PPS Energy Solutions
THE POWER OF ENERGY

2021-22

ENERGY AUDIT REPORT

Of

TATA POWER

MUMBAI DISTRIBUTION

Energy Audit Report

Submitted By

PPS Energy Solutions
THE POWER OF ENERGY

AUG 2022

Document Submission

Action	By	Date	Version
Submitted	PPS Energy Solutions	30.07.22	R0
Submitted	PPS Energy Solutions	16.08.22	R1

Designation	Name	Signature
Accredited Energy Auditor	Ravi Deshmukh (AEA – 0243)	

Acknowledgement

We express our sincere gratitude to the authorities of Tata Power Mumbai Distribution (TPC-D) for entrusting and offering the opportunity of energy performance assignment.

We are thankful to TPC-D officials for timely guidance and for their positive support in undertaking the task of system mapping and energy efficiency assessment of sampled electrical distribution system. The field studies would not have been completed on time without their interaction and guidance. We admire their cooperation during field studies and providing necessary data for the study.

Sr. No	Name	Designation	Contact Details
1	Mubin Desai	Nodal officer (Specialist- DSM)	9223503881
2	Manish M Dahake	Energy Auditor [EA-6441] (Specialist- GIS)	9867934502

1 Table of Contents

List of Tables

List of Figures

2 Abbreviations

Abbreviations	Explanations
TPC-D	Tata Power Distribution Limited Mumbai
PPSES	PPS Energy Solutions
BEE	Bureau of Energy Efficiency
Direct Consumer	Consumer on TPC-D Network
Welcome Consumer	Consumers on the Other Discom Network
DSS	Distribution Substations of 33/11kV or 33/22kV
CSS	Consumer Substations of 22/0.415 kV or 11/0.415 kV

2.1 Electrical Terms

- V (Volt) - Unit of voltage.
- kV (kilovolt) - 1,000 volts.
- W (Watt) - Unit of active power.
- kW (kilowatt) - 1,000 watts.
- MW (Megawatt) - 1,000 kW.
- Wh (watt-hour) - Unit of Energy.
- kWh (kilowatt-hour) - 1,000 Wh.
- MWh (Megawatt-hour) - 1,000 kWh.
- MUs (Million Units)-1kWh x 10^6.
- VA (Volt-ampere) - Unit of apparent power.
- kVA (kilovolt-ampere) - 1,000 VA.
- MVA (Megavolt-ampere) - 1,000 kVA.
- VAr (volt-ampere reactive) - Unit of reactive power.
- Load Factor - Ratio of average power demand to maximum power demand
  Electrical Losses - Difference between energy delivered and energy sent out.
- PF – Power Factor

3 Executive Summary

Auditors have critically examined the various systems, schemes, devices employed as well as the associated documents at TPC-D for above 11 kV level, at 11kV level and Below 11kV Level so as to ascertain its adequacy and efficacy as per the directives of the BEE and guidelines as per regulation.

3.1 Study Team

As per the directives of team given by regulation, the teams were formed by TPC-D and PPSES to conduct the energy accounting and energy audit.

3.1.1 Tata Power –D

Table 1 TPC-D team

Sr. No	Name	Designation	Contact Details
1	Mubin Desai	Nodal officer (Specialist- DSM)	9223503881
2	Manish M Dahake	Energy Auditor [EA-6441] (Specialist- GIS)	9867934502

3.1.2 PPS Energy Solutions PVT Ltd (PPSES)

Table 2 PPSES Team

Sr. No.	Name	Designation
1	Dr. Ravi Deshmukh	Team Leader. Accredited Energy Auditor (AEA-0243)
2	Dinesh Baharate	Team member - Electrical Engineer (EA 24237) (Certified Energy Auditor)
3	Shashikant Puranic	Sector Expert - Electrical Engineer
4	Mr. Prasad Bhosale	Team member- Electrical Engineer

3.2 Methodology

The methodology adopted,

1. Kick of meeting with TATA POWER –D team to finalize the sample size
2. Survey of the Distribution network
3. Collection of the Primary Data and finalization of the sample size check
4. Site visit and Energy Meter data collection
5. Collection of the Metered Energy Data for the respective voltage level as per the sample size
6. Scrutiny of collected data and Data gaps of the submitted data
7. Loss calculation for the network segment then if required normalization
8. Compilation of the Draft report

9. Presentation on Draft report
10. Final report with incorporation of comments.

As per the methodology, after collection of the data, joint site visit for different substation was conducted on 26 July and 27 July 2022, along with TPC-D Team and consultant team.

Total of 301 location Inject energy into the system. All these meters are integrated in a web-based AMR software known as e-Watch SS supplied by M/s Secure meters ltd. The eight (8) number energy injection locations are on Other Discom and the energy of these are collected monthly through MRD files

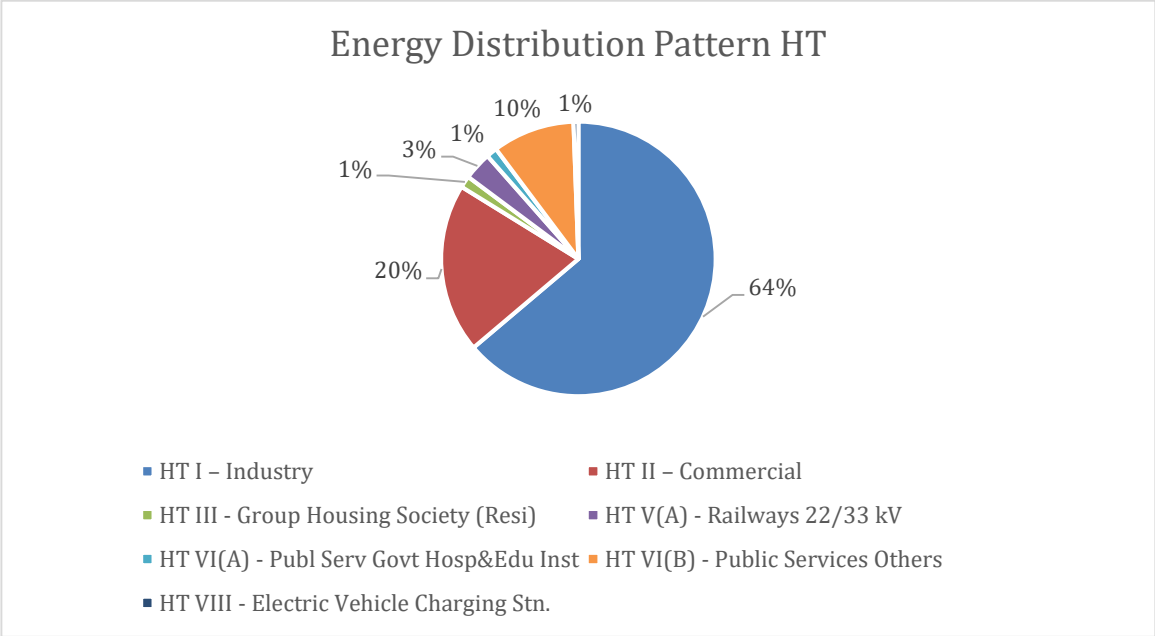
Table 3 Input MUS

Distribution Company	Type	Assessment Net Input Energy Consumption (MU)	Remarks
TPCD	DISCOM	4931.70	Total Energy purchased by TPCD. It totals of Direct consumer as well as consumer on distribution network of OTHER DISCOM
		3199.26	Energy derived for the consumer which is Directly connected TPCD network

Review of the current consumption practices in order to identify the energy loss in the system was carried out. The major energy consumption is by for HT consumers it is 65.96% .

For LT consumer's major energy consumption is of residential consumer which is 45% followed by commercial consumer having load >50kW and it is 22%.

The network length of the 11kV Level and transformer location are near to load centers. The changeover consumer data is not considered as O&M of network is not under Tata-Power-D for those consumers



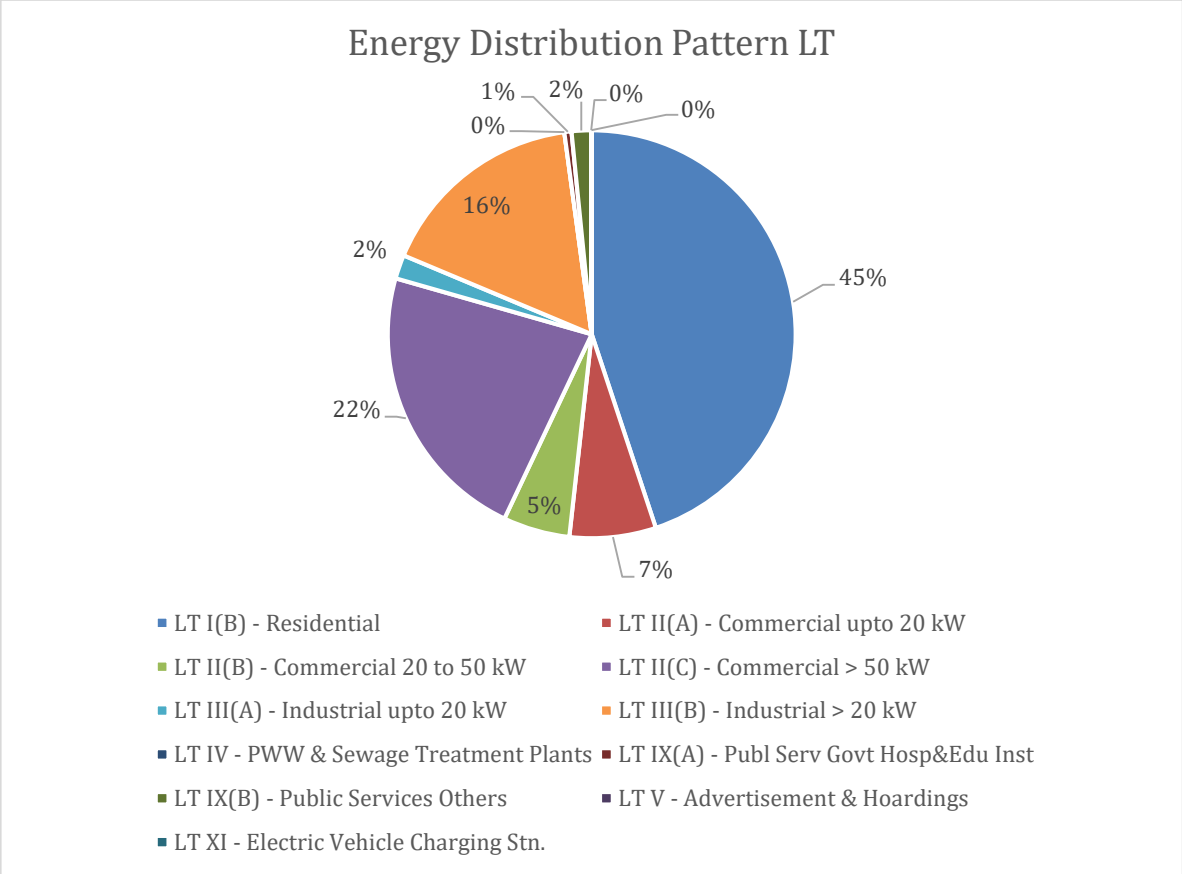


Figure 1 Energy Distribution of TPC-D

During site visit it was observed that substation had meter installed on 33kV line but due to ring main at 33kV , the energy accounting is not carried out at 33kV level and hence is a constraint for loss calculation at 33kV level. To overcome this, few sample feeders which are metered at Input and at consumer end are used for the assessment of the loss.

DTR level supply is in ring main and the clustering of those areas just have been started and hence the loss for the LT level had to be calculated for segments which behaved like a radial network for a time being and were mixture of long LT Network and Short LT network.

The Distribution Transformer of LT network of TPC-D are mainly at load Center as in the case of Ramojee CSS i.e., Near perfect LT network.

The consumer category of the TPC-D is going to shift towards residential as many of other Discom consumer are joining the TPC-D network. Total number of consumer of TPC-D are 747,458 of which 191620 are direct consumer of TPC-D.

As the mixture of the residential consumer will increase, the loss of the TPC-D is expected to increase in near future.

Table 4 TPC-D loss calculation

Particulars		Unit	Value
Input Energy including Direct + CHO	(A)	MU's	4931.70
TPC-D Input At T<>D interface	(B)	MU's	3507.12
Transmission Loss @ 3.18%	(C)	%	3.18%
TPC-D Input at T<>D interface	(D)	MU's	3395.60
TPC –D T<>D Sale	(E)	MU's	3362.92
TPC- T & D Loss	(F = B-E)	MU's	144.20
Distribution Loss	(G = D-E)	MU's	32.67
T& D Loss %	(H = F/B %)	%	4.11%
Distribution Loss %	(I = G/D %)	%	0.96%

AT & C Loss: [1- Billing Efficiency X Collection Efficiency] X 100%

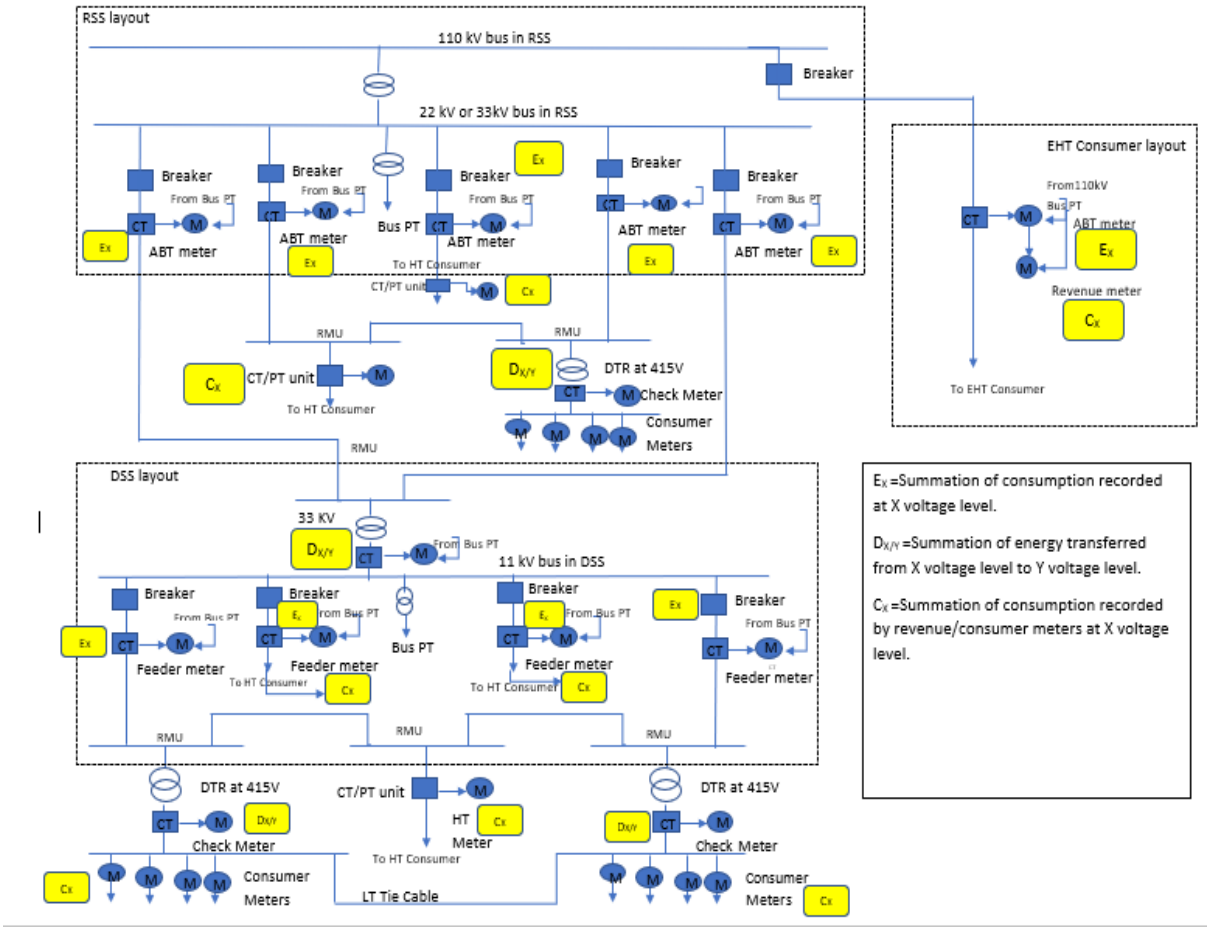
Consumer profile		Energy parameters			Losses	
Consumer category	No of connection metered (Nos)	Input energy (MU)	Billed energy (MU) Metered energy (MU)	% of energy consumption	T&D loss (MU)	T&D loss %
Residential	163385	3,199.26	512.44	16.18%	32.14	1.00%
Agricultural	0		0.00	0.00%		
Commercial/Industrial-LT	27298		569.85	17.99%		
Commercial/Industrial-HT	293		1752.08	55.32%		
Others	644		332.75	10.51%		
	191620	**3199.26**	**3167.12**	**100.00%**	**32.14**	**1.00%**

Consumer profile		Commercial Parameter			AT & C loss (%)
Consumer category	No of connection metered (Nos)	Billed Amount in Rs. Crore	Collected Amount in Rs. Crore	Collection Efficiency	
Residential	163385	453.97	457.74	100.83%	
Agricultural	0	0.00	0.00	0.00%	
Commercial/Industrial-LT	27298	572.30	579.42	101.24%	
Commercial/Industrial-HT	293	1638.25	1644.44	100.38%	
Others	644	120.26	106.82	88.82%	
	191620	**2784.78**	**2788.42**	**100.13%**	**0.88%**

The total loss of the TPC-D is 0.88% for the year 2021-22

3.3 Recommendations

- Typical SLD in Tata Power distribution network is given below.



- It is observed that Tata power Mumbai distribution network is very complex at all voltage levels due to ring structure, so individual feeder wise and individual DTR loss calculation is difficult and will not be accurate. However, volage level wise loss calculation is suggested as per following table and formulae.

Voltage Level	Input Energy (Ei)	Output Energy (Eo)	%Loss = (Ei-Eo)/Ei
>66 kV	E_{110}	C_{110}	
33 kV	E_{33}	$C_{33} + D_{33/X}$	
22 kV	E_{22}	$C_{22} + D_{22/X}$	
11 kV	$E_{11} + D_{X/11}$	$C_{11} + D_{11/X}$	
6.6 kV	$E_{6.6} + D_{X/6.6}$	$C_{6.6} + D_{6.6/X}$	
3.3 kV	$E_{3.3} + D_{X/11}$	$C_{6.6} + D_{6.6/X}$	
0.415 kV	$E_{0.415} + D_{X/0.415}$	$C_{0.415}$	

- Instead of feeder wise and DTR wise loss calculation, loss calculation and monitoring can be done by grouping all the feeders or DTR forming a ring.

- Tata power can also do DSS wise energy balance for conformity of proper energy accounting.
- The system-based reports for loss calculation at 33/22/11kV voltage level needs to be further improved and monitored from energy audit perspective.
- Metering is to be ensured for all the DSS feeders and DTR in the phase manner by commissioning balance meters. Faulty meters need to be replaced if any
- Readings of all the meters are to be ensured and updated in SAP system for each month.

4 Introduction

4.1 Energy Accounting

Energy Accounting means accounting of all energy inflows at various voltage levels in the distribution periphery of the network, including renewable energy generation and open access consumers, and energy consumption by the end consumers. Energy accounting and a consequent annual energy audit would help to identify areas of high loss and pilferage, and thereafter focus efforts to take corrective action.

Bureau of Energy Efficiency (BEE) through Ministry of Power, Government of India issued regulations namely Bureau of Energy Efficiency (Manner and Intervals for Conduct of Energy Audit in electricity distribution companies) Regulations, 2021 (hereinafter referred as 'BEE EA Regulation 2021'), for Conduct of Mandatory Annual Energy Audit and Periodic Energy Accounting in DISCOMs. As per the said regulation, all Electricity Distribution Companies are mandated to conduct annual energy audit and periodic energy accounting on quarterly basis. These Regulations for Energy audit in Electricity Distribution Companies provides broad framework for conduct of Annual Energy Audit though and Quarterly Periodic Energy Accounting with necessary Pre-requisites and reporting requirements to be met.

4.2 Designated Officer of Client

Name of the Designated Consumer TPC-D, Mumbai.

Table 5 TPC-D team

Sr. No	Name	Designation	Contact Details
1	Mubin Desai	Nodal officer (Specialist- DSM)	9223503881
2	Manish M Dahake	Energy Auditor [EA-6441] (Specialist- GIS	9867934502

The major stake holders of this assignment are TPC-D and PPS Energy Solutions (PPSES).

4.3 Accredited Firm

M/s PPS Energy Solutions Private Limited as have been appointed by TPC-D to carry out the *Energy Audit of Power Distribution Network of Tata Power Distribution Mumbai for year 2021-22.*

4.4 Objective

TPC-D has engaged PPSES to carry out the Energy Audit in Tata Power Mumbai license area for year 2021-22. The objective of this assignment is to carry out the Annual Energy Audit as per the prescribed formats of BEE EA Regulation 2021 to conduct Energy Audit in TPC-D issued by Bureau of Energy Efficiency, Ministry of Power Government of India.

4.5 Scope of work

1 To carry out Energy Audit in line with the BEE EA Regulation 2021 to Conduct Energy Audit in TPC-D.

- Preparation of checklist/action plan for Energy Audit.
- Proforma of Energy Audit will be shared with selected agency after the issuance of Purchase Order.
- DISCOM visit should be carried out by all team members of the agency as per the team declaration in technical proposal. BEE EA Regulation 2021, pro-forma (formats) will be used for this audit. The regulations along with pro-forma (formats) are enclosed at Annexure-1.
- Collection and Review of the energy related data of last Financial Year (FY 2021-22) in the Pro-forma by visiting the DISCOM physically.
- Verification of existing pattern of energy distribution across periphery of electricity distribution Company
- Collection and verification of energy flow data of electricity distribution company at all applicable voltage level of distribution network (please refer energy audit regulation) Collection of data on energy received and distributed by DISCOM and verify the accuracy of data

2 Collection & analysis the data and prepare the same with report;

I. Input energy details:

a. Collection of input energy from recorded system meter reading

b. All the inputs points of transmission system

c. Details provided by transmission unit

d. Recorded meter reading at all export points (where energy sent outside the State (interstate as well as intrastate) is from the distribution system);

e. System loading and Captures infrastructure details (i.e. no of circle, division, sub-division, feeders, DTs, & Consumers)

II. Parameters for computation of distribution losses:

a) Details of open access, EHT sale, HT sale, LT sale and transmission losses

b) Number of consumer's category wise in each circle

c) Consumers connected load category wise in each circle

d) Details of billed and un-billed energy category wise of each circle

e) Metered and un-metered details.

f) Circle wise losses of all circles under DISCOM periphery

g) Boundary meter details

h) Energy Cost and Tariff data

i) Source of energy Supply (e.g. electricity from grid or self-generation), including generation from renewables;

j) Energy supplied to Open Access Consumers which is directly purchased by Open

Access Consumers from any supplier other than electricity distribution company

III. Monitoring and verifications of input energy and consumption pattern at various voltage levels

IV. Identify the areas of energy leakage, wastage or inefficient use;

V. Identify high loss-making areas/networks, for initiating target based corrective action.

VI. Identify overloaded segments of the network for necessary capacity additions.

VII. Computation of agriculture consumption (approved by SERC)

VIII. Methodology for loss computation various losses.

IX. Computation of Average Billing Rate (ABR)

a) Total revenue billed category wise.

b) Category wise ABR with tariff subsidy.

c) Category wise ABR without tariff subsidy.

X. Collection Efficiency (Category wise) and computation of AT&C loss.

3 Observe and compile various Energy Conservation (ENCON) options implemented by the DISCOM and prepared report containing details of expenditure made by DC along with saving and payback period.

Recommendations to facilitate energy audit, energy accounting and improve energy efficiency.

4 Study the details of loss/gain of TPC-D, analysis of Average Cost of Supply (ACS) and Average Revenue realized (ARR) gap, details of energy charges/Power purchase cost along with the financial analysis.

- Current System Metering Status at various voltage level of DISCOM
- Status of Functional meters for all consumers, transformers and feeders.
- Status of default meters (non-functional meters) for all consumers, transformers and feeders
- Current status of pre-requisites mentioned in regulations (Please refer energy accounting regulation).
- Copies of relevant authentic and certified documents should support the report. Each document should be sealed and signed by DISCOM authorized representative as well as by agency's AEA.

5 Prepare final report of TPC-D as per the scope of work and as per the BEE Energy Audit Regulation, 2021, in a standard format duly indexed, covering profile of the unit and its details of energy related data w.r.t Tata Power-D Sector, analytical & Statistical details and any other relevant information. The indicative report structure is provided in second schedule of BEE EA Regulation 2022.

4.5.1 Deliverables

- Preparation of report as per BEE EA Regulation 2021
- Verify & submit the duly signed annual energy audit report

4.6 Understanding of Assignment & Action Plan

National Action Plan on Climate Change (NAPCC), was launched with 8 sub-mission in order to address the climate change and the energy security in India. National Mission for Enhanced Energy Efficiency (NMEEE) being one of the Submission. NMEE has four pillars shown in the figure below.

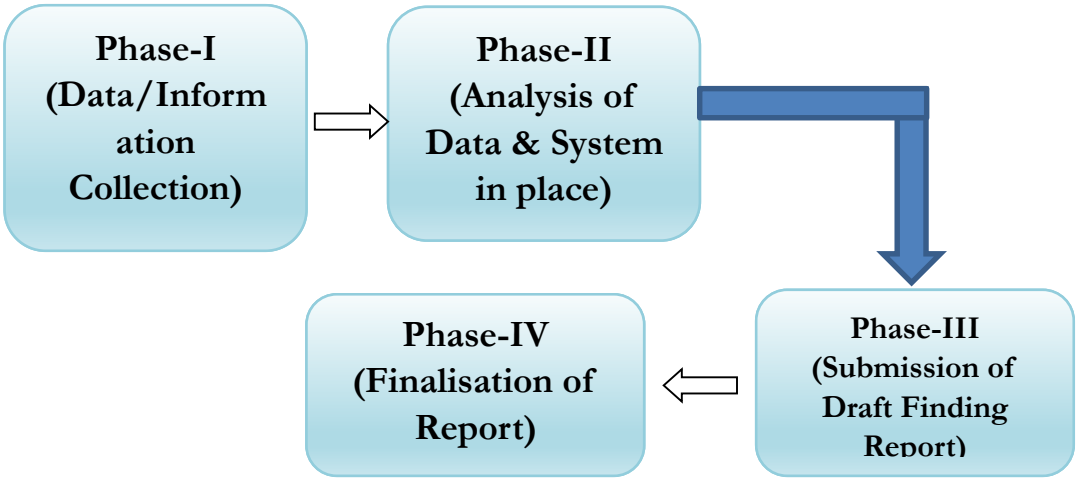
BEE is the market regulator and administrator for the Energy Efficiency Projects in India as per Energy Conservation Act.
The experts hired for the Energy Audit Project will complete the work assigned to them with in time limit.
BEE has been establishing to promote the impact of the energy efficiency on national energy security. It has hence send the regulation to DISCOM to perform period energy accounting which will lead to identification of the loss in the system. The identified areas of loss can be further being converted to energy efficient areas by implementation of system improvement schemes. The detail energy accounting is to be carried out for the DISCOM yearly is the objective of this job. The approach for the same is enclosed below

4.7 Approach

Approach for the assignment which is scheduled for 1 week is guided by following points

- **Planning:** Online meetings /offline meeting with TPC-D personnel's and Energy Audit team will be conducted
  - Communication to the selected the data points like input energy, out energy, renewable open access etc. were pointed out.
  - Different measures included to account the energy were discussed
  - Action plan for Energy schematic was prepared during the meeting
- **Document Scrutiny:** The compliance by the different DC's was checked as per the Forms of PAT.
- **Deliverable submission**: The Report submission to the BEE will be executed as specified by BEE regulations.

4.8 Methodology



Phase I: Data Collection and Analysis & Approach and methodology document 1 week from work order

(a) Deal with identification of information and data requirement to carry out the Work/Job

(b) Meeting and Discussion with TPC-D to propose a detailed work plan.

Phase II: Data Analysis

(a) Data mining and procedural analysis of system in place for record of sales data.

(b) Network Diagram Study
The network Diagram will be studied by the expert once the network is approved by the TPC-D officials in consultation with field teams.

(c) Meter reading data collection
Meter reading and data collection of field was done by the team members of Field Team.

(d) Analysis of the Meter reading
The collected data was analyzed by our team member with input from the respective experts.

(e) Based on the outcomes of the data analysis, a preliminary fact-finding report was submitted highlighting various issues at various sub-division levels.

Phase III: Detailed Analysis and Submission of Draft Report

(a) Detailed analysis and preparation a draft report highlighting the validity, basis, consistency and objectivity of the approach adopted.

(b) Analysis of Specific Issues such as:

a. Analysis of assessed sales in terms of load factor and specific consumption and its comparison with the sales based on actual meter reading.
b. Reasons for exceptional high or low metered sales as reported.
c. Consistency in approach for assessed consumption.
d. Methodology of assessing consumption and comparison of assessed sales with actual meter reading wherever meter readings are available.
e. Comparison of Actual Category-wise Average Billing Rate (ABR) with ABR approved in Order

(c) Assessment of AT&C losses for HT, LT and Total Sales and comparison vis-à-vis as reported in the MIS of Tata Power-D and suggestion of Recommendations for reducing AT&C Losses by TPC-D.

Phase IV: Detailed Analysis and Submission of Draft Report

(a) Incorporation of the suggestions received and carry out any further analysis as required and incorporate the same in the Final Report with Recommendations to reduce the AT&C losses of TPC-D.

Report Submissions

The report submitted as per the deliverables of this assignment.

5 Tata Power Distribution Network

5.1 General information of Tata Power Distribution Network

General Information of the Tata Power Company is enclosed below.

General Information				
1	**Name of the DISCOM**	The Tata Power Company Limited		
2	**i) Year of Establishment**	1919		
	ii) Government/Public/ Private	-		
3	**DISCOM's Contact details & Address**			
I	City/Town/Village	Mumbai		
i	District	Mumbai		
Iii	State	Maharashtra	Pin	400019
Iv	Telephone	022-67172701	Fax	
4	**Registered Office**			
I	Company's Chief Executive Name	Dr. Praveer Sinha		
Ii	Designation	CEO & Managing Director		
Iii	Address	Bombay House, 24 Homi Mody Street, Mumbai - 400 001		
Iv	City/Town/Village	Mumbai	P.O.	Mumbai
V	District	Mumbai		
Vi	State	Maharashtra	Pin	400001
Vii	Telephone	022-67172501	Fax	
5	**Nodal Officer Details***			
I	Nodal Officer Name (Designated at DISCOM's)	Mubin Desai		
Ii	Designation	Specialist- DSM		
Iii	Address	The Tata Power Company Limited, Dharavi Receiving Station, Near Shalimar Industrial Estate, Matunga, Mumbai 400 019, Maharashtra, India		
Iv	City/Town/Village	Mumbai	P.O.	Mumbai
V	District	Mumbai		
Vi	State	Maharashtra	Pin	400019

General Information				
Vii	Telephone	022-67172675 / 9223503881	Fax	
6	**Energy Manager Details***			
I	Name	Manish M Dahake		
Ii	Designation	Specialist- GIS	Whether EA or EM	EA
Iii	EA/EM Registration No.	EA-6441		
Iv	Telephone		Fax	
V	Mobile	9867934502	E-mail ID	manish.dahake@tatapower.com
7	**Period of Information**			
	Year of (FY) information including Date and Month (Start & End)	1st Apr, 2021 - 31st Mar, 2022		

The TPC-D network is enclosed in the snap short below.

Table 6 TPC-D in Snap Shot

Sr. No	Particulars	Unit	As on Mar 2022
1	Electricity Consumers (Direct Consumers)	Nos	191620
2	Contracted Load of Consumers	MW	3502.58
3	No of DSS	Nos	33
4	No. of DT's	Nos	1039
5	66 kV Line	ckt km	0
6	33 kV Line	ckt km	419.79
7	11 kV Line	ckt km	2256.36
8	LT Line	ckt km	2241.72

Table 7 MVA Connected via DSS and CSS

Sr. No.	Item	Nos.	Capacity (MVA)
1	DSS	33	1200
2	CSS	1039	1176.58

The data collection was followed up by the physical visit of the Import Meters and the network of TPC-D.

6 Field Verification Visit

Metering is an inevitable part of the Power Distribution network for evaluating the energy injected and transferred to end consumers. Meter readings are the only way to evaluate the accurate energy balance of the system. Faulty meters, Nonworking meters mislead the losses statement. To evaluate the metering system of the TPC-D, auditors have physically visited the sample grid and inspected the meter working conditions.

6.1 Schedule of the work

Initial kick of meeting was arranged between the TPC-D official and the PPSES Team on 27th July 2022. In the kick of meeting the various data gaps were raised by PPSES team.

TPCD officials responded to the data gaps and the plan for the site visit with Accredited Energy Auditor was prepared.

27th July and 28th July the field visit was arranged. The schedule of the visit is as follows

Date	Places visited	Information validated	Remarks
27 July 2022	Tata Power Company Limited Dharavi Receiving Station(RSS)	Meeting with Tata Power official and discussion on the data gaps compliance send by the Tata Power Company Limited	The Limitation of the ring Configuration in the Energy Accounting of the Specific Feeder of 33kV or 11kV Level were highlighted
27 July 2022	Naman CSS 11/0.44 kV DT	Visited 750 kVA Kirloskar make , Meter arrangement CT PT ratio /Whole current Meters etc working condition were observed.	Meters are working, Network of HT line is physically observed. It has the tie line with Bank of India 2 & CBI CSS through RMU and LT tie is with Income tax colony DT.
27 July 2022	Income Tax colont CSS 11kV/0.44 kV DT	Distribution Network of Tata Power Transformer installation 315 KVA Raycheme make Meter arrangement CT PT ratio /Whole current Meters etc were checked	Meters were working and the data cross checked with system HT Tie with Sofitel ISO and CBI CSS through RMU and LT tie with CBI CSS DT

27 July 2022	BMC DSS 33KV/6.6 KV	Distribution Network of Tata Power Transformer installation 17.5 MVA Bharat Bijli make Meter arrangement CT PT ratio /Whole current Meters etc were checked	Meter number were Cross verified are 4 feeder going to RMU and 06 feeders goes directly go HT consumers
28 July 2022	Tata Power Company Limited Back Bay DSS & RSS at Churchgate 33kV/11kV	Distribution Network of Tata Power Transformer installation 20 MVA ABB make Meter arrangement CT PT ratio /Whole current Meters etc were checked	04 outgoing 11 kV KVfeeders from back bay DSS all going to RMU's in different area
28 July 2022	ICC Island City Centre 1 CSS 22KV/0.44 kV DT	Distribution Network of Tata Power Transformer installation 1000 AN Dry type ABB Make for Meter arrangement CT PT ratio /Whole current Meters etc were checked	Meters are working HT side Tie with Dharawi through RMU and LT side tie with ICC-2 LT DT Building has one HT Connection
28 July 2022	ICC Island City Centre 2 CSS 22KV/0.44 kV DT	Distribution Network of Tata Power Transformer installation 1000 AN Dry type ABB Make for Meter arrangement CT PT ratio /Whole current Meters etc were checked	HT side Tie with ICC one and LT side tie with Bombay dyeing rehab LT DT Building has one HT Connection
28 July 2022	Bombay Dyeing Rehab 22/ 0.44kV	Distribution Network of Tata Power Transformer installation 1000 AN Dry type ABB Make for Meter arrangement	HT side Tie with Spring Mill through RMU and there is NO LT tie with any isolator RMU

		CT PT ratio /Whole current Meters etc were checked	

6.2 Check list Prepared by EmAEA

List of Documents

Sr. No	Description
1	Energy Purchase Documents- Power Purchase report from all sources
2	Consumers Category wise details
3	Billed energy for different category of the consumer
4	Annual Calculation of transmission Loss
5	Annual EHT Sales Report-
6	Sample 33kV input and billed energy
7	DTR and consumer mapping for the LT loss calculation
8	Average Billing Rate for consumer category
9	Feeder wise injected energy into the network
10	Open access consumers and their consumption details
11	Infrastructure details

7 Document verification

The submitted data by the Tata Power-D has been reviewed as per the guidelines of BEE regulation and comments / remarks are mentioned at respective places

7.1 Energy Distribution Verification

Verification of existing pattern of energy distribution across periphery of electricity Distribution Company

The TPC-D has consumers across other distribution licensee network also. Those consumers are called as Changeover consumer or Welcome consumers. The operation and Maintenance of the changeover consumer is not carried out by TPC-D. Hence the Distribution loss for the changeover consumers are not covered in this report.

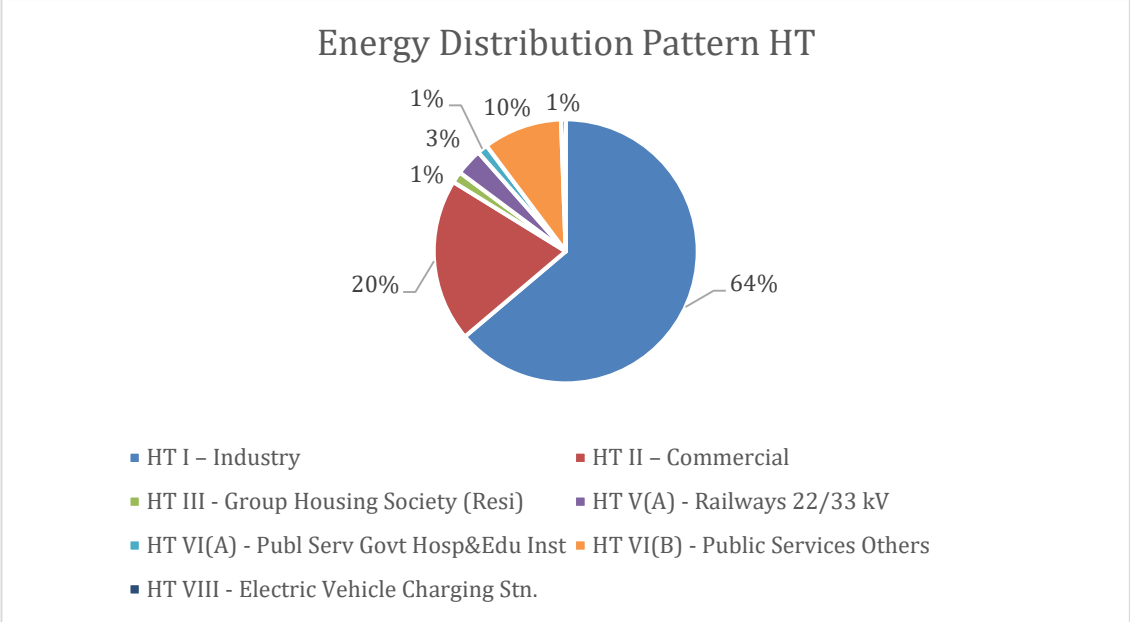
Total number of consumers of TPC-D are 747,458 of which 191620 are Direct consumer of TPC-D. Other are Welcome consumer. The breakup of 191620 consumers is enclosed below in the table.

The consumer which are called direct consumer of TPC-D (i.e., Those connected to Tata-Power Network) are studied from energy distribution point of view.

For the Energy Accounting year 2021-22, The Energy Distribution of Tata power is as follows

Table 8 Consumer as per the Category

Consumer category	No of connection metered (Nos)	No of connection Un-metered (Nos)	Total Number of connections (Nos)	Percentage of number of connections	Input energy (MU)
Residential	163385	0	163385	85.27%	3199.26
Agricultural	0	0	0	0.00%	
Commercial/Industrial-LT	27298	0	27298	14.25%	
Commercial/Industrial-HT	293	0	293	0.15%	
Others	644	0	644	0.34%	



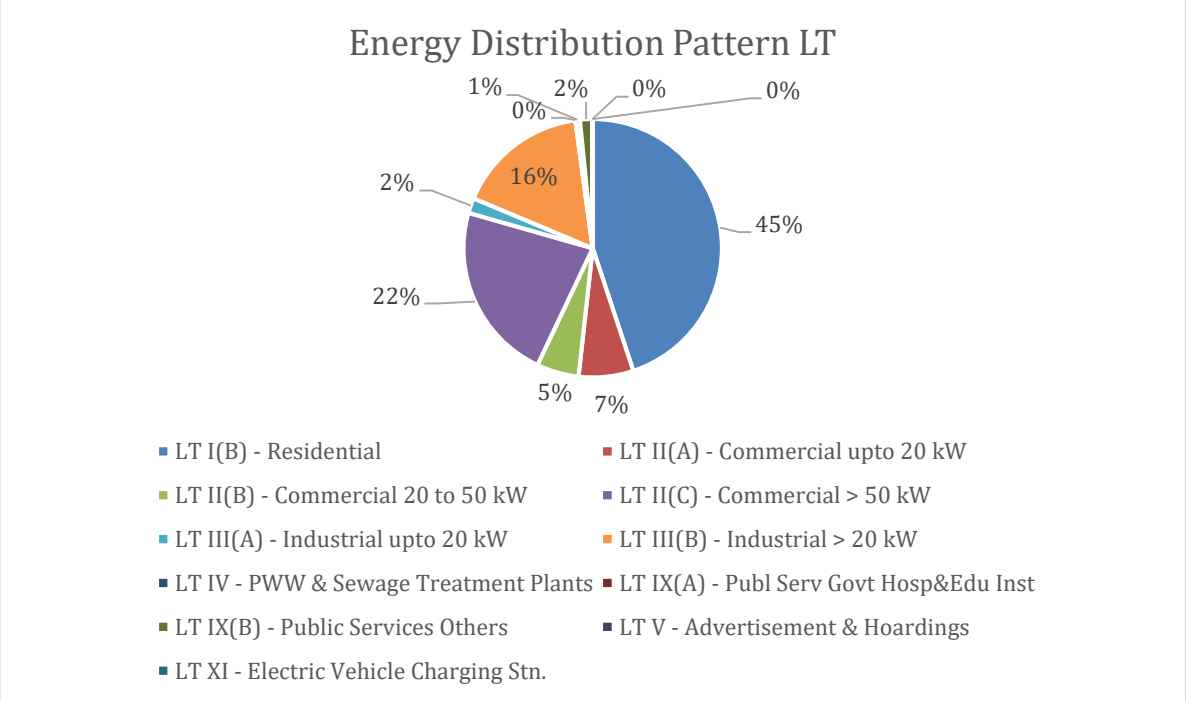


Figure 2 Distribution of energy

The Consumption of the HT consumers is 66% and of that LT is 34%.

7.2 Verification of accounted energy flow

Energy details submitted to BEE by Tata Power have been verified from the various systems deployed at Tata Power. Following are the observations.

7.2.1 Input energy flow analysis at T<>D Interface locations:

Tata Power distribution network had no internal generation. The Solar generation within its periphery was also less. So, quantum of exported energy in transmission grid was very less hence it is neglected. The Input energy share in MUs drawn from 301 T<D interface points at various voltage levels are given in the following chart.

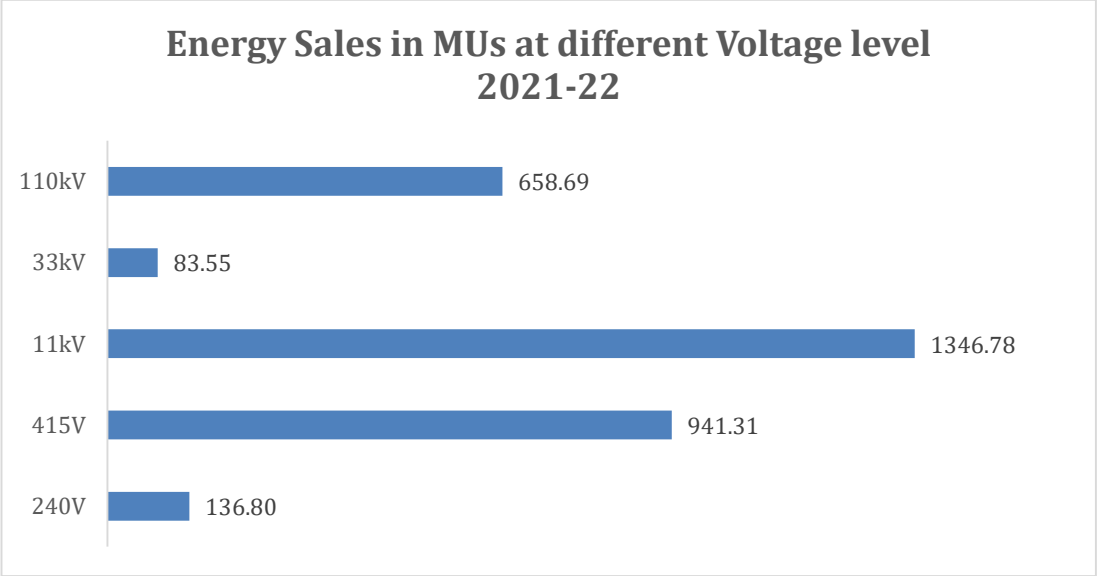


Figure 3 Imported /Input Energy of TPC-D

7.2.2 T<>D Boundary meter details:

Tata Power (TPC-D) has installed 0.2s class SEM/ ABT meters in series with STU owned ABT meters on all the T<>D interface locations. Total 301 Feeders at T<>D level are injecting energy into the Tata power distribution network for year 21-22. Voltage level wise feeder meter break up is given in the following table.

Table 9 Voltage wise feeder

Sr. No	Voltage level /Import meters	Quantity
1	0.415	10
2	3.3	2
3	6.6	2
4	11	4
5	22	184
6	33	84
7	110	15
	Grand Total	301

The site visit was carried out to ascertain the meter number and the input serial number of the meter. Physical verification along with system data was verified.

7.2.3 Energy accounting verification at EHT level (>66kV):

In FY22, Tata power had 9 EHT feeders at 110 kV. All these feeders are feeding directly to EHT consumers in radial manner. Energy at T<>D periphery and consumer sales have been verified which were 658.69 MUs and 658.69 MUs respectively. The loss is negligible.

7.2.4 Energy accounting verification at 33 kV level:

Tata Power received 100.98 MUs at 33kV level. In tata Power distribution network energy received at 33kV level is either fed directly to consumers at 33kV level or is fed to distribution network by stepping down at distribution substation mainly at 11kV or 6.6 kV.

Two samples of energy sold at 33kV level with radial network were analyzed as given below.

Table 10 33kV level consumer

Sr No	Consumer Detail	Input energy at T<>D Level	Energy Sold	%Loss
1	33kV Railways at Andheri	2867040	2846880	0.70%
2	33 kV GPX-II	17064000	17048790	0.09%
	Total	**19931040**	**19895670**	**0.18%**

Note: The above data is for year 2021-22.

Further, overall 33kV loss considering the energy fed to DSS could not be concluded due to complexity of the network limits the estimation of unavailable meter data.

7.2.5 Energy accounting verification at 22 kV/ 11 kV/6.6 kV level:

Tata power has received 1729.65 MUs at voltage levels between 22kV to 6.6 kV level in the auditing period. Further part of this energy is sold at the respective voltage level and partly it is fed to DTRs through ring network. Few samples of 22kV and 11kV radial networks were examined and results are as under.

Table 11 Verification of consumer at 22kV and 11kV

Sr No	Consumer Detail	Input energy at T<>D Level	Energy Sold	%Loss
1	22kV BMC at Ghatkopar	5585248	5595735	-0.19%
2	11kV RCF	101967050	101432000	0.52%

From the sample analysis it is found that the loss level at 22kV/11kV/6.6kV losses are less than 1%.

7.2.6 Energy accounting verification at LT (0.415 kV) level:

Tata Powers LT network is complex and not radial network. It is difficult to accurately calculate individual DTR wise loss due to following reasons.

1. There are tie cables between DTR LTPs in Tata power LT network, to ensure continuous power supply to consumers.
2. Consumer load is shifted frequently to different DTRs using the network redundancy to meet DTR maintenance/ network maintenance purpose. Thus, individual DTR loss calculation and monitoring is not possible.

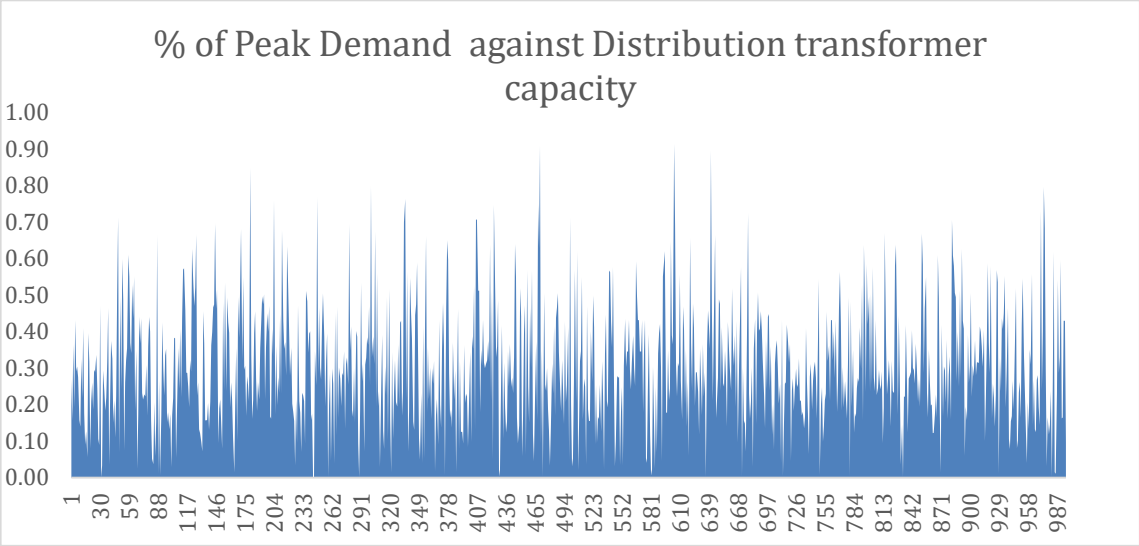
Hence Tata Power is calculating and monitoring DTR group wise loss on monthly basis.

Some of the DT groups losses have been verified during site visits which are listed below.

Table 12 Below 11kV loss verification

Source S/S Name	Substation No	Consumer Meter Count	DTR Check meter	DTR meter Consumption	Consumer Consumption	% DT Loss
Ventura	307	30	SC001374	40920	40981	-0.14907
Adonia	896	108	LCD01644	75436	73527	2.530622
Godrej Two	1516	8	LCD02258	97380	92581	4.928117
Municipal Mat Home & Hosp	1194	316	LCD00221	40736	39338	3.431854
Marathon Concord	341	69	SC001285	10900	10740	1.46789
Gorkap Properties	907	129	SC002574	33960	34384	-1.24853
Mangal Moorti	680	1110	SC001386	152800	142148	6.971204

Source S/S Name	Substation No	Consumer Meter Count	DTR Check meter	DTR meter Consumption	Consumer Consumption	% DT Loss
Kensington EXT	303A	11	LHD00159	88252	86678	1.783529
Yogayatan Ports	1026	1	LCD00513	17468	16810	3.766888
Reliance Enterprises	978	256	LCD00373	37940	37862	0.205588
NIBR Corporate Park	1036	251	LCD00643	97332	98429	-1.12707
Shushrusha Hospital	1357	43	LCD01491	12758	13164	-3.18232
Chilkur Balaji	880	44	SC001540	8800	8652	1.681818



The data of 998 DTR meter is reviewed and the peak demand of 54% of those DTR were below 30% of their respective capacity.

7.2.7 Conclusion:

From the analysis, following things can be concluded.

1. Overall distribution loss of Tata Power is less than 1%
2. From the analysis, it is observed that LT network and LT consumer base is gradually increasing and thus distribution loss will increase in future.
3. There is opportunity for improvement for proper energy accounting by doing following activities.
    a. Ensuring meter data availability of all the meter in SAP system.
    b. Replacement of faulty meters at earliest if any

c. Installing meters on few unmetered DTRs if any
d. Ensuring 100% DTR meter readings

7.3 Verification of periodic Reports

Quarterly, Yearly and End of Cycle (EoC) Data Reports by DCs (2021-22)

Tata Power has submitted quarterly and yearly data to BEE in formats provided by BEE. Those reports have been verified. Tata Power has systems like AMR system-eWatch for monitoring and analysis of T<>D input energy, SAP reports for Sales data and e Auditor tool developed in GIS. Data validated from these systems.

7.3.1 Monthly energy consumption data of consumers

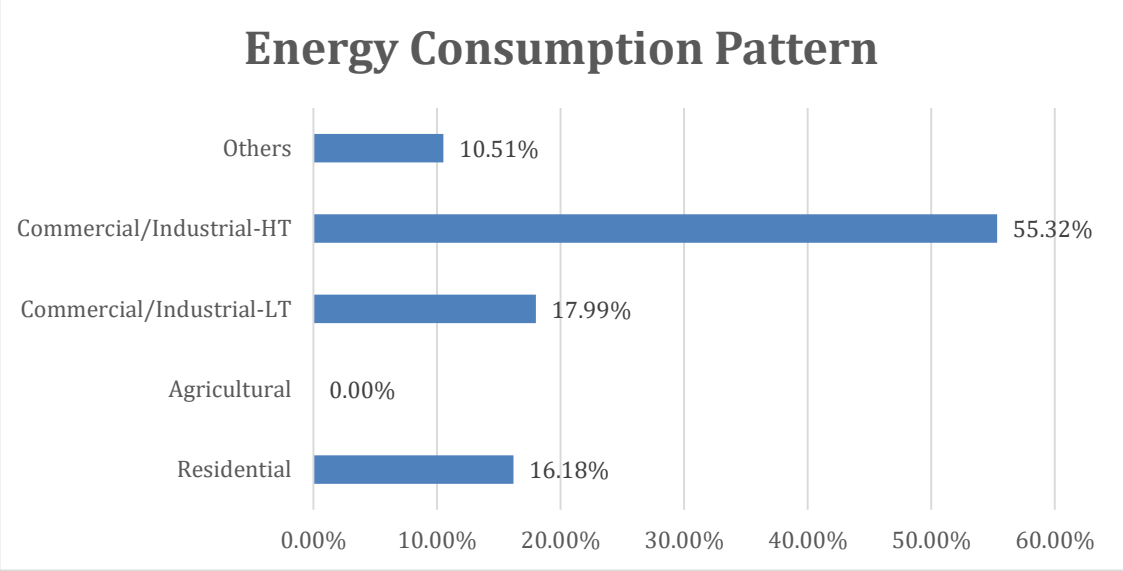


Figure 4 Energy Consumption Consumer Category wise

Review of the current consumption practices in order to identify the energy loss in the system was carried out. The major energy consumption is by the Commercial/Industrial consumer for HT consumers which is 55.32% followed by commercial/Industrial consumer which is 18 %.

For LT consumer's major energy consumption is of residential consumer which is 16.18%

The changeover consumer data is not considered as O&M of network is not under Tata-Power-D for those consumers.

7.3.2 Source of energy supply (e.g. electricity from grid or self-generation), including generation from renewables

Generation and Transmission interface points are in Tata Power's Trombay thermal generating station, hydro generating stations at Khopoli, Bhira and Bhivpuri.

Transmission and Distribution interface points are in Tata Power's receiving stations located in Mumbai MMR region. Transmission and Distribution interface locations are feeding electricity to power distribution networks of TPCD, BEST, OTHER DISCOM, MSEDCL, 110kV Railways, in Mumbai MMR region.

All these meters are integrated in a web-based AMR software known as eWatch SS supplied by M/s Secure meters ltd.

eWatch SS has total 18 different types of reports for in depth analysis of meter data and meter events. 15 min load profile data, daily midnight snapshots, daily feeder wise consumption, Virtual grouping (group of meters/all meters of one utility sums up to be one meter) reports, feeder wise events are some of the key reports.

Tata Power uses eWatch ss software for load forecasting, monitoring and energy audit purpose. This data is also being shared on weekly basis with SLDC for DSM data validation with STU main and check meters.

For distribution loss calculation, Input energy to TPCD network is calculated by summating energy of all the feeder meters allocated to TPCD from eWatch ss and further adding energy from 8 metering locations which are being fed by other discom transmission network to TPC distribution network which are not covered in eWatch ss system (Data is being received on monthly basis by other discom-T division in MRD file format)

8 Critical Network Analysis

The document verification and reports submitted by the TPC-D provided the insights to the energy consumption pattern The major energy consumption is by the Industrial consumer for HT consumers.

The peak demand of the network has increased from 510 MW in 2021 to 605.39 MW during period FY2022 . As major clients of TPCD are Commercial and Industry and since the weather, changes are minimum, the peak demand month wise has less fluctuation.

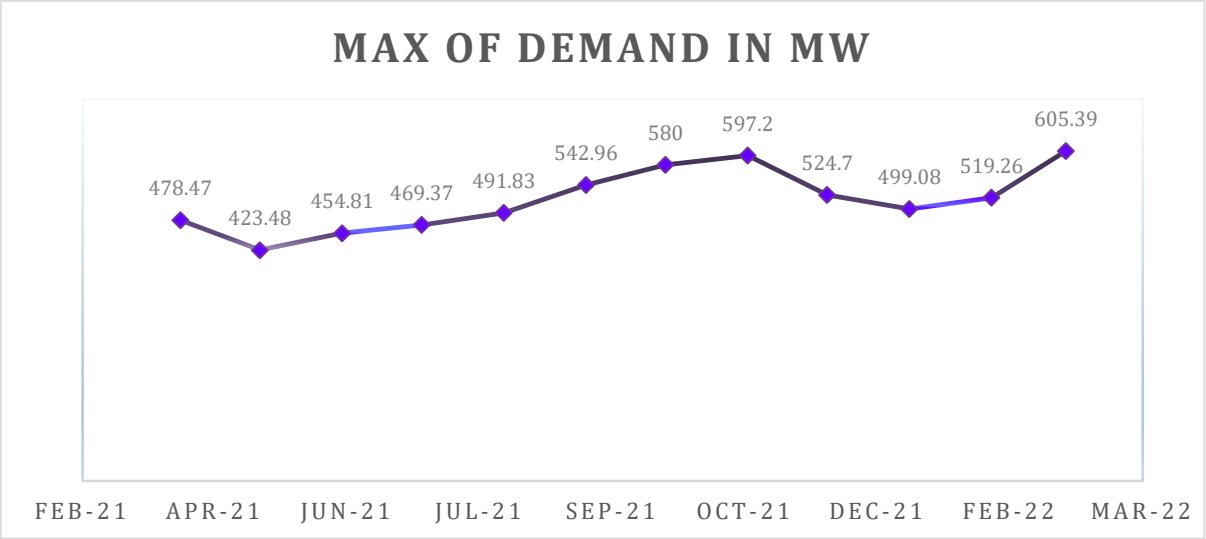


Figure 5 Max demand of TPC-D Month wise

SCADA System is used for the network monitoring and fault location analysis. During audit it was observed that every substation (DSS) had meters installed on outgoing feeders to measure power flow however energy meters are not available. Load flow data of few of the feeder meters were not visible in SCADA due to either faulty meter or meter communication issue. Hence, the energy balance analysis of the substation based on SCADA meters has a limitation.

8.1 Assessment Year Scenario

8.1.1 Input energy for 2021-22

The injected energy is measured at the Generation station. Generation and Transmission interface points are in Tata Power's Trombay thermal generating station, hydro-generating stations at Khopoli, Bhira and Bhivpuri.

Transmission and Distribution interface points are in Tata Power's receiving stations located in Mumbai MMR region. Transmission and Distribution interface locations are feeding

electricity to power distribution networks of TPCD, BEST, Other Discom, MSEDCL, 110kV Railways in Mumbai MMR region.

Table 13 Input energy

DC	Type	Assessment Net Input Energy Consumption (MU)	Remarks
TPC-D	DISCOM	4931.70	Total Energy purchased by TPCD. It totals of Direct consumer as well as consumer on distribution network of Other Discom
		3199.26	Energy derived for the consumer which is Directly connected TPCD network

Total of 290 location inject energy into the system at various voltage level. The 8 number are on other discom and the energy of this are collected monthly through MRD files.

8.1.2 Billed energy 2020-21

All the consumer of the TPCD are metered and the billed energies of direct consumers are shown below. Total number of consumer of TPCD are 760173 of which 191620 are direct consumer of TPCD. Other are Welcome and Switch over consumer.

Table 14 Billed energy

Sr. No	Direct Consumer Billed Energy (MU)	Data Source
1	3199.26	As per the submitted data by the TPCD team and cross checked by AEA by data extraction from the SAP system (Summation of Direct +Switch over Consumers)

The major energy consumption is by the HT consumers which is 64% followed by LT Consumer which is 34%.

For LT consumer's major energy consumption is of residential consumer which is 45%.

8.2 Distribution Loss calculation

The distribution network of TPCD is ring main. The feeder level energy audit is not yet performed by TPCD. The distribution loss calculation, Input energy to TPCD network is calculated by summating energy of all the feeder meters allocated to TPCD from e-Watch system and further adding energy from 8 metering locations which are being fed by other discom transmission network to TPC distribution network which are not covered in eWatch ss system (Data is being received on monthly basis by other discom-T division in MRD file format).

The input energy for the loss calculation at 33kV and 110kV is summation of metered energy of respective voltage level.

Table 15 Input Mus voltage by bifurcation

Sr.No	Voltage level	Energy Sales Particulars	MU
i	LT Level	DISCOM' consumers	1,076.38
		Demand from open access, captive	0.00
		Embedded generation used at LT level	
		Sale at LT level	1,076.38
		Quantum of LT level losses	0.00
		Energy Input at LT level	899.75
ii	11 kV Level	DISCOM' consumers	1,348.50
		Demand from open access, captive	170.36
		Embedded generation at 11 kV level used	
		Sales at 11 kV level	1,518.87
		Quantum of Losses at 11 kV	32.67
		Energy input at 11 kV level	1,551.54
iii	33 kV Level	DISCOM' consumers	83.55
		Demand from open access, captive	18.28
		Embedded generation at 33 kV or below level	
		Sales at 33 kV level	101.83
		Quantum of Losses at 33 kV	0.00
		Energy input at 33kV Level	101.83
iv	> 33 kV	DISCOM' consumers	658.69
		Demand from open access, captive	7.16
		Cross border sale of energy	
		Sale to other DISCOMs	
		Banking	
		Energy input at > 33kV Level	665.85
		Sales at 66kV and above (EHV)	665.85
Sum of all the input Energy is total Energy Requirement			**3,395.60**
Sum of all the sales Energy is total Sales Energy			**3,362.92**

The open access energy is subtracted from the 323.03 MUs from the total Input energy and sales energy, the net input energy is **3,362.92MUs.**

Table 16 Open Access MUs

Sr. No.	Open Access, Captive	Input (in Mu)	Sale (in MU)
i	LT		0.00
ii	11 kV	170.82	170.36
iii	33 kV	18.33	18.28
iv	> 33 kV	7.18	7.16

Table 17 Transmission and Distribution loss

	Billed energy (MU)			Percentage of energy consumption	T&D loss (MU)	T&D loss
Input energy (MU)	Metered energy	Unmetered/ assessment energy	Total energy			
3199.26	512.44	0.00	512.44	16.18%	32.14	**1.00%**
	0.00	0.00	0.00	0.00%		
	569.85	0.00	569.85	17.99%		
	1752.08	0.00	1752.08	55.32%		
	332.75	0.00	332.75	10.51%		
3199.26	**3167.12**	**0**	**3167.12**	**100.00%**	**32.14**	**1.00%**

From the above table it is clear the T&D loss is 1 %.

8.3 Below 11kV Loss

The meters available at the 11/0.433 kV transformer are 100% but since the LT network is not radial, it is very challenging to access the energy loss. The network of TPCD when screened through GIS, showed few Distribution network acts as radical for slum areas and hence those Network segments were used for the LT level Loss calculation.

Table 18 Sample verification of LT Distribution loss

Source S/S Name	Substation No	Consumer Meter Count	DTR Check meter	DTR meter Consumption	Consumer Consumption	% DT Loss
Ventura	307	30	SC001374	40920	40981	-0.14907
Adonia	896	108	LCD01644	75436	73527	2.530622
Godrej Two	1516	8	LCD02258	97380	92581	4.928117
Municipal Mat Home & Hosp	1194	316	LCD00221	40736	39338	3.431854
Marathon Concord	341	69	SC001285	10900	10740	1.46789
Gorkap Properties	907	129	SC002574	33960	34384	-1.24853

Source S/S Name	Substation No	Consumer Meter Count	DTR Check meter	DTR meter Consumption	Consumer Consumption	% DT Loss
Mangal Moorti	680	1110	SC001386	152800	142148	6.971204
Kensington EXT	303A	11	LHD00159	88252	86678	1.783529
Yogayatan Ports	1026	1	LCD00513	17468	16810	3.766888
Reliance Enterprises	978	256	LCD00373	37940	37862	0.205588
NIBR Corporate Park	1036	251	LCD00643	97332	98429	-1.12707
Shushrusha Hospital	1357	43	LCD01491	12758	13164	-3.18232
Chilkur Balaji	880	44	SC001540	8800	8652	1.681818

Table 19 sample 2 LT Loss

Source S/S Name	Substation No	DTR Check meter	DTR meter Consumption	Group No	No of building supplied	Consumer Meter Count	Sales	Loss	% DT Loss
Ventura	307	SC001374	40920	6011	2	30	40981	-61	-0.15
Adonia	896	LCD01644	75436	6079	2	108	73527	1909	2.53
Godrej Two	1516	LCD02258	97380	6114	1	8	92581	4799	4.93
Municipal Mat Home & Hosp	1194	LCD00221	40736	6091	1	316	39338	1398	3.43
Marathon Concord	341	SC001285	10900	6062	1	69	10740	160	1.47
Gorkap Properties	907	SC002574	33960	6081	3	129	34384	-424	-1.25
Mangal Moorti	680	SC001386	152800	6070	69	1110	142148	10652	6.97
Kensington EXT	303A	LHD00159	88252	6105	1	11	86678	1574	1.78
Yogayatan Ports	1026	LCD00513	17468	6088	1	1	16810	658	3.77
Reliance Enterprises	978	LCD00373	37940	6086	1	256	37862	78	0.21
NIBR Corporate Park	1036	LCD00643	97332	6089	4	251	98429	-1097	-1.13
Shushrusha Hospital	1357	LCD01491	12758	6097	2	43	13164	-406	-3.18
Chilkur Balaji	880	SC001540	8800	6077	6	44	8652	148	1.68

The network length of the 11kV Level and transformer location are near to load centers. The HT/LT ratio is 1.194 only .

The distribution loss calculation as per the revised method for Tata Power is as follows

Table 21 Distribution loss of Tata Power Mumbai - D

Particulars		Unit	Value
Input Energy including Direct + CHO	(A)	MU's	4931.70
TPC-D Input At Transmission interface	(B)	MU's	3507.12
Transmission Loss @ 3.18%	(C)	%	3.18%
TPC-D Input at T & D interface	(D)	MU's	3395.60
TPC -D Sale	(E)	MU's	3362.92
TPC- T & D Loss	(F = B-E)	MU's	144.20
Distribution Loss	(G = D-E)	MU's	32.67
T& D Loss %	(H = F/B %)	%	4.11%
Distribution Loss %	(I = G/D %)	%	0.96%

8.4 AT&C Losses Computation in Tata Power

Total unit received is computed from the actual meter readings of the interface meter installed at various locations in the system. The units billed are calculated as actual billed to various categories of the consumers.

Determination of Aggregate Technical and Commercial losses (AT&C) involve calculation of T&D Loss (%) as difference between input energy and units billed.
Where T&D loss: $(UI–UB)/\ UI\ \%$

UI: Units Input (excluding units traded)

UB: Units Billed (to consumers in its licensed area)

- Billing Efficiency = 1- T&D Loss
- Collection efficiency as the ratio of amount collected to amount billed.
- Collection efficiency: (Amount Realized/ Amount Billed) %
- AT&C loss as difference between units input and units realized.

AT & C Loss: [1- Billing Efficiency X Collection Efficiency] X 100%

Table 22 AT&C Loss

Consumer profile		Commercial Parameter			AT & C loss (%)
Consumer category	No of connection metered (Nos)	Billed Amount in Rs. Crore	Collected Amount in Rs. Crore	Collection Efficiency	
Residential	163385	453.97	457.74	100.83%	
Agricultural	0	0.00	0.00	0.00%	
Commercial/Industrial-LT	27298	572.30	579.42	101.24%	
Commercial/Industrial-HT	293	1638.25	1644.44	100.38%	
Others	644	120.26	106.82	88.82%	
	191620	**2784.78**	**2788.42**	**100.13%**	**0.88%**

The total loss of the TPC-D is 0.88% for the year 2021-22

8.5 Recommendations

The Typical Tata Power network layout is given below which depicts the network complexity at various voltage levels.

- It is observed that Tata power Mumbai distribution network is very complex at all voltage levels due to ring structure, so individual feeder wise and individual DTR loss calculation is difficult and will not be accurate. However, voltage level wise loss calculation is possible and can be done using following table and formula.

Table 23 Recommendation for loss calculation

Voltage Level	Input Energy (Ei)	Output Energy (Eo)	%Loss = (Ei-Eo)/Ei
>66 kV	E_{110}	C_{110}	
33 kV	E_{33}	$C_{33} + D_{33/X}$	
22 kV	E_{22}	$C_{22} + D_{22/X}$	
11 kV	$E_{11} + D_{X/11}$	$C_{11} + D_{11/X}$	
6.6 kV	$E_{6.6} + D_{X/6.6}$	$C_{6.6} + D_{6.6/X}$	
3.3 kV	$E_{3.3} + D_{X/11}$	$C_{6.6} + D_{6.6/X}$	
0.415 kV	$E_{0.415} + D_{X/0.415}$	$C_{0.415}$	

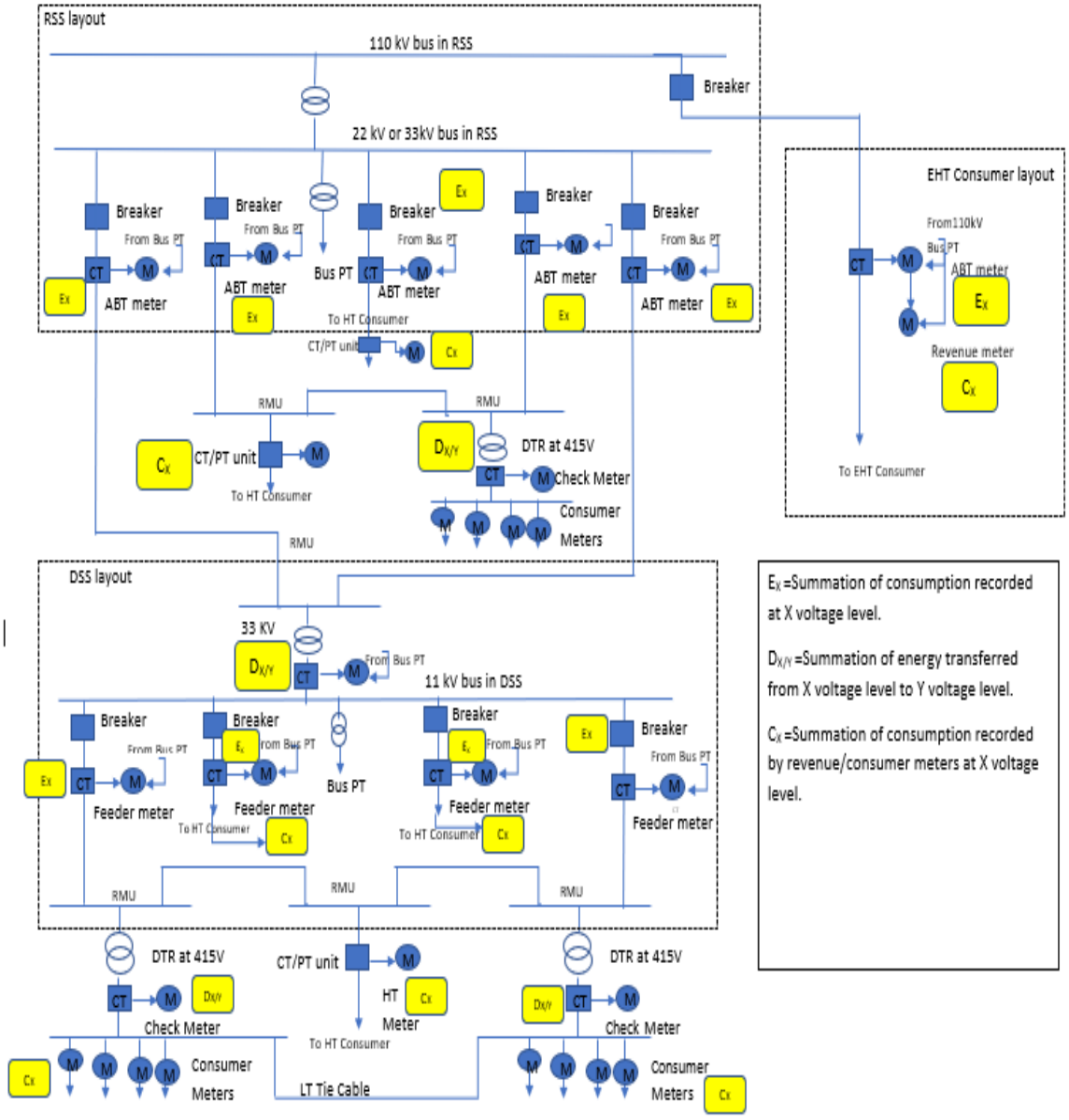


Figure 1 TPC-D Network Complexity

- Also, instead of feeder wise and DTR wise loss calculation, loss calculation and monitoring can be done by grouping all the feeders or DTR forming a ring.
- Tata power can also do DSS wise energy balance for conformity of proper energy accounting.
- The system-based reports for loss calculation at 33/22/11kV voltage level needs to be further improved and monitored from energy audit perspective.
- Metering is to be ensured for all the DSS feeders and DTR in the phase manner by commissioning balance meters. Faulty meters need be replaced if any.
- Readings of all the meters are to be ensured and updated in SAP system for each month.

9 Energy Conservation Schemes

The Transmission and Distribution losses of TPC-D are very low only 1% which is due to The major energy consumption is by the Industrial consumer for HT consumers which is 64%.

The A&TC Loss is 0.88% were as the distribution loss is 0.96% (Refer table no 21) as per the revised loss calculation method as were the T&D loss is 1% as per the BEE division wise sheet.

Since the loss level is very less, the TPC-D has initiated the customer oriented schemes like KNOW YOUR CONSUMPTION. They intimate the consumer well before time, if there consumption is going to surpass above the monthly average.

Hence further loss reduction measures are not under undertaken by TPC-D. However, The Demand Side Management have been initiated by TPC-D in order to reduce the demand by use of energy efficient equipment's.

As the residential consumer consumption will increase, the loss is expected to increase of TPC-D in future.

The Smart meters are implemented for consumer of different types are follows

Table 24 Smart Meter installation status

Total consumer	191620
Number of conventional metered consumers	126411
Number of consumers with 'smart' meters	41085
Number of consumers with 'smart prepaid' meters	2
Number of consumers with 'AMR' meters	23787
Number of consumers with 'non-smart prepaid' meters	
Number of unmetered consumers	
Total consumer with Smart/Amr Meters	64874
Percentage of Consumer with Smart meters	34%

From the above table, it is clear that, 34% of consumer have smart meters. The consumption of single part consumer (kWh billing consumers) is not more than 16% (Residential LT I (B)).

The smart meter's consumers are right now billed as per the cyclic method i.e., the consumer are divided in the sections as per travel plan of meter reader. These consumers are billed from 5 to 28 of every month. The particular section of the consumers is billed on the 30th day.

TPC-D has a plan to convert the consumer meters into smart meters in near future.

Thus 100% smart meters with historical data storage facility on day of the every month, will lead more accurate energy audit of the TPC-D and it will further reduce the billing loss.

10 Annexure

1. General Information
2. Minutes of Meeting with the DISCOM team
3. Check List prepared by auditing Firm.
4. Form-Input energy (Details of Input energy & Infrastructure
5. Infrastructure Details
6. Power Purchase Details
7. Details of Input Energy Sources
8. Details of Consumers & Category of service details (With Consumer and voltage-wise)
9. Details of Division Wise Losses (See note below**)
10. Performance Summary of Electricity Distribution Companies
11. List of Parameters arrived through calculation or formulae with list of documents as source of data
    - Above 11kV line loss
    - 33/11kV Substation loss
    - At 11kV Line loss
    - Below 11kV Line loss
12. Detailed Site visit annexed
    1. Site photos

10.1 Data Gaps raised by AEA

Table 25 Data Gaps

Sr. No	Data Gaps in the Data provided by TATA-POWER D for Annual Energy Audit as per BEE regulation 6th Oct 2020	Remarks
1	Kindly provide the identification and mapping of all of the electrical network assets;	GIS maps were received for the network understanding
2	Kindly provide the identification and mapping of high tension and low-tension consumers	GIS MAPS Used by TPC-D
3	Kindly provide the details of the energy accounting data - generated from a metering system or till such time the metering system is not in place, by an agreed method of assumption as may be prescribed by the State Commission	Metering is provided and BIS system as per tariff category
4	Whether the Metering of distribution transformers at High Voltage Distribution System up to 25KVA is done on cluster metering? If not what is the action plan	No HVDS installation
5	Kindly provide details of energy accounting and audit system and software developed to create monthly, quarterly and yearly energy accounting reports	eWatch is used for the Input Energy. SAP is used for the consumer data
6	Every electricity distribution company shall provide the details of the information technology system in place as specified in clause (f) of regulation 5 that ensures minimal manual intervention in creating the energy accounting reports and any manual intervention of any nature, in respect of the period specified therein, shall be clearly indicated in the periodic energy accounting report.	same as above
7	Energy (Electrical) Purchase report for the year 2020-21	
8	Open access consumer and their details	Data provided by TPC-D
9	Peak Demand of the system	Peak demand of TPC-D is provided
10	Feeder /Division wise Peak demand	Peak demand of TPC-D is provided
11	High loss Network segments	The segment identification is not possible due to ring main.
12	Energy Conservational Schemes implemented	Data provided by TPC-D
13	Energy conservational Schemes to be implemented	Data provided by TPC-D
14	Tata Power Distribution Transformer	Data provided by TPC-D
15	SAIDI SAIFI Data for 2020-21	Data provided by TPC-D
16	Maintenance practices - Tata Power Substation , HT lines LT lines and C/S/S	Data provided by TPC-D
17	Average Billing Rate	Category wise consumer and total billed energy of those consumer is provided by TPC-D