

## **2.4 Information technology audit of Revenue Billing Software for low tension consumers in respect of Power Distribution Companies**

### **Highlights**

**Due to inadequate input controls and lack of proper validation checks resulted in non-detection of certain concessions like employee rebate, zero security deposit and non-enhancement of security deposit made available to ineligible consumers.**

*(Paragraphs 2.4.11 and 2.4.13)*

**There were no validation checks in software detecting cases of non-billing or short/excess billing of meter rent.**

*(Paragraph 2.4.14)*

**Deficiencies in design of the system led to business rules getting by-passed.**

*(Paragraphs 2.4.16 and 2.4.17)*

**Inadequate password controls rendered the data vulnerable to unauthorized access/ modifications.**

*(Paragraph 2.4.20)*

**Unfruitful expenditure of Rs. 4.25 crore on purchase of hardware and software by MPSEB.**

*(Paragraph 2.4.22)*

### **Introduction**

**2.4.1** The distribution of electrical power in the State is being managed by three Distribution Companies (DISCOMS) namely, 'Madhya Pradesh Madhya Kshetra Vidyut Vitaran Company Limited, Bhopal', 'Madhya Pradesh Poorva Kshetra Vidyut Vitaran Company Limited, Jabalpur' and 'Madhya Pradesh Pashchim Kshetra Vidyut Vitaran Company Limited, Indore', which were created with effect from June 2005. The State is divided into seven regions, 40 circles and 143 divisions to manage a Low Tension (Supply Voltage of 230V or 400V) Consumer Base of nearly 65 lakh consumers.

**2.4.2** The information technology (IT) needs of DISCOMS are overseen by the 'Computer System & Automation (CSA)' Department of the Madhya Pradesh State Electricity Board (MPSEB), which is headed by Chief (CSA)

who reports to the Secretary, MPSEB who in turn reports to the Chairman, MPSEB. Chief (CSA) is assisted by System Managers, System Analysts, Programmers etc. Prior to the year 2000, LT billing was being done under the overall control of Chief (CSA) with the help of stand-alone, COBOL or SYBASE based systems installed in divisions.

**2.4.3** In October 2000, the MPSEB formed a separate group of 19 engineers called Capacity Building Group (CBG) under the administrative control of Executive Director, Corporate Planning Group (who reports to the Secretary, MPSEB) for in-house development of a new ORACLE based software for LT Billing called Revenue Management System (RMS).

### **Revenue Management System (RMS)**

**2.4.4** The RMS was to be implemented by the end of year 2003 at an estimated cost of Rs.55.88 crore in all divisions, circle & regional headquarters and at the corporate office. The main components of RMS were:

- Development of Application Software
- Networking solution for all divisions and headquarters
- Acquisition and Installation of Hardware for the above

**2.4.5** The main objectives of the project were as follows:

- Computerisation of all functions of revenue management leading to timely generation of Management Information System (MIS) for decision support
- Provision for Energy Accounting and Auditing to reduce commercial losses
- Better Revenue Monitoring and Management in an Online environment
- Proper implementation/adherence to business rules
- Online maintenance of three year history of consumers to improve consumer complaint redressal mechanism.

**2.4.6** As on July 2007, RMS could be implemented in only 64 divisions with a consumer base of around 30 lakh consumers

### **Audit objectives**

**2.4.7** The audit objectives were to assess whether

- IT controls in place were adequate and effective thereby ensuring data completeness, accuracy and reliability;
- Business rules, as stipulated by the Tariff Orders and Supply Code of Madhya Pradesh Electricity Regulatory Commission (MPERC) and other relevant rules and orders, have been correctly mapped on to the computerized system;

- Objectives of computerization were achieved and
- The prescribed purchase procedures were complied with and the IT infrastructure created was reasonably utilised.

### **Audit scope and methodology**

**2.4.8** Data generated by the RMS package was analysed (March 2007 to July 2007) in 13<sup>41</sup> divisions using various 'Computer Assisted Audit Techniques' like IDEA and SQL Queries. The IT Controls were evaluated to ascertain compliance to the provisions of Tariff Orders and Supply Code issued by the Madhya Pradesh Electricity Regulatory Commission (MPERC) and concerned provisions of the Electricity (Supply) Act, 2003.

**2.4.9** Methodologies and Procedures followed by the MPSEB and the three DISCOMS during implementation of the RMS Project were evaluated (March 2007 to July 2007) against best practices of 'IT Governance' and various rules framed by the MPSEB in this regard. The evaluation was carried out by scrutiny of records maintained at headquarters of the three DISCOMS at Bhopal, Indore and Jabalpur and MPSEB headquarter at Jabalpur.

### **Audit findings**

The significant audit findings are detailed in the succeeding paragraphs. Replies to the findings have been received from MPSEB and DISCOM, Jabalpur and duly incorporated. Replies from DISCOMS, Indore and Bhopal had not been received (October 2007).

### **Inadequacy of Input Controls and Validation Checks**

Input Controls ensure that the data received for processing is genuine, complete, valid, accurate and properly authorised and the data entry is done accurately and without duplication. Analysis of data of RMS package revealed various instances of failure of Input Controls and absence of validation checks.

#### ***2.4.10 Missing Dummy Consumer and Meter information in the database.***

Para 9.28 of M.P. Electricity Supply Code, 2004 provides that in the bills of metered consumers, contracted/connected/demand load, identification details of meter/consumer name etc are to be mentioned compulsorily. However during data analyses, following deficiencies were noticed:

- The RMS user manual states that the meter serial number, phase, make and rating is unique in itself. No other meter entry with the same parameters shall be accepted by the system. However, in 23,217 cases,

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<sup>41</sup> Jabalpur – South, West, East and O&M; Bhopal – North, South, East and West; Indore – North, South and West; Gwalior – North and South

one meter with unique number was found installed in the name of more than one consumer.

- In 23,588 cases, meter number was not recorded in the system.
- In 3,826 cases, connected load of the consumers was not recorded.
- In 1,009 cases, the name of the consumers was meaningless such as 'AA', 'XYZ', '-', '+' etc.

DISCOM, Jabalpur stated (September 2007) that due to acute shortage of man power at field level it was decided to start with dummy numbers for meter and due to punching errors consumer name and load was not entered in data base. The matter was being investigated and corrective action was being taken and compliance would be reported shortly.

However, compliance report had not been received (October 2007).

#### ***2.4.11 Zero' Security Deposit appearing in the bills of ineligible consumers***

M.P. Government Notification No. 2560/MPERC/2004 dated 01 October 2004 provides that the initial energy security deposit (SD) from every LT consumer (other than certain exempted categories) was to be collected on the basis of 45/90 days estimated consumption. Data of the month January 2007 was analysed with due consideration of the exempted categories and it was observed that in 17,170 bills, the security deposit was not found recorded in database which indicated lack of validation control that allowed 'null entry' even in cases of ineligible consumers.

Thus, the software failed to validate the input entries in the SD field with reference to the various categories of consumers. This led to the software allowing 'zero' SD in the bills generated for general consumers and other such consumers who were not eligible for such exemption.

DISCOM, Jabalpur stated (September 2007) that the list of such consumers where SD was missing has been investigated and it has been observed that a number of these belong to either of the following categories:

- Link consumers where security and billing is available with main meter.
- Board employee.
- Temporary Disconnected Consumers where SD has been adjusted on account of outstanding arrears.
- Cases of 'Single Light Point' customers where no SD was earlier charged.

The reply was not tenable as these cases were pointed out by audit after excluding and giving due consideration to exempted categories.

The Executive Engineer, City Division, North, Madhya Pradesh Madhya Kshetra Vidyut Vitran Company Limited, Gwalior replied (September 2007)

that fresh bills have been raised at the instance of audit in respect of consumers from whom no SD was charged previously.

#### ***2.4.12 Non-enhancement of Security Deposit of ineligible consumers by the software***

Para 1.16 of MPERC (Security Deposit) Regulations, 2004 dated 22 September 2004 provides that Security Deposit of LT consumers (other than Board employees/ retired Board employees and Government offices) should be reviewed annually on the basis of previous 12 months' consumption in the month of April every year. Data analysis of divisions revealed that the 'Security Deposit Enhance Flag' in the master table for 1,360 such consumers contained 'No' value instead of 'Yes' due to which their Security Deposit was either not reviewed or enhanced.

It was further observed that data regarding consumer category and security enhancement was fed in the same input form and the former was fed first. However, the software accepted 'No' i.e. invalid values in the 'SD Enhance Flag' even for consumers who were not exempted from yearly SD enhancement. Thus, the software allowed invalid entries in the 'SD Enhance Flag'.

#### ***2.4.13 'Employee Rebate' allowed to ineligible consumers by the software***

MPSEB order no 01-07/WAC/1381 dated 04 March 2005 stipulates that working Board employees and retired Board employees will be allowed rebate of 50 per cent and 25 per cent respectively on energy charges and fixed charges. The 'Revenue Category Code' for such consumers in the RMS package is 101-02 and 101-55 respectively and the 'Employees Rebate Flag' for such consumers in the master table is 'Y'. Analysis of data of the month January 2007 revealed that 'Employees Rebate Flag' was 'Y' for 412 general consumers (Revenue Category Code – 101-01).

It was further observed that data regarding consumer revenue category and employees rebate flag was fed in the same input form and the former was fed first. However, the software accepted 'Yes' values in "Employees Rebate Flag" even in case of general consumers.

DISCOM, Jabalpur accepted (September 2007) the audit observation and stated that all the cases pointed by the audit pertained to Board employees and that there was no loss of revenue. The consumers were now being transferred to the specified category in RMS. This further showed that the consumer master data was inaccurate as wrong revenue category code was fed into the database. This also rendered the reliability of various MIS reports generated by the RMS package doubtful.

**2.4.14 Non validation/detecting cases of non-billing or short/excess billing of meter rent.**

As per Para 5.4 of the Order on Miscellaneous and General Charges issued by the MPERC on 9 December 2004, 'Meter Rent' was to be recovered from each metered consumer at the rate of Rupees five per month for single-phase connection and Rs.12 per month for poly-phase connection with effect from 1 January 2005. Analysis of data pertaining to the period January 2005 to March 2007 (27 months) after due consideration of the cases where meter rent was not applicable revealed that meter rent in 35,30,784 bills was 'Zero' and in 61,293 bills of poly-phase consumers, meter rent was billed at the rate of Rupees five instead of Rs.12 per month. Likewise there were 645 cases where meter rent was charged at the rate of Rs. 12 per month whereas Rupees five should have been charged as per analysis of the data for the month of January 2007. This indicated that the billing software did not validate the entries regarding 'zero rent' or 'short/excess levy of rent' with reference to the meter information of the consumers.

DISCOM, Jabalpur accepted (September 2007) the audit observation and agreed to make necessary corrective measures in this regard.

**2.4.15 Non detection and validation of cases where single-phase connections were provided to consumers instead of three-phase connections**

As per Para 3.2 and 3.4 of the M.P. Electricity Supply Code 2004, maximum contract demand for single phase consumers is 3 kilowatt/4hp/3000 watt. However, data analysis revealed that in case of 4,859 consumers, the connected load was more than 3 kilowatt/4hp/3000 watt but the connection was single phase. It indicated the lack of validation check in the RMS package as the software allowed load greater than the stipulated maximum load for single phase connections to be fed into the system.

DISCOM, Jabalpur stated (September 2007) that in the present billing system all consumers over three KW of load are served three phase connection only and correction has now been made in the software. The cases pointed out by the audit are primarily the old consumers where wrong punching of data was done or consumers had enhanced their load after connection. Notices had also been served to the consumers to convert to three phase connection.

**System design deficiencies**

One of the objectives of computerization was to properly implement the business rules. However data analysis revealed instances of non-adherence to business rules by the RMS package as brought out in the succeeding paragraphs

**2.4.16 Non-entry of data related to 'Continuous Supply' allowed by the system**

As per MPERC tariff order for the financial year 2006-07, if average monthly supply is less than 23.50 hours per day (non-continuous supply), concessional fixed charges should be billed in case of 'Domestic Light and Fan (DLF)' consumers. Data analysis revealed that the provision for entering the monthly average supply was available in RMS software although the same was not a mandatory entry before generating the bills. As a result, in case of no data entry, the system evoked a default entry (24 hours) of continuous supply which may or may not represent the true and fair assessment. By not making entering information regarding continuous supply mandatory, the business rules were bypassed. Thus, the possibility of excess recovery of fixed charges from the consumers could not be ruled out.

No reply in this regard was received from the DISCOMs (October 2007).

**2.4.17 Billing based on 'Assessed Consumption' allowed by software although the meters were not declared 'Stop' or 'Defective'**

As per the orders issued by MPERC, consumers may not be billed on the basis of 'Assessed Consumption' until and unless the meter installed at consumers' premises was declared 'Stop' or 'Defective'. During the data analysis it was observed that there was inadequate system level check in the software, due to which assessed consumption was accepted by the system whereas meters of the consumers were not declared 'Stop' or 'Defective'. Further it was also observed that a separate code for assessed consumption had been introduced and as per this code it was not mandatory that the meter should be declared 'Stop' or 'Defective' for billing of assessed consumption. This indicated bypassing of the business rule by the billing software.

Further, the program also did not have any provision for automatically calculating the assessed consumption. As per the supply code, assessed consumption is to be calculated as an average on the basis of previous three months' meter reading. Due to this deficiency in the software, manual intervention was resorted to in order to calculate assessed consumption.

As per data in the computerised software, an assessed consumption of 1,03,63,126 units during the month of January 2007 appearing in 71,422 bills where the meter was not shown as 'Stop' or 'Defective' was noticed by audit. Thus, the consumers were billed 'assessed consumption' without declaring their meters 'Stop' or 'Defective' in contravention to the business rules.

DISCOM, Jabalpur stated (September 2007) that the primary causes of assessed consumption were:

- Replacement of meter during the billing month and the new meter does not cover the consumption in respect of the whole month.

- Abnormal dips in consumption are observed and remarks of doubtful consumption are recorded by Meter Readers/Junior Engineers in the Meter Reading Books (MRB).

The reply was not tenable as MPERC orders categorically state that consumers may not be billed on the basis of ‘Assessed Consumption’ until and unless the meter installed at consumers’ premises was declared ‘Stop’ or ‘Defective’. Business rules did not provide for assessed consumption in cases pointed out by the DISCOM.

Thus, the system allowed bypassing of business rules and did not have the feature of calculation of assessed consumption which was therefore, being done manually.

### **Inadequacy of General Controls**

General Controls create the environment in which IT applications and related controls operate. Scrutiny of records of the Capacity Building Group, DISCOMs, Circles, Regions and Divisions revealed instances of inadequacy of General Controls as detailed in succeeding paragraphs.

#### ***2.4.18 Organizational and Management Controls***

IT operations in MPSEB are being carried out parallelly by Executive Director (CPG) through CBG and by Chief (CSA). Lack of co-ordination between these two has led to various problems like delays in implementation of latest tariff orders, submission of MIS in different versions and diffused monitoring which has ultimately resulted in delay in implementation of RMS project. As on July 2007, RMS could be implemented in only 64 divisions out of a total of 143 divisions. Of these 64, only five divisions are online and the remaining 59 divisions are still working in stand-alone offline environment. Further, of the 14 modules that were to be developed in the RMS package only eight could be developed (July 2007). Thus, the intended benefits of the project are yet to be realized.

The MPSEB stated (November 2007) in reply that the RMS has been rolled out in 64 divisions as planned. At present there is no further roll out plan for RMS in remaining divisions. In case of any decision at DISCOM level for rollout in remaining divisions, plans shall be prepared accordingly.

The reply of the Board was not tenable because as per the original project report the RMS was to be rolled out in 143 divisions on online basis and even after lapse of more than five years, out of the 143 division only five divisions could be started on the online basis.

#### ***2.4.19 Lack of IT policy and documentation***

The MPSEB and DISCOMS failed to formulate and document an IT security policy regarding the security of IT assets, software and data security. In

absence of security policy, possibility of security breaches, data loss, fraud and errors cannot be ruled out. A written IT policy covering the organizational objectives, the technological direction and management of human resources etc. has also not been developed. A Disaster Recovery and Business Continuity Plan outlining the action to be taken immediately after a disaster and to effectively ensure that information processing capacity can be resumed at the earliest has also not been developed. Even day-to-day maintenance problems related to IT assets are being dealt on need basis, as annual maintenance contracts are not being entered into in most divisions.

#### ***2.4.20 Physical and Logical Access Controls***

The objective of physical and environmental controls is to prevent unauthorized access and interference to IT services. IT assets should be protected from environmental damage, caused by fire, water (either actual water or excess humidity), earthquakes, electrical power surges or power shortage. No separate cell is available for IT operations in divisional offices and physical access to non-IT staff was not found restricted. Proper arrangement for fire fighting was also not found in any division.

Although the password policy was formulated, normal password control procedures like restriction on unsuccessful login attempts by the users or automatic lapse of password after a predefined period and system enforced periodical change of passwords after certain period were not in existence. Further, it was noticed that there was no restriction on the number of unsuccessful login attempts. It was also noticed that divisional implementers, since the start of the system, did not change password of the Oracle User Schema and almost all divisions had identical method of passwords which were known to the entire staff.

DISCOM, Jabalpur stated (September 2007) in reply that access control document, containing physical and logical access was already in vogue. It might be possible at some places due to shortage of desired skilled operational manpower/administrators it was not properly implemented. Instructions had been issued to institutionalize the access control policy at all level. Maintaining the infrastructure/ real estate /logistics and safeguarding against natural hazards was being planned as it requires huge efforts in estimation and shall also be requiring the handsome amount of funds as well. In view of financial constraints, a total integrated IT solution was being planned for the DISCOM.

#### ***2.4.21 Program Change Controls***

Changes to software required due to change in tariff orders, court judgments, rule amendments etc are implemented through release of patches from time to time. However, no records which document these changes were found maintained at divisions to ensure that the amendments to the software were authorized, tested and accepted.

**Other points of interest**

**2.4.22 Unfruitful expenditure of Rs.4.25 crore on purchase of hardware and software by MPSEB**

MPSEB identified (2002) two divisions as ‘pilot’ sites and 21 divisions as ‘priority’ divisions situated at seven<sup>42</sup> regional headquarter cities for immediate implementation of RMS on online basis. Orders for procurement of hardware and software to be installed at these pilot and priority divisions were placed (August 2002 to February 2003) by MPSEB and the delivery was to be made at regional level.

Scrutiny (July 2007) of records of MPSEB revealed that RMS could be implemented in these divisions after an average delay of two years from the date of procurement of hardware and software. It was further noticed that only in five divisions out of these 23 divisions, RMS could be implemented on online basis. In the remaining 18 divisions, RMS continued to run on offline basis. However, the procurement of hardware and software was done as per requirement of an online system which was much greater than that of an offline system. Thus, hardware and software purchased in excess of offline requirement remained unutilized for more than four years in these 18 divisions rendering Rs.4.25 crore (as per details in *Annexure 20*) spent on purchase of these items unfruitful.

The MPSEB stated (November 2007) that the RMS implementation was planned with online access providing the terminals to concerned and functional users to access the software. The computer hardware was made available to the field officers through regions and is being utilised for RMS including servers, printers, software etc. There may be few cases of diverting the hardware for important works by the DISCOMS depending upon the requirement which can not be considered as unfruitful expenditure and PCs if utilised for other works played a vital role in efficiency improvement.

The reply was not tenable in view of the fact that hardware and software was procured for implementing RMS on online basis and could not be utilised for the purpose for which it was procured.

**2.4.23 Non procurement of networking equipment despite sanction and availability of funds**

In August 2003, MPSEB approved the procurement of hardware/ software including networking components for implementation of RMS in 21 divisions at seven regional headquarters. The tentative cost for setting up the networking infrastructure at 21 priority divisions and their sub-ordinate offices was worked out as Rs.4.10 crore and the same was approved by the Chairman on 5

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<sup>42</sup> Bhopal, Indore, Jabalpur, Gwalior, Ujjain, Sagar and Rewa

August 2003 and sent to the Chief Engineer (Stores & Purchase), MPSEB in August 2003 for procurement.

However, neither the CE (S&P) and subsequently nor the Chairmen cum Managing Directors (CMDs) of three DISCOMs could procure the networking equipment (July'2007). As a result only five divisions are online.

The Board stated (November 2007) that after the formation of DISCOMS the procurement was undertaken by the individual DISCOMS.

The reply was not tenable as procurement of networking equipments was neither done by MPSEB despite the sanction of the Board nor was subsequently done by the DISCOMS.

### ***Conclusion***

**More than five years have elapsed since inception of the RMS project. However, out of 143 divisions, only five divisions have RMS running on online basis. The RMS in its present form has only eight modules as against 14 that were to be developed. Networking between divisions, circles, regional headquarters and corporate office has not been done. Thus, none of the objectives of the project has been achieved. Data generated by the RMS software in its present form is neither accurate nor complete and is therefore not reliable. The general environment in which IT operations are being carried out are poor. IT Security Policy has not been formulated. There is no Disaster Recovery & Business Continuity Plan.**

### ***Recommendations***

- **MPSEB should consider disbanding the Capacity Building Group and hiring the services of IT professionals in order to develop an integrated solution which should be implemented uniformly in the State. IT needs of MPSEB should be managed by only one department as was being done by the Computer Systems and Automation Department prior to the year 2000.**
- **Immediate steps like data input validation, correct mapping of business rules as laid out in various statutes etc. should be initiated so that instances of possibility of loss of revenue and excess recovery from consumers can be addressed.**
- **Immediate formulation, documentation and implementation of a comprehensive IT Policy enumerating Security Controls, Physical & Logical Access Controls, Program Change Controls and Disaster Recovery & Business Continuity Plans etc is urgently required.**