

**Annual Energy Audit Report**  
**of**  
**KRC INFRASTRUCTURE AND**  
**PROJECTS PVT LTD.**  
**FY: 2022-23**



Submitted to:  
**Bureau of Energy Efficiency, New Delhi**

*in compliance of the Bureau of Energy Efficiency (Manner and Intervals for Conduct of Energy Audit in electricity distribution companies) Regulations, And amendment thereof 2021*

**Accredited Energy Auditor**

Dr. Ravi Deshmukh  
(AEA-0243)

**PPS** Energy Solutions  
**THE POWER OF ENERGY**

# Annual Energy Audit Report

## Of

### KRC INFRASTRUCTURE AND PROJECTS PVT LTD.

### FY: 2022-23



**Submitted By**

**PPS** Energy Solutions  
THE POWER OF ENERGY

**July- 2023**

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



# Acknowledgement

We express our sincere gratitude to the authorities of KRC Infrastructure and Projects Pvt Ltd (KRCIPPL) for entrusting and offering the opportunity of energy performance assignment.

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



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## Abbreviations

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Abbreviations	Explanations
KRCIPPL	KRC INFRASTRUCTURE AND PROJECTS PVT LTD.
PPSES	PPS Energy Solutions
BEE	Bureau of Energy Efficiency

## Electrical Terms

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



## 1 Executive Summary

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The Annual Energy Audit of the KRCIPPL was conducted in the month of June 2023 for the FY 2022-2023. This report is prepared based on the data provided by the KRCIPPL team and the verification done for the data authenticity. Auditors have critically examined the various systems, schemes, devices employed as well as the associated documents at KRCIPPL at 22 kV and LT (0.433 kV) Level as to ascertain its adequacy and efficacy as per the directives of the BEE and guidelines as per regulation. The gaps in the accounting and the shortcoming in energy accounting are highlighted.

### 1.1 KRCIPPL Power Introduction

KRCIPPL is a Company incorporated under the Companies Act, 1956, having its registered office DL Office, Gera-Commerzone, Survey No. 65/1, Next to Gera Song of Joy, Kharadi, Pune. In accordance with Section 14 (b) of the EA, 2003 read with Section 4(1) of the SEZ Act, 2005, KRCIPPL is a Deemed Distribution Licensee for supplying electricity to consumers in its SEZ area.

Table 1 KRCIPPL Network Snapshot

Network Snapshot	
Number of feeders	2
Number of DTs	11
Number of consumers	93

Source: Infrastructure Details sheet, BEE FY 2022-23

**PPS Energy Solution Pvt Ltd**, was awarded the job of carrying out an annual energy audit for the financial year 2022-23. The annual energy audit report of M/s KRC Infrastructure and Projects Pvt Ltd (KRCIPPL) will be submitted to the Bureau of Energy Efficiency and respective State Designated Agency as per the provisions and mandate of Gazette on Energy Accounting and Audit of Distribution Company of Bureau of Energy Efficiency (BEE), Ministry of Power, Govt. of India. Audit team has conducted energy accounting audit of the Designated Consumer (DC) during May 2023 to June 2023.



## 1.2 About Assignment

Bureau of Energy Efficiency (BEE) through Ministry of Power, Government of India issued regulations namely Bureau of Energy Efficiency (Manner and Intervals for Conduct of Energy Audit in electricity distribution companies) Regulations, 2021 (hereinafter referred as 'BEE EA Regulation 2021'), for Conduct of Annual Energy Audit and Periodic Energy Accounting in DISCOMs.

As per the notification, the work of Energy Audit of KRC Infrastructure and Projects Pvt Ltd (KRCIPPL) was awarded to PPS Energy Solutions Pvt. Ltd.

## 1.3 Study Team

As per the directives of team given by regulation, the teams were formed by KRC Infrastructure and Projects Pvt Ltd(KRCIPPL) and PPSES to conduct the energy accounting and energy audit.

**Table 2 : KRCIPPL Team**

Sr. No	Name	Designation
1	Mr. Nitin Chunarkar	Associate Vice President-Power
2	Mr. Ajit Pujari	Deputy General Manager-Power
3	Mr. Amol Chiplunkar	Energy Auditor

**Table 3 : PPSES Team**

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



## 1.4 Methodology

The methodology adopted,

1. Kick off meeting with KRC Infrastructure and Projects Pvt Ltd Team to finalize the sample size
2. Survey of the Distribution network
3. Collection of the Primary Data and finalization of the sample size check
4. Site visit and Energy Meter data collection
5. Collection of the Metered Energy Data for the respective voltage level as per the sample size
6. Scrutiny of collected data and Data gaps of the submitted data
7. Loss calculation for the network segment then if required normalization
8. Compilation of the Draft report
9. Presentation on Draft report
10. Final report with incorporation of comments

As per the methodology, after collection of the data, site visit carried out at KRC Infrastructure and Projects Pvt Ltd (KRCIPPL) in month of June 2023, along with KRC Infrastructure and Projects Pvt Ltd Team and consultant team.



## 1.5 The overall loss of the KRCIPPL for 2022-2023 year

The below table shows the overall loss of KRC Infrastructure and Projects Pvt Ltd (KRCIPPL) for FY 2022-2023.

During the FY 2022-2023, KRCIPPL has Net Input Energy of 22.90 Million kWh. Billed Energy of the KRCIPPL for FY 2022-2023 was 22.55 Million kWh at T<>D Interface point.

Table 4 Overall Loss of KRCIPPL

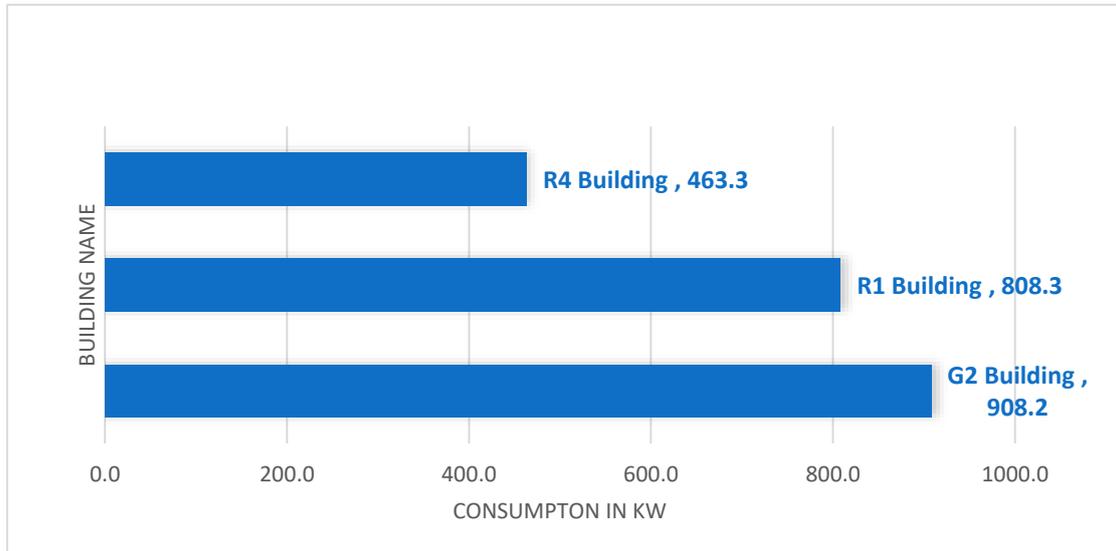
Performance Summary of Electricity Distribution Companies			
<b>1</b>	Period of Information Year of (FY) information including Date and Month (Start & End)	1st Apr, 2022 - 31st March, 2023	
<b>2</b>	<b>Technical Details</b>		
<b>(a)</b>	<b>Energy Input Details</b>		
(i)	Input Energy Purchase (From Generation Source)	Million kwh	22.99
(ii)	Net input energy (at DISCOM Periphery after adjusting the transmission losses and energy traded)	Million kwh	22.90
(iii)	Total Energy billed (is the Net energy billed, adjusted for energy traded))	Million kwh	22.55
<b>(b)</b>	Transmission and Distribution (T&D) loss Details	Million kwh	0.35
		%	1.53%
	Collection Efficiency	%	100%
<b>(c)</b>	Aggregate Technical & Commercial Loss	%	1.53%

The Distribution loss of 0.35 MU which is 1.53% of Net Input Energy at periphery and AT&C loss of 1.53% is finalized for the FY 2022-2023 for KRCIPPL.



## 1.6 Summary of Critical Analysis

KRC Infrastructure and Projects Pvt Ltd (KRCIPPL) fed the three buildings namely R4, G2 and R1. This are mostly commercial and industrial Building. Their consumption pattern is shown below for the year 2022-23.



- loss calculated are minimum loss that are going to be in the network during the normal operating condition. The transformation loss calculated based on BEE - Formula is between the range of 0.7% to 1.9%

Transformatin loss of KRCIPPL
0.7 % to 1.9%

The transformer maintenance is done regularly and hence the loss of the transformation are one of the best in the industry. The range is from 0.7% to 1.9%.



## 2 Background

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### About BEE

The Government of India set up Bureau of Energy Efficiency (BEE). on 1st March 2002 under the provisions of the Energy Conservation Act, 2001. The mission of the Bureau of Energy Efficiency is to assist in developing policies and strategies with a thrust on self-regulation and market principles, within the overall framework of the Energy Conservation Act, 2001 with the primary objective of reducing energy intensity of the Indian economy.

### 2.1 Role of BEE

#### **Energy Accounting:**

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

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

#### **Role of BEE include:**

- i. Create awareness and disseminate information on energy efficiency and conservation
- ii. Arrange and organize training of personnel and specialists in the techniques for efficient use of energy and its conservation



- iii. Strengthen consultancy services in the field of energy conservation
- iv. Promote research and development
- v. Develop testing and certification procedures and promote testing facilities
- vi. Formulate and facilitate implementation of pilot projects and demonstration projects
- vii. Promote use of energy efficient processes, equipment, devices and systems
- viii. Take steps to encourage preferential treatment for use of energy efficient equipment or appliances
- ix. Promote innovative financing of energy efficiency projects
- x. Give financial assistance to institutions for promoting efficient use of energy and its conservation
- xi. Prepare educational curriculum on efficient use of energy and its conservation
- xii. Implement international co-operation programmes relating to efficient use of energy and its conservation

## 2.2 Purpose of audit and accounting Report

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.

## 2.3 Period of Energy Auditing and Accounting

Bureau of Energy Efficiency (BEE) through Ministry of Power, Government of India issued regulations for Conduct of Mandatory Annual Energy Audit and Periodic Energy Accounting in DISCOMs. As per the regulation, all Electricity Distribution Companies are mandated to conduct annual energy audit and periodic energy accounting on quarterly basis.

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.



### 3 Discom Introduction & Overview

#### 3.1 Name and Address of Designated Consumer

The major stake holders of this assignment are KRC Infrastructure and Projects Pvt Ltd and PPS Energy Solutions (PPSES).

<b>Designated Consumer</b>	<b>KRC Infrastructure and Projects Pvt Ltd (KRCIPPL)</b>
<b>Address</b>	DL Office, Gera-Commerzone, Survey No. 65/1, Next to Gera Song of Joy, Kharadi, Pune

##### 3.1.1 Accredited Firm

M/s PPS Energy Solutions Private Limited as have been appointed by KRCIPPL to carry out the Energy Audit of Power Distribution Network of KRCIPPL for year 2022-2023.

#### 3.2 Designated Officer of Client

Table 5 : KRCIPPL Team

Sr. No	Name	Designation
1	Mr. Nitin Chunarkar	Associate Vice President-Power
2	Mr. Ajit Pujari	Deputy General Manager-Power
3	Mr. Amol Chiplunkar	Energy Auditor

Table 6 : PPSES Team

Sr. No.	Name	Designation
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2	Mr. Dinesh Baharate	Team member - Electrical Engg. (EA 24237) (Certified Energy Auditor)
3	Mr. Shashikant Puranic	Sector Expert - Electrical Engg.
4	Mr. Prasad Bhosale	Team member- (Certified Energy Manager)
5	Mr. Hemant Kadu	Team Member – Electrical Engg 2



### 3.3 Summary Profile of DCs

The submitted data by the KRCIPPL has been reviewed as per the guide lines of BEE regulation and comments / remarks are mentioned at respective places. General information of KRCIPPL Distribution Network is attached in Annexure No. 8.

KRC Infrastructure and Projects Pvt Ltd (KRCIPPL) is a Company incorporated under the Companies Act, 1956, having its registered office at DL Office, Gera-Commerzone, Survey No. 65/1, Next to Gera Song of Joy, Kharadi, Pune. In accordance with Section 14 (b) of the EA, 2003 read with Section 4(1) of the SEZ Act, 2005, KRC Infrastructure and Projects Pvt Ltd (KRCIPPL) is a Deemed Distribution Licensee for supplying electricity to consumers in its SEZ area. T<>D interface meters installed by MSETCL are directly communicable with SLDC through AMR.

Table 7 KRCIPPL Network Snapshot FY 2022-2023

KRCIPPL Network Snapshot	
Number of circles	NA
Number of divisions	NA
Number of sub-divisions	NA
Number of feeders	2
Number of DTs	11
Number of consumers	93

The data collection was followed up by the physical visit of the Input Meter at 132/22 kV Kharadi EHV Sub-Station and the network of KRCIPPL.

#### 3.3.1 Energy Flow

The total number of Buildings which are fed by the two 22kV Feeders are three, namely R1, G-2 and R4. The transformer configuration for the respective building is enclosed below.

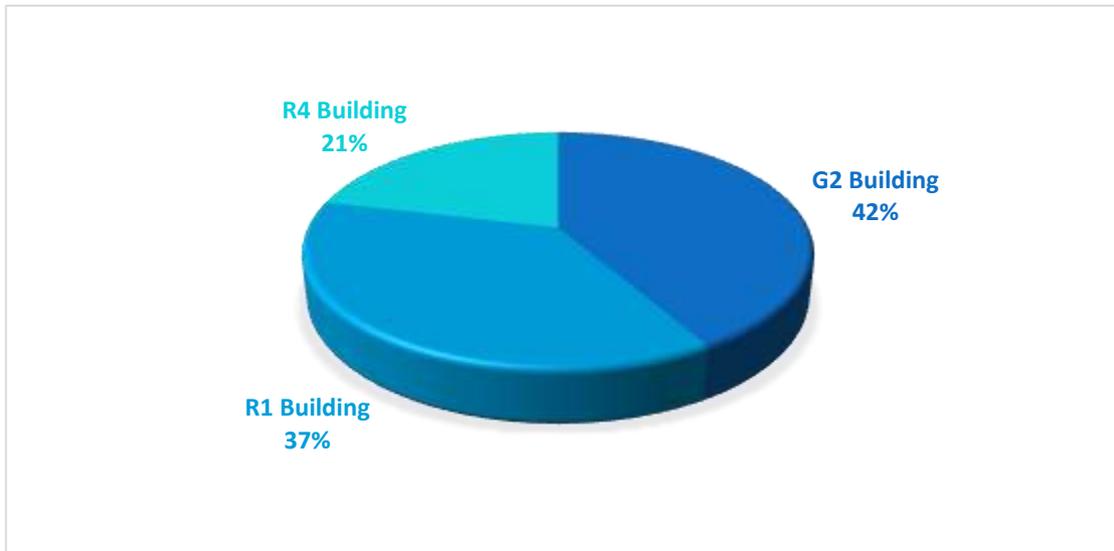
Sr. No	Building Name	Type of transformer	Transformer Rating (kVA)	No of transformer
1	R-1	Dry type	2 000	4
2	G-2	Dry type	2 000	4
3	R-4	Dry type	2 000	3



### 3.4 Pattern of Energy Distribution

KRCIPPL fed the three buildings namely R4, G2 and R1. This are mostly commercial and industrial Building. Their consumption pattern is shown below for the year 2022-23.

G2 has recorded the highest consumption of 42% as compared to R4 and R1.



#### 3.4.1 Energy Conservation Schemes

It is important that the periodical asset monitoring be carried out through thermographic inspection along with detailed energy audit to make sure the quality of the power supplied is in good order.

#### 3.4.2 Salient Features:

AMR meters are installed at all consumer's end. Energy monitoring is being carried out remotely which is in compliance to the regulation and the daily monitoring of the transformer load, consumer consumption is as per the compalince.

The energy accounting is in place for the automated energy accounting and hence the compliance of the BEE regulation is followed appropriately.

The Collection efficiency is 100%, The system is adequate for the peak load. The Technical loss is 1.53% only which level below the targeted values of 12% to 15 % of the regulation published by BEE.



## 4 Energy Flow Analysis

### 4.1 Energy Flow across Service levels:

	Voltage level	Energy Sales Particulars	MU
i	LT Level	DISCOM' consumers	
		Demand from open access, captive	
		Embedded generation used at LT level	
		Sale at LT level	0
		Quantum of LT level losses	0
		Energy Input at LT level	
ii	11 kV Level	DISCOM' consumers	
		Demand from open access, captive	
		Embedded generation at 11 kV level used	
		<b>Sales at 11 kV level</b>	0
		Quantum of Losses at 11 kV	0
		Energy input at 11 kV level	
iii	22 kV Level	DISCOM' consumers	22.55
		Demand from open access, captive	
		Embedded generation at 22kV and LT Level or below level	
		<b>Sales at 22kV and LT Level</b>	22.55
		Quantum of Losses at 22kV and LT Level	0.34
		Energy input at 22kV and LT Level	22.90
iv	> 33 kV	DISCOM' consumers	NA
		Demand from open access, captive	NA
		Cross border sale of energy	NA
		Sale to other DISCOMs	NA
		Banking	NA
		Energy input at > 33kV Level	NA
		<b>Sales at 66kV and above (EHV)</b>	NA
<b>Total Energy Requirement</b>			<b>22.90</b>
<b>Total Energy Sales</b>			<b>22.55</b>



## 4.2 Validation of metered data:

Energy details submitted to BEE by KRCIPPL have been verified from the various systems deployed at KRCIPPL.

### 4.2.1 Schedule of the work for Metered data validation

Initial kick of meeting was arranged between the KRCIPPL official and the PPSES Team on 29<sup>th</sup> June 2023. In the kick of meeting the various data, PPSES team raised gaps.

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

The field visits were conducted on June 2023. The schedule of the visits is as follows.

Table 8 Schedule of the Work

Date	Places Visited	Information validated	Remarks
29 June 2023	Office of KRCIPPL	Meeting with AEA Team and the team of KRCIPPL on report finalization for Year 2022-23.	KRCIPPL Submitted the Energy Audit data which was submitted to BEE FY 2022-2023.
29 June 2023		The physical verification of the meters at the Substation and the Consumer end meters were carried out and same were matched with the data base for sample consumers.	The field information was found to be consistent with the information in the software systems.

### 4.2.2 Check list Prepared by EmAEA

#### List of Documents

Sr. No	Description
1	Energy Purchase Documents- Power Purchase report from all sources
2	Consumers Category wise details
3	Billed energy for different category of the consumer
4	Annual Calculation of transmission Loss
5	Annual Sales Report-
6	input and billed energy
7	Infrastructure details



### 4.3 Validation of Energy Flow Data & Losses:

Data Energy details submitted to BEE by KRCIPPL have been verified from the various systems deployed at KRCIPPL. Validation of Energy Flow & Losses for Division wise is tabulated below:

#### 1) Losses for FY 2022-2023.

Name of circle	Consumer category	Input energy (MU)	Total Bill ed energy (MU)	T&D loss (MU)	T&D loss (%)	Billed Amount in Rs. Crore	Colle cted Amount in Rs. Crore	Colle ction Effic iency	AT & C loss (%)
KRCIPPL	Residential	22.9	0	0.35	1.53%	0	0	0.00%	1.53%
	Agricultural		0			0	0.00%		
	Commercial/ Industrial-LT		4.44			3.34	3.33	99.70%	
	Commercial/ Industrial-HT		18.11			16.08	16.09	100.06%	
	Others		0			0	0	0.00%	
<b>Total</b>		<b>22.9</b>	<b>22.55</b>	<b>0.35</b>	<b>1.53%</b>	<b>19.42</b>	<b>19.42</b>	<b>100.00%</b>	<b>1.53%</b>



## 5 Loss & Subsidy Computation

As KRCIPPL is SEZ, the subsidy from the central government is not provided to them.

### 5.1 Energy Accounts for previous years

Table 9 : Two year Trend of Discom Loss- KRCIPPL

ACTUAL DISCOM LOSSES		
Year	FY 2021-22	FY 2022-23
Actual Loss in %	1.87%	1.53%

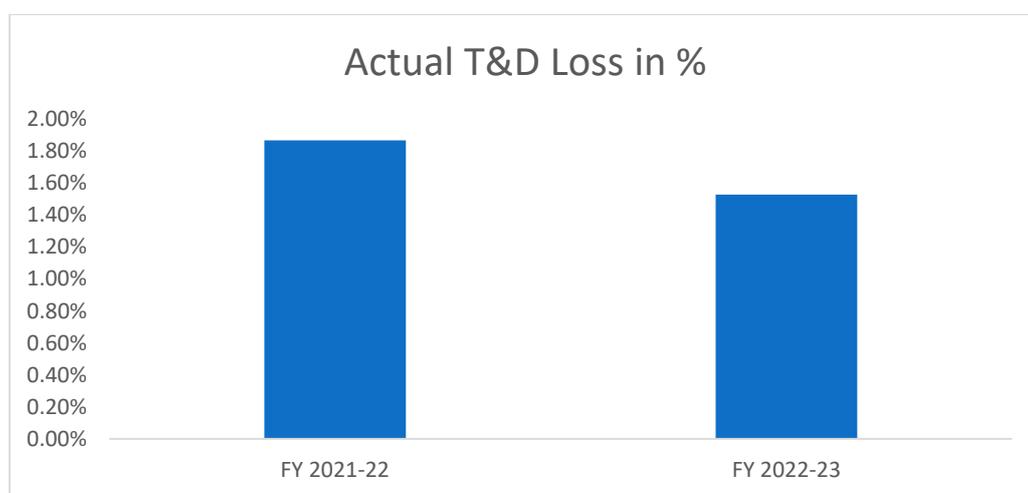


Figure 1 Distribution Losses in MU

The Distribution Loss of FY 2022-23 has been reduced to 1.53% from 1.87% of FY 2021-22.

### 5.2 Energy Accounts and performance in the Current Year

Performance Summary of Electricity Distribution Companies			
<b>1</b>	Period of Information Year of (FY)	1st Apr, 2022 - 31st March, 2023	
<b>2</b>	<b>Technical Details</b>		
<b>(a)</b>	<b>Energy Input Details</b>		
(i)	Input Energy Purchase (From Generation Source)	Million kwh	22.99
(ii)	Net input energy (at DISCOM Periphery after adjusting the transmission losses and energy traded)	Million kwh	22.90
(iii)	Total Energy billed (is the Net energy billed, adjusted for energy traded))	Million kwh	22.55
<b>(b)</b>	Transmission and Distribution (T&D) loss Details	Million kwh	0.354
		%	1.53%
	Collection Efficiency	%	100%
<b>(c)</b>	Aggregate Technical & Commercial Loss	%	1.53%



### 5.2.1 Voltage wise assessed loss of KRCIPPL

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

**Table 10 : Different Types of Meter connection in KRCIPPL**

2	Parameters	66kV and above	33kV	11/22kV	LT
a.	Number of conventional metered consumers	0	0	0	0
ii	Number of consumers with 'smart' meters	0	0	0	0
iii	Number of consumers with 'smart prepaid' meters	0	0	0	0
iv	Number of consumers with 'AMR' meters	0	0	93	0
v	Number of consumers with 'non-smart prepaid' meters	0	0	0	0
vi	Number of unmetered consumers	0	0	0	0
<b>vii</b>	<b>Number of total consumers</b>	<b>0</b>	<b>0</b>	<b>93</b>	<b>0</b>

**Table 11 : Voltage wise data**

	Voltage level	Input (in MU)	Sale (in MU)	Loss (in MU)	Loss %
i	LT	-	-	-	-
ii	11 Kv				
iii	22 kv	22.90	22.55	0.35	1.53
iv	> 33 kv	-	-	-	-



### 5.2.2 Category wise Assessed loss of KRCIPPL

Table 12 : T & D loss category wise

Consumer category	Input energy (MU)	Billed energy (MU)			% of energy consumption	T&D loss (MU)	T&D loss (%)
		Metered energy	Unmetered /assessment energy	Total energy			
Residential	22.9	0.000	0.000	0.000	0%	0.35	1.53%
Agricultural		0.000	0.000	0.000	0%		
Commercial/Industrial-LT		4.44	0.000	4.44	20%		
Commercial/Industrial-HT		18.11	0.000	18.11	80%		
Others		0.000	0.000	0.000	0%		
<b>total</b>	<b>22.9</b>	<b>22.9</b>	<b>0.000</b>	<b>22.55</b>	<b>100%</b>	<b>0.35</b>	<b>1.53%</b>

Table 13 : Category wise AT & C loss

Consumer category	Input energy (MU)	Total Billed Energy (MU)	Billed Amount in Rs. Crore	Collected Amount in Rs. Crore	Collection Efficiency	AT & C loss (%)
Residential	22.9	0.000	0.000	0.000	0.00%	1.53%
Agricultural		0.000	0.000	0.000	0.00%	
Commercial/Industrial-LT		4.44	3.34	3.33	99.70%	
Commercial/Industrial-HT		18.11	16.8	16.09	100.60%	
Others		0.000	0.000	0.000	0.00%	
<b>Total</b>	<b>22.9</b>	<b>22.55</b>	<b>19.42</b>	<b>19.42</b>	<b>100%</b>	<b>1.53%</b>

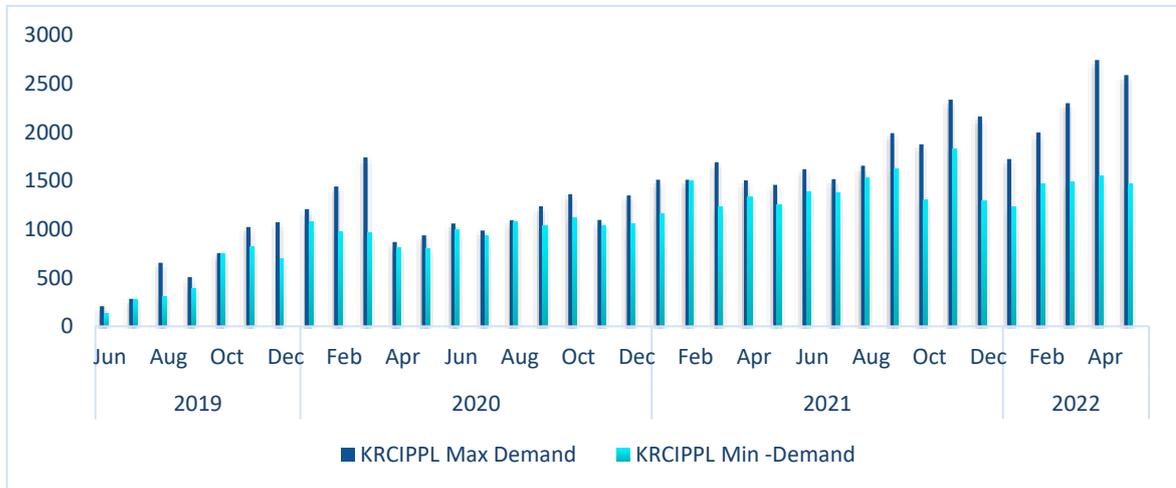
### 5.2.3 Feeder wise Assessed loss of KRCIPPL

SI No.	Name of the Station	Feeder Code/ID	Feeder Name	Type of Feeder (Urban/ Mixed/ Industrial/ Agricultural/ Rural)	Received at Feeder (Final in MU)	Feeder Consumption (In MU)	Final Net Export at Feeder Level (In MU)	T&D losses	AT&C losses
1	22kV Switching station	22kV KRC-1 & KRC-2	22kV KRC-1 & KRC-2	Dedicated Incomer Feeder for Distribution Licensee	22.90	22.55	22.55	1.53 %	1.53 %



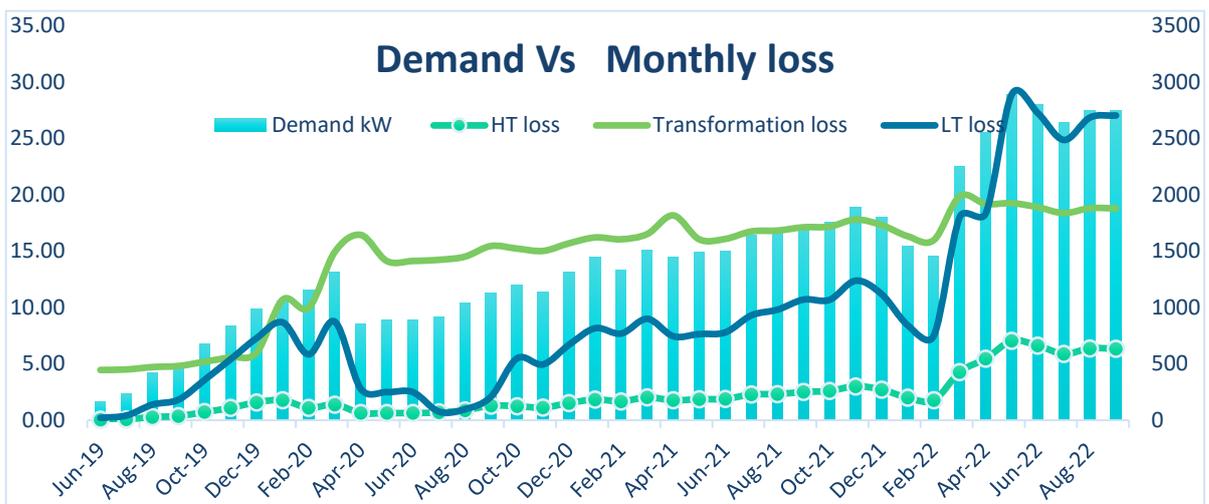
### 5.2.4 Trend Analysis of KRCIPPL

The average demand for the last year for the KRCIPPL was 1125 kW were as the average demand of the KRCIPPL from Jan 2022 to Sep 2022 is 2179 kW.



From the above graph is can be seen that monthly loading of June19 was on average of 163 kW and the average loading for the 2019-20 as per the metered data is 733kW.It is also clear that, load started to increase above 500kW from Oct 2019 onwards.

Transformation loss was high as 2.5% the during month of june -19. The transformation loss redcued as loading increased. The transformer maintaince is done regularly and hence the loss of the transformation are one of the best in the industry. The range is from 0.7% to 1.9%



## 6 Energy Audit Findings:

### 6.1.1 Review of Capacity of DISCOM's Energy accounting and audit cell

The energy accounting cell have experience personal from DISCOM sector. The head of the energy unit cell and the team members have periodically taken help of the consultant for the energy accounting. Based on the input, the energy accounting system is developed by th KRCIPPL Team.

### 6.1.2 Status of Various Compliance

Sr. No.	Particulars	Status
1	Quarterly reports for FY 2022-2023	Submitted to BEE

The following are observation based on the above the submission by KRCIPPL

### 6.1.3 Prerequisites of Audit

The annual energy audit proform and the qauterly reports were submitted by the KRCIPPL team. The records of monthly energy were shown in the system and the review meeting and action plan we dicussed and finalized. Sample monthly loss validation was carried out.

### 6.1.4 Datagaps

The following data gaps were dicussed during the meeting which were submitted by the KRCIPPL team.

**Table 14 Data Gaps**

Sr. No	Data Gaps in the Data provided by KRCIPPL for Annual Energy Audit as per BEE regulation 6 <sup>th</sup> Oct 2021	Remarks
1	Kindly provide the identification and mapping of all of the electrical network assets;	SLD is provided by KRCIPPL
2	Kindly provide the identification and mapping of high tension and low-tension consumers	SLD is provided by KRCIPPL
3	Kindly provide the details of the energy accounting data - generated from a metering system or till such time the metering system is not in place, by an agreed method of assumption as may be prescribed by the State Commission	Software was accessed during the meeting held on 2023 in front of the PPSES team.



Sr. No	Data Gaps in the Data provided by KRCIPPL for Annual Energy Audit as per BEE regulation 6 <sup>th</sup> Oct 2021	Remarks
4	Energy (Electrical) Purchase report for the year 2022-2023	Data provided by KRCIPPL
5	Peak Demand of the system	Data provided by KRCIPPL
6	Power Distribution Transformer	Data provided by KRCIPPL
7	Maintenance practices - Power Substation , HT lines LT lines ,DTR	Data provided by KRCIPPL

### 6.1.5 Comments by the Management

Energy auditor pointed out that, transformer can be optimally loaded in order to reduce the transformation loss.

Reply from Management –

Since it is SEZ, the load is critical and it is mandatory for them to keep the transformer loaded for any case of emergency.

### 6.1.6 Review of findings based on data validation and field verification

The data submitted to the Auditor's team was well documented and the energy meters are installed at the transformer centers for the various consumers. Hence the LT length is very short and the transformers are connected to the main panel by busbars.

The energy monitoring is performed on a weekly basis as well as on a daily basis. The energy meters use a portable calibration instrument for the complaint's resolution regarding metering errors.

### 6.1.7 Inclusions and Exclusions

KRCIPPL consumers are billed 100% and hence no inclusions and exclusions are made in the report.



### 6.1.8 Energy Distribution Verification

1	Parameters	Total
i	Number of circles	NA
ii	Number of divisions	NA
iii	Number of sub-divisions	NA
iv	Number of feeders	2
v	Number of DTs	11
vi	Number of consumers	93

	Parameters	66kV and above	33kV	11KV /22kV	LT
a.	Number of conventional metered consumers	Nil	Nil	0	0
i.	Number of consumers with 'smart' meters	Nil	Nil	0	0
ii	Number of consumers with 'smart prepaid' meters	Nil	Nil	0	0
iii	Number of consumers with 'AMR' meters	Nil	Nil	93	0
iv	Number of consumers with 'non-smart prepaid' meters	Nil	Nil	0	0
v	Number of unmetered consumers	Nil	Nil	0	0
vi	<b>Number of total consumers</b>	Nil	Nil	93	0
b.i.	Number of conventionally metered Distribution Transformers	Nil	Nil	0	0
ii	Number of DTs with communicable meters	Nil	Nil	11	0
iii	Number of unmetered DTs	Nil	Nil	0	0
iv	<b>Number of total Transformers</b>	Nil	Nil	11	0
c.i.	Number of metered feeders	Nil	Nil	2	0
ii	Number of feeders with communicable meters	Nil	Nil	0	0
iii	Number of unmetered feeders	Nil	Nil	0	0
iv	<b>Number of total feeders</b>	Nil	Nil	2	0
d.	Line length (ct km)	Nil	Nil	0	0
e.	Length of Aerial Bunched Cables	Nil	Nil	0	0
f.	Length of Underground Cables	Nil	Nil	15.82	0



	Voltage level	Energy Sales Particulars	MU
i	LT Level	DISCOM <sup>1</sup> consumers	0
		Demand from open access, captive	0
		Embedded generation used at LT level	0
		Sale at LT level	0
		Quantum of LT level losses	0
		Energy Input at LT level	0
ii	11 kV Level	DISCOM <sup>1</sup> consumers	0
		Demand from open access, captive	0
		Embedded generation at 11 kV level used	0
		<b>Sales at 11 kV level</b>	0
		Quantum of Losses at 11 kV	0
		Energy input at 11 kV level	0
iii	22 kV Level	DISCOM <sup>1</sup> consumers	22.55
		Demand from open access, captive	0
		Embedded generation at 22kV and LT Level or below level	0
		<b>Sales at 22kV and LT Level</b>	22.55
		Quantum of Losses at 22kV and LT Level	0.34
		Energy input at 22kV and LT Level	22.90
iv	> 33 kV	DISCOM <sup>1</sup> consumers	NA
		Demand from open access, captive	NA
		Cross border sale of energy	NA
		Sale to other DISCOMs	NA
		Banking	NA
		Energy input at > 33kV Level	NA
		<b>Sales at 66kV and above (EHV)</b>	NA
<b>Total Energy Requirement</b>			<b>22.90</b>
<b>Total Energy Sales</b>			<b>22.55</b>

Energy Accounting Summary					
	DISCOM	Input (in MU)	Sale (in MU)	Loss (in MU)	Loss %
i	LT	NA	NA	NA	NA
ii	11 Kv	NA	NA	NA	NA
iii	22 kv	22.90	22.55	0.35	1.53
iv	> 33 kv	NA	NA	NA	NA



Loss Estimation for DISCOM	
T&D loss	0.35
D loss	0.35
T&D loss (%)	1.53%
D loss (%)	1.51%

### 6.1.9 Verification of Yearly Reports

#### 6.1.9.1 Yearly energy consumption data of the consumers

Consumer category	Input energy (MU)	Total Billed energy (MU)	T&D loss (MU)	T&D loss (%)	Billed Amount in Rs. Crore	Collected Amount in Rs. Crore	Collection Efficiency	AT & C loss (%)
Residential	22.9	0	0.35	1.53%	0	0	0.00%	1.53%
Agricultural		0			0	0.00%		
Commercial/Industrial-LT		4.44			3.34	3.33	99.70%	
Commercial/Industrial-HT		18.11			16.08	16.09	100.06%	
Others		0			0	0	0.00%	
<b>Total</b>	<b>22.9</b>	<b>22.55</b>	<b>0.35</b>	<b>1.53%</b>	<b>19.42</b>	<b>19.42</b>	<b>100.00%</b>	<b>1.53%</b>

Review of the current consumption practices in order to identify the energy loss in the system was carried out.

Table 15 : Details of Consumer

S.No	Type of Consumers	Category of Consumers (EHT/HT/LT/Others)	Voltage Level	No of Consumers	Total Consumption (In MU)
1	Domestic	NA	NA	NA	NA
2	Commercial	NA	NA	NA	NA
3	IP Sets	NA	NA	NA	NA
4	Hor. & Nur. & Coffee/Tea & Rubber (Metered)	NA	NA	NA	NA
5	Hor. & Nur. & Coffee/Tea & Rubber (Flat)	NA	NA	NA	NA
6	Heating and Motive Power	NA	NA	NA	NA
7	Water Supply	NA	NA	NA	NA
8	Public Lighting	NA	NA	NA	NA
9	HT Water Supply	NA	NA	NA	NA
10	HT Industrial	HT	22000	56	18.11



S.No	Type of Consumers	Category of Consumers (EHT/HT/LT/Others)	Voltage Level	No of Consumers	Total Consumption (In MU)
11	Industrial (Small)	NA	NA	NA	NA
12	Industrial (Medium)	NA	NA	NA	NA
13	HT Commercial	NA	NA	NA	NA
14	Applicable to Government Hospitals & Hospitals	NA	NA	NA	NA
15	Lift Irrigation Schemes/Lift Irrigation Societies	NA	NA	NA	NA
16	HT Res. Apartments Applicable to all areas	NA	NA	NA	NA
17	Mixed Load	NA	NA	NA	NA
18	Government offices and department	NA	NA	NA	NA
19	LT commercial	LT	440	13	0.62
20	LT Industrial	LT	440	23	3.82
21	HT Others	HT	22000	1	0.000242
<b>Total</b>				93	22.55

#### 6.1.10 Consumer Category Wise Billed Unit and Revenue of KRCIPPL FY 2022-2023

Consumer category	Input energy (MU)	Total Billed energy (MU)	Billed Amount in Rs. Crore	Collected Amount in Rs. Crore	Collection Efficiency	AT & C loss (%)
Residential	22.9	0	0	0	0.00%	1.53%
Agricultural		0	0	0	0.00%	
Commercial/Industrial-LT		4.44	3.34	3.33	99.70%	
Commercial/Industrial-HT		18.11	16.08	16.09	100.06%	
Others		0	0	0	0.00%	
<b>Total</b>	<b>22.9</b>	<b>22.55</b>	<b>19.42</b>	<b>19.42</b>	<b>100.00%</b>	<b>1.53%</b>



### 6.1.11 Distribution Loss calculation:

(i)	Input energy (at DISCOM Periphery after adjusting the transmission losses and energy traded)	Million kwh	22.90
(ii)	Total Energy billed (is the Net energy billed, adjusted for energy traded)	Million kwh	22.55
(iii)	Transmission and Distribution (T&D) loss Details	Million kwh	0.35
		%	1.53%
	Collection Efficiency	%	100.00%
(iv)	Aggregate Technical & Commercial Loss	%	1.53%

### 6.1.12 AT&C Losses Computation in KRCIPPL

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

Determination of Aggregate Technical and Commercial losses (AT&C) involve calculation of Distribution Loss (%) as difference between input energy and units billed.

Where D loss:  $(UI - UB) / UI$  %

UI: Units Input (excluding units traded)

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

- Billing Efficiency = 1- D Loss
- Collection efficiency as the ratio of amount collected to amount billed.
- AT&C loss as difference between units input and units realized.

**AT & C Loss:  $[1 - \text{Billing Efficiency} \times \text{Collection Efficiency}] \times 100\%$**



## 6.1.12.1 Total A T&amp;C Loss of KRCIPPL

Table 16 Total AT&amp;C Loss of KRCIPPL

Performance Summary of Electricity Distribution Companies			
<b>1</b>	Period of Information Year of (FY) information including Date and Month (Start & End)	1st Apr, 2022 - 31st March, 2023	
<b>2</b>	<b>Technical Details</b>		
<b>(a)</b>	<b>Energy Input Details</b>		
(i)	Input Energy Purchase (From Generation Source)	Million kwh	22.99
(ii)	Net input energy (at DISCOM Periphery after adjusting the transmission losses and energy traded)	Million kwh	22.90
(iii)	Total Energy billed (is the Net energy billed, adjusted for energy traded))	Million kwh	22.55
<b>(b)</b>	Transmission and Distribution (T&D) loss Details	Million kwh	0.35
		%	1.53%
	Collection Efficiency	%	100.00%
<b>(c)</b>	Aggregate Technical & Commercial Loss	%	1.53%

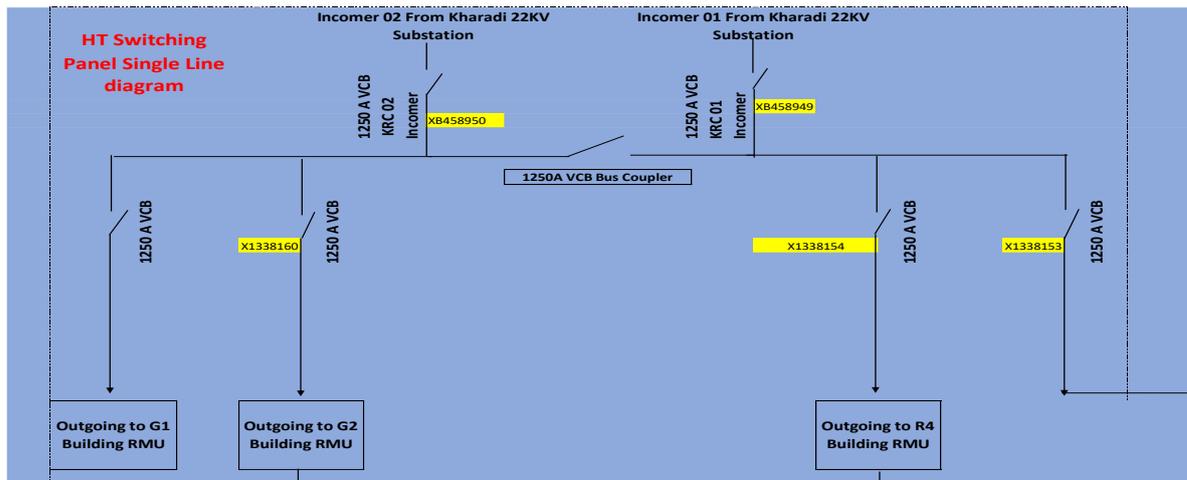
The Total AT&C loss of the KRCIPPL is 1.53% for the year 2022-2023.



## 7 Conclusion and Action Plan

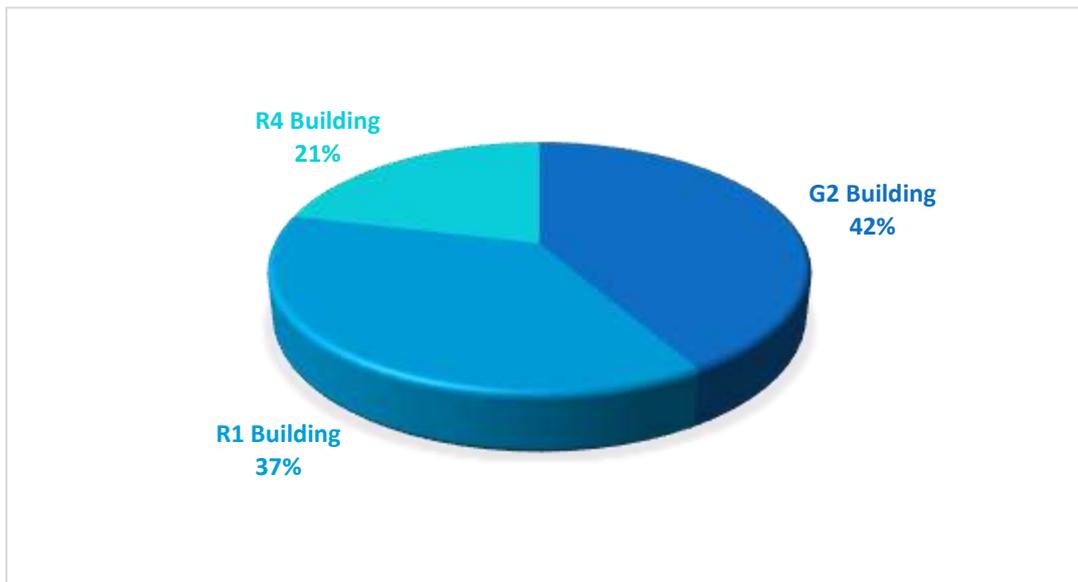
### 7.1 Critical Network Analysis by Energy Auditor

The Input Energy overall supply network is enclosed below. The 132/22KV MSETCL Kharadi Substation is the point of supply for the KRCIPPL ta 22kV Level. The SLD, shows the meter location, meter numbers at the KRCIPPL end and the meter numbers at the point of supply



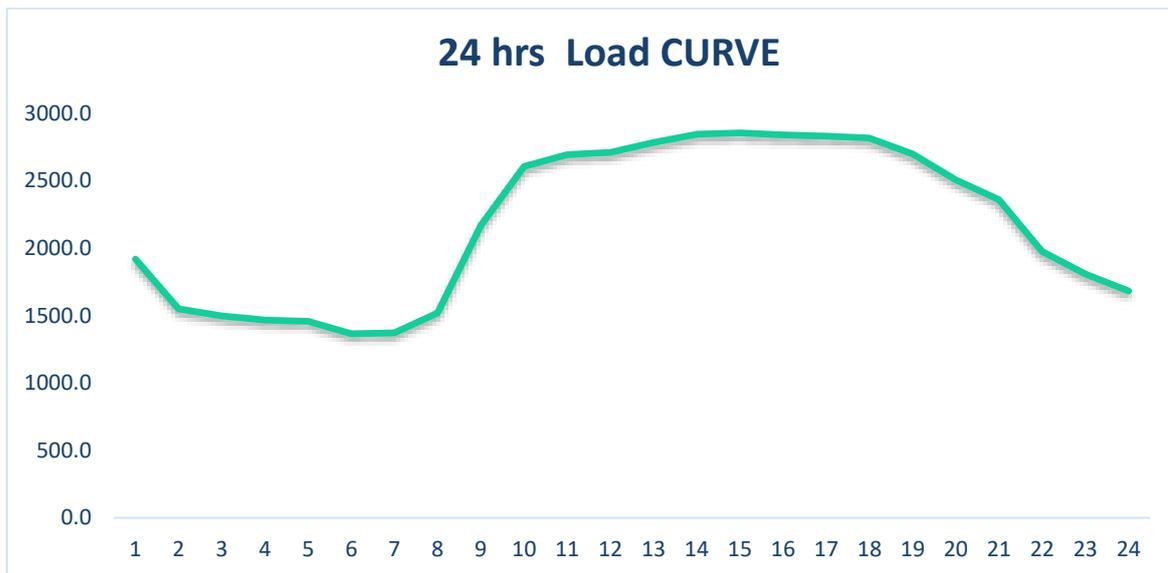
*\*Note: Additional one run of 22kV cable is existing from MSETCL EHV S/s to Kharadi Switching-Station as a standby arrangement, in case of failure of one of the two cables which are in service.*

KRCIPPL fed the three buildings namely R4, G2 and R1. This are mostly commercial and industrial Building. Their consumption pattern is shown below for the year 2022-23.



G2 has recorded the highest consumption of 42% as compared to R4 and R1.

The 24 hrs load curve is prepared from the hourly data from Jan 2022 to Sep 2022. The Consumption of HT commercial and Industrial is 88%, the demand has increased from 9 am onward still 10 p.m.



- Monthly loss verified for Apr -22 to Sep -22 on monthly basis

Sr.NO	Month	Consumption (KWH) – ABT SLDC	T&D% SLDC (ABT)
1	Apr-22	1827398	1.44%
2	May-22	2068177	1.53%
3	Jun-22	2007859	1.55%
4	Jul-22	1890896	1.45%
5	Aug-22	1967772	1.48%
6	Sep-22	1964839	1.60%

- The loss calculated are minimum loss that are going to be in the network during the normal operating condition. The transformation loss calculated based on BEE - Formula is between the range of 0.7% to 1.9%

Transformatin loss of KRCIPPL
0.7 % to 1.9%

The transformer maintaince is done regularly and hence the loss of the transformation are one of the best in the industry. The range is from 0.7% to 1.9%.



### 7.1.1 Purchased Energy for 2022-2023

The purchased energy for FY 2022-2023 is show below.

**Table 17 Purchased Energy FY 2022-2023**

DC	Type	Purchased Energy (MU)	Remarks
KRCIPPL	DISCOM	<b>22.99</b>	Total Energy purchased by KRCIPPL .

### 7.1.2 Net Input Energy

The energy recorded at the Interface point of transmission and KRCIPPL Distribution network is **22.90 MU** for FY 2022-2023.

#### 7.1.2.1 Net Input Energy Details Monthly FY 2022-2023

DC	Type	Net Input Energy (MU)	Remarks
KRCIPPL	DISCOM	<b>22.90</b>	Net input energy (at DISCOM Periphery after adjusting the transmission losses and energy traded)

### 7.1.3 Billed energy 2022-2023

**Table 18 Billed energy FY 2022-2023**

Sr. No	Billed Energy (MU)	Data Source
1	<b>22.55</b>	As per the submitted data by the KRCIPPL team

### 7.1.4 Energy Balance -2022-23

Name of circle	Input energy (MU)	Total Billed energy (MU)	T&D loss (MU)	T&D loss (%)	Billed Amount in Rs. Crore	Collected Amount in Rs. Crore	Collection Efficiency	AT & C loss (%)
KRCIPPL	22.9	22.55	0.35	1.53%	19.42	19.42	100.00%	1.53%

### 7.1.5 Recommendation

It is important that the periodical asset monitoring be carried out through thermographic inspection along with detailed energy audit to make sure the quality of the power supplied is in good order.



### **7.1.6** Action Plan for monitoring and reporting

Energy monitoring is being carried out remotely which is in compliance to the regulation and the daily monitoring of the transformer load, consumer consumption is as per the compliance.

### **7.1.7** Action plan for Automated energy accounting

The energy accounting is in place for the automated energy accounting and hence the compliance of the BEE regulation is followed appropriately.



## 8 List of Annexures attached with the Report

Annexure-

Annexure No	Annexure Description
1	Introduction of Verification Firm
2	Minutes of Meeting with the DISCOM team
3	Check List prepared by auditing Firm.
4	Brief Approach, Scope & Methodology for audit
5	Infrastructure Details
6	Electrical Distribution System
7	Power Purchase Details
8	Line Diagram(SLD)
9	Category of service details (With Consumer and Voltage wise)
10	Detailed formats
11	List of documents verified with each parameter
12	Brief Description of Unit
13	List of Parameters Arrived through calculation or Formula with list of documents as source of data



General Information				
1	Name of the DISCOM	KRC Infrastructure and Projects Private Limited		
2	i) Year of Establishment	2019		
	ii) Government/Public/Private	Private		
3	DISCOM's Contact details & Address			
i	City/Town/Village	Pune		
ii	District	Pune		
iii	State	Maharashtra	Pin	411014
iv	Telephone	022 26564667	Fax	
4	Registered Office			
i	Company's Chief Executive Name	Mr. Nitin Chunarkar		
ii	Designation	Associate Vice President-Power		
iii	Address	DL Office, Mindspace Business Parks Private Limited, SEZ Division,		
iv	City/Town/Village	Airoli East	P.O.	
v	District	Thane		
vi	State	Maharashtra	Pin	400708
vii	Telephone		Fax	
5	Nodal Officer Details*			
i	Nodal Officer Name (Designated at DISCOM's)	Mr. Ajit Pujari		
ii	Designation	Deputy General Manager		
iii	Address	DL Office, Mindspace Business Parks Private Limited, SEZ Division,		
iv	City/Town/Village	Airoli East	P.O.	
v	District	Thane		
vi	State	Maharashtra	Pin	400708
vii	Telephone		Fax	
6	Energy Manager Details*			
i	Name	Mr. Amol Chiplunkar		
ii	Designation	Energy Auditor	Whether EA or EM	EA
iii	EA/EM Registration No.	EA 10856		
iv	Telephone		Fax	
v	Mobile	9420081764	E-mail ID	<a href="mailto:aaecpune@gmail.com">aaecpune@gmail.com</a>
7	Period of Information			
	Year of (FY) information including Date and Month (Start & End)	1st April, 2022 - 31st March, 2023		

### Minutes of Meeting

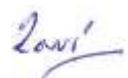
Client	KRC Infrastructure and Projects Private Limited
Consultant Company	PPS Energy Solutions Pvt Ltd
Date & Time of Meeting	29 <sup>th</sup> June 2023
Subject	Kick of Meetings and Project plan discussion - 2022-23 of KRCIPPL
Place	KRCIPPL Kharadi, Pune.
Recorded by	PPS Energy Solutions Pvt Ltd ( PPSES)
Project Name	Energy Audit of KRCIPPL FY 2022-23
Work Order No	

Sr. No	Name	Designation
1	Mr. Nitin Chunarkar	Associate Vice President-Power
2	Mr. Ajit Pujari	Deputy General Manager-Power
3	Mr. Amol Chiplunkar	Energy Auditor

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

Annexure-2 Annual Energy Audit of KRCIPPL FY 2022-23

<b>Sr. Nos.</b>	<b>Minutes</b>
1	During Meeting the work scope and it action plan was discusses
2	KRCIPPL Officials submitted the quarterly available Energy Audit data as perthe BEE Regulation
3	The site visit are planned for 29 <sup>th</sup> June 2023 for the KRCIPPL
4	The Visit to the Account office was planned on 29 <sup>th</sup> June 2023
5	The as per the records in system will be provided by KRCIPPL for the verification of sales figures
6	The Annexure data is to be provided by KRCIPPL
7	Network Checked, Meters are present, Meter accuracy checked, As it is short distribution network supply is directly provided from HT Panel
8	The purchase data is to be considered from Annual Report for 2022-23
9	The data gaps will be raised by AEA and compliance of the same will be provided by KRCIPPL

Ravi Deshmukh	
Prasad Bhosale	

### Check List Prepared by auditing Firm

Sr. No	Description
1	Energy Purchase Documents- Power Purchase report from all sources
2	Consumers Category wise details
3	Billed energy for different category of the consumer
4	Annual Calculation of transmission Loss
5	Sample 22 kV input and billed energy
6	DTR and consumer mapping for the LT loss calculation
7	Average Billing Rate for consumer category
8	Infrastructure details

## Brief Approach, Scope & Methodology for audit

### 1.1 Scope of work

- 1 To carry out Energy Audit in line with the BEE EA Regulation 2021 to Conduct Energy Audit in KRCIPPL
  - Preparation of checklist/action plan for Energy Audit.
  - Pro-forma of Energy Audit will be shared with selected agency after the issuance of Work Award.
  - DISCOM visit should be carried out by all team members of the agency as per the team declaration in technical proposal. BEE EA Regulation 2021, proforma (formats) will be used for this audit.
  - Collection and Review of the energy related data of last Financial Year (FY 2022-23) in the Pro-forma by visiting the DISCOM physically.
  - Verification of existing pattern of energy distribution across periphery of electricity distribution Company
  - Collection and verification of energy flow data of electricity distribution company at all applicable voltage level of distribution network Collection of data on energy received and distributed by DISCOM and verify the accuracy of data
- 2 Collection & analysis the data and prepare the same with report;
  - I. Input energy details:
    - a. Collection of input energy from recorded system meter reading
    - b. All the inputs points of transmission system
    - c. Details provided by transmission unit
    - d. Recorded meter reading at all export points (where energy sent outside the State (interstate as well as intrastate) is from the distribution system);
    - e. System loading and Captures infrastructure details (i.e. no of circle, division, sub-division, feeders, DTs, & Consumers)
  - II. Parameters for computation of distribution losses:
    - a) Details of open access, EHT sale, HT sale, LT sale and transmission losses
    - b) Number of consumer's category wise in each circle
    - c) Consumers connected load category wise in each circle and division
    - d) Details of billed and un-billed energy category wise of each circle and division
    - e) Metered and un-metered details.
    - f) Division and Circle wise losses of all circles under DISCOM periphery
    - g) Boundary meter details

h) Energy Cost and Tariff data

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

j) Energy supplied to Open Access Consumers, which is directly purchased by Open Access Consumers from any supplier other than electricity Distribution Company

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

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

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

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

VII. Computation of agriculture consumption

VIII. Methodology for loss computation various losses.

IX. Computation of Average Billing Rate (ABR)

a) Total revenue billed category wise.

b) Category wise ABR with tariff subsidy.

c) Category wise ABR without tariff subsidy.

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

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

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

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

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

- 5 Prepare final report of KRCIPPL as per the scope of work and as per the BEE Energy Audit Regulation, 2021, in a standard format duly indexed, covering profile of the unit and its details of energy related data w.r.t KRCIPPL analytical & Statistical details and any other relevant information.

#### 1.1.1 Deliverables

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

## 1.2 Approach

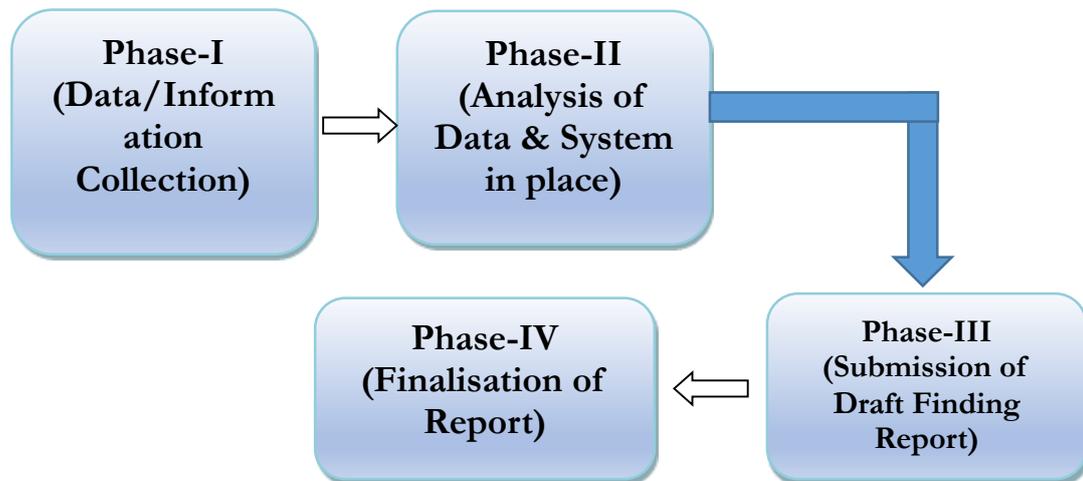
Approach for the assignment, which was scheduled for 1 month, is guided by following points

- **Kick of Meeting:** Offline meeting with KRCIPPL personnel's and Energy Audit team will be conducted
  1. Communication to the selected the data points like input energy, out energy, renewable open access etc. were pointed out.
  2. Different measures included to account the energy were discussed
- **Site Visit:**

Site visits were carried out in order to ascertain the meter numbers, boundary location meters, 22kV meters and LT distribution connection.
- **Data analysis and Data Gaps:**

Data Scrutiny was carried out and the data gaps were raised. The data validation was performed.
- **Deliverable submission:** The Report submission to the BEE will be executed as specified by BEE regulations.

### 1.3 Methodology



#### **Phase I: Data Collection and Analysis & Approach and methodology document**

- (a) Deal with identification of information and data requirement to carry out the Work/Job
- (b) Meeting and Discussion with KRCIPPL to propose a detailed work plan.

#### **Phase II: Data Analysis**

- (a) Data mining and procedural analysis of system in place for record of sales data.
- (b) Meter reading data collection  
The team members of Field Team did meter reading and data collection of field.
- (c) Analysis of the Meter reading  
Our team member with input from the respective experts analyzed the collected data.
- (d) Based on the outcomes of the data analysis, a preliminary fact-finding report was submitted highlighting various issues at various sub-division levels.

#### **Phase III: Detailed Analysis and Submission of Draft Report**

- (a) Detailed analysis and preparation a draft report highlighting the validity, basis, consistency and objectivity of the approach adopted.
- (b) Analysis of Specific Issues such as:
  - Analysis of assessed sales in terms of load factor and specific consumption and its comparison with the sales based on actual meter reading.
  - Reasons for exceptional high or low-metered sales as reported.
  - Consistency in approach for assessed consumption.

- Methodology of assessing consumption and comparison of assessed sales with actual meter reading wherever meter readings are available.
  - Comparison of Actual Category-wise Average Billing Rate (ABR) with ABR approved in Order
- (b) Assessment of AT&C losses for HT, LT and Total Sales and comparison vis-à-vis as reported in the MIS of KRCIPPL and Recommendations for reducing AT&C Losses by KRCIPPL.

**Phase IV: Detailed Analysis and Submission of Draft Report**

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

**Report Submissions**

The report submitted as per the deliverables of this assignment.

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	NA	NA	NA	KRCIPPL is a Deemed Distribution Licensee within its notified area
ii	Number of divisions	NA	NA	NA	
iii	Number of sub-divisions	NA	NA	NA	
iv	Number of feeders	2	2	2	
v	Number of DTs	11	10	10	
vi	Number of consumers	93	80	80	
<b>2</b>	<b>Parameters</b>	<b>66kV and above</b>	<b>33kV</b>	<b>11/22kV</b>	<b>LT</b>
a. i.	Number of conventional metered consumers			0	
ii	Number of consumers with 'smart' meters			0	
iii	Number of consumers with 'smart prepaid' meters			0	
iv	Number of consumers with 'AMR' meters			93	
v	Number of consumers with 'non-smart prepaid' meters			0	
vi	Number of unmetered consumers			0	
vii	<b>Number of total consumers</b>			93	
b. i.	Number of conventionally metered Distribution Transformers			0	
ii	Number of DTs with communicable meters			11	
iii	Number of unmetered DTs			0	
iv	<b>Number of total Transformers</b>			11	
c. i.	Number of metered feeders			2	T<>D interface meters installed by MSETCL are directly communicable with SLDC through AMR
ii	Number of feeders with communicable meters			2	
iii	Number of unmetered feeders			0	
iv	<b>Number of total feeders</b>			2	
d.	Line length (ct km)				
e.	Length of Aerial Bunched Cables			0	
f.	Length of Underground Cables			15.82	

3	Voltage level	Particulars	MU	Reference	Remarks (Source of data)
i	66kV and above	Long-Term Conventional		Includes input energy for franchisees	
		Medium Conventional			
		Short Term Conventional			
		Banking			
		Long-Term Renewable energy			
		Medium and Short-Term RE		Includes power from bilateral/ PX/ DEEP	
		Captive, open access input		Any power wheeled for any purchase other than sale to DISCOM. Does not include input for franchisee.	
		Sale of surplus power			
		Quantum of inter-state transmission loss		As confirmed by SLDC, RLDC etc	
		<b>Power procured from inter-state sources</b>	0	Based on data from Form 5	
		<b>Power at state transmission boundary</b>	0		
ii	33kV	Long-Term Conventional	0		
		Medium Conventional	0		
		Short Term Conventional	17.86		HT Network is at 22 Kv (U/G network)
		Banking	0		
		Long-Term Renewable energy	0		
		Medium and Short-Term RE	5.13		RE procurement from GDAM from Power Exchange Platform
		Captive, open access input	0		
		Sale of surplus power	0		
		Quantum of intra-state transmission loss	0		
		<b>Power procured from intra-state sources</b>	22.99		
		<b>Input in DISCOM wires network</b>	22.99		
iii					
iv	33 kV	Renewable Energy Procurement			
		Small capacity conventional/ biomass/ hydro plants Procurement			
v	11 kV	Captive, open access input			
		Renewable Energy Procurement			
vi	LT	Small capacity conventional/ biomass/ hydro plants Procurement			
		Sales Migration Input			
vii		Renewable Energy Procurement			
		Sales Migration Input			
viii		<b>Energy Embedded within DISCOM wires network</b>	0		
		<b>Total Energy Available/ Input</b>	22.99		

4	Voltage level	Energy Sales Particulars	MU	Reference	
i	LT Level	DISCOM' consumers		Include sales to consumers in franchisee areas, unmetered consumers	
		Demand from open access, captive		Non DISCOM's sales	
		Embedded generation used at LT level		Demand from embedded generation at LT level	
		Sale at LT level	0		
		Quantum of LT level losses	0		
		Energy Input at LT level			
ii	11 kV Level	DISCOM' consumers		Include sales to consumers in franchisee areas, unmetered consumers	
		Demand from open access, captive		Non DISCOM's sales	
		Embedded generation at 11 kV level used		Demand from embedded generation at 11kV level	
		<b>Sales at 11 kV level</b>	0		
		Quantum of Losses at 11 kV	0		
		Energy input at 11 kV level			
iii	33 kV Level	DISCOM' consumers	22.55	Include sales to consumers in franchisee areas, unmetered consumers	Sales includig Both HT & LT
		Demand from open access, captive		Non DISCOM's sales	
		Embedded generation at 33 kV or below level		This is DISCOM and OA demand met via energy generated at same voltage level	
		<b>Sales at 33 kV level</b>	22.55		
		Quantum of Losses at 33 kV	0.34		
		Energy input at 33kV Level	22.89		HT Network is at 22 Kv (U/G network)
iv	> 33 kV	DISCOM' consumers		Include sales to consumers in franchisee areas, unmetered consumers	
		Demand from open access, captive		Non DISCOM's sales	
		Cross border sale of energy			
		Sale to other DISCOMs			
		Banking			
		Energy input at > 33kV Level			
		<b>Sales at 66kV and above (EHV)</b>			
<b>Total Energy Requirement</b>			<b>22.89</b>		
<b>Total Energy Sales</b>			<b>22.55</b>		
<b>Energy Accounting Summary</b>					
5	DISCOM	Input (in MU)	Sale (in MU)	Loss (in MU)	Loss %
i	LT			0	-
ii	11 Kv			0	-
iii	33 kv	22.89	22.55	0.35	1.52
iv	> 33 kv			0	-
6	Open Access, Captive	Input (in MU)	Sale (in MU)	Loss (in MU)	Loss %
i	LT			0	-
ii	11 Kv			0	-
iii	33 kv			0	-
iv	> 33 kv			0	-
<b>Loss Estimation for DISCOM</b>					
	T&D loss	0.35			
	D loss	0.35			
	T&D loss (%)	1.51%			
	D loss (%)	1.52%			

## **Electrical Distribution System**

### **Details of Supply**

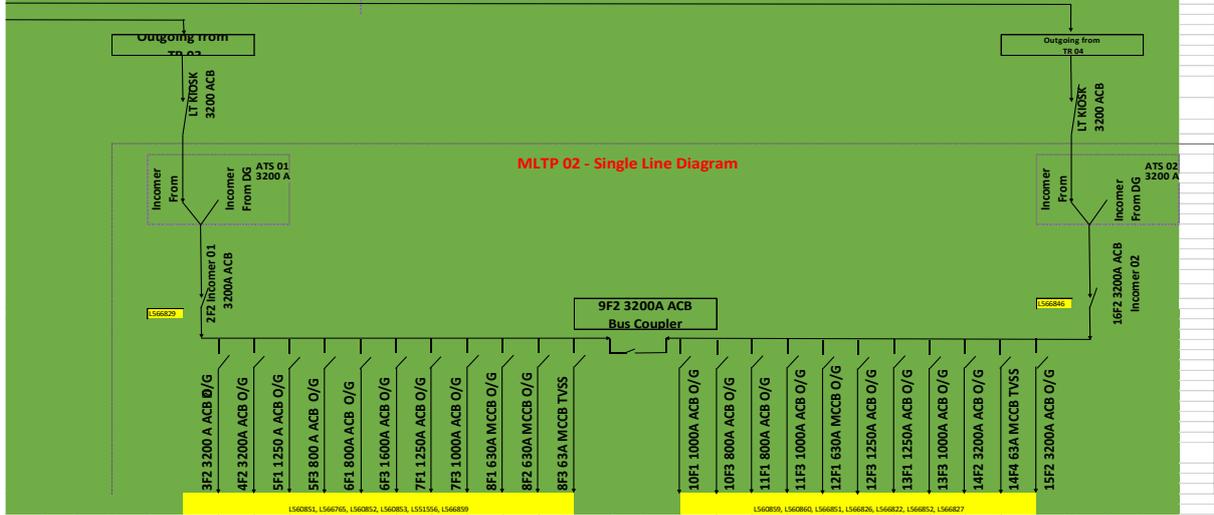
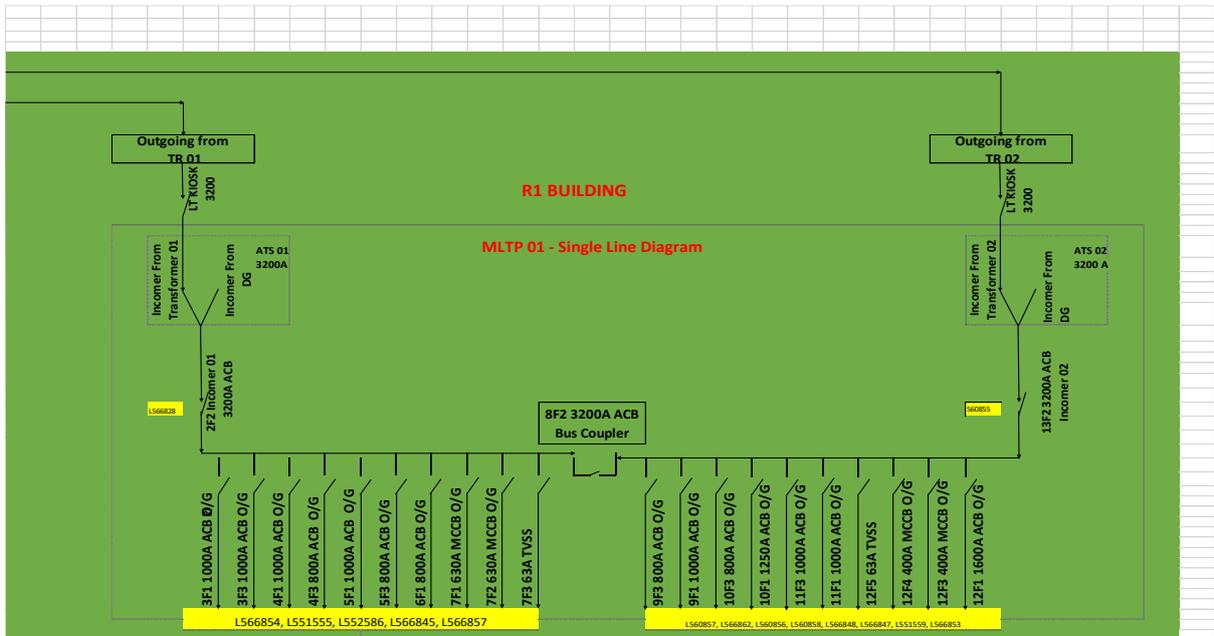
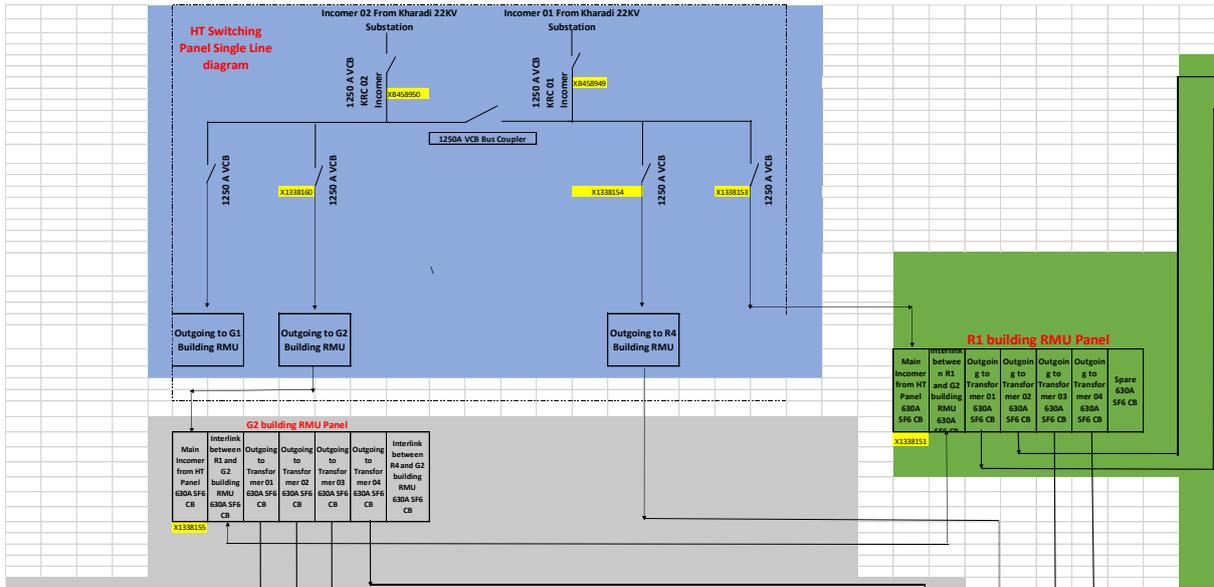
Facility receives power from two numbers of 22kV Incomers Namely 22kV KRC -1 and 22kV KRC -2 emanating from 132/22kV Kharadi Sub-Station.

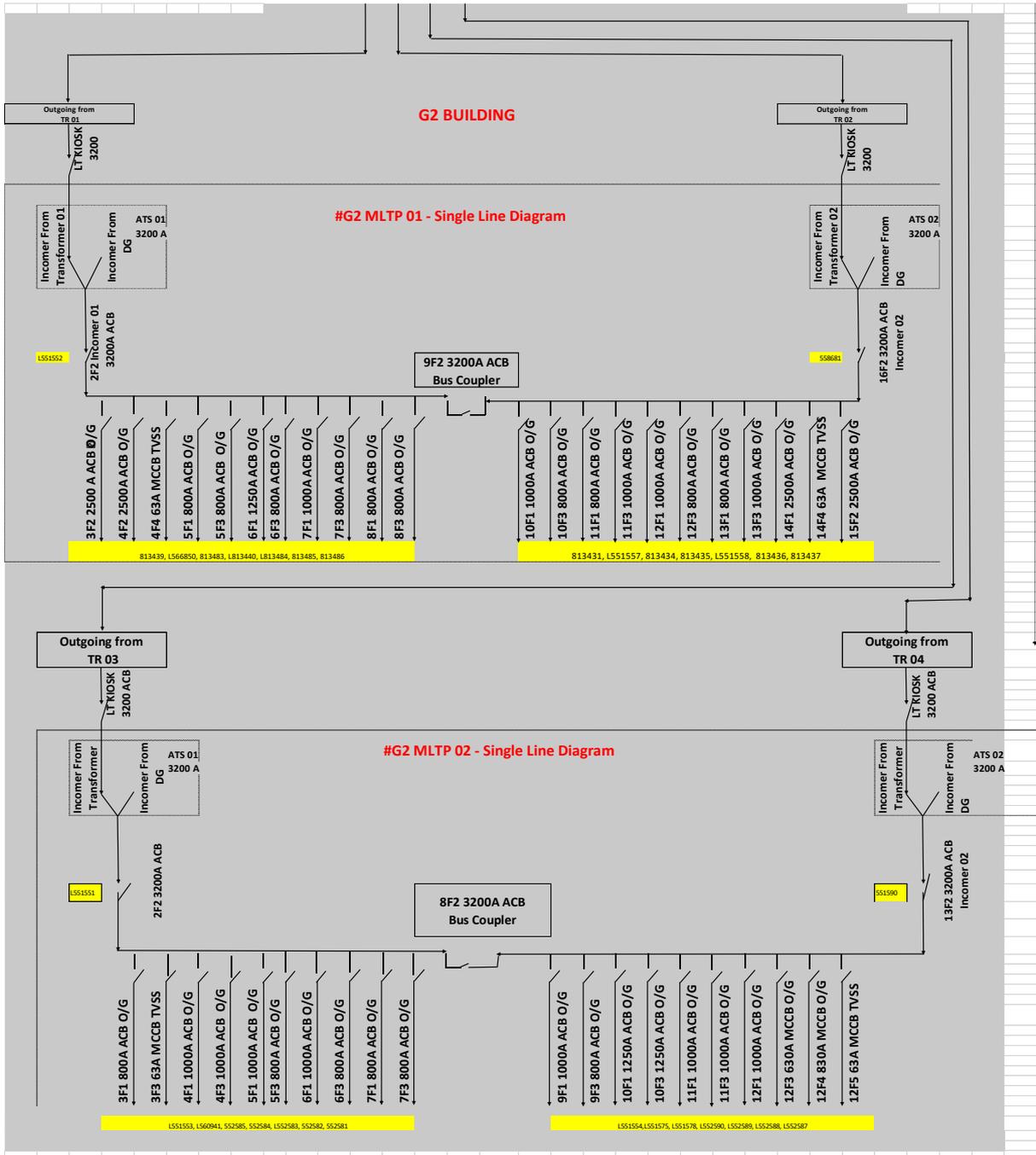
Incomer 1 has 1250 Amp VCB for switching Purpose and Incomer 2 has 1250 Amp VCB for switching purpose. Both Incomers are coupled using 1250 Amp VCB Bus Coupler. Further four outgoing feeders are installed for distributing supply through RMU for each building. For Controlling Power to each building 1250 Amp VCBS are installed. Further LT distribution is carried out using Transformers and DG Set for each building. For switching LT supply 3200 Amp ACBs are installed. In LT distribution also 3200 Amp ACB Bus Couplers are installed.

## Power Purchase Details

Period From April-22 To Mar-23								
A. Generation at Transmission Periphery (Details)								
S.No.	Name of Generation Station	Generation Capacity (In MW)	Type of Station Generation (Based- Solid (Coal ,Lignite)/Liquid/ Gas/Renewable (biomass-bagasse)/Others)	Type of Contract (in years/ months/days)	Type of Grid (Intra-state/ Inter-state)	Point of Connection (POC) Loss MU	Voltage Level (At input)	Remarks (Source of data)
1	Power Exchange	NA	Power was procured from exchange (Conventional and Non-conventional)	NA	Inter State	NA	NA	KRCIPPL procured power from exchange platforms as and when required basis
2	PTC India Limited	26	Biomass-Bagasse	4 Months Short Term	Inter State	PoC not applicable as PPA is at State Periphery	NA	Short term Peak power PPA of 1 Mw from Nov-22 to Feb-23 with Trader PTC India Limited
3	PTC India Limited	28	Biomass-Bagasse	1 Month Short Term	Inter State	PoC not applicable as PPA is at State Periphery	NA	Short term Peak power PPA of 1 Mw for March 2023 with Trader PTC India Limited
4	GMR Energy Trading LTD		Coal	1 Year Short Term	Inter State	PoC not applicable as PPA is at State Periphery	NA	Short term Base power PPA of 1.5 Mw from Nov-22 to Oct-23

## Line Diagram (SLD)









<b>Performance Summary of Electricity Distribution Companies</b>			
<b>1</b>	Period of Information Year of (FY) information including Date and Month (Start & End)	1st April, 2022 - 31st March, 2023	
<b>2</b>	<b>Technical Details</b>		
<b>(a)</b>	<b>Energy Input Details</b>		
(i)	Input Energy Purchase (From Generation Source)	Million kwh	22.99
(ii)	Net input energy (at DISCOM Periphery after adjusting the transmission losses and energy traded)	Million kwh	22.90
(iii)	Total Energy billed (is the Net energy billed, adjusted for energy traded))	Million kwh	22.55
<b>(b)</b>	Transmission and Distribution (T&D) loss Details	Million kwh	0.35
		%	1.53%
	Collection Efficiency	%	100.00%
<b>(c)</b>	Aggregate Technical & Commercial Loss	%	1.53%

**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.**

**Authorised Signatory and Seal**

**Name of Authorised Signatory**

**Name of the DISCOM:**

**Full Address:-**

**Signature:-**

**Name of AEA\*:**

**Dr. Ravi Deshmukh**

**Registration Number: AEA - 0243**



**Seal**

Details of Division Wise Losses (See note below)**																							
Division Wise Losses																							
S.No	Name of circle	Circle code	Name of Division	Consumer profile										Energy parameters				Losses		Commercial Parameter			AT & C loss (%)
				Period From April-22 To Mar-23										Billed energy (MU)				T&D loss (MU)	T&D loss (%)	Billed Amount in Rs. Crore	Collected Amount in Rs. Crore	Collection Efficiency	
				Consumer category	No of connection metered (Nos)	No of connection Un-metered (Nos)	Total Number of connections (Nos)	% of number of connections	Connected Load metered (MW)	Connected Load Un-metered (MW)	Total Connected Load (MW)	% of connected load	Input energy (MU)	Metered energy	Unmetered/a sssessment energy	Total energy	% of energy consumption						
1				Residential	0	0	0	0%	0	0	0	0%	22.9	0	0	0	0%	0.35	2%	0	0	0.00%	
				Agricultural	0	0	0	0%	0	0	0	0%		0	0	0	0%			0	0	0.00%	
				Commercial/Industrial-LT	36	0	36	39%	2.32	0	2.32	12%		4.44	0	4.44	20%			3.34	3.33	99.70%	
				Commercial/Industrial-HT	57	0	57	61%	17.06	0	17.06	88%		18.11	0	18.11	80%			16.08	16.09	100.06%	
				Others	0	0	0	0%	0	0	0	0%		0	0	0	0%			0	0	0.00%	
Sub-total					93	0	93	100%	19.38	0	19.38	100%	22.9	22.55	0	22.55	100%	0.35	2%	19.42	19.42	100.00%	2%
	Total			Residential	0	0	0	0%	0	0	0	0%	22.9	0	0	0	0%	0.35	2%	0	0	0.00%	
				Agricultural	0	0	0	0%	0	0	0%	0		0	0	0%	0			0	0.00%		
				Commercial/Industrial-LT	36	0	36	39%	2.32	0	2.32	12%		4.44	0	4.44	20%			3.34	3.33	99.70%	
				Commercial/Industrial-HT	57	0	57	61%	17.06	0	17.06	88%		18.11	0	18.11	80%			16.08	16.09	100.06%	
				Others	0	0	0	0%	0	0	0%	0		0	0	0%	0			0	0	0.00%	
At company level					93	0	93	100%	19.38	0	19.38	100%	22.9	22.55	0	22.55	100%	0.35	2%	19.42	19.42	100.00%	2%

\*\* Note - It shall be mandatory to record the energy supplied separately for each category of consumers which is being provided a separate rate of subsidy in the tariff, by the state government, so that the subsidy due for the electricity distribution company is quarterly calculated by multiplying the energy supplied to each of such category of consumers by the applicable rate of subsidy notified by the state government.

Color code	Parameter
	Please enter name of circle
	Please enter circle code
0	Please enter numeric value or 0
	Formula protected

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.

Authorised Signatory and Seal

Name of Authorised Signatory:  
Name of the DISCOM:  
Full Address:-  
Seal

Signature:-  
Name of Energy Manager: Mr. Amol Chiplunkar  
Registration Number: EA 10856



Form-Input energy(Details of Input energy & Infrastructure)			
A. Summary of energy input & Infrastructure			
S.No	Parameters	Period From April-22 To Mar-23	Remarks (Source of data)
A.1	Input Energy purchased (MU)	22.99	
A.2	Transmission loss (%)	0.39%	
A.3	Transmission loss (MU)	0.090	
A.4	Energy sold outside the periphery(MU)	0	
A.5	Open access sale (MU)	0	
A.6	EHT sale	0	
A.7	Net input energy (received at DISCOM periphery or at distribution point)-(MU)	22.90	HT Network is at 22 Kv (U/G network)
A.8	Is 100% metering available at 66/33 kV (Select yes or no from list)	Yes	
A.9	Is 100% metering available at 11 kV (Select yes or no from list)	Yes	
A.10	% of metering available at DT	100%	
A.11	% of metering available at consumer end	100%	
A.12	No of feeders at 66kV voltage level	0	
A.13	No of feeders at 33kV voltage level	2	22 KV HT network (U/G network)
A.14	No of feeders at 11kV voltage level	0	
A.15	No of LT feeders level	0	
A.16	Line length (ckt. km) at 66kV voltage level	0	
A.17	Line length (ckt. km) at 33kV voltage level	15	(U/G 22kV network)
A.18	Line length (ckt. km) at 11kV voltage level	0	
A.19	Line length (km) at LT level	0.82	U/G network
A.20	Length of Aerial Bunched Cables	0	
A.21	Length of Underground Cables	15.82	
A.22	HT/LT ratio		

B. Meter reading of input energy at injection points																				
S.No	Zone	Circle	Voltage Level (kVA)	Division (kVA)	Sub-Division (kVA)	Feeder ID	Feeder Name	Feeder Metering Status (Metered/ un-metered/ AMU/AMR)	Status of Meter (Functional/Non-functional)	Metering Date		Status of Communication			Period From April-22 To Mar-23		Slits	Remarks (Source of data)		
										Date of last actual meter reading/ communication	Feeder Type (Agri/ Industrial/Mixed)	% data received through automatically if feeder AMR/AMI	Number of hours when meter was unable to communicate in month	Total Number of hours in the period	Meter S.No	CT/PT ratio			Import (MU)	Export (MU)
B.1	KRCIPPL	NA	22 kV	NA	NA	KRC-1	KRC-1	Metered	Functional	01-01-2023	Dedicated Incrmer Feeder for Distribution Licensee	NA	NA	NA	MSETC001553	CT Ratio -290/5 A PT Ratio - 22000/110 V	22.9	0.00	22.55	Sales shown here includes both feeder
B.2	KRCIPPL	NA	22 kV	NA	NA	KRC-2	KRC-2	Metered	Functional	01-01-2023	Dedicated Incrmer Feeder for Distribution Licensee	NA	NA	NA	MSETC002279	CT Ratio -290/5 A PT Ratio - 22000/110 V				KRCIPPL is a deemed DL within notified SEZ area
B.3																				T<D interface meters installed by MSETCL are directly communicable with SLOC through AMR
Total (MU)																				
Net input energy at DISCOM periphery (MU)																				
22.90      0.00      22.90																				

Color code	Parameter
	Please enter voltage level or leave blank
	Please enter feeder id and name or leave blank
	Enter meter no or leave blank
	Enter CT/PT ratio or leave blank
0	Please enter numeric value or 0
	Please select yes or no from list
	Formula protected

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.

Authorized Signatory and Seal

Name of Authorized Signatory

Name of the DISCOM:

Full Address:-

Seal

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

  
Mr. Anil Chhunkar  
EA 10856



<b>(Details of Feeder-wise losses)</b>																
Period From April-22 To Mar-23																
SI No.	Zone	Received at Circle (In MU)	Received at Division (In MU)	Received at Sub-division (In MU)	Name of the Station	Feeder Code/ID	Feeder Name	Type of Feeder ( Urban/Mixed/Industrial/Agricultural/Rural)	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)	T&D losses	AT&C losses	% Data Received through Automatically (if feeder AMR/AMI)	Remarks
1	KRCIPPL	NA	NA	NA	22kV Switching station	KRC-1 & KRC-2	KRC-1 & KRC-2	Dedicated Incomer Feeder for Distribution Licensee	AMR	22.90	22.55	22.88	2%	2%	0	T<>D interface meters installed by MSETCL are directly communicable with SLDC through AMR

### **List of Documents verified with each parameter**

Input Energy has been verified with the Gross Energy Consumption (GEC) data provided by Maharashtra State Load Despatch Centre (MSLDC), Billed Energy and Demand Data is collected from their Automated Meter Reading (AMR) System. System Installed for their consumer as well as energy accounting meters at HT & LT levels. Team has collected data extracted from the software and considered for preparation of this report

## Brief Description of Unit

KRCIPPL is a Company incorporated under the Companies Act, 1956, having its registered office at Plot No. C-30, Block 'G', Opp. SIDBI, Bandra-Kurla Complex, Bandra (East), Mumbai. In accordance with Section 14 (b) of the EA, 2003 read with Section 4(1) of the SEZ Act, 2005, KRCIPPL is a Deemed Distribution Licensee for supplying electricity to consumers in its SEZ area. KRC Infrastructure and projects Private Limited has commenced its operation as distribution licensee w.e.r. 01.06. 2019..

KRCIPPL Team:

Sr. No	Name	Designation
1	Mr. Nitin Chunarkar	Associate Vice President-Power
2	Mr. Ajit Pujari	Deputy General Manager-Power
3	Mr. Amol Chiplunkar	Energy Auditor

Facility receives power from two numbers of 22kV Incomers Namely 22kV KRC -1 and 22kV KRC -2 emanating from 132/22kV Kharadi Sub-Station.

Incomer 1 has 1250 Amp VCB for switching Purpose and Incomer 2 has 1250 Amp VCB for switching purpose. Both Incomers are coupled using 1250 Amp VCB Bus Coupler. Further four outgoing feeders are installed for distributing supply through RMU for each building. For Controlling Power to each building 1250 Amp VCBS are installed. Further LT distribution is carried out using Transformers and DG Set for each building. For switching LT supply 3200 Amp ACBs are installed. In LT distribution also 3200 Amp ACB Bus Couplers are installed.

Network Snapshot	
Number of feeders	2
Number of DTs	11
Number of consumers	93

The KRCIPPL Network is very small with only 5.6kM HT length at 22kV Level. The connections are given at the LT panel just next to transformer which is placed at the load centre. Hence the loss of KRCIPPL are very less. Loading of KRCIPPL increased in the year 2022-23 and hence the no load loss of the Network reduced.

**List of Parameters arrived through calculation or formulae with list of documents as source of data**

Data for each load is collected and calculations were done based on collected data only. No additional formulas were used.