ANNUAL ENERGY AUDIT REPORT FOR THE YEAR 2023-24

Of



COCHIN PORT AUTHORITY (CoPA)

Willingdon Island, Cochin

July 2024

conducted by



Centre for Energy, Environment and Productivity

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25th July 2024

The Chief Mechanical Engineer,

Cochin Port Authority,

Willingdon Island,

Cochin 682009.

Sir,

Sub: Energy Audit Report of the Cochin Port Authority (Designated Consumer Number: DIS0048 for the year 2023-24 -Submission -reg

Ref:

- 8/1/BEE/DISCOM/2021. Dated 06th October 2021 -Manner and Intervals for Conduct of Energy Audit (Accounting) in Electricity Distribution Companies) Regulations,2021 and subsequent amendments by the Bureau of Energy Efficiency
- 2. Contract No: GEMC-511687788965203 dated 25th July 2024

As per the reference cited above, please find enclosed herewith the Energy Audit Report of Cochin Port Authority (Designated Consumer Number: DIS0048KL), for favour of further action.

Yours faithfully

J. mm

J Nagesh Kumar Accredited Energy Auditor

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Enclosure: Energy audit report of Cochin Port Authority for the year 2023-24

ACKNOWLEDGEMENT

On behalf of Centre for Energy, Environment and Productivity (CEEP), Chennai we place on record our sincere gratitude to the management of Cochin Port Authority (CoPA) for awarding us the task of carrying out Mandatory Energy audit, for the kind hospitality and support extended for the study of their services.

We extend our deepest gratitude to Shri V. Thuraipandian, Chief Mechanical Engineer, for his insightful suggestions and the wisdom he generously shared with us throughout the Audit period.

We are tankful to P. Muniasamy, Deputy Chief Engineer, Mechanical for his valuable suggestions and support.

We are also indebted to Shri Ajithkumar D., Superintendent Engineer (Elec) & Nodal Officer, and Smt Jayalakshmy S., Executive Engineer (Elec) & Energy Manager, for their extensive interactions and unwavering support during the study.

Our sincere thanks go to Shri Mathew Paul, Assistant Engineer (Elec), Shri Johny Alumparambil, Assistant Engineer (Elec), and all other officers and staff who enthusiastically participated in and helped organize the audit process. Their dedication was key to successfully achieving the audit's objectives.

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1. Executive Summary

1.1 About DISCOM

Cochin Port Authority (CoPA) -Distribution -Overview

Overview

Cochin Port Authority (CoPA) operates under the Major Port Authorities Act, 2021 (formerly Cochin Port Trust). It is a Deemed Electricity Distribution Licensee as per the Electricity Act 2003 and a notified Designated Consumer (DC No: DIS0048KL) under PAT Cycle VII, as per the Ministry of Power's notification (S.O.4552(E), dated 26th September 2022).

Electricity Procurement and Distribution

CoPA purchases electricity from Kerala State Electricity Board Limited (KSEBL) and distributes it to consumers in the port areas of Willingdon Island, Vallarpadam, and Puthuvypin.

Power Procurement

- Willingdon Island: 6.5 MVA power at 110 KV from KSEBL.
 - **Vallarpadam**: 5 MVA power at 11 kV from KSEBL through two feeders:
 - Old feeder: 3 MVA contract demand.
 - New feeder (commissioned in March 2024): 2 MVA contract demand, dedicated to a commercial establishment under the CoPA.

Substations

- Willingdon Island: 110kV/11kV Substation with two 10/12.5MVA power transformers.
- Vallarpadam: 11kV receiving station with two incoming feeders.

Power Distribution

Power is distributed to consumers through 11kV underground (UG) cables connected via a Ring Main system to ensure a reliable 24x7 supply. Low Tension (LT) feeding is done using LT overhead (OH) and UG cable lines.

Consumer Base

CoPA serves 1,288 consumers as on 31st March 2024.

- HT consumers: 37
- LT consumers: 1,251

All consumers except 50% of the self-consumption meters and street light meters are SMART meters with Advanced Metering Infrastructure (AMI) features and prepaid facilities. These

meters are connected to a centralized AMI software system via GPRS, with billing and accounting managed through the SAP system.

Feeder and Transformer Infrastructure

- Willingdon Island: Eleven 11 kV feeders from the 110/11 kV substation.
- Vallarpadam & Puthuvypin: five 11 kV feeders.
- **Transformers**: 30 distribution transformers (11kV/415Volt and 11kV/3.3 kV).

Renewable Energy Initiatives

- Solar Plants: 100kWp and 150kWp grid-connected solar plants.
- Solar Prosumers: There are 9 solar prosumers as on the end of the FY 2023-24
- Net Metering: Available for LT and HT prosumers.
- Energy Audit: Solar energy inputs are included in the energy audit.

Key Projects

RDSS Project

- Funding: Rs 15.13 Crores under the Revamped Distribution Sector Scheme (RDSS).
- Goals: Modernization and loss reduction through:
 - Replacement of old cables, transformers, and Ring Main units.
 - Addition of three 11 kV panels.
 - Completion of metering for 11 kV feeders and distribution transformer (DTR) metering.
 - Implementation of SCADA project.
- **Timeline**: FY 2021-22 to 2025-26

Other Projects

- **Contract Demand Enhancement**: Contract demand will be enhanced to 8 MVA at Vallarpadam by December 2024. (The work is under progress).
- **Shore Power Supply**: Provision of shore power to international cruise vessels by FY 2025-26 with 6 MVA Green Energy through open access.
- Floating Solar Plant: Installation of a 1.5MWp grid-connected floating solar plant by the end of FY 2024-2025.
- 350 kWp Roof top SPV by the end of 2024-25
- **SMART Lighting proposal amounting 2**.05 Cr submitted for MOPSW,

This comprehensive approach ensures CoPA's commitment to reliable power distribution, modernization, and sustainable energy initiatives.

1.2 Energy performance of the DISCOM

S.NO	Energy input details	Units	Quantity
i	Energy purchased	MU	40.12
ii	Net input energy (at DISCOM Periphery after adjusting the transmission losses and energy traded)	MU	40.43
iii	Energy billed	MU	39.50
iv	T& D Loss	MU	0.933
v	% T&D Loss	%	2.308
vi	Amount of Energy billed	Rs (Crores)	43.18
vii	Amount of collection	Rs (Crores)	43.11
viii	Collection efficiency	%	99.83
ix	% AT&C Loss	%	2.47

1.2.1 Performance summary of the CoPA for the FY 2023-24

• Energy purchased also includes internal generation and solar roof top.

Table 1

1.2.2. Quarter wise performance of the CoPA for the FY 2023-24

S.NO	Energy input details	Units	QTR1	QTR2	QTR3	QTR 4
A	Energy purchased	MU	10.38	9.28	9.59	10.87
В	Net input energy (at DISCOM Periphery after adjusting the transmission losses and energy traded)	MU	10.47	9.35	9.67	10.94
С	Energy billed	MU	10.201	9.150	9.466	10.685
D	T& D Loss	MU	0.266	0.205	0.203	0.259
Е	% T&D Loss	%	2.54	2.19	2.10	2.37
G	Amount of Energy billed	Rs	10.97	10.01	10.44	11.76
		(Crores)				
Н	Amount of collection	Rs	10.95	10.00	10.42	11.74
		(Crores)				
Ι	Collection efficiency	%	99.83	99.83	99.83	99.83
J	% AT&C Loss	%	2.70	2.36	2.26	2.54





1.2.3 Quarter wise Energy performance of the CoPA for FY 2023-24

Figure-1



1.2.4 Quarter wise T&D Loss performance for the FY 2023-24

Fig -2

Period From 1st April 2023 to 31st March 2024								
Consumer profile	Ene	rgy parame	eters	Los	ses			
	Total			% of		T&D loss (%)		
Consumer category	Number	Input	Total	energy	T&D loss (MU)			
consumer category	of	energy		consump				
	connecti (MU)	energy	tion					
Residential	412	2	0.97	2%				
Agricultural	0		0.00	0%				
Commercial/Industrial-LT	605	40.43421	4.63	12%	0.933059	2.31%		
Commercial/Industrial-HT	30		28.77	73%				
Others	241		5.13	13%				
	1288	40.43421	39.50	100%	0.933	2.308%		

1.3.1 Category wise Consumers and Energy sales for the FY 2023-24



1.3.2 Percentage wise Consumption of different category of consumers



Fig 3

1.4. Infrastructure details

.

Form-Details of Input Infrastructure								
1	Parameters	Total	Covered during in audit	Verified by Auditor in Sample Check	Remarks (Source of data)			
i	Number of circles	1	1		In CoPA there is no Division or Subdivision wise formation.			
ii	Number of divisions	0						
111	Number of sub- divisions	0						
iv	Number of feeders	16	16	11	Through AMI meter software for 11 nos out of 16 feeders			
v	Number of DTs	30	30	1	No meter is installed			
vi	Number of consumers	1288	1288	1288	Through SAP			

Table 4

1.5. ENERGY INJECTION & FEEDER WISE ENERGY DISTRIBUTION IN CoPA

1.5.1 Meter readings of energy injection points

			Feeder Metering	Feeder Type	input ene	Period fr	omto	ints	
S.No	Zone	Voltge Level (KVA)	Status (Metered/ unmetered/ AMI/AMR)	(Agri/ Industrial /Mixed)	Meter S.No	CT/PT ratio	lmport (MU)	Export (MU)	Remarks (Source of data)
B.1	CoPA	110 kV	AMR	Mixed	17078922	150	28.65	0.00	Input energy at Transmission boundary
B.2	CoPA	11	AMR	Mixed	22001331	40	11.00	0.00	
B.3	CoPA	11	AMR	Mixed	23013883	24	0.47	0.00	New feeder
B.4	CoPA	0.415	AMI	Mixed			0.31		Solar energy input
B.5									

Rev:0

1..6 Feeder wise energy import and consumption

SI No.	Zone	Received at Circle (In MU)	Name of the Station	Feeder Code/ID	Feeder Name	Type of feeder meter (AMI/AMR/ Other)	Received at Feeder (Final in MU)	Feeder Consumption (In MU)	Final Net Export at Feeder Level (In MU)	Remarks
										Consumer
1	CoPA	0.3	Willingdon Island	K01 A	MNC	AMI	0.3	Not recorded	0	Mapping not completed
2	CoPA	4.5	Willingdon Island	K16	NTRO KV	AMI	4.5	Not recorded	0	do
3	CoPA	2.3	Willingdon Island	3	Q9 1	AMI	2.3	Not recorded	0	do
4	CoPA	5.4	Willingdon Island	4	Q92	AMI	5.4	Not recorded	0	do
5	CoPA	2.2	Willingdon Island	5	MH2	AMI	2.2	Not recorded	0	do
6	CoPA	2.7	Willingdon Island	9	UTL	AMI	2.7	Not recorded	0	do
7	CoPA	6.0	Willingdon Island	10	Q93	AMI	6.0	Not recorded	0	do
8	CoPA	0.2	Willingdon Island	11	MH3	AMI	0.2	Not recorded	0	do
9	CoPA	0.1	Willingdon Island	12	STN TR	AMI	0.1	Not recorded	0	do
10	CoPA	2.3	Willingdon Island	K15	PENNA	AMI	2.3	Not recorded	0	do

11	CoPA	2.6	Willingdon	K17	NTRO	A N/I	26	Not recorded	0	do
11	CUFA	2.0	Islanu			Aivii	2.0	Notrecorded	0	uu
			vallarpada		RIVIU					
12	CoPA	0.0	m		NO.1		0.0	Not recorded	0	do
			Vallarpada		LOTT					
13	CoPA	0.0	m				0.0	Not recorded	0	do
			Vallarpada							
14	CoPA	0.0	m		SINIR		0.0	Not recorded	0	do
			Vallarpada		RMU					
15	CoPA	11	m		NO.3		11	Not recorded	0	do
			Vallarpada		DPWOR					
16	CoPA	0.477	m		LD		0.477	Not recorded	0	do

Table 6

1.7 Energy Conservation measures implemented under the DISCOM

			PA	T-Cycle				
NAS	ME OF DISCOMPTION FORT ATTEND	ORITY						
Reg	istration no. DIS0048KL							
								1
	<u>्रा</u> त्र		lare	Form 3				
			The second se	C. R. SAGAR, SP SHEEP R				
	Details of energy officient a	ey improvem nel progress m	et measures in ade in the imple	plemented, inv mentation of o	estament anada a ther remains	and aavings i Intions.	n energy ach	5avai
A. 1	Details of energy effectors aplemented: (PY 2023-24)	wy improveme nd progress m	nt measures im ade in the imple	plemented, inv mentation of o	estament made a ther remainment	nd savings i Isticus,	n energy ach	bavač
A, I SI NO	Details of energy effection and mailtomented: (FY 2023-24) Description of Boorgy Efficiency improvement Measures	ey improveme nel progress m Category	et mensures in ade in the impli- linvestment (Laiche Eupers)	plemented, inv mentation of o Versitied envirops (Latrice Rupers)	staneni mada a ther remonstrate varifiaat smorgy sawings	nd savings i Istions, Units	n energy ach Fuel	fewed Remarks
A. 1 31 100	Details of energy effections and an energy efficiency improvement of Inergy Efficiency improvement of Inergy with LED Incore	ey improveme nd progress m Category Lighting	nt measures im ade in the imple Investment (Lakbs Rupses) 9.77916	plemented, inv mentation of o vorified sovings (Lakhs Kuptes) 2.47119	estament made a dher remainista Verifieet energy sawirugs 35303	nd savings i fations. Unita KWH	n energy adb	feved Bemarks
A. 1 131 100 1 8	Details of energy efficiency aplemented: (FY 2023-24.) Description of Beergy Efficiency improvement Measures Replacement of large with LED large Replacement of Did AC units with 3 Star 10.5 Star ACs in surrous bestices	Category Lighting Aue - Construit au	nt mensures im ade in the imple Investment (Lakba Rupses) 0.77916 7.69319	plemented, inv mentation of o sovings (Lakts Rupees) 2.47119 1.78500	estament made a ther remonstrate energy savings 35303 25000	nd savings i Iations. Thits KWH KWH	n energy ath Fuel Mi	Remarks 16 ner. of A.Ca replaced with Sta rated A.Ca

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- 3 JUL 2024

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Name of the Accedited Energy Auditor' J.Nagesh Kumuv Ameriditation details " AEA 0133

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SUPERINTCHOING ENGINEER TITLE - 2,500 CHIN PORT AUTHOR

- U	(nder Implementation: (FY 2024 Str)	(
51	Description of Energy Efficiency Improvement Measures	Category	Investment (Ropers in Laided Estimated	Ventied savings Glupees in Jakhe S Extimated	Vershed energy envirings Estimated	Unšte	Faul	Statue of implementation
1	Susar, lighting of High Masus & Yard Lights with LED	Lighting	201.33	27.45	392229	163611	Net	DPR Sent to MoPSW for grant from MIV 2050
t.	PDESS - Replacement of old less Knergy efficient transformer (25) 40 Yes old) with BEE rating transformer.	Electricity Distribution	80.509	554 SH4	20490001	KWH	NU	Approval memory and Tambering process started
N.	Replacement of old Tower Type AC unit with star rated units in the Samuelation Hall	Air conditioning	12.5	0.171.98	านาร์	-ICWH	NIL	Approval manimum and Tandoring process started
K	Replacement of Old DG Sets 625 kVA & 525 kVA (50 Yrs eld) with New Bearge Effection Examples of 269 kVA = 1 no & 22.5 kVA (2 mm) at new OPGIN (BEE) Normal	Backup Down Scheratten Luon Power Domer	75.65	a.00 lakhe	5500	1.54	Pard approximate	e Alver

Name of the energy manager Name of the company : $C_DC_{15,100}$ \oplus O_CT $O_{10,100}$ $O_{10,100}$ Plane of the company : CDC++++ COCCC A OT CDE(11) Pull Addressi Data State Cocccc Building (C) Island Contact Person : Take Plane Coccccc Cocccc Cocccc Email Addressi Unide Address (C) Cocccc Cocccc Plant Addressi Cocccc Cocccc Cocccc Cocccc Coccc Plant Addressi Cocccc Cocccc Cocccc Cocccc Coccc Plant Addressi Cocccc Cocccc Cocccc Cocccc Coccc Coccc Hill PORT AUTIORITY Cocc Hill PORT AUTIORITY

- 3 JUL 2024

Signature

Name of the Accessified Energy Auditor 1 J. Nugseh Kumar Accessibilitation details CARA (2003) Seal -

Card Bridge Transmission (1998) Name (201, No. Law (1995) Name (201, No. Law (1995) Name (2019) No. 1995 (2019) No. 1997 (2019) No. 1995 (2019)

Table 7

1.7.2.1 Energy conservation measures proposed during the FY 2023-24

		En	ergy c	onservation	measure	s Propos	ed during	g the FY 2	023-24			
S.NO	Energy effeciency measure	QTY (No)	Unit	Captal investment (Rupees in Lakh)	Annual energy saving (kWH)	Annual savings (Rs) (Lakhs)	Discount rate(%)	CASH FLOW (Years)	Simple Pay back Period (Years)	NPV (Lakh Rs)	IRR(%)	Remarks
1	Replacement of Old copper(SWG 8) conductor with 3 PHASE 5 wire LT ABC of size 3x95sqmm+1x70 sqmm+1x 16 sqmm	9.17	kM	70	275549.60	16.53	8	13	4.2	₹ 71.70	26%	
2	Rectification of the inverter and clearing shading of the 100 kW solar power plant	1	NO	3	50000	3.55	8	5	0.8	₹ 12.66	110%	Presently 3 Nos of 30 kVA inverter units are in breakdown condition
				73	325549.60	20.08						

Table 8A

1.7.2.2 Other Energy conservation measures proposed during the FY 2023-24tA

		Other measures proposed	
1	Energy conservation measu Halt w	res proposed in the 50 hP Mattanchery ater Pump house	
	Observations	Measures recommender	Anticipated svings
<u>a.</u>	Apprciable water leakage observed in the delivery Pipe line. Pump main delivery pipe	To arrest the leakage Up on site analysis there is no flow adgustment required for the	The closing of the Pump valve by 20%
b	Valve found partially throttled for controling the flow.	operation.Hence the operator to be instructed to ensure the full opening of the delivery valve.	will increase the Power consumption by about 1/3.
c	Pump Motor found not fitted any Power factor correction Capacitor	For 50 HP motor the rated power factor correction capacitor is 14 kVAR	The power factor correction capacitor will reduce the apparent power at the load side by 2 kVA.Hence there will be savings due to the line loss also

Table No: 8B

2. Back ground

2.1 Extent of Regulations and role of BEE

The Bureau of Energy Efficiency (BEE), through Ministry of Power, Government of India, notified the regulations viz. 'Bureau of Energy Efficiency (Manner and Intervals for Conduct of Energy Audit in Electricity Distribution Companies) Regulations, 2021' vide Notification No.18/1/BEE/DISCOM/2021 dated 6th October 2021, and subsequent amendment issued thereof on 28th Oct. 2022. The extent of regulations specifies the following key aspects related to energy accounting and audit for electricity distribution companies.

- I. Intervals of time for conduct of periodic energy accounting and annual energy audit and report submission thereof.
- II. Pre-requisites for annual energy audit and periodic energy accounting.
- III. Reporting requirements for annual energy audit and periodic energy accounting.
- IV. Manner of annual energy audit and periodic energy accounting.
- V. Prioritization and preparation of action plan and
- VI. Structure of annual energy audit report

These regulations have been issued under the ambit of Energy Conservation Act, 2001, with an overall objective to reduce inefficiencies and losses in distribution sector thereby ensuring financial and economic viability of DISCOMs. These regulations shall apply to all electricity distribution companies specified as designated consumer. They shall come into force on the date of their publication in the Official Gazette.

1. Intervals of time for conduct of annual energy audit. - (1) Every electricity distribution company shall conduct an annual energy audit for every financial year and submit the annual energy audit report to the Bureau and respective State Designated Agency which will be made available on the website of the electricity distribution company within a period of four months from the expiry of the relevant financial year. Provided that, on the commencement of these regulations, the first annual energy audit of every electricity distribution company shall be conducted within six months from the date of such commencement, by taking into account the energy accounting of electricity distribution company for the financial year immediately preceding the date of the commencement of these regulations.

2. Intervals of time for conduct of periodic energy accounting. -

(1) Every electricity distribution company shall —

(a) ensure that all feeder wise, circle wise and division wise periodic energy accounting shall be conducted by the energy manager of the electricity distribution company for each quarter of the financial year; and

(b) submit the periodic energy accounting report to the Bureau and respective State Designated Agency and also made available on the website of electricity distribution company within forty-five days from the date of the periodic energy accounting.

(2) After the commencement of these regulations, every electricity distribution company shall, notwithstanding anything in sub-regulation (1),

(a) Conduct its first periodic energy accounting, for the last quarter of the financial year immediately preceding the date of such commencement; and

(b) Conduct its subsequent periodic energy accounting for each quarter of the financial year for a period of two financial years from the date of such commencement,

5. Pre-requisites for annual energy audit and periodic energy accounting — Save as otherwise provided, every electricity distribution company shall undertake all actions as may be required for the annual energy audit and periodic energy accounting before the start of the relevant financial year, including the following actions, namely: —

(a) the identification and mapping of all of the electrical network assets;

(b) the identification and mapping of high tension and low-tension consumers;

(c) the development and implementation of information technology enabled energy accounting and audit system, including associated software;

(d) the electricity distribution company shall ensure the installation of functional meters for all consumers, transformers and feeders: Provided that meter installation may be done in a phased manner within a period of three financial years from the date of the commencement of these regulations in accordance with the trajectory set out in the First Schedule;

(e)All distribution transformers (other than high voltage distribution system upto 25kVA and other distribution system below 25 kVA) shall be metered with communicable meters. And

existing noncommunicable distribution transformer meters shall be replaced with communicable meters and integrated with advanced metering infrastructure;

(f)The electricity distribution company shall establish an information technology enabled system to create energy accounting reports without any manual interference: Provided that such system may be established—

(i) within a period of three years from the date of the commencement of these regulations in case of urban and priority area consumers; and

(ii) within five years from the date of the commencement of these regulations in case of rural consumers;

(g) the electricity distribution company shall create a centralized energy accounting and audit cell comprising of— (i) a nodal officer, an energy manager and an information technology manager, having professional experience of not less than five years;

(ii) a financial manager having professional experience of not less than five years; (h) any other requisite that Bureau may direct for energy audit and accounting purpose.

6. Reporting requirements for annual energy audit and periodic energy accounting

- (1) Every electricity distribution company shall designate a nodal officer, who shall be a full-time employee of the electricity distribution company in the rank of the Chief Engineer or above, for the purpose of reporting of the annual energy audit and periodic energy accounting and communicate the same to the Bureau.
- (2) Every electricity distribution company shall ensure that the energy accounting data is 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.
- (3) Metering of distribution transformers at High Voltage Distribution System up to 25KVA can be done on cluster meter installed by each electricity distribution company.
- (4) The energy accounting and audit system and software shall be developed to create monthly, quarterly and yearly energy accounting reports.
- (5) 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.

7. Manner of annual energy audit and periodic energy accounting. -

(1) Every annual energy audit and periodic energy accounting under these regulations shall be conducted in the following manner, namely: —

(a) verification of existing pattern of energy distribution across periphery of electricity distribution company; and

(b) verification of accounted energy flow submitted by electricity distribution company at all applicable voltage levels of the distribution network, —

(i) energy flow between transmission and 66kV/33kV/11kV incoming distribution feeders;
(ii) energy flow between 66kV/33kV outgoing and 11kV/6.6kV incoming feeders;

(iii) energy flow between 11 kV/6.6kV feeders and distribution transformers, or high voltage distribution system;

(iv) energy flow between distribution transformer, or high voltage distribution system to end consumer, including ring main system;

(v) energy flow between Feeder to end-consumer; and

(vi) energy flow between 66/33/11 kV directly to consumer.

(2) The accredited energy auditor, in consultation with the nodal officer of the electricity distribution company shall, —

(a) develop a scope of work for the conduct of energy audit required under these regulations;

(b) agree on best practice procedures on accounting of energy distributed across the network; and

(c) collect data on energy received, and distributed, covered within the scope of energy audit.

(3) The accredited energy auditor shall— (a) verify the accuracy of the data collected in consultation with the nodal officer of the electricity distribution companies as per standard practice to assess the validity of the data collected; and (b) analyse and process the data with respect to—

(i) consistency of data monitoring compared to the collected data;

(ii) recommendations to facilitate energy accounting and improve energy efficiency; and

(iii) with respect to the purpose of energy accounting in reducing losses for the electricity distribution company

TRAJECTORY FOR METER INSTALLATION

Timeline for metering—

- (i) 100% Communicable Feeder Metering integrated with AMI, by 31 st December 2022 along-with replacement of existing non-communicable feeder meters.
- (ii) All Distribution Transformers (other than HVDS DT upto 25kVA and other DTs below 25 kVA) shall be metered with communicable meters. Communicable DT Metering for the following areas / consumers to be completed by December 2023 and in balance areas by December 2025:
 - All Electricity Divisions of 500 AMRUT cities, with AT&C Losses > 15%
 - All Union Territories (for areas with technical difficulty, non-communicable meters may be installed);
 - All Industrial and Commercial consumers;
 - All Government offices at Block level and above;
 - Other high loss areas i.e. rural areas with losses more than 25% and urban areas with losses more than 15%. Further, existing non-communicable Distribution Transformer meters to be replaced with communicable meters integrated with AMI, within the timelines applicable to the respective areas.
- (iii) Prepaid Smart Consumer Metering to be completed for all directly connected meters and AMR in case of other meters, by December 2023 in the following areas:
 - All Electricity Divisions of 500 AMRUT cities, with AT&C Losses > 15%; o All Union Territories (for areas with technical difficulty, prepaid meters to be installed);
 - All Industrial and Commercial consumers;
 - All Government offices at Block level and above; o Other high loss areas i.e. rural areas with losses more than 25% and urban areas with losses more than 15%. The balance areas and consumers may be taken up in a phased manner subsequently. However, Distribution Companies can additionally cover any other areas as well as agricultural consumers, at their option by December 2023. Further, in rural / hilly areas with connectivity or communication issues, wherein installation of smart meters may not be feasible, prepaid meters may be opted for
- (iv) Consumer Metering:
 - 98% by FY 2022-23
 - 99% by FY 2023-24

Meter	2022-23	2023-24	2024-25	
Feeder Metering	98.5%	99.5%	995%	
DT Metering	90%	95%	98%	
Consumer Metering	93%	96%	98%	

2.2 Purpose of audit and accounting Report

Bureau of Energy Efficiency (BEE) through Ministry of Power, Government of India issued regulations for the Conduct of Mandatory Annual Energy Audit and Periodic Energy Accounting in DISCOMs vide regulation No:

As per the regulation, all Electricity Distribution Companies are mandated to conduct annual energy audit and periodic energy accounting on quarterly basis.

Owing to the impact of energy auditing on the entire distribution and retail supply business and absence of an existing framework with dedicated focus on the same, it was imperative to develop a set of comprehensive guidelines that all Distribution utilities across India can follow and adhere to.

Accordingly, Regulations on Manner and Intervals for Conduct of Energy Audit and Accounting in Electricity Distribution Companies has been framed. 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.

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.

2.3 Period of the Energy Audit

The period of the audit is for the year 2023-24. This is the third annual energy audit in the CoPA, as per the BEE Regulations.

3. Introduction of DISCOM

3.1 Name and address of the DISCOM (DC)

Cochin Port Authority (CoPA)

P.O. Willingdon Island

Ernakulam -682009,

Kerala.

3.1 .1 Name and details of Energy Manager and authorized signatory of DISCOM

1	Energy Manager	2	Nodal officer
	Mrs. Jayalakshmy. S		Mr. Ajith kumar D
	Exe. Engineer (Ele)- EM		Superintending Engineer (Ele)
	Cochin Port Authority		Cochin Port Authority
	Willingdon Island, Kochi,		Willingdon Island, Kochi,
	Kerala 682009		Kerala 682009
	Whether CEA/CEM- Nil		Phone: 9444610664
	Phone No: 9496450704		
	Email: jayalakshmi@cochinport.gov.in		

Table 10 A

3.1.2 Centralised Energy accounts and Audit Cell in CoPA (Team members)

S.No	Name of the Officer	Official designation	Role
1.	Sri Ajith Kumar D	Superintending Engineer (Ele)	Nodal officer
2.	Smt Jayalakshmy S	Executive Engineer (Ele)	Energy Manager
3.	Sri Vinod C	Senior Deputy Director EDP	I.T Manager
4	Smt Surya Madhu	Senior Accounts officer	Finance Manager

3.2 Summary profile of the DISCOM with salient features

Cochin Port Authority (CoPA): Electricity Distribution

Overview

Cochin Port Authority (CoPA) operates under the Major Port Authorities Act, 2021 (formerly Cochin Port Trust). It is a Deemed Electricity Distribution Licensee as per the Electricity Act 2003 and a notified Designated Consumer (DC No: DIS0048KL) under PAT Cycle VII, as per the Ministry of Power's notification (S.O.4552(E), dated 26th September 2022).

Electricity Procurement and Distribution

CoPA purchases electricity from Kerala State Electricity Board Limited (KSEBL) and distributes it to consumers in the port areas of Willingdon Island, Vallarpadam, and Puthuvypin.

Power Procurement

- Willingdon Island: 6.5 MVA power at 110 KV from KSEBL.
- Vallarpadam: 5 MVA power at 11 kV from KSEBL through two feeders:
 - Old feeder: 3 MVA contract demand.
 - New feeder (installed March 2024): 2 MVA contract demand, dedicated to a commercial establishment under CoPA.

Substations

- Willingdon Island: 110kV/11kV Substation with two 10/12.5MVA power transformers.
- Vallarpadam: 11kV receiving station with two incoming feeders.

Power Distribution

Power is distributed to consumers through 11kV underground (UG) cables connected via a Ring Main system to ensure a reliable 24x7 supply. Low Tension (LT) feeding is done using LT overhead (OH) and UG cable lines.

Consumer Base

CoPA serves 1,288 consumers:

- HT consumers: 37
- LT consumers: 1,251

All consumers except 50% of the self-consumption meters and street light meters are SMART meters with Advanced Metering Infrastructure (AMI) features and prepaid facilities. These meters are connected to a centralized AMI software system via GPRS, with billing and accounting managed through the SAP system.

Feeder and Transformer Infrastructure

- Willingdon Island: Eleven 11 kV feeders from the 110/11 kV substation.
- Vallarpadam & Puthuvypin: Six 11 kV feeders.
- Transformers: 30 distribution transformers (11kV/415Volt and 11kV/3.3 kV).

Renewable Energy Initiatives

- Solar Plants: 100kWp and 150kWp grid-connected solar plants.
- Net Metering: Available for four LT and HT prosumers.
- Energy Audit: Solar energy inputs are included in the energy audit.

Key Projects

RDSS Project

- Funding: Rs 15.13 Crores under the Revamped Distribution Sector Scheme (RDSS).
- Goals: Modernization and loss reduction through:
 - \circ $\;$ Replacement of old cables, transformers, and Ring Main units.
 - Addition of three 11 kV panels.
 - Completion of metering for 11 kV feeders and distribution transformer (DTR) metering.
 - Implementation of SCADA project.
- **Timeline**: FY 2021-22 and 2025-26.

Other Projects

- **Contract Demand Enhancement**: Contract demand will be enhanced to 8 MVA at Vallarpadam by December 2024. (The work is under progress)
- Shore Power Supply: Provision of shore power to international cruise vessels by FY 2025-26 with 6 MVA Green Energy through open access.
- Floating Solar Plant: Installation of a 1.5MWp grid-connected floating solar plant by the end of FY 2024-2025.
- 350 kWp Roof top SPV by the end of 2024-25
- **SMART Lighting proposal amounting 2**.05 Cr submitted for MOPSW,
- •

This comprehensive approach ensures CoPA's commitment to reliable power distribution, modernization, and sustainable energy initiatives.

3.3 Asset details

3.3.1 Infrastructure details

	Form	n-Detai	ls of Inp	ut Infrastruc	ture
1	Parameters	Total	Covered during in audit	Verified by Auditor in Sample Check	Remarks (Source of data)
i	Number of circles	1	1		In CoPA there is no Division or Subdivision wise formation.
ii	Number of divisions	0			
iii	Number of sub- divisions	0			
iv	Number of feeders	16	16	11	Through AMI meter software for 11 nos out of 16 feeders
v	Number of DTs	30	30	1	No meter is installed
vi	Number of consumers	1288	1288	1288	Through SAP

Table 11 A

3.3.2 Voltage wise consumers metering infrastructures and other assets.

S.NO	Parameters	66kV and above	33kV	11/22kV	LT
	Number of conventional metered				
a i	consumers	0	0	0	89
ii	Number of consumers with 'smart' meters	0	0	37	1162
	Number of consumers with 'smart				
iii	prepaid' meters	0	0	0	0
iv	Number of consumers with 'AMR' meters	0	0	0	0

	Number of consumers with 'non-smart				
v	prepaid' meters	0	0	0	0
vi	Number of unmetered consumers	0	0	0	0
vii	Number of total consumers	0	0	37	1251
	Number of conventionally metered				
b i	Distribution Transformers	0	0	0	0
	Number of DTs with communicable				
ii	meters	0	0	0	0
iii	Number of unmetered DTs	0	0	30	0
iv	Number of total Transformers	0	0	30	
c i	Number of metered feeders	0	0	12	0
	Number of feeders with communicable				
ii	meters	0	0	12	0
iii	Number of unmetered feeders	0	0	4	
iv	Number of total feeders	0	0	16	
d.	Line length (ckt km2	0		85	105
e.	Length of Aerial Bunched Cables (kM)	0	0	0	0
f.	Length of Underground Cables (kM)	0	0	85	

Table 11 B

S.No	Asset details	Unit	Quantity
1	110kV/11 kV 12.5 MVA Power Transformers		2
2	Capacitor bank (PF correction) 1000 kVAR		2
3	Distribution Transformer 11kV/415 V 1250 kVA		2
4	Distribution Transformer 11kV/415 V 1000 kVA	No	1
5	Distribution Transformer 11kV/415 V 800 kVA		3
6	Distribution Transformer 11kV/415 V 630 kVA		9
7	Distribution Transformer 11kV/415 V 500 kVA	No	8
8	Distribution Transformer 11kV/415 V 315 kVA	No	3
9	Distribution Transformer 11kV/415 V 300 kVA	No	1
10	Distribution Transformer 11kV/415 V 250 kVA	No	3

3.3.3 Power Transformer, Capacitor bank and Distribution Transformer details

Table 11 C

Rev:0

3.3.4.1 ENERGY FLOW DIAGRAM



Fig No:4

S.NO	Energy input details	Units	Quantity
1.	Energy purchased	MU	40.12
2.	Net input energy (at DISCOM Periphery after adjusting the transmission losses and energy traded)	MU	40.43
3.	Energy billed	MU	39.50
4.	T& D Loss	MU	0.93
5.	% T&D Loss	%	2.31
6.	Amount of Energy billed	Rs (Crores)	43.18
7.	Amount of collection	Rs (Crores)	43.11
8.	Collection efficiency	%	99.83
9.	% AT&C Loss	%	2.47

3.3 4.2 . Performance summary of the CoPA for the FY 2023-24

Table 12

3.3.5 Energy Input Particulars of the CoPA for the FY 2023-24

	Voltage level	Particulars	MU
i	66kV and above	Long-Term Conventional	28.65
		Medium Conventional	0
		Short Term Conventional	0
		Banking	0
		Long-Term Renewable energy	0
		Medium and Short-Term RE	0
		Captive, open access input	0
		Sale of surplus power	0
		Quantum of inter-state transmission loss	0
		Power procured from inter-state sources	0.00
		Power at state transmission boundary	28.65
ii	33kV	Long-Term Conventional	0
		Medium Conventional	0
		Short Term Conventional	0

		Banking	0
		Long-Term Renewable energy	0
		Medium and Short-Term RE	0
		Captive, open access input	0
		Sale of surplus power	0
		Quantum of intra-state transmission loss	0
		Power procured from intra-state	0
iii		Input in DISCOM wires network	0
iv	33 kV	Renewable Energy Procurement	0
		Small capacity conventional/ biomass/ hydro plants	0
		Procurement	
		Captive, open access input	0
v	11 kV	Renewable Energy Procurement	0
		Small capacity conventional/ biomass/ hydro plants Procurement	0
		Sales Migration Input	11.47
vi	LT	Renewable Energy Procurement	0
		Sales Migration Input	0
vii		Energy Embedded within DISCOM wires network	0.312
viii		Total Energy Available/ Input	40.43

Table 13
	Voltage level	Energy Sales Particulars	MU
i	LT Level	DISCOM' consumers	8.37
		Demand from open access, captive	0
		Embedded generation used at LT level	0.053
		Sale at LT level	8.42
		Quantum of LT level losses	0
		Energy Input at LT level	9.35
ii	11 kV Level	DISCOM' consumers	31.08
		Demand from open access, captive	0
		Embedded generation at 11 kV level used	0
		Sales at 11 kV level	31.08
		Quantum of Losses at 11 kV	0
		Energy input at 11 kV level	40.12
iii	33 kV Level	DISCOM' consumers	0
		Demand from open access, captive	0
		Embedded generation at 33 kV or below level	0
		Sales at 33 kV level	0
		Quantum of Losses at 33 kV	0
		Energy input at 33kV Level	0
	> 33 kV	DISCOM' consumers	0
		Demand from open access, captive	0
		Cross border sale of energy	0
		Sale to other DISCOMs	0
		Banking	0
		Energy input at > 33kV Level	28.65
		Sales at 66kV and above (EHV)	0
Tota	l Energy Sales		39.50
Tota	l Energy Input		40.43
T&D	Loss		0.93

3.3.6 Energy sales Particulars of the CoPA for the FY 2023-24

^{**}HT and LT Level losses could not be assessed due to the absence of Feeder meters and DTR meters

Table 14

3.3.7 Category wise consumers

Period From 1st April 2023 to 31st March 2024								
Consumer profile		Ene	rgy paramo	Losses				
Consumer category	Total Number of connecti	Input energy (MU)	Total energy	% of energy consump tion	T&D loss (MU)	T&D loss (%)		
Residential	412		0.97	2%				
Agricultural	0		0.00	0%				
Commercial/Industrial-LT	605	40.43421	4.63	12%	0.933059	2.31%		
Commercial/Industrial-HT	30		28.77	73%				
Others	241		5.13	13%				
	1288	40.43421	39.50	100%	0.933	2.308%		

Table 15

3.3.7.2 Percentage wise consumption of different Consumer category of CoPA for the FY 2023-24



Rev:0

3.4 Energy Conservation measures implemented under the DISCOM

NAM	HE OF DISCOM COCHIN PORT AUTHO Intration no. DISCOMSKL	ORITY						
	Na.			Form 1		4	_	
			law	e mida 200200				
	Details of anyongy efferior a	ey improveme nd progress m	est measures im ade in the hoph	plemented, inv munitation of o	estment made a ther recomment	nd savings i Intiona	n energy seld	bervai
SL DO	Description of Brangy Efficiency improvement Measures	Category	Investment (Lakis Rupeed	Verified anvings Claths Rupees	Verified searcy savings	Units	Fuel	Remarks
1	Replacement of lamps with LRD lamps	Lighting	2029096	2,47119	35503	KWH		0
2	Replacement of Old AC units with 3 Star to 5 Star ACs in express locations	Air Conditions	7.69319	1,78500	20000	icwit	351	10 mm of A.Co. replaced with Star rated A.Co.
	Total	10461	10.46505 -	4,26610	40803	KWH		

ANT Mundsandcar a

- 3 HUL 2024

The Southern

PAT-Cycle:

Name of the Accredited Energy Auditor, J.Nagesh Komar Accreditation details 7 AEA 0135

S. A.

IL L

SUPERINTERDING ENGINE PERMITS

H. 1	Under Implementation: (FY 2024-201)							
571 mo	Description of Energy Efficiency improvement Measures	Catugory	Investment (Rupous in Lukha) Estimated	Verified soriage (Rupees in lakhe) Estimated	Verified energy savings Estimated	Units	Fuei	Status of implementation
١.	Susant lighting of High Moore & Yard Lights with LED	Lighting	201.33	27, 45	392229	RWH	Ngt	DPR Sent to MoPSW for grant from MIV 2000
9	HDEE – Replacement of old loss Energy efficient transformer (20) 40 Vrc old) with BEE rating transformer.	Electricity Distribution	00,00	24,26		EWH	244	Approval received and Templering process started
9(:	Replacement of shi Tower Type AC unit with star rated sorts in the Samulaiba Hall	Air conditioning	12.5	0.47100	7072	6WH	NIL	Approval received and Tenderizin process started
н.	Replacement of OLI DC Sets 636 EVA 6:525 EVA 1:50 Yes old with New Receipt Efficient Regimes of 280 EVA - 1 no 6: 82.5 EVA 32 not- int new CPUE (BUE). Normal	Reclamp power percention free Pawer House	75,65	,8.00 lakhe	2300	Lu	Part	

Signature =

Name of the energy manager : Name of the company : CDCUIM VISE E PISTHORICH Full Addresse : there is a thread to Buildham OF Island Contact Person : Daug Julies in mar 2 E multice - 6 8 100 9 Valuation Email Addresse : Daug Julies in mar 2 E multice - 6 8 100 9 Valuation Telephone/fam rulinbles Out = 1000 000 Plant Addresse : SAU DO 15 7 11 COCHIN PORT AUTHORITY COCHIN PORT AUTHORITY



Signature

Name of the Accessited Energy Auditor - J.Name & Kumar Accessitation details : AEA 0105 Eval :

Sans in Darge Sciences of Finish Name and Art Party, Print, And Sons Art Rate, 2010, 30 (91) 71, 411 (2010), 104000000

Table 16

3.5.1. Energy conservation Measure proposed during the FY 2022-23 and pending for Implementations

Energy effeciency measures proposed during the year 2022-23 and pending for implimentation									
Energy effeciency measure	QTY (No)	Captal investment (Rupees in Lakh)	Annual energy saving (kWH)	Annual savings (Rs) (Lakhs)	Discount rate(%)	CASH FLOW (Years)	Simple Pay back Period (Years)	NPV (Lakh Rs)	IRR(%)
Replacement of one 800 kvA Old Transformer with two new energy effecienct 315 kVA Transformer	2	37.36	42514.8645	2.976041	8	12	12.6	₹ 3.72	-1%
Replacement of one 630 kvA Old Transformer with Two new energy effecienct 315kVA Transformer	3	56.64	72405.5886	5.068391	8	12	11.2	₹ 38.20	1%
Replacement of one 500 kvA Old Transformer with two new energy effecienct 250 kVA Transformer	1	15.71	13814.52	0.967016	8	12	16.2	₹ 7.29	-4%
Replacement of one 500 kvA Old Transformer with one new energy effecienct 500 kVA Transformer	1	11.58	2263.584	0.158451	8	12	73.1	₹ 1.19	-21%
Replacement of 315 kvA Old Transformer with two new energy effecienct 160 kVA Transformer	1	11.706	11624.52	0.813716	8	12	14.4	₹ 6.13	-3%
	Energy effeciency measure Replacement of one 800 kvA Old Transformer with two new energy effecienct 315 kVA Transformer Replacement of one 630 kvA Old Transformer with Two new energy effecienct 315kVA Transformer Replacement of one 500 kvA Old Transformer with two new energy effecienct 250 kVA Transformer Replacement of one 500 kvA Old Transformer with one new energy effecienct 500 kVA Transformer Replacement of 315 kvA Old Transformer with two new energy effecienct 160 kVA Transformer	Energy effeciency measuresCTY (No)Replacement of one 800 kvA Old Transformer with two new energy effecienct 315 kVA TransformerReplacement of one 630 kvA Old Transformer with Two new energy effecienct 315kVA TransformerReplacement of one 630 kvA Old Transformer with Two new energy effecienct 315kVA TransformerReplacement of one 500 kvA Old Transformer with two new energy effecienct 250 kVA TransformerReplacement of one 500 kvA Old Transformer with one new energy effecienct 500 kVA TransformerReplacement of one 500 kvA Old Transformer with one new energy effecienct 500 kVA TransformerReplacement of 315 kvA Old Transformer with two new energy effecienct 160 kVA TransformerReplacement of 315 kvA Old Transformer with two new energy effecienct 160 kVA Transformer	Energy effeciency measures proposed du Captal investment QTY (Rupees in Lakh)Energy effeciency measureQTY (No)Captal investment (Rupees in Lakh)Replacement of one 800 kvA Old Transformer with two new energy effecienct 315 kVA Transformer37.36Replacement of one 630 kvA Old Transformer with Two new energy effecienct 315 kVA Transformer with Two new energy effecienct 315 kVA Transformer37.36Replacement of one 630 kvA Old Transformer with Two new energy effecienct 250 kVA Transformer356.64Replacement of one 500 kvA Old Transformer with two new energy effecienct 250 kVA Transformer15.71Replacement of one 500 kvA Old Transformer with one new energy effecienct 500 kVA Transformer with one new energy effecienct 500 kVA Transformer11.58Replacement of 315 kvA Old Transformer with two new energy effecienct 160 kVA Transformer11.706	Energy effeciency measures proposed during the yetEnergy effeciency measureCaptal investment (Rupees in Lakh)Annual energy saving (kWH)Replacement of one 800 kvA Old Transformer with two new energy effecienct 315 kVA Transformer37.3642514.8645Replacement of one 630 kvA Old Transformer with Two new energy effecienct 315kVA Transformer37.3642514.8645Replacement of one 630 kvA Old Transformer with Two new energy effecienct 315kVA Transformer36.6472405.5886Replacement of one 500 kvA Old Transformer with two new energy effecienct 250 kVA Transformer15.7113814.52Replacement of one 500 kvA Old Transformer with one new energy effecienct 500 kVA Transformer11.582263.584Replacement of one 500 kvA Old Transformer with one new energy effecienct 500 kVA Transformer11.70611624.52Replacement of 315 kvA Old Transformer with two new energy effecienct 160 kVA Transformer11.70611624.52	Energy effeciency measures proposed during the year 2022-Captal investment (Rupees in Lakh)Annual energy saving (kWH)Annual savings (Rs) (Lakhs)Replacement of one 800 kvA Old Transformer with two new energy effecienct 315 kVA Transformer237.3642514.86452.976041Replacement of one 630 kvA Old Transformer with Two new energy effecienct 315kVA Transformer237.3642514.86452.976041Replacement of one 630 kvA Old Transformer with Two new energy effecienct 315kVA Transformer356.6472405.58865.068391Replacement of one 500 kvA Old Transformer with two new energy effecienct 250 kVA Transformer115.7113814.520.967016Replacement of one 500 kvA Old Transformer with one new energy effecienct 500 kVA Transformer111.582263.5840.158451Replacement of 315 kvA Old Transformer with two new energy effecienct 160 kVA Transformer111.70611624.520.813716	Energy effeciency measures proposed during the year 2022-23 and put Captal investment (Rupees in Lakh)Annual energy saving (Rs) (Lakhs)Annual savings poisount rate(%)Replacement of one 800 kvA Old Transformer with two new energy effecienct 315 kVA Transformer with Two new energy effecienct 315 kVA Transformer with two new energy effecienct 250 kVA Transformer with two new energy effecienct 250 kVA Transformer with one new energy effecienct 500 kvA Old Transformer with two new energy effecienct 2115.Captal Annual energy saving (Rs) (Lakhs)Annual energy saving (Rs) (Lakhs)Discount rate(%)Replacement of one 630 kvA Old Transformer with Two new energy effecienct 250 kVA Transformer237.3642514.86452.9760418Replacement of one 500 kvA Old Transformer with two new energy effecienct 250 kVA Transformer356.6472405.58865.0683918Replacement of one 500 kvA Old Transformer with one new energy effecienct 500 kVA Transformer115.7113814.520.9670168Replacement of 315 kvA Old Transformer with one new energy effecienct 500 kVA Transformer111.582263.5840.1584518Replacement of 315 kvA Old Transformer with two new energy effecienct 160 kVA Transformer111.70611624.520.8137168	Energy effeciency measures proposed during the y=r 2022-23 and pending forCaptal investment (Rupees in Lakh)Annual energy saving (KWH)Annual saving (Rs) (Lakhs)CASH FLOW rate(%)Replacement of one 800 kvA Old Transformer with two new energy effecienct 315 kVA Transformer237.3642514.86452.976041812Replacement of one 630 kvA Old Transformer with Two new energy effecienct 315kVA Transformer356.6472405.58865.068391812Replacement of one 630 kvA Old Transformer with Two new energy effecienct 315kVA Transformer115.7113814.520.967016812Replacement of one 500 kvA Old Transformer two new energy effecienct 250 kVA Transformer111.57113814.520.967016812Replacement of one 500 kvA Old Transformer with one new energy effecienct 500 kVA Transformer111.582263.5840.158451812Replacement of one 500 kvA Old Transformer with one new energy effecienct 500 kVA Transformer111.70611624.520.813716812	Energy effeciency measures proposed during the year 2022-23 and pending for impliment Annual saving Captal investment inve	Energy effeciency measures proposed during the year 2022-23 and pending for implimentationCaptal investment (Rupess in Lakh)Annual savings (Rs)Annual paring (Rs)Annual paring (Rs)Annual paring (Rs)Captal DiscountNPV (Lakh PeriodNPV (Lakh Rs)Replacement of one 800 kvA Old Transformer with two new energy effecienct 315 kVA Transformer237.3642514.86452.97604181212.6₹ 3.72Replacement of one 630 kvA Old Transformer with two new energy effecienct 315kVA Transformer356.6472405.58865.06839181211.2₹ 38.20Replacement of one 630 kvA Old Transformer15.7113814.520.96701681211.2₹ 38.20Replacement of one 500 kvA Old Transformer vith two new energy effecienct 250 kVA Transformer11.57113814.520.96701681216.2₹ 7.29Replacement of one 500 kvA Old Transformer with two new energy effecienct 500 kVA Transformer11.582263.5840.15845181216.2₹ 7.29Replacement of one 500 kvA Old Transformer with on new energy effecienct 500 kVA Transformer111.582263.5840.15845181216.2₹ 1.19Replacement of 315 kvA Old Transformer with too new energy effecienct 160 kvA Transformer111.70611624.520.81371681214.4₹ 6.13

3.5.2. Energy conservation Measures proposed during the FY 2023-24

	Energy conservation measures Proposed during the FY 2023-24											
S.NO	Energy effeciency measure	QTY (No)	Unit	Captal investment (Rupees in Lakh)	Annual energy saving (kWH)	Annual savings (Rs) (Lakhs)	Discount rate(%)	CASH FLOW (Years)	Simple Pay back Period (Years)	NPV (Lakh Rs)	IRR(%)	Remarks
1	Replacement of Old copper(SWG 8) conductor with 3 PHASE 5 wire LT ABC of size 3x95sqmm+1x70 sqmm+1x 16 sqmm	9.17	kM	70	275549.60	16.53	8	13	4.2	₹71.70	26%	
2	Rectification of the inverter and clearing shading of the 100 kW solar power plant	1	NO	3	50000	3.55	8	5	0.8	₹ 12.66	110%	Presently 3 Nos of 30 kVA inverter units are in breakdown condition
				73	325549.60	20.08						

For detailed calculation of energy savings and NPV please refer Page No in the Annexure

Table 17 A

3.5.2 Other Energy conservation Measures proposed during the FY 2023-24

		Other measures proposed	
1	Energy conservation measu Halt w	res proposed in the 50 hP Mattanchery ater Pump house	
	Observations	Measures recommender	Anticipated svings
a.	Apprciable water leakage observed in the delivery Pipe line. Pump main delivery pipe Valve found partially	To arrest the leakage Up on site analysis there is no flow adgustment required for the operation.Hence the operator to be	The closing of the Pump valve by 20% will increase the Power consumption
b	throttled for controling the flow.	instructed to ensure the full opening of the delivery valve.	by about 1/3.
c	Pump Motor found not fitted any Power factor correction Capacitor	For 50 HP motor the rated power factor correction capacitor is 14 kVAR	The power factor correction capacitor will reduce the apparent power at the load side by 2 kVA.Hence there will be savings due to the line loss also

Table No:17 B

SOLAR PRODUCTION								
	M/ Ha	alt (100 KW	p Ground)	RNA				
M.no.				M.no. GP4408587,				
GP4408589		M.F:	50	Ν	I.F:	40		
Month	IR	FR	Production (Units)	IR	FR	Production (Units)	TOTAL	
Apr-23	6563	6730	8350	17141	17623	19280	27630	
May-23	6730	6887	7850	17623	18069	17840	25690	
Jun-23	6887	7002	5750	18069	18400	13240	18990	
Jul-23	7002	7120	5900	18400	18688	11520	17420	
Aug-23	7120	7282	8100	18688	19088	16000	24100	
Sep-23	7282	7397	5750	19088	19367	11160	16910	
Oct-23	7397	7536	6950	19367	19722	14200	21150	
Nov-23	7536	7622	4300	19722	20071	13960	18260	
Dec-23	7622	7705	4150	20071	20433	14480	18630	
Jan-24	7705	7789	4200	20433	20817	15360	19560	
Feb-24	7789	7841	2600	20817	21093	11040	13640	
Mar-24	7841	7902	3050	21093	21459	14640	17690	
		TOTAL	66950		TOTAL	172720	239670	
			Table	18				

3.5.3	100 kWp AND	150 kWp	solar Plant performance	ce during the year 2023-24
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3.5.4. 100 kWp solar Plant Month wise generation graph







3.5.5. 150 kWp solar Plant Month wise generation graph

Fig 6 B

Energy flow analysis

4.1. Energy flow across 5 service levels

In CoPA presently the Energy consumption is only in 11 KV and LT Levels. Power is received in Willingdon Island at 110 kV and stepdown to 11 kV level. Renewable injection is at LT levels. Due to non-installation of meters in all the 11 kV feeders and DTRs, losses cannot be segregated at feeder level and DTR level. However, the energy is distributed by the CoPA in two separate geographical areas without any border sharing. Hence presently loss can be assessed only at the DISCOM level and at the area level in the two distribution areas. The power input at the two areas is indicated in the following diagram.

Rev:0



Fig 7

	Voltage	Particulars	MU
	level		
i	66kV and	Long-Term Conventional	28.65
	above	Medium Conventional	0
		Short Term Conventional	0
		Banking	0
		Long-Term Renewable energy	0
		Medium and Short-Term RE	0
		Captive, open access input	0
		Sale of surplus power	0.0
		Quantum of inter-state transmission loss	0
		Power procured from inter-state sources	0.00
		Power at state transmission boundary	28.65
ii	33kV	Long-Term Conventional	0
		Medium Conventional	0
		Short Term Conventional	0
		Banking	0
		Long-Term Renewable energy	0
		Medium and Short-Term RE	0
		Captive, open access input	0
		Sale of surplus power	0
		Quantum of intra-state transmission loss	0
		Power procured from intra-state sources	0
iii		Input in DISCOM wires network	0
iv	33 kV	Renewable Energy Procurement	0
		Small capacity conventional/ biomass/ hydro plants Procurement	0
		Captive, open access input	0
v	11 kV	Renewable Energy Procurement	0
		Small capacity conventional/ biomass/ hydro plants Procurement	0
		Sales Migration Input	11.474
vi	LT	Renewable Energy Procurement	0
		Sales Migration Input	0
vii		Energy Embedded within DISCOM wires network	0.312
viii		Total Energy Available/ Input	40.434

4.1.1 ENERGY INPUT PARTICULARS OF CoPA for the FY 2022-23

4.1.2 Energy sales Particulars	s for the FY	2022-23
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	Voltage level	Energy Sales Particulars	MU
i	LT Level	DISCOM' consumers	8.37
		Demand from open access, captive	0
		Embedded generation used at LT level	0.052
		Sale at LT level	8.42
		Quantum of LT level losses	0
		Energy Input at LT level	9.35
ii	11 kV Level	DISCOM' consumers	31.08
		Demand from open access, captive	0
		Embedded generation at 11 kV level used	0
		Sales at 11 kV level	31.08
		Quantum of Losses at 11 kV	0
		Energy input at 11 kV level	40.12
iii	33 kV Level	DISCOM' consumers	0
		Demand from open access, captive	0
		Embedded generation at 33 kV or below level	0
		Sales at 33 kV level	0
		Quantum of Losses at 33 kV	0
		Energy input at 33kV Level	0
	> 33 kV	DISCOM' consumers	0
		Demand from open access, captive	0
		Cross border sale of energy	0
		Sale to other DISCOMs	0
		Banking	0
		Energy input at > 33kV Level	28.65
		Sales at 66kV and above (EHV)	0
Total	Energy Sales		39.50
Total	Energy Input		40.43
T&D	Loss		0.93

**HT and LT category level losses could not be assessed due to the absence of Feeder meters and DTR meters

4.2 Validation of metered data

S.NO	ENERGY PARTICULARS	METERING INFRASTRUCTU RE	NUMBER OF METERS	FUNCTION AL STATUS	SAMPLE CHECKED	REMARKS
1			Energy inp	ut points		
i	110 Kv Wellingdon island	1	1	Utility side meter	1	Verified supplier invoice and also check reading taken on 10/07/2024
ii	11 kV Vallarppadam S/s	2		Utility side meter	2	Verified supplier invoice and also check reading taken on 10/07/2024
iii	150 Kw SOLAR PLANT	1	1	Functional	1	Verified meter readins from the AMI software
iv	100 Kw SOLAR PLANT	1	1	Functional	1	Verified meter readins from the AMI software
v	SOLAR PROSUMERS	9	9	Functional	9	Verified meter readins from the AMI software
vi	DG SETS	3	3	Functional	3	Verified meter readins at the DG Sets
	•	Energy	consumptior	n Points		
						Check reading taken on 10/04/2024 and verified the monthly readings from the
vii	11 kV feeders	17	13	Functional	13	AMI software
viii	Distribution Transformer	30	4	Non functional	4	DTR meter not installed
IX	CONSUMER METERS	1288	1288	Functional	1288	Full Month data verified through the AMI software

Table 21

4.2.1 Physical verification of meters at Substation

Willingdon Island

S.NO	FEEDER NAME	Meter S.NO	Meter reading	Date of reading
1	Q91	GP4409885	624154	11/07/24
2	Q92	GP4409882	536353	11/07/24
3	PENNA	GP4409879	362016	11/07/23
4	NTRO A2	GP4409899	181904	11/07/24

Table 22

4.3. Verification and Validation of input energy

A.3.1.1 I Ower purchase details of the winningdon Island								
Consumer N	lo: 135541							
Contract der	nand :650							
		MD Charg	ges	E	Inergy char	rges		Total charges
BILL MONTH	Maximu m demand	Rate /KVA	MD Charge	Consumpti	Unit rate	Energy charges	PF Incentive/	Total charges
May-23	6270	380	2382600	2524050	6.25	15775312.5	315506	17843964
Jun-23	6430	380	2443400	2851650	6.25	17822812.5	356456	19909947
Jul-23	5124	380	1947120	2296800	6.25	14355000	358875	15975405
Aug-23	5261	380	1999180	2384550	6.25	14903437.5	372585	16533630
Sep-23	5728	380	2176640	2473360	6.25	15458500	386460	17248616
Oct-23	4875	380	1852500	2041650	6.4	13066560	319007	14300777
Nov-23	5436	380	2065680	2193150	6.4	14036160	342679	15430188
Dec-23	5585	400	2234000	2196300	6.4	14056320	351408	15941366
Jan-24	5866	400	2346400	2403900	6.4	15384960	384624	17349082
Feb-24	5589	400	2235600	2369400	6.4	15164160	379104	17024628
Mar-24	5824	400	2329600	2299650	6.4	14717760	367944	16681882
Apr-24	6468	400	2587200	2613450	6.4	16726080	418152	18897487
Total				28647910				203136972

4.3.1. Verification of Purchase bill

4.3.1.1 Power purchase details of the Willingdon Island

Table 234.3.1.2 Power Purchase details of theVallarpadam & Puthuvypin area throughFeeder 1

Consumer N	o: 1355xx								
Contract der	mand 3000								
		MD Charg	ges	E	Energy cha	rges			
MONTH	Maximum demand	Rate KVA	MD Charges	Consumptic	Unit rate	Energy charge	PF Incentive	Total charges (Including duty and surcharge	
May-23	2461	340	836740	1023560	6.25	6397250	127945	7418478	
Jun-23	2250	340	765000	914560	6.25	5716000	114320	6668899	
Jul-23	2250	380	783200	772560	6.25	4828500	97900	5787348	
Aug-23	2250	380	855000	766360	6.25	4789750	95795	5747854	
Sep-23	2250	380	829440	783200	6.25	4895000	97900	5863255	
Oct-23	2250	380	855000	829440	6.25	4396750	6131582	6131582	
Nov-23	2250	400	900000	914880	6.4	5855232	114360	6695688	
Dec-23	2250	400	900000	856120	6.4	5479168	109583	6468940	
Jan-24	2250	400	900000	1027400	6.4	6575360	131507	7637787	
Feb-24	2571	400	1028400	1038040	6.4	6643456	132869	7807503	
Mar-24	2647	400	1058800	1133120	6.4	7251968	108779.52	8504841	
Apr-24	2798	400	1119200	939920	6.4	6015488	120309	7218263	
Total				10999160				81950438	

4.3.1.3 Power Purchase details of the Vallarpadam & Puthuvypin area through Feeder 2

Consumer No:1355650096081								
Contract der	Contract demand 2000							
		MD Charg	ges	E	energy char	rges		
MONTH	Maximum Rate demand KVA MD Charges Consumptic Unit rate Energy charges				PF Incentive	Total charges (Including duty and surcharg		
Apr-24	1319	400	527600	474744	6.4	3038361.6	15192	3550770
Total				474744				3550770

Table 24 A

4.3.2 Validation of Input energy

A. Month wise statements generated from Software

Billing	Energy input to	Distributio	n Network			
Month		(1)	(2) Interna	l Generation	l	(3) Total:
		Purchase	Solar	Solar	DG Sets	(1) + (2)
			Plant	Prosumers	Port	
May-23	W/Island	25,24,050	27,630	4,512	113	25,56,305
	Vallarpadam	1023560	0	0	0	10,23,560
	Total	35,47,610	27,630	4,512	113	35,79,865
Jun-23	W/Island	28,51,650	25,690	2,914	542	28,80,796
	Vallarpadam	914560	0	0	0	9,14,560
	Total	37,66,210	25,690	2,914	542	37,95,356
Jul-23	W/Island	22,96,800	18,990	2,689	147	23,18,626
	Vallarpadam	772560	0	0	0	7,72,560
	Total	30,69,360	18,990	2,689	147	30,91,186
Aug-23	W/Island	23,84,550	17,420	5,006	1	24,06,977
	Vallarpadam	766360	0	60	0	7,66,420
	Total	31,50,910	17,420	5,066	1	31,73,397
Sep-23	W/Island	24,73,350	24,100	6,809	34	25,04,293
	Vallarpadam	783200	0	464	0	7,83,664
	Total	32,56,550	24,100	7,273	34	32,87,957
Oct-23	W/Island	20,41,650	16,910	4,451	113	20,63,124
	Vallarpadam	829440	0	1008	0	8,30,448
	Total	28,71,090	16,910	5,459	113	28,93,572
Nov-23	W/Island	21,93,150	21,150	6,519	11	22,20,830
	Vallarpadam	914880	0	452	0	9,15,332
	Total	31,08,030	21,150	6,971	11	31,36,162
Dec-23	W/Island	21,96,300	18,260	5,357	210	22,20,127
	Vallarpadam	856120	0	408	0	8,56,528

	Total	30,52,420	18,260	5,765	210	30,76,655
Jan-24	W/Island	24,03,900	18,630	5,487	76	24,28,093
	Vallarpadam	1027400	0	44	0	10,27,444
	Total	34,31,300	18,630	5,531	76	34,55,537
Feb-24	W/Island	23,69,400	19,560	6,422	186	23,95,568
	Vallarpadam	1038040	0	372	0	10,38,412
	Total	34,07,440	19,560	6,794	186	34,33,980
Mar-24	W/Island	22,99,650	13,640	5,980	1,805	23,21,075
	Vallarpadam	1133120	0	260	0	11,33,380
	Total	34,32,770	13,640	6,240	1,805	34,54,455
Apr-24	W/Island	26,13,450	17,690	8,319	1,204	26,40,663
	Vallarpadam	1414664	0	764	0	14,15,428
	Total	40,28,114	17,690	9,083	1,204	40,56,091

Table 25

4.3.3. Consolidated details of the Energy input under the CoPA

For the year 2023-24

S.NO	Energy import details	MU	Remarks
1.	Energy purchase through Willingdon Island (110 kV)	28.647	At 110 kV input
2	Energy purchase through Vallarppadam - Feeder 1	10.999	At 11 kV
3	Energy purchase through Vallarppadam - Feeder 2	0.4747	Do
4	Total energy injection from the Solar power plant (250 kWp)	0.2397	At LT level
5	Embedded energy from the Solar prosumers	0.0683	Do
6	Small energy injection from the Diesel generator set for essential load during the black out period	0.0004	Do
	Total input	40.43	

Table 26 A

4.3.4. Validation of Energy Sale Particulars

2023-	24 Q1	W/Island					
Cons.	Billing	Net input	Billed	Loss	% Loss		
Apr	May	25,56,305	24,77,359	78,946	3.088		
May	Jun	28,80,796	27,92,925	87,871	3.050		
Jun	Jul	23,18,626	22,64,134	54,492	2.350		
TOTAL		77,55,727	75,34,418	2,21,309	2.853		

Vallarpadam									
Purchase	Billed	Loss	% Loss						
10,23,560	10,04,683	18,877	1.844						
9,14,560	9,00,678	13,882	1.518						
7,72,560	7,60,931	11,629	1.505						
27,10,680	27,10,680 26,66,292 44,388 1.638								

2023-	24 Q2	W/Island					
Cons.	Billing	Net input	Billed	Loss	% Loss		
Jul	Aug	24,06,977	23,33,804	73,173	3.040		
Aug	Sep	25,04,293	24,29,916	74,377	2.970		
Sep	Oct	20,63,124	20,13,929	49,195	2.384		
TOTAL		69,74,394	67,77,649	1,96,745	2.821		

2023-	24 Q3	W/Island					
Cons.	Billing	Net input	Billed	Loss	% Loss		
Oct	Nov	22,20,830	21,53,755	67,075	3.020		
Nov	Dec	22,20,127	21,67,023	53,104	2.392		
Dec	Jan	24,28,093	23,62,891	65,202	2.685		
TOTAL		68,69,050	66,83,669	1,85,381	2.699		

Vallarpadam							
Net input	Billed	Loss	% Loss				
7,66,420	7,64,763	1,657	0.216				
7,83,664	7,80,404	3,260	0.416				
8,30,448	8,26,991	3,457	0.416				
23,80,532	23,72,158	8,374	0.352				

Vallarpadam							
Net input	Billed	Loss	% Loss				
9,15,332	9,10,844	4,488	0.490				
8,56,528	8,50,675	5,853	0.683				
10,27,444	10,20,412	7,032	0.684				
27,99,304	27,81,931	17,373	0.621				

2023-	24 Q4		W/Isl	and	
Cons.	Billing	Net input	Billed	Loss	% Loss
Jan	Feb	23,95,568	23,12,357	83,211	3.474
Feb	Mar	23,21,075	22,54,086	66,989	2.886
Mar	Apr	26,40,663	25,61,255	79,408	3.007
TOTAL		73,57,306	71,27,699	2,29,607	3.121

Vallarpadam							
Net input	Billed	Loss	% Loss				
10,38,412	10,34,765	3,647	0.351				
11,33,380	11,19,172	14,208	1.254				
14,15,428	14,03,403	12,025	0.850				
35,87,220	35,57,340	29,880	0.833				

Table No:26. B

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4.3.5. Calibration report of the Feeder meters

The feeder meters and consumer meters are new and the manufactures calibration report verified.

Meter Sr 1	No: GP4409	<u>T</u>	EST CE	RTIFIC.	ATE		
1.Limits	Of Error Me	asurement		-			
Active Ene	rgy Measuren	sent		Reactive E	nergy Measure	ement	
LOAD	PE	PHASES	% Error	LOAD	PE	PHASES	Re Error
Imax	UPF	Combined	0.19	ть	UPF	Combined	
	0.5Lag	Combined	0.15		0.SLag	Combined	6
	0.866Lead	Combined	0.14		0.866Lead	Combined	
ib i	UPF	Combined	0.06	10% of Ib	0.SLag	Combined	
	0.SLag	Combined	0.09		0.866Lead	Combined	0
	0.8551.631	Combined	0.04	5% of 15	UPF	Combined	0
10% of its	UPF	Combined	0.11	1% of Ib	UPF	Combined	
	0.5Lag	Combined	0.11	-	1		
	0.866Lead	Combined	0.11				
5% of ib	UPF	Combined	0.19				
		0.0000000000000000000000000000000000000			1		-

Sr. no.	TEST	CLAUSE	Results
2.	AC High Voltage test	OL 12.7.6.3	OK
3.	Insulation resistance test	CL 12.7.6.4	OK .
4.	No Load Condition test	CL 12.12	OK
5.	Starting Condition test	OL 12.13	OK

This is system generated report, hence no signature required. For any query , pl. contact to- Testing In charge, Genus Power Infrastructures Ltd, Haridwar

FIG 8A

Genus

Genus Power Infrastructure Ltd., Haridwar 3Phase-4Wire,AC Static Energy Meter 3*63.5V,3*-J5A, 50Hz,C1-0.2S Routine Test Report As Per IS 14697:1999

TEST CERTIFICATE

Meter Sr No: GP4409883

1.Limits	Of Error Me	asurement					()	
Active Energy Measurement				Reactive Energy Measurement				
LOAD	PF	PHASES	96 Error	LOAD	PE	PHASES	Sie Error	
Imax	UPF	Combined	0.06	16	UPF	Combined	0.08	
	0.5Lag	Combined	0.13		0.SLag	Combined	0.18	
	0.866Lead	Combined	0.07		0.866Lead	Combined	0.10	
16	UPF	Combined	0.02	10% of Ib	0.SLag	Combined	0.02	
	0.SLag	Combined	0.18		0.866Lead	Combined	0.18	
	0.866Lead	Combined	0.08	5% of Ib	UPF	Combined	0.13	
10% of ib	UPF	Combined	0.12	1% of Ib	UPF	Combined	0.15	
	O.SLag	Combined	0.18		1	1	1	
	0.866Lead	Combined	Q.15					
5% of Ib	UPF	Combined	0.15					
1% of Ib	UPF	Combined	0.10					

Sr. no.	TEST	CLAUSE	Results	
2.	AC High Voltage test	CL 12.7.6.3	OK.	
з.	Insulation resistance test	CL 12.7.6.4	ok	
4.	No Load Condition test	CL 12.12	ок	
5.	Starting Condition test	OL 12.13	ok	

This is system generated report, hence no signature required. For any query , pl contact to-Testing In charge. Genus Power Infrastructures Ltd. Haridwar

Fig 8B

Losses and Subsidy computation

5.1. Energy accounts of the Previous Years

S.NO	Energy input details	Units	2020-21	2021-22	2022-23
A	Energy purchased	MU	35.581	36.719	36.534
в	Net input energy (at DISCOM Periphery after adjusting the transmission losses and energy traded)	MU	35.581	36.719	36.534
с	Energy billed	MU	34.219	35.405	35.611
D	T& D Loss	MU	1.362	1.313	0.923
E	% T&D Loss	%	3.82	3.577	2.53

Table 27

5.2 Input Energy, AT&C losses-aggregate, Voltage wise, category wise and Area wise

5.2.1 Energy account and performance for the FY 2023-34

S.NO	Energy input details	Units	Quantity
1.	Energy purchased	MU	40.12
2.	Net input energy (at DISCOM Periphery after adjusting the transmission losses and energy traded)	MU	40.43
3.	Energy billed	MU	39.50
4.	T& D Loss	MU	0.93
5.	% T&D Loss	%	2.31
6.	Amount of Energy billed	Rs (Crores)	43.18
7.	Amount of collection	Rs (Crores)	43.11
8.	Collection efficiency	%	99.83
9.	% AT&C Loss	%	2.47

Voltage	Energy input particulars	QTR	QTR	QTR	QTR	Year
level		1	2	3	4	2023-
		(MU)	(MU)	(MU)	(MU)	24
			6.00	< 7 0		(MU)
66kV	Long-Term Conventional	7.67	6.90	6.79	7.28	28.65
and	Medium Conventional	0.00	0.00	0.00	0.00	0.00
above	Short Term Conventional	0.00	0.00	0.00	0.00	0.00
	Banking	0.00	0.00	0.00	0.00	0.00
	Long-Term Renewable energy	0.00	0.00	0.00	0.00	0.00
	Medium and Short-Term RE	0.00	0.00	0.00	0.00	0.00
	Captive, open access input	0.00	0.00	0.00	0.00	0.00
	Sale of surplus power	0.00	0.00	0.00	0.00	0.00
	Quantum of inter-state transmission loss	0.00	0.00	0.00	0.00	0.00
	Power procured from inter- state sources	0.00	0.00	0.00	0.00	0.00
	Power at state transmission boundary	7.67	6.90	0.00	7.28	28.65
33kV	Long-Term Conventional	0.00	0.00	0.00	0.00	0.00
	Medium Conventional	0.00	0.00	0.00	0.00	0.00
	Short Term Conventional	0.00	0.00	0.00	0.00	0.00
	Banking	0.00	0.00	0.00	0.00	0.00
	Long-Term Renewable	0.00	0.00	0.00	0.00	0.00
	Medium and Short-Term RE	0.00	0.00	0.00	0.00	0.00
	Captive, open access input	0.00	0.00	0.00	0.00	0.00
	Sale of surplus power	0.00	0.00	0.00	0.00	0.00
	Quantum of intra-state transmission loss	0.00	0.00	0.00	0.00	0.00
	Power procured from intra- state sources	0.00	0.00	0.00	0.00	0.00
	Input in DISCOM wires network	7.67	6.90	6.79	7.28	28.65
33 kV	Renewable Energy Procurement	0.00	0.00	0.00	0.00	0.00
	Small capacity conventional/ biomass/ hydro plants procurement	0.00	0.00	0.00	0.00	0.00
	Captive, open access input	0.00	0.00	0.00	0.00	0.00

5.2.2 Quarter wise energy input to the CoPA for the FY 2023-24

11 Kv	Renewable Energy Procurement	0.00	0.00	0.00	0.00	0.00
	Small capacity conventional/ biomass/ hydro plants Procurement	0.00	0.00	0.00	0.00	0.00
	Sales Migration Input	2.71	2.38	2.80	3.59	11.47
LT	Renewable Energy Procurement	0.00	0.00	0.00	0.00	0.00
	Sales Migration Input	0.00	0.00	0.00	0.00	0.00
	Energy Embedded within DISCOM wires network	0.08	0.08	0.08	0.08	0.31
	Total Energy Available/ Input	10.47	9.35	9.67	10.94	40.43

Table 29

5.2.3. Quarterwise Energy sales of CoPA for the FY 2023-24

	YEAR	QTR 1	QTR 2	QTR 3	QTR 4	2023-24
Voltage	Energy Sales Particulars	MU	MU	MU	MU	MU
level						
LT	DISCOM' consumers	2.03	1.86	2.15	2.32	8.37
Level	Demand from open access, captive	0.00	0.00	0.00	0.00	0.00
	Embedded generation used at LT level	0.01	0.01	0.01	0.02	0.05
	Sale at LT level	2.04	1.87	2.16	2.34	8.42
	Quantum of LT level losses	**	**	**	**	**
	Energy Input at LT level	2.3	2.08	2.37	2.60	9.35
11 kV	DISCOM' consumers	8.16	7.28	7.30	8.34	31.08
Level	Demand from open access, captive	0.00	0.00	0.00	0.00	0.00
	Embedded generation at 11 kV level used	0.00	0.00	0.00	0.00	0.00
	Sales at 11 kV level	8.16	7.28	7.30	8.34	31.08
	Quantum of Losses at 11 kV	**	**	**	**	**
	Energy input at 11 kV level	10.38	9.28	9.59	10.87	40.12
33 kV	DISCOM' consumers	0.00	0.00	0.00	0.00	0.00
Level	Demand from open access, captive	0.00	0.00	0.00	0.00	0.00
	Embedded generation at 33 kV or below level	0.00	0.00	0.00	0.00	0.00
	Sales at 33 kV level	0.00	0.00	0.00	0.00	0.00
	Quantum of Losses at 33 kV	0.00	0.00	0.00	0.00	0.00
	Energy input at 33kV Level	0.00	0.00	0.00	0.00	0.00

> 33 kV	DISCOM' consumers	0.00	0.00	0.00	0.00	0.00
	Demand from open access,	0.00	0.00	0.00	0.00	0.00
	captive					
	Cross border sale of energy	0.00	0.00	0.00	0.00	0.00
	Sale to other DISCOMs	0.00	0.00	0.00	0.00	0.00
	Banking	0.00	0.00	0.00	0.00	0.00
	Energy input at > 33kV Level	7.67	6.90	6.79	7.28	28.65
	Sales at 66kV and above	0.00	0.00	0.00	0.00	0.00
	(EHV)					
Total En	ergy sales	10.20	9.15	9.47	10.69	39.50
Total En	ergy input /requirement	10.47	9.35	9.67	10.94	40.43
	T&D Loss (%)	2.54	2.19	2.10	2.37	2.31

**HT and LT Level losses could not be assessed due to the absence of Feeder meters and DTR meters

Table 29 B

ANNUAL T&D LOSS PERFORMANCE AGAINST THE PAT TARGET



Fig 9







5.2.4 Loss analysis of the Two Distribution areas under the CoPA for the FY 2023-24

5.2.4.2 Month wise T&D loss performance for the two distribution areas

Month wise T&D loss performance of the Willingdon Island and Vallarpadam area.

Energy	WILI	LINGDON ISL	AND	VALLARPADAM				
	Net Energy input (MU)	ENERGY SALE(MU)	T&D LOSS (MU)	Net Energy input (MU)	ENERGY SALE(MU)	T&D LOSS (MU)		
Apr-23	2.56	2.48	0.08	1.02	1.00	0.019		
May-23	2.88	2.79	0.09	0.91	0.90	0.014		
Jun-23	2.32	2.26	0.05	0.77	0.76	0.012		
Jul-23	2.41	2.33	0.07	0.77	0.76	0.002		
Aug-23	2.50	2.43	0.07	0.78	0.78	0.003		
Sep-23	2.06	2.01	0.05	0.83	0.83	0.003		
Oct-23	2.22	2.15	0.07	0.92	0.91	0.004		
Nov-23	2.22	2.17	0.05	0.86	0.85	0.006		
Dec-23	2.43	2.36	0.07	1.03	1.02	0.007		
Jan-24	2.40	2.31	0.08	1.04	1.03	0.004		
Feb-24	2.32	2.25	0.07	1.13	1.12	0.014		
Mar-24	2.64	2.56	0.08	1.42	1.40	0.012		
ANNUAL TOTAL	28.96	28.12	0.83	11.48	11.38	0.10		
T& D Loss %			3.03%			1.09%		



5.2.4.3 T&D LOSS TREND IN THE TWO AREAS



5.2.5. Feeder wise energy distribution in Willingdon Island

(Feeder wise loss could not be assessed due to the absence of functional meters in DTRs.

Feeder wise Energy Distribution under the CoPA for the FY 2022-23

SI. no.	Panel no.	Feeder	Meter S.NO	IR (Apr 23)	FR (Mar 24)	M.F	Consumption (kWh)
1	K01A	MNC	GP4409886	11419.35	18147.7	40	269134
2	K16	NTRO KV	GP4409880	130181.6	241756.7	40	4463004
3	3	Q9-1	GP4409885	537287	595587.5	40	2332020
4	4	Q9-2	GP4409882	357795.1	491819.2	40	5360964
5	5	MH-2 (MH)	GP4409887	84682.55	139551.2	40	2194746
6	9	UTL	GP4409883	292001.9	360528.9	40	2741080
7	10	Q9-3	GP4409888	185909.1	336236	40	6013076
8	11	MH-3 (ISRF)	GP4409884	28039.75	33997.50	40	238310
9	12	STN. TR	GP4409889	159792.9	203332.8	2	87080
10	K 15	PENNA	GP4409879	264799.7	323235.3	40	2337424
11	K 17	NTRO A2	GP4409890	92608.15	156496.8	40	2555546
			Total				2,85,92,384
(The ab							

Table No:31

Rev:0

5.3.1. Category wie and quarter wise energy consumption and Loss

						Divi	sion Wise L	osses								
						Period	From 1st A	pril 2023 to	31st Ma	rch 2024						
		Consumer pr		Energy parameters					ses	Comm	nercial Para	ameter				
	Name of		Total	% of		Bille	d energy (MU)	% of			Billod	Collected			Average
S.No	Name or		Number	number	Increase		Unmeter		% 01	TRD	TODIA	America	Conected	Collectio		billing
	circie	Consumer category	of	of	input	Metered	ed/assess	Total	energy		(%)	in Bc	in Bc	n		rate
			connecti	connecti	energy	energy	ment	energy	tion	(1010)		(%)	III KS.	III KS.	Efficiency	
			ons	ons	(1010)		energy		tion			Crore	Crore			
		Residential	419	34%		0.26	0	0.26	3%			0.18	0.18	100.00%		6.906622
		Agricultural	0	0%		-	0	0.00	0%	1		0.00	0.00	0.00%		0
1		Commercial/Industrial-LT	545	44%	10.46641	1.07	0	1.07	11%	0.265698	2.54%	1.37	1.37	100.00%	QTR 1	12.76102
		Commercial/Industrial-HT	29	2%		7.56	0	7.56	74%			8.28	8.28	100.00%		10.94832
		Others	255	20%		1.31	0	1.31	13%			1.14	1.14	100.00%		8.764262
Sub-	total		1248	100%	10.46641	10.20071	0	10.2007	100%	0.266	2.54%	10.97	10.95	99.83%	2.70%	10.75539
		Residential	410	33%		0.22	0	0.22	2%			0.15	0.15	100.00%		6.491637
		Agricultural	0	0%	%	-	0	0.00	0%		2.19%	0.00	0.00	0.00%	QTR 2 1	0
2		Commercial/Industrial-LT	544	44%	9.354926	0.97	0	0.97	11%	0.205119		1.27	1.27	100.00%		13.0703
		Commercial/Industrial-HT	29	2%		6.74	0	6.74	74%			7.53	7.53	100.00%		11.16117
		Others	252	20%		1.21	0	1.21	13%			1.07	1.07	100.00%		8.850743
Sub-	total		1235	100%	9.354926	9.149807	0	9.149807	100%	0.205119	2.19%	10.01	10.00	99.83%	2.36%	10.94501
		Residential	407	32%		0.23	0	0.23	2%			0.15	0.15	100.00%	100.00% 0.00% 100.00% 100.00% 0,0	6.758131
		Agricultural	0	0%		-	0	0.00	0%			0.00	0.00	0.00%		#DIV/0!
3		Commercial/Industrial-LT	563	45%	9.668354	1.22	0	1.22	13%	0.202754 2.	4 2.10%	1.58	1.58	100.00%		12.93164
		Commercial/Industrial-HT	29	2%		6.74	0	6.74	71%			7.57	7.57	100.00%		11.23087
		Others	258	21%		1.28	0	1.28	14%			1.14	1.14	100.00%		8.885179
Sub-	total		1257	100%	9.668354	9.46560	0	9.4656	100%	0.202754	2.10%	10.44	10.42	99.83%	2.26%	11.02551
		Residential	412	32%		0.26	0	0.26	2%			0.19	0.19	100.00%		7.281203
		Agricultural	0	0%		-	0	0.00	0%			0.00	0.00	0.00%		#DIV/0!
4		Commercial/Industrial-LT	605	47%	10.94453	1.36	0	1.36	13%	0.259488	2.37%	1.75	1.75	100.00%	QTR 4	12.81439
		Commercial/Industrial-HT	30	2%		7.73	0	7.73	72%			8.62	8.62	100.00%		11.16117
		Others	241	19%		1.33	0	1.33	12%	1		1.20	1.20	100.00%		8.983226
Sub-	total		1288	100%	10.94453	10.68504	0	10.68504	100%	0.259488	2.37%	11.76	11.74	99.83%	2.54%	11.00572
		Residential	412	32%		0.97	0	0.97	2%			0.67	0.67	100.00%		6.877225
		Agricultural	0	0%		0.00	0	0.00	0%	1		0.00	0.00	0.00%		#DIV/0!
76	Total	Commercial/Industrial-LT	605	47%	40.43421	4.63	0	4.63	12%	0.933059	2.31%	5.96	5.96	100.00%	2023-24	12.88674
		Commercial/Industrial-HT	30	2%		28.77	0	28.77	73%			32.00	32.00	100.00%	1	11.12156
		Others	241	19%		5.13	0	5.13	13%			4.55	4.47	98.41%		8.871756
77	ompany le	vel	1288	100%	40.43421	39.50115	0	39.501	100%	0.933	2.31%	43.18	43.11	99.83%	2.47%	10.93175
** N	ote - It shall	be mandatory to record the e	nergy supp	lied separa	tely for ea	ch categor	y of consur	ners which	is being p	rovided a s	eparate rat	e of subsid	ly in the ta	riff, by the	state	

Table No:3

5.3.2 Trend analysis



Fig 11

5.4 Subsidy computation and analysis based on the quarterly data

						Ponod Fram.aar	2004 to March 2004(not	applicable						
Consumer Cetegory (Separate for each subsidized consumer category)	silled theray			Subsidiced Silled Energy			Applicable rate of Subaidy as notified by State govt.		Subaidy Due from State Govt.			Subsidy Actually Billed / claimed from State Govt. (As against col.12)	Subsidy Received from State Govt. (As egainst col.13)	Belence Subsidy y to be Received from State Bovt.
	Metered	Un-metered*	Total	Metered (out of col.2)	Un-metered*jout of enl.1)	Total	Metered Energy**	Un-metered Energy**	Metered Energy	Un-metered Energy	Total			
		lin kWhj		2 2 3	ôn kWhi		(iii	Rs/kWh		(in Rs. Cr.)		(in As. Cr.)	(in Rs. Cr.)	(In Rs. Cr.)
here at a	2	3	A#243	5		215+6	6	and the general second	10=5306	13=6x9	12+10+11	Ti	14	15=13-14
Residential	0.97	п	11.97	No su	No subsidy class by the DISCOM			rate notification by the Government Np subsidy due from the Government			4000000	p	. 0	-
Agricultural	0.00	0	0.00											
Commercial/Indust rial-LT	4.61	0	4.63											
Commercial/Indust rial-HT	28.77	Q	28.77											
Other (Specify)	5.13	0	5.13											
Total	39.50	D	39.50		()									

Table No:33

In CoPA there is no subsidy claim or payment by the Government.

5.4.1 Category wise consumption, Loss and average billing rate of CoPA for thee FY 2023-24

Period From 1st April 2023 to 31st March 2024													
Consumer profile		Ene	rgy parame	eters	Losses		Comn	nercial Para	meter				
	Total			% of		s T&D loss	Billed	Collected	Collectio		Average		
Consumer estagon	Number	Input	Total	energy	T&D loss		Amount	Amount	n Efficioney	(%)	billing rate		
Consumer category	of	energy	energy	consump	(MU)	(%)	in Rs.	in Rs.			(Rs./kw)		
	connecti	(MU)		tion			Crore	Crore	Efficiency				
Residential	412		0.97	2%			0.67	0.67	100.00%		6.88		
Agricultural	0		0.00	0%		2.31%	0.00	0.00	0.00%		0.00		
Commercial/Industrial-LT	605	40.43421	4.63	12%	0.933059		5.96	5.96	100.00%		12.89		
Commercial/Industrial-HT	30		28.77	73%			32.00	32.00	100.00%		11.12		
Others	241		5.13	13%			4.55	4.47	98.41%		8.73		
	1288	40.43421	39.50	100%	0.933	2.308%	43.18	43.11	99.8325%	2.47%	10.91		

Table No: 33 A

5.4.2 Average billing rate

As per revenue analysis the average billing rate of the CoPA for the FY 23-24 is Rs 10.90

6 Energy audit Findings

6.1. Review of Capacity of the DISCOMS Energy Accounting and Audit Cell

Overview

As per Bureau of Energy Efficiency (BEE) regulations, the DISCOM has established a centralized energy accounting and audit cell. This cell oversees the entire consumer base, which predominantly uses advanced SMART meters with Advanced Metering Infrastructure (AMI) features. There are some exceptions, such as a few streetlight meters and self-consumption meters. The AMI server collects readings from these SMART meters and is integrated with the accounting SAP system.

Changes in Energy Input Structure

In the fiscal year 2023-24, there was a significant change in the energy input structure of the DISCOM. In March 2024, a new 11 kV feeder was commissioned to import 2 MVA of power from KSEBL and allocated as a dedicated feeder to an HT Consumer in Vallarppadam area by the Cochin Port Authority (CoPA).

Energy Accounting Practices

Quarterly energy accounts are prepared manually by the DISCOM This involves extracting data from the AMI software and SAP system and after making manual adjustments for the following consumptions.

- 1. Energy used by solar prosumers after adjusting their grid exports.
- 2. Energy sold to ships for minor works in the port, recorded in the respective month but accounted for in the subsequent month.

Energy purchase details are manually entered into the software based on the meter readings from supplier invoices, as there is no communicable check meter on the DISCOM side.

Compliance with Energy Audit Regulations

Energy input, sales, and loss details must be prepared on a Distribution Transformer (DTR) wise, Feeder wise, Low Tension (LT) wise, and High Tension (HT) wise basis for microanalysis of losses. However, CoPA faces challenges in meeting these requirements due to:

- a. Incomplete DTR wise and feeder wise consumer mapping.
- b. Pending installation of DTR meters.
- c. Only 12 out of 16 feeder meter installations completed.
- d. Feeder connections in a Ring main system, making feeder wise loss assessment inaccurate.

Action Plan and Compliance

The DISCOM has committed to the following actions, which are yet to be complied with:

- 1. Complete DTR wise and Feeder wise Consumer mapping and incorporate it into the AMI software.
- 2. Installations of feeder meters in the remaining 4 feeders.
- 3. Installation of DTR meters.in all DTRs

A revised action plan with clear target dates needs to be submitted.

Internal Generation and Sales Report Observations

The DISCOM has internal generation using three diesel generator sets for maintaining supply for essential supply during blackouts. This power is combined with renewable energy in the distribution format.

Up on sales report review for March 2024 showed that 109 consumers previously categorized under self-consumption have been accounted in respective tariff categories in the sales report as per the direction of the KSERC.

Subsidy and Loss Analysis

According to the DISCOM energy audit regulations, details of subsidies provided, claimed, and sanctioned by the government must be furnished. However, CoPA reported that no subsidized consumers.in CoPA.

Revenue and Collection Efficiency

.Collection efficiency is reported at 99.84 % for all consumer categories.

Prepaid Billing Implementation

Although SMART meters with prepaid facilities are installed, the prepaid billing feature has not been activated. This implementation must follow the timeline set by the BEE.

Poor state of the LT Distribution Lines

Up on site patrolling the LT Distribution lines in 9 locations it is observed that distribution lines are very old copper conductors with multiple joints .Also the lines are found SWG 8 type conductor with excessive sag and touching. Moreover, the service connections are found effected by improper joints using aluminium service wire.

Loss of generation due to the breakdown of inverters in the two Solar plant.

The renewable energy generation found reduced considerably due to the failure of inverters in the two solar plants. The solar generation from the 100-kW solar plant found decreased by

about 63 % and the 150-kW solar plant found decreased by about 24% when comparing the generation in the month of April 2023 and March 2024.

Energy saving opportunities in the Mattanchery halt Pump house

Mattanchery halt Pump house is pumping the water to three locations.

- 1. Mattanchery Warf
- 2. Ernakulam Warf
- 3. RNA Quarters

The destination point from the pump house are about 4 km. The pump house consists of 2 pumps with 31.73 kW each. The Motor rating is 50 HP. Out of the three pump one is operating at a time. The storage tank consists of 12 tanks with 450 Tonne capacity each. The discharge capacity of the Pump is 230 m3 /hour.

The pump house operation and maintenance is not up to the mark and there is scope for energy saving due to the followings reasons.

- 1. Up on inspection the delivery pipe valve found partially throttled for controlling the flow rate.
- 2. There is appreciable water leak in the Pipe.
- 3. No power factor correction capacitor connected to the motor.
- 4. Also the present pump operating schedule is from 8AM to 9 PM . which includes the peak hours.

Based on the field inspection the following suggestions are required

- 1. The delivery valve should not be throttled. Throttling the valve will cause additional friction loss and hence more energy consumption. Therefore the better method for achieving the reduced flow on a permanent basis is by trimming the impeller. Or the Pump manufacturer may be contacted for an impeller with reduced Diameter
- 2. Water leak in the pipe to be arrested
- 3. Power factor correction capacitor to be installed at the Motor terminal. This will reduce loss due to the reactive energy flow. The recommended value of the capacitor for the 50 HP motor is 14 kVAR.
- 4. Operating the pump during the peak hour will cause increased power consumption due to reduced voltage. Hence operation schedule of the motor may be altered by avoiding the evening peak hour.
6.2. Critical Analysis by Energy Auditor

As per the regulations, the compliance of the DISCOM was verified for the status and progress to prerequisites, reporting requirements and other technical aspects and the compliance status are furnished below with detailed responses of the DISCOM Management.

S.NO	Parameters verified as per the Energy audit regulation for the DISCOM 2021	Relevant regulation number	Whether the DISCOM Complied or not	Comments by the DISCOM management
1	Pre-requisites for annual energy audit and periodic energy accounting	Reg No: 5		
a)	The identification and mapping of all of the electrical network assets;	Clause (a)	Not yet completed The mapping of feeders, DTR and consumers are pending.	The work is proposed under the RDSS Scheme.
(b)	The identification and mapping of high tension and low-tension consumers;	Clause (b)	Not fully completed.	Proposed under the RDSS Scheme.
(c)	The development and implementation of information technology enabled energy accounting and audit system, including associated software.	Clause (c)	Not fully complied.	Proposed under the RDSS Scheme. Presently the quarterly and annual Energy account reports are prepared based on the AMI software and SAP System.
(d)	100% Communicable Feeder Metering integrated with AMI, by 31 st December 2022 along- with replacement of existing non-communicable feeder meters.	The first schedule. Trajectory for meter installation	Not yet complete.	Pending for installation in 4 feeders. Proposed under the RDSS Scheme
(e)	All Distribution Transformers (other than HVDS DT up to 25kVA and other DTs below 25 kVA) shall be metered with communicable meters. Communicable DT Metering for the following areas / consumers to be completed by December 2023 and in balance areas by December 2025:		Not yet complied.	Proposed under the RDSS Scheme.

6.2.1 Status and progress in compliance with the prerequisites for energy accounting

(f)	All Electricity Divisions of 500 AMRUT cities, with AT&C Losses > 15 %		Not Applicable.	
(g)	All Industrial and Commercial consumers;		Yes complied.	All HT and LT Consumers are fitted with SMART Meters with AMI features.
(h)	All Government offices at Block level and above;		Yes complied.	
(i)	Other high loss areas i.e. rural areas with losses more than 25% and urban areas with losses more than 15%.		Not applicable	
(j)	Further, existing non- communicable Distribution Transformer meters to be replaced with communicable meters integrated with AMI, within the timelines applicable to the respective areas		Not applicable	
(iii)	Prepaid Smart Consumer Metering to be completed for all directly connected meters and AMR in case of other meters, by December 2023 in the following areas:		Yes complied.	The SMART Meter installed have prepaid facility.
(a)	All Electricity Divisions of 500 AMRUT cities, with AT&C Losses > 15%		Not applicable	
(b)	All Industrial and Commercial consumers;		Yes	
(c)	All Government offices at Block level and above;		Yes complied.	
(d)	Other high loss areas i.e. rural areas with losses more than 25% and urban areas with losses more than 15%.		Not applicable	
(iv)	Targets for the installation of functional meters.	Year	2022-23	
	Meter type	Target	Achieveme nt	Remarks
(a)	Feeder metering (%)	98.5%	73 % (12/17)	Proposed under the RDSS Scheme.
(b)	DT metering (%)	90%	0%	Do
(c)	Consumer metering (%	93%	100 %	Complied.

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(v)	Whether created a centralized energy accounting and audit cell comprising of— (i) a nodal officer, an energy manager and an information technology manager, having professional experience of not less than five years; and (ii) a financial manager having professional experience of not less than five years	Regulation 5(g)	Yes complied.	The DISCOM has a centralised energy accounting and audit cell comprising of a Nodal officer, Energy Manager, I.T Manager and a Financial Manager.

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Table 33 B

6.2.2.1 Status and progress in compliance with the reporting requirements of the regulation (Refer regulation No: 6)

	Parameters verified as per the Energy audit regulation for the DISCOM 2021	Relevant regulatio n number	Whether the DISCOM Complied or not	Comments by the DISCOM management
(i) a	Every electricity distribution company shall designate a nodal officer, who shall be a full-time employee of the electricity distribution company in the rank of the Chief Engineer or above, for the purpose of reporting of the annual energy audit and periodic energy accounting and communicate the same to the Bureau.	Regulati on No: 6(1)	Yes complied.	Mr. Ajithkumar D Superintending Engineer (Ele) Nodal officer, Cochin Port Authority is a small distribution licensee with hardly 1288 consumers under the port area. Hence the nodal officer is in the rank of of the Superintend Engineer.
(i) b	Intervals of time for the conduct of annual energy audit	6(1)	Yes	 Energy audit report for the year 2022-23 is submitted with in the stipulated time. Energy audit report for the year 2023-24 is prepared and is under submission.

(i) c	Intervals of time for the conduct of periodic energy accounting		Yes	Periodic energy accounting for Q1 FY23-24 been submitted to BEE and SDA and also at the website of the DC within the scheduled time.
				P Periodic energy accounting for Q2 to Q3 OF FY22-23 have been submitted to BEE and SDA and also at the website of the DC within the scheduled time
(ii)	 Every electricity distribution company shall ensure that the energy accounting data is 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 	Regulati on No: 6(2)	Yes complied.	The energy accounting data is generated from metering system. Hence there are no assumptions.
(iii)	Metering of distribution transformers at High Voltage Distribution System up to 25KVA can be done on cluster meter installed by each electricity distribution company	Regulati on No: 6(3)	Not applicable.	There is no HVDS in CoPA.
(iv)	The energy accounting and audit system and software shall be developed to create monthly, quarterly and yearly energy accounting reports.	Regulati on No: 6(4)	Not complied to the fullest extent.	The installation of functional meters for the feeders and DTRs are yet to be completed. Presently, all the consumer meters and 12 Nos of Feeders are installed with SMART meters. In CoPA, AMI Software is used to fetch data from smart meters installed at consumer premises and integrated with SAP system. Monthly Invoices are generated from SAP by accounts Department. Various reports including preparation of energy audit and accounting reports are generated from

				SAP system with manual intervention.
(v)	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 manual intervention of any nature, in respect of the period specified therein, shall be clearly indicated in the periodic energy accounting report.	Regulati on No: 6(5)	Not yet complied.	In CoPA, AMI Software is used to fetch data from smart meter and same software is integrated with SAP. In the Finance department, SAP is used to generate Monthly invoice for the individual consumers. Presently the energy account and audit reports are prepared manually using the SAP and AMI Software data. The information technology system as per clause (f) of regulation 5 is proposed under the RDSS system

Table 33 C

	Reporting requirement -Compliance of the BEE Regulation						
No. 1	L8/1/BEE/DISCOM/2021,N	Aanner and Intervals for Co	nduct of Energy Audit (Accounting) in Electr	ricity Distributi	on Companies) Regu	lations 2021 dated 6th October 2021	
Clause No	Clause details	Time period for submission and display in the website	Period of the Energy audit /Account report	Target date as per regulation	Whether complied or not	Remarks	
	Intervals of time for	Within a period of four	1. Energy audit for the year 2022-23	31-07-2023	Annual report submitted on 21/08/2023	The delay occurred due to the delay in finalising the tender for the Energy audit.Request for extension sought to BEE vide letter 14/07/2023.	
3(1)	conduct of annual energy audit	of the relevant financial year:	2. Complience of comments if any from BEE	15-12-2023	Yes Complied the BEE comments. Submitted on 14/12/2023		
			3. Energy audit for the year 2023-24	31-07-2023			
		time for within 45 days from the date of the periodic	Energy account of the 1ST quarter of the year 2023-24	15-08-2023	Yes. Submitted on 05/09/2023. Extension sought from BEE.	The delay occurred due to the delay in finalising the tender for the Energy audit.Request for extension sought to BEE Wide letters attached as annexure 1 &2 dated 27/05/2022 & 14/07/2023 respectively.	
			1. Complience of comments if any from BEE	04-03-2024	05-03-2024		
			Energy account of the2nd quarter of the year 2023-24	15-11-2023	24-11-2023		
4.1(a) &	Intervals of time for		. Complience of comments if any from BEE	18-03-2024	21-03-2024		
(b)	energy accounting	energy accounting (After two years)					
			Energy account of the3rd quarter of the year 2023-24	15-02-2024	22-02-2024		
			. Complience of comments if any from BEE	04-07-2024	04-07-2024		
			Energy account of the 4th quarter of the year 2023-24	15-05-2024	28-05-2024	Extension sought to BEE since the bills for March 2024 was not received inMay 20 by M/s KSEBL for the newly energised 2 MVA feeder.	
			Compliance of comments if any from BEE	Not yet recived			

6.2.2.2. Compliance report of the reporting requirement

Table 33 D

6.2 3. Management Analysis

The key aspects of the regulations are, the conduct of the annual energy audit in DISCOMs by an external accredited auditor every year and submission of regular quarterly energy account report to the BEE and to the SDA prepared by the Energy Manager of the DISCOM within the time frame. There are clear guidelines in regulation for the preparation of quarterly accounts and the manner of conducting energy audit. The Energy accounting for all energy inflows in the distribution system, including renewable energy generation, open access

consumers, and energy consumption by the end consumers, shall be conducted on a periodic basis. This necessitates the availability of energy accounting data at consumer, transformer, feeder and system level. Energy accounting will help the DISCOM to identify areas of heavy loss and pilferage, and thereafter, focused efforts can be made by the DISCOMs to take corrective action.

- The installation of 4 Nos Feeder meters and 30 Nos DTR meters are proposed under the RDSS scheme. The work was delayed due to the delay in obtaining sanction from the PFC.Now sanction obtained and the tender process initiated.
- The change of the input structure is incorporated in the accounting report
- 109 Nos of the consumer under the self-consumption category was recategorized in to the respective tariff category based on the purpose of usage as pointed out by the KSERC.
- The metering works and consumer mapping was delayed due to the delay in obtaing sanction for the RDSS project. Revised action plan for the metering works and other works prepared and will be completed within the schedule.
- Prepaid billing system will be implemented once the billing software work is completed under the RDSS scheme.
- LT Distribution maintenance will be undertaken immediately for the reshackling and line touching clearence.LT Line Conductor changing works are proposed under the RDSS scheme and the work is under the tendering process.
- The two number solar plant breakdown work will undertake immediately. The quotation for the inverter repair is already invited.
- Action will be initiated for the installation of the Power factor correction capacitor at the Mattancherry halt water pump house. Rectification of the water leak will be carry out immediately and the operator will be instructed not to throttle the delivery valve.

Summary of the critical observation made by the Energy auditor and the management response analysis are furnished below:

1. The mapping of consumers with DTR and Feeders is the prime requirement for the Energy accounting of Feeders and Distribution Transformers. This is essential for tracking the loss and weak points of the DISCOM. But the mapping of the consumers with DTR and Feeders are yet to completed in CoPA. The Management has reported that the mapping work will be complete by the DISCOM along with the completion of feeder meters proposed under the RDSS scheme. The management has also promised to complete the task by the year 2024-25.

2. As per the trajectory set by the regulation, the installations of functional meters for all feeders shall be completed by the DISCOM before 31st December 2022.But it is seen that, CoPA has installed functional meters only in 12 feeders out of the 16 feeders. Moreover, the feeders are arranged in Ring main system consisting of multiple feeders. There is no proper monitoring system for the ring arrangement. This is a major bottle neck for assessing the feeder wise energy accounting. The Energy auditor has recommended a proper monitoring system for the Ring main arrangement with optimal load distribution in the feeders.

The installation of 4 Nos Feeder meters and 30 Nos DTR meters are proposed under the RDSS scheme. The work was delayed due to the delay in obtaining sanction from the PFC. Now sanction obtained and the tender process initiated. Revised action plan prepared. Also action will be initiated for monitering the Ring network through SCADA, proposed under the RDSS scheme.

- 3. Subsidy account: There is no subsidy payment by the Government.
- 4. The 11 kV distribution is through UG cables with RMU system. The loading in feeders is also low. Hence the distribution loss is relatively low in feeder
- Regarding the failure of the inverters in the 100 kW and 150 kW solar plant. The management promised for immediate action for the rectification of the inverters and for the clearing of the solar panel shade.
- 6. One major observation made by the Energy auditor is that majority of the Distribution transformers are old with higher capacity compared to the load requirement. On, sample verification of DTR load an unbalance is seen in the LT feeding. Hence there is scope for loss reduction in DTR through load balancing. The management explained that CoPA has already proposed the replacement of 20 Transformers with energy efficient transformers and has also ensured that immediate action will be initiated for regular load monitoring and balancing of load in distribution transformers.

7. The CoPA is not yet equipped with a software for the energy account and audit without manual intervention.

The Management explained that all the consumers are fitted with SMART Meters with AMI feature. Moreover, all SMART meters are connected with AMI software through GPRS system The AMI software is integrated with the SAP system. Hence system loss assessment is prepared manually based on the data from the SAP system. Further, the creation of software for Energy accounts as stipulated by the regulation is proposed under the RDSS scheme and will be completed by the year 2024-25.

6.3. Revised findings based on the data validation and field verification and corrective action proposed.

As per the BEE regulation, energy flow is to be monitored at all voltage levels. But based on the data validation and field verification, the following observations are made for necessary corrections.

- 1. There is no input meter on the DISCOM side for the 110 kV supply input at the Willingdon Island and the 11 kV supply input at Vallarpadam. The monthly meter readings are recorded in the CoPA register, while taking the meter reding by the KSEBL. Also input energy is accounted from the purchase bill. Hence functional meters are to be installed at the supply input points on the 11 kV side, both at the Willingdon Island and at Vallarpadam. This is essential for automated energy accounting.
- 2. The 11 kV distribution is connected in Ring main system by connecting multiple feeders for ensuring better supply reliability. But there is no proper monitoring system for the Ring feeding arrangement. This makes it difficult for the load assessment in feeders. Hence for assessing the feeder wise load and loss the following measures to be adopted:
 - a. All the ring networks are to be properly defined based on the optimal load condition in the feeders with separate identification number for each ring and subring.
 - b. There shall be proper monitoring for the ring main network operations from the substation or from other control centre. Ring network diagram is to be placed in the substations.
 - c. Border meter has to be installed at the identified feeder changing points in the ring network.
 - d. Consumer, DTR and feeder mapping has to be completed at the earliest.

6.4 Inclusion and exclusion.

- All energy input sources are included in the energy accounting including the roof top solar energy from the solar prosumers ,Energy from the internal solar plant and the energy from DG for black out supply .
- The loss report is prepared only on circle wise and area wise. As there are no division or subdivision wise formation in the Cochin Port Authority.
- The Feeder wise and DTR wise energy loss report could not be furnished due to the non-completion of the consumer mapping and the Feeder and DTR metering.

6.5 Recommendations for Loss reduction

Energy losses occur in the process of supplying electricity to consumers due to technical and commercial reasons. The technical losses are due to energy dissipated in the conductors, transformers and other equipment's used for transmission, sub-transmission and distribution of power. These technical losses are inherent in a system and can be reduced to a certain level.

Pilferage by hooking, bypassing meters, defective meters, errors in meter reading and in estimating un-metered supply of energy are the main sources of the commercial losses. When Commercial losses are added to Technical losses, it gives Transmission & Distribution (T&D) loss.

There is another component of commercial losses, which is attributable to non-recovery of the billed amount and is reflected in collection efficiency. T&D losses together with loss in collection give us Aggregate Technical & Commercial (AT&C) losses.

Based on the field visit and sample load study on the Transformer loading under the CoPA, the following recommendations are offered for the loss reduction:

Low cost and high yield saving proposals

- 1. LT Line reshackling and clearing the touching's and use best construction practises for the service connection.
- 2. Do best operating practises for the water pump operation as detailed below
 - a. Do not throttle the delivery valve for flow control
 - b. Do regular maintenance on the pump.
 - c. Check for the flow quantity of the Pump and Load current at regular interval
- 3. Monitor the generation output of the solar plants and do routine maintenance.
- 4. Under loaded transformers: On sample verification it is observed that, high capacity DTR are employed in majority of the locations, when compared to the actual load. Hence, load has to be redistributed among transformers based on the best efficiency conditions. While procuring new energy efficient transformers, transformer capacity is to be selected based on the actual load requirement.
- 5. Tighten all loose joints at the transformer cables and service lines to reduce joint loss.

Medium cost and high yield energy saving measures

- 1. Conductor change: -Replace old conductors with higher cross section AB Conductors
- 2. Provide duplicate feeder for the overloaded feeder
- 3. Reroute the long LT line if feasible

- 4. Provide appropriate power factor compensation capacitors on the secondary side of the distribution transformers.
- 5. Provide LT service connection box
- 6. Convert long and loaded single-phase line to three phase line.
- 7. Convert loaded long three phase line to HT line by installing transformer near the load centre.

Best practises in Distribution management

- 1. Feeder automation with automated switches in Ring main unit. The existing Ring main unit can be converted as SCADA compatible RMU.
- 2. Implementation of Advanced SCADA System in Distribution.
- 3. Implementation of advanced EMS (Energy Management Software for the optimal load management and energy accounting.

7. Conclusion and action Plan

7.1. Summary of the Critical Analysis by Energy Auditor

The key aspect of the regulations is the conduct of the annual energy audit in DISCOMs by an external accredited auditor in every year and submission of regular quarterly energy account report to the BEE and to the SDA prepared by the Energy Manager of the DISCOM within the time frame. There is clear guide lines in the regulation for the preparation of quarterly accounts and the manner of conduct of the energy audit. The Energy accounting for all energy inflows in the distribution system, including renewable energy generation, open access consumers, and energy consumption by the end consumers, shall be conducted on a periodic basis. This necessitates that energy accounting data is made available at a consumer, transformer, feeder and system level. Energy accounting will help the DISCOM to identify areas of high loss and pilferage, and thereafter, focused efforts can be made by the DISCOMs to take corrective action

On scrutiny of the prerequisite conditions, reporting requirements and other technical and commercial aspects, the following observatory remarks are made by the Energy auditor for which reply has been submitted by the Management of the DISCOM. Summary of the critical observation made by the Energy auditor and the management response analysis are furnished below:

1. The mapping of consumers with DTR and Feeders is the prime requirement for the Energy accounting of Feeders and Distribution Transformers. This is essential for tracking the loss and weak points of the DISCOM. But the mapping of the consumers with DTR and Feeders are yet to be completed in CoPA.

The Management has reported that the mapping work will be complete by the DISCOM along with the completion of feeder meters proposed under the RDSS scheme. The management has promised to complete the task by the year 2024-25. The Management also ensured that it will check the reason for the variation in the T&D loss in the Vallarpadam area.

 As per the trajectory set by the regulation, the installations of functional meters for all feeders shall be completed by the DISCOM before 31st December 2022.But CoPA installed functional meters only in 12 feeders out of the 16

feeders. Moreover, the feeders are arranged in Ring main system consisting multiple feeders. There is no proper monitoring system for the ring arrangement. This is a major bottle neck for assessing the feeder wise energy accounting. The Energy auditor has recommended a proper monitoring system for the Ring main arrangement with optimal load distribution in feeders. The DISCOM management has replied that the installation of functional

meters in all the feeders are the top priority and the same will be completed by the DISCOM before 31st December 2025.Further, arrangements will be made for proper monitoring of the Ring network with optimal load distribution in the 11 kV feeders.

- Presently no meters are installed in DTRs in CoPA. The Management of the DISCOM has explained that the DTR meter installations are already proposed under the RDSS scheme and will be completed before 31st March 2025.
- 4. Installation of SMART prepaid meters for the LT and HT consumers: The CoPA has already completed the work for the consumers. These meters are connected with an AMI software through mobile network using GPRS ...This is a major advantage for the CoPA.
- Formation of Centralised energy auditing and accounting cell CoPA has a Centralised Energy auditing and accounting cell consisting of a Nodal officer, Energy Manager, IT Manager and the Financial Manager.
- 6. The CoPA is a small distribution licensee with hardly 1288 consumers in two separate areas without any border sharing. Hence energy accounting is relatively easy. The 73 % of the energy consumption is by the Commercial sectors.
- Subsidy account: There is no subsidy payment by the Government. The 11 kV distribution is through UG cables with RMU system. Also the loading in the feeders are low. Hence the distribution loss will be relatively low in feeders.
- 8. One major observation made by the Energy auditor is that majority of the Distribution transformers are old with high capacity compared to the load requirement. On sample verification of DTR load an unbalance is seen in the LT feeding Hence there is scope for loss reduction in DTR through load balancing.

The management explained that the CoPA has already proposed the replacement of 20 Transformers with energy efficient transformers and has also ensured that immediate action will be initiated for regular load monitoring and balancing of load in distribution transformers.

9. The CoPA is not yet equipped with a software for the energy account and audit without manual intervention.

The Management explained that all the consumers are fitted with SMART Meters with AMI feature. Also, all the SMART meters are connected with the AMI software through GPRS system. The AMI software is integrated with the SAP system. Hence system loss assessment is prepared manually based on the data from the SAP system. Further the creation of software for Energy accounts as stipulated by the regulation is proposed under the RDSS scheme and will be completed by the year 2024-25.

7.2 Summary of Key findings

As per the BEE regulation energy flow to be monitored at all voltage levels. But based on the data validation and field verification the following observations are made and to be corrected.

- There is no input meter on the DISCOM side for the 110 kV supply input at the Willingdon Island and at the 11 kV supply input at the Vallarpadam. Presently the input energy is accounted from the purchase bill. And based on the Energy meter reading of the utility. Hence functional meters are to be installed at the supply input points on the 11 kV side both at the Willingdon Island and at Vallarpadam. This is essential for energy audit purpose.
- 2. The 11 kV distribution is connected in Ring main system by connecting multiple feeders for ensuring better supply reliability. But there is no proper monitoring system for the Ring feeding arrangement. This makes it difficult for the load assessment in feeders. Hence for assessing the feeder wise load and loss the following measures to be adopted.
 - a. All the ring networks to be properly defined based on the optimal load condition in the feeders with separate identification number for each ring and subring.
 - b. There shall be proper monitoring for the ring main network operations from the substation or from other control centre. Ring network diagram to be placed in the substations.
 - c. Border meter has to be installed at the identified feeder changing points in the ring network.
 - d. Consumer, DTR and feeder mapping to be completed at the earliest.
 - e. Feeder meter installations to be completed on top priority.

- 3. Up on scrutiny of the quarterly account report the following anomalies are noted
- I. Small quantum of DG energy is found clubbed with the Renewable energy input. But presently there is no provision to add this in the LT system in the Format. This will be taken up with the BEE.
- II. Higher -capacity transformers are found used for Distribution and based on sample verification; majority of the Transformers are found underloaded.
- III. Up on sample verification of the peak load measurement on transformers the Transformer LT supply is found in unbalanced conditions

7.3 Recommendations and best practises for Energy accounting and loss reduction

- 1. Energy losses occur in the process of supplying electricity to consumers due to technical and commercial reasons. The technical losses are due to energy dissipated in the conductors, transformers and other equipment's used for transmission, sub-transmission and distribution of power. These technical losses are inherent in a system and can be reduced to a certain level.
- 2. Pilferage by hooking, bypassing meters, defective meters, errors in meter reading and in estimating un-metered supply of energy are the main sources of the commercial losses □ when Commercial losses are added to technical losses, it gives Transmission & Distribution (T&D) loss.
- 3. There is another component of commercial losses, which is attributable to non-recovery of the billed amount, which is reflected in collection efficiency. T&D losses together with loss in collection give us Aggregate Technical & Commercial (AT&C) losses.
- 4. Based on the field visit and sample load study on the Transformer loading under the CoPA the following recommendations are offered for the loss reduction.
- 5. Low cost and high yield saving proposals
- (i) Unbalanced load condition in transformers. Up on sample load verification in transformers, it is observed heavy unbalance load conditions in transformers. Balancing the load will substantially reduce the loss. Hence transformer load to be monitored on regular interval and load balancing to be undertaken urgently.
- (ii) Under loaded transformers: Up on sample verification it is observed higher capacity DTR are employed in majority of the locations, when compared to the actual load requirement. Hence load to be redistributed among transformers based on the best efficiency conditions. While procuring new energy efficient transformers, transformer capacity to be selected based on the actual load requirement.
- (iii) Tighten all the loose joints at the transformer cables and service lines, this will reduce joint loss.
- (iv) Check the transformer earthing and also measure the neutral current on regular interval.
- (v) The load in the two 12.5 MVA Power transformers are found below 30%. Hence switching off one transformer alternatively will reduce the transmission loss.
- 6. Medium cost and high yield energy saving measures
- i. Conductor changing: Replace old conductors with higher cross section new conductors.
- ii. Provide appropriate power factor compensation capacitors on the secondary side of the distribution transformers.
- iii. Convert long and loaded single-phase line to three phase line.
- iv. Convert long three phase line to HT line by installing transformer near the load centre.

7. Best practises in Distribution management

- (i) Feeder automation with automated switches in Ring main unit. The existing Ring main unit can be converted as SCADA compatible RMU.
- (ii) Implement Advanced SCADA System in Distribution
- (iii)Implement advanced EMS (Energy Management Software for the optimal load management and energy accounting

7.4. 1. Action Plan for monitoring and reporting

	Action plan for monitoring and reporting						
S.NO	TASK	Approximate cost	Benefit	Time frame for implementation	Remarks (Reason for the delay)		
1	Completion of the Mapping of the Consumers with the connecting DTR	405000	Loss reduction , consumer load details, DT load optimisation and complying the regulation	31-03-2025	Work being included in RDSS work. Intial tender discharged by KSEBL, Retendering of work by COPA is in progrees. Final completion by 30-12-25		
2	Since the 11 kV distribution is through Ring main system, the ring networks to be properly defined with normal feeding arrangement, considering the optimal load through the feeder.	14625000	Efficient monitoring of the distribution system, optimisation of load requirements, Load flow measurements and remote switching of feeders to reduce the down time.	30-06-2026	Optimisation and final completion will be done after implemendation SCADA system in the RDSS work being taken up with KSEBL including CoPA works as per PFC direction.		
3	Set up a monitoring system for the Ring operation either at the Substation control room or in another place.	22750000	Efficient monitoring of the distribution system , optimisation of load requirements for feeders , Load flow measurements and remote switching of feeders to reduce the down time.	30-06-2026	After implemendation SCADA system in the RDSS work being taken up with KSEBL as per PFC direction.		
4	Mapping of the DTR with the Feeders	180000	Loss reduction , optimisation of load requirements , Load flow measurements	31-03-2025	Work being included in RDSS work. Intial tender discharged by KSEBL, Retendering of work by COPA is in progrees. Final completion by 30-12-25		
5	Completion of the Feeder meter installations in all feeders	3960000	Uploading of data as per requirements Optimisation of load requirements , Load flow measurements	31-03-2025	It has been included in RDSS works, but PFC asked COPA to do the work directly by CoPA. Hence separate tender has to be invited by COPA for doing the work by		
6	Incorporation of the DTR and Feeder Mapping DATA in the existing AMI software so that DTR wise and Feeder wise Energy loss statement can be generated	8320000	Loss reduction , Efficient monitoring of the distribution system , optimisation of load requirements , Load flow measurements .	30-06-2026	After implemendation SCADA system in the RDSS work being taken up with KSEBL as per PFC direction.		
7	Completion of the DTR Meter installations	3960000	Loss reduction , Efficient monitoring of the distribution system , optimisation of load requirements , Load flow measurements and remote switching of feeders to reduce the down time.	31-12-2024	It has been included in RDSS works, but PFC asked COPA to do the work directly by CoPA. Hence separate tender has to be invited by COPA for doing the work by OWN fund.		

Rev:0

Table No: 34 A

A	ction Plan for automation				
1	Task details	Approximate cost (Lakhs)	Benefit /Saving	Payback period	Remarks
1	Distribution SCADA implementation	542	Advanced load monitoring and control. Better supplier reliability parameters and hence high revenue and customer satisfaction.	To be worked out based on the existing parameters.	
2	Implement the advanced EMS software in the Distribution	15	Complete energy management solutions and revenue management.		

7.4 .2. Action Plan for automated Energy accounting

Table No: 34 B

8. ANNEXURES

8.1 Introduction of the Verification team

The audit is conducted by M/s Centre for Energy, Environment and Productivity (CEEP) an Empanelled accredited auditing firm in DISCOM. The details of the auditing team members are furnished below.

S.NO	Name of the officer	Qualifica tion	Designation
1.	Dr. J. Nagesh Kumar	Ph.D.	Accredited Energy auditor Reg No: 0133
2	Shri Sunilkumar V K	B. Tech (Elec)	Sector expert (DISCOM) & Certified Energy Auditor Reg No: EA 3642
3.	Shri Prakasan N.K	B.E.(Ele)	Electrical Engineer
4.	Shri K.G. Diwakar	M.E.	Certified Energy Auditor

AUDIT TEAM

Table 35

8.2 Minutes of the Meeting with DISCOM

Minutes of the Opening Meeting held with Chief Mechanical Engineer on the Mandatory Annual Energy Audit in Electricity Distribution Companies under purview of Energy Conservation Act, 2001 on 11/07/2024 at 10.45 am.

Present :

- Sri.V.Thuraipandian, Chief Mechanical Engineer
- · Sri.P. Muniyasamy, Dy.Chief Mechanical Engineer,(Electrical)
- Smt.Humblie Ursala John, Exe.Engineer, (Electrical)
- Smt.Jayalakshmi, Executive Engineer (Electrical)
- · Smt.V.Mini, Asst.Exe.Engineer (Electrical)
- Sri.Mathew Paul, Asst.Engineer (Electrical)
- · Sri.Jolly Antony, Asst.Engineer (Electrical)

Representing M/s Centre for Energy Environment and Productivity

- Shri Sunilumar V K "Sector Expert (Discom) & Certified Energy Auditor
- · Shri Prakasan N K "Electrical Engineer

Read 1. Contract No: GEMC-511687788965203 dated 04th July 2023

The meeting started at 11 AM in the chamber of the Chief Mechanical Engineer (CME) of the Cochin Port Authority, with the CME presiding. The Chair welcomed all the members and emphasized the importance of the PAT regulation. He then asked the Deputy Chief Mechanical Engineer (DCME) to actively follow up on the PAT activities. The DCME informed that he has been following up on the PAT audit activities. The Chair then invited Shri Sunilkumar V.K, the Energy Auditor, to explain the energy audit findings and the further course of actions to be completed.

Shri Sunilkumar V.K., the Energy Auditor of M/s Centre for Energy, Environment and Productivity, Chennai, the accredited auditing firm, informed that they had started the audit on 09/07/2024, and it is under progress. He stated that over the past two days, they have completed the inspection of the energy injection points at the 110 KV Willingdon Island substation, the 11 KV Vallarpadam substation, the 100 KW solar plant site, the Diesel Generator site for check readings, and approximately five distribution transformer yards, as well as LT line routes to explore energy conservation opportunities. He also mentioned that the draft annual accounting report for the year 2023-24 has already been prepared.

He reminded the Chair that the current year is the assessment year for the PAT target, and they need to achieve the T&D loss target of 1.88% during the current year. He also noted that the Cochin Port Authority has successfully reduced the T&D loss target steadily over the past three years due to systematic actions.

5.NO	Quarter wise performance Year 2023-24	Net input energy (at DISCOM Periphery (after adjusting the transmission losses) (MU)	Total Energy billed (MU)	T&D Loss (MU)	T&D Loss (%)
1	1 [#] Quarter (April to June)	10.47	10.20	0.27	2.5
	2 ND Ouarter	9.35	9.15	0.21	2.2
	3 rd Quarter	9.67	9.47	0.19	2.0
	4 th Quarter	10.94	10.68	0.27	2.4
	Year 2023-24	40.43	39.50	0.93*	2.3

0.01 rounding error

T&D Loss performance

S NO	Year	T&D Loss (MU)	T&D Loss (%)
1	2020-2021	1.36	3.82
2	2021-2022	1.31	3.58
3	2022-2023	0.92	2.51
4	2023-24	0.93	2.30

Shri Sunilkumar V.K. informed that under the existing conditions, the Cochin Port Authority needs to reduce another 2 lakh units to attain the target through various energy conservation measures. He then pointed out the grey areas for improvement based on the audit findings:

1. Transformer Load Balancing:

- Although some measures have been taken by the Cochin Port Authority for the load balancing of five transformers, the remaining transformers also need to be checked for load balance.
- He highlighted the difficulty in taking the transformer load at the site due to the scaling of the transformer's terminal and the busbar panel.
- The expected annual savings from transformer load balancing will be approximately 30,000 units annually.

2. Non-installation of Capacitors at the Water Pump House:

- The pump house, with two 50 HP motors, is operating without any power factor correction capacitors, causing reactive loss in the line.
- Leakage was observed in the line, and the valves were found to be partially closed.
- The pump operating schedule is reported as from 8 AM to 9 PM in two shifts.
- The following corrections were suggested: a. Install power factor correction capacitors on both motor terminals. b. Fix the pipe line leakage and instruct the operator to ensure the valves are fully open. c. The pump discharge is

reported as 100 tonnes/hour at the delivery point, while the rated discharge capacity is 230 KL / hour, indicating that the pump is not operating at its best efficiency point. d. Reschedule the operation to avoid peak hours, specifically from 6 PM to 9 PM.

3. Poor Maintenance of the Distribution Overhead Lines:

- The LT distribution lines are found touching the trees and overhang in many places.
- A majority of the lines are copper conductors (approximately SWG 8) with multiple joints and sagging.
- Lines need to be maintained properly by clearing the touchings, re-shackling, and replacing line spans with multiple joints.
- 4. The Chair directed the maintenance wing to schedule the maintenance. However, the maintenance AE reported that the LT lines are proposed for replacement with ABC lines under the RDSS scheme and will be undertaken within six months.
- The Chair reiterated the urgency and directed the maintenance team to complete the maintenance of the lines without waiting for the RDSS project.

4. Solar Plant Issues:

The solar plant generation has reduced considerably due to the breakdown of the inverters (four inverter units in the 100 kW plant and one inverter unit in the 150 kW plant), causing valuable green energy loss, for which CME replied that action is being taken to rectify the defective inverters.

- 5. Additionally, some panels are under the shade
- 6. Pending Actions to be Completed :

i. Installation of Feeder Meters in Four Feeders at Vallarpadam Substation: -This is to be completed urgently to comply with the Energy Audit regulation. - The Chair directed the urgent purchase of four feeder meters to meet the regulation requirements.

ii. Incorporation of Transformer Details in the AMI Software: - Transformer details need to be incorporated based on feeder-wise and transformer-wise consumer mapping data to enable the software to provide feeder-wise loss details. - The Chair directed the exploration of incorporating this data into the software. - Action Target Date: 31/12/2024..

iii. Installation of DTR Meters in All Transformers: - This is necessary to comply with the Energy Audit regulation and to help identify high-loss areas. - The Superintending Engineer (Electrical) informed that the DTR meters and feeder meters are proposed under the RDSS scheme. The delay is due to pending sanction from PFC, and the work is currently in the tender stage. - Target Completion Date: 31/03/2025

7.Development of Software for Energy Audit Reports:

- The Energy Auditor informed that, as per the Energy Audit regulation, the DISCOM needs to develop software to prepare the quarterly energy account report and annual energy account report without any manual intervention.
- He suggested modifying the current accounting software (SAP) to comply with this requirement.
- The Chair directed the exploration of the feasibility of this modification.

8. Presentation of Energy Audit Findings:

- a. The Chair directed the Energy Auditor to present the energy audit findings and PAT pending actions in a Power Point presentation.
- b. The Energy Auditor agreed, and the presentation was conducted for 12:30 PM in the conference room. The meeting concluded at 11:30 AM.

CME

SUNIL KUMAR V.K Certified Energy Auditor Reg. No: EA 3642

8.3 Checklist prepared by the Empanelled Accredited auditing Firm

1. Opening meeting and information gathering about the DISCOM operations

For understanding about business of the DISCOM and planning the course of the audit and capture the following information

- a. Overall structure of the DISCOM and business
- b. Number of circles, Division, subdivision and section
- c. Number of substations voltage levels and metering status and SLD
- d. Major energy inflows and voltage levels, metering status and trading
- e. Number of border sharing and metering status

2. Checking the regulatory Compliance of the DISCOM

- Check for the compliance of the prerequisites for the annual energy audit and periodic energy accounting reports and understanding the new energy audit regulation by the DISCOM
- Check for the compliance of the reporting requirement for annual energy audit and periodic energy account

3.Data Collection and Analysis:

 Collect the quarterly energy account reports of the four quarters and monthly reports Collect monthly data for the energy inputs and sales Collect the Energy purchase bills and internal generation data including the renewable energy sources Collect meter reading data and metering details of Input points, feeders, Border meters and Distribution transformers and consumer points Collect data regarding the infrastructure of the distribution like number of Distribution transformers, capacity Line length, UG cable length, and Metering infrastructure Analyse the monthly data and quarterly reports and check for any variance 							
/. Review billing and metering data for accuracy.							
Collect monthly collection efficiency data overall and unit wise							
Collect annual reports of the previous year and analyse the overall performance and trend							

o 4.Verication and validation of Data

a) Verify and check the current metering status

- At the sample input injection points,
- feeder import points and export points,
- generation input points,
- Distribution transformers and
- Consumer points and validate the same

b) Verify the mapping status of the feeder, Distribution transformers and the consumers

c) Verification of energy flow data within DISCOM at all applicable voltage levels of distribution network as specified in the regulations.

d)The service level wise energy flow data is to be computed by the DISCOM on a monthly basis, and it would submit a consolidated Quarter wise report to the validation through sample data checks and field visits:

e. Evaluate DSM programs and their effectiveness.

f. Assess customer-side energy management initiatives.

5.Vation of Energy inflows and outflows data:

Based on data available in 11 kV Feeder meter at substation for a sample size of 10% for which documentary evidence to be captured in the audit report.

- Min. 10 or 1% (whichever is higher) of DISCOM's input energy metering points between Transmission and 66kV/33kV/11kV distribution feeders by checking functional and communication status of meters etc.
- For all Divisions with AT&C losses greater than 25% or at-least 1/3 of the total Divisions of DISCOM,

• verify: Total of min. 10 or 1% of metering points (whichever is higher) between 220132 110- 66 /33 kV outgoing and 22kV-11kV-6.6kV-3kV incoming feeders/ direct end-consumer by checking functional and communication status of meters.

• In an Urban High Loss Division, check 5 or 1% of Metering points (whichever higher) at DTs where communicable meters were already installed under other schemes such as R-APDRP and IPDS. o Total of min. of 10 or 1% of metering points (whichever is higher) between 11kV/6.6kV feeders and DTs by checking functional and communication status of meters, foot survey of feeder to check for thefts/ hooking etc.

• Verify metering and connection status of min. of 10 or 2% consumers of the Division (whichever is higher) of the following category of consumers

- Agriculture (Metered and Un-metered),
- o Govt. category connection (ULB, RLB etc.), and LT Industry
- 6.. Infrastructure Assessment:
- Inspect distribution transformers, lines, and substations for losses and inefficiencies.
- Assess the condition of equipment and identify areas of energy wastage.
- Check for power factor improvement opportunities.
- 7.. Demand Side Management (DSM):
- 8. Energy Efficiency Measures:
 - Review the effectiveness of energy-saving measures previously implemented.
 - Identify new opportunities for energy efficiency improvements.
 - Consider energy-efficient technologies for grid management.
- 9.. Tariff Analysis:
 - Review tariff structures and assess their impact on energy consumption.
- 10. Reporting and Compliance Documentation:
 - Prepare a comprehensive energy audit report.
 - Include findings, recommendations, and a plan for implementation.
 - Ensure all required documentation for regulatory compliance is complete.

8.4. Brief approach, Scope and methodology of the audit

I. <u>The objectives of the work</u>

As per notification No: 18/1/BEE/DISCOM/2021 dated 6th October 2021 (Manner and interval for conduct of energy audit (accounting) in Electricity Distribution companies regulations issued by the BEE, MOP and amendment issued thereof on 28th October 2022, every Distribution companies shall conduct an annual energy audit by an external accredited auditor for every financial year and submit the annual energy audit report to the Bureau of Energy Efficiency and respective SDA and also made available on the website of the DISCOM within a period of four months from the expiry of the relevant financial year.

The objectives of the work are to conduct a comprehensive energy audit and submit the report containing the details as stipulated by the regulation with recommendations and action plan with time frame and priority to reduce the loss and best practises in energy accounting and energy conservation techniques so as to improve the efficiency and the financial viability of the DISCOM

II. <u>Approach and methodology of the work</u>

The proposed audit will be conducted in the following three phases.

1. Pre-audit phase

- I. Discussion and review meeting(s) with DISCOMs and Energy Manager(s) to ensure reliable and timely data availability
- II. A review of the Macro level data in order to assess the areas of high losses and data gaps
- III. Planning field visits to verify and collect data
- IV. Planning and phasing of various steps involved in audit exercise including data collection, manpower/team deployment,
- V. Organizing the structure of the audit report in consonance with energy accounting regulations notified by BEE; and the output required for corrective action and decision making
- VI. Undertake a review of the capacity of the centralized energy accounting and audit cell created at the DISCOM in terms of adequate representation from professional backgrounds of IT Manager, Energy Manager and Financial Manager

2.Audit phase

a) Review of present structure of energy flow in DISCOM at different levels - State level, transmission, sub-transmission, DT level, feeder level to end consumer etc.

Capture details of DISCOM infrastructure - no. of circles, divisions, sub-divisions, sections, Substations, total No. of Power Transformers with capacity in MVA, total No. of Capacitor Banks in Substations and capacity in MVAR, feeders, DTs with capacity in MVA, boundary meters, category wise consumers and

- b) Voltage level for each consumer category etc. (Refer Regulation 5)
- c) Stakeholder interactions with DISCOM, Energy Manager, SE (Circle level), XEN (Division level) for data accuracy and other issues.
- d) Verify, check and validate current metering status (operational/ faulty/ unmetered) and type (communicable/ static etc.) at various voltage levels (feeders, DTs, consumers) and Metering details (such as Meter Sl. Number, Meter reading date and the Mu34ltiplying Factor) through sample field visits and available records with DISCOM.
- e) Verification of energy flow data within DISCOM at all applicable voltage levels (Refer Regulation 7) of distribution network as specified in the regulations. The service level wise energy flow data is to be computed by the DISCOM on a monthly basis, and it would submit a consolidated Quarter wise report to the Energy Auditor, who would only verify the same
- f) Validation through sample data checks and field visits:
 - a. Validation of feeder data: Based on data available in 11 kV Feeder meter at substation for a sample size of 10% for which documentary evidence will be captured in the audit report.
 - b. Validation of energy flow data and losses: Based on field survey as per the following sample size:
 - I. Min. 10 or 1% (whichever is higher) of DISCOM's input energy metering points between Transmission and 66kV/33kV/11kV distribution feeders by checking functional and communication status of meters etc.
 - II. For all Divisions with AT&C losses greater than 25% or at-least 1/3 of the total Divisions of DISCOM, verify: Total of min. 10 or 1% of metering points (whichever is higher) between 220-132-110- 66 /33 kV outgoing and 22kV-11kV-6.6kV-3kV incoming feeders/ direct end consumer by checking functional and communication status of meters.
 - III. In an Urban High Loss Division, check 5 or 1% of Metering points (whichever is higher) at DTs where communicable meters were already installed under other schemes such as R-APDRP and IPDS.
 - IV. Total of min. of 10 or 1% of metering points (whichever is higher) between 11kV/6.6kV feeders and DTs by checking functional and communication status of meters, foot survey of feeder to check for thefts/ hooking etc.
 - V. Verify metering and connection status of min. of 10 or 2% consumers of the Division (whichever is higher) of the following category of consumers Agriculture (Metered and Un-metered), Govt. category connection (ULB, RLB etc.), and LT Industrial

VI.

- g) Computation of AT&C losses for each division:
 - I. Input energy data: Identification of all input points of transmission system, collection of input energy from recorded system, meter reading including energy received and distributed by DISCOM, recorded meter reading at all DISCOM export points, system loading, source of energy supply including generation from RE, etc.
- II. Billing and collection data: Feeder wise and category wise no. of consumers, Voltage

Level for every consumer category, metered and un-metered, connected load, billed and unbilled energy, details of open access, EHT sale, HT sale, LT sale and transmission losses, etc.

III. Computation of distribution loss, collection efficiency and AT&C loss at Feeder level, DT Level and Utility level

a. T&D LOSS

(NET INPUT ENERGY / TOTAL ENERGY BILLED)

b. BILLING EFFECIENCY (%)

((TOTAL ENERGY BILLED /NET INPUT ENERGY)

c. COLLECTION EFFECIENCY (%)

{AMOUNT COLLECTED /AMOUNT BILLED}

d. AT&C LOSS (%)

(1-BILLING EFFECIENCY X COLLECTION EFFECIENCY)

- IV. Identify high-loss Feeder and network segments: Based on energy loss
- V. losses, wastage or inefficient use of electricity etc. for initiating target based corrective action
- VI. Identify overloaded segments/ infrastructure: Based on sample assessment and data analysis, make recommendations on undertaking necessary capacity augmentations in substations, Feeders, Transformers and up to consumer end as observed.
 - h) Computation of subsidy assessed based on energy accounting data:
 - i) Revise the findings accordingly as per the field visits undertaken as mentioned above
 - j) Trend analysis with quarterly audit findings, past data review
 - k) Exception analysis and aberrations if any observed in audit exercise

3. Post Audit and Reporting phase

- a) Detailed Energy Audit Report preparation and submission as per BEE energy accounting regulations (Refer Regulation 9)
- b) Audit report should include energy accounting data captured on a quarterly basis for the FY.
- c) The audit report should point out variances in quarterly and annual data and recommendations for alignment of periodic accounting and annual energy audit report, key data gaps, assumptions and exceptions.
- d) Wherever available and feasible, validate Energy Audit report with the Energy Audit report generated by the DISCOM for smart meters for this, the DISCOM would facilitate data/ report availability from the respective AMISP.

iv. Submit an Action Plan in the Energy Audit Report, which should necessarily capture the following:

- a) Provide recommendations w.r.t energy accounting, loss reduction, subsidy accounting, consumption analysis etc. This should include cost-benefit analysis, payback periods etc.,
- b) accompanied by a detailed implementation plan and a mechanism for regular review and monitoring so that desired objectives are achieved within stipulated timelines.
- c) Develop a comprehensive action plan for monitoring of energy flow at each voltage level (Refer Regulation 8)
- d) Recommendations to also include that energy accounts prepared and submitted to BEE to be used for financial audit reporting.
- e) Auditor to obtain detailed action plan from the DISCOM to establish an IT enabled system to create energy accounting reports without any manual interference. This should include timelines for completion of Smart metering of Feeders and DTs, and generation of automated energy accounting reports through an IT platform/ solution. Detailed action plan to form part of energy audit report for regular review and monitoring.
- f) Auditor should observe and compile various Energy Conservation options implemented by the DISCOM and prepare report containing details of expenditure done by DISCOM along with saving and payback period.
- v. Assessment details and recommendations related to annual energy audit of previous year

8.5 Infrastructure details

Form-Details of Input Infrastructure							
1	Parameters	Total	Covered during in audit	Verified by Auditor in Sample Check	Remarks (Source of data)		
i	Number of circles	1	1		In CoPA there is no Division or Subdivision wise formation.		
ii	Number of divisions	0					
iii	Number of sub- divisions	0					
iv	Number of feeders	16	16	11	Through AMI meter software for 11 nos out of 16 feeders		
v	Number of DTs	30	30	1	No meter is installed		
vi	Number of consumers	1288	1288	1288	Through SAP		

Table 36

8.5.1. Voltage based consumers and metering infrastructure

		66kV and			
S.NO	Parameters	above	33kV	11/22kV	LT
	Number of conventional metered				
a i	consumers	0	0	0	89
ii	Number of consumers with 'smart' meters	0	0	37	1162
	Number of consumers with 'smart				
iii	prepaid' meters	0	0	0	0
iv	Number of consumers with 'AMR' meters	0	0	0	0
	Number of consumers with 'non-smart				
v	prepaid' meters	0	0	0	0
vi	Number of unmetered consumers	0	0	0	0
vii	Number of total consumers	0	0	37	1251

	Number of conventionally metered				
b i	Distribution Transformers	0	0	0	0
	Number of DTs with communicable				
ii	meters	0	0	0	0
iii	Number of unmetered DTs	0	0	30	0
iv	Number of total Transformers	0	0	30	
c i	Number of metered feeders	0	0	12	0
	Number of feeders with communicable				
ii	meters	0	0	12	0
iii	Number of unmetered feeders	0	0	4	
iv	Number of total feeders	0	0	16	
d.	Line length (ckt km2	0		85	105
е.	Length of Aerial Bunched Cables (kM)	0	0	0	0
f.	Length of Underground Cables (kM)	0	0	85	

Table 37

8.5.2. Detailed list of Transformers

LIST OF TRANSFORMERS							
SI.	Sl. Transformer Details						
No.	Type & Capacity	Make	Maker's	Yr. of mfr	Location		
1	11 KV/433 V, 630 KVA	KEL	26643	1992	Mattancherry Halt S/s.		
2	11 KV/433 V, 315 KVA	Crompton parkison Ltd	29826V	1975	Mattancherry Halt Qtrs.	•	
3	11 KV/433 V, 500 KVA	KEL	58942	2008	SBI RMU (Coal Stacking Area)		
4	11 KV/433 V, 250 KVA	Unipower	2263	2011	A3 Area, IMU Campus		
5	11 KV/433 V, 500 KVA	Megawin	947	2014	Subramaniyam Road		
6	11 KV/433 V, 630 KVA	Intrans	T-2676	2019	New Leasing Area		
7	11 KV/433 V, 500 KVA	KEL	4821	1979	110 KV Substation		
8	11 KV/433 V, 630 KVA	Talwane	TPE 740	2009	RNAS		
9	11 KV/433 V, 630 KVA	Intrans	T-2677	2018	RNAS		
10	3.3 KV/433 V, 500 KVA	Intrans	T-1653	2012	Hospital Substation		
11	11 KV/433 V, 630 KVA	Intrans	T-2678	2019	Konkan - 2		
12	11 KV/433 V, 250 KVA	Resi Tech	TR-205	2018	Walkway RMU Premise		
13	11 KV/433 V, 315 KVA	Resi Tech	TR-205	2018	Tropicana RMU Premise		
14	11 KV/433 V, 800 KVA	KEL	5115	1981	N.End SSn		
15	11 KV/433 V, 800 KVA			2001	BTP Substation	Wellingdon	
16	11KV/3.3KV - 630kVA		Sl.no. 1599, Intrans	2012	E/Wharf :Substation premises	Island	
17	11KV/433V - 500 KVA		Sl.no. 46534, KEL	2002	E/Wharf :Substation premises		
18	11`KV/433V - 630 KVA		Sl.no. 36884	1996	Old leasing Area		
19	11`KV/433V - 630 KVA		Sl,no. 48824, KEL	2004	Old leasing Area		
20	11 KV/433 V - 500 KVA		Sl.no. 5895, Indian Transformers Ltd	1978	SAGARIKA Cruise Terminal		
21	11 KV/433 V -1250 KVA		Sl.no.739	2009	Q9 Substation		
22	11 KV/433 V - 630 KVA		Sl.no.16969	1977	Q5 Substation		
23	11 KV/433 V - 800 KVA		Sl.no. 8333, KEL	1986	Q10 Substation CFS		
24	11 KV/433 V - 500 KVA		Sl.no. 52888	2005	CWC		
25	11KV/3.3 KV, 1250 KVA		TR12, Indoor NPH		NPH		
26	11 KV/3.3 KV, 1000 KVA		TR13, Indoor NPH		NPH		
27	11 KV/433 V, 500 KVA				VALLARPADOM SUBSTATION		
28	11 KV/433 V, 250 KVA				Near IOC	Vallarppada	
29	11 KV/433 V, 315 KVA				Near SEZ Bldg. (Gate)	m	
30	11 KV/433 V, 300 KVA				MULT		

Table No: 38

8.6. Electrical Distribution system

Cochin Port Authority (CoPA) is a Body Corporate under the Major Port Authorities Act, 2021 (formerly Cochin Port Trust). CoPA is also a Deemed Electricity Distribution Licensee as per the Electricity Act 2003 and a notified DC (DC No: DIS0048KL) under the PAT Cycle VII vide notification No: S.O.4552(E) dated 26th September 2022 by the Ministry of Power, GOI.

CoPA purchases electricity from M/s Kerala State Electricity Board Limited (KSEBL), a major distribution licensee, and distributes it to consumers in the Port area under its jurisdiction in Willingdon Island, Vallarpadam, and Puthuvypin. CoPA avails 6.5 MVA power at a 110 kV system from KSEBL in Willingdon Island and 3 MVA power at 11 kV in Vallarpadam, distributing electricity to consumers within the Port premises.

Presently, CoPA operates a 110kV/11kV Substation with two 10/12.5 MVA power transformers and associated switchgears and control gears at Willingdon Island, and an 11 kV Receiving Station at Vallarpadam with two feeders. The 11 kV power is distributed to consumers through 11 kV underground (UG) cables, dedicated 11 kV UG cables, and linked through a Ring Main system for redundancy in supply, ensuring 24x7 supply. Low Tension (LT) feeding is by means of LT overhead (OH) and UG cable lines.

Currently, CoPA has 1288 consumers, including 36 High Tension (HT) consumers and 1220 LT consumers. Consumer metering is 100% SMART meters for all categories of consumers. However, self-consumption and street light supply are metered through SMART meters/electronic meters. Action has already been taken to purchase SMART meters to replace the electronic meters with SMART meters. SMART meters are equipped with Advanced Metering Infrastructure (AMI) features and prepaid facilities. All the SMART meters are connected to a centralized AMI software system through a mobile network using GPRS. Billing and accounting are done using the SAP system.

There are eleven 11 kV feeders emanating from the 110/11 kV substation at Willingdon Island and five 11 kV feeders at Vallarpadam and Puthuvypin areas. Additionally, there are 30 distribution transformers with specifications of 11kV/415Volt and 11 kV/3.3 kV.

CoPA has commissioned 100 kWp and 150 kWp grid-connected solar plants. CoPA has also permitted net metering facilities for solar plants of nine LT and HT prosumers. Import/export of energy from the solar plants is accounted for through SMART meters. The energy inputs from the solar plants are also covered in the Energy audit.

	Panel							Feeder
SI. no.	no.	Feeder	Meter S.NO	IR (Apr 23)	FR (Mar 24)	M.F	Cons. (Units)	load %
1	K01A	MNC	GP4409886	11419.35	18147.7	40	269134	0.9
2	K16	NTRO KV	GP4409880	130181.6	241756.7	40	4463004	15.6
3	3	Q9-1	GP4409885	537287	595587.5	40	2332020	8.2
4	4	Q9-2	GP4409882	357795.1	491819.2	40	5360964	18.7
5	5	MH-2 (MH)	GP4409887	84682.55	139551.2	40	2194746	7.7
6	9	UTL	GP4409883	292001.9	360528.9	40	2741080	9.6
7	10	Q9-3	GP4409888	185909.1	336236	40	6013076	21.0
8	11	MH-3 (ISRF)	GP4409884	28039.75	33997.50	40	238310	0.8
9	12	STN. TR	GP4409889	159792.9	203332.8	2	87080	0.3
10	K 15	PENNA	GP4409879	264799.7	323235.3	40	2337424	8.2
11	K 17	NTRO A2	GP4409890	92608.15	156496.8	40	2555546	8.9
Total							2,85,92,384	100.0
(The above readings are taken from 1st day 00:00 Hrs to last day 00:00 Hrs)								

8.6.1 .Feeder wise load distribution under the Willingdon Distribution System

Table 39

On analysing the feeder loads, major loads are found in 3 feeders namely, NTROKV, Q92 and Q93. The load in the rest of the feeders are found very low. Hence there is scope for energy saving through optimal load sharing of feeders
8.6.2 Energy performance of the previous years

S.NO	Energy input details	Units	2020-21	2021-22	2022-23
A	Energy purchased	MU	35.581	36.719	36.534
в	Net input energy (at DISCOM Periphery after adjusting the transmission losses and energy traded)	MU	35.581	36.719	36.534
с	Energy billed	MU	34.219	35.405	35.611
D	T& D Loss	MU	1.362	1.313	0.923
E	% T&D Loss	%	3.82	3.577	2.53

Table 40

Energy	WILI	LINGDON ISL	AND	VALLARPADAM				
	Net Energy input (MU)	ENERGY SALE(MU)	T&D LOSS (MU)	Net Energy input (MU)	ENERGY SALE(MU)	T&D LOSS (MU)		
Apr-23	2.56	2.48	0.08	1.02	1.00	0.019		
May-23	2.88	2.79	0.09	0.91	0.90	0.014		
Jun-23	2.32	2.26	0.05	0.77	0.76	0.012		
Jul-23	2.41	2.33	0.07	0.77	0.76	0.002		
Aug-23	2.50	2.43	0.07	0.78	0.78	0.003		
Sep-23	2.06	2.01	0.05	0.83	0.83	0.003		
Oct-23	2.22	2.15	0.07	0.92	0.91	0.004		
Nov-23	2.22	2.17	0.05	0.86	0.85	0.006		
Dec-23	2.43	2.36	0.07	1.03	1.02	0.007		
Jan-24	2.40	2.31	0.08	1.04	1.03	0.004		
Feb-24	2.32	2.25	0.07	1.13	1.12	0.014		
Mar-24	2.64	2.56	0.08	1.42	1.40	0.012		
ANNUAL TOTAL	28.96	28.12	0.83	11.48	11.38	0.10		
T& D Loss %			3.03%			1.09%		

8.6.3 Analysis of performance in the two Distribution areas under the CoPA

Table 41



Month wise and area wise T&D Loss curve for the year 2023-24

Fig 12

8.7 POWER PURCHASE DETAILS

CoPA imports Power from KSEBL through two locations as listed below.

8.7.1 Power purchase details of the Willingdon Island

Consumer N	o: 135541							
Contract der	mand :650							
		rges		Total charges				
BILL MONTH	BILL Maximu MONTH demand /KVA		MD Charge	Consumpti Unit rate Ener		Energy charges	PF Incentive/	Total charges
May-23	6270	380	2382600	2524050	6.25	15775312.5	315506	17843964
Jun-23	6430	380	2443400	2851650	6.25	17822812.5	356456	19909947
Jul-23	5124	380	1947120	2296800	6.25	14355000	358875	15975405
Aug-23	5261	380	1999180	2384550	6.25	14903437.5	372585	16533630
Sep-23	5728	380	2176640	2473360	6.25	15458500	386460	17248616
Oct-23	4875	380	1852500	2041650	6.4	13066560	319007	14300777
Nov-23	5436	380	2065680	2193150	6.4	14036160	342679	15430188
Dec-23	5585	400	2234000	2196300	6.4	14056320	351408	15941366
Jan-24	5866	400	2346400	2403900	6.4	15384960	384624	17349082
Feb-24	5589	400	2235600	2369400	6.4	15164160	379104	17024628
Mar-24	5824	400	2329600	2299650	6.4	14717760	367944	16681882
Apr-24	6468	16726080	418152	18897487				
Total				28647910				203136972

Table 42

8.7.2. Power Purchase details of Vallarpadam . through Feeder 1

Consumer N	o: 1355xx							
Contract der	mand 3000							
		MD Charg	ges	E	Energy cha	rges		
MONTH Maximum Rate demand KVA		Rate KVA	MD Charges	Consumptic	Unit rate	Energy charge	PF Incentive	Total charges (Including duty and surcharge
May-23	2461	340	836740	1023560	6.25	6397250	127945	7418478
Jun-23	2250	340	765000	914560	6.25	5716000	114320	6668899
Jul-23	2250	380	783200	772560	6.25	4828500	97900	5787348
Aug-23	2250	380	855000	766360	6.25	4789750	95795	5747854
Sep-23	2250	380	829440	783200	6.25	4895000	97900	5863255
Oct-23	2250	380	855000	829440	6.25	4396750	6131582	6131582
Nov-23	2250	400	900000	914880	6.4	5855232	114360	6695688
Dec-23	2250	400	900000	856120	6.4	5479168	109583	6468940
Jan-24	2250	400	900000	1027400	6.4	6575360	131507	7637787
Feb-24	2571	400	1028400	1038040	6.4	6643456	132869	7807503
Mar-24	2647	400	1058800	1133120	6.4	7251968	108779.52	8504841
Apr-24 2798 400 1119200				939920	6.4	6015488	120309	7218263
Total				10999160				81950438

Table 43

8.7.2. Power Purchase details of Vallarpadam . through Feeder 2

Consumer No	Consumer No:1355650096081										
Contract der	mand 2000										
MONTH	MONTH Maximum Rate MD Charges				Consumptic Unit rate Energy charges			Total charges (Including duty and surcharg			
Apr-24	1319	400	527600	474744	6.4	3038361.6	15192	3550770			
Total				474744				3550770			

Table 44

8.8 . SINGLE LINE DIAGRAM OF THE DISTRIBUTION SYSTEM



1. SLD OF THE WILLINGDON ISLAND

Fig 13

SINGLE LINE DIAGRAM OF THE -VALLAPADAM AREA



Fig 14

Period From 1st April 2023 to 31st March 2024											
Consumer profile		Enei	gy parame	eters	Los	ses	Commercial Parameter				
	Total			% of			Billed	Collected	Collectio	AT & Close	Average
Concumor catogory	Number	Input	Total	energy	T&D loss (MU)	T&D loss (%)	Amount	Amount	Collectio	(%)	billing rate
consumer category	of	energy	lotal energy	consump			in Rs.	in Rs.	Efficiency		(Rs./kw)
	connecti	(MU)		tion			Crore	Crore	LITICIEIICY		
Residential	412		0.97	2%		2.31%	0.67	0.67	100.00%		6.88
Agricultural	0		0.00	0%			0.00	0.00	0.00%		0.00
Commercial/Industrial-LT	605	40.43421	4.63	12%	0.933059		5.96	5.96	100.00%		12.89
Commercial/Industrial-HT	30		28.77	73%			32.00	32.00	100.00%		11.12
Others	241		5.13	13%			4.55	4.47	98.41%		8.73
	1288	40.43421	39.50	100%	0.933	2.308%	43.18	43.11	99.8325%	2.47%	10.91

8.9.1.Category vise consumers and average billing rate

Table 45 A

8.9.2 Pending arrear details in CoPA for the year 2023-24

		Pending	arrear details in CoPA for the Yea	r 2023-24
S.NO		B.P NO	B.P Name	Amount(Rs)
	1	100534	Udayan	232
	2	1001836	Police	190636
	3	1001838	Commisssioner of customs	86187.84
	3	1001840	Corporation of Cochin	445045.57
	4	1001920	K.P Sebastian	254
	5	1004367	Mercury Cab	602.53
	6	1005030	Paid & Unpid Trainee Mech Engg	122.12
				723080.06

Table 45 B

	(Details of Consumers)									
		Summary of Ene	rgy							
	Period	From 1st April 2023 to	31st March	2024						
S.No	Type of Consumers	Category of Consumers (EHT/HT/LT/Others)	Voltage Level (In Voltage)	No of Consumers	Total Consumption (In MU)	Remarks (Source of data)				
1	Domestic	LT	415V/230 V	412.00	0.97					
2	Commercial	LT	415 V /230 V	590.00	4.34					
3	IP Sets	0								
4	Hor. & Nur. & Coffee/Tea & Rubber (Metered)	0								
5	Hor. & Nur. & Coffee/Tea & Rubber (Flat)	0								
6	Heating and Motive Power	0								
7	Water Supply	0								
8	Public Lighting	LT	415 V	63	0.28					
9	HT Water Supply	0	1							
10	HT Industrial	HT	11 kV	1	0.82					
11	Industrial (Small)	LT	415 V	15.00	0.29					
12	Industrial (Medium)	0			1					
13	HT Commercial	HT	11 kV	29	27.95					
14	Applicable to Government Hospitals & Hospitals	0								
15	Lift Irrigation Schemes/Lift Irrigation Societies	0								
16	HT Res. Apartments Applicable to all areas	0			2					
17	Mixed Load	HT	11 kV		0					
18	Government offices and department	HT	11 KV	7	2.31	-				
19	Government offices and department	LT	415 V	121	1.63					
20	Mixed load	LT	415V/230 V	50.00	0.91					
21	Others-3 (if any, specify in remarks)									
22	Others 4 (if any , specify in remarks)									
23	Others-5 (if any, specify in remarks)									
24			<u> </u>							
25				-						
26		<u> </u>								
27										
28		-								
29										
30										
31										
32				-						
33										
34				-						
35				-						
30		-		-						
3/		-								
38		5 O								
39										
40		-								
		1	Terel		20.00					
			Iotal	1288	39.50					
		32 32			8					

8.10 Details of the consumers and consumption for the year 2023-24

Table 46

S.NO	List of Parameters verified	Reference documents /Criteria
1.	Broad system of the DISCOM	1. Single line diagram of the Distribution
		system
		2. Site visit at incoming substations
		3. Overall visit of the Distribution area
2.	DISCOM input energy for the	1. Energy account reports prepared by the
	FY 2023-24	Energy Manager of the DISCOM
		2. Power purchase bills from KSEBL for the
		year 2023-24
		3. Verification of the Solar energy input &
		DG input from monthly report & sample
		readings
3.	DISCOM Category wise Sale of	1. SAP Report
	Energy	2. AMI software report
		3. Quarterly account report prepared by the
		Energy Manager of the DISCOM
4.	T&D Loss	1. Through calculation
		2. Energy account report prepared by the
		Energy Manager of the DISCOM.
5.	Subsidy account	1. Tariff petition filed by the DISCOM
		No subsidy Payment from the
		Government to the CoPA.
6.	Energy conservation measures	1. Previous Energy audit report for the
	implemented by the DISCOM	Year 2022-23
	and under implementations	2. Report submitted by the DISCOM
7.	Compliance of the reporting	1. Previous accounts report and audit reports
	requirement	submitted by the DISCOM
		2. Previous Energy audit report
		3. Website of the DISCOM

8.11 List of documents verified with each Parameters

Table 47

8.12 Brief Description of the Unit

Since the CoPA is a small Licensee with hardly 1288 consumers under the Port area there is

no Division, Sub Division or Section wise formation.

8.13 List of Parameters arrived through calculation

All consumptions are metered.

Rev:0

8.13.1A . Energy saving proposal-for the FY 2023-24

	Energy conservation measures Proposed during the FY 2023-24											
S.NO	Energy effeciency measure	QTY (No)	Unit	Captal investment (Rupees in Lakh)	Annual energy saving (kWH)	Annual savings (Rs) (Lakhs)	Discount rate(%)	CASH FLOW (Years)	Simple Pay back Period (Years)	NPV (Lakh Rs)	IRR(%)	Remarks
1	Replacement of Old copper(SWG 8) conductor with 3 PHASE 5 wire LT ABC of size 3x95sqmm+1x70 sqmm+1x 16 sqmm	9.17	kM	70	275549.60	16.53	8	13	4.2	₹ 71.70	26%	
2	Rectification of the inverter and clearing shading of the 100 kW solar power plant	1	NO	3	50000	3.55	8	5	0.8	₹ 12.66	110%	Presently 3 Nos of 30 kVA inverter units are in breakdown condition
				73	325549.60	20.08						

Table No:48 A

8.13.1 B. Other Energy saving project proposal

		Other measures proposed	
1	Energy conservation measur Halt w	res proposed in the 50 hP Mattanchery ater Pump house	
	Observations	Measures recommender	Anticipated svings
а.	Apprciable water leakage observed in the delivery Pipe line.	To arrest the leakage	
b	Pump main delivery pipe Valve found partially throttled for controling the flow.	Up on site analysis there is no flow adgustment required for the operation.Hence the operator to be instructed to ensure the full opening of the delivery valve.	The closing of the Pump valve by 20% will increase the Power consumption by about 1/3.
c	Pump Motor found not fitted any Power factor correction Capacitor	For 50 HP motor the rated power factor correction capacitor is 14 kVAR	The power factor correction capacitor will reduce the apparent power at the load side by 2 kVA.Hence there will be savings due to the line loss also

Table 48 B

8.13.2 Replacement of Copper conductor with LT ABC -Energy saving calculation

				Assume distributed load		Assume distributed		Net energy saving	
			Assume average	Calculated, Loss/km for	Loss due to the	load Calculated	Loss due to the	due to conductor	
			load current A and	3 phase line with SWG 8	proposed length	loss/km for 3 phase	proposed	replacement(kW	Total annual Energy
	Total 9.1 KM OH A	ABC	balanced load	Copper conductor (kW)	(kW)	95 sqmm LT ABC (kW)	length (kW)	Н)	savings (kWh)
SI.No.	Route	Length	Α	В	C=BX Length	D	E=D X Length	F=(C-E)	8760XF
	North end SBI to Zuari								
1	Jn	0.29	70	6.0264	1.72	1.488	0.43	0.23	2048.34
2	North end cross Roads	0.67	70	6.0264	4.02	1.488	0.99	2.53	22159.30
3	Inside subramaniyan Rd	0.24	70	6.0264	1.43	1.488	0.35	-0.05	-465.53
	Approach roads to new								
4	cruise terminal	0.48	70	6.0264	2.87	1.488	0.71	1.38	12103.82
	front of HDFC banh to								
5	bristow rd	0.17	70	6.0264	1.03	1.488	0.26	-0.45	-3984.95
	Uthra tech cement to								
6	DLB Jn	1.19	70	6.0264	7.17	1.488	1.77	5.69	49811.86
7	Terminals Jn to CFS	1.45	70	6.0264	8.74	1.488	2.16	7.25	63512.45
8	Ntro to Masthyafed Jn	0.31	70	6.0264	1.87	1.488	0.46	0.38	3305.27
	Bristow Rd to Malabar								
9	gate	0.52	70	6.0264	3.16	1.488	0.78	1.67	14617.69
10	Temple Jn to market	0.19	70	6.0264	1.15	1.488	0.28	-0.34	-2979.40
	Bristow Rd to behind								
11	south club Rd.	0.24	70	6.0264	1.43	1.488	0.35	-0.05	-465.53
13	DLB to M/W	0.36	70	6.0264	2.15	1.488	0.53	0.66	5819.14
	M/w to FCI- ammonia								
14	tank	0.86	70	6.0264	5.17	1.488	1.28	3.68	32214.77
15	IG rd to Ambuja cement	0.26	70	6.0264	1.58	1.488	0.39	0.09	791.40
	Cross Rd near hospital /								
16	customs quraters	1.14	70	6.0264	6.89	1.488	1.70	5.40	47297.99
17	Marar Rd	0.43	70	6.0264	2.58	1.488	0.64	1.09	9589.95
	Civil Water tank to	0.00							201-2 02
18	temple Jn	0.38	70	9.951	3.79	1.488	0.57	2.30	20173.03
	Total	9.17			56.75		13.64	31.46	275549.6043

Table No:48 C

8.13.3 Replacement of Copper conductor with LT ABC-Load loss calculation

	1	1		1	1	1	1
	1 10 1 1	100 1					
Assume distributed load and load is distrib	ued uniformly at ever	y 100 meter					
Average LT feeder phase current	70 A						
	Α	В	C	▲ D	♦ Ε .	F 1	
							-
Length of the section (Km)	0.1	0.1	0.1	0.1	0.1	0.5	
			SW	G 8 Copper conduct	tor		
	70	60	5	0 40	30	20	
	SECTION LENGTH	RESITANCE/K	CURRENT	SECTION RESIST	Power loss W	Loss (kW)	
Load loss at section A	0.1	1.296	7	0 0.1296	635.04	0.63504	70X 70(O.1X2.14)
Load loss at section B	0.1	1.296	6	0 0.1296	466.56	0.46656	60X60X(0.1X2.14)
Load loss at section C	0.1	1.296	5	0 0.1296	324	0.324	50X50X(0.1X2.14)
Load loss at section D	0.1	1.296	4	0 0.1296	207.36	0.20736	40X40X(0.1X2.14
Load loss at section E	0.1	1.296	3	0 0.1296	116.64	0.11664	30X30X(0.1X2.14)
Load loss at section F	0.5	1.296	2	0 0.648	259.2	0.2592	20X20X(0.5X2.14)
Total load loss /km						2.0088	
			LT ABC 9	5 SQMM PHASE CON	DUCTOR		
	70	60	5	0 40	30	20	
	SECTION LENGTH	RESITANCE/KI	CURRENT	SECTION RESIST	Power loss W	kW loss	
Load loss at section A	0.1	0.32	7	0 0.032	156.8	0.1568	70X 70(O.1X2.14)
Load loss at section B	0.1	0.32	6	0 0.032	115.2	0.1152	60X60X(0.1X2.14)
Load loss at section C	0.1	0.32	5	0 0.032	80	0.08	50X50X(0.1X2.14)
Load loss at section D	0.1	0.32	4	0 0.032	51.2	0.0512	40X40X(0.1X2.14
Load loss at section E	0.1	0.32	3	0 0.032	28.8	0.0288	30X30X(0.1X2.14)
Load loss at section F	0.5	0.32	2	0 0.16	64	0.064	20X20X(0.5X2.14)
Total load loss /km						0.496	
Load loss /km per conductor of SWG 8	CONDUCTOR	2.0088					
Load loss per km of the three phase lir	ne	6.0264					
Load loss /km per conductor of 95 sqm	m LT AB CONDUC	0.496					
Load loss per km of the three phase lin	ne	1.488					

Table 48 D

8.13.4.SWG 8 Copper conductor and 95 sqmm LT ABC Resistance specification

		Conductor		
	Overall dia of the	resitance		
Cnonductor specification	conductor(m.m)	ohm/kM	weight /km	
Copper bare conductor SWG 8	4.064	1.296	130	0
Copper bare conductor SWG 10			70	0
Copper bare conductor SWG 12			40	0
LT ABC 3X95+1X70+1X16 SQMM				
ABC 95 SQMM CONDUCTOR	11.3	0.32		8



8.13.5 SWG Copper conductor -Diameter specification

A CONTRACTOR OF							
	SWG - Standard Wire Gauge	Diameter					
	Diameter						
	inches	mm					
4	0.232	5.893					
5	0.212	5.385					
6	0.192	4.877					
7	0.176	4.470					
<u>8</u>	<u>0.160</u>	<u>4.064</u>					
9	0.144	3.658					
10	0.128	3.251					

Table 48 F:

Work name: O	Conductor rep	placement
IRR AND	ONPV Calcul	ation
*All an	nounts in Lal	khs
		item
1		-70
2		19.56
3		19.56
4		19.56
5		19.56
6		19.56
7		19.56
8		19.56
9		19.56
10		19.56
11		19.56
12		19.56
13		19.56
NPV		₹ 71.70
IRR		26%

8.13.6 NPV Calculation for the Conductor replacement work

100 kW Solar plant Inverter rectification and maintenance.			
1	_3		
2	3.55		
3	3.20		
4	3.20		
5	3.20		
6	3.20		
7	₹ 12.66		
8	110%		

Table 48 H

Table 48 G

1. Energy saving opp					
			Energy loss		
	Pump rated		due to	Daily operating hours	Annual energy loss
	(kw)	Throttling %	throttling(kW)	of the Pump (H)	kWh
Removing the					
throtteling in the					
delivery valve					
The valve found					
throttled by about					
20%	31.7	20	11.412	11	45191.52
**	Pump throttli	ng loss - Rateo	d Power of the P	ump x(1-(1-throttling %)	^2)

8.13.7 Energy saving opportunities in the Water Pump house in Mattachery Halt.

Table 49:

8.13.7.2. Energy saving oppertunities due to the installation of PF correction Capacitor

2. Energy saving due t	o the installati	on of the Pow	er factor cap	acitor
			KVAR	
	Present		Rating of	
	Power factor		the	Increase of KVA load
Motor rating (kW)	of the Motor	Proposed PF	Capacitor	due to reactive load
37.3	0.8	0.95	14	2.53

Table 50

8.13. 7..3 Calculation of the taken back copper scrap.

	Calcul	ation of taken bac	k value of Old copper sc	rap					
				PROPOSED			TOTAL TAKEN	TAKEN BACK	AMOUNT OF
		Existing		DISMANTLING			BACK LENGTH	SCRAP WIGHT	TAKEN BACK
S.NO		conductor		LENGTH(KM)		*WEIGHT (KG/KM	(KM)**	(KG)	ITEM(RS ***
		CONDUCTO							
		R SWG 8							
1		Copper			27.51	130	10.92	1419.6	780780
		Neutral SWG							
2		10 Copper			9.17	70	3.668	256.76	141218
		SWG 12 Copper							
3		street main			9.17	40	3.668	146.72	80696
				Total					1002694
*		From copper con	ductor specification						
R SWG 8 27.51 130 10.92 1419.6 7 Neutral SWG 9.17 70 3.668 256.76 1 SWG 12 Copper 9.17 70 3.668 146.72 SWG 12 Copper 9.17 40 3.668 146.72 Total 10 10 10 * From copper conductor specification 10 10 ** Taken back scrap length taken only 40% of the original length due to wear and mixing of aluminium conductor etc. ****		etc.							
***		Scrap value of co	pper is taken @ Rs 550 /	Kg					

Table 51:

8.14 . Photos of the CoPA substation and site



Incoming feeders from KSEBL at Vallarppadam 11 kV S/S

Fig 15





Vallarppadam 11 kV S/S



New dedicated feeder from Vallarppadam S/S

Fig 17



Fig 18

100 kWp Solar plant site in Mattanchery Halt



L.T.Distribution Line

8.15 ENERGY AUDIT FORMATS

1.General information

1.General information

	Gen	eral Inform	ation		
1	Name of the DISCOM	the second s	Cochin	Port Authority	100 C
2	D Year of Establishment	100		1936	
	ii) Government/Public/Private			Public	
3	DISCOM's Contact details & Address				
1	City/Town/Village			Cochin	
il	District		E	Inukulam	
liii	State	Kerali	L.	Pin	652009
iv	Telephone	0484-2668	3200	Fax	0484-2666512
4	Registered Office		With the second		
i	Company's Chief Executive Name		B. KASIVISI	VANATHAN IRS ME	Contraction of the local division of the loc
ii	Designation		10	Chainman	
ш	Address		Cochin Port	t Authority, W.Island	The second second
iv	City/Town/Village	Cochi	n	P.O.	Wisland
v	District		12	Emakulam	
vî	State	Keral	ľ.	Pin	682009
vii	Telephone	0484-266	3566	Fax	0484-2668163
5	Nodal Officer Details*				
i	Nodal Officer Name (Designated at DISCOM's)		AJI	THKUMAR D	
ii .	Designation		Superitero	lent Engineer (ELE)	
iii	Address		Cochin Por	t Authority, W.Island	and the second second
iv	City/Town/Village	Cochi	n	P.O.	W. Island
v	District	ι	3	Emakulam	£.
vi.	State	Keral	£.	Pin	652009
vii	Telephone	0484-258	2320	Fax	0484-2666639
6	Energy Manager Details"				
i	Name		JAY.	ALAKSHMY S	and the second second
ii	Designation	Executive Eng	ineer(Ele)	Whether EA or EM	EM
iii	EA/EM Registration No.			NE	N 10 11
iv	Telephone	0484-238	2360	Fax	0454-2666639
v	Mobile	9496450704	E-mail ID	instalaishmi@con	hisport gov in
7	Period of Information				
	Year of (FY) information including Date and Month (Start & End)		1st April 20	123 to 31st March 2024	μ.

14 hs

SUPERINTENDING ENGINEER (ELE.)

1.2. Performance summary of the DISCOM

1.2. Performance summary of the DISCOM

	Performance Summary of Electricity Distri	oution Companies	
1	Period of Information Year of (FY) information including Date and Month (Start & End)	1st April 2023	to 31st March 2024
2	Technical Details		
(a)	Energy Input Details		
(1)	Input Energy Purchase (From Generation Source)	Million kwh	40.12
(ii)	Net input energy (at DISCOM Periphery after adjusting the transmission losses and energy traded)	Million kwh	40.43
(明)	Total Energy billed (is the Net energy billed, adjusted for energy traded)	Million kwh	39.50
-	Inducting the second se	Million kwh	0.933
(b)	Transmission and Distribution (T&D) loss Details	%	2.31
1414-02	Collection Efficiency	%	99.83
(c)	Aggregate Technical & Commercial Loss	%	2.47

I/We undertake that the information supplied in this Document and Pro-forma is accurate to the best of my knowledge and if any of the information supplied is found to be incorrect and such information result into loss to the Central Government or State Government or any of the authority under them or any other person affected, I/we undertake to indemnify such loss.

ILL Authorised Signatory and Seal

SUPERINTENDING ENGINEER (ELE.)

COCHIN PORT AUTHORITY Name of Authorised Signatory : Ajithkumar .D ß

Name of th Cochin Port Authority

Full Addre W.Island , Cochin -682009, Kerala

Signature:-Name of Energy Manager*: **Registration Number:**

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J.Nagesh Kumar

AEA0133

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SUPERINTENDING ENGINEER (ELE.)

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Centre for Energy, Environment and Productivity Pict No. 1039, 26th Smeet, H-Block, Ponel Colony, Anna Nagar, Chennal - 600 040. PH : 044 2616 3463, 9444862553 3.Division wise Losses for the FY 2023-24

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4.Form of Input Energy

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SUPERINTENDING ENGINEER (ELE.)

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Centre for Energy, Environment and Productivity Post Ho. 1035, 28th Street, H-Sicok, Punel Colony, Avea Nagar, Chemai - 600 040. PH : 044 2516 3453, 9444825553 6.Details of Received sources

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6.1Details of Embedded generation in DISCOM area

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7.Details of Feeder level information

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Carter for Energy, Environment and Productivity Post No. 1028, 2008 Sanad, H-Block, Post Colony, Anna Negar, Classical - 600 SHO, PH 344 2516 3453, 9444342553

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7.1Details on DT Wise information and Losses

7.2 Details of consumer category wise subsidy billed/received

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SUPERINTENDING ENGINEER (ELE.)

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Caster for Energy, Environment and Productivity Plot No. 1033, 2585 Sared, H-Bicch, Panel Colony, Anna Nagar, Chemis - 800 040, Pri: 044 2016 3453, 9444582553

8.16 .1 Energy Purchase bill for the supply of Energy at Vallarpadam (Feb 2024-Supplier KSEBL.

Tariff L COCHIN P JOINT DIR COCHIN P ERNAKUL Mobile no-	PORT TRUS RECTOR,PO PORT TRUS AM, COCHI		DE DRE	02-Feb-	2024	Du	e Date	08-Feb-2	924 5	iii.No	2	1028111	144284 V	fer 0
COCHIN P JOINT DIR COCHIN P ERNAKUL Mobile no-	PORT TRUS RECTOR PO PORT TRUS					DC	Date	24-Feb-2	024 0	D	55	22420 B	G	155492
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Disputed	Amears as	on 31-Dec-20	123		Date of	Previ	ous Raadi	ng 3	1-Dec-2023	dycmeeleg	(coching	port gov	in .	
	d	Undisputed	14	367297	Date of	Press	ont Readin	g 3	1-Jan-2024	Supply Volta	ge 11	κV.	нī	
Contract	75% of CD	130% of C	D Conned	ted Load	-		Avera	ige	as lor	Billing Type	N	on-DPS	3 - ²²	
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	Rea	ding Deta	lis of me	ter 2200	1331-4	Vork	log (KV	A KWb	KVAh &	KVArh) for	r 01-20	24		
1. Energy Co	onsumption(KV	(h)			1	S. Ene	Nrgy Cons	umption	(KVArh) L	and	KVAF	th (Lead	0	
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8.16.2 Energy purchase bill for the Willingdon Island (April 2024)-Supplier KSEBL

KERALA STATE ELECTRICITY BOARD LIMITED

Office of the Special Officer/Revenue), Pattorn Thiruwscandupu DEMAND NOTICE FOR APRIL 2024

(As par CHAPTER VEOF NERALA ELETRICITY SUPPLY CODE -3014)

Con.	1355410002	806	Dill Cinta	05-Apr	-2024	Dut	Data	12-Apr	2024	2.0	No	1	100811	1110003	26 Veri:	a.
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8.17 Photos of functional feeder meters installed in Willingdon substation

Feeder Name: Q9-2

Fig 20



Feeder Name PENNA

Fig 21



Feeder Name: Q9-1

Fig 22



Feeder Name: NTRO A2

8.18 FEEDER METER READINGS DOWNLOADED FROM AMI SOFTWARE

1. <u>FEEDER NAME : Q9-1</u>

RTC	MeterNo	KWH_Import	KWH_Export	KVAH_Import	MD_KW	MD_kVA	KVAR	Current_IR	Current_IY	Current_IB
11-07-2024 23:06	GP4409885	605852.5	0	624172.7	7.8	8.5	-1.1	-0.06	-0.07	-0.06
11-07-2024 22:08	GP4409885	605852.3	0	624171.5	7.8	8.5	-1.1	-0.06	-0.07	-0.06
11-07-2024 21:10	GP4409885	605851.8	0	624170.4	7.8	8.5	-1.1	-0.06	-0.07	-0.06
11-07-2024 20:19	GP4409885	605851.5	0	624169.4	7.8	8.5	-1.09	-0.06	-0.07	-0.06
11-07-2024 19:09	GP4409885	605850.7	0	624168.1	7.8	8.5	-1	-0.06	-0.07	-0.06
11-07-2024 18:07	GP4409885	605849.8	0	624166.8	7.8	8.5	-0.9	-0.06	-0.07	-0.07
11-07-2024 17:09	GP4409885	605848.9	0	624165.4	7.8	8.5	-0.92	-0.09	-0.09	-0.08
11-07-2024 16:09	GP4409885	605847.6	0	624163.8	7.8	8.5	-0.57	-0.15	-0.15	-0.13
11-07-2024 15:09	GP4409885	605846	0	624162.1	7.8	8.5	-0.88	-0.09	-0.07	-0.08
11-07-2024 14:07	GP4409885	605844.7	0	624160.6	7.8	8.5	-0.74	-0.08	-0.07	-0.08
11-07-2024 13:32	GP4409885	605843.9	0	624159.7	7.8	8.5	-0.93	-0.08	-0.07	-0.08
11-07-2024 13:22	GP4409885	605840.4	0	624155.6	7.8	8.5	-0.52	-0.1	-0.09	-0.1
11-07-2024 10:44	GP4409885	605839.4	0	624154.6	7.8	8.5	-0.47	-0.16	-0.15	-0.15
11-07-2024 08:05	GP4409885	605835.5	0	624149.8	7.8	8.5	-1.13	-0.06	-0.06	-0.07
11-07-2024 07:08	GP4409885	605835.3	0	624148.7	7.8	8.5	-1.1	-0.06	-0.06	-0.06
11-07-2024 06:07	GP4409885	605835	0	624147.6	7.8	8.5	-1.1	-0.06	-0.07	-0.06
11-07-2024 05:09	GP4409885	605834.6	0	624146.4	7.8	8.5	-1.11	-0.06	-0.07	-0.07
11-07-2024 04:10	GP4409885	605834.2	0	624145.3	7.8	8.5	-1.12	-0.06	-0.07	-0.07
11-07-2024 03:11	GP4409885	605833.9	0	624144.1	7.8	8.5	-1.12	-0.06	-0.07	-0.07
11-07-2024 02:05	GP4409885	605833.5	0	624142.9	7.8	8.5	-1.11	-0.06	-0.06	-0.07
11-07-2024 01:14	GP4409885	605833.2	0	624141.9	7.8	8.5	-1.11	-0.06	-0.07	-0.06
11-07-2024 00:27	GP4409885	605832.8	0	624141	7.8	8.5	-1.11	-0.06	-0.07	-0.07

Fig 24

2. **FEEDER NAME : Q9-2**

RTC	MeterNo	KWH_Import	KWH_Export	KVAH_Import	MD_KW	MD_kVA	KVAR	Current_IR	Current_IY	Current_IB
11-07-2024 23:06	GP4409882	532215.8	0	536564.5	22.4	22.4	-0.27	0.71	0.74	0.66
11-07-2024 22:08	GP4409882	532203	0	536551.7	22.4	22.4	-0.54	0.71	0.73	0.68
11-07-2024 21:10	GP4409882	532187.9	0	536536.6	22.4	22.4	-0.35	0.83	0.84	0.82
11-07-2024 20:10	GP4409882	532173.7	0	536522.2	22.4	22.4	0.65	0.69	0.72	0.67
11-07-2024 19:09	GP4409882	532159	0	536507.6	22.4	22.4	0.65	0.79	0.8	0.76
11-07-2024 18:07	GP4409882	532143.8	0	536492.4	22.4	22.4	-0.36	0.73	0.72	0.7
11-07-2024 17:09	GP4409882	532128.4	0	536477	22.4	22.4	- <mark>0.9</mark> 6	0.9	0.91	0.85
11-07-2024 16:09	GP4409882	532110.7	0	536459.1	22.4	22.4	-0.7	1.1	1.08	1.04
11-07-2024 15:09	GP4409882	532090.4	0	536438.8	22.4	22.4	-0.58	1.18	1.16	1.12
11-07-2024 14:07	GP4409882	532068.5	0	536416.9	22.4	22.4	0.04	1.15	1.13	1.09
11-07-2024 13:22	GP4409882	532053.4	0	536401.7	22.4	22.4	-0.41	1.03	1.02	0.98
11-07-2024 11:06	GP4409882	532005.4	0	536353.5	22.4	22.4	-0.04	1.1	1.09	1.06
11-07-2024 10:22	GP4409882	531989.8	0	536337.9	22.4	22.4	0.25	1.2	1.17	1.18
11-07-2024 08:05	GP4409882	531948.1	0	536296.1	22.4	22.4	-0.26	0.74	0.71	0.69
11-07-2024 07:08	GP4409882	531937	0	536284.9	22.4	22.4	-0.32	0.68	0.66	0.65
11-07-2024 06:07	GP4409882	531925.5	0	536273.3	22.4	22.4	-1.65	0.57	0.57	0.55
11-07-2024 05:09	GP4409882	531914.8	0	536262.7	22.4	22.4	-0.99	0.58	0.6	0.55
11-07-2024 04:10	GP4409882	531904	0	536251.7	22.4	22.4	-0.33	0.62	0.64	0.61
11-07-2024 03:11	GP4409882	531892.7	0	536240.5	22.4	22.4	-1.32	0.59	0.58	0.56
11-07-2024 02:05	GP4409882	531880.6	0	536228.3	22.4	22.4	-0.65	0.57	0.6	0.56
11-07-2024 01:08	GP4409882	531870.3	0	536217.8	22.4	22.4	-0.78	0.65	0.67	0.64
11-07-2024 00:12	GP4409882	531858.5	0	536206	22.4	22.4	-0.75	0.69	0.7	0.66

3. <u>FEEDER NAME : PENNA</u>

RTC	MeterNo	KWH_import	KWH_Export	KVAH_Import	MD_KW	MD_kVA	KVAR	Current_IR	Current_IY	Current_IB	Voltage_VR	Voltage_VY	Voltage_VB	PF
11-07-2024 23:06	GP4409879	355548.4	0	362105.5	15.9	16.9	-0.72	0.18	0.16	0.2	6245	6288	6235	0.98
11-07-2024 22:08	GP4409879	355545.4	0	362102.5	15.9	16.9	-0.6	0.18	0.15	0.2	6295	6311	6281	0.98
11-07-2024 21:10	GP4409879	355542.2	0	362099.1	15.9	16.9	-0.6	0.18	0.16	0.2	6289	6303	6275	0.98
11-07-2024 20:10	GP4409879	355538.9	0	362095.8	15.9	16.9	-0.62	0.2	0.17	0.22	6268	6299	6245	0.99
11-07-2024 19:09	GP4409879	355535	0	362091.8	15.9	16.9	-0.31	0.25	0.22	0.25	6248	6272	6220	1
11-07-2024 18:07	GP4409879	355529.7	0	362086.6	15.9	16.9	-0.04	0.32	0.29	0.33	6272	6316	6265	1
11-07-2024 17:09	GP4409879	355522.5	0	362079.3	15.9	16.9	0.87	0.47	0.41	0.47	6291	6320	6273	1
11-07-2024 16:09	GP4409879	355513.2	0	362070	15.9	16.9	0.68	0.58	0.51	0.56	6232	6254	6217	1
11-07-2024 15:09	GP4409879	355502.5	0	362059.3	15.9	16.9	1.55	0.63	0.59	0.61	6202	6206	6192	0.99
11-07-2024 14:07	GP4409879	355491.8	0	362048.5	15.9	16.9	1.27	0.59	0.57	0.6	6189	6184	6173	0.99
11-07-2024 13:22	GP4409879	355484.4	0	362041.1	15.9	16.9	0.61	0.52	0.46	0.52	6249	6251	6240	1
11-07-2024 11:06	GP4409879	355460.1	0	362016.5	15.9	16.9	1.07	0.56	0.53	0.55	6226	6235	6212	0.99
11-07-2024 10:22	GP4409879	355452.3	0	362008.7	15.9	16.9	1.59	0.62	0.56	0.62	6231	6245	6219	0.99
11-07-2024 08:05	GP4409879	355434.3	0	361990.6	15.9	16.9	0	0.21	0.17	0.2	6270	6310	6255	1
11-07-2024 07:08	GP4409879	355431.5	0	361987.6	15.9	16.9	-0.79	0.13	0.13	0.18	6242	6257	6222	0.95
11-07-2024 06:07	GP4409879	355428.9	0	361984.9	15.9	16.9	-0.96	0.15	0.14	0.18	6188	6197	6167	0.94
11-07-2024 05:09	GP4409879	355426	0	361982	15.9	16.9	-0.99	0.16	0.13	0.19	6230	6241	6211	0.94
11-07-2024 04:10	GP4409879	355423.4	0	361979.1	15.9	16.9	-0.86	0.17	0.14	0.19	6231	6249	6216	0.96
11-07-2024 03:11	GP4409879	355420.5	0	361976.2	15.9	16.9	-0.91	0.16	0.14	0.19	6281	6285	6258	0.95
11-07-2024 02:05	GP4409879	355417.4	0	361973	15.9	16.9	-0.87	0.16	0.13	0.18	6306	6334	6282	0.96
11-07-2024 01:08	GP4409879	355414.7	0	361970.1	15.9	16.9	-0.9	0.17	0.14	0.19	6291	6311	6280	0.95
11-07-2024 00:12	GP4409879	355412	0	361967.3	15.9	16,9	-0.77	0.16	0.14	0.18	6319	6324	6304	0.97

<u>Fig 26</u>

4. FEEDER NAME: NTRO A2

RTC	MeterNo	KWH_Import	KWH_Export	KVAH_Import	MD_KW	MD_kVA	KVAR	Current_IR	Current_IY	Current_IB
11-07-2024 23:06	GP4409890	176175.1	0	182012.6	12.5	12.9	1.16	0.44	-0.42	-0.4
11-07-2024 22:08	GP4409890	176167.8	0	182005.2	12.5	12.9	0.66	0.44	-0.44	-0.41
11-07-2024 21:10	GP4409890	176161.2	0	181998.5	12.5	12.9	0.41	0.34	-0.34	-0.33
11-07-2024 20:26	GP4409890	176156.7	0	181994.1	12.5	12.9	0.36	0.36	-0.35	-0.33
11-07-2024 19:09	GP4409890	176147.9	0	181985.2	12.5	12.9	1.75	0.43	-0.42	-0.41
11-07-2024 18:14	GP4409890	176140.4	0	181977.6	12.5	12.9	0.68	0.44	-0.41	-0.41
11-07-2024 17:24	GP4409890	176133	0	181969.9	12.5	12.9	2.4	0.53	-0.49	-0.5
11-07-2024 16:46	GP4409890	176127.3	0	181964	12.5	12.9	2.44	0.54	-0.51	-0.49
11-07-2024 15:09	GP4409890	176110.8	0	181947	12.5	12.9	2.54	0.6	-0.6	-0.6
11-07-2024 14:22	GP4409890	176102.3	0	181938.3	12.5	12.9	2.74	0.69	-0.67	-0.67
11-07-2024 13:22	GP4409890	176093	0	181928.8	12.5	12.9	1.94	0.5	-0.51	-0.52
11-07-2024 11:06	GP4409890	176068.9	0	181904.2	12.5	12.9	2.61	0.6	-0.59	-0.57
11-07-2024 10:22	GP4409890	176061.6	0	181896.8	12.5	12.9	0.97	0.51	-0.5	-0.5
11-07-2024 08:05	GP4409890	176044.5	0	181879.5	12.5	12.9	0.09	0.3	-0.29	-0.27
11-07-2024 07:08	GP4409890	176038.9	0	181873.9	12.5	12.9	0.92	0.35	-0.33	-0.33
11-07-2024 06:07	GP4409890	176032.6	0	181867.6	12.5	12.9	-0.58	0.32	-0.31	-0.29
11-07-2024 05:09	GP4409890	176026.8	0	181861.7	12.5	12.9	-0.05	0.34	-0.33	-0.32
11-07-2024 04:10	GP4409890	176020.7	0	181855.6	12.5	12.9	0.35	0.37	-0.35	-0.34
11-07-2024 03:11	GP4409890	176013.8	0	181848.8	12.5	12.9	0.75	0.39	-0.38	-0.38
11-07-2024 02:05	GP4409890	176006.6	0	181841.4	12.5	12.9	0.16	0.36	-0.35	-0.34
11-07-2024 01:08	GP4409890	176000.5	0	181835.4	12.5	12.9	0.02	0.35	-0.34	-0.33
11-07-2024 00:19	GP4409890	175995.6	0	181830.4	12.5	12.9	0.01	0.35	-0.34	-0.32

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