

Chapter - III

3. Compliance Audit Observations on Power Sector PSUs

Important findings emerging from audit that highlight deficiencies in planning, investment and activities of the Management in the Power Sector Public Sector Undertakings (PSUs) are included in this Chapter. These include observations on cases where the intended objectives of the projects were not achieved.

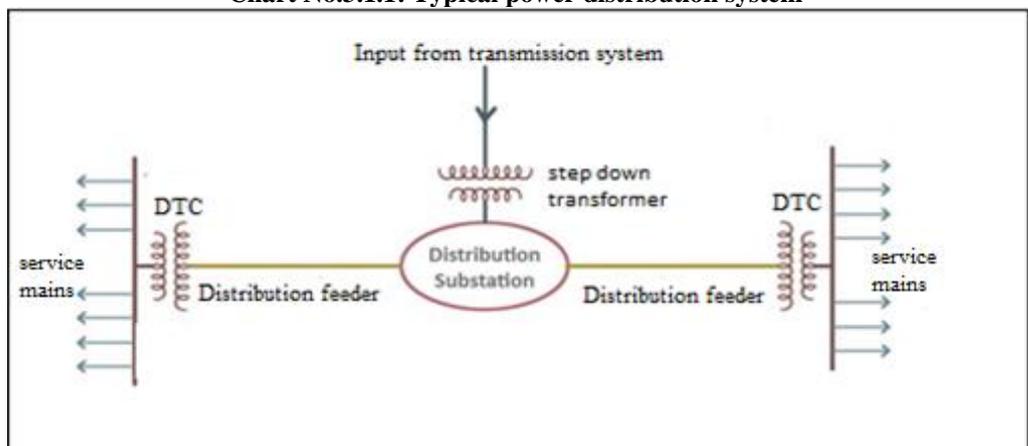
Bangalore Electricity Supply Company Limited, Hubli Electricity Supply Company Limited and Mangalore Electricity Supply Company Limited

3.1. Metering of Distribution Transformer Centres in non-RAPDRP/Rural areas by the Electricity Supply Companies

Introduction

3.1.1. A Distribution Transformer Centre (DTC), which provides final transformation in the electric power distribution system, is basically a step-down transformer. The high voltage from the transmission line (400/220/110/66kV) is stepped down to the primary distribution voltage level (11kV) by a step-down transformer. This voltage is further stepped down to 400/220 volts through DTC for consumption by the end users. Output from a DTC is transmitted by a distributor conductor for power supply to the end consumers through a small cable (called service mains) at the nearest electric pole. A typical power distribution system consisting of Distribution substation, feeders, Transformer Centres and end user points is depicted below:

Chart No.3.1.1: Typical power distribution system



The consumers are mapped (tagged) to the respective DTCs from which the power is supplied, by assigning unique codes to the consumer meters and to the DTCs. The purpose of consumer mapping is to identify revenue leakages by comparing the outflow of power from the DTC meters with that of consumer's meters connected under that DTC. The metering of DTCs and

conduct of energy audit⁴⁹ facilitate proper assessment of distribution losses and enable detection and prevention of commercial losses at DTC level.

3.1.2. In order to have a realistic estimate of distribution losses and to avoid the payment by the consumers for the inefficiencies of the Electricity Supply Companies (ESCOMs) in the State, Karnataka Electricity Regulatory Commission (KERC) has been fixing the targets on distribution losses⁵⁰ for each ESCOM and issuing directions, from time to time, to reduce the losses.

In Tariff Order 2008, KERC directed the ESCOMs to prepare a metering plan for energy audit to measure the energy received in each of the responsibility centres and to account for the energy sales. The ESCOMs were required to undertake energy audit at DTC level and to report technical and commercial losses every year backed up by relevant studies justifying the loss levels indicated. Further, the ESCOMs were instructed (Tariff Order 2010) to complete the installation of meters to all the DTCs by 31 December 2010. The time lines were extended from time to time as the ESCOMs failed to meet them. As per the latest time line fixed by the Commission (Tariff Order 2019), ESCOMs were to complete DTC metering and submit energy audit reports by 31 May 2019.

Meanwhile, the Karnataka Electricity Distribution Code (KEDC), 2015 which came into effect from February 2016 also mandated fixing of meters to DTCs to facilitate monthly meter readings of all consumer installations along with the DTCs and to conduct month-wise DTC-wise energy audit, so as to reduce commercial and technical losses.

Scope of Audit

3.1.3. The ESCOMs had taken up metering of DTCs in 98 towns (towns with population of above 30,000) under the Central Government Sponsored Scheme of Restructured Accelerated Power Development and Reforms Programme⁵¹ (R-APDRP) during July 2008 and completed in September 2016. The ESCOMs, in order to comply with the directives of KERC, also took up the metering of DTCs in non-RAPDRP/Rural areas between 2013-14 and 2018-19. The funding for these works (non-RAPDRP/ Rural areas) was met out of borrowings (₹ 334.15 crore) and internal resources.

The present audit covered the metering of DTCs by three ESCOMs in non-RAPDRP/Rural areas between 2013-14 and 2018-19, viz. Bangalore Electricity Supply Company Limited (BESCOM), Hubli Electricity Supply Company Limited (HESCOM) and Mangalore Electricity Supply Company

⁴⁹ Assessment of input and output energy from the DTCs with reference to actual consumption.

⁵⁰ For the financial year 2008, distribution losses of ESCOMs ranged between 14.99 per cent and 25.64 per cent (BESCOM-21.10 per cent; HESCOM-25.64 per cent; MESCOM-14.99 per cent).

⁵¹ Performance Audit on implementation of R-APDRP was included in the Audit Report of C&AG of India on Public Sector Undertakings, Government of Karnataka for the year ended 31 March 2016.

Limited (MESCOM). Audit examined records in 15 divisions⁵², apart from Corporate Offices of three ESCOMs. Three ESCOMs incurred capital expenditure of ₹ 449.81 crore and interest expense of ₹ 133.63 crore on the loans borrowed for DTC metering as of March 2019.

Audit objectives

3.1.4. The Audit objectives were to assess whether the ESCOMs:

- planned and executed the works of metering of DTCs in line with the applicable rules and norms;
- complied with the directives of KERC and the provisions of the Karnataka Electricity Distribution Code, 2015 on metering of DTCs in non-RAPDRP/rural areas; and
- conducted energy audit for evaluating distribution losses at DTC level to achieve the targeted levels.

Audit findings

Planning and execution

3.1.5.1. The project of metering of DTCs envisaged capturing the energy audit data from the DTCs, establishing a communication network between DTC and Data Management Centre in the subdivisions of ESCOMs using GPRS/GSM⁵³ network and pushing the data to server installed in the respective subdivisions. On receipt of meter data of all the DTCs, the respective Operation and Maintenance (O&M) sub-divisions were to evaluate the DTC meter data against the consumer meter data to measure the distribution losses at DTC level for corrective action.

The three ESCOMs (BESCOM, HESCOM and MESCOM) awarded the contracts for metering 1,14,324 Nos of DTCs⁵⁴ out of 1,56,174 between January 2013 and September 2015. The contracts were placed on total turnkey basis, *i.e.*, supply, installation, commissioning and maintenance⁵⁵ for five years from the date of commissioning. The construction period was six to twelve months and operation and maintenance period was for five years from the date of completion.

Audit observed that the ESCOMs issued work orders with delay ranging from two years to more than five years from the stipulated date of completion by KERC (December 2010). There were no recorded reasons for such delay.

⁵² BESCOM– Harihara, Hosakote, Magadi and Madhugiri; HESCOM – Dharwad Rural, Haveri, Sirsi, Belgaum Rural, Raibagh, Bijapur and Bagalkote; MESCOM – Bantwal, Udupi, Shivamogga and Kadur.

⁵³ General Packet Radio Service (GPRS)/Global System for Mobile communication (GSM).

⁵⁴ BESCOM: January 2013 for 45,000 of 77,333 DTCs; HESCOM: between March 2014 and May 2015 for 40,793 of 48,969 DTCs; MESCOM: September 2015 for 28,531 of 29,872.

⁵⁵ Contractor was responsible for downloading and analysis of data from DTC meters and push to data management centre and such data was to be used by the subdivision concerned.

Further, there were delays noticed in installation and commissioning of DTC meters by the contractors which ranged from four to twelve months⁵⁶ from the stipulated dates of the contracts. The ESCOMs extended the contracts for completion of metering the DTCs beyond the scheduled dates given in the contracts. In respect of BESCOM and HESCOM, there were no recorded reasons for delay in installation by contractors, however, in the case of MESCOM, the delays were attributed to non-availability of line clearances and monsoon rains. Thus, ESCOMs did not take up works in time and ensure timely completion.

The Government replied (June 2020) that metering of DTCs in urban areas under RAPDRP was initially taken up in 2007-08. Metering of all the DTCs could not be taken up at one go due to more number of DTCs and involvement of huge investment. It was further stated that the contracts were extended due to non-availability of line clearance, monsoon and delay in procuring materials.

The fact, however, remained that the ESCOMs failed to adhere to the KERC directives. Further, non-availability of line clearance and delay in procurement of material indicated deficient planning.

3.1.5.2. Regarding the balance DTCs (45,992 nos.) and the incremental DTCs (66,302 nos.) that were added in the system subsequently, ESCOMs did not take up metering. The details of balance DTCs and the incremental DTCs that were pending for metering are indicated in the table below:

Table No.3.1.1: Details of addition of DTCs and pending DTCs for metering

Sl. No.	ESCOM	DTCs to be metered	DTCs metered	Balance DTCs required metering	Incremental DTCs	DTCs to be metered (as of March/June 2019)
1	BESCOM	77,333	37,058 ⁵⁷	40,275	25,189	65,464
2	HESCOM	48,969	43,252	5,717	8,970	14,687
3	MESCOM	29,872	31,218 ⁵⁸	-	32,143	32,143

(Source: Information furnished by the ESCOMs)

Though the incremental DTCs in the system were substantial, ESCOMs failed to chalk out any plan for metering these DTCs. In BESCOM, the Board decided (March 2013) to carry out a post-work analysis of DTC metering to assess the extent of the benefits derived before proceeding for further metering, however, no such analysis was done by the Company in completed

⁵⁶ **BESCOM:** Ordered 45,000 DTCs, Completed in March 2014 against stipulated date of July 2013; **HESCOM:** Ordered for 40,793 DTCs, Completed between January 2015 and September 2015 (Phase-I) and between March 2015 and December 2015 (Phase-II), against stipulated date between August 2014 and October 2015 (Phase-I) and between June 2015 and December 2015 (Phase-II); **MESCOM:** Ordered for 28,531, Completed in November 2017 against stipulated date between April 2016 and November 2016.

⁵⁷ Though the DWA issued was for 45,000 DTCs, only 37,058 DTCs were done in the Non-RAPDRP Rural areas. Balance were metered for IP installations. Hence only 37,058 are considered.

⁵⁸ 2,687 DTCs were additionally entrusted for metering during the course of contract.

cases. Audit observed that for arriving at the overall losses based on DTC level, it was essential to ensure metering of all the DTCs in the distribution system. Since, BESCOM and HESCOM had not completed metering of the existing DTCs and MESCOM did not take up metering of newly added DTCs, the ESCOMs could not arrive at the overall losses despite incurring capital expenditure of ₹ 449.81 crore and interest expense of ₹ 133.63 crore as at 31 March 2019. In addition, ESCOMs had to incur recurring annual interest on outstanding loans to the extent of ₹ 40.43 crore⁵⁹.

The Government in its reply stated (June 2020) that incremental DTCs would be taken up after addressing the bottlenecks (network and communication issues) for the DTCs already metered as per the directions (September 2019) of the KERC.

Audit, however, observed that the ESCOMs failed to meter even the existing meters as of March/June 2019 and resolve the bottlenecks in conducting energy audit even after lapse of considerable time, despite persistent directives by the KERC year after year.

3.1.5.3 Audit further observed that even the installed meters were not communicating in certain DTCs which hampered the downloading of the meter data for carrying out energy audit. As of March 2020, 8,470 meters in BESCOM, 6,683 meters in HESCOM and 15,926 meters in MESCOM were not communicating, though the Executive Engineers/Assistant Executive Engineers concerned had certified, at the time of releasing payments to the contractors, that the meters were successfully commissioned.

Moreover, the contracts for DTC metering included maintenance for five years after commissioning. As per the terms of maintenance contract, it was the responsibility of the contractor to ensure establishment of a communication network between DTCs and the data management centre of ESCOMs using GPRS/GSM network and to ensure availability of all meter data at the data management centre server for facilitating energy audit. Despite having a maintenance contract, the problem of downloading data from meters persisted, thereby defeating the purpose of metering.

The Government replied (June 2020) that the payment was released after ensuring data communication and downloading of data. Non-communication of these meters subsequently was due to network and other issues and the agency has been directed to rectify the issues. The fact remained that the meters installed after incurring huge expenditure were not serving the intended purpose. Due to the Company's failure to enforce the contract terms of ensuring sustained good network, accurate data for realistic estimation of distribution losses could not be arrived at through energy audit.

Violation of terms of contract

3.1.6. The scope of contract (Clause 3.2 of agreement and item 20.01 (a) of DWA) for metering of DTCs included installation and commissioning of all

⁵⁹ BESCOM – ₹ 28.63 crore; HESCOM – ₹ 7.93 crore; MESCOM - ₹ 3.87 crore.

such items, which were needed for successful, efficient, safe and reliable operation of the equipment, unless otherwise specifically excluded in the specifications under ‘exclusion’ or Letter of Award. Any other items of work not specifically mentioned, but which are essentially required for satisfactory performance and completeness of these works were deemed to be included in the scope of works and the same were to be executed/carried out by the contractor at no extra cost to the ESCOMs.

Audit, however, observed that two ESCOMs, *viz.* BESCOM and HESCOM have supplied lead wires and Copper/Aluminum lugs⁶⁰ to the Contractors at the cost of ESCOMs, though these material were essentially required for commissioning of DTC meters and the cost of which were to be borne by the contractors as per the terms of contract. BESCOM and HESCOM incurred ₹ 7.07 crore⁶¹ and ₹ 7.33 crore respectively towards supply of lead wires and Copper/Aluminum lugs in violation of terms of contract⁶². Thus, the payment of ₹ 14.40 crore tantamount to extension of an undue advantage to the contractors and resulted in avoidable financial burden to the ESCOMs.

The Government replied (June 2020) that the supply of lead wire and accessories were not included in the scope of the bidders and hence the expenditure was incurred as they were absolutely necessary for metering.

The reply is not acceptable, as the scope of contract included installation and commissioning of all such items, which were needed for successful, efficient, safe and reliable operation of the equipment. As confirmed in the reply, lead wire and other accessories were absolutely necessary for metering and hence they fall within scope of the bidders. Therefore, the expenditure of ₹ 14.40 crore incurred by the ESCOMs was unwarranted.

Non-conducting of energy audit

3.1.7.1. ESCOMs failed to carry out energy audit for all the DTCs that were metered. The energy audit⁶³ was done for only around 60 *per cent* of the metered DTCs in BESCOM and HESCOM and 43 *per cent* in MESCOM. KERC took a serious view (Tariff Order 2015 and 2016) in this regard stating that energy audit was not taken-up even in such DTCs for which metering has been completed negating the very purpose of metering them at a substantial cost.

The reasons for non-conducting of energy audit for the balance DTCs were attributed to non-completion of consumer indexing (mapping of consumers to DTCs), software integration issues, mismatch in DTC codes, *etc.* In the Audit Report of the C&AG on implementation of metering of DTCs under

⁶⁰ Lead wires are cables used to connect transformer with DTC meter and lugs are devices used for connecting cables to DTC meter.

⁶¹ ₹ 1.50 crore to M/s. Genus Power Infrastructure Ltd and ₹ 5.57 crore to M/s. Asian Fab Tech Limited.

⁶² This issue was not observed in MESCOM.

⁶³ BESCOM: 22,189 of 37,058 DTCs (60 *per cent*); HESCOM: 26,903 of 43,252 DTCs (62 *per cent*); MESCOM: 13,367 of 31,218 (43 *per cent*).

R-APDRP, Audit had highlighted similar operational issues⁶⁴ encountered by the ESCOMs. However, ESCOMs, without addressing these operational issues, went ahead with awarding the works for metering the DTCs in Non-RAPDRP and Rural areas also, defeating the very purpose of metering.

The Government while confirming audit observation on the reasons for non-conducting of energy audit stated (June 2020) that efforts are being made to resolve the issues and conduct energy audit.

3.1.7.2. Further, due to not resolving some of the operational issues such as, software integration, mismatch of DTC code, *etc*, the data generated through energy audit was not accurate. The division-wise and sub-division-wise results of energy audit are given in **Appendix-10**. It could be observed that the results had depicted ‘negative loss’ or ‘100 per cent loss’ or error (‘Blank’ or ‘N/A’). The results of energy audit in three ESCOMs in test checked cases are given in the following table:

Table No. 3.1.2: Details of results of energy audit

Sl. No.	ESCOM	Test checked DTCs (Nos)	No. of DTCs with 100 per cent loss	No. of DTCs with negative loss	No. of DTCs with no data/error	Percentage of errors
	(a)	(b)	(c)	(d)	(e)	$f = (c+d+e)/b*100$
1	BESCOM	9,368	1,373	1,569	4,292	77
2	HESCOM	6,028	2	636	4,847	91
3	MESCOM	9,462	-	745	3,473	45

(Source: Energy audit reports of respective ESCOMs)

It could be seen that the percentage of erratic results ranged between 45 per cent and 91 per cent. The ESCOMs, therefore, should have taken remedial measures on priority for addressing the bottlenecks, as DTC metering involved huge capital expenditure.

BESCOM, while furnishing the compliance to KERC (Tariff Order 2016), stated that mapping of DTCs to respective consumers is in progress and could be completed by January 2016 and it will be in position to submit system generated energy audit reports with effect from February 2016. Subsequently, BESCOM stated (Tariff orders 2017, 2018 and 2019) that though energy audit is being carried out, results were erratic due to incomplete mapping and software integration problems. HESCOM and MESCOM stated that action would be taken to address the issues and conduct energy audit for all the DTCs. Audit, however, observed that the ESCOMs have not resolved the various issues adversely impacting the DTC metering and have not submitted the accurate energy audit reports to the KERC yet (December 2019).

The Government confirmed (June 2020) in its reply that erratic results were due to improper tagging of consumer installations with the DTCs, mismatch of DTC codes, burnt meters, communication errors, *etc*. It further stated that action is being taken to resolve the issues.

⁶⁴ Refer performance audit on implementation of R-APDRP included in Audit Report on Public Sector Undertakings, GoK for 2015-16 (Para 2.2.18 to 2.2.20).

3.1.7.3. Audit conducted (June 2019) physical verification of DTCs to assess their functioning on a test check basis. Subdivision-wise observations are given in *Appendix-11*. The following table indicates the observations noticed during physical verification by audit and the counter check from the data obtained from energy audit reports and Demand, Collection and Balance (DCB) Report:

Table No. 3.1.3: Results of physical verification of DTCs, energy audit report and DCB

Sl. No.	ESCOM	Good	Non-mapping of consumers	Meter burnt	Meter not recording/display not working	Mismatch in location/ serial number of DTCs	Other issues ⁶⁵	Total
1	BESCOM	4	8	4	3	-	12	31
2	HESCOM	-	4	11	50	21	12	98
3	MESCOM	-	4	2	7	4	17	32

(Source: Physical verification, energy audit reports and DCB reports)

Audit observed that only four out of 161 DTC meters physically verified in three ESCOMs were in good condition and the balance meters were either burnt or non-functional. There were also cases of mismatch in location codes of DTCs in the energy audit reports, differences in number of consumers as per DTC and that recorded in billing software (called DCB –Demand, Collection and Balance Report) causing the errors in energy audit results. Further, the number of consumers as recorded in energy audit reports and that in DCB report were not matching, the differences ranged from 1 to 306 in HESCOM and 1 to 326 in MESCOM (refer *Appendix-12*).

It was observed that the contracts for metering DTCs included maintenance for five years from the date of commissioning. However, the maintenance contract was restricted only to downloading and analysis of data from DTC meters for use by the subdivision concerned for energy audit purposes. The maintenance contract was deficient to the extent that it did not include remedial measures, such as replacing the burnt meters, rectifying the non-functional meters, rectifying the mismatch in codes, *etc.* As a result, ESCOMs have resorted to manual collection of the energy consumption as recorded in the DTC meters and as per the billing software maintained at sub-divisions for carrying out the energy audit. This defeated the very purpose of DTC metering.

The Government stated (June 2020) that the measures were taken to address the issues.

Impact of non-achievement of distribution loss levels

3.1.8. The distribution loss is the difference between the energy input and energy sold. The investments made to improve the distribution network should normally translate into reduction of distribution losses. Considering the achievement made by the ESCOMs in reduction of losses in the previous years and looking at the current loss levels, besides the capital expenditure

⁶⁵ Include meter not found on site, actual consumption less than that recorded in energy audit report, battery drained, *etc.*

incurred so far and the proposed capital expenditure for the current year, KERC fixed the targets for distribution losses while approving tariff. KERC allowed incentive for achieving the target and levied penalty for shortfall.

The details of targets *vis-a-vis* achievement of distribution losses and levy of penalty in three ESCOMs during 2016 to 2019 are indicated below:

Table No. 3.1.4: Penalty for non-achievement of distribution loss levels

Sl. No.	Tariff order	Targets fixed by KERC (Per cent)	Loss levels achieved (Per cent)	Penalty levied ⁶⁶ (₹ in crore)
BESCOM				
1	2016	13.80	14.78	116.57
2	2019	13.00	13.17	28.75
HESCOM				
3	2017	18.00	20.92	164.35
MESCOM				
4	2018	11.35	11.40	1.48
5	2019	11.25	13.50	63.83
Total				374.98

(Source: Tariff orders issued by KERC)

Audit observed that ESCOMs had to pay penalty of ₹ 374.98 crore due to non-achievement of targeted distribution losses during the period from 2016 to 2019. The ESCOMs could have initiated corrective action, if the sources of losses were properly assessed. As the ESCOMs delayed implementation of metering of DTCs and failed to take any corrective action for resolving the bottlenecks in conduct of energy audits, payment of penalty was inevitable. This expenditure has to be absorbed by the ESCOMs, as this is not allowed to be factored into the tariff.

KERC had issued directions to ESCOMs every year at the time of approving tariff orders between 2008 and 2019 and also followed up the progress achieved in metering by each ESCOM. The year-wise summary of directives of KERC are given in *Appendix-13*. KERC also expressed (Tariff Orders 2017 and 2018) its displeasure for not resolving the issues and repeating the same assurances for the last several years without actually implementing them.

The Government stated (June 2020) that steps have been taken to replace faulty meters, updating consumer indexing, synchronizing DTC codes with billing software, *etc.* It was also stated that efforts are being made to reduce losses through re-conductoring and regular maintenance works.

Conclusion and recommendations

The ESCOMs incurred huge capital expenditure of ₹ 449.81 crore and interest expense of ₹ 133.63 crore on the loans borrowed for DTC metering as of March 2019. In addition, ESCOMs had to incur recurring annual interest on outstanding loans to the extent of ₹ 40.43 crore. However, the substantial capital expenditure incurred by the ESCOMs on metering remained unfruitful as the ESCOMs were not able to measure the accurate losses at DTC level on

⁶⁶ The actual distribution losses in other years (other than that mentioned in the table) were within the targets fixed by KERC.

account of incomplete consumer mapping to DTCs, non-communication of DTC meters due to poor network, software integration, etc. Besides, ESCOMs had to pay penalty to the tune of ₹ 374.98 crore due to non-achievement of targeted distribution losses which could have been avoided, had the ESCOMs taken action for resolving the bottlenecks in implementation of metering DTCs. Further, the capital expenditure incurred by the ESCOMs on metering gets into tariff fixation and increases the charges to be recovered from the consumers without any corresponding benefit.

The ESCOMs are therefore required to take constructive steps to make the investment on DTC metering fruitful, viz. ensuring metering of incremental DTCs on a continuous basis, identification of consumers under each DTC and mapping, resolving network issues (increasing bandwidth, etc), rectification of mismatch of DTC location codes with billing software and timely replacement/rectification of non-functional meters.

The Government stated (June 2020) that the action has been taken to address the bottlenecks in conducting DTC-wise energy audit and to reduce the distribution losses.

Karnataka Power Transmission Corporation Limited

3.2. Repair of failed Power Transformers

The Company failed to comply with its own circulars and guidelines prescribed for repair of failed power transformers. 55 transformers (64 per cent of the audit sample) valued at ₹ 41.55 crore have been left unrepaired for a period of one month to seven and a half years beyond the period of 360 days allowed for repair. These transformers could therefore not be used in the transmission system, leading to an avoidable purchase of new transformers with additional expenditure of ₹75.90 crore.

3.2.1.The Karnataka Power Transmission Corporation Limited⁶⁷ (the Company), which is a transmission licensee under Section 14 of the Electricity Act, 2003, operates and maintains Power Transformers (PT) of various capacities⁶⁸ in its transmission network. PT is an electrical device used in the transmission and distribution network of higher voltages for stepping-up and stepping-down the voltage. Any failure of a PT disrupts the power transmission system and jeopardizes the transmission network. To achieve



Picture No.3.2.1: Power Transformer

⁶⁷ The Company was incorporated (July 1999) under the Companies Act, 1956 as a wholly owned company of Government of Karnataka.

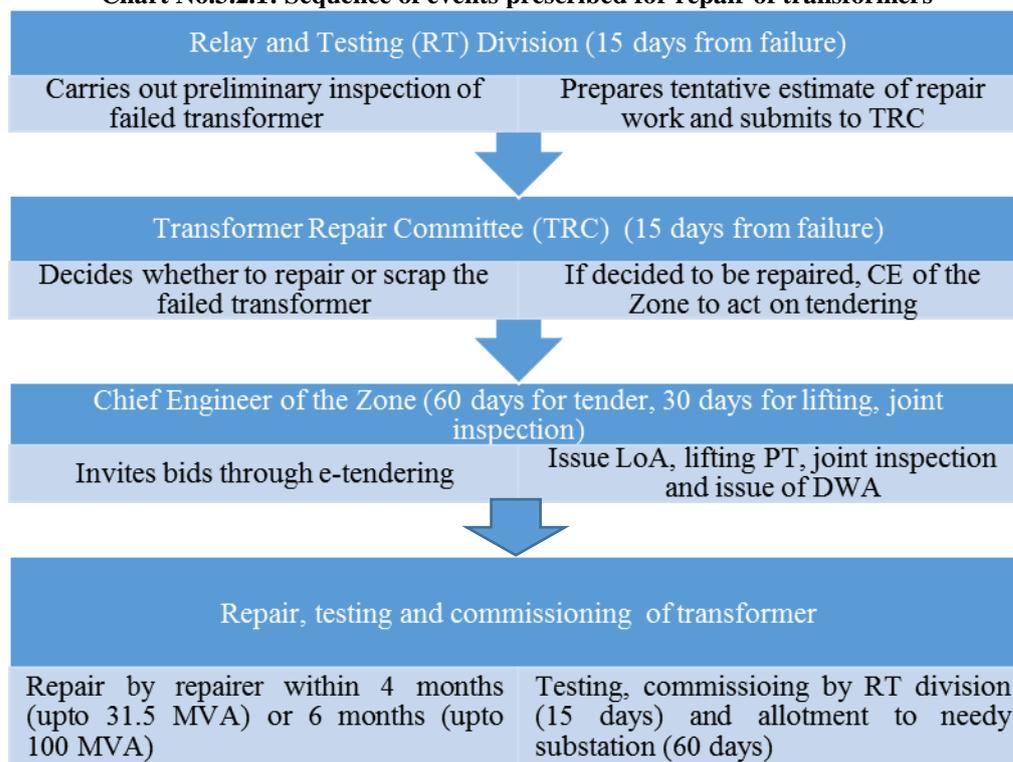
⁶⁸ 8 MVA, 10 MVA, 12.5 MVA, 16/20 MVA, 31.5 MVA 100 MVA and 150/167 MVA transformers.

efficiency in a transmission system, installation of required capacity of PTs and their proper maintenance are essential.

3.2.1.1. The Company prescribed (July 2009) the time schedule for the process of identification and repair of the failed/faulty PTs. The repair of transformers was carried out by inviting competitive bids. The tendering process was governed by the Karnataka Transparency in Public Procurement (KTPP) Act⁶⁹, 1999 and KTPP Rules, 2000.

The Relay and Testing (RT) Division of the Company, headed by an Executive Engineer and the Transmission Zone⁷⁰, headed by a Chief Engineer, were primarily responsible for identifying and getting the failed transformers repaired and putting them back into the transmission system. The following is the sequence of events/time schedule prescribed (July 2009) in the circulars for repair of failed transformers.

Chart No.3.2.1: Sequence of events prescribed for repair of transformers



(Days in brackets indicate period allowed for the activity)

Scope of Audit

3.2.2. To assess whether the failed PTs were identified and repaired within the stipulated time adhering to the circulars and guidelines issued (July 2009/June 2016) by the Company, provisions of KTPP Act, 1999 and KTPP Rules and relevant circulars issued thereunder. Out of the total 126 failed PTs in six

⁶⁹ As per the Act, no Procurement Entity shall procure goods or services except by inviting Tenders, where the value of procurement exceeds five lakh rupees in case of construction works and one lakh rupees in case of goods or services other than construction works.

⁷⁰ The Company has six zones each headed by a Chief Engineer to manage the functions relating to transmission system at the field level.

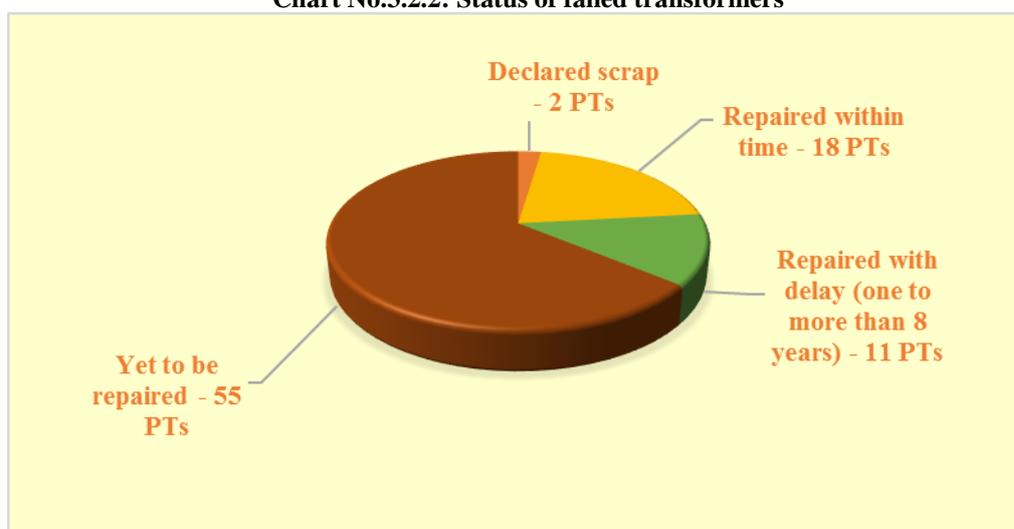
zones of the Company, Audit examined records relating to 86 failed PTs⁷¹ with written down value of ₹ 59.62 crore in three⁷² zones. The selected sample of 86 PTs represented 68.25 per cent of the total transformer failures during 2013-19.

Repair management

3.2.3. The repair process of a failed/faulty PT was to be carried out in accordance with the time schedule prescribed (July 2009) by the Company. The total time allowed to get a failed transformer repaired and re-allotted to the needy substation was 360 days (refer **Chart No.3.2.1**).

Audit observed that despite having a structured schedule, failed PTs were not repaired and put back into the system for use within the prescribed time. The status of the sample of 86 failed PTs out of 126 PTs reviewed in audit is indicated in the chart below:

Chart No.3.2.2: Status of failed transformers



It could be observed that, out of 86 PTs examined in the three zones, only 18 PTs (21 per cent) were repaired within the stipulated time and 11 PTs were repaired with delays ranging from one year to more than eight years beyond the prescribed time of 360 days (refer **Paragraph 3.2.4**).

Out of the balance 55 PTs valued at ₹ 41.55 crore (refer **Appendix-14**) which were yet to be repaired (December 2019), 33 PTs (valued at ₹ 28 crore) were held with the repairers beyond the completion period stipulated in the contracts (refer **Paragraph 3.2.5**) and 22 PTs were lying in the respective substations (December 2019), as the contracts for these PTs had not been finalised (refer **Paragraph 3.2.6**). These 55 PTs were lying idle for one month to seven and a half years beyond the prescribed period of 360 days from the date of failure. The fact that 64 per cent of the failed transformers were yet to be repaired clearly demonstrates poor repair management by the Company.

⁷¹ The three zones were selected considering highest incidence of failure in that order.

⁷² Bengaluru – 36 PTs with WDV of ₹ 24.78 crore; Mysuru – 13 PTs with WDV of ₹ 9.22 crore; and Bagalkote- 37 PTs with WDV of ₹ 25.62 crore.

Delay in repairing Power Transformers

3.2.4. In respect of 11 PTs, which were repaired and received back, it was observed that the delays in repair were mainly attributable to delay by the RT Divisions/Zones concerned in finalizing tenders and awarding works as detailed in the table below:

Table No.3.2.1: Delays at various stages for repaired PTs

Sl. No.	Stages	Stipulated period	Delay beyond stipulated period
1	Submission of initial test report with tentative estimate by RT Division	15 days from date of failure	3 to 72 months
2	Tendering and issue of Letter of Award (LoA)	2 months from date of initial test report	5 to 14 months
3	Lifting of PT by repairer and issue of Detailed Work Award (DWA)	1 month from LoA	5 to 30 months
4	Repair	4 months from DWA	1 to 14 months

While the delay attributable to the RT Divisions/Zones (in initiating the tenders and in issuing LoA/DWA), ranged from 3 to 72 months, the delay attributable to the repairers was from 1 to 14 months beyond the scheduled completion period stipulated in the contracts. These delays from both RT Divisions/Zones and the repairers had delayed putting the PTs back into the transmission system by one to more than eight years beyond the prescribed schedule of 360 days from the date of their failure (refer *Appendix-15*), which could have been avoided had the Zones taken timely action for finalising the tenders (including issue of LoA/DWA). The reasons for such delays on the part of the Company were not available on record. Moreover, the Company did not act upon repairers for delay in repair beyond the stipulated dates of contracts.

Power Transformers held with repairers

3.2.5. The Letters of Award for 33 PTs were issued between May 2012 and March 2019 (refer *Appendix-16*). Audit noticed considerable delay both on the part of the Zones in awarding the contracts and also on the part of the contractors in repairing the PTs leading to these PTs being held with repairers (December 2019) beyond their scheduled date of completion of repairs. Delay in finalizing tenders and awarding contracts for 33 PTs by the Zones and delay in their repair by contractors are indicated in the following table:

Table No.3.2.2: Delays at various stages for PTs yet to be received from repairers

Sl. No.	Stages	Stipulated period	Delay beyond stipulated period
1	Submission of initial test report with tentative estimate by RT Division	15 days from date of failure	2 to 46 months
2	Tendering and issue of Letter of Award (LoA)	2 months from date of initial test report	2 to 35 months
3	Lifting of PT by repairer and issue of Detailed Work Award (DWA)	1 month from LoA	3 to 66 months
4	Repair (as of December 2019)	4 months from DWA	4 to 63 months

As per the terms of the contracts, the transformers were to be repaired within four months from the date of the joint inspection/DWA⁷³. If the repairer failed to execute the works, the Company, after issue of 30 days' notice to this effect, could terminate the contracts and execute the balance works at the risk and cost of the contractor. In addition, the terms of the contracts allowed forfeiture of the performance security and imposition of liquidated damages for non-performance of the contract. The liquidated damages were to be levied at the rate of ½ per cent of the contract price per week or part thereof subject to a maximum of 10 per cent of the contract price.

Audit observed the following deficiencies:

- i. The repairers, within 30 days of LoA, were required to lift the failed transformers from the subdivisions and offer for joint inspection for preparing detailed estimate and issue of DWA. However, Audit noticed delays ranging from one month to three months beyond the stipulated period for lifting the PT and offering for joint inspection by the repairer in 28 of 33 PTs⁷⁴ (refer **Appendix-17**). The Zones did not invoke penal provisions for the delay, though the terms of contracts allowed forfeiture of bid security and termination of the contracts;
- ii. The PTs were to be repaired within four months from the date of joint inspection/DWA. The repairers did not deliver (December 2019) the transformers on time, with the delays ranging between 4 to 63 months beyond the stipulated time. Considering the delay caused by the repairers at various stages in respect of the 33 PTs, liquidated damages of ₹ 1.26 crore were leviable (refer **Appendix-17**). However, this amount was not levied and recovered by the Zones from the defaulting repairers, though the zones had issued notices to the repairers. The notices issued by the Zones, while pointing out the delay in repair, stated that action would be taken as per the terms of contract, but audit did not notice any action being taken;
- iii. Apart from the above, there was considerable delay on the part of the Zones in finalizing the tenders, issue of LoA and DWA (ranging upto 66 months). There was nothing on record to explain the reasons justifiable for such abnormal delays on the part of the Company. The Company attributed such delays to preoccupation of RT division attending break downs of substations and commissioning of new substations. This caused the deferment of repair process.

Audit further observed the following lacunae in repair management, which contributed to delays in repair:

- The Zones placed contracts repeatedly on two firms, viz. Seven contracts on M/s. Tarapur Transformer Ltd, Mumbai between May

⁷³ The Company conducts joint inspection of the failed transformer with the repairer in the premises of the repairer to arrive at the actual quantum of repairs required and issue DWA. Repairs should be taken up only after joint inspection and DWA. Joint inspection was to be offered by the repairer immediately after lifting the failed transformer (30 days from LoA).

⁷⁴ Sl.No.1, 2, 4 to 13, 15, 16, 17, 19 to 25, 27, 28 and 30 to 33 of **Appendix-17**.

2012 and July 2016, and eight contracts on M/s. Vidyuth Transformers Pvt. Ltd, Kutch between May 2013 and September 2017 (refer **Appendix-18**), though these repairers had not repaired and returned the PTs placed in the previous orders. The system of awarding the works was deficient to the extent that it did not involve an assessment of the previous performance of repairers before placing the new orders;

- It was also noticed that the Zonal Chief Engineers concerned served notices and issued reminders to the repairers for delay in repair. However, none of the three zones had either invoked the contractual provisions for levying liquidated damages on the defaulted repairers or initiated action to terminate these contracts and execute the balance works for repair of the PTs at the risk and cost of the repairers. Resultantly, the transformers remained with the contractors beyond the scheduled dates of completion as they did not pay any heed to these notices;
- Further, as per the instruction issued (June 2016) by the Company, the Zonal Chief Engineers concerned were required to review the status of the repair every month and report to the Superintending Engineer (Planning & Monitoring) at the Corporate Office of the Company. A separate report was also to be furnished in respect of transformers pending repair beyond seven months. No evidence for such a reporting arrangement by the CE was forthcoming from the records made available to audit. This lapse hampered the quality of monitoring due to absence of timely feedback from the executing authority to the planning and monitoring authority on the nature of the delays in repair.

Thus, the 33 PTs with book value of ₹ 28 crore were not brought back into the transmission system even after lapse of a considerable period of time from the date of their failure due to laxity on part of the Zones in executing the repair contracts, compounded by negligence in initiating timely action for cancelling the contracts or invoking penal provisions on the defaulting repairers.

The Government replied (July 2020) that the delays occurred due to preoccupation of the RT division in attending to breakdowns of substations and non-conducting of Transformer Repair Committee (TRC) meeting due to busy schedule of the members. With regard to delay in lifting PTs by the tenderers, it was stated that there was delay in furnishing Bank Guarantee (BG). Further it was replied that, out of 33 PTs, 15 PTs were repaired and the balance 18 PTs were with repairers and the Company was continuously pursuing with the repairers for expediting the repair. Liquidated damages were levied for delays.

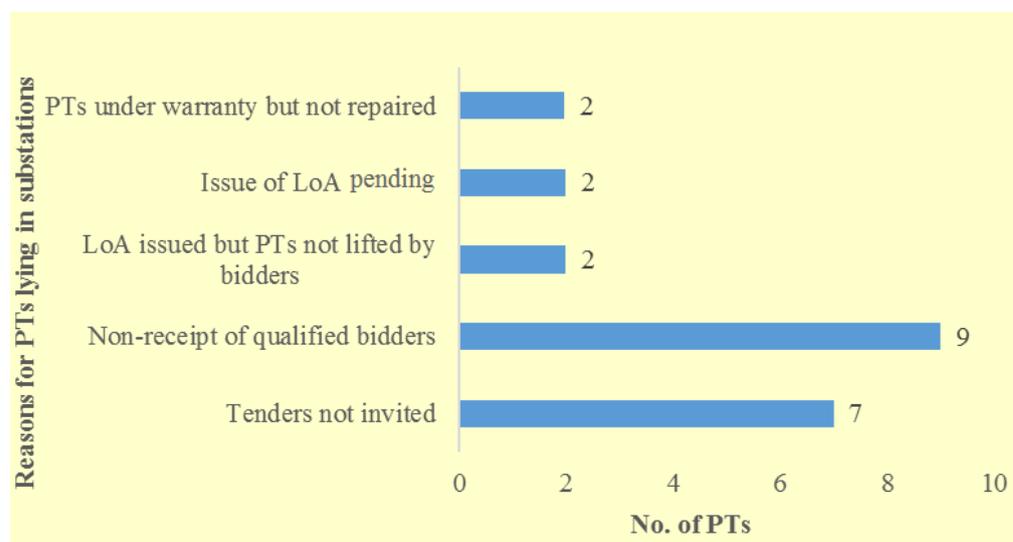
The reply is not acceptable, as there was breach of timelines fixed for repair and also there was nothing on record to show that RT Division ever discussed the constraints in adhering to the time schedule with management. The reason that the delay occurred due to busy schedule of TRC is not justified as it was the responsibility of the management to ensure that TRC takes timely decisions. As regards non-furnishing of BG, action should have been taken to terminate the contract as per the contractual terms. The fact also remained that

18 PTs out of 33 PTs were yet to be repaired and even the repaired 15 PTs were received after considerable delays.

Failed Power Transformers held at substations

3.2.6. The contracts for repair of 22 PTs valued at ₹ 13.55 crore, (refer *Appendix-19*) have not been finalised yet (December 2019) for various reasons as tabulated below:

Chart No.3.2.3: Reasons for PTs lying in the substations without repair



It could be observed that while the Zones did not initiate action for inviting tenders for seven PTs, it did not analyse the reasons for non-response of qualified bidders for nine PTs. Further, in four contracts, either issue of LoA was pending or PTs were not lifted even after issue of LoA. Resultantly, these 22 PTs were lying idle without repair for a period ranging from one year to more than six years since their failure (December 2019).

The Government replied (July 2020) that out of 22 PTs, tender processing was completed in case of six PTs and for the remaining 16 PTs there were single bid/no response even after invitation of tenders for more than three times. However, the fact remained that all the 22 PTs were lying idle without repair for a period ranging from one to more than six years since their failure. Further, the Company did not analyse the reasons for low participation of bidders and moreover, in case of single bids, the Company could have awarded the contracts after third attempt with recorded justification as per the Karnataka Transparency in Public Procurement (KTPP) Act.

Impact of Delays - Avoidable cost on purchase of new PTs due to delay in repair

3.2.7. As a part of Company’s annual capital works programme, the Company procures new transformers for the purpose of augmentation/creation of new sub-stations and replacement of faulty/failed PTs. It was observed that the Company procured 137 new PTs at a total cost of ₹ 231.61 crore in three zones during 2013-14 to 2018-19. Of these 137 PTs, the Company could have

avoided purchase of 55 numbers costing ₹ 75.90 crore⁷⁵, had the failed transformers (refer **Paragraph 3.2.5 & 3.2.6**) been repaired timely and made available for use. Thus, the Company's failure in repair management had not only led to purchase of new PTs with additional cost, but also resulted in idling of 55 PTs valued at ₹ 41.55 crore.

The Government replied (July 2020) that the new PTs were procured considering requirement of augmentation/creation of new substation works. If any of the PTs failed and if the spare/repaired PTs were not available in the zone, then the available new PTs would be utilised to provide uninterrupted power supply. The reply confirms the fact that new PTs were purchased and put into use due to delay in repair of failed PTs, which could have been avoided if the time lines fixed for repair were adhered to.

Conclusion

- The Zones failed to adhere to its own timelines prescribed for repair of PTs, and only 21 *per cent* of the total PTs (18 out of 86 PTs) in three zones were repaired within the prescribed time. 22 PTs valued at ₹ 13.55 crore, were lying idle for one to more than six years since their failure because of non-finalisation of contracts.
- 33 PTs valued at ₹ 28 crore were held with repairers for a period ranging from 4 months to 63 months from the due dates in the contracts, yet the Zones did not take action to terminate the contract and levy and recover the liquidated damages of ₹ 1.26 crore from the defaulting repairers.
- Consequent to non-repair of failed PTs within prescribed timelines, these PTs (55 Nos) could not be brought back into the transmission system and also resulted in additional expenditure of ₹ 75.90 crore on purchase of new PTs.

The Government stated (July 2020) that necessary instructions will be issued to all the Chief Engineers of Transmission Zones to follow up the transformer repairs and to get back the repaired transformers well within the scheduled time as per the terms of contract and also to invoke contractual provisions to levy and recover the liquidated damages for all the commissioned PTs. It was also stated that the penalty would be calculated after completion of repair work in case of PTs which were under repair.

Recommendations

The Company may ensure:

- **adherence to the prescribed timelines by the RT Divisions with regard to initial inspection and finalisation of estimates of failed power transformers;**

⁷⁵ Calculated considering average cost of ₹ 1.69 crore per PT (₹ 231.61 crore / 137) less average repair cost of ₹ 30.69 lakh per PT. (55 x ₹ 1.38 crore = ₹ 75.90 crore).

- **timely decisions by the Transformer Repair Committee and finalisation of tenders by the Zones;**
- **enforcement of penal provisions of contracts in case of defaulting repairers;**
- **monthly review of progress of repair of PTs at zonal level as well as by the Superintending Engineer (Planning and Monitoring) in line with the existing instructions (June 2016) of the Company.**