Chapter 5

Aggregate Technical & Commercial Losses

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5 Chapter

5.1 AT&C Losses

The Aggregate Technical & Commercial (AT&C) Losses comprise of two elements:-

- Technical Losses: Technical losses primarily take place due to (a) transformation losses (at various transformation levels) and (b) high losses on distribution lines due to inherent resistance and poor power factor in the electrical network.
- Commercial Losses: Any illegal consumption of electrical energy, which is not correctly metered, billed and revenue collected, causes commercial losses to the utilities. Commercial losses occur due to (i) discrepancy in meter (ii) theft by direct hooking and (iii) collection inefficiency.

The reduction of the AT&C losses was one of the important objectives of the APDRP scheme. However, the same could not be achieved as brought out in CAG's Report no. 16 of 2007. R-APDRP scheme also aimed at reducing the AT&C losses to below 15 *per cent* on a sustainable basis.

Out of 1,121 towns which had declared 'Go Live', 976 towns had submitted reports on AT & C losses. 749 of these towns (77 *per cent*) had reported a reduction in AT & C losses with reference to base line data. Audit, however, noticed that this information was provided by the Utilities without having been verified by any third party. Even PFC did not have any mechanism to verify the correctness of AT&C losses being reported by state utilities.

In the Audit sample of 596 towns, 'Go-live' had been declared in 444 towns. Audit noticed the following status of AT&C losses in these towns:

- Though baseline data was established in all the 444 towns, AT&C losses were not available/were not generated in 43 towns.

- In the balance 401 towns, the AT&C losses had decreased only in 298 towns. AT&C losses actually increased in 102 towns while it remained unchanged in one town.

In the other 152 towns where 'Go-live' had not been declared, AT&C losses were not available/were not generated in 143 towns (for 43 of which, baseline data was also not established). In the balance nine towns, AT&C losses decreased in three while it increased in the other six towns.

Thus, in the Audit sample, it can be seen that AT&C losses have increased in more than 100 towns (23 *per cent*) relative to the baseline. AT&C losses could not be generated at all in another 43 which rendered the process of declaration of 'Go Live' doubtful.

MOP stated (March 2016) that the high AT&C loss shown in these towns may be due to correct energy data not being captured due to faulty meter, modem and communication failure issues, error in billing and collection data and increase in commercial losses due to pilferage. PFC, however, on its part is monitoring town-wise AT&C losses based on system generated data uploaded by the Utilities on IPDS website and Utilities are informed for sanitization of data as well as taking administrative and other measures for reduction of losses. These reports are also discussed in monthly Review Planning and Monitoring (RPM) meeting of the MOP. Further, regarding non-reliability of Go-Live reports submitted by Utilities, it is stated that after declaration of Go-Live, Utilities are submitting system generated Go-Live reports without any manual interventions thereby giving enough assurance about their reliability.

The reply of MOP suggested that the towns were declared as 'Go Live' without ensuring stability of the systems and verifying that the systems are communicating accurate information. The objective of R-APDRP was to reduce AT&C Losses as well as to have reliable data of AT&C Losses which does not appear to have been achieved. Further, it was noted in many cases that the data is not being communicated automatically.

5.2 Verification of baseline data by the TPIEAs

It was seen from the records furnished by the Utilities that the AT&C losses were not completely verified by the TPIEAs in five States[14]. The verification of the base AT & C losses and the yearly losses was required, to ascertain status before the scheme and the progress under the scheme. The failure to do so would make it difficult to verify the progress of the scheme to ascertain whether any mid-course corrective measures were required.

MOP stated (March 2016) that at present baseline data has been established in all States except Goa (4 Towns), J&K (17 Towns), Puducherry (4 Towns), Bihar (24 Towns), Jharkhand (11 Towns), Arunachal Pradesh (2 Towns), Mizoram (1 Town), Odisha (12 Towns) which are also expected to be completed soon. It was stated that the process is being monitored regularly by PFC/MOP and added that the validation of yearly AT&C loss figures was to be done one year after completion of Part A (IT) as well as completion of Part B for the purpose of conversion of Part B loan into Grant as per R-APDRP guidelines which is not due yet.

In this regard, it is to be noted that the evaluation of the AT&C figures was to be done every year, which was to commence one year after the Part B projects were taken up and not after the completion of the Part B projects as stated by the MOP. Hence, the evaluation of AT&C losses is due but has not yet been done and the baseline data itself has not been collected before the project was taken up. Further, it is seen that the details of the verification of baseline data furnished by the Utilities and by the MOP are not tallying, raising questions about the validity of the data.

5.3 Unreliable data of AT & C losses

The PAC, in their 77th Report (14th Lok Sabha), had expressed displeasure over significant deficiencies in the maintenance of records relating to AT&C losses including absence of proper guidelines and supporting records resulting in the data reported by MOP not being regarded as authentic, accurate and acceptable. Further, the Standing Committee on Energy 2012-13 (15th Lok Sabha), while noting that PFC has been mandated to maintain AT&C losses data, stated that it was unable to comprehend as to whether the data can vary on year to year basis. The Committee directed the

[14] Goa, Jammu & Kashmir, Manipur, Meghalaya and Puducherry.

Ministry to monitor this vital aspect and also include a statement of State-wise AT&C losses in the Annual Report of the Ministry on annual basis as it was the basis for approval of projects under national programmes like R-APDRP, National Electricity Fund Scheme and a new scheme for financial assistance to DISCOMs.

It was, however, observed that despite the observations of the PAC and the Standing Committee on authenticity of AT&C loss data, there were differences in the figures of AT&C losses for the same years reflected in various documents, namely:

- (i) Report of 14th Standing Committee on Energy (2010-11) submitted to Parliament in March 2011[15]

  (ii) XII Five Year Plan document,

  (iii) Annex referred to in reply to parts (c) & (d) of unstarred question no. 5892 answered in the Lok Sabha on 02 May 2013 and

  (iv) Report of the 5th Standing Committee on Energy 2014-15 Sixteenth Lok Sabha submitted to Parliament in April 2015

  (v) Report on "The Performance of State Power Utilities for the years 2011-12 to 2013-14" (July 2015)

The data on AT&C losses for the years 2008 – 09, 2009 – 10 and 2010 – 11 is presented as ***Annexure - XIII*** while the data for the years 2011 – 12 and 2012 – 13 is presented as ***Annexure XIV***. Further, the Standing Committee's direction to include a statement of State-wise AT&C losses in the Annual Report of the Ministry on annual basis was not complied with.

It can be concluded from the above that PFC and MOP did not comply with the directions of the PAC and the Parliamentary Standing Committee on Energy and do not yet have authenticated figures of AT&C losses for various states.

MOP stated (March 2016) that though the methodology for calculation of AT&C losses is uniform, the AT&C losses for previous year may undergo changes when:

- The utility sends revised information with respect to parameters not available in the annual accounts.

[15] For 2008-09

- The audited accounts have been received subsequently and the information contained therein is not the same as in the provisional accounts.
- Resource Plans contain information for three years. If there is a change in information for previous two years, the entire data is updated and all parameters including AT&C losses are recalculated.

Since, the information was submitted to Standing Committee/ Ministry of Power/ CEA as per the latest updated information as on date, the AT&C losses vary in different documents.

The reply of MOP needs to be seen in light of the fact that there were differences in the data obtained from different sources pertaining to older periods which was not expected. For instance, the data for the year 2008 – 09 presented in April 2015 (after seven years) was different from the data presented in May 2013 (after four years). Authentic figures of AT&C losses, thus, do not appear to be available with MOP though it was to be the basis for achieving the basic objectives of R-APDRP.

5.4 Discrepancies in computation of AT&C losses

During 22nd Steering Committee Meeting held on 22 February 2011, it was decided that CEA will carry out the sample check of base AT&C loss of towns verified by TPIEA-EA, particularly where the variations are found to be large. CEA had conducted test check of AT&C losses of 243 projects in four states and found variations ranging up to 5 *per cent* in 116 projects and more than 10 *per cent* in 52 projects. The variations were stated to be on account of change in area of computation of AT&C losses, non-completion of ring fencing, variation in computation methods, consideration of different period spells for computation of AT&C losses and time lag between preparation of DPRs and computation of AT&C losses.

Audit observed that the methodology for calculation of AT&C losses was prepared by PFC during September 2009 and circulated to all the State utilities. As such, all utilities should assess AT&C losses in a uniform manner. It was seen that PFC did not verify the adherence to prescribed method for computation of AT&C losses. Audit noticed that the methodology is not being uniformly followed as brought out below:

Andhra Pradesh

In Andhra Pradesh, meters and modems were fixed at 11 KV feeders emerging from 33/11 KV sub-stations instead of at the input points of 33/11 KV sub-stations which was in contravention of clause 3.1.1 of 'Base Line Methodology for calculation of AT&C losses'. Further, this system did not calculate the losses arising due to stepping down the power from 33 KV to 11 KV.

Meghalaya

- In respect of all the towns where base line AT&C losses were fixed by Water and Power Consultancy Services (WAPCOS), it was observed that the collection efficiency was calculated without considering the previous months' arrears which resulted in higher collection efficiency and less AT&C losses than the actual.

- In respect of Jowai, Resubelpara, Williamnagar and Mairang towns, AT&C losses were fixed based on erroneous energy input and output figure as the 33KV & 11 KV CT PT sets were defective.

- In respect of Shillong and Mairang towns, the AT&C losses were fixed based on energy input and output as measured by old meters installed in 11KV and 33KV feeders and export and import points which were not as per the specification approved for R-APDRP projects.

MOP stated (March 2016) that the methodology for establishment of baseline data has been applied uniformly across various States. The baseline of town areas has been established through TPIEA using the same methodology uniformly.

The contention of the Ministry is not acceptable in light of the audit findings listed above.

5.5 Energy Accounting and Audit

Energy accounting involves preparation of accounts of the energy flow to various segments and various categories of consumers and how it has been consumed out of the total available quantum over a specified time period. Energy audit involves analysis of energy accounting data in a meaningful manner to evolve measures to introduce checks

and balances in the system to reduce leakages and losses and also to improve technical performance. In order to achieve effective energy accounting and audit, it is imperative that meters are installed at all levels, i.e., feeder, distribution transformers and consumers, meter readings are taken regularly and reconciled, and proper consumer indexing is done through GIS mapping and linked to the billing system so that loss pockets are identified and corrective measures taken. Energy accounting is not a onetime exercise but is to be done on a continuous basis.

As per the recommendations in CAG's Report no. 16 of 2007, a system of energy accounting and audit was to be developed to ensure that the AT & C losses were estimated correctly and the impact of the corrective measures was measured accurately. The PAC had also, in their 77th Report (14th Lok Sabha), observed that one of the most important pre-requisites for ensuring reduction of commercial losses, with relatively lower capital investment, is comprehensive energy accounting and audit, which would enable quantification of losses in different segments of the system and their segregation into commercial and technical losses. The Committee also observed that effective energy accounting and auditing was not being carried out in most States due to lack of 100 *per cent* system metering, lack of accountability at the circle and feeder level and low progress in respect of IT enabling activities such as consumer indexing, digital mapping, Automated Meter Reading instruments, Data Loggers etc. The metering of all the electricity connections and the subsequent billing on the basis of the units metered rather than lump sum billing on assessment basis would improve the billing efficiency and help in reducing the AT&C losses.

R-APDRP envisaged establishment of authenticated baseline data. All assets and consumers were to be mapped and indexed, Feeder and Distribution Transformer (FDT) meters and bulk consumer meters were to be read remotely and the base-line data was to be validated through independent auditors to be appointed by MOP. Mapping of assets and consumers would enable Utilities identify specific areas where electricity was being pilfered which would, in turn, enable them to take targeted corrective measures for reduction of AT&C losses.

Audit noticed that energy accounting and audit was not being done in 12 States[16] while in another 13 States[17], the data for energy accounting and audit was being collected manually raising concerns about its reliability and accuracy. It was observed that the main reason for not conducting energy accounting and audit was the non – completion of Part A projects and the non – integration of different modules for collection of data.

MOP stated (March 2016) that as of January 2016, Utilities have uploaded IT system generated (without manual intervention) energy audit reports of 1,069 towns out of 1,164 Go-Live towns in 25 States and hence considered as reliable.

The reply of MOP is not tenable in light of audit findings indicated below:

- **Andhra Pradesh and Telangana**: Communication of meters was far less than 100 *per cent* required for transmission of data without human intervention.
- **Madhya Pradesh and Jharkhand**: Communication of DT Meters and Feeder Meters in many cases was zero *per cent*.
- **Chhattisgarh**: Out of 8,165 General Packet Radio Service (GPRS) modems installed under Part A, only 5,733 were communicating energy data compelling the Utility to fill the gaps in the energy data through manual entries.
- **Himachal Pradesh**: 628 PTR/ feeder/ DTR meters were not connected to online communication.
- **Tamil Nadu**: No Energy Audit Reports could be generated through Auto Mode even in February 2016.

The fact is that energy accounting and audit is either not being done or being done with manual intervention raising concern about their authenticity.

The status of the various components required for energy accounting and audit is presented in the following paragraphs:

[16] Bihar, Goa, Haryana, Himachal Pradesh, Karnataka, Meghalaya, Mizoram, Nagaland, Odisha, Puducherry, Sikkim and Uttar Pradesh

[17] Andhra Pradesh, Assam, Chhattisgarh, Jharkhand, Jammu & Kashmir, Kerala, Madhya Pradesh, Manipur, Rajasthan, Tamil Nadu, Telangana, Tripura and West Bengal

5.5.1 Metering

Implementation of 100 *per cent* metering of feeders, Distribution Transformers (DT) and consumers is a pre – requisite to ensure proper energy accounting and auditing. Metering would ensure that energy supplied is properly accounted for and accurately billed. It is essential that metering is at all the levels, namely, the feeder level, the distribution transformer level and the consumer level to ensure a proper trail of the supply of energy which would help in better energy accounting and audit.

The State wise status of feeder, DT and consumer metering is given in ***Annexure XV*** **and** ***Annexure XVI*** respectively. Audit observed that in the 29 States where sample check was carried out, the metering remained incomplete as seen from the table below:

Table 9 : **Status of feeder, DT and consumer metering**

Sl. No.	Percentage of metering	Number of States		
		11KV feeders metering	DT metering	Consumer metering
1.	0-60	2	8	2
2.	60-80	2	8	2
3.	80-100	24	12	22
4.	Data not available	1	1	3

As can be seen from the table, the metering in some States were below 60 *per cent*.

MOP in their reply (March 2016) stated that under R-APDRP, Part A (IT) projects, online energy accounting up to DT level (feeder metering / boundary metering / DT metering) was envisaged which is monitored by PFC in respect of Part-A (IT) towns of the programme. The details provided by MOP as part of their reply (March 2016) indicated that feeder metering was less than 60 *per cent* in four[18] States while DT metering were less than 60 *per cent* in five[19] States. Further, MOP could not furnish data of feeder metering in respect of four[20] States. As regards consumer metering, MOP stated that funding towards consumer metering was only for replacement of electro – mechanical meters/ defective meters and added that Utilities are making every effort to achieve 100 *per cent* consumer metering.

[18] 0 *per cent* in Jharkhand, Puducherry, Rajasthan (two utilities) and 40 *per cent* in Jammu and Kashmir.
[19] Jammu and Kashmir -14 *per cent,* Odisha-40 *per cent*, One utility in Rajasthan -55 *per cent*, One utility in Haryana-56 *per cent* and Chhattisgarh-57 *per cent.*
[20] Manipur, Meghalaya, Mizoram and Sikkim.

The reply of MOP only strengthens the audit contention that 100 *per cent* metering is yet to be achieved in all States even after eight years of implementation of the scheme.

5.6 Power sector reforms

The recommendations in the CAG's Report No. 16 of 2007 and the report of the PAC thereon dealt mainly with the restructuring of the Power sector, measures for reducing AT&C losses like formation of vigilance squads, setting up of special courts etc. Since the R-APDRP was also aimed at achieving similar objectives, these measures, though not specifically covered in R-APDRP guidelines, were equally important for ensuring effective implementation of the scheme. The status of achievement of various states in respect of these measures is presented in the following paragraphs.

5.6.1 Special Courts and Vigilance Squads

Unauthorised connections from the electricity supply system, tampering, by-passing of meters by the consumers etc., are different modes of theft of electricity leading to AT&C losses. The theft of electricity can be checked by forming vigilance squads to conduct inspection of connections. The speedy trial of offences relating to theft of power would act as a deterrent to repeated acts of theft of electricity. This can be achieved through the setting up of special courts as the existing judicial system is already burdened with large number of cases leading to delays. The National Electricity Act has also envisaged the setting up of special courts in each state for speedy trial of offences relating to theft of power etc. The formation of vigilance squads and the creation of special courts would help to check theft of electricity and thereby enable reduction of AT&C losses.

5.6.1.1 Special Courts

In the course of audit, it was seen that special courts were not established in **Goa**, **Haryana**, and **Jammu & Kashmir**. In Goa, the special courts were not set up as the theft cases were stated to be fractional. The reasons for not setting up of the special courts were not available on record in case of Haryana and Jammu & Kashmir. The state – wise details of setting up of courts, cases of power thefts and other such offences noticed and punished is given in ***Annexure XVII*****.** The status of the cases as observed by Audit in the States were as below:

- In **Chhattisgarh**, 9,460 cases were pending in the special courts while 1,43,678 cases were pending with the special courts in **Madhya Pradesh** and 1,838 cases were pending with the special courts in **Uttar Pradesh**.
- In **Odisha** and **Tamil Nadu**, 2,623 cases and 19 cases were pending in special courts respectively, with some cases pending for five years or more. Instances of pendency of cases for five years or more in special courts were also noticed in **Andhra Pradesh**, **Gujarat** and **Telangana**.

5.6.1.2 Vigilance Squads

Audit noticed the following discrepancies in functioning of Vigilance Squads in the States:

- Vigilance Squads had not been set up in **Mizoram**. The reasons for not constituting vigilance squads were not available from the records furnished to Audit.
- No targets were fixed for the Vigilance Squads in 10 States[21]. The details of the inspections conducted by the vigilance squads in these States were not furnished.
- In four States[22], the number of connections checked by the vigilance squads were less than 2 *per cent* of the total connections.
- Theft cases had increased in **Chhattisgarh**. The trend of theft cases in respect of the other states were not provided to Audit.

Recommendations

4. Ministry may ensure 100 *per cent* completion of metering so that verification of Baseline Data of Aggregate Technical & Commercial losses is completed, annual verification of Aggregate Technical & Commercial losses is done and to enable effective energy accounting and audit.
5. Ministry may encourage States to set up the special courts and vigilance squads, based on population of project area, so that speedy trials of offences act as deterrent to theft of electricity thereby reducing the commercial losses.

[21] Assam, Bihar, Goa, Jammu and Kashmir, Kerala, Manipur, Puducherry, Punjab, Tamil Nadu and Uttarakhand.

[22] Chhattisgarh, Jammu and Kashmir, Kerala and Uttarakhand.