereof with the help of CAAT, issue of preliminary audit observations to the management for response with a view to firming up the audit conclusion, discussion and interaction with the officers of the Company and billing agencies were adopted. The Government replied (August 2009) to the audit observation relating to HT billing system and the response in respect of LT billing was yet to be received (September 2009).

Ajmer, Bhilwara, Nagaur, Udaipur, Rajsamand, Chittorgarh, Banswara, Jhunjhunu and Sikar.

** Ajmer, Bhilwara, Nagaur, Udaipur, Rajsamand, Chittorgarh and Banswara

Ajmer Circle (billing agency - BIPS) and Jhunjhunu Circle (billing agency- Aditi Computers)

Audit objectives

2.2.3 Information Technology (IT) audit of computerisation of revenue billing of the Company was carried out to evaluate the adequacy and effectiveness of IT policy of the Company, mapping of business rules, completeness and correctness of the data and achievement of overall objectives of the Company.

Audit criteria

2.2.4 IT audit of computerisation of revenue billing of the Company was assessed against the following parameters:

- Tariff for supply of electricity-2004, Terms and Conditions of Supply (TCOS)-2004, Rules, notifications and directions issued by the Commission;
- Orders and circulars issued by Commercial wing of the Company; and
- Best practices pertaining to IT Systems.

Audit findings

Audit findings based on review of the IT System are as under:

Organizational set up

2.2.5 The Chief Engineer (Commercial) of the Company had the overall responsibility for monitoring the Billing system, while Superintending Engineers (SEs) of the Circle offices were responsible for their respective circles. It was, however, noticed that the Company did not have separate mechanism for co-ordinating and monitoring IT Applications as well as for liaisoning with the billing agencies which led to various deficiencies as detailed below.

General Controls

IT policy

2.2.6 A formulated and documented IT policy is essential to assess the time frame, key performance indicators and cost benefit analysis for developing and integration of various systems. The Company, however, is yet to formulate a formal IT policy. Further, the Company did not constitute a planning/steering committee with clear roles and responsibilities to monitor each functional area in a systematic manner.

The Government stated (August 2009) that the newly posted SE (IT) has been asked to formulate IT policy and to monitor each functional area in a systematic manner.

Business continuity and disaster recovery plan

2.2.7 The billing system is a critical system as it has a direct impact on the revenue realisation of the Company. If there is any untoward incident or disaster and the consumer's bills are not generated in time or done incorrectly, earnings of the Company may be substantially affected and also can cause lot of inconvenience to the consumers. It is, therefore, essential for the entity to have a documented disaster recovery and business continuity plan to be implemented such that information processing capability can be resumed at the earliest in case of any disaster. It was observed that

- There was no designated mechanism in the Company for the business continuity and disaster recovery and there was no documented business continuity plan either.
- There was no offsite storage of backups.
- Retrieval of data from backup had not been tested.
- The backup file of HT consumer database for the year 2006-07 could not be made available to Audit by the Company.

The Government stated (August 2009) that the newly posted SE (IT) will formulate the business continuity and disaster recovery plan also. It further stated that the back up of data of previous years would be obtained.

System Design Deficiencies

Capture of Permanent Account Numbers (PAN)

2.2.8 The Company was required to deduct the tax at source (TDS) on interest paid exceeding certain amount on security deposit of a consumer and PAN of HT consumers were required to be mentioned while filing TDS return with the Income Tax Department. It was noticed that the system did not have provision for entering PAN of consumer and TDS certificates were issued manually.

The Government assured (August 2009) to take corrective action from the billing month of September 2009 onwards.

Power factor incentive/surcharge

2.2.9 As per provisions of tariff-2004, an incentive/surcharge is to be given/charged for improvement/fall in power factor as the case may be. Instead of ascertaining the power factor separately in case of a consumer having an HT connection and using the power for domestic, non-domestic or for mixed load category, the power factor at the main HT Meter was considered and incentive was allowed even when the power factor of these consumers in domestic, non-domestic or mixed load connection was found to be less than 0.95 (95 *per cent*). Further, in case the individual power factor falls below 0.90, a surcharge at one *per cent* fall in power factor below 0.90 was also not charged. The excess incentive allowed or short levy of surcharge has been tabulated below:

(Rs. in lakh)

Category	No. of cases	Excess Incentive	No. of cases	Short levy of Surcharge
Domestic	12-18	15.71	2-6	3.65
Non-domestic	4-5	2.57	1	0.87
Mix load	5-7	2.26	1	2.76
Total		**20.54**		**7.28**

Thus, the Company allowed irregular incentive amounting to Rs. 20.54 lakh and also did not levy surcharge of Rs. 7.28 lakh.

The Government stated (August 2009) that cases pointed out would be reviewed.

Adjustment of excess/short billing

2.2.10 As per the agreements with billing agency, the adjustment of excess/short billing of earlier month through debits/credits was to be accounted for both in terms of units of energy as well as in amounts. Scrutiny of LT database of Jhunjhunu circle, however, revealed that the Aditi Computers had the provision to indicate the adjustment of debits/credits in respect of amounts alone. Due to absence of provision in terms of units of energy, the figures of energy sold shown in the MIS and financial statements of the Company were incorrect to that extent.

Mapping of business rules

Compliance of Commissions' directions

2.2.11 The Commission issued (May 2004) instructions to calculate the power factor separately for the broken periods where the contract demand/connected load of a HT consumer was changed during the month.

Scrutiny of data for the month of April and May 2007, revealed that due to non-mapping the Commission's instruction, separate power factor was not calculated in case of 12 consumers* though their contract demand changed

* ID number 170, 216, 243, 271,358, 404, 444, 1426, 1437, 1453, 1501 and 1535.

during the month. Consequently, the power factor incentive/surcharge was allowed/levied for the complete month. In absence of the dates on which the contracts demand/connected load was changed, impact of power factor incentive/surcharge could not be ascertained.

The Government stated (August 2009) that the power factor was calculated on the basis of provisions of TCOS. However, it is reiterated that Commission's instruction in this regard need to be followed by the Company.

Voltage Rebate

2.2.12 As per the tariff, a voltage rebate at the rate of 0.75 or 1 *per cent* (as amended from 1 October 2007) was to be allowed to HT consumers on the billed amount for the month if the supply is at 33 KV. The Company withdrew (August 2007) this rebate where the supply was given to such consumers whose contract demand was less than 1500 KVA. Audit noticed that these changes were not mapped in the system. As a result, the system allowed voltage rebate of Rs. 18.77 lakh during the period from August 2007 to March 2008 to such consumers also whose contract demand was less than 1500 KVA.

The Government stated (August 2009) that such rebate was withdrawn for new consumers only. However, the fact remained that this rebate was withdrawn for existing consumers also.

Computation of fixed charges

2.2.13 Tariff -2004 provides for collection of 'Fixed Charges' in respect of domestic services (LT) on the basis of average monthly consumption of previous financial year at the rate of Rs. 80 per month upto 50 units and Rs. 105 per month above 50 units. However, scrutiny of data revealed that due to non mapping of such rules in the system, the average consumption and fixed charges were manually fed and the fixed charges in respect of 2,708 and 1,808 consumers of Ajmer and Jhunjhunu circle respectively were charged more than the prescribed tariff.

Rebate for LT consumers

2.2.14 (a) Clause 30(2) of TCOS-2004 stipulates that in case a stopped/defective meter is not replaced within a period of two months of its detection, a rebate of five *per cent* on the total bill of the LT consumer shall be allowed from third monthly bill in case of monthly/fortnightly billing and second bill in case of bi-monthly billing after such detection till the meter is replaced.

Scrutiny of billing data of Jhunjhunu circle revealed that 603 LT consumers were billed on average basis during 2007-08 indicating that the meters were defective during the period. The admissible rebate of Rs. 3.88 lakh at the rate of five *per cent* was, however, not allowed to these consumers.

2.2.14 (b) Tariff -2004 provides for a rebate of 5 paisa per unit in the "Energy Charges" for usage of "Solar Water Heating System". Scrutiny of data, however, revealed that this rule was not mapped in the system and as a result, the rebate was not given to 399 consumers using "Solar Water Heating System".

Short recovery of fixed voltage charges

2.2.15 As per Tariff -2004, fixed charges for HT consumers at the rate of Rs. 90 per KVA per month of billing demand *i.e.* the maximum demand actually recorded in KVA during the month or 75 *per cent* of contract demand, whichever was higher, were to be recovered.

Audit, however, noticed that in the absence of mapping of such rules in the system, wherever the reading of energy consumption was recorded twice in a month due to change in meter/Current Transformer Potential Transformer (CTPT) or change in contract demand, the fixed charges were levied on average demand. Thus, the fixed charges worked out by the system were short recovered by Rs. 9.82 lakh in 9 to 24 cases during 2007-08.

Application controls

Input controls and Validation checks

2.2.16 To ensure correctness, completeness and reliability of the database, it is necessary to ensure appropriate input control and data validation during the data entry. This would help in reduction in duplication of efforts and redundancy. The following deficiencies were noticed in audit in this regard.

Input Controls

Completeness of database

2.2.17 The system did not have adequate input controls to ensure complete data capture. Analysis of HT/LT database revealed that the database was incomplete as vital details, were left blank as detailed below:

HT billing system

- date of connection (168 cases)/disconnection (96 cases), date of agreement (736 cases), sanctioned load (1,361 cases), connected load (1,380 cases), reference to security deposit (134 cases), date on which the security amount deposited (355 cases), industrial code (267 cases) and area code (246 cases) were found blank.

LT billing system

- meter number (551 cases), sanctioned load (170 cases)/connected load (172 cases), bill number (15,113 cases), username involved in generation of bill (15,113 cases), periodicity of outstanding dues (7,769 cases) were not indicated.

Status of defective meters

2.2.18 As per clause 27 of TCOS in case of non-functioning of meter, the bills of energy consumption are to be prepared on average basis. Analysis of data of HT consumers revealed that in many cases though the consumption of a consumer in different months continuously remained same yet the system did not indicate any alert about non-functioning of the meters as the field indicating status of meter was found blank. It was further noticed that in such cases the assessment was made manually instead of through system.

The Government stated (August 2009) that instructions have now been issued to the billing agencies to indicate the status of the meters.

Observance of provisions of TCOS

2.2.19 Clause 27 of the TCOS provided that if the meter installed at the LT consumer's premises is stopped/lost/stolen/burnt, the consumption of electricity for this period shall be assessed on the basis of consumption of the corresponding period of the previous year or the average monthly consumption of the previous six months, whichever is higher. Audit, however, noticed that adequate input controls were not in-built in the system. As a result of it, the following discrepancies were noticed:

- in Jhunjhunu circle, the consumption details for the corresponding period of the previous year had been shown as 'nil' in respect of 11,351 consumers in April 2007;
- database depicted negative consumption of previous corresponding period in respect of 249 consumers;
- in Ajmer and Jhunjhunu circle, average monthly consumption of the previous six months in the database was also shown as 'nil' in 3,538 and 11,952 cases respectively.

As a result, the data could not be utilised for billing during the period of non-functioning of the meter and the same were assessed manually.

Duplicate meter numbers

2.2.20 Each energy meter installed at the premises of the consumers has a unique serial number. The system, however, accepted the same meter numbers for different consumers. Data analysis revealed 58 and 251 duplicate serial numbers of energy meters in case of HT and LT consumers respectively.

The Government assured (August 2009) to take corrective action.

Rebate for domestic connections in rural areas

2.2.21 Tariff -2004 provides for a rebate of 10 *per cent* of energy charges for domestic connections (LT) in rural areas only. This rebate was, however, not to be allowed in such villages where round the clock supply of electricity was being provided. Such villages were identified in the system with the tariff code '1500'. As per the management information system (MIS) of the Company, out of total 1,025 villages under Ajmer circle, 949 villages have been electrified upto March 2008 and round the clock supply of electricity was provided in these villages.

Scrutiny of database, however, revealed that

- status of 444 such villages have not been updated in the system and therefore the rebate was allowed to domestic connections which were not eligible for this rebate,

- in the absence of provision in the system, the rebate of 10 *per cent* was directly reduced from the tariff/energy charges instead of showing it separately,

- in the absence of necessary validation checks, the system indicated tariff code '1500' in case of urban connections also.

Security Deposit from HT consumers

2.2.22 As per TCOS provisions, the Company assessed the requirement of security deposit from a consumer at the beginning of each financial year on the basis of actual average consumption for the preceding twelve months to cover the risk towards the Company's dues. In case the security deposit given by a consumer is found insufficient or in excess, the difference so worked out shall be adjusted accordingly. Audit noticed that security deposit amount shown in the system was not reconciled with the records compiled by the Commercial Section and there was a difference of Rs. 3.20 crore as on March 2008. The differences were due to non-communicating the data relating to recovery or refund of security deposit to service provider on regular and timely basis for data entry. The differences in amounts of security deposit of individual consumers noticed during test check are given in **Annexure-10**.

The Government assured (August 2009) to take corrective action to update the security deposit records.

Validation checks

Disparity between agreement date and connection date

2.2.23 An agreement is required to be executed by the consumer before release of HT connection. Audit noticed that the system did not have a check to validate the date of agreement with reference to date of release of connection. As a result, in 33 cases the database displayed agreement date subsequent to the date of release of connection.

The Government stated (August 2009) that necessary instructions will be issued to the service providers.

Multiplication factor

2.2.24 For computation of consumption, the units recorded in the KWH meters are being multiplied by the Multiplication Factor (MF) having numerator and denominator as indicated on the Current Transformer Potential Transformer (CTPT) installed at the consumers' premises. Audit, however, noticed that in case of HT consumers, the system did not validate the denominator while calculating the consumption as in some cases though the MF denominator indicated zero value yet it calculated the consumption and generated the bills indicating manual intervention. Thus, the system was deficient to this extent. Besides above, the system also did not have the provision to indicate the CTPT numbers installed at the consumers' premises, in absence of which the system was not able to validate the change in MF in case the CTPT installed at consumers' premises was replaced.

The Government assured (August 2009) to take corrective action.

Discrepancies in serial numbers and date of generation of bills

2.2.25 The system was deficient and also lacked validation checks. Audit while analysing HT consumers' data, noticed that:

- the serial numbers of electricity bills were not being given by default and therefore the bills generated on subsequent dates have the serial numbers prior to bills which had already been generated on an earlier date;

- bill issue date and the bill generation date were not validated in the system. Instances were noticed wherein the bill generation date *i.e.* the date of printing of the bill was subsequent to the date of bill issue. Such discrepancies in the system may lead to consumer grievances and legal disputes.

The Government assured (August 2009) to issue necessary directions to the service providers.

Manual intervention in generation and issue of bills

2.2.26 As per the work order, BIPS was required to generate bills on the very same date on which the inputs were provided to them. In case of HT consumer, the reading of the electricity consumed was being recorded on first date of the month and the bills were to be realised within 12 days of issue. Audit, however, noticed the following discrepancies:

- even after allowing six days grace period for generation and distribution of bills, most of bills were realised from twentieth to last day of the month resulting in delay of 2 to 12 days;

- delay in generation and issue of bills for 2 to 12 days consequently delayed the realization of revenue to the tune of Rs. 351.66 crore* during 2007-08 affecting already strained financial position of the Company;

- manual intervention in checking of all the bills defeated the very purpose of using IT facilities.

Despite improvements in IT facilities and infrastructure and also availability of trivector meters capable of taking readings directly from meters through hand held devices and transferring input data directly to the service provider, the Company did not initiate action to reduce the revenue realisation cycle. The delay in generation and distribution of bills could not be assessed by Audit in absence of records of time taken in the each activity of processing of bills.

Compliance of provisions of contract

Terms and conditions of the work order

2.2.27 The service providers were required to submit deliverables such as:

- flow chart of programme and source code before commencement of work;

- getting the HT billing data insured for safety of data;

- enabling the billing software web/net enabled for viewing of consumer wise billing status/outstanding/securities and other consumer related information;

- providing requisite operational and other training to the personnel nominated by the Company.

It was noticed that both the service providers failed to comply with the requisite provisions of the contractual agreement as mentioned above.

The Government replied (August 2009) that the matter is being taken up with the service providers.

* Revenue after 18th day of the respective months.

Utilisation of system

2.2.28 The system was also designed to provide details of outstanding against various consumers, adjustment of security deposits in case of Permanent Disconnected Consumers (PDCs) and to take effective measure on MIS being generated through it.

Scrutiny of database of 1,385 HT consumers revealed that Rs. 15.90 crore was outstanding against 197 PDCs as on March 2008, comprising of Board Dues (BD) of Rs. 13.56 crore, Electricity Duty (ED) of Rs. 0.41 crore and Late Payment Surcharge (LPS) of Rs. 1.93 crore. Among these, Rs.14.55 crore (154 consumers) were outstanding for more than three years.

Audit further noticed that the outstanding dues of Rs. 48.48 lakh consisting of BD (Rs. 44.20 lakh), ED (Rs. 3.22 lakh) and LPS (Rs. 1.06 lakh) were not shown adjusted from the available security deposit (Rs. 80.08 lakh) of 27 PDCs disconnected during the period between July 2004 and March 2007. No periodical reconciliation of regular dues between the figures shown in the database of system and accounting records was done to ascertain the effectiveness of system and reliability of information.

The Government stated (August 2009) that action has been initiated to adjust the dues of the consumers in order of priority and steps are being taken to recover the dues from PDCs under relevant Act.

Internal Control

2.2.29 The activity of billing system comprising of processing and generation of bills for HT/LT consumers was very important as the timely assessment, billing and realization of revenue is critical for survival for the Company and can be considered as backbone system of the Company. This mission critical activity has been outsourced. The Company was expected to exercise prudent controls over the outsourcing activity as well as on outsourced agency to which this activity was assigned. It was noticed that:

- the Company has never checked the activities of the billing system, infrastructure of service provider, adequacy and security of infrastructure;
- the competency of staff deployed for data entry by billing agencies was never verified by the Company. This may lead to a risk of copying/manipulation/deleting the critical data of the Company;
- monitoring of access controls employed by the billing agencies has never been done to protect the database and to avoid any miscreant activity;

- the Company did not have any system to review the correctness of mapping of tariff/business rules in the system and to ensure the reliability of outsourced billing system.

Thus, the internal control in respect of IT application was non-existent. The Company also could not address the associated risks of outsourced billing system.

Conclusion

The Company does not have an IT policy or a business continuity plan. The design deficiencies and inadequate input controls resulted in allowance of inadmissible incentives. The outputs generated by the system were not reconciled with financial statements of the Company. The Company could not improve the reliability of system by including outsourced billing system under the scope of internal control/audit to ensure its reliability and effectiveness. Despite strained fund position, the Company could not reduce duplication of efforts and reduce the cycle of revenue collection period. Thus, the Company could not leverage the use of technology to its maximum potential. The Company assured to take effective steps in this direction to improve the system.

Recommendations

The Company should:

- **formulate and implement a clear and comprehensive IT policy and periodically review it in view of changing scenario;**
- **conduct periodical reconciliation of system data and financial statements;**
- **build in input controls and validation checks into the system to prevent duplicate entries and to ensure complete and correct data entries; and**
- **cover the outsourced IT application under the scope of internal control/audit to enhance the reliability and effectiveness of billing system.**

Annexure-9
(Referred to in paragraph 2.2.1)
Statement showing categories of consumers and revenue realized from them during 2007-08

Sl. No.	Categories of consumers	Number of consumers	Revenue assessed (Rs. in lakh)	Revenue realised (Rs. in lakh)	Percentage
1.	**Domestic services**	1613413	54221.90	53056.05	20.65
2.	**Non-domestic services**	200061	23357.94	23109.55	8.99
3.	**Agricultural services**	291567	41747.81	39790.71	15.49
4.	**Industrial services**	56820	141759.62	140981.07	54.87
	Grand Total	**2161861**	**261147.27**	**256937.38**	**100.00**

Annexure-10
(Referred to in paragraph 2.2.22)
Statement showing the difference in amount of security deposit of consumers as per system and records of Commercial wing

(Amount in Rupees)

Sl. No.	Name of the consumer	Amount of SD as per data maintained by Service Provider	Amount of SD as per register maintained at Commercial section	Difference
1.	M/s Dheeraj Marbles	482993.00	328993.00	(-) 154000.00
2.	M/s Nayan Marbles	354839.00	434339.00	79500.00
3.	M/s Quality Marble	481119.00	481569.00	450.00
4.	M/s Kiran Marbles	248419.00	332742.00	84323.00
5.	M/s Sajjan	297137.00	361041.00	63904.00
6.	M/s Rasika Marble	208671.00	236340.00	27669.00
7.	M/s Shiv Shakti	212438.00	236392.00	23954.00
8.	M/s Shree Dowda Mata ji	124740.00	199740.00	75000.00
9.	M/s Thakur Marbles Pvt Ltd.	289154.00	321764.00	32610.00
10.	M/s Swastik Marmo Stones	288600.00	325102.00	36502.00