

## **2.5 High Tension Billing in two Power Distribution Companies (CPDCL and NPDCL) of Andhra Pradesh**

### **Highlights**

The Discoms (CPDCL and NPDCL) did not have an IT strategy and have not drawn up a long term/short term IT policy to enhance the packages being used for HT billing.

**(Paragraph 2.5.6)**

The objectives of migrating to a new and comprehensive package developed by outsourcing in CPDCL were not fully achieved. NPDCL continued with an old legacy system which was deficient.

**(Paragraphs 2.5.9 and 2.5.10)**

Inadequacies in checks for data validation resulted in presence of inconsistent and meaningless data in the databases maintained by the systems of both the Discoms (CPDCL and NPDCL)

**(Paragraph 2.5.11)**

Supply to 552 HT consumers continued despite these continuing with a Power Factor of less than 0.75 for more than seven consecutive months which otherwise should have been disconnected as per provisions of the tariff orders of APERC.

**(Paragraph 2.5.13)**

A number of deficiencies were observed in the basis for computation of Load Factor incentives. Analysis of the databases revealed anomalous situations where irrational incentives have been given to the HT consumers in both CPDCL as well as NPDCL.

**(Paragraph 2.5.15)**

Temporary HT consumers were not billed through the HT billing system.

**(Paragraph 2.5.16)**

**Introduction**

**2.5.1** As a part of reforms in power sector, the erstwhile Andhra Pradesh State Electricity Board (APSEB) was unbundled into two companies viz., Andhra Pradesh Power Generation Corporation Limited (AP Genco) and Transmission Corporation of Andhra Pradesh Limited (AP Transco) with effect from 1 February 1999. AP Genco was responsible for power generation; AP Transco for power Distribution.

Four-distribution companies (Discoms) viz., Central Power Distribution Company of Andhra Pradesh Limited, Hyderabad (CPDCL- seven districts<sup>11</sup>), Northern Power Distribution Company of Andhra Pradesh Limited, Warangal (NPDCL-five districts<sup>12</sup>), Eastern Power Distribution Company of Andhra Pradesh Limited, Visakhapatnam (EPDCL-five districts) and Southern Power Distribution Company of Andhra Pradesh Limited, Tirupathi (SPDCL-six districts) were set up on 31 March 2000 as subsidiary companies of AP Transco to take over retail distribution of power in the geographical area of 23 districts in the State of Andhra Pradesh.

The business of retail distribution of power for 2000-01 was carried out by AP Transco on ‘no-profit/no-loss’ basis in the absence of separate licenses for Discoms for carrying out retail business for that year. The Andhra Pradesh Electricity Regulatory Commission (APERC) governs all the companies.

The electricity consumers are divided into two categories i.e. High Tension<sup>13</sup> (HT) and Low Tension<sup>14</sup> (LT). The HT consumers are categorised into six categories<sup>15</sup>. The HT consumers are billed as per the Tariff Orders issued by APERC from time to time.

The details of revenue from HT consumers in CPDCL and NPDCL, which were selected for audit, and the total revenue from sale of power during the last three years, in the two DISCOMS are as follows:

**(Rupees in crore)**

Discom	Total revenue			HT Revenue (figure in brackets - percentage to total revenue)		
	2004-05	2005-06	2006-07	2004-05	2005-06	2006-07
CPDCL	4139.94	4559.42	5047.60	1988.98 (48.04)	2310.82 (50.68)	2593.25 (51.38)
NPDCL	1221.30	1219.24	1279.24	531.20 (43.49)	635.11 (52.09)	607.32 (47.48)

<sup>11</sup> Rangareddy, Mahaboobnagar, Kurnool, Anantapur, Nalgonda, Medak and Hyderabad

<sup>12</sup> Warangal, Karimnagar, Khammam, Nizamabad and Adilabad.

<sup>13</sup> High Tension consumer means a consumer who is supplied electricity at a voltage higher than 440 volts but not exceeding 33000 volts.

<sup>14</sup> Low Tension consumer means a consumer who is supplied electricity at a voltage up to 440 volts;

<sup>15</sup> Category I (Industry-general), IB (Ferro alloys), II (non-industrial), IV a (Government lift irrigation schemes), IV b (agricultural), V (railway traction) and VI (Townships and residential colonies).

The process of HT billing was initially automated in-house by the erstwhile APSEB in June 1988. The package was developed in Solaris 5.8 with Oracle 7.3 at the backend, SQL\*Forms3 at the front end and Pro\*C as programming language. APSEB and later AP Transco prepared the HT Bills up to February 2002, after which the same package was handed over to the four Discoms for generation of bills of HT consumers.

NPDCL was using (as of July 2007) the same legacy system as developed by the AP Transco in 1988. However, in CPDCL, HT billing operations were being carried out using a new package developed by Andhra Pradesh Sahakara Vignana Samithi Limited, Hyderabad (APSVS) since June 2002. The package developed by APSVS and now in operation was developed in Linux9, with Oracle 9.2 at the backend and Visual Basic 6 at the front-end.

### **IT Organisational set up**

**2.5.2** For administrative purposes each of the Discoms are governed by Board of Directors including Chairman and Managing Director (C&MD) who is assisted by Directors for Finance, Projects & Materials Management, Operations, Human Resource Development & Commercial respectively. The area of operations is divided into circle offices each headed by a Superintending Engineer (SE). At the Corporate level, General Manager (IT) who directly reports to the CMD heads IT Organisation in the Discoms. The process of HT Billing is carried out at the Corporate Office. The Senior Accounts Officer (assisted by Junior Accounts Officer/UDCs) at each circle office is responsible for billing the HT consumers

### **Process of HT billing**

**2.5.3** The entire HT billing process is centralised at the respective Corporate Offices of Discoms. In CPDCL, after completion of billing cycle, the system administrator places the closing meter readings of previous month on the internal mail server. The data is accessed by the circle offices and the details like current month meter readings taken by field engineers, meter status etc., are entered in an excel sheet. The same is uploaded into the billing application, the bill process is run and bills generated. After examination of the bills generated with manual meter cards, the staff from Circle office collects the bills for distribution to the consumers.

In NPDCL, the current month meter readings taken by field engineers are keyed in the database at the respective circle offices through wide area network. The data is accessed at the Corporate Office, the bill process is run and bills generated. After examination of the bills generated with manual meter cards, the staff from Circle office collects the bills for distribution to the consumers.

## **Audit objectives**

**2.5.4** Audit had the following objectives:

- examine IT billing applications, to see whether the intended objectives were achieved in the two Discoms i.e., CPDCL and NPDCL;
- obtain assurance regarding IT controls in the HT billing applications and evaluate accuracy, efficiency, economy and effectiveness of the process of HT Billing in the two Discoms;
- ensure that the billing application supports various systems of procedure/terms and conditions/tariff orders/regulations issued by APERC relating to HT billing; and
- ensure that the data on collections and arrears is promptly incorporated in the database.

## **Scope of Audit, methodology and coverage**

**2.5.5** For the purpose of IT audit, two Discoms viz., CPDCL (having 3026 HT Consumers as of January 2007), and NPDCL (having 606 HT consumers as of January 2007), along with two circle offices under each viz., Anantapur, Nalgonda circle offices under CPDCL and Warangal, Karimnagar circle offices under NPDCL were selected.

The data residing at the databases relating to the period from June 2002 to February 2007 was analysed using CAATs<sup>16</sup>. The results of queries on the databases were cross verified with physical records at Circle offices, to evaluate the adequacy and working of IT controls, to identify loss/leakage of revenue and to ensure comprehensiveness of the package/data. The audit findings are discussed in the succeeding paragraphs.

## **Audit findings**

### ***Lack of formulated and documented IT policy***

**2.5.6** Though both the Discoms are operating the automated billing applications since their inception; these are yet to formulate and document a formal IT policy and long-term/medium-term IT strategy incorporating the time frame, key performance indicators and cost benefit analysis for developing and integrating various systems. As a result, CPDCL even after experimenting with various billing applications have not standardised a comprehensive billing application. NPDCL continue to operate the legacy package without any changes thereto for removing the deficiencies of the old system.

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<sup>16</sup> Computer Assisted Audit Techniques.

***Lack of Physical security controls***

**2.5.7** In both selected Discoms no fire/water-fighting equipment was installed to protect the critical IT assets/systems. No documentation exists detailing the tested emergency plans in case of disruptions.

***HT bills not test-checked for assessing accuracy and compliance with applicable tariff rules***

**2.5.8** The Senior Accounts Officer functioning at the circle office is responsible for generation and accuracy of the bills served to the consumers. It was noticed in both the Discoms that no records exist to indicate that the HT bills generated were test checked by higher authorities on a regular basis and whenever there is a revision in tariff. Also, HT billing process has not so far been audited internally by the two Discoms.

***Objectives of migration to a comprehensive HT billing application were not fully achieved in CPDCL***

**2.5.9** A scrutiny of the agreements entered into with the two software firms viz., Andhra Pradesh Sahakara Vignana Samithi Limited, Hyderabad (APSVS) and Phoenix IT Solutions, Visakhapatnam (Phoenix) revealed that (i) the agreements were entered into post facto, (ii) the terms of the agreements were not adhered to and (iii) the objectives of entering into the agreements were not achieved. The various observations are as follows.

In January 2002, APSVS was awarded (January 2002) the task of developing and implementing a new HT billing application. It was also noticed that though bills were being generated through system developed by APSVS since June 2002, formal agreement was entered into and purchase order was issued post facto only in July 2003.

The objectives of migration/features of new HT billing package were to develop a web based application including for LT category III (B)<sup>17</sup> consumers enabling multiple users to log on and work simultaneously from Circle offices, manage revenue collection by tracking of revenue and demand in an integrated manner, generate reports to study demand and revenue pattern, collection pattern in a month, defaulted payments etc., automate and standardise the processing of HT billing, generate statutory and analytical reports for the management, generate revenue collection information to ensure seamless integration of metering, billing and collection processes, make the staff of the Company familiar with the billing system by imparting training and to overcome the deficiencies in the legacy package.

Audit observed that the billing application as planned was not implemented and most of the features of the system are not built into the package being put to use by CPDCL. The current system is not a web based application necessitating interventions for data transfers from the field to the corporate offices making the whole process vulnerable to unauthorised changes. Various MIS reports as envisaged in the scope of the project are not generated by the

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<sup>17</sup> Industrial consumers (Small Scale Industrial Units) with connected loads above 75 HP and up to 150 HP. The demand in excess of Contracted Maximum Demand would be billed at demand charges prescribed under HT Category-I.

system which otherwise could have minimised the instances of incorrect billing. It was further observed that there were inherent weaknesses in the process for change management as many of the prevailing business rules are not incorporated in the logic of the system leading to losses as pointed out later in the report. Thus the objectives were not fully achieved.

Also the agreements entered into with APSVS specified that the billing application would include LT Category III (B) consumers, however there was no facility in the billing application to bill these consumers and they are billed separately at Electricity Revenue Offices.

***Deficiencies in the legacy system being used by NPDCL for billing***

**2.5.10** No changes were made to the HT billing application taken over from AP Transco. It was seen that the HT billing application had the following deficiencies

- Lack of provision for maintaining History data i.e., changes in Load, contracted demand, Multiplying factor, meter changes etc
- Lack of provision for calculation of surcharges and penal charges. These charges are manually prepared and fed into the billing package
- Exception reports such as consumers not availing supply at specified voltage, consumers with a Power Factor of less than 0.75, defective meter cases, etc. were being generated for use of the management,
- The application does not support billing of LT Category III (B) consumers

***Lack of data validation in the billing systems***

**2.5.11** Queries on the database of CPDCL pertaining to the period from June 2002 to February 2007 revealed that the database contained invalid entries or inconsistent data pointing towards lack of validation checks and input controls as evident from the following

- The database contained 32 records indicating present meter reading date beyond system date (between 19/6/2019 and 23/6/2024)
- In 291 cases of billing (relating to 178 live consumers), the meter status was shown as ‘working’, though the consumption was ‘nil’ for the periods ranging between 1 to 27 months.
- The “Date” fields in the table relating to monthly bill contained invalid entries. In 90,751 cases, the fields “bill issue date” and “bill due date” were blank.
- Date of installation of meters was blank in 3,452 cases (including disconnected cases)
- In 461 cases, the fields “Date of commencement of supply” and “agreement date” contained dates between “1950-1999” and “1963-2008”, respectively and the “Date of commencement of supply” was prior to “Agreement date” which is inconsistent.

- Though a separate field has been created for “voltage surcharge” on the consumers’ not availing power at specified voltage, the field contains no data. Instead, the surcharge is being included in ‘Demand charges’ and as such amount of voltage surcharge levied cannot be known separately.
- The tables relating to Consumer Master and Monthly Billing Data also contain data relating to HT consumers outside CPDCL.
- Each consumer is allotted a Consumer number, which is unique. Though this being so, it was noticed that in 14 out of 46 reconnected cases, consumer numbers were re-allotted to another consumer. Resultantly, the arrears in respect of 14 old consumers were not depicted correctly in the table containing the data on arrears. Since, consumer number is the primary and unique key in the database, allotting the same to a different consumer is not only against the cardinal principles of Relational Data Base Management System, but also renders the database weak and unreliable.
- In 12870 cases of billing of HT consumers, the Billed Maximum Demand (BMD) was recorded as Nil although it should be equal to the recorded maximum demand or 80 *per cent* of the contracted maximum demand.

Likewise, analysis of data in NPDCL for the period June 2002 to June 2007 showed that in 153 cases relating to 97 consumers the Power Factor (PF)<sup>18</sup> was recorded as more than 1.

#### ***Irregular time limit for payment of Bills by consumers***

**2.5.12** As per terms and conditions of supply of power, “Bills shall be paid by the High Tension consumers within 14 days from the date of the Bill (15 days from the year 2004-05), failing which the consumer shall be liable to pay additional charges at the rates as prescribed from time to time.

In the current system for HT Billing used in CPDCL, the ‘bill issue date’ and ‘bill due date’ were constant, irrespective of the month of the year i.e., 26<sup>th</sup> of the month and 10<sup>th</sup> of the following month and the number of days for payment varied depending on the number of days in that month. As a result there were variations in the number of days allowed for payment ranging from 12 to 16 days as against 15 days stipulated as per the tariff orders issued by the APERC.

Audit could not compute delayed payment surcharge possibly short levied in all cases because the HT billing application does not capture the actual date of payment. Test check of manual records at Anantapur and Nalgonda circles of CPDCL revealed that between billing months of April 2006 and February 2007, the realisation of an amount of Rs.130.24 crore was delayed by one day as the same was realised on the 16<sup>th</sup> day.

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<sup>18</sup> Power factor means the ratio of kilowatt-hours consumed in the month to kilovolt ampere-hours registered during the month, which shall be calculated to two decimal places and cannot exceed one.

***Non-disconnection of supply where the PF was below 0.75 for six consecutive months***

**2.5.13** According to Tariff orders, should the PF drop below 0.75 and remain so for a period of two consecutive months, it should be brought up to 0.90 within a period of six months, failing which the supply to the consumer may be discontinued.

It was noticed that in respect of 552 consumers (226 in CPDCL and 326 in NPDCL) that though the PF recorded was less than 0.75 for periods ranging from seven consecutive months to 58 consecutive months the information was neither made use of for generating MIS reports, nor the supply disconnected.

On being pointed out the Discoms replied (July 2007) that most of these cases of low PF relate to Government departments and as such no disconnections were affected. The reply of the company is not acceptable because, in the matter of low power factor the tariff orders do not differentiate between Government and non-Government consumers. Further, non-maintenance of a healthy PF would adversely affect the efficiency of distribution system of the Discoms.

***Variations in arrears indicated in the database vis-à-vis books of accounts.***

**2.5.14** As per the guidelines issued by the APERC, the arrears due from the consumer are to be exhibited on the face of the bill. Accordingly in NPDCL the amounts due from the consumer are printed on the bill.

In Karimnagar circle office of NPDCL the database exhibited Rs.11.53 crore (from 104 consumers) as due from consumers as on March 2006. However the Trial Balance and Schedules for that year indicated that the amount due from the consumers was Rs.38.49 crore. Thus the database exhibited Rs.26.96 crore less than the actual arrears.

It was also noticed that the arrears involved in court cases/due from disconnected cases was not maintained separately in the database to watch their recovery. Further, the data on the amounts collected was also not being incorporated/updated in the database, rendering the database incomplete and undependable in the matters of arrears. It is apparent that the arrears shown on the face of the bill are not correct.

***Deficiencies in the basis for computing Load Factor Incentives***

**2.5.15** The Discoms, with the approval of APERC introduced a scheme of allowing incentive (discount on tariff) for HT-I (A) consumers from the year 2001-02. These consumers would be eligible for incentives subject to fulfillment of two conditions viz., (i) monthly consumption of the consumer should be in excess of average monthly consumption for the year 2000-01; and (ii) the Load Factor of the consumer should be above the threshold level of 40 per cent. From the year 2002-03, however, the incentive scheme was revised. The relation with the base year was removed. According to this scheme, all HT I (A) category consumers including new consumers, whose Load Factor was above a certain limit, would be eligible for incentive. The rates of

incentive were revised every year and were notified in the respective tariff orders.

In view of the fact that from the year 2002-03 the incentive was no longer linked to the consumption of the base year and was based on the Load Factor, the method of computation of Load Factor assumes significance. An analysis of incentives allowed to consumers during the period from April 2002 to January 2007 revealed that HT I-A consumers are being allowed incentives based on Load Factor computed using a formula<sup>19</sup>.

In the matters of allowing Load Factor incentives, Audit noticed that there were variations in practices followed by the two Discoms, the revisions made in the formula were neither documented nor formally approved, and the HT billing application allowed incentives to consumers under categories other than HT I-A.

**(A) Calculation of Load Factor adopting PF even if below 0.90**

On the issue of allowing incentives to consumers who maintain a PF above 0.90 as it reduces losses, CPDCL had stated that for an ideal system, the PF should approach unity (i.e., one) and the LPF surcharge was imposed so as to ensure that the PF does not fall below a certain level and this does not mean that incentive should be paid if PF is above that level.

APERC was also of the view that ideally the PF should be unity and those with higher PF are achieving only what is normally expected of them; and therefore did not find any justification for providing incentives for this purpose.

It was noticed in audit that in CPDCL up to the year 2005-06, PF even if below 0.90 was being reckoned for computation of Load Factor. In the formula for computation of Load Factor, PF is one of the denominators, and any value less than unity would increase the Load Factor thereby increasing the incentive allowed. This also would result in passing on higher rewards to such consumers whose installation was inefficient than to those whose installation was efficient and healthy.

During the period from April 2002 to March 2006 a total number of 2,330 consumers, who had a PF between 0.01 and 0.89 were allowed incentives to the extent of Rs.4.02 crore resulting in extension of irrational benefit to consumers.

In NPDCL during the period from April 2002 to March 2007 a total number of 348 consumers, who had a PF between 0.01 and 0.89 were allowed incentives to the extent of Rs.34.60 lakh resulting in extension of irrational benefit to consumers.

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<sup>19</sup> Billed KWH  
LF= -----  
Billed KVA \* power factor recorded \* (number of days \* 24 hours)

***(B) Incentives allowed to ineligible consumers***

Further, a scrutiny of database, in NPDCL, revealed that contrary to the scheme, incentives amounting to Rs.31.77 lakh were allowed to 17 consumers other than HT Category I, who were otherwise not eligible for such incentives.

***(C) Low Power Factor surcharge levied was less than incentives allowed***

As indicated earlier, consumers who did not maintain a PF of 0.90 were liable to pay a surcharge at the rates prescribed. However, it was noticed that in CPDCL in 926 cases the LPF surcharge levied was less than the Load Factor incentives allowed. The excess of incentive allowed over the surcharge levied during the above period worked out to Rs.2.21 crore.

In NPDCL, it was observed in audit that in 118 cases the LPF surcharge levied was less than the Load Factor incentives allowed. The excess of incentive allowed over the surcharge levied during the above period worked out to Rs.14.56 lakh.

***(D) Incentives allowed to consumers who had no consumption and were billed at minimum charges***

As per the original scheme, the incentives were allowed depending on the consumption in excess of the base year consumption and to encourage consumption.

However, it was noticed that in 58 billing cases in CPDCL pertaining to the period from May 2002 to February 2006, consumers who recorded no consumption and thus were billed minimum charges were also allowed incentives to the extent of Rs.3.03 lakh.

In NPDCL it was noticed that in 28 billing cases pertaining to the period from April 2003 to December 2006, consumers who recorded no consumption and thus were billed minimum charges were also allowed incentives to the extent of Rs.3.15 lakh.

***(E) Incentives allowed to consumers who had Load Factor less than the threshold limit***

In NPDCL it was noticed that there were 315 cases between January 2002 and January 2005 where incentives amounting to Rs.66.28 lakh were allowed to consumers even though their Load Factor was lesser than the threshold limit of 30 percent (applicable during the period).

***(F) Incentives allowed to consumers who had arrears***

In terms of para 243 of tariff order 2001-02, incentives should be allowed to consumers only if the consumer does not have any outstanding dues to AP Transco/Discoms.

Contrary to the above, CPDCL allowed incentives to consumers who were in arrears. A test check of one month (January 2007) records revealed that in 548

cases incentives amounting to Rs.10.10 crore were allowed to consumers who had outstanding arrears amounting to Rs.18.25 crore (other than Court cases).

Likewise, in NPDCL incentives were allowed to consumers who were in arrears. A test check of one month (January 2007) revealed that in 82 billing cases incentives amounting to Rs.1.14 crore were allowed to consumers who had outstanding arrears amounting to Rs.18.68 crore (other than Court cases).

***Temporary HT Consumers were not billed through HT billing application***

**2.5.16** During the course of audit it was noticed that in both the Discoms 'temporary HT' consumers were being billed, manually, at respective Circle offices, though Masters were created in the billing application for tariff applicable to Temporary consumers.

As the total number of temporary connections, units sold and revenue realised has been increasing year after year, there is a necessity to bill them through the HT billing application to have uniformity and control.

The database lacks completeness to this extent and the MIS Reports generated from the database regarding sale of power, revenue realised etc., from the consumers, are also not accurate and deficient as these do not incorporate data about temporary HT connections.

The matter was referred to the Government/Management in August 2007; their reply is awaited.

**Conclusion**

**Though IT systems were introduced way back in 1988 and HT billing is being done using automated systems which continued in four Discoms after 2002, there were deficiencies found in both the systems being used by CPDCL and NPDCL. The applications lacked input controls resulting in inconsistent and meaningless data residing in the databases. It was observed that the systems are not used for MIS purposes. Both the Discoms were yet to formulate and document an IT strategy and to focus effectively for harnessing the potential of IT. Data analysis of the billing data of HT consumers revealed that not all business rules framed by APERC have been incorporated into the billing applications.**

## **Recommendations**

The Discoms should formulate IT policy and document business continuity and disaster recovery plan.

- There is need for an assessment of the working of the HT Billing applications operational in CPDCL and NPDCL with a view to enhance these to leverage the advancement in technology. Till such time system enhancements are done, there is need for assuring that all latest business rules especially the tariff orders are built into the logic of the system.
- There is need for having a strong change control mechanism to immediately incorporate all changes in the business rules into the systems after authorisations at appropriate levels.
- Validation controls should be built into the billing system to avoid inconsistent and meaningless data residing in the system.
- Reporting features in HT Billing applications should be strengthened to facilitate better control and monitoring of the billing process which may result in better realisation of revenues from the HT consumers.
- Temporary HT connections and LT Category III (B) consumers may be billed through the HT billing applications.