Annual Energy Audit Report of APEPDCL FY 22-23

Designated Consumer
Registration No.: - DIS0001AP

Andhra Pradesh Eastern Power Distribution Company Limited

APEPDCL, Seethammadhara Rd, TPT Colony, P & T Colony,

Balayya Sastri Layout, Seethammadhara, Vishakhapatnam,

Andhra Pradesh, India-530013

Conducted by

M/s Zenith Energy Services Private Limited,

3rd Floor,C1, Space&moreBusiness Park1-89/A/8/C2 VitalRao Nagar, Hyderabad-500 081, Telangana State,India.

July– 2023

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I. ACKNOWLEDGEMENT

Zenith Energy Services Private Limited (ZESPL), Hyderabad (an EmAEA by BEE) expresses its sincere gratitude to the management of "Andhra Pradesh Eastern Power Distribution Company Limited (APEPDCL)"for giving them an opportunity for conducting the "Annual Energy Audit" 2022-23.Our special thanks go to the following APEPDCL officials for their whole-hearted support and the excellent cooperation extended to the Energy Audit team from ZESPL.

Smt. D.Suman Kalyani	CGM&Plant Head (RA&P.P)
Shri. K.Chalapathi Rao	General Manager (Energy Audit)
Shri.V.S.V.Ramana Murthy	Executive Engineer (Energy Audit)
Shri. V.Ravi Sankar	Energy Manager (Energy Audit)

ZESPL also wishes to thank all other executives and staff of APEPDCL Vishakhapatnam for their active involvement, providing all the data connected to the audit, and sharing their experience on the implementation of energy conservation measures in APEPDCL.

R. GOPALA KRISHNA
Accredited Energy Auditor
(B E E) EA-0432, AEA-0123

ENERGY AUDIT TEAM
ZENITH ENERGY SERVICES (P) LIMITED

II. STUDY TEAM

S. No	Name	Qualification	EM/EA/AEA/EmAEA Registration No	Experience (In Years) EE/ Sector
Accredited Energy Auditor				
1	Shri. R. Gopal krishna	B.E-Mechanical Engineering	AEA-0123	45
Certified Energy Auditor/ Manager				
2	Shri.R. Sasidhar	B.E-Mechanical Engineering	CEA-7970	30
3	Shri.Kotha Veeresh	B.E-Electrical Engineering	EA-34649	7
DISCOM Sector Specialist				
4	Shri. S. Veera Swamy	M. Tech- Power Systems	DISCOM Sector Expert	40
5	Shri Ch.Shankar Satya Sai	M.Tech, Power Electronics	Senior Electrical Engineer	6

1 EXECUTIVE SUMMARY

1.1. Introduction

As per BEE Notification No 18/BEE/DISCOM/2021 dated 6th October 2021 every energy Distributing Company shall conduct an annual energy audit for every financial year and submit the annual energy report to the BEE and SDA and also made available on the web site of the electrical distribution company within a period of four months from the date of expiry of the financial year.

In order to evaluate various critical parameters like T&D losses, Collection Efficiency, ATC Losses etc. BEE has developed a Sector Specific Pro forma on 02-02-2022 and distributed the same to the eligible DISCOMs.

1.2. Details of Energy Purchased, Net Input Energy % of Losses

As per the Energy accounting pro forma submitted by APEPDCL for the FY 2022-23 the details is as under.

a) The gross energy purchased by APEPDCL from all the generating sources put together is 28366.305 MU.
b) Exchange sales is 643.421 MU
c) The Net energy purchased by APEPDCL from all the generating sources put together is 27722.884 MU. The same value is entered in the Energy Accounting Proforma.
d) The net input energy at DISCOM (After adjusting the transmission losses and energy traded) is 26944.84 MU.
e) The total Energy Billed is 25344.21 MU.
f) The Distribution Loss for the AY 2022-23 is 1600.63 MU.
g) The % of Distribution Losses is 5.94%
h) The billing efficiency is 94.06%

All the above data is also verified from the 23rd Annual report published by APEPDCL in July for the FY 2022-23.

1.3. Percentage of transmission and distribution losses

The Percentage of Distribution Losses incurred by APEPDCL during the FY 2020-21, 21-22 and 22-23 is shown as under.

Financial Year	2020-21	2021-22	2022-23
D Losses (%)	6.62	6.60	5.94

From the above figures it is evident that the Distribution Losses have shown decreasing tendency in each financial year and the ECMs (Circle wise Technical and Commercial Action Plan for the years 2020-21 to 22-23) implemented by APEPDCL during 2021-22 &2022-23 are enumerated in the latter chapters. All the documents were signed by the head of the department of the respective circles.

1.4. Critical comment

Each parameter in the Pro forma is verified the from the certified documents provided by APEPDCL and also cross checked from the Data furnished by APPCC/Transco for FY 2022-23. The data furnished is also verified from the 23rd Annual Report published by APEPDCL in July 2023.

1.5. Comment on Metering of DTs

1.5.1 As intimidated by APEPDCL and as per the infrastructural details made available in the Energy Accounting Pro Forma, out of 2,97,503 no's DTRs 27151 DTs are provided with communicable meters but due to defective modems, communication is not available and hence 11 kv and LT combined loss arrived. Providing of communicable meters to all the DTs is covered under RDSS Scheme.

Due to non-availability of conventional meters in the DTs and non-functioning of Communicable meters provided on 27151Nos Transformers the losses in the LT Side could not assessed and taken as zero and total sales were added to 11 Kv sales to evaluate the distribution losses.

1.5.2 APEPDCL has provided the information about the extent of DTs to Feeders and Consumers to DTs mapping achieved so far and is enclosed at Annexure 3

Empaneled accredited energy auditing firm [EMAEA] – an overview

Name of the Firm :M/s Zenith Energy Services (P) Ltd, Hyderabad

Registration No of the Firm :EmAEA – 011

Registration No. of the Lead AEA: R Gopala Krishna (AEA –0123)

Other BEE empaneled AEA/ CEA/ DISCOM sector Expert

S.Veera Swamy- Discom Expert

Y. Venkateswarlu - CEA EA 17704

R. Sasidhar - CEA EA 7970

Zenith Energy Services Private Limited (ZESPL) is a BEE empaneled energy auditing technical consultancy organization providing techno–commercial advisory services in the areas of Energy Efficiency, Renewable Energy, and Climate Change Management(CDM) for over three decades. The company also has rich experience in conducting baseline Audits, Energy Audits for DISCOMs, Cement sector and Power sector etc. The clients include DISCOMs like TSNPDCL, MSEDCL, DGVCL, cement majors like KCP, PENNA, and KESORAM group. besides Thermal Power Plants like NCTPS Stage II, KTPS (TS GENCO)

Designated consumer – an overview

Name and Address of Designated Consumer

Andhra Pradesh Eastern Power Distribution Company Limited (APEPDCL)

Registration No.& Address

DC No.: DIS0001AP

1.5.3 APEPDCL, Seethammadhara Rd, TPT Colony, P & T Colony, Balayya Sastri Layout, Seethammadhara, Vishakhapatnam, Andhra Pradesh, India – 530013.

Name & details of Energy Auditor and Authorized signatory of DC

Details of Energy Manager	Details of Authorised Signatory
Shri. V.Ravi Sankar (Energy Manager) Reg. No: EA- 10986 Mobile : +91- 9440816383 Mail : varri.ravisankar@gmail.com	Smt D.Suman Kalyani Chief General Manager/RA&P.P Mobile : 9490618686 Mail : cgm_rac@apeasternpower.com

1.5.4 Brief Details of Andhra Pradesh Power Distribution Company Limited Andhra Pradesh Eastern Power Distribution Company Limited was incorporated on 31st March 2000 by Andhra Pradesh Transmission Corporation (APTRANSCO).

The company is involved in electricity sub-transmission distribution and retail supply in the State of Andhra Pradesh. APEPDCL mandate is to establish and use a power system network and to buy and sell electrical energy, and to implement Energy Conservation Measures for T&D loss reduction. The Andhra Pradesh Electricity Board (Re-Organization & Regulation) Act 2003 paved the way for comprehensive reform and restructuring of the State Electricity Board with an aim to restructure the Electricity Industry in a manner that will ensure the long-term viability and sustainability of the power sector in the state. As a part of the reform process, the APSEB was reorganized into several autonomous entities.

The Electricity Act 2003 introduced competition by way of open access in the transmission and distribution of electricity. The Government of Andhra Pradesh reorganized the APSEB functionally into a Generation Company, a Transmission Company and four Distribution Companies. Thereby Andhra Pradesh Eastern Power Distribution Company Limited became functional on 1st April 2000.

2. SCOPE, APPROACH AND METHODOLOGY

2.1. Scope of energy audit

The Work order given by the DC to EmAEA is attached as an Annexure -1.

2.2. Approach adopted for annual energy audit

Based on the field visit and data collection as per BEE guidelines, EmAEA prepared the annual energy audit report for the FY 2022-23 and presented it to the DC.

2.2.1. Data Review, interpretation and analysis

All the documents submitted by APEPDCL is studied in detail and after detailed scrutiny APEPDCL is requested to make additional documents (Duly certified) ready to support the data entered in the Pro forma and the final values like T&D Losses .AT&C Losses arrived at in the pro forma. APEPDCL made all the documents available by the time Zenith team visited their office.

Activity	Period
Field energy audit carried out at APEPDCL Vishakhapatnam	26-07-2023 to 28-07-2023
Post visit report preparation	29.07.2023 – 30-07-2023

2.3. Methodology adopted for Annual Energy Audit

- Discussion with the Audit team of APEPDCL regarding the plan of action for conducting Energy audit.
- Detailed study of various ENCON measures taken during 2022-23
- Verification of energy input and sales data submitted by the DC.
- Examining mandatory Forms and source documents of the data presented during the audit.

Preparation of Annual Energy Audit report for the submission. The signed copy of Energy Accounting Pro Forma is enclosed separately with a link.

2.3.1. Team Composition

The following members from Zenith Energy and APEPDCL have participated in the Annual Energy study of the DC.

ZESPL Hyderabad	APEPDCL- Vishakhapatnam
Sri. R Gopala Krishna, AEA	Sri. V.Ravi Sankar Dy EE Energy Manager
Sri R Veera Swamy DISCOM Expert	Sri. J.Angada Rao (Finance Manager & AO)
Sri. Kotha Veeresh, EA-34649	Sri. V.A.N. Srinivas (IT Manager)
Sri Ch Shankar Satya Sai, Engineer	

2.3.2. Minutes of Meeting/Verification

The audit team verified the data filled in sector specific Pro forma document by the DC with certified documents by the DC and other certified intra departmental documents and from the annual reports conducted by Independent Third-party Auditors.

2.4. Purpose of the Annual Energy Audit report

Energy Conservation Act 2001 (EC Act 2001) requires DCs to:

a) Furnish report of energy consumption to the BEE and SDA (By External Agency)
b) Designate or appoint an Energy Manager who will be in-charge for submission of annual energy consumption returns to BEE and SDA (Section 14 (l))
c) Comply with the energy conservation norms and standards prescribed under Section 14 (g) of the Act

As per BEE Notification No 18/BEE/DISCOM/2021 dt. 6th October 2021 every energy distribution Company shall conduct an annual energy audit for every financial year and submit the annual energy report to the BEE and SDA and also made available on the web site of the electrical distribution company within a period of four months from the date of expiry of the financial year. The general structure of the report shall be as under.

a) It shall be mandatory to record the energy supplied separately for each category of consumers which is being provided a separate of subsidy in the tariff by the State Government, so that the subsidy due for the electricity distribution company is

quarterly calculated by multiplying the energy supplied to each of such category of consumers by the applicable rate of subsidy notified by the State Government.

b) Provide for monitoring of input energy and consumption pattern at various levels.

c) Identify the areas of energy leakage, wastage or inefficient use

d) Identify high loss making areas and networks for initiating target based corrective action and

e) Identify overloaded segments of the network for necessary capacity addition.

f) In addition, the report shall highlight the strength and weakness of the electricity distribution company in the management of energy and energy resources in the annual energy audit report and recommend necessary action to improve upon method of reporting data. energy management system in detail along with their underlying rationale.

g) The audit report shall be signed by the AEA under the seal of its firm giving all the accreditation details along with details of manpower employed in conducting the annual energy audit.

3. INFRASTRUCTURAL DETAILS OF APEPDCL

3.1. Introduction

APEPDCL, Vishakhapatnam is responsible for Power Distribution for about 69.49 Lakh consumers in 5circles belonging to different categories as shown in the following table:

Table 1: Consumer Details

No.	Parameters	Total	Covered during in audit
i	Number of circles	5	5
ii	Number of divisions	26	26
iii	Number of sub-divisions	95	95
iv	Number of EHT Sub Stations	103	103
v	Number of feeders	4955	4955
vi	Number of DTs	297503	0
vii	Number of consumers	6944312	6944312

3.2. Statistical details of Metered Consumers

APEPDCL, Vishakhapatnam is purchasing its entire energy requirement from APTRANSCO at 11 kV, 33kV and 66kV and above voltage levels.

Table 2: Distribution Grid Details

No.	Parameters	66kV & above	33 kV	11 / 22kV	LT
i	Number of conventional metered consumers	71	144	581	6852836
ii	Number of consumers with 'smart' meters	0	0	0	0
iii	Number of consumers with 'smart prepaid' meters	0	0	0	0
iv	Number of consumers with 'AMR' meters	9	189	3690	0
V	Number of consumers with 'non-smart prepaid' meters	0	0	0	0
vi	Number of unmetered consumers	0	0	0	91476
vii	Number of total consumers	80	333	4271	6944312

3.3. Statistical data of Meters on Power Transformers and DTs

Power Transformers installed at 33/11kV substations are maintained by APEPDCL. Below is the detail of the meters provided on power transformers.

Table 3: Details of meters on power transformers and DTs

No.	Parameters	66kV and above	33kV	11/22kV	LT
i	Number of conventionally metered Distribution Transformers	0	0	0	14501
ii	Number of DTs with communicable meters	0	0	0	27151
iii	Number of unmetered DTs	0	0	0	255851
iv	Number of total Transformers	0	0	0	297503

3.4. Statistical data of feeders and meters provided on the feeders

APEPDCL, Vishakhapatnam maintains the network at 33kV and below. APEPDCL has 278no. Of 66kV& above feeders, 621 no of 33kVfeeders and 4056 no feeders of 11kV level. Details of consumers with different type of meters are tabulated as under.

Table 4:Details of Consumers with different type of meters

Sl No	Parameter	66 kV and above	33kV	11kV	LT
i	Number of conventional metered consumers	71	144	581	6852836
ii	Number of consumers with 'smart' meters	0	0	0	0
iii	Number of consumers with 'smart prepaid' meters	0	0	0	0
iv	Number of consumers with 'AMR' meters	9	189	3690	0
v	Number of consumers with 'non-smart prepaid' meters	0	0	0	0
vi	Number of unmetered consumers	0	0	0	91476
	Number of total consumers	**80**	**333**	**4271**	**6944312**

3.5. The details of Feeders

The details of Feeders at Different Voltage levels and type of meters provided on the feeders are tabulated as under.

Table 5: Details of Feeders and meters provided on the feeders

S.no	Parameters	66kV and above	33kV	11/22kV	LT
i	Number of metered feeders	278	621	4056	0
ii	Number of feeders with communicable meters	278 (MRI Compatible)	621 (MRI Compatible)	4056	0
iii	Number of unmetered feeders	0	0	0	0
iv	Number of total feeders	278	621	4056	0
d.	Line length (ct km)	92513(including AB and UG cable)			
e.	Length of Aerial Bunched Cables	0			
f.	Length of Underground Cables	1334.191			

4. ENERGY SCENARIO OF APEPDCL FOR THE YEAR 2022-23

4.1. The Energy Scenario

The Energy Scenario of APEPDCL during the FY 22-23 is tabulated as below.

Table 6: Performance Summary

S. No	Description	Units	2022-23
1	Input Net Energy Purchase	MU	27722.88
2	Net Input Energy	MU	26944.84
2	Total Sales	MU	25344.21
3	Distribution Losses	MU	1600.63
4	Distribution Losses	%	5.94
5	Collection Efficiency	%	98.83
6	Billing Efficiency	%	94.06
7	AT&C Losses	%	7.04
8	Revenue from Sale of Energy	INR Cr	18608.05
9	Collection	INR Cr	18390.01
10	Collection Efficiency	%	98.83
11	No of Consumers	No	6948996
12	Profit	INR Cr	19.695

Note: The above data is verified from the 23rd Annual report submitted by APEPDCL in July 2023.In the report the total energy purchased was shown as 28366.30 MU whereas the input energy shown was 27722.88MU. The difference is mainly gross input energy shown in the report includes open access exchange energy of 643.421 MU whereas input energy shown in the Pro forma the exchange energy is excluded.

4.2. The details of Power purchased from different sources

The details of Power purchased from different sources during the Financial 2022-23 is available in the Energy Accounting Pro forma and the total tallies with the total referred in the 23rd annual report and also statement of SLDC.

The following table shows the energy input, sales and losses at various voltage levels.

Table 7: Energy accounting Summary (voltage wise)

Energy Accounting Summary					
S.no	**Voltage**	**Input (in MU)**	**Sale (in MU)**	**Loss (in MU)**	**Loss %**
i	LT		12862.342		
ii	11 Kv+ LT	16601.936	2221.859	1517.736	9.14
iii	33 kV	2579.42626	2488.191	91.23553	3.54
iv	> 33 kV	7763.48082	7771.818	-8.33680	-0.11
S.no	**OA, Captive**	**Input (in MU)**	**Sale (in MU)**	**Loss (in MU)**	**Loss %**
i	LT	0	0	0	0
ii	11 KV	30.9262	30.9262	0	0
iii	33 kV	335.4601	335.4601	0	0
iv	> 33 kV	116.9669	116.9669	0	0

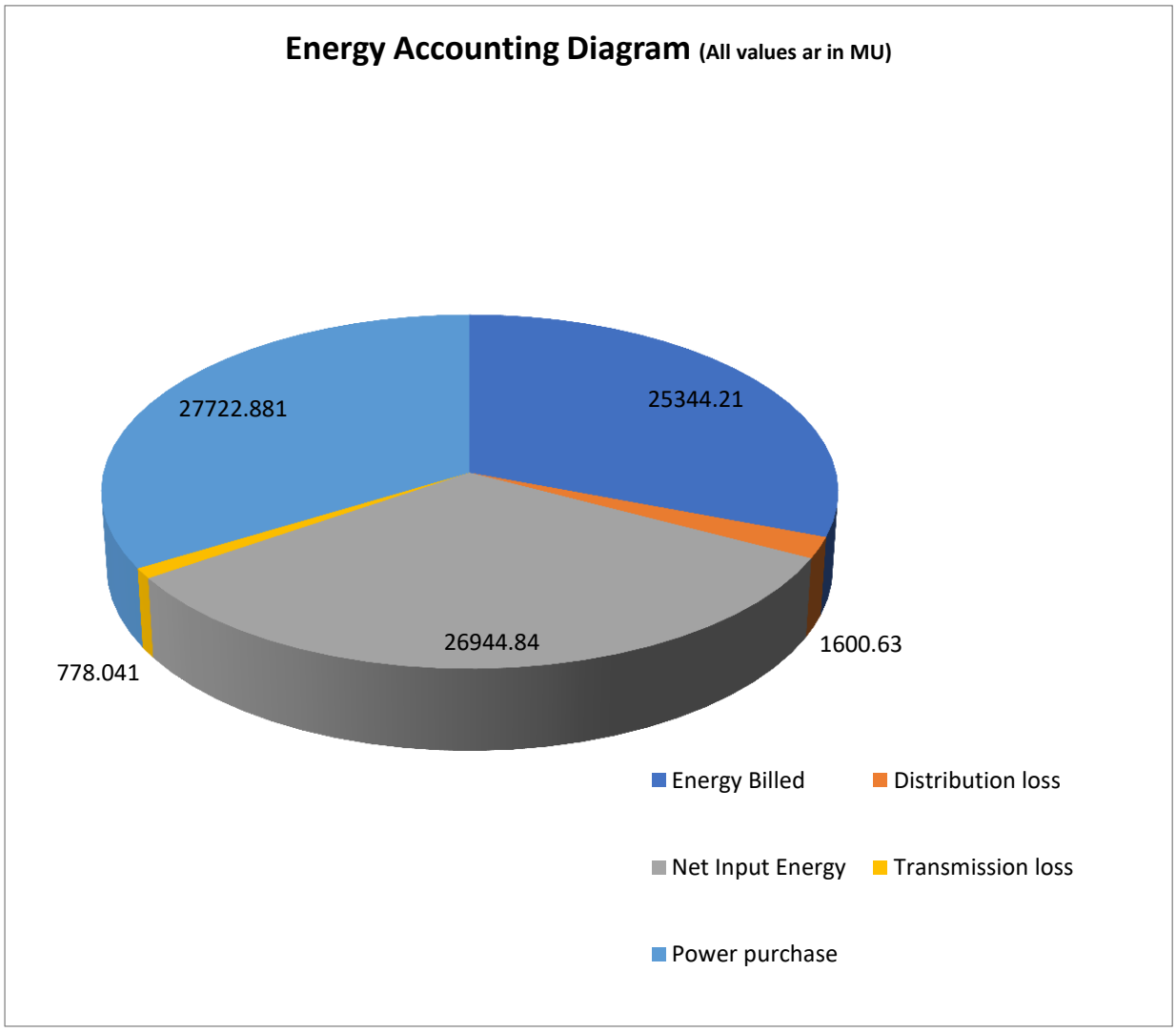
Note: Due to non-Communication of the modems of DTs the sale of Energy at LT Level is added to 11 kV level sales and then the losses at 11 kV level are evaluated. i.e 11kV Input 16601.936 MU.

11 kV +LT Sales= 2221.859+12862.342=15084.201 MU

Loss= 1517.735 MU

The Pie diagram showing the above data is shown as under

Figure 1:Energy Accounting Pie Diagram



4.3. The Energy sales particulars and loss calculations at different voltage levels

Though the input energy is arrived at feeder wise, the sales are not computed feeder wise. The sales are being computed circle wise based on the meter dumps. The Energy sales particulars and loss calculations at different voltage levels is tabulated as under.

Table 8: Voltage-wise sales, open access demand and loss

S.no	Voltage	Energy Sales Particulars	MU
I	LT Level	DISCOM' consumers	12862.342
		Demand from open access, captive	0
		Embedded generation used at LT level	0
		Sale at LT level	12862.342
		Quantum of LT level losses(Notional)	0
		Energy Input at LT level	-
Ii	11 kV Level	DISCOM' consumers	2221.859
		Demand from open access, captive	30.926
		Embedded generation at 11 kV level used	0
		Sales at 11 kV level	2252.785
		Quantum of Losses at 11 Kv(Including LT Losses)	1517.735
		Energy input at 11 kV+LT level	16632.86
Iii	33 kV Level	DISCOM' consumers	2488.191
		Demand from open access, captive	335.460
		Embedded generation at 33 kV or below level	0
		Sales at 33 kV level	2823.651
		Quantum of Losses at 33 kV	91.236
		Energy input at 33kV Level	2914.886
Iv	>66 kV	DISCOM' consumers	7771.818
		Demand from open access, captive	116.967
		Cross border sale of energy	0
		Sale to other DISCOMs	0
		Banking	0
		Sales at 66kV and above (EHV)	7889
Total Energy Requirement(Including OA Sales+3rd party sales and loss)			27436.533
Total Energy Sales(Discom sales+ Open access sales)			25344.209

4.4. Procedures for Loss Calculations

The following table provides the loss calculations

.

Table 9: Calculation Procedures for Loss Calculations

Procedure-I with actual network flow

EHT network loss calculation			
1	EHT Distribution network Input (Transco-Discom Boundary)	7880.448	MU
2	EHT Discom sales	7771.818	MU
3	EHT 3rd Party sales	15.164	MU
4	EHT Open access sales which is being adjusted to respective HT consumer recorded energy	101.80	MU
5	Total EHT sales =2+3+4	7888.785	MU
6	**EHT Distribution N/w loss =1-5**	**-8.337**	**MU**
7	**% EHT N/w loss =6/1**	**-0.11%**	**MU**
33KV network loss calculation			
1	33KV EHT SS PTRs LVs input (Transco Discom Boundary)	19367.581	MU
2	33KV Pvt. Developers connected to DISCOM grid input	179.443	MU
3	33KV import energy from neighbour DISCOM	30.290	MU
4	33KV Export energy from neighbor DISCOM	27.316	MU
5	EHT SS Station aux .consumption	7.822	MU
6	**Net 33KV Input Energy =1+2+3-4-5**	**19542.176**	**MU**
7	33/11 KV SS LVs or all 11KV Feeders recorded sent out Energy	16039.175	MU
8	33KV Discom HT sales	2488.191	MU
9	33KV 3rd Party sales including wheeled Energy	0.000	MU
10	33KV Open access sales which is being adjusted to respective HT consumer recorded energy	335.460	MU
11	33KV network output =7+8+9+10	18862.826	MU
12	33KV Network loss =6-9	679.351	MU
13	**% 33KV N/w loss =12/6**	**3.48%**	**MU**
11KV network loss calculation			
1	33/11 KV SS LVs or all 11KV Feeders recorded sent out Energy	16039.175	MU
2	11KV Pvt. Developers connected to discom grid input	1.335	MU
3	11KV Import energy from neighbor Discom	0.109	MU
4	11KV Export energy from neighbor Discom	1.006	MU
5	11KV Energy drawn directly from Genco	5.135	MU
6	**Net 11KV+LT Input Energy =1+2+3-4+5**	**16044.747**	**MU**
7	11KV Discom HT sales	2221.859	MU
8	11KV 3rd Party sales including wheeled Energy	0.000	MU
9	11KV Open access sales which is being adjusted to respective HT consumer recorded energy	30.926	MU
10	LT Discom Sales	12862.342	MU
11	11KV +LT network output =7+8+9+10	15115.127	MU
12	11KV +LT Network loss =6-11	929.620	MU
13	**% 11KV +LT N/w loss =12/6**	**5.79%**	**MU**

Procedure-II as per CEA methodology network loss statement

EHT net work loss calculation			
1	EHT Distribution network Input (Transco-Discom Boundary)	7880.448	MU
2	EHT 3rd Party sales	15.164	MU
3	EHT Open access sales which is being adjusted to respective HT consumer recorded energy	101.80	MU
4	**Net EHT Input Energy =1-2-3**	**7763.48**	**MU**
5	EHT Discom sales	7771.818	MU
6	**EHT Distribution N/w loss =4-5**	**-8.337**	**MU**
7	**% EHT N/w loss =6/4**	**-0.11%**	**MU**
33KV net work loss calculation			
1	33KV EHT SS PTRs LVs input (Transco Discom Boundary)	19367.581	MU
2	33KV Pvt. Developers connected to discom grid input	179.443	MU
3	33KV import energy from neighbour Discom	30.290	MU
4	33KV Export energy from neighbour Discom	27.316	MU
5	EHT SS Station aux .consumption	7.822	MU
6	33KV 3rd Party sales including wheeled Energy	0.000	MU
7	33KV Open access sales which is being adjusted to respective HT consumer recorded energy	335.460	MU
8	**Net 33KV Input Energy =1+2+3-4-5-6-7**	**19206.716**	**MU**
9	33/11 KV SS LVs or all 11KV Feeders recorded sent out Energy	16039.175	MU
10	33KV Discom HT sales	2488.191	MU
11	33KV net work output =9+10	18527.366	MU
12	33KV Network loss =8-11	679.351	MU
13	**% 33KV N/w loss =12/6**	**3.54%**	**MU**
11KV network loss calculation			
1	33/11 KV SS LVs or all 11KV Feeders recorded sentout Energy	16039.175	MU
2	11KV Pvt. Developers connected to discom grid input	1.335	MU
3	11KV Import energy from neighbour Discom	0.109	MU
4	11KV Export energy from neighbour Discom	1.006	MU
5	11KV Energy drawn directly from Genco	5.135	MU
6	11KV 3rd Party sales including wheeled Energy	0.000	MU
7	11KV Open access sales which is being adjusted to respective HT consumer recorded energy	30.926	MU
8	**Net 11KV+LT Input Energy =1+2+3-4+5-6-7**	**16013.821**	**MU**
9	11KV Discom HT sales	2221.859	MU
10	LT Discom Sales	12862.342	MU
11	11KV +LT network output =9+10	15084.201	MU
12	11KV +LT Network loss =8-11	929.620	MU

13	**% 11KV +LT N/w loss =12/8**	**5.81%**	**MU**

Comparative Statement of Procedure-I and Procedure-II

S.No	Parameter	Procedure-I		Procedure-II
		Loss MU	%Loss	%Loss
1	EHT N/W Loss	-8.337	-0.11%	-0.11%
2	33KV N/W Loss	679.351	3.48%	3.54%
3	11KV+LT N/W Loss	1517.735	5.79%	5.81%

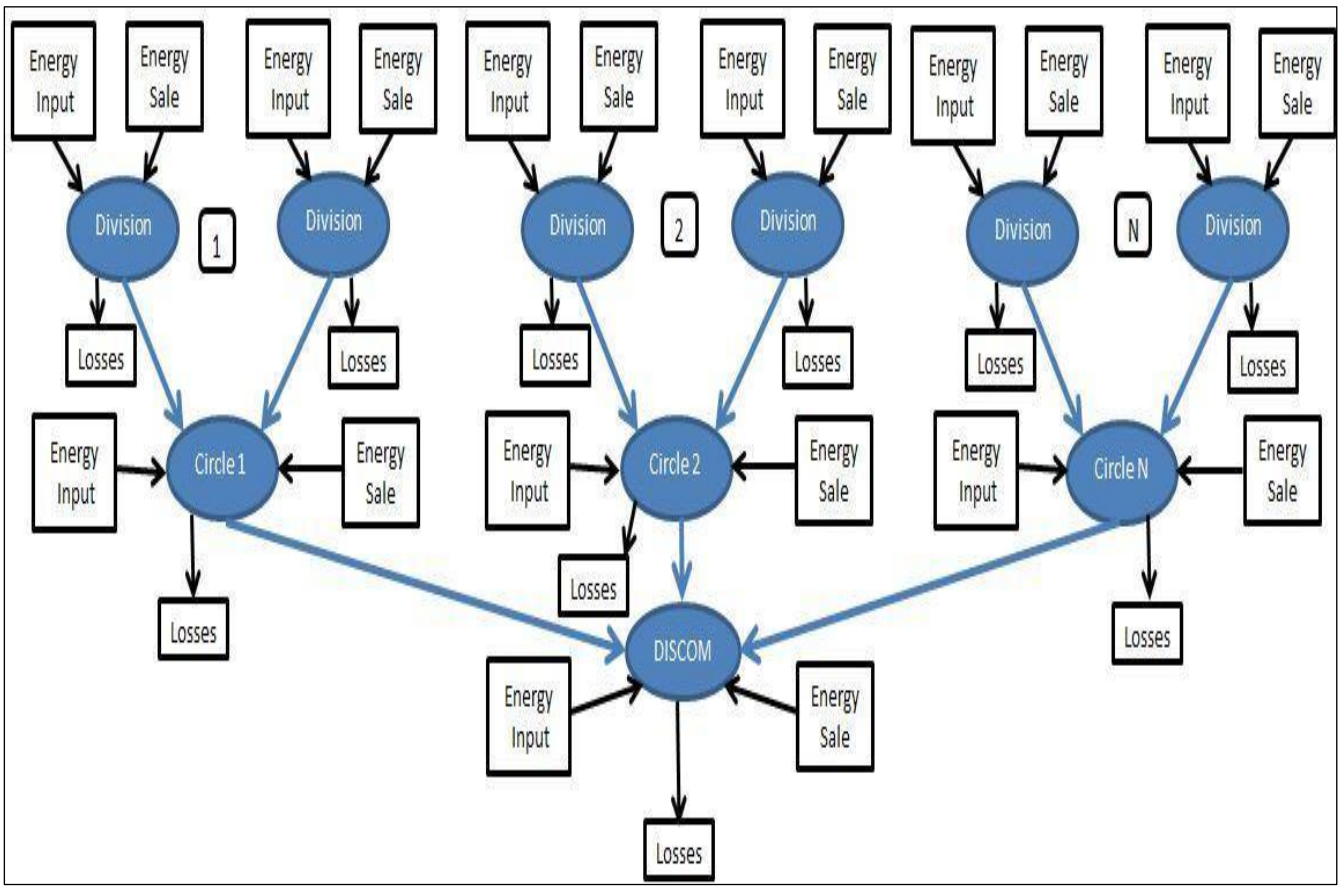
*** In both the procedures Loss MU is same but % of loss is differed. In 1st case % loss calculated w.r.t Gross Input Energy and in IInd case % loss calculated w.r.t Net input Energy.**

There is minor variation in the losses calculated by both methods for all the level voltages. The negative loss shown for EHT Network occurred due to some CT/PT Connections issue at the measuring end. The minor variation in the calculations occur to adjustment of entries of different parameters to various decimal levels. Due to non-availability of conventional meters in the DTs and non-functioning of Communicable meters provided on 27151 Transformers the losses in the LT Side could not assessed and taken as zero and total sales were added to 11 Kv sales to evaluate the distribution losses**.** D Loss = 5.94% & T&D loss = 8.58%

4.5. The voltage level-based hierarchy of the APEPDCL

The following figure shows the voltage level-based hierarchy of the APEPDCL

Figure 2: Hierarchy of Distribution loss by DISCOM



4.6. The methodology adopted by the DISCOM is as under

i. Input energy is arrived with the joint Meter readings of Transco, DISCOM and other concerned officials at inter face points of Transco-Discom, Genco-Discom, Private developers –Discom, Discom- Discom.

ii. The Input energy will be reconciled at Transco level every month with MRI dumps of all inter face points and will be considered as total input energy for APEPDCL.

iii. The metered sales arrived through energy billing software using which bills are being

issued.

iv. The agricultural sales are being assessed as per the methodology proposed by Indian Statistical Institute.

v. By knowing the input energy, metered sales and consumption, the Distribution losses and AT&C losses are computed at company level.

vi. APEPDCL is also calculating the circle wise losses based on the inputs from boundary meters installed at circle level. Net energy input is finalised after Import/export of energy on the basis of boundary meters at circle level.

vii. Energy billed is considered as per the Energy Billing System (EBS) reports of the DISCOM.

viii. T&D losses are calculated at circle level. Revenue billed and realized is taken from the financial records of APEPDCL finance department and accordingly AT&C losses are finalized.

ix. The energy input is taken from the sub- station meters of 11 kV/22kV, 33kV and 66 kVfeeders and 66 kV, 132 kV and 220 kV feeders. Sale of energy is taken as per Energy Billing System (EBS) software. Agricultural consumption will be arrived as per ISI methodology.

x. Since the DTs do not have meters the sale of Energy at LT Level is added to 11 kV level sales and then the losses at 11 kV level are evaluated.

4.7. Input Energy

4.8. The energy purchase and net energy input details are as under.

Table 10: Energy Input Details

S. No	Particular	FY (2022-23) MU
1	Net Input Energy Purchase (From Generation Source)	27722.88
2	Net Input Energy against Sale of Energy to Discom consumers	26944.84

The source of Data AP Transco EBC Wing. The input energy purchased from Generation sources for the FY 2022-23 is 27722.88 MU. The above Net Input energy value is verified from the MIS data of APEPDCL for the year 2022-23. The above values are also verified from 23rd Final audit report of APEPDCL published in July 2023.

4.9 The abstract of energy exchanges between APTRANSCO and APEPDCL and abstract of kWh consumption of APEPDCL are tabulated as under.

Table 11: Abstract Of Energy Exchanges Between APTRANSCO And APEPDCL For The Year 2022-23 In MU

ABSTRACT OF ENERGY EXCHANGES BETWEEN TRANSCO AND APEPDCL FOR THE YEAR 2022-23														
S.No.	Description	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	CUM
1	Energy received at 33KV or 11KV Bulk supply points in EHT SS (MU)	1802.12	1769.33	1735.62	1485.40	1624.12	1572.08	1496.93	1484.68	1483.77	1562.61	1593.72	1762.34	19372.72
2	Energy received at 132KV feeders points at SS (MU)	496.89	575.33	673.42	693.70	674.91	674.37	692.67	662.28	695.91	679.22	652.33	709.42	7880.45
3	Energy Export (+)/Import(-) at interface points of private developers (MU)	18.07	13.06	11.56	13.30	15.65	16.77	16.95	12.73	12.37	17.86	15.74	16.71	180.78
4	Energy received (+)/sent out (-) at interface points of other Circles (MU)	0.93	-1.14	1.34	-0.21	-0.54	0.06	0.44	0.09	0.39	0.18	0.29	0.25	2.08
5	Total Energy Received (1+2+3+4) (MU)	2318.01	2356.59	2421.94	2192.20	2314.15	2263.28	2206.98	2159.78	2192.44	2259.86	2262.08	2488.72	27436.02
6	Energy Delivered to EHT Consumers as 3rd party Sale (MU)	0.97	1.05	1.10	1.04	1.05	1.03	1.49	1.55	2.08	1.83	1.02	0.95	15.16
7	Energy Delivered as 3rd party Sale at 33KV and 11 KV (MU)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	75% Wheeling charge for 3rd party sale at 33KV and 11 KV (MU)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
9	Aux. Consumption (MU)	0.72	0.71	0.71	0.66	0.66	0.65	0.64	0.60	0.59	0.57	0.59	0.74	7.82
10	Total outflow not chargeable (6+7+8+9)(MU)	1.69	1.75	1.81	1.70	1.70	1.68	2.13	2.15	2.66	2.40	1.61	1.69	22.99
11	Net Energy Chargeable (5-10) (MU)	2316.32	2354.83	2420.13	2190.50	2312.44	2261.60	2204.85	2157.63	2189.78	2257.46	2260.46	2487.03	27413.03
12	11 KV open access sales	2.31	1.48	2.91	3.47	2.00	3.16	2.24	1.76	1.95	2.72	4.09	2.84	30.93
13	33KV Open access sales	19.75	29.32	26.64	36.41	27.76	29.47	38.46	16.82	23.16	36.45	20.40	30.81	335.46
14	EHT open access sales	10.97	12.38	10.74	9.99	5.44	6.39	13.07	4.06	4.99	8.64	11.92	3.20	101.80
15	Total Open access sales(12+13+14+15)	33.03	43.18	40.29	49.87	35.20	39.02	53.77	22.64	30.10	47.82	36.41	36.85	468.19
16	Actual Net Energy Against billed sales(11-15)	2283.29	2311.65	2379.83	2140.63	2277.24	2222.58	2151.07	2135.00	2159.68	2209.64	2224.05	2450.18	26944.84

Table 12: Abstract of Kwh Consumption of APEPDCL for The Year 2022-23 In MU:

ABSTRACT OF KWH CONSUMPTION OF APEPDCL FOR THE YEAR 2022-23														
S.No.	Category	APR	MAY	JUN	JULY	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	CUM
LT SALES														
1	Domestic Cat-I A	658.89	639.32	750.13	623.54	587.93	613.77	575.49	528.15	455.90	444.35	435.54	463.06	6776.07
2	Commercial & Others cat-II(A to F)	114.77	113.42	129.07	108.49	104.70	107.11	104.77	102.53	96.14	97.43	93.53	97.91	1269.87
3	Industrial cat-III (A to D)	44.48	40.88	42.21	38.63	32.10	30.44	32.04	31.65	33.10	42.12	43.50	41.58	452.73
4	Institutional cat-IV (A to F)	39.69	37.49	32.83	31.99	33.52	34.37	35.41	37.26	37.24	37.32	37.70	36.82	431.64
5	Agricultural Related (otherthan paying and Free Agl)	206.61	189.63	148.22	127.17	119.30	138.08	163.79	168.05	158.69	150.51	164.71	165.88	1900.64
	Agricultural Paying metered	2.74	2.21	1.61	1.45	1.27	1.47	1.52	1.59	1.78	1.88	2.10	2.28	21.90
	Agricultural free category metered	8.83	5.74	3.78	3.33	4.59	7.93	5.93	6.72	8.26	6.35	8.71	9.21	79.38
	Agricultural free category un metered	209.94	179.98	142.35	83.59	176.82	118.66	91.75	134.26	137.34	244.07	221.00	190.34	1930.11
TOTAL WITH AGL.		1285.95	1208.67	1250.20	1018.19	1060.24	1051.82	1010.70	1010.22	928.43	1024.04	1006.79	1007.09	12862.34
HT SALES														
1	Townships and Colonies	2.93	3.32	3.26	2.86	3.05	2.74	2.61	2.34	2.17	2.18	2.00	2.59	32.05
2	Commercial & Others	74.11	75.87	75.15	72.28	76.13	72.43	68.93	67.02	73.03	72.42	73.05	85.52	885.92
3	Industrial	668.97	781.09	902.96	893.70	904.39	882.07	885.31	888.44	935.69	874.69	857.29	949.79	10424.39
4	Institutional	89.71	86.60	85.92	83.78	88.47	89.41	92.79	83.59	82.66	96.16	83.47	93.41	1055.98
5	Agricultural and Related	4.11	2.46	3.41	4.49	12.91	12.95	9.03	14.86	3.72	5.11	5.78	4.70	83.53
6	RESCOs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL		839.83	949.33	1070.69	1057.10	1084.96	1059.60	1058.67	1056.24	1097.27	1050.56	1021.59	1136.02	12481.87
TOTAL SALES (LT+HT)		2125.78	2158.00	2320.89	2075.29	2145.20	2111.42	2069.37	2066.47	2025.70	2074.59	2028.38	2143.11	25344.21
	loss	157.51	153.65	58.94	65.33	132.04	111.16	81.70	68.53	133.98	135.05	195.67	307.08	1600.63
	%loss	6.90	6.65	2.48	3.05	5.80	5.00	3.80	3.21	6.20	6.11	8.80	12.53	5.94

APEPDCL supplies Power to about 69.49 lakhs consumers belonging to different categories through a network consisting of 4955 feeders 11 kV, 33kV and 66 kV levels and 2,97,503 no's distribution transformers of different capacities. The procedure for verification of calculations by Zenith team to compute % of T&D Losses and % of Distribution Losses is as under.

1. Set the boundary of the operation as per gate-to-gate concept
2. Identify the sources of energy
3. Data collection from DISCOM
4. Account for Billed Energy, Net input Energy consumption and Meter reading of input energy injection points in different scenarios
5. Calculate Circle wise losses
6. Calculate DISCOM % T&D Loss

The % T&D Loss of the DISCOM is calculated excluding Open Access Energy on a monthly basis using the Transmission and Distribution losses in MU, the % T&D Loss of the DISCOM as per the following formula:

% T&D Loss = (Input Energy Purchase (MU) – Billed Energy (MU)) / Input Energy (MU)*100

% Distribution Losses = (Net Input Energy Purchase (MU) – Billed Energy (MU)) / Input Energy (MU)*100

Table 13: Losses summary

No.	Particulars	Units	Quantity
1	Net Input Energy Purchase	MU	27722.88
2	Net Input Energy(At DISCOM Periphery after adjusting the transmission losses and energy traded)	MU	26944.84
3	Total Energy Billed (Is the net energy billed, adjusted for energy traded)	MU	25344.21
4	(T&D) Losses	MU	2378.675
5	% of T&D Losses	%	8.58
6	Distribution Losses	MU	1600.634
7	% of Distribution Losses	%	5.94

5. DETAILS OF ENCON MEASURES AND IMPROVEMENTS

5.1. Consumer profile

APEPDCL, Vishakhapatnam supplies power to about 69.42 lakh numbers of consumers as per data up to FY-2022-23, detail of consumer for the FY-2022 - 2023 is given in the table below.

Table 14: Consumer profile

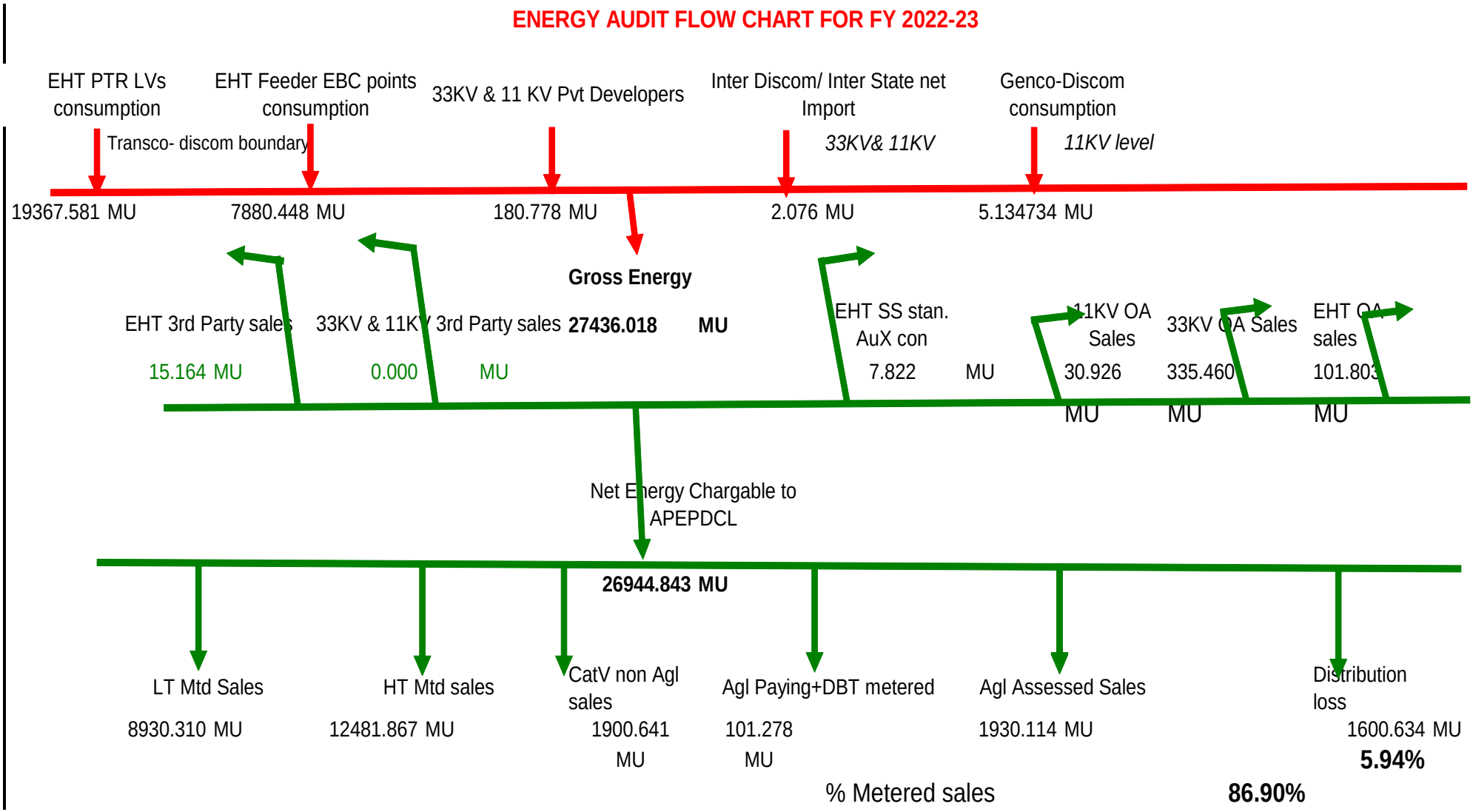
Period From Apr-22 to Mar-23					
S.No	Type of Consumers	Category of Consumers (EHT/HT/LT/Others)	Voltage Level (In kV)	No of Consumers	Total Consumption (In MU)
1	Domestic	LT	11	5820978	6721.39
2	Commercial	LT	11	650269	1092.86
3	IP Sets			277992	2031.39
4	Hor. & Nur. & Coffee/Tea & Rubber (Metered)	LT	LT	977	6.799
5	Hor. & Nur. & Coffee/Tea & Rubber (Flat)	HT	11	740	6.522
6	Heating and Motive Power				
7	Water Supply	LT	LT	15950	218.61
8	Public Lighting	LT	11	41234	97.33
9	HT Water Supply	HT	11	148	101.83
	HT Water Supply	HT	33	1	0.02
10	HT Industrial	HT	11	1961	1455.82
	HT Industrial	HT	33	224	2221.4
	HT Industrial	HT	EHT	43	6731.99
11	Industrial (Small)	LT	11	1706	2.66
12	Industrial (Medium)	LT	11	19429	450.07
13	HT Commercial	HT	11	1858	520.85
	HT Commercial		33	88	209.89
	HT Commercial		EHT	15	118.31
14	Applicable to Government Hospitals & Hospitals	LT	LT	1552	8.68
	Applicable to Government Hospitals & Hospitals		11	35	18.83
	Applicable to Government Hospitals & Hospitals		33	0	0
15	Lift Irrigation Schemes/Lift Irrigation Societies	LT	LT	104	0.73
	Lift Irrigation Schemes/Lift Irrigation Societies	HT	11	112	17.94
	Lift Irrigation Schemes/Lift Irrigation Societies	HT	33	20	44.15
16	HT Res. Apartments Applicable to all areas		11	46	32.05
17	Mixed Load				
18	Government offices and department	LT	LT	52711	285.64
	Government offices and department	HT	11	171	52.07
19	Others-1 (if any , specify in remarks)	LT Agl & General			
20	Others-2 (if any , specify in remarks)	Railway Tractions		19	919.37
21	Others-3 (if any , specify in remarks)	Agl Related (otherthan Agl Free & Paid category)		32697	1900.64
22	Others-4 (if any , specify in remarks)	Others		27916	76.37
23	Others-5 (if any , specify in remarks)				
			Total	6948996	25344.21

(Note: The above data is collected from Revenue Wing of Corporate Office.)

5.2. APEPDCL Block Diagram

The Block diagram indicating Energy flow from various sources and energy distribution to various category consumers is enclosed for reference.

Figure 3: Block Diagram of APEPDCL


ENERGY AUDIT FLOW CHART FOR FY 2022-23
EHT PTR LVs consumption
Transco- discom boundary
19367.581 MU
EHT Feeder EBC points consumption
7880.448 MU
33KV & 11 KV Pvt Developers
180.778 MU
Inter Discom/ Inter State net Import
33KV& 11KV
2.076 MU
Genco-Discom consumption
11KV level
5.134734 MU
Gross Energy
27436.018 MU
EHT 3rd Party sales
15.164 MU
33KV & 11KV 3rd Party sales
0.000 MU
EHT SS stan. AuX con
7.822 MU
11KV OA Sales
30.926 MU
33KV OA Sales
335.460 MU
EHT OA sales
101.803 MU
Net Energy Chargable to APEPDCL
26944.843 MU
LT Mtd Sales
8930.310 MU
HT Mtd sales
12481.867 MU
CatV non Agl sales
1900.641 MU
Agl Paying+DBT metered
101.278 MU
Agl Assessed Sales
1930.114 MU
Distribution loss
1600.634 MU
5.94%
% Metered sales
86.90%

5.3. The details of Input metering points in various Divisions

The details of Input metering points in various Divisions are verified from the previous data and import and export at sample locations are mentioned as under.

Table 15: Input metering points (Sample Basis)

S.No	Voltge Level	Division	Sub-Station	Feeder Name	Feeder Metering Status (Metered/ unmetered/ AMI/AMR)	Status of Meter (Functional/Non-functional)	Metering Date	Period from Apr-2022 to Mar-2023			
							Date of last actual meter reading/ communication	Meter S.No	MF	Import (MU)	Export (MU)
B.1	33KV	Srikakulam	Chilakapalem	31.5MVA 132/33 kV Transformer#1	Metered	Functional	31.03.2023	15462117	1000	110.02	0.00
B.2	33KV	Srikakulam	Chilakapalem	31.5MVA 132/33 kV Transformer#2	Metered	Functional	31.03.2023			0.00	0.00
B.3	33KV	Srikakulam	Chilakapalem	50MVA 132/33 kV Transformer#3	Metered	Functional	31.03.2023	15462012	1000	163.84	0.00
B.4	33KV	Srikakulam	Pydibhimavaram	50 MVA power Transformer#1	Metered	Functional	31.03.2023	15462116	1500	177.13	0.00
B.5	33KV	Srikakulam	Pydibhimavaram	50 MVA power Transformer#2	Metered	Functional	31.03.2023	XE411356	150	201.95	0.00
B.6	33KV	Srikakulam	Srikakulam	16MVA 132/33 kV Transformer#1	Metered	Functional	31.03.2023	XD551493	333.33	60.54	0.00
B.7	33KV	Srikakulam	Srikakulam	16MVA 132/33 kV Transformer#2	Metered	Functional	31.03.2023	Y0280309	666.66	93.03	0.00
B.8	132KV	Srikakulam	Chilakapalem	132 kV Chilakapalem - Tekkali (Ponduru Traction)	Metered	Functional	31.03.2023			0.00	0.00
B.9	132KV	Srikakulam	Pydibhimavaram	132 kV Arabindo pharma	Metered	Functional	31.03.2023	APX01739	2000	120.45	0.00
B.10	132KV	Srikakulam	Pydibhimavaram	132 kV Ponduru Rly. Traction	Metered	Functional	31.03.2023	18117238	1000	209.31	0.00
B.11	33KV	Srikakulam	EHT SS Aux Consumption	220 KV Pydi bhimavaram (sancham)	Metered	Functional	31.03.2023	5064571	1	0.00	0.16
B.12	33KV	Srikakulam	EHT SS Aux Consumption	Chilakapalem	Metered	Functional	31.03.2023	2149599	1	0.00	0.04
B.13	33KV	Srikakulam	EHT SS Aux Consumption	Ponduru (Traction)	Metered	Functional	31.03.2023			0.00	0.00
B.14	33KV	Srikakulam	EHT SS Aux Consumption	Pydibhimavaram	Metered	Functional	31.03.2023	15667083	1	0.00	0.05
B.15	33KV	Srikakulam	EHT SS Aux Consumption	Srikakulam	Metered	Functional	31.03.2023	666994	1	0.00	0.07

5.4. The Energy Scenario of APEPDCL

The Energy Scenario of APEPDCL during the FY 2020-21,21-22 and 22-23 is tabulated as under.

Table 16: Energy and commercial losses

S. No	Description	Units	2020-21	2021-22	2022-23
1	Input Energy	MU	21862.75	24765.45	26944.84
2	Total Sales	MU	20416.442	23129.70	25344.21
3	Distribution Losses	MU	1446.31	1635.746	1600.63
4	Distribution Losses	%	6.62	6.60	5.94
5	Collection Efficiency	%	84.04	98.68	98.83
6	Billing Efficiency	%	93.38	93.40	94.06
7	AT&C Losses	%	21.52	7.84	7.04
8	Demand	INR Cr	13892.52	14640.6	18608.05
9	Collection	INR Cr	11675.34	14447.6	18390.01
10	% of metered Sales	%	82.97	84.77	86.90
11	No of Consumers	No	6344315	6772785	6948996
12	Profit after Tax	INR Cr	431.86	366.53	19.695

APEPDCL prepared quarter wise trajectory report for different parameters and the details are enclosed in Annexure4.As per the data the following conclusions may be drawn.

a) The Collection Efficiency increased from 84.04% to 98.83% from the FY2020-21 TO 2022-23.
b) The number of Consumers increased from 6344315 to 6948996. (An increase of 9.53%)
c) The AT&C Losses reduced from 21.52% to 7.04%.
d) Around 54 MU Energy was saved during 2022-23 due to various ENCON measures undertaken by APEPDCL and the details are enclosed at Annexure 5

5.5. Billed Energy

Billed energy reported by APEPDCL for the Assessment Year 2022-23 is 25344.21 MU and is confirmed from other certified Documents received from APEPDCL and also from the 23rd annual report published by APEPDCL in July 23.

The Billed Energy of the DISCOM is calculated Circle wise on a monthly basis using the Metered Energy and Unmetered Energy. The Billed Energy of the DISCOM measured in MU as per the following formula

Billed Energy (Total Energy) = Metered Energy (MU) + Un-Metered energy (MU)

Category wise sale for Assessment Year-2022-23 verified and matching to the total audited sale for Assessment Year-2022-23. The details are enclosed in Annexure 6.

5.6. Year wise T&D Losses

The Distribution losses for FY 2020-21,21-22 and 22-23 are shown below. tabulated below.

Table 17: Year wise T&D losses

S. No	Particulars	Unit	2020-21	2021-22	2022-23
1	% of Distribution Losses	%	**6.62**	**6.60**	**5.94**

From the above data it is evident that APEPDCL has initiated technical steps to reduce losses and legal steps to control the theft of electricity during 2022 - 2023.

5.7. Measures taken in various circles to reduce T&D Losses

VSP - Visakhapatnam

SKLM- Srikakulam

VZM – Vizianagaram

RJY - Rajahmundry

ELR - Eluru

Table 18: Encon measures related details

Sl No	Particulars	VSP Circle	SKLM Circle	VZM Circle	RJY Circle	ELR Circle
1	New EHT Sub Station Charged	0	0	0	0	1
2	New 33Kv Feeders Commercially Charged	4	0	2	4	6
3	New 33 Kv line charged in KM	3.92	0.3	0	9.37	4.51
4	New 33/11 Kv Sub stations Charged	1	0	0	1	2
5	New 11Kv Feeders Charged	11	2	4	29	25
6	New 11 KV Line Charged in KM	1723.44	178.82	1201.79	494.06	804.12
7	New LT Line Charged in KM	678.68	140.965	2068.89	301.54	1017.31
8	New DTR Charged	5924	1548	3502	5510	5261
9	New 11 Kv Line reinforced /Replaced	0	0	0	0	0
11	No of Theft Energy Cases Booked(LT+HT)	1078	1187	1126	963	1066

12	Theft amount assessed INR in Lakhs	34.20	28.24	144.51	64.44	84.80
13	No of Defective/Back Billing Cases Booked	233	90	158	646	518
14	Amount assessed due to Defective/Back Billing Cases	203.44	77.71	153.83	472.61	448.96

5.8. Comments on Division vive losses and ENCON Measures taken by APEPDCL

Division vise Distribution loss for FY 2022-23			
Sl. No.	Name of the Circle	Name of the Division	%Loss
1	Srikakualam	Srikakualam	7.49
2	Srikakualam	Palakonda	12.82
3	Srikakualam	Tekkali	9.98
4	Vizianagaram	Vizianagaram	2.87
5	Vizianagaram	Cheepurupalli	27.05
6	Vizianagaram	Bobbili	3.99
7	Vizianagaram	Parvathipuram	13.85
8	Visakhapatnam	ZONE - I	3.06
9	Visakhapatnam	ZONE - II	1.32
10	Visakhapatnam	ZONE-III	2.99
11	Visakhapatnam	Anakapalli	1.47
12	Visakhapatnam	Narsipatnam	10.57
13	Visakhapatnam	Paderu	28.13
14	Visakhapatnam	Kasimkota	16.25
15	Rajamahendravaram	Rajamahendravaram	5.08
16	Rajamahendravaram	R.C.Puram	7.06
17	Rajamahendravaram	Amalapuram	9.98
18	Rajamahendravaram	Kakinada	5.04
19	Rajamahendravaram	Jaggampeta	10.59
20	Rajamahendravaram	Rampachodavaram	10.24
21	Eluru	Eluru	9.10
22	Eluru	Nidadavole	7.30
23	Eluru	Bhimavaram	9.00
24	Eluru	TPGudem	8.58
25	Eluru	J.R.Gudem	10.84
26	Eluru	Narasapuram	9.03

a) Various measures taken by all the circles of APEPDCL during the FY 2022-23 are enclosed in the Annexure5

b) The details also show the measures taken in FY 2022-23 and indicate that there is substantial amount of improvement in the quantity of measures implemented.

c) The ENCON measured taken resulted in reduction of Distribution losses by 0.66% from the previous year.

d) APEPDCL is requested to concentrate more on theft cases in the circles where it exceeded 1000 in number.

e) The year wise loss reduction statement with effect from 2018-19 to 2022-23 and technical measures taken to reduce the loss are elaborated and attached at Annexure 7.

5.9. Analysis of High Loss areas

The Losses in the following Divisions of 5 Circles are more than 10%.

Table 19: Divisions with high % Losses

Division vise Distribution loss for FY 2022-23			
Sl. No.	**Name of the Circle**	**Name of the Division**	**%Loss**
1	**Srikakualam**	**Palakonda**	**12.82**
2	**Vizianagaram**	**Cheepurupalli**	**27.05**
3	**Vizianagaram**	**Parvathipuram**	**13.85**
4	**Visakhapatnam**	**Narsipatnam**	**10.57**
5	**Visakhapatnam**	**Paderu**	**28.13**
6	**Visakhapatnam**	**Kasimkota**	**16.25**
7	**Rajamahendravaram**	**Jaggampeta**	**10.59**
8	**Rajamahendravaram**	**Rampachodavaram**	**10.24**
9	**Eluru**	**J.R.Gudem**	**10.84**

Sl. No 2&6 are previously maintained by RESCOS till last year and other Divisions predominantly agency/rural areas where length of lines is more and quantum of energy handled is less.

5.10. Comments on high loss area

a) It was observed that while in all the circles the loss is below the average loss in few of the Divisions, in Srikakulam and Eluru circle the losses in all the Divisions are more that the average loss.
b) % Losses in Cheepurupalli increased from 24.5% to 28.13% from 2021-22 to 2022-23.
c) % Losses in Kasimkota Division decreased from 26.92% to 16.25% from 2021-22 to 2022-23 which is appreciable.
d) The AT&C losses in the very high loss (More than 20%) divisions are also high.
e) In order to reduce the Losses meetings (On virtual basis) are regularly conducted between top officials of APEPDCL and Field Officers and staff. Sample Minutes of a meeting held with All EE's and M&P, EE's Operation by JMD V&S, CMD, APEPDCL is enclosed for reference in Annexure 8.

5.11. Agriculture Methodology

APEPDCL is following the Indian Statistical Institute (ISI) methodology for assessing the free agricultural consumption. Per Hp consumption is being arrived from the meters fixed on the LV side of the sampled Agriculture DTRs in different areas and the total agricultural consumption is extrapolated from the per HP consumption.

The estimated agricultural consumption per KVA per DTR depends on the total connected load, type of crop raised, seasonal variation, geographical conditions and water table. Therefore, per KVA consumption of sample DTR varies from capacity to capacity and area to area. APEPDCL has taken initiative as per the Government of Andhra Pradesh directives to provide meters to every unmetered agriculture consumer to implement DBT in the state.

The sample of Agriculture metering and unmetered calculation given in the below table. The below table is the sample for the Rajahmundry &Vishakhapatnam circles agriculture metering and the calculation table used in calculation for the month Jan 2023. Similar calculations were done for the rest of the circles for agriculture consumption. The signed copy of the following calculations was attached in the Annexure.

Table 20: Ag. Unmetered Energy computational method

AGL Statement for the month of Jan 2023 based on Agl. sample meter Readings											
Sl.No		**Name of the Division**	**No of DTR with LV side metering / readings submitted**	**No of DTRs with valid readings submitted**	**Exceptional DTR meters**	**Consumption**	**Total connected load in HP**	**Per HP consumption units**	**Total Division wise Services**	**Total Dvn Contracted load in HP**	**Division Agl. Extrapolated consumption in MU**
1	RJY	Rajahmundry	30	30	0	76295	540	141	11966	119175	16.85
		Kakinada	45	45	0	37066	505	73	4205	42179	3.10
		Jaggampeta	50	50	0	91415	805	114	17778	171719	19.50
		R.Ch.varam	30	30	0	35863	300	120	1539	11029	1.32
		Amalapuram	25	23	2	35472	372	92	7927	39848	3.65
		R.C.Puram	40	40	0	78678	659	119	7706	53350	6.37
			220	218	2	354789	3181	116	51121	437300	50.79

AGL Statement for the month of Jan 2023 based on Agl. sample meter Readings											
Sl. No		Name of the Division	No of DTR with LV side metering / readings submitted	No of DTRs with valid readings submitted	Exceptional DTR meters	Consumption	Total connected load in HP	Per HP consumption units	Total Division wise Services	Total Dvn Contracted load in HP	Division Agl. Extrapolated consumption in MU
2	Vishakapatnam Circle	Zone-2	-	-	-	-	-	28.00	43	149.0	0.0042
		Zone-3	15	15	0	17191	346	49.68	5102	19397.14	0.9637
		Ankapalli	45	44	1	34306	1118	30.69	10866	73359.62	2.2511
		Narsipatnam	74	65	9	63205	1131	55.88	20778	101668.0	5.6816
		Paderu	-	-	-	-	-	85.00	168	1311.23	0.1115
		Kasimkota(RESCO)	-	-	-	-	-	-	12807	56938.50	4.72
		Vishakapatnam incl.Kasimkota	134	124	10	114701.55	2595	44.20	49764	252823.47	13.73

5.12. Agriculture Billing

The schedule approved by the Commission for "Category-V for the FY 2022-23: Agriculture & Related" is given below.

Table 21: Agriculture & related Billing

Consumer Category		LT SUPPLY		Billing Unit	HT SUPPLY			
		Fixed / Demand Charges per month (`/HP or kW)	Energy Charges (`/Unit)		Fixed / Demand Charges per month / kVA	Energy Charges		
						11 kV	33 kV	132 kV & above
V	AGRICULTURE & RELATED							
	(A) : Agriculture							
	(i) Corporate farmers	-	3.50	kWh	-	-	-	-
	(ii) Non-Corporate farmers	-	-	-	-	-	-	-
	(iii) Salt farming units upto 15 HP	-	2.50	kWh	-	-	-	-
	(iv) Sugarcane crushing	-	-	-	-	-	-	-
	(v) Rural Horticulture Nurseries	-	-	-	-	-	-	-

Consumer Category	LT SUPPLY		Billing Unit	HT SUPPLY			
	Fixed / Demand Charges per month (`/HP or kW)	Energy Charges (`/Unit)		Fixed / Demand Charges per month / kVA	Energy Charges		
					11 kV	33 kV	132 kV & above
(vi) Floriculture in Green House	75/kW	4.50	kWh/kVAh	-	-	-	-
(B) : Aquaculture and Animal Husbandry	30/kW	3.85	kWh/kVAh	30	3.85	3.85	3.85
(D):Agro Based Cottage Industries upto 10 HP	20/kW	3.75	kWh	-	-	-	-
(E) : Government / Private Lift Irrigation Schemes	-	-	kVAh	-	7.15	7.15	7.15

5.13. Energy Scenario of APEPDCL for the Last 3 Years

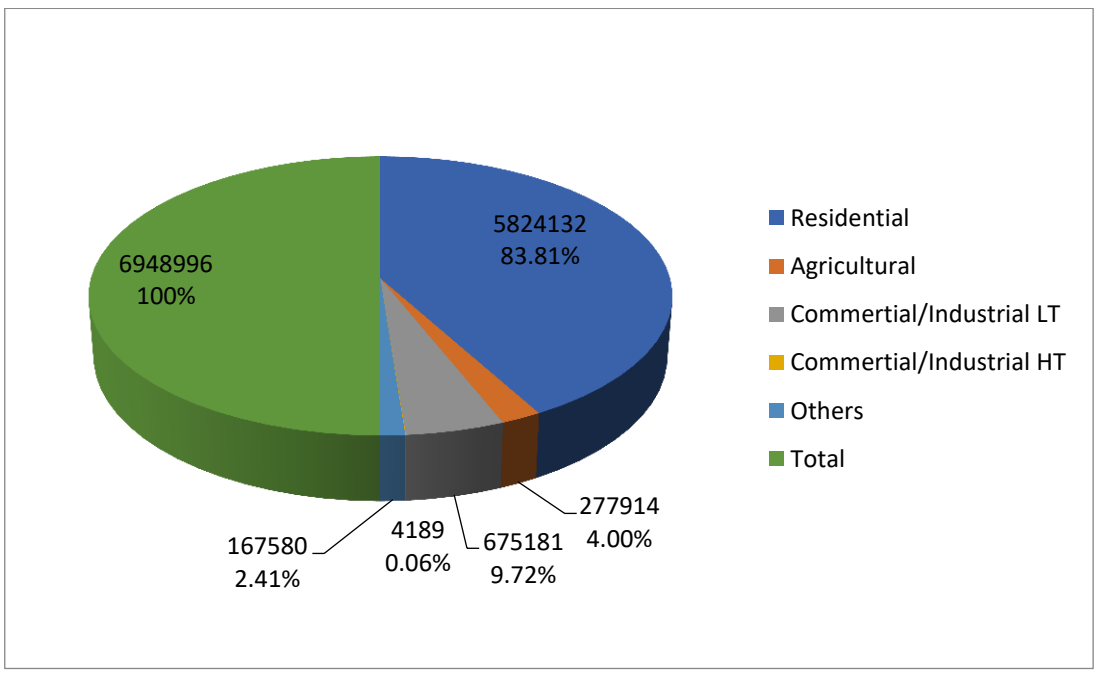
The Energy scenario of APEPDCL for the last 3 years (Including the AY are shown as under.

Table 22: Consumer details - Year wise

Consumer Category	FY (2020-21)	FY (2021-22)	FY(2022-23)
Residential	5353473	5685813	5824132
Agricultural	243124	322571	277914
Commercial/Industrial-LT	598411	649567	675181
Commercial/Industrial-HT	3792	4004	4189
Others	145515	110830	167580
Total	**6344315**	**6772785**	**6948996**

The figurative representation of various consumer category in FY 22-23is given below.

Figure 4: Consumer category profile



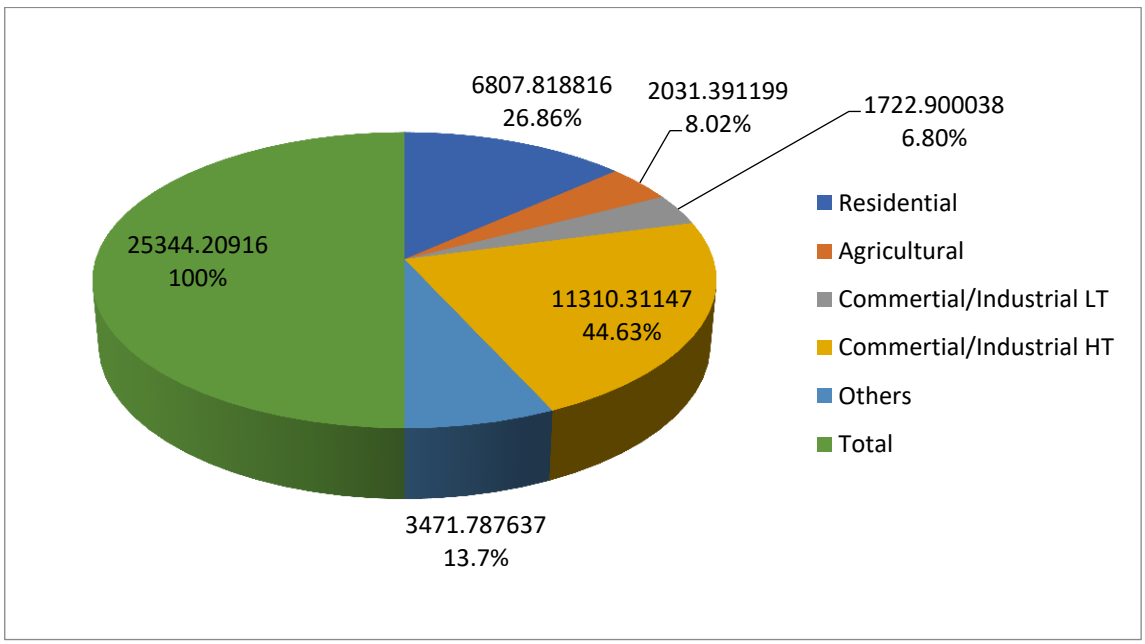
5.14. Billed Energy (MU)

The Billed Energy of each category of the consumer for the last 3 years is shown as under

Table 23: Billed energy details - Year wise

Consumer Category	FY(2020-21)	FY (2021-22)	FY(2022-23)
Residential	6365.402	6766.7	6807.819
Agricultural	2276.685	2221.51	2031.391
Commercial/Industrial-LT	1248.987	1527.13	1722.90
Commercial/Industrial-HT	7263.735	9372.5	11310.311
Others	3261.634	3241.85	3471.788
Total	**20416.442**	**23129.8**	**25344.209**

Figure 5:Billed energy of various category consumers



The figure given above is a pictorial representation of various category consumer's energy billed in FY 22-23.Please note that as per the accounting proforma the unmetered agricultural consumption is 1930.113 MU and metered agricultural energy consumption is 101.278 MU. The total works out to be 2031.391 MU and the same

value is shown in the above table. The unmetered energy sales reduced from 2135.258 MU during 2021-22 to 1930.11 MU in 2022-23

Table 24: Performance Summary tables for the Last 3 Years

Summary Table: Feeder wise energy details

Description	FY (2020-21)	FY (2021-22)	FY(2022-23)
No of feeders at 66 kV level and above	244	263	278
No of feeders at 33 kV level	575	605	621
No of feeders at 11/22 kV level	3797	3985	4056

Summary Table: Input energy details

Name of the Circle	Input energy (MU)		
	FY(2020-21)	FY (2021-22)	FY(2022-23)
APEPDCL	**23448.98**	**25341.71**	**26944.84**

Summary Table: Input & Billed energy details (In MU)

S. No	Description	FY (2020-21)	FY (2021-22)	FY(2022-23)
1	Net input energy at DISCOM periphery (MU)	**21862.75**	**24765.45**	**26944.84**
2	Billed energy (MU)	**20416.44**	**23129.70**	**25344.21**

Summary Table: Loss details

S.No	Name of the Discom	Distribution loss (MU)			Distribution Losses %		
		FY (2020-21)	FY (2021-22)	FY(2022-23)	FY(2020-21)	FY(2021-22)	FY(2022-23)

1	APEPDCL	1446.31	1635.75	1600.63	6.62	6.60	5.94

The total Power purchased from various sources, their fixed cost, variable cost for the FY 2022-23 is tabulated as under.

Table 25: APEPDCL Cost variables of FY 22-23

Sl No	Name of the Source	Energy in MU	Fixed Cost (INR Lakhs)	Variable Cost (INR Lakhs)	Total Cost (INR Lakhs)
1	AP Genco-Thermal	6731.094	76010.18	269254.4	345264.6
2	AP Genco -Hydel	1530.551	9595.135	8548.395	18143.53
3	Other State Generating Stations	2098.305	54629.33	71402.33	126031.7
4	CG Stations	4649.962	73854.26	183481.7	257335.9
5	IPPs	2516.703	80287.91	74714.41	155002.3
6	Interstate Traders short term	3049.77	83.3222	239176.6	239259.9
7	NCE -BAGASSE	9.893167	37.32969	510.6629	547.9926
8	NCE - Biomass	4.243845	49.6774	268.3424	318.0198
9	NCE-Industrial Waste	87.82398	144.3801	5432.568	5576.948
10	Mini Hydel	24.30437	158.5275	418.2092	576.7367
11	NSC Wind	571.0539	0	26395.67	26395.67
12	NSC Solar	483.3623	0	23332.53	23332.53
10	NSC Others	985.3937	2035.408	40411.98	42447.39
11	Transmission & UI Charges	14.47477	138457.8	8311.404	146769.2

12	Inter State Traders (MTOA)	10.33469	0	782.3364	782.3364
13	Others	208.0013	586.8366	9.024804	595.8614
14	Swap energy	176.7406	0	8686.621	8686.621
15	Purchase from SPDCL D-D Transactions	5214.294	0	263389.8	263389.8
16	Exchange Sales	-643.421	0	-30789.2	-30789.2

5.15. Power Purchase cost

Table 26: Grand total Power Cost analysis in 2022-23

Description	Energy in MU	Fixed Cost in INR Lakhs	Variable Cost in INR Lakhs	Total Cost in INR Lakhs	Average rate Of unit in INR
Grand total	**27722.88**	**435930.06**	**1193737.71**	**1629667.77**	**5.88**

Note: The above data is from APEPDCL annual report published in July 2023.

5.16. Aggregate Revenue Requirement

Table 27: Revenue Report for FY 2022-23

S.NO.	ARR ITEM	VALUE IN CRORES
1	Transmission Cost	736.00
2	SLDC Cost	89.18
3	Distribution Cost	2616.64
4	PGCIL Expenses	391.04
5	ULDC Charges	1.71
	Network & SLDC Cost (1 to 5)	**3834.57**
6	Power purchase cost	11676.52
7	Interest on CSD	85.17
8	Supply margin in Retail Supply Business	20.87
9	Other cost if any	48.47
	Supply Cost (6 to 9)	**11831.03**
	Aggregate Revenue Requirement	**15665.60**

The aggregated revenue requirement / cost items for the FY 22 – 23 are ass under.

Table 28: Revenue report details FY 2022-23

Sl No	ARR Item	Value (INR in Crores)
1	Transmission Cost	736
2	SLDC Cost	89.18
3	Distribution Cost	2616.64
4	PGCIL Expenses	391.04
5	ULDC Charges	1.71
6	Network and SLDC Cost (1+2+3+4+5)	3834.57
7	Power Purchase Cost	11676.52
8	Interest on CSD	85.17
9	Supply Margin in Retail Supply Business	20.87
10	Other Costs if any	48.47
11	Supply Cost (7+8+9+10)	11831.03
12	**Aggregate Revenue Requirement (6+11)**	**15665.60**

5.17. DISCOM wise POC Loss statement issued by APSLDC for the Fy 2022-23

DISCOM wise POC Loss statement issued by APSLDC for the Financial year 2022-23 all the DISCOMS in the State of Andhra Pradesh) is shown in the following table.

Table 29: APSLDC Discom wise POC loss data for FY 2022-23

Month	CGS actual drawl at APTRANSCO periphery in MU	APTRANSCO Ex-Bus CGS drawl with maps & kaps wh.benefit in MU	Diff	**APCPDCL**	**APSPDCL**	**APEPDCL**
Apr-22	2541.17516	2627.40458	86.22942	**20.126**	**34.871**	**31.232**
May-22	1863.569567	1930.138981	66.56941	**15.537**	**26.921**	**24.111**
Jun-22	2254.293903	2333.419475	79.12557	**18.468**	**31.998**	**28.659**
Jul-22	1344.874406	1395.947888	51.07348	**11.921**	**20.654**	**18.499**
Aug-22	1616.300696	1676.503463	60.20277	**14.051**	**24.346**	**21.805**
Sep-22	1759.867993	1819.848063	59.98007	**13.999**	**24.256**	**21.725**
Oct-22	1936.837012	2007.043331	70.20632	**16.386**	**28.391**	**25.429**
Nov-22	2208.189277	2294.715075	86.5258	**20.195**	**34.991**	**31.340**
Dec-22	2112.632839	2199.587531	86.95469	**20.295**	**35.164**	**31.495**
Jan-23	2408.830450	2517.01222	108.1818	**25.250**	**43.749**	**39.183**
Feb-23	2404.800171	2504.302441	99.50227	**23.224**	**40.239**	**36.040**
Mar-23	2461.08924	2557.607889	96.51865	**22.527**	**39.032**	**34.959**
Total	**24912.46071**	**25863.53094**	**951.0702**	**221.980**	**384.613**	**344.478**

5.18. Details of 11 kv Feeders and No of DTs on each feeder

APEPDCL provided the complete details of 11 Kv Feeders and No of DTs on each feeder and other details like number of unmetered DTs, number of AMR Communicable DTs, Number of AMI Communicable DTs, Number of Non-Communicable metered DTs Circle Wise and Division Wise. APEPDCL clearly indicated the Energy Audit of any of the DTs could not be taken up due to non-communicating status of DTs' meters. All the details are enclosed in the Annexure 3.

5.19. A Note on Data Gaps

After verification of the complete documents except for a minor variation there are no data gaps found in the total data submitted by APEPDCL. Since at the time of making the

report all the relevant data is not finalised (All the data was provisional) there were some gaps.

(Note Please note that the certified copy of Energy Accounting Proforma occupies huge space and hence was not shown in the Annexure but will be uploaded separately.)

LIST OF ENCLOSURES

Annexure-1: Copy of Work Order

Annexure-2: Copy of Minutes of Meeting

Annexure-3: Copy of DTs to Feeders and Consumers to DTs mapping

Annexure-4: APEPDCL Quarter wise trajectory report

Annexure-5: Details of Technical and Commercial Action Plans (ENCON Measures)

Annexure-6: Category wise Energy Sales

Annexure-7: Details of Energy Savings in MU for the FY 2022-23

Annexure-8: Sample Minutes of a meeting held with Srikakulam Circle

Annexure-9: Rajahmundry Agricultural statement for the month of Jan-2023

Annexure-10: Vishakhapatnam Agricultural statement for the month of Jan-2023

Annexures-11: Division wise loss statement

Annexure-12 Quarterly Consumer Category wise subsidy billed/received/due for FY 2022-23