FY 2022-23 (JULY 2023)

# ANNUAL ENERGY AUDIT REPORT

# OF

# BSES YAMUNA POWER LTD.

**SHAKTI KIRAN BUILDING, KARKARDOOMA, DELHI-110032**

*Audit Conducted and Report prepared by*

K K JHA (AEA -007/ EMAEA-026)


PESPL


## PADMASHTDAL ENERGY SERVICES PVT. LTD.

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# Acknowledgement

We express our sincere gratitude to the management of BSES – Yamuna New Delhi for giving us the opportunity to conduct the energy audit of DISCOM for FY 2022-23, in accordance with the Bureau of Energy Efficiency (Manner and Intervals for Conduct of Energy Audit (Accounting) In Electricity Distribution Companies) Regulation, 2022 And Its Amendment (Vide Notification No 18/1/BEE/DISCOM/2021 Dated 6th October 2021 and Amendment Dated 28th October 2022). . We thankfully acknowledge the support provided by Mr. Brajesh Kumar, Head – Business & Mr. Naveen Vats, Head – Business (Retail) & Mr. Rajesh Srivastava, VP & Energy Manager and concerned departmental leaders during the conduct of this exercise.

| | |
|---|---|
| Mr. Samir Banger | Asst. V P -GIS |
| Mr. Dilip Agrawal | Asst. V P -PMG |
| Mr. Devanshu Sharma | GM-PAT Cell & Business |
| Mr. Bidyut Dey | GM- Energy Audit |
| Mr. Govind Gandhi | GM, Finance |
| Mr. Manjeet Singh | GM, O&M |
| Mr. Mohan Tahilyani | DGM, IT |
| Mr. Vikas Dixit | DGM, Regulatory Affairs |
| Mr. Sameer Singh | DGM, Regulatory Affairs |

We are thankful to all officers and employees of the BSES – Yamuna Power Ltd. New Delhi with whom we interacted during the field studies for their wholehearted support in undertaking measurements and eagerness to assess the system / equipment efficiencies and saving potential. The willingness of these key personnel to participate in this program and acknowledge the call for energy efficiency is more than half the issues resolved.

e are also thankful to the site working staff for their positive support in undertaking this intricate task of system mapping and measurement activity. The field studies would not have been completed on time without their interaction and timely support. We are grateful for their co-operation during field studies and providing of data for the study.

Last but not the least; The management of the company deserves special appreciation for undertaking energy audit of its system, this initiative by the company is a major step towards mitigating the biggest risk the mankind is facing in this 21st century- global warming.

PESPL looks forward to their continued support in all future endeavors as well.

**Signature**

Name : Kamalesh K Jha
Designation : Accredited Energy Auditor
Registered No : AEA 0007
Firm : Padmashtdal Energy Services P Ltd.

# LIST OF ABBREVIATIONS

| | |
|---|---|
| AEA | Accredited Energy Auditor |
| AMI | Advanced Metering Infrastructure |
| AMR | Automated Meter Reading |
| AMRUT | Atal Mission for Rejuvenation and Urban Transformation |
| AT&C | Aggregate Technical and Commercial |
| APFC | Automatic Power Factor Control |
| BEE | Bureau of Energy Efficiency |
| BYPL | BSES Yamuna Power Limited |
| CEA | Certified Energy Auditor |
| CERC | Central Electricity Regulatory Commission (India) |
| CO2 | Carbon dioxide |
| CKT | Circuit |
| CT | Current Transformer |
| DC | Designated Consumer |
| DEEP | Discovery of Efficient Electricity Price |
| DERC | Delhi Electric Regulatory Company |
| DISCOM | Electricity Distribution Company |
| DT | Distribution Transformer |
| EA | Energy Audit |
| EAR | Energy Audit Report |
| EC | Energy Conservation |
| EE | Energy Efficiency |
| ECM | Energy Performance Improvement Action |
| EHT | Extra High Tension |
| EHV | Extra High Voltage |
| EM | Energy Manager |
| FY | Financial Year |
| GHG | Greenhouse Gas |
| HT | High Tension |

| | |
|---|---|
| HVDS | High Voltage Distribution System |
| IPMVP | International Performance Measurement and Verification Protocol |
| LT | Low Tension |
| MNRES | Indian Ministry of Non-Conventional and renewable Energy Sources |
| MoP | Ministry of Power |
| M&V | Measurement and Verification |
| NCV | Net Calorific Value |
| NO | Nodal Officer |
| OA | Open Access |
| O&M | Operation and Maintenance |
| PF | Power Factor |
| PLC | Programmable Logic Control |
| POC | Point of Connection |
| PT | Potential Transformer |
| PX | Power Exchange |
| PMV | Performance Measurement and Verification |
| RE | Renewable Energy |
| RLDC | Regional Load Dispatch Centre |
| SDA | State Designated Agency |
| SLD | Single Line Diagram |
| SLDC | State Load Dispatch Centre |
| T&D | Transmission and Distribution |

### *UNITS AND MEASURES*

| | |
|---|---|
| GWh (or MU) | Giga Watt Hour or Million Units |
| KVA | Kilo Volt Ampere |
| MW | Mega Watt |
| KWh | Kilo Watt Hour (Unit) |
| MWe / GWe | Megawatt / Gigawatt of electricity capacity |
| V | Voltage |

### *Conversion Factors*

| | |
|---|---|
| 1kgoe | 10000 Kcal |
| 1 kWh | 860 Kcal |

### *Emission Factor*

| | |
|---|---|
| Electricity | 0.82 Kg $Co_2$/KWh |

# 1 Executive summary

## 1.1 Brief Overview of the BSES- Yamuna Power Ltd. (BYPL)

BYPL is responsible for Central and East Delhi Power Distribution, spread over an area of 180 sq. km catering to a customer base of 1.9 million, with the apparent customer density for it being 10,575 Cons. /sq. km. While the energy billed by BYPL for the customer is 6958 MU, the peak demand of 1752 MW, the monthly consumption per customer stands at 304.6 Kwh/Month. BYPL cater to areas spread over 14 division across Central, North East and South East areas including Chandni Chowk, Darya Ganj, GT Road, Karkardooma, Karawal Nagar, Krishna Nagar, Laxmi Nagar, Mayur Vihar Phase I & II, Mayur Vihar – Phase III, Nandnagri, Pahar Ganj, Patel Nagar, Shankar Road and Yamuna Vihar. The Consumer profile of BYPL is shown in following table.

**Table 1 BYPL Consumer Profile (FY 2022-23)**

| BYPL Customer Profile | | | | |
|---|---|---|---|---|
| Category | Consumption | | Consumer Number | |
| | MU | % Share | Number | % Share |
| Residential HT | 85 | 1.23% | 43 | 0.00% |
| Residential LT | 4,312 | 61.97% | 1,482,598 | 77.89% |
| Commercial-HT | 308 | 4.43% | 314 | 0.02% |
| Commercial-LT | 1,407 | 20.22% | 406,731 | 21.37% |
| Industrial-HT | 79 | 1.14% | 34 | 0.00% |
| Industrial-LT | 302 | 4.33% | 7,620 | 0.40% |
| Others | 466 | 6.69% | 6,217 | 0.33% |
| Total | 6,958 | | 1,903,557 | |

## 1.2 Goals and Objective

BYPL is a designated consumer in Discom sector. Being a designated Consumer BYPL need to haveAnnual energy audit (Accounting) of their facilities as per BEE notification No 18/1/BEE/Discom/2021 dated 6th October 2021.

The Annual Energy Audit (Accounting) at BYPL is conducted with the following Objectives:

- Verification of existing pattern of energy distribution across periphery of electricity Distribution Company.
- Verification of accounted energy flow submitted by electricity Distribution Company at all applicable voltage levels of the distribution network.
- Verification of the accuracy of the data collected and analyse and process the data with respect to consistency, improvement in accounting and reducing loss of DISCOM.
- Verification of the information submitted by DC to the SDA/BEE about status of energy input, Output and loss for the previous two year.
- Access the past performance of the establishment.
- Quantification of Energy Losses, and Energy Saving Potential.

## 1.3 About Energy Audit Firm

**Padmashtdal Energy Services Private Limited (PESPL)** is a service consultancy company providing techno commercial solution to customers in the areas of Power System, Industrial Electronics and Utility system management since 1996. In last few years of its operation, the company has been able to generate positive reputation and goodwill among its clientele.

PESPL entered into the arena of ENERGY CONSERVATION in 2005 with the aims to assist all stakeholders in implementing energy efficiency and creating awareness about the merits of energy efficiency and safety practices. Company is an accredited energy audit firm and also empanelled with BEE (A statutory body under Ministry of Power, Govt. of India) for PAT Baseline Audit, Mandatory Energy Audit and M & V Audits. Our CEO of company Mr. Kamalesh Kumar Jha is also an Accredited Energy Auditor by BEE.

We have conducted several energy audits and provided consultancy to industrial units and office facilities to achieve substantial reduction in their Energy-Cost. Our client base includes Sugar industries, Paper Industries, Power Plants, steel plant, MSME units, commercial buildings etc.

## 1.4 Period of audit

Energy audit activity was started with a meeting at Head Office of BYPL in the month of June 2023. Based on the requirement, visits were made to Division, Subdivision, Grid etc. for data collection and technical discussion. The period of study was from April 2022 to March 2023.

## 1.5 Energy Input, Output and Losses

The trends of energy input, output and loss for the year 2022-23 is shown in following table.

**Table 2 Energy Performance**

| Trend of BYPL (2022-23) | | | | |
|---|---|---|---|---|
| **Sr. No.** | **Energy Input Details** | **Formula** | **UOM** | **Value** |
| 1 | Purchase Energy (From Generation Source) | A | MU | 8704 |
| 2 | Net Energy Input to Discom (at DISCOM Periphery after adjusting the transmission losses and energy traded) | B | MU | 7504 |
| 3 | Energy billed (is the Net energy billed, adjusted for energy traded) | C | MU | 6,958.33 |
| 4 | | D | Rs. Crores | 5,592.87 |
| 5 | Average Billing Rate | E=D*10/C | Rs/Kwh | 8.04 |
| 6 | Amount collected | F | Rs. Crores | 5,641.15 |
| | Transmission and Distribution (T&D) Loss | G=B-C | MU | 545.43 |
| 7 | | H= G/B | % | 7.27% |
| 8 | | J=E*G/10 | Rs. Crores | 438.40 |
| 10 | Billing Efficiency | K=C/B | % | 92.73% |
| 11 | Collection efficiency | L=F/D | % | 100.86% |
| 12 | Aggregate Technical & Commercial (AT&C) Loss | M =1-(K*L) | % | 6.47% |

## 1.6 Major challenges and goals for the upcoming year

- For sustainable growth of company major challenge and goal is to reduce T&D and AT&C loss in divisions which are having losses higher than Discom average value.
- To meet the T&D reduction target given by DERC and PAT target given by BEE.

## 1.7 Major activities to meet challenge and goal

To achieve Loss reduction target BYPL has started various activities for strengthening and monitoring of entire network so that corrective action can be taken to reduce losses.

## 1.8 Summary and classification of Energy

- Being a Discom, BYPL procures Electrical Energy from long term and short-term sources and distributed it to the end users.
- To fulfill the requirement of RPO compliance BYPL is procuring power from long term purchases, net metering consumers and REC certificates etc.

## 1.9 Energy Conservation measures and initiative for technical loss reduction

- Various measures are identified to reduce the T & D as well as AT&C losses in FY 2022-23. Some of them are mentioned below:

**Table 3 Details of Recommendation**

| Sl. No | Energy Efficiency Measures | Estimated Annual Energy Savings/Billing Electricity (M KWh) | Estimated Investment (Rs. In Crores) | Monetary Savings (Rs. In Crores) | Simple Payback Period (Months) | Emission Reduction (t $CO_2$) | Eq. Energy Saving (TOE) |
|---|---|---|---|---|---|---|---|
| 1 | ECM 1- Improvement in metering system | 25 | 40 | 18 | 27 | - | - |
| 2 | ECM 2- Improvement & Automation | 34 | 60 | 25 | 31 | 28900 | 2923 |
| **Total** | | **59** | **100** | **43** | **-** | **28900** | **2923** |

## 1.10 Notes On Calculation of Feeder Wise Loss

- Every 11kV Feeder is having RING main supply arrangement under which DTs or HT Consumers are back-feeded through other than normal dedicated feeder based on the system and network requirements. Since the downstream network from feeder to DT is so dynamic in nature that it is very cumbersome to maintain the feeder network connectivity to DT accurately. Such switchovers will trigger the change in normal

network configuration leading to downstream network connectivity and shift the network cut-off points and ultimately the change in grouping of DTs.

- Hence, there could be instances where the Feeder consumption figure would be higher than the figure of energy received at that Feeder. Hence, It is requested to modify this form to exclude Subdivision and Feeder consumption or consider the aggregated figures of consumption and feeder input for all feeders taken together.

- Further, a Feeder can supply load to multiple Division & Subdivision.

## 1.11 Notes On Calculation of DT Wise Loss

- As per Govt. of India Gazette Notification of Bureau of Energy Efficiency (Manner and Intervals for Conduct of Energy Audit (Accounting) in Electricity Distribution Companies) Regulations, 2021 dated 07th October, 2020-21 format for the DT wise Loss computation was not notified. Format is included in the Gazette Notification of Energy Audit Amendment Regulation named as "The Bureau of Energy Efficiency (Manner and Intervals for Conduct of Energy Audit in electricity distribution companies) Amendment Regulations, 2022" dated 28th October, 2022.

### 1.11.1 Constraint to compute DT Wise Loss:

- The downstream network from DT to consumer is dynamic in nature as group of consumers can be shifted from one DT to another DT in that locality hence it is very cumbersome to maintain the DT network connectivity to consumer accurately. The network is being changed during load transfer conditions which triggers to shift the network cut-off points and ultimately the change in grouping of consumers. This poses an acute problem in computing the losses at DT level.
- As per the Bureau of Energy Efficiency (Manner and Intervals for Conduct of Energy Audit in electricity distribution companies) Amendment Regulations, 2022, smart meters installation for consumers to be completed till March 2025. After completion of smart meter installation, deviation between input energy cycle and consumer billing cycle can be eliminated, and actual DT wise loss can be calculated.
- It is requested to consider cluster wise DT loss report instead of individual DT loss report so that energy gaps due to shifting of group of consumers from on DTs to the nearby DTs can be accounted.
- BYPL is submitting Cluster wise loss report to DERC.
- Completion of consumer connect project after getting the approval from Hon'ble commission, Individual DT loss can be calculated.

- It is expected that mapping of low-tension consumers with DTs and LT network on GIS will take 2 years after getting approval from DERC.

- ***Disclaimer***

- The above analysis is based on the details available on publicly available data and the data shared the DISCOM from their MIS/ Dashboard/ R15/ Power BI. Therefore, there may be deviation between the numbers shown in this report and the values shown in the Annual Audit report.

# 2 Background

## 2.1 Extent Regulation and Role of BEE

Recognizing the fact that efficient use of energy and its conservation is an essential part of India's goals to mitigate the gap between demand and supply and to promote economic competitiveness, the Government of India enacted the Energy Conservation Act – 2001.The Act provides for institutionalizing and strengthening delivery mechanisms for energy efficiency services in the country and provides the much-needed coordination between the various organizations and stakeholders, within the Government and in the private sector.

The Government of India has set up Bureau of Energy Efficiency (BEE) (Website: www.beeindia.gov.in) on 1st March, 2002 under the provisions of the Energy Conservation Act, 2001. The mission of 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 primary objective of reducing energy intensity of the Indian economy. Overcoming barriers for financing of energy efficiency is a key policy goal. This will be achieved with active participation of all stakeholders, resulting in accelerated and sustained adoption of energy efficiency in all sectors.

The setting up of Bureau of Energy Efficiency (BEE) provides a legal framework for energy efficiency initiatives in the country. The Act empowers the Central Government and in some instances the State Governments to:

- Notify energy intensive industries, other establishments, and commercial buildings as designated consumers.
- Establish and prescribe energy consumption norms and standards for designated consumers.

- Direct designated consumers to designate or appoint certified energy manager in charge of activities for efficient use of energy and its conservation.
- Get an energy audit conducted by an accredited energy auditor in the specified manner and intervals of time.
- Furnish information with regard to energy consumed and action taken on the recommendation of the accredited energy auditor to the designated agency.
- Comply with energy consumption norms and standards, and if not so, to prepare and implement schemes for efficient use of energy and its conservation.
- Prescribe energy conservation building codes for efficient use of energy and its conservation in commercial buildings State Governments to amend the energy conservation building codes to suit regional and local climatic conditions.
- Direct owners or occupiers of commercial buildings to comply with the provisions of energy conservation building codes.
- Direct mandatory display of label on notified equipment's and appliances.
- Specify energy consumption standard for notified equipment's and appliances.
- Prohibit manufacture, sale, purchase and import of notified equipment and appliances not conforming to standards.

Schedule to EC Act provides list of 15 energy intensive industries and other establishments to be notified as designated consumers (DC).

Section 14 (e) of the EC Act provides that the Central Government may, by notification, in consultation with the Bureau of Energy Efficiency specify any user or class of user of energy as designated consumers which satisfies the following conditions:

i. Energy Quantity or Energy Intensity
ii. Amount of investment required for switching over to energy efficient equipment;
iii. Capacity of the industry to make investment for switching over to energy efficient equipment; and
iv. Availability of the energy efficient machinery and equipment required by the industry.

Since the objective of the Act is to promote energy efficiency and its conservation and consequently to reduce the energy cost, selection of industry for the purpose of declaring it, the Designated Consumer under Section 14(e) of the EC Act should primarily take into account-

(i) total annual energy consumption in Metric Ton of Oil Equivalent;

(ii) Energy intensity; and

(iii) Percentage of Energy cost on total cost, as every designated consumer is always keen to reduce energy consumption as well as energy cost to make its product competitive. in exercise of the powers conferred by clause (g) of sub-section (2) of section 58, read with clause (q) of sub-section (2) of section 13 of the Energy Conservation Act, 2001 (52 of 2001), the Bureau of Energy Efficiency, with the previous approval of the Central Government, hereby makes the following regulations, namely: --Manner and Intervals for Conduct of Energy Audit in electricity distribution companies Regulations, 2021.

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 which is 6th October 2021

### 2.1.1 The objective of BEE

- To develop Policies and Programmers on efficient use of energy and its conservation with the involvement of Stakeholders.
- To Plan manage and implement energy conservation programmers as envisaged in the EC Act.
- To assume leadership and provide policy framework and direction to national energy efficiency and conservation efforts and programmers.
- To demonstrate energy efficiency delivery mechanism, as envisaged in the EC Act, through public – private partnership (PPP).
- To establish systems and procedures to measure, monitor and verify energy efficiency results in individual sectors as well as at the national level.
- To leverage multi-lateral, bi-lateral and private sector support in implementation of programmers and project on efficient use of energy and its conservation.
- To promote awareness of energy saving and energy conservation.

### 2.1.2 Role of BEE

- BEE coordinates with designated agencies, designated consumers and other organization working in the field of energy conservation/efficiency to recognize and utilize the existing resources and infrastructure in performing the functions assigned to the bureau under the energy conservation Act.
- The Act provides regulatory mandate for: standards and labeling of equipment and appliances; energy conservation building code for commercial buildings; and energy consumption norms of energy intensive industries.

- The EC Act was amended in 2010 to incorporate few additional provisions required to better equip BEE to manage ever evolving sphere of energy efficiency in the country.
- Create awareness and disseminate information of energy efficiency and conservation.
- Arrange and organize training of personnel and specialist in the techniques for efficient use of energy and its conservation.
- Strengthen consultancy services in the field of Energy Efficiency.
- Promote research and development.
- Develop testing and certification procedures and promote testing facilities.
- Formulate and facilitate implementation of pilot project and demonstration projects.
- Promote use of energy efficient processes, equipment, devices and systems.
- Take steps to encourage preferential treatment for use of energy efficient equipment or appliances.
- Promote innovative financing of energy efficiency projects.
- Give financial assistance to institution for promoting efficient use of energy and its conservation.
- Prepare educational curriculum on efficient use of energy and its conservation.
- Implement international co-operation programmers relating to efficient use of energy and its conservation.

### 2.1.3 Regulatory framework for Energy Accounting & Audit

The Energy Conservation Act 2001 (hereafter referred to as EC Act. 2001) was enacted on 29th September 2001 & EC (Amendment) Act 2022. The EC Act 2001 & further amendments empowers BEE to notify regulations regarding energy conservation and efficiency improvement in accordance with the EC Act, BEE notified the Bureau of Energy Efficiency (Manner and Intervals for Conduct of Energy Audit) Regulations, 2021, on 6th October 2021. BEE subsequently amended these regulations with the Bureau of Energy Efficiency (Manner and Intervals for Conduct of Energy Audit) (Amendment) Regulations, 2022, The Ministry of Power (MoP) issued guidelines on 17th January 2023 for energy accounting and auditing of distribution companies, in line with the BEE regulations. Distribution companies and energy Audit firms must comply with this regulatory framework when preparing energy accounts and audit reports. The regulatory framework for Energy accounting and Energy Auditing is shown in the below figure:

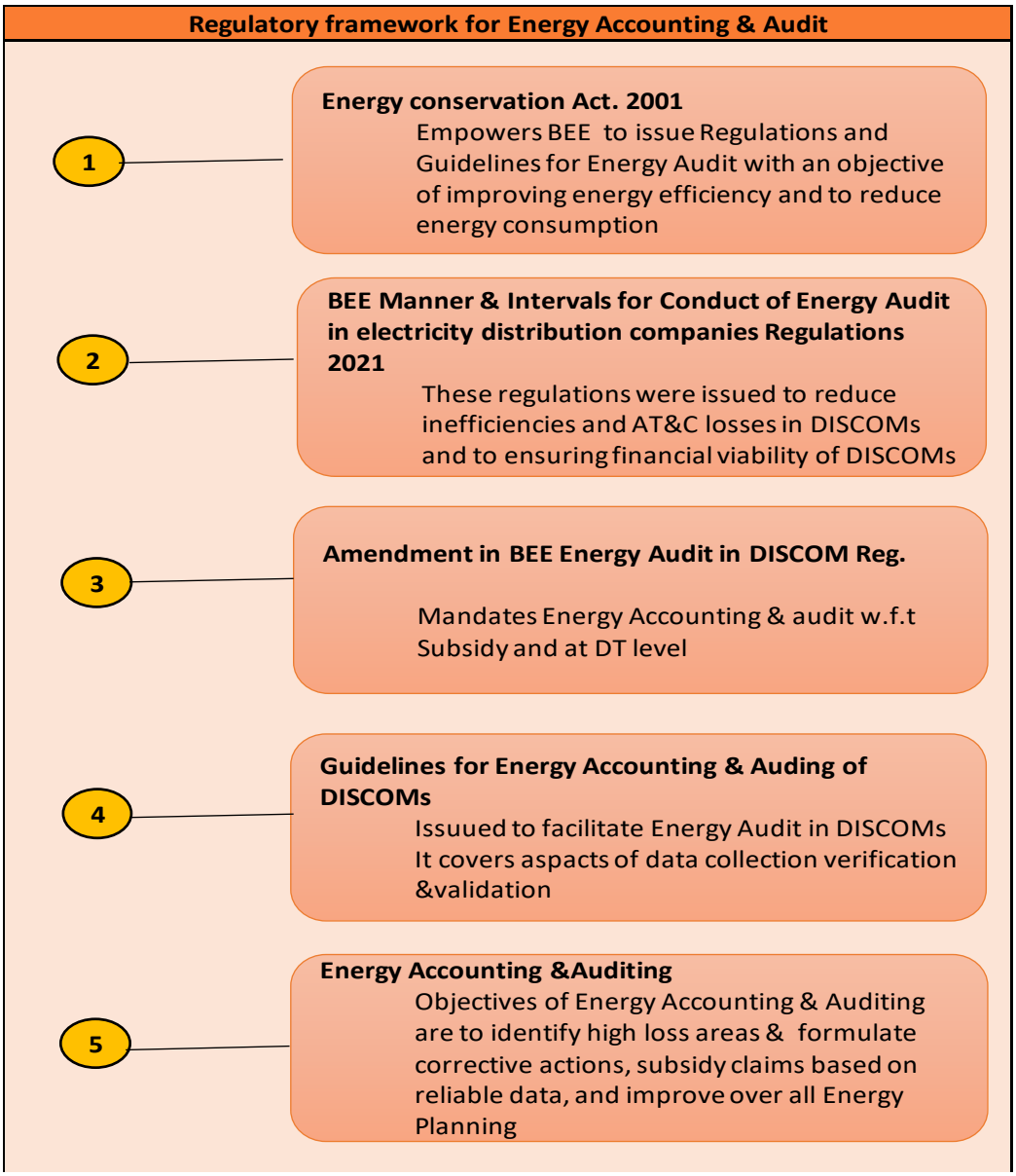



Figure 1Regulatory Framework for Energy Accounting & Audit

#### 2.1.3.1 Key Highlights of the Regulatory Framework Are Listed Below

- The Central Government may issue the energy savings certificate to the designated consumer whose energy consumption is less than the prescribed norms and standards in accordance with the procedure as may be prescribed.
- The designated consumer whose energy consumption is more than the prescribed norms and standards shall be entitled to purchase the energy savings certificate to comply with the prescribed norms and standards

- The Central Government may, in consultation with the Bureau prescribe value of per metric ton of oil equivalent of energy consumed
- Commercial building which are having a connected load of 100kw or contract demand of 120 kva and above brought under the purview under the EC Act.

## 2.2 Purpose of Audit and Accounting Report

BYPL is a designated consumer in Discom sector. Being a designated Consumer BYPL need to haveAnnual energy audit (Accounting) of their facilities as per BEE notification No 18/1/BEE/Discom/2021 dated 6th October 2021.

The energy intensity of India is higher with respect to GDP growth and there is an urgent need to address these issues on priority through integrated and comprehensive approach and by adopting latest techniques and technologies with active participation of all stakeholders.

Sensing the need of the hour Government of India initiated a mechanism for all energy intensive large industries and facilities (designated consumer) known as PAT Scheme which is "A market-based mechanism to enhance cost effectiveness of improvements in energy efficiency in designated consumers, through certification of energy savings that could be traded."

Annual Energy audit (Accounting) will not only help in reducing losses in system but it also helps DISCOM in sustainable growth. The objective of this energy audit is to reduce T&D loss and AT&C loss of the DISCOM through identification of commercially viable and implementable scheme for reduction of technical and commercial loss in the DISCOM thus leading to sustainable energy cost reductions.

The Annual Energy Audit (Accounting) at BYPL is conducted with the following Objectives:

- Verification of existing pattern of energy distribution across periphery of electricity distribution company.
- Verification of accounted energy flow submitted by electricity distribution company at all applicable voltage levels of the distribution network.
- Verification of the accuracy of the data collected and analyse and process the data with respect to consistency, improvement in accounting and reducing loss of DISCOM.

- Verification of the information submitted by DC to the SDA/BEE about status of energy input, Output and loss for the previous two year.
- Access the past performance of the establishment.
- Quantification of Energy Losses, and Energy Saving Potential.

## 2.3 Period of Energy Auditing and Accounting

Energy audit activity was started with a meeting at Head Office of BYPL in the month of June 2023. Based on the requirement visit was made to Division, Subdivision, Grid etc. for data collection and technical discussion. The period of study was from April 2022 to March 2023.

**Table 4 Period of Energy Auditing and Accounting**

| Particulars | Energy Accounting | | | | Energy Audit |
|---|---|---|---|---|---|
| | Q1 | Q2 | Q3 | Q4 | FY22-23 |
| Applicable Period | 1st April 2022 to 30th June 2022 | 1st July 2022 to 30th September 2022 | 1st October 2022 to 31st December 2022 | 1st January 2023 to 31st March 2023 | 1st April 2022 to 31st March 2023 |
| Date Commencement | - | - | - | - | - |
| Date of Publishing | - | - | - | - | - |
| Officer In charge | - | - | - | - | K K Jha (AEA 0007)<br>Reg. No EmAEA 0026 |

The quarterly reports have been sent to BEE by discom.

# 3 Introduction of Discom

## 3.1 Details of BSES- Yamuna Power Ltd. (BYPL)

The details of BYPL are shown in following table.

Table 5 Details of BYPL

| Details of DISCOM – BSES- Yamuna Power Ltd. (BYPL) | | | | |
|---|---|---|---|---|
| **General Details** | | | | |
| Name of the Unit | BSES Yamuna Power Ltd. | | | |
| Year of Establishment | 2002 | | | |
| Government/Public/Private | Private | | | |
| **Contact details & Address** | | | | |
| City/Town/Village | **Karkardooma** | | | |
| District | Delhi | | | |
| State | Delhi | Pin | 110092 | |
| Telephone | 011-41247111 | Fax | 011-41249765 | |
| **Registered Office** | | | | |
| **Name of Chief Executive** | **Sh. Amarjeet Singh** | | | |
| Designation | **CEO** | | | |
| Address | Shakti Kiran Building, Karkardooma | | | |
| City/Town/Village | New Delhi | PO | | |
| District | | | | |
| State | Delhi | Pin | 110092 | |
| Telephone | 011-41249382 | Fax | 011-41249765 | |

## 3.2 Details of Authorised signatory and Energy Manager of BYPL

The PAT-Cell is looked after by Mr. **Devanshu Sharma,** (**General Manager**) and Mr. **Rajesh Srivastava** (Deg) is a BEE certified Energy Manager is leading the energy accounting activities in BYPL. The details of DISCOM'S energy manager and authorized signatory for this report are shown in following table.

Table 6 Details of Authorised Signatory and Energy Manager of BYPL

| Details of Authorised Signatory and Energy Manager (BYPL) | | | |
|---|---|---|---|
| **Nodal Officer Details** | | | |
| **Name of Nodal Officer** | **Sh. Devanshu Sharma** | | |
| Designation | **General Manager** | | |
| Address | Shakti Kiran Buidling, Karkardooma | | |
| City/Town/Village | New Delhi | PO | |
| District | | | |
| State | Delhi | Pin | 110032 |
| Telephone | 011-41249135 | Fax | 011-41249765 |
| **Energy Manager Details** | | | |
| Name of Energy Manager | **Sh Rajesh Srivastava** | | |
| Designation | **Vice-President** | Whether EA/EM | Energy Manager |
| EA/EM Registration No. | EA-24509 | | |
| Telephone | 011-41249842 | Fax | 011-41249765 |
| Mobile | 9350261189 | Email Id | rajesh.r.srivastava@relianceada.com |

## 3.3 Profile of BYPL

BSES with its tagline 'A Journey of Operational Excellence' commenced its operations in Delhi in the year 2002 after the privatization of the Delhi Power Distribution System. While whole Delhi accounts for 4% of total India, BSES mainly operates in West, South, East and Central Delhi while the TPDDL (Formerly known as NDPL) operates in the North Delhi.

Prior to privatization the Delhi power situation was very poor and in dire need of improvements where AT&C Loss Level was more than 63% while the operation reliability only stood at 70%. Even with a govt. support of Rs. 1200 Cr. p.a. the Technology used was of Obsolete Legacy System with the customer service being generalist.

Post-privatization Delhi saw a turnaround in the Delhi Power Distribution System with reduction in AT&C loss, improvement in operational reliability, adoption of an Integrated System Technology and having a customer centric approach.

It has also been certified with ISO - 9001:2015 for Quality Management System, ISO – 14001:2015 for Environment Management System, ISO – 45001-2018 for Occupational Health and Safety Management, ISO/IEC – 27001:2013 for IT Security Management and ISO/IEC 17025:2005 for Testing and calibration Laboratory.

Also, due to its excellence in the field of Power Distribution System, BSES has also been graced with multiple Rewards as well as recognition both National like D L Shah - Quality Council of India, PHDCCI *(PHD Chamber of Commerce)* ICC *(Indian Chambers of Commerce) etc.* as well as international like Stevie Award and British Safety Council Award.

**BSES Yamuna Power Limited (BYPL)**

BYPL is the second largest utility in National Capital of Delhi in terms of Area been served and numbers of consumers been served. Since the privatization, BYPL has traversed a long and successful journey to become one of the most respected utilities in the country. Among various other achievements, BYPL has been successful in drastically bringing down the AT&C Losses from 63 % in FY 2002-03 to 7.26% in FY 2021-22 which by any standard is a significant reduction. BYPL has achieved operational excellence by providing 24X7 reliable and quality power to it consumers for more than two decade. BYPL has transformed itself into a world class utility with integrated state of the art systems, automated processes, and customer friendly value-added services. BYPL 's ever improving customer centering service initiatives at Delhi. In the challenging environment of electricity distribution BYPL is redesigning its business process towards B2C business model. BYPL is Committed towards utilities led Demand Side Management (DSM) program for its consumers and view Energy efficiency as well as DSM as the cheapest resource to be dispatched in Integral Resource planning (IRP). BYPL Power Purchase Portfolio: Nearly 22% power (more than 440 MW) expected from Renewable Energy by 2022-23. Roof Top solar system has been promoted aggressively by BYPL as a result more than 12 MWp roof top solar has been installed in last 3 years.

BYPL is responsible for Central and East Delhi Power Distribution, spread over an area of 180 sq. km catering to a customer base of 1.9 million, with the apparent customer density for it being 10,575 Cons. /sq. km. While the energy billed by BYPL for the customer is 6958 MU, the peak demand of 1752 MW, the monthly consumption per customer stands at 304.6 Kwh/Month. BYPL cater to areas spread over 14 division across Central, North East and South East areas including Chandni Chowk, Darya Ganj, GT Road, Karkardooma, Karawal Nagar, Krishna Nagar, Laxmi Nagar, Mayur Vihar Phase I & II, Mayur Vihar – Phase III, Nandnagri, Pahar Ganj, Patel Nagar, Shankar Road and Yamuna Vihar.

The energy available at the peripheral of Delhi which is procured from generating station and transmitted by Transmission system are used by BYPL, BYPL, TPDDL, NDMC and MES.

### 3.3.1 Details of Energy Accounting /Audit wing of BSES Yamuna Power Limited (BYPL)

The Energy Accounting/Audit wing in the BYPL has been established on 13/12/2021. The Organization details of the DISCOM are as shown below:

**Table 7 Details of Energy accounting/Audit Wing of BYPL**

| Sr. No. | Name | Department | Designation | Responsibility |
|---|---|---|---|---|
| 1 | Sh Rajesh Srivastava | Business | Vice - President | Energy Manager |
| 2 | Sh Govind Gandhi | Finance | General Manager | Financial Manager |
| 3 | Sh Mohan Tahilyani | IT | Dy. General Manager | IT Manager |
| 4 | Sh Devanshu Sharma | PAT Cell & Business | General Manager | Nodal Officer |

**Figure 2 Organisational chart of Energy Accounting/ audit wing of BYPL**

### 3.3.2 Organizational Structure of BSES Yamuna Power Limited (BYPL)

BYPL is having its corporate office at Shakti Kiran Building, Karkardooma, Delhi and has 3 circles. These Circles are further divided into 14 Divisions & 46 Sub Division as shown in the below tables.

**Table 8 Administrative hierarchy structure in BYPL**

| Parameter | Total |
|---|---|
| Number of Circles | 3 |
| Number of Divisions | 14 |
| Number of Sub-Divisions | 46 |

The Circles are further divided into Divisions and Sub- Divisions as shown in the table below:

**Table 9 Administrative hierarchy in BYPL up to Section Level**

| Circle | Division | No. of Sub-Division | Name of Sub-Division | Name of Sections |
|---|---|---|---|---|
| Central | Chandni Chowk | 3 | Hamilton Road | |
| | | | Lahori Gate | |

| | | | | |
|---|---|---|---|---|
| | | | Town Hall | |
| | Darya Ganj | 3 | Daryaganj | |
| | | | Jama Masjid | |
| | | | Minto Road | |
| | Paharganj | 3 | B G Road | |
| | | | Chuna Mandi & Ram Nagar | |
| | | | Pp Quarters | |
| | Shankar Road | 3 | Chhaparwalan | |
| | | | Pusa Road | |
| | | | R Block New Rajender Nagar | |
| | Patel Nagar | 3 | Kikarwalan | |
| | | | Patel Nagar | |
| | | | Sarai Rohilla | |
| North East | GT Road | 3 | E&F Dilshad Garden | |
| | | | Gt Road Shahdra | |
| | | | Zaffrabad | |
| | Yamuna Vihar | 4 | C-12 Yamuna Vihar | |
| | | | Ghonda | |
| | | | New Seelampur | |
| | | | Shastri Park | |
| | Karawal Nagar | 3 | Gokul Puri | |
| | | | Karawal Nagar | |
| | | | Sonia Vihar | |
| | Nand Nagri | 3 | C-4 Nandnagri | |
| | | | Mig East Of Loni Road | |
| | | | Sudama Puri | |
| South - East | Karkardooma | 3 | B-Block Vivek Vihar | |
| | | | Jwala Nagar | |
| | | | Saini Enclave | |
| | Krishna Nagar | 5 | Gagan Vihar | |
| | | | Gandhi Nagar | |

| | | | | |
|---|---|---|---|---|
| | | | Geeta Colony | |
| | | | Kanti Nagar | |
| | | | Krishna Nagar | |
| | Laxmi Nagar | 4 | Anand Vihar Isbt | |
| | | | Laxmi Nagar | |
| | | | Mandawali | |
| | | | Preet Vihar | |
| | Mayur Vihar | 3 | S/Stn 8 Pocket C | |
| | | | Sadar Appartments | |
| | | | Trilokpuri | |
| | Vasundhara Enclave | 3 | Mvr-Iii | |
| | | | New Ashok Nagar | |
| | | | Vasundhara Enclave | |
| **Total** | **14** | **46** | | |

### 3.3.3 Consumer Details of BSES Yamuna Power Limited (BYPL)

The energy received by BYPL in the year 2022-23 and its consumption with type of customer in different segment is shown in following table and figure.

**Table 10 Customer Profile BYPL (FY 2022-23)**

| BYPL Customer Profile | | | | |
|---|---|---|---|---|
| Category | Consumption | | Consumer Number | |
| | MU | % Share | Number | % Share |
| Residential HT | 85 | 1.23% | 43 | 0.00% |
| Residential LT | 4,312 | 61.97% | 1,482,598 | 77.89% |
| Commercial-HT | 308 | 4.43% | 314 | 0.02% |
| Commercial-LT | 1,407 | 20.22% | 406,731 | 21.37% |
| Industrial-HT | 79 | 1.14% | 34 | 0.00% |
| Industrial-LT | 302 | 4.33% | 7,620 | 0.40% |
| Others | 466 | 6.69% | 6,217 | 0.33% |
| Total | 6,958 | 100% | 1,903,557 | 100% |

## 3.4 Electrical infrastructure and assets Voltage wise

### 3.4.1 Network Infrastructure of BSES Yamuna Power Limited (BYPL)

The Details of network Infrastructure owned by BYPL is shown in following table.

**Table 11 Network Infrastructure Details**

| Asset | Particulars | Unit | FY 18-19 | FY 19-20 | FY 20-21 | FY 21-22 | FY 22-23 |
|---|---|---|---|---|---|---|---|
| 66KV and above | 66/11 KV Sub Station | Nos | 20 | 20 | 20 | 20 | 20 |
| | 66 KV feeders | Nos | 60 | 60 | 61 | 61 | 61 |
| | 66 KV Line | CKt KM | 225 | 225 | 235 | 244 | 244 |
| 33kv | 33/11 KV Sub Station | Nos | 33 | 33 | 33 | 33 | 33 |
| | 33 KV feeders | Nos | 105 | 105 | 110 | 110 | 110 |
| | 33 KV Line | CKt KM | 381 | 394 | 422 | 423 | 432 |
| 11kv | 11 KV feeders | Nos | 894 | 924 | 955 | 988 | 998 |
| | 11 KV OH Line | CKt KM | 14 | 14 | 14 | 14 | 14 |
| | 11 KV UG Line | CKt KM | 2869 | 2953 | 3012 | 3123 | 3207 |
| LT | LT Line | CKt KM | 2855 | 2939 | 2998 | 3109 | 3193 |
| PT | Power Transformer | Nos | 5460 | 5560 | 5684 | 5765 | 5915 |
| | Power Transformer capacity | MVA | 162 | 164 | 168 | 168 | 168 |
| DT | Distribution Transformer | Nos | 3778 | 3821 | 3921 | 3930 | 3989 |
| | Distribution Transformer Capacity | MVA | 3946 | 4009 | 4063 | 4101 | 4132 |

The Input energy, consumption, transmission losses and key infrastructure details of the BYPL are summarized in table below:

**Table 12 Input Energy and Infrastructure Details**

| Sr. No | Parameters | UOM | FY 2022-23 |
|---|---|---|---|
| | Input energy purchased | MU | 8704 |
| | Transmission loss | % | 4.70 |

| | | | |
|---|---|---|---|
| | Transmission loss | MU | 409 |
| | Energy sold outside the periphery | MU | 791 |
| | Net input energy (received at DISCOM periphery or at distribution point) | MU | 7503 |
| | Is 100% metering available at 66/33 Kv | Yes/No | Yes |
| | Is 100% metering available at 11 kv | Yes/No | Yes |
| | Metering available at DT | % | 100 |
| | Metering available at consumer end | % | 100 |
| | No of feeders at 66kv voltage level | Nos | 61 |
| | No of feeders at 33kv voltage level | Nos | 110 |
| | No of feeders at 11kv voltage level | Nos | 998 |
| | No of LT feeders' level | Nos | 19,543 |
| | Line length at 66kv voltage level | Ckt KM | 244 |
| | Line length at 33kv voltage level | Ckt KM | 432 |
| | Line length at 11kv voltage level | Ckt KM | 3,207 |
| | Line length at LT level | KM | 5,915 |
| | Length of Aerial Bunched Cables | KM | 3,235 |
| | Length of Underground Cables | KM | 6375 |
| | HT/LT ratio | % | 0.54 |

### 3.4.2 Metering Details of BSES Yamuna Power Limited (BYPL)

The status of meters installed in BYPL as on 31st March 2023 are given in the below tables

**Table 13 voltage wise Metering Details**

| Parameters | 66kv and above | 33kv | 11/22kv | LT |
|---|---|---|---|---|
| Number of conventional metered consumer | BYPL is working on report generation through IT | | | |
| Number of consumers with 'smart' meters | | | | |
| Number of consumers with 'smart prepaid' meters | | | | |
| Number of consumers with 'AMR' meters | | | | |
| Number of consumers with 'non-smart prepaid' meters | | | | |

| | | | |
|---|---|---|---|
| Number of unmetered consumers | | | |
| **Numbers of total consumers** | 3 | 465 | 1903089 |

### 3.4.3 Distribution Transformer (DT) Details of BYPL

The details of distribution transformers in BYPL as on 31st March 2023 are given in the below table:

**Table 14 details of distribution Transformer**

| Parameters | 66kv and above | 33kv | 11/22 kv | LT |
|---|---|---|---|---|
| Number of Conventionally metered Transformers | | | 2174 | NA |
| Number of Trfs with Communicable meters | 70 | 98 | 1959 | NA |
| Number of Unmetered Trfs | - | - | - | NA |
| Number of total transformers | 70 | 98 | 4133 | NA |

### 3.4.4 Feeder Details of BYPL

The details of feeders in BYPL as on 31st March 2023 are given in the below table:

**Table 15 Details of Feeder**

| Parameters | 66kv and above | 33kv | 11/22kv | LT |
|---|---|---|---|---|
| Number of meter feeders | - | - | - | NA |
| Number of feeders with Communicable meters | 61 | 110 | 998 | NA |
| Number of Unmetered feeders | - | - | - | NA |
| Number of total feeders | 61 | 110 | 998 | NA |

### 3.4.5 Distribution Line Details of BYPL

The details of Distribution line in BYPL as on 31st March 2023 are given in the below table:

**Table 16 Length of Distribution Line**

| Particulars | Value(km) |
|---|---|
| Line length (ct km) | 5915 |
| Length of Aerial Bunched Cables | 2799 |

### 3.4.6 Energy Flow Details

Energy flow details for FY 2022-23 are given in the table and figure

**Table 17 Energy Flow Details**

| Trend of BYPL (2022-23) | | | | |
|---|---|---|---|---|
| **Sr. No.** | **Energy Input Details** | **Formula** | **UOM** | **Value** |
| 1 | Purchase Energy (From Generation Source) | A | MU | 8704 |
| 2 | Net Energy Input to Discom (at DISCOM Periphery after adjusting the transmission losses and energy traded) | B | MU | 7,503 |
| 3 | Energy billed (is the Net energy billed, adjusted for energy traded) | C | MU | 6,958.33 |
| 4 | | D | Rs. Crores | 5,592.87 |
| 5 | Average Billing Rate | E=D*10/C | Rs/Kwh | 8.04 |
| 6 | Amount collected | F | Rs. Crores | 5,641.15 |
| | Transmission and Distribution (T&D) Loss | G=B-C | MU | 545.43 |
| 7 | | H= G/B | % | 7.27% |
| 8 | | J=E*G/10 | Rs. Crores | 438.40 |
| 10 | Billing Efficiency | K=C/B | % | 92.73% |
| 11 | Collection efficiency | L=F/D | % | 100.86% |
| 12 | Aggregate Technical & Commercial (AT&C) Loss | M =1-(K*L) | % | 6.47% |

### 3.4.7 Pattern of Energy Distribution in BYPL

Energy flow details for FY 2022-23 are given in the table and figure

**Energy Input:**

During the analyzed period, BYPL's maximum energy input of 867 million units (MUs) in the month of Jun'22, while the least energy input of- 419 MUs was in the month of Nov'22. This shows that the company's energy input varies considerably from month to month irrespective of the seasonal impact.

**Energy Billed:**

The energy billed by BYPL was lowest in Dec'22 – 407 MUs & Highest in Sep'22 – 762 MUs.

The Month wise break up of input energy (MUs) parameter for all divisions is given below:

**Table 18 Month wise input energy for FY 2022-23**

| Division Name | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chandni Chowk | 25.79 | 29.75 | 30.97 | 31.03 | 29.79 | 28.10 | 19.44 | 15.19 | 14.62 | 16.02 | 12.22 | 14.23 | 267.14 |
| Darya Ganj | 51.15 | 60.12 | 62.38 | 62.53 | 58.74 | 53.31 | 35.81 | 28.66 | 30.34 | 34.41 | 24.27 | 29.28 | 531.00 |
| Pahar Ganj | 34.58 | 40.25 | 43.03 | 42.58 | 40.41 | 37.56 | 24.89 | 18.70 | 18.72 | 21.43 | 17.19 | 20.02 | 359.38 |
| Shankar Road | 37.24 | 43.74 | 45.72 | 44.69 | 41.46 | 39.04 | 26.44 | 21.10 | 20.85 | 23.58 | 18.91 | 22.02 | 384.79 |
| Patel Nagar | 42.52 | 48.82 | 51.56 | 51.79 | 48.61 | 45.26 | 31.62 | 26.74 | 27.36 | 30.44 | 24.99 | 28.39 | 458.10 |
| Jhilmil | 43.88 | 52.40 | 54.80 | 53.92 | 50.50 | 45.56 | 31.19 | 24.30 | 25.40 | 29.58 | 22.54 | 25.44 | 459.51 |
| Dilshad Garden | 61.22 | 68.40 | 71.42 | 70.44 | 66.77 | 64.03 | 46.13 | 42.23 | 43.67 | 45.62 | 39.06 | 42.50 | 661.50 |
| Krishna Nagar | 68.17 | 79.26 | 83.31 | 80.90 | 76.86 | 70.64 | 47.64 | 36.21 | 35.30 | 39.68 | 33.47 | 39.10 | 690.53 |
| Laxmi Nagar | 79.31 | 95.83 | 100.36 | 100.20 | 93.27 | 84.56 | 57.76 | 46.39 | 48.91 | 57.10 | 43.84 | 49.16 | 856.67 |
| Mayur Vihar | 40.96 | 49.33 | 51.64 | 52.51 | 48.48 | 41.76 | 28.17 | 24.25 | 25.98 | 29.55 | 22.36 | 25.44 | 440.44 |
| Mayur Vihar - III | 26.37 | 31.74 | 33.19 | 33.27 | 31.27 | 27.73 | 19.50 | 15.50 | 16.60 | 19.57 | 14.70 | 16.94 | 286.39 |
| Yamuna Vihar | 71.97 | 81.58 | 87.13 | 85.90 | 83.74 | 76.12 | 53.61 | 42.13 | 43.57 | 49.05 | 38.18 | 44.62 | 757.58 |
| Karawal Nagar | 70.67 | 80.20 | 84.31 | 85.29 | 80.96 | 73.34 | 54.82 | 44.90 | 46.49 | 52.84 | 41.99 | 48.33 | 764.14 |
| Nandnagri | 55.11 | 63.22 | 66.91 | 66.01 | 63.22 | 56.85 | 40.35 | 33.12 | 34.75 | 40.42 | 31.17 | 35.45 | 586.58 |
| **Total** | 708.93 | 824.64 | 866.73 | 861.09 | 814.08 | 743.86 | 517.36 | 419.41 | 432.56 | 489.29 | 384.89 | 440.92 | 7,503.76 |

The Month wise break up of billed energy (MUs) parameter for all the circle is given below:

**Table 19 Month wise Billed Energy Fy 2022-23**

| Division Name | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chandni Chowk | 17.71 | 23.88 | 26.24 | 26.45 | 25.54 | 27.04 | 21.77 | 16.17 | 14.09 | 13.75 | 13.66 | 14.76 | 241.05 |
| Darya Ganj | 28.93 | 46.66 | 52.45 | 52.65 | 51.99 | 51.49 | 41.25 | 30.00 | 26.61 | 30.19 | 29.02 | 36.96 | 478.19 |
| Pahar Ganj | 23.67 | 33.44 | 37.57 | 37.71 | 36.69 | 37.84 | 29.18 | 20.65 | 18.37 | 18.28 | 18.35 | 15.84 | 327.58 |
| Shankar Road | 25.95 | 38.44 | 41.84 | 41.88 | 40.00 | 40.98 | 32.49 | 24.08 | 21.01 | 21.24 | 21.29 | 18.79 | 367.98 |
| Patel Nagar | 31.06 | 42.84 | 46.42 | 47.57 | 45.99 | 47.06 | 37.25 | 29.09 | 26.69 | 27.74 | 26.60 | 24.02 | 432.34 |
| Jhilmil | 32.42 | 47.05 | 50.88 | 50.76 | 47.79 | 48.31 | 35.66 | 27.41 | 24.84 | 27.31 | 24.72 | 23.14 | 440.30 |
| Dilshad Garden | 46.74 | 60.82 | 65.26 | 64.70 | 62.90 | 64.71 | 52.36 | 42.09 | 42.41 | 42.93 | 40.96 | 37.66 | 623.54 |
| Krishna Nagar | 46.73 | 67.61 | 74.50 | 74.42 | 69.16 | 72.03 | 54.57 | 39.12 | 34.84 | 35.22 | 33.90 | 34.03 | 636.13 |
| Laxmi Nagar | 58.24 | 83.21 | 91.33 | 92.90 | 87.33 | 88.71 | 66.17 | 49.98 | 46.32 | 51.22 | 47.21 | 42.72 | 805.35 |
| Mayur Vihar | 26.42 | 42.56 | 46.13 | 47.00 | 45.26 | 44.44 | 32.19 | 23.65 | 23.92 | 26.24 | 23.65 | 22.92 | 404.38 |
| Mayur Vihar - III | 17.77 | 26.65 | 29.82 | 30.03 | 28.67 | 28.86 | 22.60 | 16.07 | 15.46 | 17.11 | 15.58 | 14.24 | 262.86 |
| Yamuna Vihar | 48.81 | 68.72 | 73.22 | 74.78 | 72.99 | 75.20 | 57.85 | 43.52 | 42.15 | 40.75 | 40.38 | 44.34 | 682.70 |
| Karawal Nagar | 51.83 | 69.97 | 75.49 | 75.96 | 73.78 | 76.43 | 59.19 | 47.60 | 46.13 | 46.77 | 45.13 | 44.88 | 713.15 |
| Nandnagri | 38.08 | 54.69 | 58.46 | 59.48 | 56.85 | 59.09 | 45.22 | 34.62 | 34.27 | 34.87 | 34.08 | 33.04 | 542.77 |
| **Total** | 494.36 | 706.53 | 769.61 | 776.29 | 744.94 | 762.20 | 587.75 | 444.04 | 417.11 | 433.61 | 414.53 | 407.35 | 6,958.33 |

The Voltage wise Consumption Pattern is given below:

**Table 20 Voltage Wise Consumption Pattern**

| Voltage Level | Consumers | | Energy Consumption | |
|---|---|---|---|---|
| | No. | % Share | MUs | % Share |
| **440v** | 1903089 | 99.98% | 6,215.79 | 89.33% |
| **11kv** | 465 | 0.02% | 628.43 | 9.03% |
| **33kv** | | | | |
| **66kv** | 3 | 0.00% | 114.11 | 1.64% |
| **132kV** | - | - | - | - |
| **220kv** | - | - | - | - |
| **Total** | **1903557** | **-** | **6,958.33** | **-** |

### 3.4.8 Salient Features of BYPL

BYPL'S main objectives are to achieve efficiency gains and make necessary changes to make the company commercially viable, progressively self- sustainable, and less dependent on the government while balancing the interests of consumers with regards to quality of service and economical tariffs.

**a) Vision**

BYPL aspires to be the best electricity supply company in India by continuously enhancing its technological leadership and commercial acumen to satisfy its customers,

**b) Mission**

Our Mission is to provide quality electricity supply services to each customer satisfying his/ her needs in most efficient and effective manner at reasonable prices through continuous innovations and by maintaining commercial & financial viability of the company along with employee's satisfaction.

- To ensure a balanced all- round development of power infrastructure in all circles of operation.
- To achieve high standards of consumer satisfaction by committing to Honesty, Transparency and Integrity in all of our actions.
- To achieve technological excellence and financial turnaround for the overall benefit of the consumers.
- To become a self –learning organization focusing on continuous improvement.

**c) Core Values**

To achieve its mission, the company and its employees commit themselves to honesty and integrity, result oriented work, transparency in work, dedication to duty, cost consciousness, openness to suggestions and feedback from all stake holders.

## 3.5 Energy Conservation Measures

Energy conservation is a critical issue in today's World, as the demand for energy continues to increases while the resources available to produce it are finite. The energy conservation measures that have already been taken and propose some measures for the future are explained below.

### 3.5.1 Energy Conservation Measures Already Taken by BYPL

BSES Yamuna Power Ltd has implemented various proactive programs and awareness campaigns to curb demand-supply imbalances and promote the responsible use of electricity, in accordance with the Demand Side Management Regulations – DERC.

Following Initiatives were undertaken over the years in the direction of Demand-side Management and Energy Conservation apart from general awareness to all consumers:

| DSM Activities Undertaken In FY 2022-2023 | | |
|---|---|---|
| S No. | Energy Efficiency Measures | Activity |
| 1 | Tube light Replacement with LED | No replacement done in FY 2022-2023 |
| 2 | Old Fans with Energy Efficient Fans | No replacement done in FY 2022-2023 |
| 3 | Replacement of Old AC's with Energy Efficient AC | No replacement done in FY 2022-2023 |
| 4 | Awareness Programs | 767 Numbers of awareness programs done for energy conservation |
| 5 | Home Automation | MoU signed between BYPL and SE in October 2022 |
| 6 | Smart Innovation Norway | MoU signed between BYPL and SIN in Norway Embassy in February 2023 |
| 7 | Jan Suraksha Muheem For Energy Conservation | 52 number of Jan suraksha Muheem done for safety and Energy Conservation |

Form 3 of FY 2022-23 is enclosed as Attachment 4

### 3.5.2 Proposal for Energy Conservation Measures.

During Energy Audit of establishment all energy consuming equipment and processes studied. The analysis of all major energy consuming equipment and appliances carried out and the same is discussed in earlier section of this report. Based on the analysis Energy conservation measures (ECM) have been identified; each of which are described below:

#### 3.5.2.1 ECM 1: System Improvement and Automation

### *Project*

- System Improvement and Automation

### *Study & investigation*

- Overloaded distribution transformer
- Unbalanced and overloaded LT feeder.
- Network components are old and inefficient
- Old technology for distribution system management
- Hot spot-on termination due to poor termination

### *Recommendation Action*

For the improvement of system, it is recommended to:

- Replace overloaded distribution transformer
- Load Balance DT & LT feeders by shifting of load from overloaded phase to under loaded feeder
- Replace old equipment's, cables with efficient equipment's
- Upgrade Distribution system management
- Do real time health monitoring of DT.
- Replacement of old obsolete network element.
- Addition of new substations to reduce LT length
- Do thermal scanning of electrical joints
- Install pole meters, pole distribution box, lock and revamp feeder pillar.
- Lay new LT feeder to relieve overloaded LT feeders

### *Saving Assessment*

- The cost-benefit analysis of the energy conservation measure is as shown in the table below:

**Table 21 Cost Benefit of Recommendation 1**

| Sl. No | Parameters | Units | Present | Proposed |
|---|---|---|---|---|
| 1 | Energy Available | MU | 7503 | 7468 |
| 2 | T&D Loss | % | 7.27% | 7.15% |
| 3 | T&D Loss | MU | 545 | 534 |

| | | | | |
|---|---|---|---|---|
| 4 | Energy Sale | MU | 6958 | 6934 |
| 5 | Cost of Energy | Rs/Unit | 8.04 | 9.48 |
| 6 | Cost of Energy | Rs. Crores/Year | 5593 | 6575 |
| 7 | Energy Savings | MU/year | 34 | |
| 8 | Annual Rs saved | Rs. Crores/Year | 32 | |
| 9 | Investment required | Rs. Crores | 60 | |
| 10 | Payback Period | Months | 33 | |

## *Action Plan*

| Item | Action |
|---|---|
| **Operation & Maintenance** | Load balancing on DT and LT feeder<br>Replacement of old inefficient equipment's<br>Revamping of pole distribution box, feeder pillar<br>Health monitoring of DT and feeders<br>Thermal scanning of Electrical joints |
| **Replacement** | Defective and overloaded DT, Pole distribution |
| **Procurement** | Pole Meter, DT, Distribution management system, electrical hardware etc. |
| **Construction** | Installation of new 66/33 KV grid substation,<br>Laying of new LT feeders |
| **Costing** | Rs 60 Crores |
| **Project Specific Baseline Parameters** | • Present T&D Loss<br>• Energy Purchase power and power billed |
| **Baseline** | As shown in this section |
| **M&V** | It is proposed to use IPMVP protocol 'C', the 'Whole Facility Method'. Conduct T & D loss calculation before and after implementation in particular segment. |
| **Implication, If any & precaution** | None |
| **Social Benefits** | Reduction in $Co_2$ emission and Improvement in Reliability of power supply |

## *Notes*

- As ECM 1 are having impact on reduction on T& D loss and activities are inter related hence it will be very difficult to quantify the losses due to any isolated activities.
- T&D loss of the year is 7.27 % which is already very near to best achievable value hence the scope of further reduction is very difficult whereas investment is required for

maintain the system as well as T&D loss percentage. This is the reason for high payback period.

- Due to Covid 19 and subsequent lock down consumption is very low for industrial as well as commercial sector. Consumption of certain other sector also got affected due to non-operation of Delhi Metro and Railway.
- It is observed that consumption is low in the area where T&D loss as well as AT&C loss was minimum which means area having high T&D loss and AT&C loss are now major contributor in overall T&D Loss and AT&C loss causing which overall T&D loss as well as AT&C loss may increase

#### 3.5.2.2 ECM 2: Improvement in metering system

##### *Project*

- Improvement in metering system

##### *Study & investigation*

- Advanced technology meter / Smart Meter is very accurate
- Better understanding of energy usages
- Meter box found tampered
- There are some defective meters/aged meters

##### *Recommendation Action*

To improve metering system, it is recommended to install smart meters for better result.

##### *Saving Assessment*

The cost-benefit analysis of the energy conservation measure is as shown in the table below:

**Table 22 Cost Benefit of Recommendation 2**

| Sl. No | Parameters | Units | Present | Proposed |
|---|---|---|---|---|
| 1 | Energy Available | MU | 7503 | 7468 |
| 2 | Billing Efficiency | % | 92.73% | 92.8% |
| 3 | Collection Efficiency | % | 100.86% | 99.80% |
| 4 | AT & C Loss | MU | 6.47% | 7.34% |
| 5 | Energy Sale | MU | 6958 | 6934 |
| 6 | Cost of Energy | Rs/Unit | 8.04 | 9.48 |
| 7 | Cost of Energy | Rs. Crores/Year | 5593 | 6575 |
| 8 | Improvement in Energy Billing | MU/year | 25 | |
| 9 | Annual Rs earned | Rs. Crores/Year | 24 | |

| | | | |
|---|---|---|---|
| 10 | Investment required | Rs. In Crores | 44 |
| 11 | Payback Period | Months | 22 |

### *Action Plan*

| Item | Action |
|---|---|
| **Operation & Maintenance** | |
| **Retrofit** | Smart Energy Meters |
| **Replacement** | Old Meter |
| **Procurement** | Smart Meter |
| **Construction** | The installation and commissioning can be done by in-house staff/ on contract |
| **Costing** | Rs 44 Crores |
| **Project Specific Baseline Parameters** | • Present Billing Efficiency<br>• Present Collection Efficiency<br>• Energy Purchase power and power billed |
| **Baseline** | As shown in this section |
| **M&V** | It is proposed to use IPMVP protocol 'C', the 'Whole Facility Method'. Conduct energy monitoring before and after installation of energy meters |
| **Implication, If any & precaution** | None |
| **Social Benefits** | Reduction in Co2 emission and Confidence building |

# 4 Energy Flow Analysis

## 4.1 Energy Flow Across Five Service Level

- Energy flow between transmission and 220kV/132kV/33kV/20kV/11kV/6.0 kV/3.3 kVincoming distribution feeders
- Energy flow between 132kV/33kV outgoing and 20 kV/11kV/6.6 kV/6.0 kV incomingfeeders
- Energy flow between 11kV/6.0 kV/3.3 kV feeders and distribution transformers, or highvoltage distribution system
- Energy flow between distribution transformer, or high voltage distribution system to endconsumer, including ring main system
- Energy flow between Feeder to end-consumer & Energy flow between 132kV/33kV/20kV/11 kV/6.0 kV/3.3 kV directly to consumer

## 4.2 Validation of Metered Data

**AS per SoP validation of meter data must be as per the below criteria. Accordingly, the metered data validated needs to be elaborated.**

**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 to be captured in the audit report.

**b) Validation of energy flow data losses:** Based on field survey as per the following sample size:

- Min. 10 or1%(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 Division with AT&C losses greater than 25% or at least1/3 of the total Divisions of DISCOM, verify:
  - Total of min. 10 or 1% of metering points (whichever is higher) between 220-132-110-66/33kv 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 is higher) at DTs where communicable meters were already installed under other Schemes such as R-APDRP IPDS.
  - 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), Govt. category connection (ULB,RLB etc.) and LT Industrial

c) **Field verification report** of the activities undertaken in a) and b) above to be included as an annexure to the energy audit report>

# 5 Loss And Subsidy Computation

## 5.1 Energy accounts analysis for FY 2022-23

### 5.1.1 Summary of AT&C Loss

The AT&C losses over the q1, q2, q3, q4 FY 2022-23 and annual AT&C losses for FY 2022-23 are as shown below:

Table 23 AT&C Losses FY 2022-23

| Input Energy and Losses BYPL FY 2022-23 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sr. No. | Energy Input Details | Formula | UOM | Quarterly | | | | FY 22-23 |
| | | | | Q1 | Q2 | Q3 | Q4 | |
| 1 | Purchase Energy (From Generation Source) | A | MU | 2733.9 | 2766.0 | 1608 | 1597 | 8704.4 |
| 2 | Net Energy Input to Discom (at DISCOM Periphery after adjusting the transmission losses and energy traded) | B | MU | 2,400.30 | 2,419.03 | 1,369.33 | 1,315.09 | 7,503 |
| 3 | Energy billed (is the Net energy billed, adjusted for energy traded) | C | MU | 1,970.50 | 2,283.43 | 1,448.91 | 1,255.49 | 6,958.33 |
| 4 | | D | Rs. Crores | 1,507.71 | 1,806.85 | 1,215.69 | 1,062.62 | 5,592.87 |
| 5 | Average Billing Rate | E=D*10/C | Rs/Kwh | 7.65 | 7.91 | 8.39 | 8.46 | 8.04 |
| 6 | Amount collected | F | Rs. Crores | 1,281.90 | 1,785.66 | 1,329.89 | 1,243.70 | 5,641.15 |
| 7 | Transmission and Distribution (T&D) Loss | G=B-C | MU | 429.80 | 135.60 | -79.58 | 59.60 | 545.43 |
| 8 | | H= G*100/B | % | 17.91% | 5.61% | -5.81% | 4.53% | 7.27% |
| 9 | | J=E*G/10 | Rs. Crores | 328.86 | 107.30 | -66.77 | 50.45 | 438.40 |
| 10 | Billing Efficiency | K=C*100/B | % | 82.09% | 94.39% | 105.81% | 95.47% | 92.73% |
| 11 | Collection efficiency | L=F*100/D | % | 85.02% | 98.83% | 109.39% | 117.04% | 100.86% |
| 12 | Aggregate Technical & Commercial (AT&C) Loss | M =1-(K*L) | % | 30.20% | 6.71% | -15.75% | -11.74% | 6.47% |

### 5.1.2 Division wise T&D and AT&C Losses

The Circle wise connected load & input energy, transmission & distribution losses and AT&C loss is given in following table:

**Table 24Division wise T&D and AT&C Loss FY 22022-23**

| Division Wise T&D and AT&C Losses FY 2022-23 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sr. No | Name of Division | No of Connections | Connected Load | Input energy | T&D Loss | | AT&C Loss |
| | | Number | MW | MU | MU | % | % |
| 1 | Chandni Chowk | 99804 | 252.47 | **267** | 26 | 9.77% | 9.89% |
| 2 | Darya Ganj | 74444 | 334.48 | **531** | 53 | 9.94% | 7.00% |
| 3 | Pahar Ganj | 106883 | 267.03 | **359** | 32 | 8.85% | 8.17% |
| 4 | Shankar Road | 68734 | 325.65 | **385** | 17 | 4.37% | 4.42% |
| 5 | Patel Nagar | 110793 | 342.32 | **458** | 26 | 5.62% | 5.40% |
| 6 | Jhilmil | 99193 | 367.03 | **460** | 19 | 4.18% | 3.60% |
| 7 | Dilshad Garden | 118474 | 418.04 | **662** | 38 | 5.74% | 5.41% |
| 8 | Krishna Nagar | 196039 | 504.51 | **691** | 54 | 7.88% | 7.35% |
| 9 | Laxmi Nagar | 204281 | 645.98 | **857** | 51 | 5.99% | 5.46% |
| 10 | Mayur Vihar | 114941 | 295.48 | **440** | 36 | 8.19% | 6.07% |
| 11 | Mayur Vihar - III | 83886 | 199.34 | **286** | 24 | 8.22% | 7.66% |
| 12 | Yamuna Vihar | 217534 | 446.33 | **758** | 75 | 9.88% | 9.63% |
| 13 | Karawal Nagar | 234972 | 459.99 | **764** | 51 | 6.67% | 5.37% |
| 14 | Nandnagri | 173579 | 371.42 | **587** | 44 | 7.47% | 6.26% |
| | **Total** | **1903557** | **5,230.08** | **7504** | 545 | 7.27% | 6.47% |

## 5.2 Energy accounts analysis for FY 2022-23

### 5.2.1 Summary of AT&C Loss

The AT&C losses over the q1, q2, q3, q4 FY 2022-23 and annual AT&C losses for FY 2022-23 are as shown below:

Table 25 AT&C Losses FY 2022-23

| Input Energy and Losses BYPL FY 2022-23 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sr. No. | Energy Input Details | Formula | UOM | Quarterly | | | | FY 2022-23 |
| | | | | Q1 | Q1 | Q1 | Q1 | |
| 1 | Purchase Energy (From Generation Source) | A | MU | 2733.9 | 2766.0 | 1608 | 1597 | 8704.4 |
| 2 | Net Energy Input to Discom (at DISCOM Periphery after adjusting the transmission losses and energy traded) | B | MU | 2,400.30 | 2,419.03 | 1,369.33 | 1,315.09 | 7503 |
| 3 | Energy billed (is the Net energy billed, adjusted for energy traded) | C | MU | 1,970.50 | 2,283.43 | 1,448.91 | 1,255.49 | 6,958.33 |
| 4 | | D | Rs. Crores | 1,507.71 | 1,806.85 | 1,215.69 | 1,062.62 | 5,592.87 |
| 5 | Average Billing Rate | E=D*10/C | Rs/Kwh | 7.65 | 7.91 | 8.39 | 8.46 | 8.04 |
| 6 | Amount collected | F | Rs. Crores | 1,281.90 | 1,785.66 | 1,329.89 | 1,243.70 | 5,641.15 |
| 7 | Transmission and Distribution (T&D) Loss | G=B-C | MU | 429.80 | 135.60 | -79.58 | 59.60 | 545.43 |
| 8 | | H= G*100/B | % | 17.91% | 5.61% | -5.81% | 4.53% | 7.27% |
| 9 | | J=E*G/10 | Rs. Crores | 328.86 | 107.30 | -66.77 | 50.45 | 438.40 |
| 10 | Billing Efficiency | K=C*100/B | % | 82.09% | 94.39% | 105.81% | 95.47% | 92.73% |
| 11 | Collection efficiency | L=F*100/D | % | 85.02% | 98.83% | 109.39% | 117.04% | 100.86% |
| 12 | Aggregate Technical & Commercial (AT&C) Loss | M =1-(K*L) | % | 30.20% | 6.71% | -15.75% | -11.74% | 6.47% |

### 5.2.2 Division wise T&D and AT&C Losses

The Circle wise connected load & input energy, transmission & distribution losses and AT&C loss is given in following table:

Table 26Division wise T&D and AT&C Loss FY 22-23

| Division Wise T&D and AT&C Losses FY 2022-23 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sr. No | Name of Division | No of Connections | Connected Load | Input energy | T&D Loss | | AT&C Loss |
| | | Number | MW | MU | MU | % | % |
| 1 | Chandni Chowk | 99804 | 252.47 | 241 | -15 | 99.86% | 9.77% |
| 2 | Darya Ganj | 74444 | 334.48 | 478 | 31 | 103.27% | 9.94% |
| 3 | Pahar Ganj | 106883 | 267.03 | 328 | 36 | 100.75% | 8.85% |
| 4 | Shankar Road | 68734 | 325.65 | 368 | -11 | 99.94% | 4.37% |
| 5 | Patel Nagar | 110793 | 342.32 | 432 | 49 | 100.24% | 5.62% |
| 6 | Jhilmil | 99193 | 367.03 | 440 | 86 | 100.60% | 4.18% |
| 7 | Dilshad Garden | 118474 | 418.04 | 624 | 68 | 100.35% | 5.74% |
| 8 | Krishna Nagar | 196039 | 504.51 | 636 | 137 | 100.57% | 7.88% |
| 9 | Laxmi Nagar | 204281 | 645.98 | 805 | 160 | 100.56% | 5.99% |
| 10 | Mayur Vihar | 114941 | 295.48 | 404 | 120 | 102.30% | 8.19% |
| 11 | Mayur Vihar - III | 83886 | 199.34 | 263 | 91 | 100.60% | 8.22% |
| 12 | Yamuna Vihar | 217534 | 446.33 | 683 | 219 | 100.28% | 9.88% |
| 13 | Karawal Nagar | 234972 | 459.99 | 713 | 228 | 101.39% | 6.67% |
| 14 | Nandnagri | 173579 | 371.42 | 543 | 168 | 101.31% | 7.47% |
| | **Total** | **1903557** | **5,230.08** | 6958 | 1,365 | 100.86% | 7.27% |

## 5.3 Energy accounts analysis for FY 2022-23

### 5.3.1 Month wise Input energy and billed energy details

The month wise input energy & billed energy for FY 2022-23 of the Discom periphery is shown in below table.

**Table 27 Month wise Input energy & Billed Energy**

| Sl No | Month | Energy Input | Energy billed | | Amount collected |
|---|---|---|---|---|---|
| | | MU | MU | Rs. Crores | Rs. Crores |
| 1 | Apr-22 | 708.93 | 494.36 | 388.39 | 282.03 |
| 2 | May-22 | 824.64 | 706.53 | 531.35 | 455.18 |
| 3 | Jun-22 | 866.73 | 769.61 | 587.97 | 544.70 |
| 4 | Jul-22 | 861.09 | 776.29 | 613.40 | 592.39 |
| 5 | Aug-22 | 814.08 | 744.94 | 591.67 | 597.78 |
| 6 | Sep-22 | 743.86 | 762.20 | 601.79 | 595.48 |
| 7 | Oct-22 | 517.36 | 587.75 | 476.66 | 522.14 |
| 8 | Nov-22 | 419.41 | 444.04 | 381.63 | 434.15 |
| 9 | Dec-22 | 432.56 | 417.11 | 357.39 | 373.60 |
| 10 | Jan-23 | 489.29 | 433.61 | 366.74 | 371.33 |
| 11 | Feb-23 | 384.89 | 414.53 | 357.81 | 372.08 |
| 12 | Mar-23 | 440.92 | 407.35 | 338.08 | 500.29 |
| Total | Total | 7,503.76 | 6,958.33 | 5,592.87 | 5,641.15 |

*Note: Details Sheet Attached in Annexure*

### 5.3.2 Quarterly and annual AT&C losses

The Quarter wise and annual AT &C losses for FY 2022-23 shown in below table.

**Table 28 Energy Input and AT&C Losses FY 2022-23**

| Input Energy and Losses BYPL Fy 2022-23 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sr. No. | Energy Input Details | Formula | UOM | Quarterly | | | | FY 22-23 |
| | | | | Q1 | Q1 | Q1 | Q1 | |
| 1 | Purchase Energy (From Generation Source) | A | MU | 2733.9 | 2766.0 | 1608 | 1597 | 8704.4 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2 | Net Energy Input to Discom (at DISCOM Periphery after adjusting the transmission losses and energy traded) | B | MU | 2,400.30 | 2,419.03 | 1,369.33 | 1,315.09 | 7,503 |
| 3 | Energy billed (is the Net energy billed, adjusted for energy traded) | C | MU | 1,970.50 | 2,283.43 | 1,448.91 | 1,255.49 | 6,958.33 |
| 4 | | D | Rs. Crores | 1,507.71 | 1,806.85 | 1,215.69 | 1,062.62 | 5,592.87 |
| 5 | Average Billing Rate | E=D*10/C | Rs/Kwh | 7.65 | 7.91 | 8.39 | 8.46 | 8.04 |
| 6 | Amount collected | F | Rs. Crores | 1,281.90 | 1,785.66 | 1,329.89 | 1,243.70 | 5,641.15 |
| 7 | Transmission and Distribution (T&D) Loss | G=B-C | MU | 429.80 | 135.60 | -79.58 | 59.60 | 545.43 |
| 8 | | H= G*100/B | % | 17.91% | 5.61% | -5.81% | 4.53% | 7.27% |
| 9 | | J=E*G/10 | Rs. Crores | 328.86 | 107.30 | -66.77 | 50.45 | 438.40 |
| 10 | Billing Efficiency | K=C*100/B | % | 82.09% | 94.39% | 105.81% | 95.47% | 92.73% |
| 11 | Collection efficiency | L=F*100/D | % | 85.02% | 98.83% | 109.39% | 117.04% | 100.86% |
| 12 | Aggregate Technical & Commercial (AT&C) Loss | M =1-(K*L) | % | 30.20% | 6.71% | -15.75% | -11.74% | 6.47% |

**Analysis based on the above table may be provided**

### 5.3.3 Voltage wise AT&C losses

The voltage wise AT&C losses of Discom for FY 2022-23 are as shown in the below table:

**Table 29 Voltage wise AT&C Losses FY 2022-23**

| 4 | Voltage level | Energy Sales Particulars | MU |
|---|---|---|---|
| i | LT level | DISCOM' consumers | 1,903,089 |
| | | Demand from open access, captive | - |
| | | Embedded generation used at LT level | - |
| | | Sale at LT Level | 6,216 |
| | | Quantum of LT level losses | 531 |
| | | Energy Input at LT level | 6,747 |
| ii | 11 kV level | DISCOM' consumers | 465 |

| | | | |
|---|---|---|---|
| | | Demand from open access, captive | - |
| | | Embedded generation at 11 kV level used | - |
| | | Sale at 11 kV Level | 628 |
| | | Quantum of 11 kV level losses | 13 |
| | | Energy Input at 11 kV level | 642 |
| iii | >33 kV level | DISCOM' consumers | 3 |
| | | Demand from open access, captive | - |
| | | Embedded generation at >33 kV or below level | - |
| | | Sale at >33 kV Level | 114 |
| | | Quantum of Losses at >33 kV | 0.65 |
| | | Energy input at >33kV Level | 114.76 |
| | | **Total Energy Requirement** | - |
| | | **Total Energy Sales** | 6,958 |

### 5.3.4 Circle wise AT&C losses analysis

#### 5.3.4.1 Circle Wise connections, load, input energy & Billed energy

Circle Wise connections, load, input energy & Billed energy with Percentage share in different circle is given below the"x" circle having maximum numbers of consumers and "Y" circle having maximum numbers of consumers. "Z" has maximum input energy as well as billed units and "T" have maximum input energy as well as billed units as shown in table:

Table 30 Circle Wise No of consumer, Input Energy & Losses FY 2022-23

| Circle | Total Number of Connection | | Total Connected Load | | Input Energy | | Billed energy | |
|---|---|---|---|---|---|---|---|---|
| | Nos. | % Share | MW | % Share | MU | % Share | MU | % Share |
| Central | 460658 | 24.20% | 1,521.95 | 29% | 2,000.40 | 26.66% | 1,847.15 | 26.55% |
| South East | 698340 | 36.69% | 2,012.34 | 38% | 2,733.55 | 36.43% | 2,549.02 | 36.63% |
| North East | 744559 | 39.11% | 1,695.79 | 32% | 2,769.80 | 36.91% | 2,562.16 | 36.82% |
| Total | 1903557 | | 5230.084 | | 7,503.76 | | 6,958.33 | |

#### 5.3.4.2 Circle- wise AT&C losses

The circle wise AT&C losses are shown in the table below:

**Table 31 Circle wise T&D losses, Collection Efficiency and AT&C Losses**

| Name of circle | Input Energy | Billed energy | | T&D loss | | Collection Efficiency | AT&C loss |
|---|---|---|---|---|---|---|---|
| | MU | MU | Rs. In Cr | (MU) | (%) | % | % |
| **Central** | **2,000.40** | **1,847.15** | **1,758.40** | 153.25 | 7.66% | 100.98% | 6.76% |
| **South East** | **2,733.55** | **2,549.02** | **1,954.32** | 184.53 | 6.75% | 100.83% | 5.98% |
| **North East** | **2,769.80** | **2,562.16** | **1,880.15** | 207.65 | 7.50% | 100.79% | 6.76% |
| **Total** | **7,503.76** | **6,958.33** | **5,592.87** | **545.43** | **7.27%** | **100.86%** | **6.47%** |

***Note:*** *AT&C Loss's calculation as per BEE Performa the calculation is as actual Collection efficiency.*

#### 5.3.4.3 High loss Circle

North East Circle had the highest T&D loss quantum of 208 MUs and Central Circle had the highest T&D loss percentage of 7.66 %. However, when T&D losses (MU) and AT&C losses (%) are seen together than reducing T&D losses in North East Circle must be prioritized in order to have overall reduction in AT&C losses of the DISCOM. Further, the circle with high loss that needs to be prioritized can be identified from the below chart:

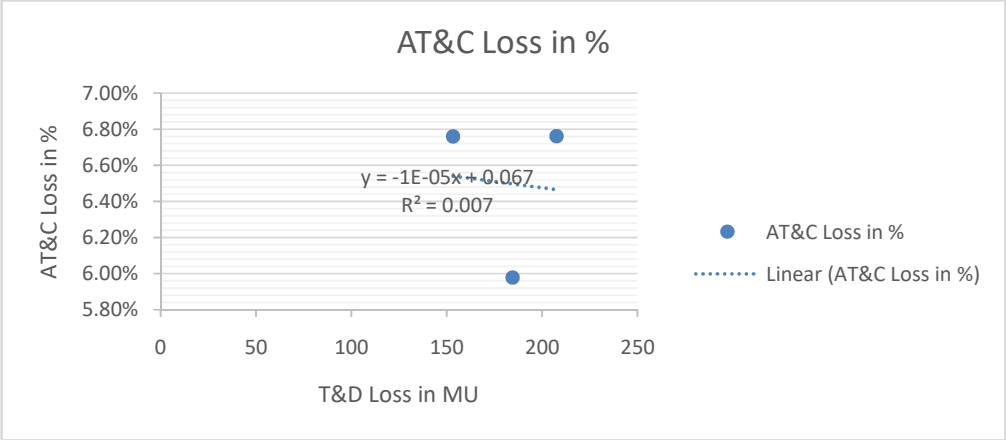



**Figure 3 Circle wise T&D Loss %**

### 5.3.5 Division wise AT&C losses analysis

#### 5.3.5.1 Division- wise AT&C losses

The Division wise AT&C losses are shown in the table below:

**Table 32 Division wise T&D losses, collection efficiency and AT&C Losses**

| Name of Division | Period (2022-23) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Consumer profile | Energy parameters | | | Losses | | Commercial Parameter | | | |
| | Consumer category | No of connection metered (Nos) | Input energy (MU) | Billed energy (MU) Metered energy | T&D loss (MU) | T&D loss (%) | Billed Amount in Rs. Crore | Collected Amount in Rs. Crore | Collection Efficiency | AT & C loss (%) |
| Chandni Chowk | Residential | 36963 | 267 | 99 | 26 | 9.77% | 53.62 | 256 | | |
| | Agricultural | - | | - | | | - | | | |
| | Commercial/ Industrial-LT | 62479 | | 134 | | | 194.38 | | | |
| | Commercial/ Industrial-HT | | | | | | | | | |
| | Others | 362 | | 7 | | | 7.90 | | | |
| | | **99804** | **267** | **240** | **26.09** | **9.77%** | **255.90** | **255.56** | **99.86%** | **9.89%** |
| Darya Ganj | Residential | 52707 | 531 | 204 | 53 | 9.94% | 133.10 | 462 | | |
| | Agricultural | - | | - | | | - | | | |
| | Commercial/ Industrial-LT | 21223 | | 164 | | | 224.40 | | | |
| | Commercial/ Industrial-HT | | | | | | | | | |
| | Others | 514 | | 100 | | | 90.06 | | | |
| | | **74444** | **531.00** | **468** | **52.80** | **9.94%** | **447.56** | **462.20** | **103.27%** | **7.00%** |
| Pahar Ganj | Residential | 61408 | 359 | 178 | 32 | 8.85% | | 294 | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 92.95 | | | |
| | Agricultural | - | | - | | | - | | | |
| | Commercial/ Industrial-LT | 45045 | | 142 | | | | | | |
| | Commercial/ Industrial-HT | | | | | | 190.05 | | | |
| | Others | 430 | | 7 | | | 8.96 | | | |
| | | **106883** | **359.38** | **328** | **31.80** | **8.85%** | **291.97** | **294.14** | **100.75%** | **8.17%** |
| Patel Nagar | Residential | 83672 | 458 | 244 | 26 | 5.62% | 133.16 | 384 | | |
| | Agricultural | 1.00 | | 0.02 | | | 0.01 | | | |
| | Commercial/ Industrial-LT | 26847 | | 178 | | | | | | |
| | Commercial/ Industrial-HT | | | | | | 240.21 | | | |
| | Others | 273 | | 10 | | | 10.14 | | | |
| | | **110793** | **458.10** | **432** | **25.76** | **5.62%** | **383.52** | **384.44** | **100.24%** | **5.40%** |
| Shanker Road | Residential | 37673 | 385 | 165 | 17 | 4.37% | 108.42 | 379 | | |
| | Agricultural | - | | - | | | - | | | |
| | Commercial/ Industrial-LT | 30757 | | 195 | | | | | | |
| | Commercial/ Industrial-HT | | | | | | 263.71 | | | |
| | Others | 285 | | 7 | | | 7.32 | | | |
| | | **68715** | **384.79** | **368** | **16.80** | **4.37%** | **379.45** | **379.22** | **99.94%** | **4.42%** |
| GT Road | Residential | 100042 | 662 | 309 | 38 | 5.74% | 167.10 | 558 | | |
| | Agricultural | 1.00 | | 0.04 | | | 0.01 | | | |
| | Commercial/ Industrial-LT | 18020 | | 302 | | | | | | |
| | Commercial/ Industrial-HT | | | | | | 377.82 | | | |
| | Others | 411 | | 10 | | | 11.05 | | | |
| | | **118474** | **661.50** | **622** | **37.97** | **5.74%** | **555.98** | **557.94** | **100.35%** | **5.41%** |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Karawal nagar | Residential | 201059 | 764 | 487 | 51 | 6.67% | 225.12 | 492 | | |
| | Agricultural | 20.00 | | 0.07 | | | 0.04 | | | |
| | Commercial/ Industrial-LT | 33428 | | 132 | | | 174.61 | | | |
| | Commercial/ Industrial-HT | | | | | | | | | |
| | Others | 465 | | 94 | | | 85.02 | | | |
| | | **234972** | **764.14** | **713** | **50.99** | **6.67%** | **484.79** | **491.55** | **101.39%** | **5.37%** |
| Nand nagri | Residential | 150939 | 587 | 411 | 44 | 7.47% | 211.64 | 380 | | |
| | Agricultural | 15.00 | | 0.05 | | | 0.03 | | | |
| | Commercial/ Industrial-LT | 22092 | | 101 | | | 134.53 | | | |
| | Commercial/ Industrial-HT | | | | | | | | | |
| | Others | 533 | | 30 | | | 29.01 | | | |
| | | **173579** | **586.58** | **543** | **43.81** | **7.47%** | **375.21** | **380.12** | **101.31%** | **6.26%** |
| Yamuna Vihar | Residential | 180965 | 758 | 502 | 75 | 9.88% | 249.77 | 465 | | |
| | Agricultural | 2.00 | | 0.05 | | | 0.01 | | | |
| | Commercial/ Industrial-LT | 35890 | | 153 | | | 190.94 | | | |
| | Commercial/ Industrial-HT | | | | | | | | | |
| | Others | 677 | | 24 | | | 23.45 | | | |
| | | **217534** | **757.58** | **679** | **74.88** | **9.88%** | **464.17** | **465.48** | **100.28%** | **9.63%** |
| Karkardooma | Residential | 83991 | 460 | 316 | 19 | 4.18% | 197.97 | 356 | | |
| | Agricultural | - | | - | | | - | | | |
| | Commercial/ Industrial-LT | 14834 | | 113 | | | 145.14 | | | |
| | Commercial/ Industrial-HT | | | | | | | | | |
| | Others | 368 | | 11 | | | 10.70 | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | **99193** | **459.51** | **440** | **19.22** | **4.18%** | **353.81** | **355.94** | **100.60%** | **3.60%** |
| Krishna Nagar | Residential | 141741 | 691 | 439 | 54 | 7.88% | 238.93 | 502 | | |
| | Agricultural | 1.00 | | 0.03 | | | 0.01 | | | |
| | Commercial/ Industrial-LT | 53874 | | 189 | | | 251.86 | | | |
| | Commercial/ Industrial-HT | | | | | | | | | |
| | Others | 423 | | 8 | | | 8.48 | | | |
| | | **196039** | **690.53** | **635** | **54.40** | **7.88%** | **499.28** | **502.14** | **100.57%** | **7.35%** |
| Laxmi nagar | Residential | 173311 | 857 | 548 | 51 | 5.99% | 314.60 | 649 | | |
| | Agricultural | - | | - | | | - | | | |
| | Commercial/ Industrial-LT | 30454 | | 238 | | | 310.94 | | | |
| | Commercial/ Industrial-HT | | | | | | | | | |
| | Others | 516 | | 19 | | | 19.43 | | | |
| | | **204281** | **856.67** | **805** | **51.33** | **5.99%** | **644.97** | **648.59** | **100.56%** | **5.46%** |
| Mayur Vihar Ph 1 | Residential | 103032 | 440 | 298 | 36 | 8.19% | 158.57 | 291 | | |
| | Agricultural | 1.00 | | 0.04 | | | 0.01 | | | |
| | Commercial/ Industrial-LT | 11504 | | 73 | | | 95.22 | | | |
| | Commercial/ Industrial-HT | | | | | | | | | |
| | Others | 404 | | 33 | | | 30.18 | | | |
| | | **114941** | **440.44** | **404** | **36.06** | **8.19%** | **283.98** | **290.52** | **102.30%** | **6.07%** |
| Mayur Vihar Ph 3 | Residential | 75139 | 286 | 210 | 24 | 8.22% | 111.47 | 173 | | |
| | Agricultural | - | | - | | | - | | | |
| | Commercial/ Industrial-LT | 8451 | | 36 | | | 45.50 | | | |
| | Commercial/ Industrial-HT | | | | | | | | | |
| | Others | 296 | | 16 | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 15.31 | | | |
| | | **83886** | **286.39** | **263** | **23.53** | **8.22%** | **172.28** | **173.32** | **100.60%** | **7.66%** |
| Total | Residential | 1482642 | 7504 | 4410 | 545 | 7.27% | 2396 | 5641 | | 6.47% |
| | Agricultural | 41 | | 0 | | | 0 | | | |
| | Commercial/ Industrial-LT | 414898 | | 2152 | | | 2839 | | | |
| | Commercial/ Industrial-HT | 0 | | 0 | | | 0 | | | |
| | Others | 5957 | | 376 | | | 357 | | | |
| BYPL | | **1903538** | **7504** | **6938** | **545** | **7.27%** | **5593** | **5641** | **100.86%** | **6.47%** |

### 5.3.5.2 High loss division

Yamuna Vihar Division had the highest T&D loss quantum of 74.88 MU and Chandni Chowk Division had the highest AT&C loss percentage of 9.89 %. Further, the circles with high loss that needs to be prioritized can be identified from the below chart:

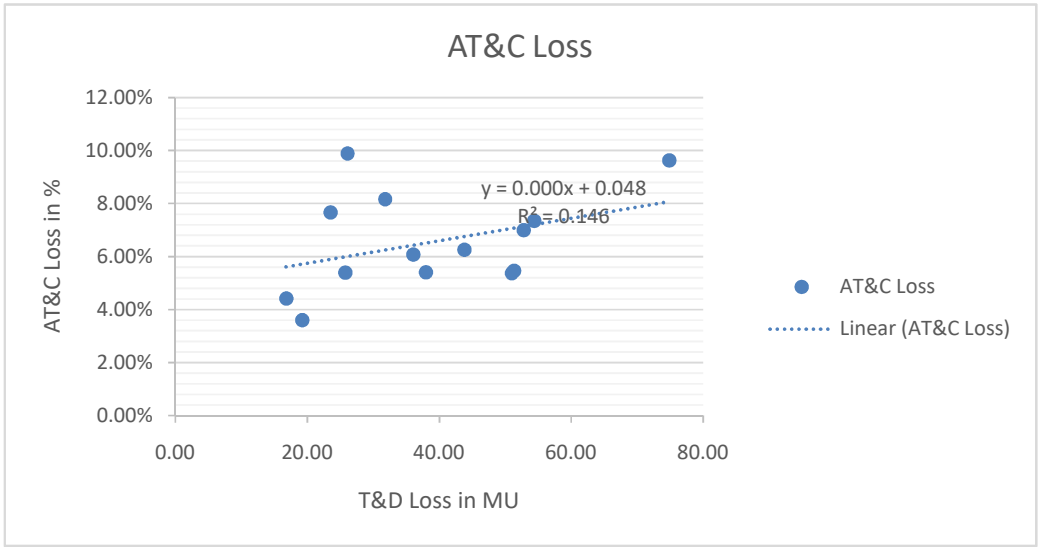



Figure 4 Division Wise T&D Losses in MU Vs In AT&C Loss in %

As seen in following chart AT&C losses increases with increase of T&D losses.

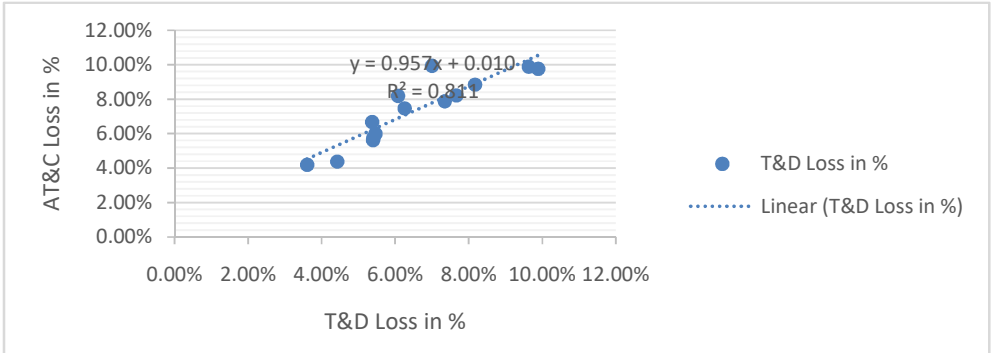


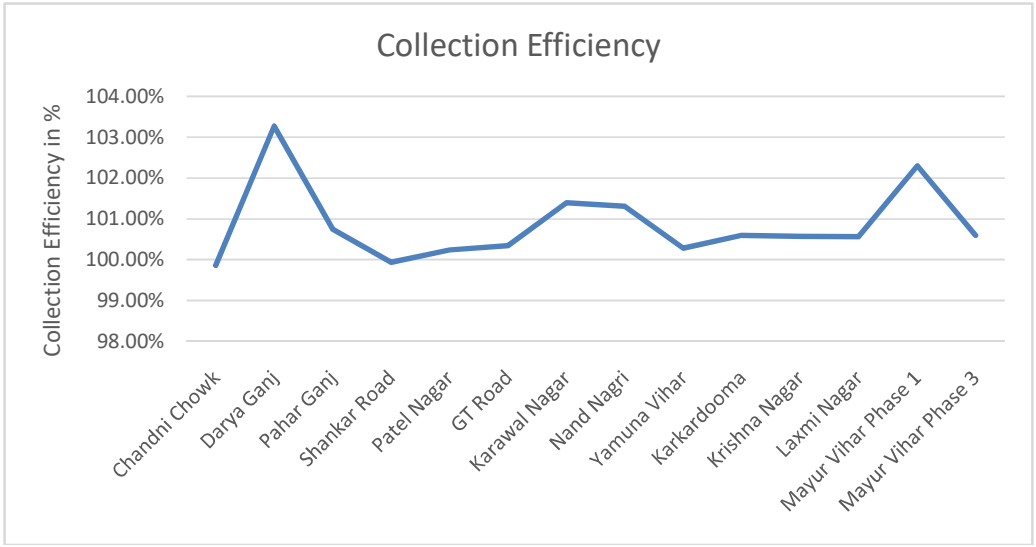

Figure 5 AT&C Loss VS T&D Loss in %

The list of top five number Division with higher AT&C losses (%) & T&D losses (MU) identified from the above chart are tabulated below:

Table 33 Top 5 number division with higher AT&C Losses in % and T&D Losses in MU

| Sr. No. | Division | T&D loss (MU) | AT&C loss (%) |
|---|---|---|---|
| 1 | Yamuna Vihar | 74.88 | 9.63% |
| 2 | Krishna Nagar | 54.40 | 7.35% |
| 3 | Darya Ganj | 52.80 | 7.00% |
| 4 | Pahar Ganj | 31.80 | 8.17% |
| 5 | Chandni Chowk | 26.09 | 9.89% |

Further, it was observed that the collection efficiency is 100% or more across all the Division as shown below:




| Division | Collection Efficiency |
|---|---|
| Chandni Chowk | 99.86% |
| Darya Ganj | 103.27% |
| Pahar Ganj | 100.75% |
| Patel Nagar | 100.24% |
| Shanker Road | 99.94% |
| GT Road | 100.35% |
| Karawal nagar | 101.39% |
| Nand nagri | 101.31% |
| Yamuna Vihar | 100.28% |
| Karkardooma | 100.60% |

| | |
|---|---|
| Krishna Nagar | 100.57% |
| Laxmi nagar | 100.56% |
| Mayur Vihar Ph 1 | 102.30% |
| Mayur Vihar Ph 3 | 100.60% |
| **BYPL** | **100.86%** |

Figure 6 Division wise Collection efficiency

### 5.3.6 Feeder wise AT&C losses analysis

#### 5.3.6.1 Feeder wise AT&C losses

BYPL is ring network, hence losses are calculated division-wise

The Feeder wise losses are as shown in the Table below:

#### 5.3.6.2 Identify high loss feeders

BYPL is ring network, hence losses are calculated division-wise

## 5.4 Subsidy Computation and analysis (based on quarterly data)

### 5.4.1 Subsidy Computation & Analysis (based on quarterly data)

The quarter wise subsidy details during FY 2022-23 are shown in the table below :-

## Table 34 Quarter Wise Subsidy Details

| Category | Energy billed (MU) | Subsidized energy billed (MU) | Tariff (Rs. /kwh) | Subsidy Per Unit (Rs./kwh) | Total Amount Subsidy (Rs. Cr.) | Subsidy received | Balance Subsidy |
|---|---|---|---|---|---|---|---|
| | *1* | *2* | *3* | *4* | *5= 2*4* | *6* | *7=5-6* |
| Opening Subsidy (outstanding) | | | | | 23.92 | | |
| Quarter-1 | | BYPL is working on online preparation of report | NA | NA | | | |
| Residential | 1,296.73 | | | | 188.97 | | |
| Agricultural | 0.08 | | | | 0.01 | | |
| Commercial/Industrial-LT | 463.14 | | | | 0.18 | | |
| Commercial/Industrial-HT | 105.05 | | | | | | |
| Other (specify) | 105.50 | | | | | | |
| Total | 1,970.50 | | | | 189.15 | 0 | |
| Quarter-2 | | | | | | | |
| Residential | 1,516.94 | | | | 198.55 | | |
| Agricultural | 0.09 | | | | 0.01 | | |
| Commercial/Industrial-LT | 518.17 | | | | 0.20 | | |
| Commercial/Industrial-HT | 120.68 | | | | | | |
| Other (specify) | 127.54 | | | | | | |
| Total | 2,283.43 | | | | 198.76 | 252.91 | |
| Quarter-3 | | | | | | | |
| Residential | 853.66 | | | | 187.96 | | |
| Agricultural | 0.07 | | | | 0.01 | | |
| Commercial/Industrial-LT | 400.66 | | | | 0.10 | | |
| Commercial/Industrial-HT | 86.02 | | | | | | |
| Other (specify) | 108.49 | | | | | | |
| Total | 1,448.91 | | | | 188.06 | 0 | |
| Quarter-4 | | | | | | | |
| Residential | 729.99 | | | | 185.33 | | |
| Agricultural | 0.05 | | | | 0.01 | | |
| Commercial/Industrial-LT | 326.36 | | | | 0.15 | | |
| Commercial/Industrial-HT | 75.22 | | | | | | |
| Other (specify) | 123.87 | | | | | | |
| Total | 1,255.49 | | | | 185.48 | 537.47 | |

### 5.4.2 Category Wise subsidy details

The category wise subsidy details are as shown in the table below:

**Table 35 Subsidy details 2022-23**

| Category | Consumer Number | | Billed Energy | | Subsidy | |
|---|---|---|---|---|---|---|
| | Number | % Share | MU | % Share | Rs. In Crore | % Share |
| Agriculture | 41 | 0.00% | 0.29 | 0.00% | 0.03 | 0.00% |
| Commercial-HT | 314 | 0.02% | 307.94 | 4.43% | - | 0.00% |
| Commercial-LT | 406731 | 21.37% | 1,406.80 | 20.22% | 0.63 | 0.08% |
| Residential | 1482641 | 77.89% | 4,397.33 | 63.20% | 760.80 | 99.91% |
| Industrial-HT | 34 | 0.00% | 79.03 | 1.14% | | 0.00% |
| Industrial-LT | 7620 | 0.40% | 301.53 | 4.33% | | 0.00% |
| Others | 6176 | 0.32% | 465.41 | 6.69% | | 0.00% |
| Total | 1903557 | 100.00% | 6,958.33 | 100.00% | 761.46 | 100.00% |

Across the subsidized categories, Residential category accounted for 99.91 % of total Subsidy billed amount.

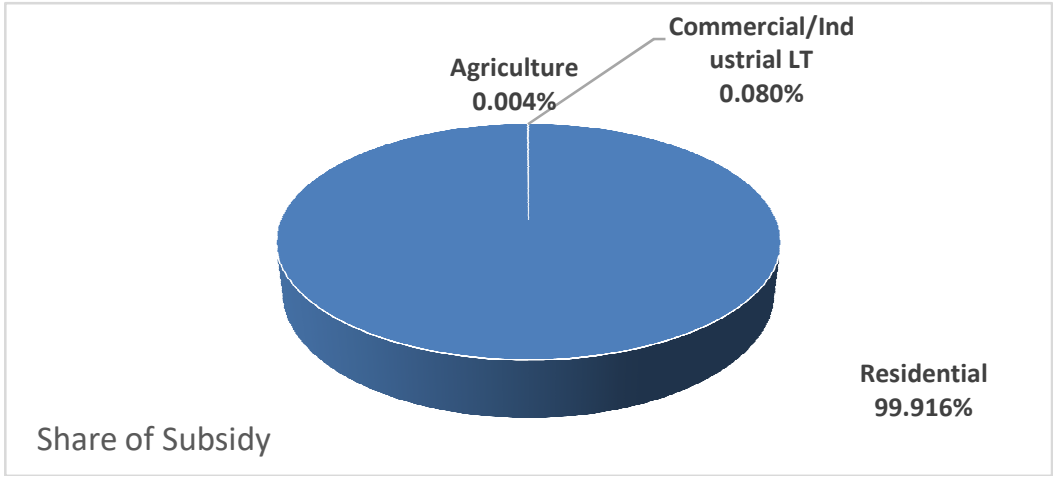


**Figure 7 Category wise Subsidy 2022-23**

Across the Divisions, the Subsidy billed amount ranges between Rs. 14.98 Cr. to Rs. 112.68 Cr. The Subsidy billed amount across Divisions is shown in the below table. Karawal Nagar had the highest Subsidy of 112.68 (Rs.Cr.) and Shankar Road had the lowest Subsidy of 14.98 (Rs. Cr.)

| | | | Billed Energy | Subsidized Energy billed | Tariff | Subsidy Per unit | Subsidy | Subsidy received | Balance subsidy |
|---|---|---|---|---|---|---|---|---|---|
| | | | MU | MU | Rs./KWH | Rs./KWH | Rs in Cr. | Rs in Cr. | Rs in Cr. |
| Circle | Division | Category | 1 | 2 | 3 | 4 | 5=2*4 | 6 | 7=5-6 |
| Central | Chandni Chowk | Residential | 98.96 | | | | 17.67 | | |
| | | Agricultural | - | | | | 0.01 | | |
| | | Commercial/ Industrial-LT | 134.26 | | | | | | |
| | | Commercial/ Industrial-HT | - | | | | | | |
| | | Others | 7.83 | | | | | | |
| | | Total Chandni Chowk | 241.05 | | | | 17.68 | | |
| Central | Darya Ganj | Residential | 204.02 | | | | 25.82 | | |
| | | Agricultural | - | | | | | | |
| | | Commercial/ Industrial-LT | 164.39 | | | | | | |
| | | Commercial/ Industrial-HT | - | | | | | | |
| | | Others | 109.79 | | | | | | |
| | | Total Darya Ganj | 478.19 | | | | 25.82 | | |
| Central | Pahar Ganj | Residential | 177.69 | | | | 28.84 | | |
| | | Agricultural | - | | | | | | |
| | | Commercial/ Industrial-LT | 142.39 | | | | | | |
| | | Commercial/ Industrial-HT | - | | | | | | |
| | | Others | 7.50 | | | | | | |
| | | Total Pahar Ganj | 327.58 | | | | 28.84 | | |
| Central | Patel Nagar | Residential | 244.21 | | | | 42.30 | | |
| | | Agricultural | 0.02 | | | | | | |
| | | Commercial/ Industrial-LT | 178.00 | | | | | | |
| | | Commercial/ Industrial-HT | - | | | | | | |
| | | Others | 10.11 | | | | | | |
| | | Total Patel Nagar | 432.34 | | | | 42.30 | | |
| Central | Shanker Road | Residential | 165.14 | | | | 14.98 | | |
| | | Agricultural | - | | | | | | |
| | | Commercial/ Industrial-LT | 195.46 | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Commercial/ Industrial-HT | - | | | | | | |
| | | Others | 7.39 | | | | | | |
| | | Total Shanker Road | 367.98 | | | | 14.98 | | |
| North East | GT Road | Residential | 309.13 | | | | 50.37 | | |
| | | Agricultural | 0.04 | | | | 0.00 | | |
| | | Commercial/ Industrial-LT | 302.46 | | | | | | |
| | | Commercial/ Industrial-HT | - | | | | | | |
| | | Others | 11.91 | | | | | | |
| | | Total GT Road | 623.54 | | | | 50.37 | | |
| North East | Karawal Nagar | Residential | 486.67 | | | | 112.67 | | |
| | | Agricultural | 0.07 | | | | 0.01 | | |
| | | Commercial/ Industrial-LT | 132.29 | | | | | | |
| | | Commercial/ Industrial-HT | - | | | | | | |
| | | Others | 94.12 | | | | | | |
| | | Total Karawal Nagar | 713.15 | | | | 112.68 | | |
| North East | Nand Nagri | Residential | 411.22 | | | | 84.58 | | |
| | | Agricultural | 0.05 | | | | 0.01 | | |
| | | Commercial/ Industrial-LT | 101.23 | | | | | | |
| | | Commercial/ Industrial-HT | - | | | | | | |
| | | Others | 30.27 | | | | | | |
| | | Total Nand Nagri | 542.77 | | | | 84.59 | | |
| North East | Yamuna Vihar | Residential | 502.22 | | | | 96.66 | | |
| | | Agricultural | 0.05 | | | | 0.00 | | |
| | | Commercial/ Industrial-LT | 152.78 | | | | | | |
| | | Commercial/ Industrial-HT | - | | | | | | |
| | | Others | 27.65 | | | | | | |
| | | Total Yamuna Vihar | 682.70 | | | | 96.66 | | |
| South East | Karkardooma | Residential | 316.40 | | | | 39.64 | | |
| | | Agricultural | - | | | | | | |
| | | Commercial/ Industrial-LT | 112.80 | | | | 0.62 | | |
| | | Commercial/ Industrial-HT | - | | | | | | |
| | | Others | 11.09 | | | | | | |
| | | Total Karkardooma | 440.30 | | | | 40.26 | | |
| South East | Krishna Nagar | Residential | 438.75 | | | | 68.82 | | |
| | | Agricultural | 0.03 | | | | 0.00 | | |
| | | Commercial/ Industrial-LT | 188.89 | | | | | | |
| | | Commercial/ Industrial-HT | - | | | | | | |
| | | Others | 8.46 | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Total Krishna Nagar | 636.13 | | | | 68.82 | | |
| South East | Laxmi Nagar | Residential | 547.56 | | | | 86.67 | | |
| | | Agricultural | - | | | | | | |
| | | Commercial/ Industrial-LT | 238.16 | | | | | | |
| | | Commercial/ Industrial-HT | - | | | | | | |
| | | Others | 19.63 | | | | | | |
| | | Total Laxmi Nagar | 805.35 | | | | 86.67 | | |
| South East | Mayur Vihar Ph I | Residential | 298.01 | | | | 53.77 | | |
| | | Agricultural | 0.04 | | | | 0.00 | | |
| | | Commercial/ Industrial-LT | 72.88 | | | | | | |
| | | Commercial/ Industrial-HT | - | | | | | | |
| | | Others | 33.46 | | | | | | |
| | | Total Mayur Vihar Ph I | 404.38 | | | | 53.77 | | |
| South East | Mayur Vihar Ph III | Residential | 209.98 | | | | 38.02 | | |
| | | Agricultural | - | | | | | | |
| | | Commercial/ Industrial-LT | 36.29 | | | | | | |
| | | Commercial/ Industrial-HT | - | | | | | | |
| | | Others | 16.60 | | | | | | |
| | | Total Mayur Vihar Ph III | 262.86 | | | | 38.02 | | |
| BYPL All Circles | BYPL All Divisions | Residential | 4,409.97 | | | | 760.80 | | |
| | | Agricultural | 0.29 | | | | 0.04 | | |
| | | Commercial/ Industrial-LT | 2,152.27 | | | | 0.62 | | |
| | | Commercial/ Industrial-HT | - | | | | - | | |
| | | Others | 395.80 | | | | - | | |
| | | Total BYPL All Divisions | 6,958.33 | | | | 761.46 | | |

**Figure 8 Division wise Subsidy 2022-23**

## 5.5 Trend analysis and identification of key exceptions

BYPL has commendable AT&C loss level of 6.47% due to many initiatives & focused approach. More concentric approach is required for High loss divisions as mentioned / analysed in above sections.

Comparative performance of DISCOM in last three year is shown in following table

| Comparative Performance of DISCOM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sr. no** | **Description** | **UOM** | **2020-21** | | **2021-22** | | **2022-23** | |
| 1 | Number of Consumer | Million No | 1.77 | | 1.83 | | 1.90 | |
| 2 | Consumer density | Number per SQ KM | 9833.2 | | 10161.7 | | 10575.3 | |
| 3 | Purchase Energy | MU | 7329 | | 8278 | | 8704 | |
| 4 | Cost of purchase Power | Rs/KWH | 7.24 | | 7.63 | | 8.04 | |
| 5 | Peak Demand | MW | 1439 | | 1662 | | | |
| 6 | Net energy to DISCOM | MU | 6374 | | 6683 | | 7504 | |
| 7 | Consumption | MU | 5866 | | 6171 | | 6958 | |
| 8 | Consumption per consumer per month | KWH/Month | 276.2 | | 281.2 | | 304.6 | |
| 9 | T&D Loss | MU | 509 | | 511 | | 545 | |
| 10 | | % | 7.98 | | 7.65 | | 7.27 | |
| 11 | Billing efficiency | % | 92.02 | | 92.35 | | 92.73 | |
| 12 | Collection efficiency | % | 100.57 | | 100.43 | | 100.86 | |
| 13 | AT&C Loss | % | 7.46 | | 7.26 | | 6.47 | |
| 14 | Circle Wise | | | | | | | |
| 14.1 | Lowest T&D Loss | % | South East | 6.21 | South East | 6.30 | South East | 6.75 |
| 14. | Highest T&D | % | Centra | 10.27 | Central | 9.55 | Central | 7.66 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2 | Loss | | l | | | | | |
| 14.3 | Lowest AT&C Loss | % | South East | 5.55 | South East | 5.93 | South East | 5.98 |
| 14.4 | Highest AT&C Loss | % | Central | 9.70 | Central | 9.36 | Central | 6.76 |
| 15 | Division Wise | | | | | | | |
| 15.1 | Lowest T&D Loss | % | Shankar Road | 3.71 | Karkardooma | 4.39 | Karkardooma | 4.18 |
| 15.2 | Highest T&D Loss | % | Darya Ganj | 16.79 | Darya Ganj | 14.78 | Darya Ganj | 9.94 |
| 15.3 | Lowest AT&C Loss | % | Shankar Road | 3.03 | Shankar Road | 3.98 | Karkardooma | 3.60 |
| 15.4 | Highest AT&C Loss | % | Darya Ganj | 16.146 | Darya Ganj | 14.26 | Chandni chowk | 9.89 |

# 6 Energy Audit Finding

As required by clause 5(g) of Bureau of energy efficiency (manner and interval for conduct of energy audit in electricity distribution companies) regulation Energy audit Cell (EAC) comprising of Additional Vice President Mr. Rajesh Srivastavaas Energy Manager, General ManagerMr. Devanshu Sharma as Nodal officer and supported by one Financial Manager (Mr. Govind GandhiGM) and one IT Manager (Mr. Mohan Tahilyani Dy.GM).

This was already informed to BEE vide letter no CEO(BYPL)/21-22/1976 dated 29th December 2021

## 6.1 Review of capacity of DISCOM's energy accounting and audit wing

Details and analysis may be specified such as compliance of staffing in Energy Accounting/ Energy Audit wing w.r.t the Regulations

## 6.2 Critical Analysis

- BYPL provides services to approx. 1.9 million consumers of various categories. The consumer base of DISCOM consists of Domestic, Non-Domestic, Industrial consumers etc.
- While the energy billed by BYPL for the customer is 6958 MU, the monthly consumption per customer stands at 304.6 KWh/Month. BYPL caters to area spread in 180Sq. Km.
- Verified Distribution (T&D) losses, collection efficiency & aggregate technical & commercial losses of BYPL for FY22-23, i.e., 1st April'2022 to 31st March'2023 is 7.27%, 100.86% & 6.47% respectively.
- BYPL has 100 % metering available at all level.

- BYPL 's distribution network consists of3numbers of circles, 14 numbers of divisions, 42 numbers of sub-division, 20712 number of feeders, 4133 number of DTs and 1903557 numbers of consumers.
- Calculation methodology of AT&C Losses, calculated on not more than 100% collection efficiency.
- The electrical energy which is supplied by various interstate Purchase Power agreement at v, 66kv, 33 kv and same is supplied to Customers at 66 kv, 33 kv, 11 kv, 400 v and 230 v single phase.
- BYPL has 100% metering available at 11/33/66 kv system. However, there is 100 % metering at consumer end and 100 % metering available at DT.
- The electrical energy which is supplied by Delhi Transco & Power Grid Corporation Ltd. at 400 KV, 220 KV, 66 KV, 33 KV and same is supplied to customers at 66 KV, 33 KV, 11 KV, 400 V and 230 V single phase.
- Being a Discom BYPL have RPO obligation which will be a certain percentage of energy sale. For the FY 2022-23 it is about 10.25%. It can be fulfilled by either purchasing of power from renewable energy producer or purchasing of REC certificate.
- The objective of this is to promote generation of electricity from renewable source of energy hence for non-compliance; there is a provision for penal action.
- Quantum of electricity generated under Delhi Electricity Regulatory commission (net metering for renewable energy) Regulation 2014 shall qualify towards compliance of renewable purchase obligation (RPO) for the Discom if renewable energy generator is not an obligated entity
- At present source for solar power is from SECI, Thyagraj, Delhi MSW, Roof Top Net Metering etc. The balance is by purchasing of REC certificate.
- The source for non-solar renewable energy is TOWMCL and PTC (Wind) and balance is by purchasing of REC certificate.
- Discom has initiated various activities for Technical Loss reduction as well as AT & C Loss reduction. Some of major activities are mentioned as under.

  ❖ Technical Loss Reduction Activity

  - New Grids, HT and LT feeders
  - DT Addition/ Augmentation for overloaded DT, HVDS
  - Balancing of Load at all voltage levels; Shunt Capacitors at LV
  - LT Less system for Agriculture Pump connections
  - Pole Metering; Group Metering,
  - HVDS Bushing mounted DB
  - New armoured street light Ckts in HVDS area
  - Heat Shrink Coatings on theft prone points in network

- Chemical Joints; Application of Conductive paste on LT bushings to reduce contact resistance
- Commercial Loss Reduction Activity
- Meter Relocation, Old Meter Replacement; MS box with shearing nut arrangement
- Bare conductor with armour cable; Armour cable in place of heavily punctured AB cable span, armoured cast tape to secure joints.
- Enforcement activities - Curbing E-Rickshaw theft, Odd Hour/ Surprise raids, Lady Guards
- Facilitator engagement to support team on the ground
- Surveillance of actions taken and generation of LR leads

1. Specify best & worst performing Circle/ Divisions
2. Areas where in DT loading/ Network loading needs to be improved
3. Areas with low PF/ require Capacity banks installations.
4. High Theft prone areas
5. Improvement /degradation in comparison with previous Years
6. **Specify best & worst performing Circle/ Divisions**

| Category | Best | Worst |
|---|---|---|
| **AT&C** | 5.98% | 6.76% |
| **Circle** | South East | North East |

| Category | Best | Worst |
|---|---|---|
| **AT&C** | 3.60% | 9.89% |
| **Division** | KKD | CCK |

**High Theft prone areas**

| Category | Division | Major Areas | Pockets |
|---|---|---|---|
| High Theft Prone Areas | Darya Ganj | Jama Masjid | Kucha Challan, Gali Pahadwali, Dujana House, Girdharpanna, Mohalla Qabristaan, Turkman Gate, Bulbuli Khana, Chandi Mahal, Chitli Qabar, Chata Lal Mian, Rakabganj & Choodiwalan |
| | Chandni Chowk | Lahori Gate | Lal Darwaza, Jangli Kuan, Chatta Nawab, Farsh Khana, Shahganj Chowk Bridge,Gali Chahshirin,Gali Chabuk Sawar, Ballimaran, Chatta Rajan, Katra Dina Beg ,Phathak Loharu |

| | | | |
|---|---|---|---|
| | Yamuna Vihar | New Seelampur & Ghonda | New Seelampur, Gamri, Chauhan Banger, ,Tikona Park, Babu Ram Chowk, Ghonda village, Welcome, Janta Majdoor Colony & Kabootar Market |
| | Pahar Ganj | BG Road and PP Quarter | Bara Hindo Rao, Chimni Mil, Model Basti, Gali Darjiyan, Basti Julan. Gali Daryajan, Ahata Kidara, Old Quashab Pura, New Quashab Pura, A K Tanki Outside, Choti Masjid, Chamelian Road |
| | Nandnagri | MIG East of Loni Road & Sudamapuri | Loni Border No. 1 & 2, Gokalpur, Chajjupur, Babarpur, Shakti Garden. |
| | Krishna Nagar | Krishna Nagar and Gandhi Nagar | Old Seelampur Village, Ghondli Village, Shastri Park and Pandit park and Kaushik Puri |

**Improvement /degradation in comparison with previous Years***

| | FY 21-22 | | | FY 22-23 | |
|---|---|---|---|---|---|
| Division Name | AT&C Loss (%) | T&D Loss (%) | | AT&C Loss (%) | T&D Loss (%) |
| Chandni Chowk | 13.02% | 12.68% | | 9.89% | 9.77% |
| Darya Ganj | 14.26% | 14.78% | | 7.00% | 9.94% |
| Pahar Ganj | 9.27% | 9.37% | | 8.17% | 8.85% |
| Patel Nagar | 5.63% | 5.31% | | 5.40% | 5.62% |
| Shankar Road | 3.98% | 4.75% | | 4.42% | 4.37% |
| GT Road | 5.29% | 5.92% | | 5.41% | 5.74% |
| Karawal Nagar | 5.63% | 6.41% | | 5.37% | 6.67% |
| Nandnagri | 6.88% | 7.88% | | 6.26% | 7.47% |
| Yamuna Vihar | 10.15% | 10.26% | | 9.63% | 9.88% |
| Karkardooma | 4.18% | 4.39% | | 3.60% | 4.18% |
| Krishna Nagar | 7.15% | 6.85% | | 7.35% | 7.88% |
| Laxmi Nagar | 5.44% | 6.02% | | 5.46% | 5.99% |
| Mayur Vihar | 6.40% | 7.05% | | 6.07% | 8.19% |
| Mayur Vihar - III | 6.28% | 7.70% | | 7.66% | 8.22% |
| **BYPL** | **7.26%** | **7.65%** | | **6.47%** | **7.27%** |

### 6.2.1 Transformer loading & Efficiency analysis

Details of transformer loading & efficiency is discussed as under.

| Parameter | Units | SCHOOL KHATTA- | MOHAN | J EXTN. | U BLOCK | MANDAWALI |
|---|---|---|---|---|---|---|

| | | II,MANDAWALI:PM | PARK LAXMI NAGAR:K | LAXMI NAGAR:PM | SHAKARPUR:PM | ( POST OFFICE):PL |
|---|---|---|---|---|---|---|
| **Rating** | **KVA** | 1000 | 1000 | 1000 | 1600 | 2000 |
| **No Load Loss** | **W** | 1090 | 1090 | 1090 | 1524 | 1800 |
| **Load Loss (100% Loading)** | **W** | 7700 | 7700 | 7700 | 11800 | 15000 |
| **Max. Operating Load** | **KW** | 801 | 738 | 664 | 1271 | 1644 |
| **Avg. Operating Load** | **KW** | 486 | 493 | 398 | 881 | 895 |
| **Power factor @ maximum loading** | **PF** | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 |
| **Max. Operating Load** | **KVA** | 809 | 745 | 671 | 1284 | 1661 |
| **Avg. Operating Load** | **KVA** | 491 | 498 | 402 | 890 | 904 |
| **maximum loading percentage** | **%** | 81% | 75% | 67% | 80% | 83% |
| **Transformer losses at max.** | **KW** | 7.32 | 6.83 | 6.26 | 10.99 | 14.26 |
| | **%** | 0.93% | 0.95% | 0.97% | 0.99% | 1.01% |

Table 36 Transformer Loading and Efficiency analysis

### 6.2.2 Status and Progress in Compliance to pre-requisites to energy accounting

This Energy Audit report is being issued within the timeline stipulated in Regulations and hence no further comments from Energy Auditor with regards to this aspect.

BYPL has submitted all quarterly & annual reports so far. Further, the compliance with regards to Regulations and pre-requisites are tabulated in the table below:

Table 37 Compliance status w.r.t Timelines and Pre-requisites

The pre-requisites have been complied / being complied

| Clause | Details | Sub-Clause | Criteria | Compliance Status |
|---|---|---|---|---|
| 3 | Intervals of time for conduct of annual energy audit | a | Conducted an annual energy audit for every financial year and submitted the annual energy audit report to the Bureau and respective State. Designated Agency and also made available on the website of the electricity distribution company within a period of four months from the expiry of the relevant financial year | |
| 4 | Intervals of time for conduct of periodic energy accounting. | a | All feeder wise, circle wise and division wise periodic energy accounting is conducted by the energy manager of the electricity distribution company for each quarter of the financial year. | |
| | | b | All feeder wise, circle wise and division wise periodic energy accounting is conducted by the energy manager of the electricity distribution company for each quarter of the financial year. | |
| | | c | Electricity distribution company conducted its first periodic energy accounting, for the last quarter of the financial year immediately preceding the date of such commencement (i.e., | |

| Clause | Details | Sub Clause | Criteria | Compliance Status |
|---|---|---|---|---|
| | | | 6thOctober 2021) | |
| | | d | Electricity distribution company conducted 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 and submit the periodic energy accounting report within sixty days from the date of periodic energy accounting. | |
| 5 | Pre-requisites for annual energy audit and periodic energy accounting | a | Pre-requisites for annual energy audit and periodic energy accounting | |
| | | b | Identification and mapping of high tension and low-tension consumers | |
| | | c | Development and implementation of information technology enabled energy accounting and audit system, including associated software | |
| | | d | Electricity distribution company ensures the installation of functional meters for all consumers, transformers and feeders. Meter installation is 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<br>d.1. 100% Communicable Feeder Metering integrated with AMI, by 31st December 2022 along with replacement of existing non-communicable feeder meters. | |
| | | | d.2. 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: | |
| | | | d.2.1. All Electricity Divisions of 500 AMRUT cities, with AT&C Losses > 15% | |
| | | | d.2.2. All Union Territories (for areas with technical difficulty, non-communicable meters may be installed) | |
| | | | d.2.3. All Industrial and Commercial consumers | |
| | | | d.2.4. All Government offices at Block level and above | |
| | | | d.2.5. Other high loss areas i.e., rural areas with losses more than 25% and urban areas with losses more than 15% | |
| | | | d.3. 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: | |

| Clause | Details | Sub-Clause | Criteria | Compliance Status |
|---|---|---|---|---|
| | | | d.3.1. All Electricity Divisions of 500 AMRUT cities, with AT&C Losses > 15%; | |
| | | | d.3.2. All Union Territories (for areas with technical difficulty, prepaid meters to be installed); | |
| | | | d.3.3. All Industrial and Commercial consumers; | |
| | | | d.3.4. All Government offices at Block level and above; | |
| | | | d.3.5. Other high loss areas i.e., rural areas with losses more than 25% and urban areas with losses more than 15%. | |
| | | | d.4. Consumer Metering: 98% by FY 2022-23 99% by FY 2023-24 | |
| | | | d.5. Targets for functional meters - Meter FY 22-23 FY 23-24 FY24-25 Feeder metering 98.5% 99.5% 99.5% DT metering 90% 95% 98% Consumer metering 93% 96% 98 | |
| | | e | e.1. All distribution transformers (other than high voltage distribution system up to 25kVA and other distribution system below 25 kVA) is metered with communicable meters. | |
| | | | e.2. And existing non communicable distribution transformer meters is replaced with communicable meters and integrated with advanced metering infrastructure. | |
| | | f | Electricity distribution company has established an information technology enabled system to create energy accounting reports without any manual interference and such systems may be within a period of three years from the date of the commencement of these regulations in case of urban and priority area consumers; and within five years from the date of the commencement of these regulations in case of rural consumers | |
| | | g | Electricity distribution company has a centralized energy accounting and audit cell comprising of<br>(i) a nodal officer, an energy manager and an information technology manager, having professional experience of not less than five years; and<br>(ii) a financial manager having professional experience of not less than five years | |
| 6 | Reporting requirements for annual energy audit and periodic energy | a | Electricity distribution company has a nodal officer, who is a full time employee of the electricity distribution company in the rank of the Chief Engineer or above, for the purpose of | |

| Clause | Details | Sub-Clause | Criteria | Compliance Status |
|---|---|---|---|---|
| | accounting | | reporting of the annual energy audit and periodic energy accounting and communicate the same to the Bureau | |
| | | b | Electricity distribution company ensures 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. | |
| | | c | Metering of distribution transformers at High Voltage Distribution System up to 25KVA is done on cluster meter installed by the electricity distribution company | |
| | | d | The energy accounting and audit system and software is developed to create monthly, quarterly and yearly energy accounting reports. | |
| | | e | Electricity distribution company has provided 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 | |

**Table 38 Pre-Requisites for Annual Energy Audit and periodic Energy Accounting**

| Sr No | Activity | Status |
|---|---|---|
| 1 | Identification and mapping of all of the electrical network assets. | Identified |
| 2 | Identification and mapping of high tension and low-tension consumers. | Identified & already shared |
| 3 | Development and/or implementation of information technology enabled energy accounting and audit system including associated software; | GEMS, MDAS, SAP Software are used |
| 4 | Electricity distribution company shall ensure installation of functional meters for all consumers, and feeders. It is clarified that meter installation shall be done in a phased manner within a period of 3 financial years from the date of coming into effect of these regulations in accordance with the trajectory as set-out in Annexure 2. | All feeders are having communicable meters – 1169 feeders (66/33/11 KV). |
| 5 | All Distribution Transformers (other than those connected with dedicated / segregated agricultural feeders, HVDS DTs below 25kVA and DTs below 25 kVA) shall be metered with communicable meters. Existing non-communicable Distribution Transformer meters shall also be replaced with communicable meters and integrated with AMI. | Around 50% % Communication meter installed at DTs. Activities are going on for remaining Distribution |

| | | |
|---|---|---|
| | | Transformers. |
| 6 | To establish an IT system to create energy accounting reports without any manual interference. Such system shall be established within a period of 3 years from the date of coming into effect of these regulations for urban and priority area consumers; and within 5 years from the date of coming into effect of these regulations for rural consumers excluding agricultural consumers. | Ongoing |
| 7 | Create a centralized energy accounting and audit cell comprising of nodal officer, energy manager, IT manager (not below 5 years' service experience) and a financial manager (not below 5 years' service experience). | List have already shared (Attached as Attachment 1) |
| 7.1 | Nodal Officer, who shall be a full-time employee of the Electricity Distribution Company in the rank of the Chief Engineer or above and also having professional experience of not less than five years. | List have already shared |
| 7.2 | 1 Energy Manager, 1 Financial Manager and 1 IT Manager, having professional experience of not less than five years. | List have already shared |

### 6.2.3 Data gaps

The Audit firm has raised the data gaps to the DISCOM dated 17/07/2023 and the DISCOM has submitted the details to the Audit firm dated 18/07/2023. The Summary of data gaps raised and response from DISCOM is summarized in the table below:

**Table 39 Summary of Data gaps**

| Sr.No. | Data gaps raised by Energy Auditor | Response shared by DISCOM | Status data submission by DISCOM |
|---|---|---|---|
| 1 | Voltage-wise & meter-type wise segregation of consumers | Working for online availability of report / data | Yes |
| 2 | Subsidized Energy Billed (MU) | Working for online availability of report / data | Yes |

Comments of BEE data sheet is discussed as under.

**Table 40 Comments on BEE format**

| Sr. No | Reference Data Sheet | Comments & Queries | Remarks |
|---|---|---|---|
| 1 | General information sheet | Nil | Nil |
| 2 | Input Infrastructure | T&D Loss and D Loss | Since T&D Loss and D loss is same for DISCOMs so D loss to be removed from modified format. |
| 3 | Input energy injection point | Zone, Circle, Division & Sub-division column | Net Input energy at DISCOM periphery is calculated based on Import/Export interface ABT meters installed at Transco level.<br>The Transco ABT meters are installed on incoming feeders (66kV/33kV) feeding to DISCOM Grid.<br>Outgoing 11kV feeders connected to Distribution Transformer located in different Divisions / Subdivisions.<br>11kV feeders can be segregated in division but 66/33kV Feeders can't be segregated into Division / Subdivision level.<br>Based on Above fact modification of Part B Table is required and Zone, Circle, Division & Sub-division column to be excluded from the Form. |
| 4 | Input energy source | POC Loss Calculation and voltage level | BYPL is purchasing power from different generating station situated at different states and connected through national, regional and state level grid hence generating station wise POC loss is not feasible. Generating station voltage level is also not feasible as BYPL is receiving power mostly at 66 KV level and 33 KV level. In view of above fact POC loss and voltage level to be excluded from Input Energy Source form. |
| 5 | Embedded generation | Circle, Division and subdivision wise embedded generation | Circle and Division wise distribution of embedded generation is given in attached file Note- MU means Million units (kwh) |

| Sr. No | Reference Data Sheet | Comments & Queries | Remarks |
|---|---|---|---|
| 6 | Details of consumer | Nil | Nil |
| 7 | Feeder wise loss | Individual Feeder wise loss calculation is not feasible | Every 11kV Feeder is having RING main supply arrangement under which DTs or HT Consumers are back-feeded through other than normal dedicated feeder based on the system and network requirements. Since the downstream network from feeder to DT is so dynamic in nature that it is very cumbersome to maintain the feeder network connectivity to DT accurately. Such switchovers will trigger the change in normal network configuration leading to downstream network connectivity and shift the network cut-off points and ultimately the change in grouping of DTs.<br>Further, a Feeder can supply load to multiple Division & Subdivision.<br>Based on above fact feeder wise loss sheet to be modified suitably.<br>T&D Loss for feeders to be calculated on YTM basis instead of quarterly basis. |
| 8 | Division Wise loss | Loss calculation on quarterly basis | T&D Loss & AT&C Loss should be computed on YTM Basis instead of Quarterly Basis |
| 9 | Subsidy Reconciliation | NIL | NIL |

## 6.3 Revised finding based on data validation and field verification

40 DTs & 44 feeders were analysed & field verification done. Data & images attached as attachment 13 & 14.

## 6.4 Inclusions and Exclusions

### 6.4.1 Input Energy Details & Infrastructure

- Net Input energy at DISCOM periphery is calculated based on Import/Export interface ABT meters installed at Transco level.

- The Transco ABT meters are installed on incoming feeders (66kV/33kV) feeding to DISCOM Grid.
- Outgoing 11kV feeders connected to Distribution Transformer located in different Divisions / Subdivisions.
- 11kV feeders can be segregated in division but 66/33kV Feeders can't be segregated into Division / Subdivision level.
- Similar format (Form 1, Part B) is also being submitted during PAT Cycle-II submissions, under which Division and Sub-division was not included.

### 6.4.2 Details of Feeder Levels

- Name of the Station: Name of DISCOM Grid Station
- Received at Feeder (Final): Energy at 11kV Feeder level emanating from DISCOM Grid
- Feeder consumption: Summation of energy recorded at Distribution Transformer and HT Consumer connected to a respective 11kV Feeder

Every 11kV Feeder is having RING main supply arrangement under which DTs or HT Consumers are back-feeded through other than normal dedicated feeder based on the system and network requirements. Since the downstream network from feeder to DT is so dynamic in nature that it is very cumbersome to maintain the feeder network connectivity to DT accurately. Such switchovers will trigger the change in normal network configuration leading to downstream network connectivity and shift the network cut-off points and ultimately the change in grouping of DTs.

Hence, there could be instances where the Feeder consumption figure would be higher than the figure of energy received at that Feeder. Hence, It is requested to modify this form to exclude Subdivision and Feeder consumption or consider the aggregated figures of consumption and feeder input for all feeders taken together.

Further, a Feeder can supply load to multiple Division & Subdivision. A sample SLD is enclosed wherein the Cut-off points have been marked as **X** through which supply changeovers can be performed.

### 6.4.3 Generating Station wise POC Loss Calculation

BYPL is purchasing power from different generating station situated at different states and connected through national, regional and state level grid hence generating station wise POC loss is not feasible. Generating station voltage level is also not feasible as BYPL is receiving power mostly at 66 KV level and 33 KV level. In view of above fact POC loss and voltage level to be excluded from Input Energy Source form.

NRSLDC is not calculating POC loss based on Generating station wise but calculating POC loss for all inter-state generation on weekly basis whereas SLDC /DTL is declaring POC loss and state transmission unit (STU) basis not on generating unit basis.

### 6.4.4 Division and Subdivision wise distribution of embedded generation

| S. No. | Name of Generation Station | Generation Capacity (In MW) | Based-Solid/Liquid/Gas | Type of Contract | Type of Grid | Voltage Level (KV) | Circle Load (MW) | Received at Circle (KV) | Received at Circle (MU) | Division Level Load (MW) | Received at Division Level (KV) | Received at Division Level (MU) | Sub-Division Level Load (MW) | Received at Sub-Division Level (KV) | Received at Sub-Division Level (MU) | Remarks (Source of data) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Roof Top Solar System | 2.00 | Solar | Net Metering | Intrastate | 11 KV | | 11 KV | | | 11 KV | | | 11 KV | | Chandni Chowk |
| 2 | Roof Top Solar System | 0.03 | Solar | Net Metering | Intrastate | 230 V | | 230 V | | 2.42 | 230 V | 0.86 | 2.42 | 230 V | 0.86 | Chandni Chowk |
| 3 | Roof Top Solar System | 0.39 | Solar | Net Metering | Intrastate | 415 V | | 415 V | | | 415 V | | | 415 V | | Chandni Chowk |
| 4 | Roof Top Solar System | 4.83 | Solar | Net Metering | Intrastate | 11 KV | | 11 KV | | | 11 KV | | | 11 KV | | Daryaganj |
| 5 | Roof Top Solar System | 0.05 | Solar | Net Metering | Intrastate | 230 V | | 230 V | | 5.69 | 230 V | 4.29 | 5.69 | 230 V | 4.29 | Daryaganj |
| 6 | Roof Top Solar System | 0.81 | Solar | Net Metering | Intrastate | 415 V | | 415 V | | | 415 V | | | 415 V | | Daryaganj |
| 7 | Roof Top Solar System | 1.04 | Solar | Net Metering | Intrastate | 11 KV | | 11 KV | | | 11 KV | | | 11 KV | | Pahar Ganj |
| 8 | Roof Top Solar System | 0.02 | Solar | Net Metering | Intrastate | 230 V | 12.41 | 230 V | 8.26 | 1.35 | 230 V | 0.43 | 1.35 | 230 V | 0.43 | Pahar Ganj |
| 9 | Roof Top Solar System | 0.30 | Solar | Net Metering | Intrastate | 415 V | | 415 V | | | 415 V | | | 415 V | | Pahar Ganj |
| 10 | Roof Top Solar System | 0.06 | Solar | Net Metering | Intrastate | 11 KV | | 11 KV | | | 11 KV | | | 11 KV | | Patel Nagar |
| 11 | Roof Top Solar System | 0.10 | Solar | Net Metering | Intrastate | 230 V | | 230 V | | 1.42 | 230 V | 1.53 | 1.42 | 230 V | 1.53 | Patel Nagar |
| 12 | Roof Top Solar System | 1.26 | Solar | Net Metering | Intrastate | 415 V | | 415 V | | | 415 V | | | 415 V | | Patel Nagar |
| 13 | Roof Top Solar System | 0.54 | Solar | Net Metering | Intrastate | 11 KV | | 11 KV | | | 11 KV | | | 11 KV | | Shankar Road |
| 14 | Roof Top Solar System | 0.08 | Solar | Net Metering | Intrastate | 230 V | | 230 V | | 1.53 | 230 V | 1.14 | 1.53 | 230 V | 1.14 | Shankar Road |
| 15 | Roof Top Solar System | 0.91 | Solar | Net Metering | Intrastate | 415 V | | 415 V | | | 415 V | | | 415 V | | Shankar Road |
| 16 | Roof Top Solar System | 0.34 | Solar | Net Metering | Intrastate | 11 KV | | 11 KV | | | 11 KV | | | 11 KV | | Gt Road |
| 17 | Roof Top Solar System | 0.12 | Solar | Net Metering | Intrastate | 230 V | | 230 V | | 1.49 | 230 V | 1.52 | 1.49 | 230 V | 1.52 | Gt Road |
| 18 | Roof Top Solar System | 1.03 | Solar | Net Metering | Intrastate | 415 V | | 415 V | | | 415 V | | | 415 V | | Gt Road |
| 19 | Roof Top Solar System | 3.47 | Solar | Net Metering | Intrastate | 11 KV | | 11 KV | | | 11 KV | | | 11 KV | | Karawal Nagar |
| 20 | Roof Top Solar System | 0.07 | Solar | Net Metering | Intrastate | 230 V | 8.10 | 230 V | 8.03 | 3.68 | 230 V | 4.52 | 3.68 | 230 V | 4.52 | Karawal Nagar |
| 21 | Roof Top Solar System | 0.14 | Solar | Net Metering | Intrastate | 415 V | | 415 V | | | 415 V | | | 415 V | | Karawal Nagar |
| 22 | Roof Top Solar System | 0.97 | Solar | Net Metering | Intrastate | 11 KV | | 11 KV | | | 11 KV | | | 11 KV | | Nand Nagri |
| 23 | Roof Top Solar System | 0.09 | Solar | Net Metering | Intrastate | 230 V | | 230 V | | 2.12 | 230 V | 1.24 | 2.12 | 230 V | 1.24 | Nand Nagri |
| 24 | Roof Top Solar | 1.06 | Solar | Net Meter | Intrasta | 415 V | | 415 V | | | 415 V | | | 415 V | | Nand Nagri |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | System | | | ing | te | | | | | | | | | | | |
| 25 | Roof Top Solar System | 0.04 | Biowaste | Net Metering | Intrastate | 415 V | | 415 V | | 0.81 | 415 V | 0.75 | 0.81 | 415 V | 0.75 | Yamuna Vihar |
| 26 | Roof Top Solar System | 0.17 | Solar | Net Metering | Intrastate | 11 KV | | 11 KV | | | 11 KV | | | 11 KV | | Yamuna Vihar |
| 27 | Roof Top Solar System | 0.09 | Solar | Net Metering | Intrastate | 230 V | | 230 V | | | 230 V | | | 230 V | | Yamuna Vihar |
| 28 | Roof Top Solar System | 0.52 | Solar | Net Metering | Intrastate | 415 V | | 415 V | | | 415 V | | | 415 V | | Yamuna Vihar |
| 29 | Roof Top Solar System | 1.34 | Solar | Net Metering | Intrastate | 11 KV | 14.12 | 11 KV | 12.47 | 3.47 | 11 KV | 3.18 | 3.47 | 11 KV | 3.18 | Karkar Dooma |
| 30 | Roof Top Solar System | 0.55 | Solar | Net Metering | Intrastate | 230 V | | 230 V | | | 230 V | | | 230 V | | Karkar Dooma |
| 31 | Roof Top Solar System | 1.58 | Solar | Net Metering | Intrastate | 415 V | | 415 V | | | 415 V | | | 415 V | | Karkar Dooma |
| 32 | Roof Top Solar System | 0.04 | Biowaste | Net Metering | Intrastate | 415 V | | 415 V | | 1.04 | 415 V | 0.98 | 1.04 | 415 V | 0.98 | Krishna Nagar |
| 33 | Roof Top Solar System | 0.04 | Solar | Net Metering | Intrastate | 11 KV | | 11 KV | | | 11 KV | | | 11 KV | | Krishna Nagar |
| 34 | Roof Top Solar System | 0.29 | Solar | Net Metering | Intrastate | 230 V | | 230 V | | | 230 V | | | 230 V | | Krishna Nagar |
| 35 | Roof Top Solar System | 0.67 | Solar | Net Metering | Intrastate | 415 V | | 415 V | | | 415 V | | | 415 V | | Krishna Nagar |
| 36 | Roof Top Solar System | 3.75 | Solar | Net Metering | Intrastate | 11 KV | | 11 KV | | 7.08 | 11 KV | 5.92 | 7.08 | 11 KV | 5.92 | Laxmi Nagar |
| 37 | Roof Top Solar System | 0.20 | Solar | Net Metering | Intrastate | 230 V | | 230 V | | | 230 V | | | 230 V | | Laxmi Nagar |
| 38 | Roof Top Solar System | 3.14 | Solar | Net Metering | Intrastate | 415 V | | 415 V | | | 415 V | | | 415 V | | Laxmi Nagar |
| 39 | Roof Top Solar System | 0.32 | Solar | Net Metering | Intrastate | 11 KV | | 11 KV | | 1.55 | 11 KV | 1.59 | 1.55 | 11 KV | 1.59 | Mayur Vihar i&ii |
| 40 | Roof Top Solar System | 0.13 | Solar | Net Metering | Intrastate | 230 V | | 230 V | | | 230 V | | | 230 V | | Mayur Vihar i&ii |
| 41 | Roof Top Solar System | 1.09 | Solar | Net Metering | Intrastate | 415 V | | 415 V | | | 415 V | | | 415 V | | Mayur Vihar i&ii |
| 42 | Roof Top Solar System | 0.20 | Biowaste | Net Metering | Intrastate | 11 KV | | 11 KV | | 0.99 | 11 KV | 0.79 | 0.99 | 11 KV | 0.79 | Vasundhra Enclave |
| 43 | Roof Top Solar System | 0.11 | Solar | Net Metering | Intrastate | 11 KV | | 11 KV | | | 11 KV | | | 11 KV | | Vasundhra Enclave |
| 44 | Roof Top Solar System | 0.03 | Solar | Net Metering | Intrastate | 230 V | | 230 V | | | 230 V | | | 230 V | | Vasundhra Enclave |
| 45 | Roof Top Solar System | 0.64 | Solar | Net Metering | Intrastate | 415 V | | 415 V | | | 415 V | | | 415 V | | Vasundhra Enclave |

### 6.4.5 Period for T&D Loss and AT&C loss calculation

T&D Loss & AT&C Loss should be computed on YTM Basis instead of Quarterly Basis.

# 7 Conclusion and Action Plan

## 7.1 Summary of critical analysis and way forward proposed by Energy Auditor

The Primary energy- consuming areas are the distribution network, the office buildings, and the fleet of vehicles used for maintenance and repairs. The distribution network accounts for the majority of energy consumption, followed by office building and vehicles.

### 7.1.1 Areas of Inefficiencies:

- **LT/HT Ratio:** Increasing HT lines can help in reducing both line losses and voltage drops. Efforts should be made to achieve a low LT/HT ratio, which would be very beneficial for improving efficiency of power distribution in BYPL.
- **Vehicle conversion :** BYPL may take-up conversion of vehicles to EVs as it is having large fleet

### 7.1.2 Recommendations:

BYPL has already achieved AT &C loss level of 6.47%. Focused approach can be adopted for divisions which are operating at higher AT&C loss level than BYPL's at company level.

### 7.1.3 Cost- Benefit Analysis:

To determine the cost- effectiveness of the recommended measures, a cost- benefit analysis should be conducted. The cost of implementing the measures should be compared to the potential energy saving to determine the return on investment. This analysis will help the company prioritize the implementation of the recommended measures.

The electricity distribution company revealed several areas of Inefficiencies in energy consumption. The recommended measures, including upgrading the infrastructure, promoting employee awareness, and further improving the fleet of vehicles, will help to improve energy efficiency and reduce energy consumption. Conducting a cost-benefit analysis will help the company to prioritize the implementation of these measures. Overall, the implementation of these measures will improve the company's energy efficiency, reduce energy consumption, and lower energy costs.

## 7.2 Summary of key findings-energy balance and losses

The Energy balance and losses of BYPL for FY 2022-23 are as shown in the table below:

Table 41 Energy balance and losses

| Trend of BYPL (2022-23) | | | | |
|---|---|---|---|---|
| **Sr. No.** | **Energy Input Details** | **Formula** | **UOM** | **Value** |
| 1 | Purchase Energy (From Generation Source) | A | MU | 8704 |
| 2 | Net Energy Input to Discom (at DISCOM Periphery after adjusting the transmission losses and energy | B | MU | 7,503 |

| | | | | |
|---|---|---|---|---|
| | traded) | | | |
| 3 | Energy billed (is the Net energy billed, adjusted for energy traded) | C | MU | 6,958.33 |
| 4 | | D | Rs. Crores | 5,592.87 |
| 5 | Average Billing Rate | E=D*10/C | Rs/Kwh | 8.04 |
| 6 | Amount collected | F | Rs. Crores | 5,641.15 |
| 7 | Transmission and Distribution (T&D) Loss | G=B-C | MU | 545.43 |
| 8 | | H= G*100/B | % | 7.27% |
| 9 | | J=E*G/10 | Rs. Crores | 438.40 |
| 10 | Billing Efficiency | K=C*100/B | % | 92.73% |
| 11 | Collection efficiency | L=F*100/D | % | 100.86% |
| 12 | Aggregate Technical & Commercial (AT&C) Loss | M =1-(K*L) | % | 6.47% |

## 7.3 Recommendations and best practices

### 7.3.1 Energy accounting

Energy accounting is being done regularly in BYPL. Meters are installed at all levels. All feeder meters are communicable & more than 50% of DT meters are communicable. Almost all the reports are generated through system data.

### 7.3.2 Loss reduction

- Discom has initiated various activities for Technical Loss reduction as well as AT & C Loss reduction. Some of major activities are mentioned as under.

❖ Technical Loss Reduction Activity

- New Grids, HT and LT feeders
- DT Addition/ Augmentation for overloaded DT, HVDS
- Balancing of Load at all voltage levels; Shunt Capacitors at LV
- LT Less system for Agriculture Pump connections
- Pole Metering; Group Metering,
- HVDS Bushing mounted DB
- New armoured street light Ckts in HVDS area
- Heat Shrink Coatings on theft prone points in network

- Chemical Joints; Application of Conductive paste on LT bushings to reduce contact resistance
- Commercial Loss Reduction Activity
- Meter Relocation, Old Meter Replacement; MS box with shearing nut arrangement
- Bare conductor with armour cable; Armour cable in place of heavily punctured AB cable span, armoured cast tape to secure joints.
- Enforcement activities - Curbing E-Rickshaw theft, Odd Hour/ Surprise raids, Lady Guards
- Facilitator engagement to support team on the ground
- Surveillance of actions taken and generation of LR leads

### 7.3.3 Energy conservation

BSES Yamuna Power Ltd has implemented various proactive programs and awareness campaigns to curb demand-supply imbalances and promote the responsible use of electricity, in accordance with the Demand Side Management Regulations – DERC.

Following Initiatives were undertaken over the years in the direction of Demand-side Management and Energy Conservation apart from general awareness to all consumers:

| DSM Activities Undertaken In FY 2022-2023 | | |
|---|---|---|
| S No. | Energy Efficiency Measures | Activity |
| 1 | Tube light Replacement with LED | No replacement done in FY 2022-2023 |
| 2 | Old Fans with Energy Efficient Fans | No replacement done in FY 2022-2023 |
| 3 | Replacement of Old AC's with Energy Efficient AC | No replacement done in FY 2022-2023 |
| 4 | Awareness Programs | 767 Numbers of awareness programs done for energy conservation |
| 5 | Home Automation | MoU signed between BYPL and SE in October 2022 |
| 6 | Smart Innovation Norway | MoU signed between BYPL and SIN in Norway Embassy in February 2023 |
| 7 | Jan Suraksha Muheem For Energy Conservation | 52 number of Jan suraksha Muheem done for safety and Energy Conservation |

## 7.4 Action Plan for line loss reduction

Following energy conservation Measures (ECMs)is adopted for line loss reduction

1. Installation of Smart Meters.
2. Installation of Automatic power factor controller (Capacitor Bank).
3. System improvement & automation.

4. Improvement in metering system.
5. Replacing of conventional/non star rated transformer into energy efficient transformers.
6. Replacement of all conventional mechanical energy meters with static digital energy meters having less power consumption and more accuracy.
7. Laying of AB Cable in theft prone area where loss are in higher side.
8. HVD System to reduce low tension line losses.
9. Replacing worm out/ under sized conductors.
10. Increase in HT/LT Ratio.
11. Preventive & periodic maintenance of line & transformer.
12. Load balancing of Distribution transformers.
13. MIS Based periodic reporting of unit wise business parameters.
14. Installation of solar generation plant & solar pumps.
15. Strengthening of energy accounting infrastructure-100% consumer metering.
16. GIS based asset mapping of all 33/11kv substations, 11kv Lines and distribution transformers has been completed.
17. 11kv Feeder wise base line technical data i.e., length, peak load, VR and technical loss calculated by algorithm & published in power BI.
18. Feeder wise baseline commercial loss is being collected by subtracting technical loss for total T&D loss.
19. Selection/priority of area must be made under:
    i. Feeder having VR more than 15%.
    ii. Feeder having VR more than 9 to 15%.
    iii. Feeder having peak load more than 100 amp. & length more than 30km.
    iv. High T&D loss feeder.
    v. High commercial loss feeder.

## 7.5 Action plan for monitoring and reporting

Monitoring of loss levels & activities are being motored at all levels of BYPLs.

At divisional level it is monitored on daily / weekly basis & at circle level every fortnightly.

Top Management reviews performance every month.

## 7.6 Action plan for automated energy accounting

Automated energy accounting is a critical component of modern electricity distribution systems. It allows for accurate and efficient tracking of energy usage, which helps identify energy waste, reduce energy consumption, and improve billing accuracy. In this report, we will outline an action plan for implementing automated energy accounting in an electricity distribution company.

### *Step 1: Evaluate Current Energy Accounting System*

The first step is to evaluate the current energy accounting system to identify areas that need improvement. This will involve reviewing the current processes, systems, and data management practices. The evaluation should consider the following factors:

- Accuracy of billing and metering

- Timeliness of bill generation
- Data management practices
- Energy usage tracking capabilities
- Customer feedback and complaints

### *Step 2: Identify Automated Energy Accounting System Requirements*

After evaluating the current energy accounting system, the next step is to identify the requirements for an automated energy accounting system. This will involve considering the following factors:

- Energy usage tracking capabilities
- Billing accuracy and timeliness
- Integration with existing systems
- Data management capabilities
- Scalability and flexibility

### *Step 3: Research and select an Automated Energy Accounting system*

Once the requirements are identified, the next step is to research and select an automated energy accounting system. This will involve reviewing available options and selecting a system that meets the identified requirements. The selected system should have the following features:

- Real-time energy usage tracking
- Automated billing and metering
- Data management and analysis capabilities
- Integration With existing systems
- User friendly interface

### *Step 4: Develop Implementation plan*

After selecting an automated energy accounting system, the next step is to develop an implementation plan. This will involve determining the following:

- Timeline for implementation
- Resource requirements
- Roles and responsibilities
- Training requirements
- Data migration Plan

### *Step 5: Implementation and Testing*

Once the Implementation plan is developed, the next step is to implement and test the automated energy accounting system. This will involve the following:

- Installation and configuration of the system
- Data migration from the old system to the new system
- User training
- System testing

### *Step 6: Rollout and Monitoring*

After successful testing, the next step is to rollout the automated energy accounting system to all customers. This will involve communicating the changes to customers and ensuring a smooth transition. Once rolled out, the system should be continuously monitored to identify any issues and improve the system's performance.

In conclusion implementing an automated energy accounting system can help in improving billing accuracy, reduce energy waste, and enhance data management capabilities. The action plan outlined above provides a framework for implementing an automated energy accounting systems in an electricity distribution company. By following this plan, the company can successfully implement the system and achieve its energy accounting goals.

# 8 Annexure

## 8.1 Annexure 1:Introduction of Verification Firm

### 8.1.1 Brief of Verification Firm

**Padmashtdal Energy Services Private Limited (PESPL)** is a service consultancy company providing techno commercial solution to customers in the areas of Power System, Industrial Electronics and Utility system management since 1996. In last few years of its operation, the company has been able to generate positive reputation and goodwill among its clientele.

The experience of PESPL in various industries around the country made it realize that there is huge potential of saving energy in almost all industries. In some of the industrial units and office set up the possibility of saving energy is as high as 20%. In some of the industries and companies the energy conservation seemed possible by simply adhering to better operating practices and in some by technical up-gradation in instrumentation & control system and modification in plants.

With this experience, PESPL entered into the arena of ENERGY CONSERVATION in 2005. It focused on ensuring that our client industries adopt efficient energy management systems that help them to optimize their resource utilization thereby reducing the operational cost. We have conducted several energy audits and provided consultancy to industrial units and office facilities to achieve substantial reduction in their Energy-Cost. Our client base includes Sugar industries, Paper Industries, Power Plants, steel plant, MSME units, commercial buildings etc.

*PESPL has been accredited as an ESCO (Energy Service Company) by BEE (A statutory body under Ministry of Power, Govt. Of India) in the year 2008. Our CEO of company Mr. Kamalesh Kumar Jha is also an Accredited Energy Auditor by BEE*

### 8.1.2 Composition of Team

The composition of team is shown in following table. We would like to add further that apart from this there are few support staffs who are also participated in this exercise.

Table 42 Details of Study Team

| Sr No | Name | Qualification | EM/EA/AEA/EmAEA Registration No | Experience In Years / Sector |
|---|---|---|---|---|
| **Team Leader** | | | | |
| | Mr. Kamalesh Kr Jha | BE MS | EmAEA-026/AEA-0007/ EA 2197 | 34 |
| **Sector Expert** | | | | |
| | Mr.S G Nima | PG Dip, B.E. | Sector Expert | 60 |
| **Team Members** | | | | |
| 1 | Mr. Santosh S Malani | B E. | EA- 14799 | 32 |
| 2 | Mr. Gautam K Dam | BE | EA- 15151 | 41 |
| 3 | Mr. Amit | M Tech | EA - 19689 | 12 |
| 4 | Mr. N K Singh | M Tech | Energy Engineer | 21 |
| 5 | Mr. Amit Kr Verma | BE | Energy Engineer | 06 |

### 8.1.3 Registration No

EmAEA-026/AEA-0007/ EA 2197

### 8.1.4 Undertaking

*It is undertaken that the Audit is carried out as per BEE regulations with sample check of data through field verification.*

*The details as submitted are as per data submitted by BYPL*

## 8.2 Annexure 2: Minutes Of Meeting with the Discom Team

Attached as attachment 15.

## 8.3 Annexure 3: Checklist Prepared by Auditing Firm

Based on the BEE notification No 18/1/BEE/DISCOM/2021 dated 6th October 2021 regarding Manner and Interval for conduct of Energy audit (Accounting) in Electrical Distribution company following general checklist was prepared for completion of Energy Audit assignment.

**List of documents required:**

- Month Wise input and billed energy.

- T&D losses Computation approach.
- Internal field audit report of input and billed energy.
- Performance of disicom on distribution losses.
- Outcome of internal filed audit.
- Measures taken to reduce losses and improve losses.
- Zone/circle/Division/Sub-division wise loss computation.
- Reduction achieved, measures adopted for energy conservation and quantify of energy saved.
- Report on distribution losses.
- List of measuring equipment's and calibration certificates and frequency of calibration.
- Wire up on energy scenario.
- Generation Via solar, DG and other source and share of energy consumption.
- Net input Energy Computation Details.
- Category wise consumer's details.
- Category wise consumer's connected load and %load.
- Bifurcation of billed Energy (metered billed energy and unmetered billed energy).
- Disconnected consumers detsils.
- Loss Analysis report.
- Write up on procedure followed Technical loss analysis.
- Details of Energy Purchase, Energy Billing, Revenue Collection, Losses (T&D as well as AT & C) etc. with proper supporting documents for April 2020 to March 2021.
- Signed form as per final regulation notified by BEE.
- Signed Form III submitted to BEE
- Energy Flow and balance.
- Details of RPO obligation with supporting documents.
- Unit Profile with past history
- Details of Infrastructure.
- Present consumer profile
- Annual Report submitted to DERC.
- Third Party audited Power Purchase Certificate
- Input energy at Discom Periphery verified by DTL Bill.
- Third Party audited Billing Certificate
- Third Party audited Subsidy Certificate
- Details of Enforcement protocol.
- Meter calibration/healthiness protocol.

## 8.4 Annexure 4: Brief Approach, Scope & Methodology for audit

### 8.4.1 Scope

#### 8.4.1.1 Data collection and verification of energy distribution

- Monthly energy consumption data of consumers and system metering from electricity distribution company at following voltage levels
  - ❖ 33/66 kV levels, including 33/66kV feeder and Sub-station;
  - ❖ 11kV levels, including 11kV feeder and Distribution Sub-station;
  - ❖ 415 V level, including Distribution Transformer and low-tension consumer;
- Input energy details for all metered input points
- Boundary meter details
- Source of energy supply (e.g., Electricity from grid or self-generation), including generation from renewables
- Review of the current consumption practices
- Identification of the energy loss in the system

#### 8.4.1.2 Data verification, validation and correction

- A monitoring and verification protocol to quantify on annual basis the impact of each measure with respect to energy conservation and cost reduction for reporting to Bureau and the concerned State designated agency
- Verification and correction of input energy, taking into account the following
  - ❖ Recorded system meter reading by metering agency
  - ❖ All the input points of transmission system
  - ❖ Details provided by the transmission unit
  - ❖ Relevant records at each electricity test division for each month
  - ❖ Recorded meter reading at all export points (where energy sent outside the State is from the distribution system)
  - ❖ system loading and corresponding infrastructure
- Energy supplied to Open Access Consumers which is directly purchased by Open Access consumers from any supplier other than electricity distribution company
- Verify and validate the system metering data provided by metering agency through random field visit (particularly for data irregularity)

### 8.4.2 Approach and methodology

The following flow chart illustrates the methodology followed for carrying out different tasks leading to preparation of the EAR.

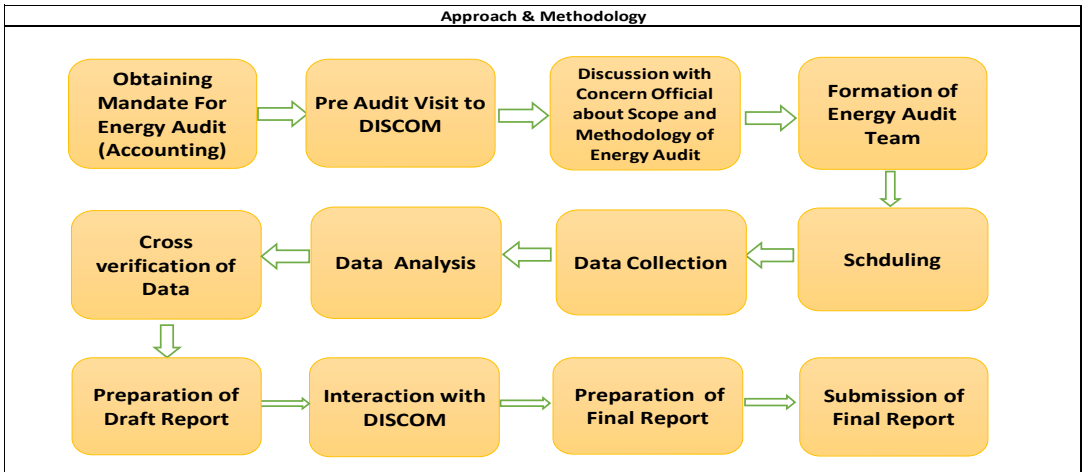



Figure 9 Methodology

## 8.5 Annexure 5: Infrastructure Details

The major components of BYPL are listed as under:

Table 43 Infrastructure Details

| Parameters | Total | Covered during in Audit | Verified by Auditor in Sample Check | Remarks (Source of data) |
|---|---|---|---|---|
| Number of Circles | 3 | 2 | Data verified | MDAS, SAP, GEM and DTL bill |
| Number of Divisions | 14 | 5 | | |
| Number of Sub-Divisions | 46 | 14 | | |
| Number of Feeders | 20712 | 44 | | |
| Number of DTs | 4133 | 40 | | |
| Number of Consumers | 1903557 | 200 | | |

Table 44 Metering Details

| 1 | Parameters | Total | Covered during in audit | Verified by Auditor in Sample Check | Remarks (Source of data) |
|---|---|---|---|---|---|
| i | Number of circles | 3 | 22-23 | | |
| ii | Number of divisions | 14 | | | |

| | | | | | |
|---|---|---|---|---|---|
| iii | Number of subdivisions | 46 | | | |
| iv | Number of feeders | 20,712 | | | |
| v | Number of DTs | 4,133 | | | |
| vi | Number of consumers | 1,903,557 | | | |
| **2** | **Parameters** | **66kV & above** | **33kV** | **11/22kV** | **LT** |
| a. i. | Number of conventional metered consumers | BYPL working on the preparation of report for segregation. | | | |
| ii | Number of consumers with 'smart' meters | | | | |
| iii | Number of consumers with 'smart prepaid' meters | | | | |
| iv | Number of consumers with 'AMR' meters | | | | |
| v | Number of consumers with 'non-smart prepaid' meters | | | | |
| vi | Number of unmetered consumers | | | | |
| vii | **Number of total consumers** | **3** | **465** | | **1,903,089** |
| b. i. | Number of conventionally metered Distribution Transformers | NA | NA | 2174 | NA |
| | Number of DTs with communicable meters | | | 1959 | |
| | Number of unmetered DTs | | | 0 | |
| | **Number of total Transformers** | | | **4133** | |
| c. i. | Number of metered feeders | 61 | 110 | 998 | 19543 |
| ii | Number of feeders with communicable meters | 61 | 110 | 998 | NA |
| iii | Number of unmetered feeders | 0 | 0 | 0 | NA |
| iv | **Number of total feeders** | 61 | 110 | 998 | 19,543 |
| d. | Line length (ct km) | 244 | 432 | 3,207 | 5,915 |
| e. | Length of Aerial Bunched Cables | *(No Aerial Bunch Cable at 66kV level; 66.5 KM of O/H network)* | *(No Aerial Bunch Cable at 33kV level; 10.7 of O/H network)* | 436 | 2,799 |
| f. | Length of Underground Cables | 67 | 421 | 2771 | 3116 |

- Grid substation 66KV/33KV/11KV
- Distribution Substation 11KV/415 V
- Power/Distribution Transformer
- Protection system
- Metering system

- Cables
- Power Capacitor
- Earthing

**Table 45 Inventory List as on March 2023**

| Sl No | Description | UOM | **2022-23** |
|---|---|---|---|
| 1 | Grid | Number | 55 |
| 2 | 66 KV feeder | Number | 61 |
| 3 | 66 KV Lines/Cable | KM | 244 |
| 4 | 33 KV Feeder | Number | 110 |
| 5 | 33 KV Lines/Cable | KM | 432 |
| 6 | Power Transformer | Number | 168 |
| 7 | EHV capacity | MVA | 3989 |
| 8 | Metering at 66/33 KV | % | 100 |
| 9 | Shunt Capacitors | MVAr | 990 |
| 10 | 11 KV Feeder | Number | 998 |
| 11 | 11 KV lines/Cable laid (UG)/OH | KM | 3207 |
| 12 | Metering at 11 KV level | % | 100 |
| 13 | Distribution Transformer | Number | 4132 |
| 14 | | MVA | 3638 |
| 15 | Metering at DT Level | % | 100 |
| 16 | LT feeders | Number | 19543 |
| 17 | LT Line Length | KM | 5915 |
| 18 | Length of AB cables | KM | 2799 |
| 19 | Length of U/G Cables | KM | 6486 |
| 20 | HT/LT ratio | Number | 0.54 |
| 21 | Metering at consumer end | % | 100 |

### 8.5.1 Grid Source

The BYPL is getting supply from Transco and Power grid at 66 KV and 33 KV. Total number of grid substation in BYPL is 55 in the year 2022-23.

### 8.5.2 Power Transformer

Power transformers installed at various grid substation and it is used to step down voltage level from 66/33 which is received Transco, to 11 KV for different feeders. Total number of power transformer of different rating installed at BYPL is 168 having a cumulative capacity of 3969 MVA.

### 8.5.3 EHV Feeder

BYPL is having 171 number of EHV feeders at 66/33 KV. It is used to receive power from Transco and also for feeding of Bulk consumer like DIAL, DJB, Railway, DMRC etc.

### 8.5.4 Distribution Transformer

BYPL is having 4133 number of distribution transformer with a cumulative capacity of 3638 MVA. It is used to convert voltage from 11 KV to 415 V. it is located near to consumer base.

### 8.5.5 11 KV Feeder

11 KV Feeders are used to transport power from grid substation to HT consumers and different distribution transformers. BYPL is having about 998 number of 11 KV feeders.

### 8.5.6 LT Feeders

LT feeders are used to transfer power from distribution transformer to end consumers. It may be at 415 V for three phase connection and at 220 V for small domestic consumers. BYPL is having about 19543 number of LT feeders.

### 8.5.7 Protection/Switching System

Complete distribution network is protected with proper protection relays like overload, earth fault, distance protection relay, Feeder Protection relay installed at different feeder panels.

Power Transformers are protected with Overload, Earth fault, Differential relays.

Switching of different feeders are with VCB/SF6 for HT switching and ACB/MCCB/ SFU for LT switching

### 8.5.8 Metering System

Energy meters are installed for all individual as well as bulk consumers. Apart from this energy meters are also installed at all EHV, HT feeders and distribution transformers for monitoring of energy flow in the Discom. BYPL is having very good metering system for real time monitoring of power flow in the distribution network.

### 8.5.9 Cables

Cables are used to for interconnecting of different feeders to power transformers, Distribution transformers, end consumers etc. Based on the site condition and requirement overhead as well as underground cables are used. The cable length in BYPL is shown as under:

- 66 KV cables/Lines : 244 KM
- 33 KV cable/Lines : 432 KM
- 11 KV cables/Lines : 3207 KM
- LT Cable /Lines : 5915 KM

- AB cables : 3235 KM
- U/G Cables : 6486 KM

### 8.5.10 Power Capacitors

Copper Loss in electrical system is very much dependent on current flowing through the system. Hence to reduce copper loss current should be as low as possible. To reduce current, we have to increase voltage and maintain power factor as high as possible near to unity. Voltage level is already optimized as per requirement of network.

To reduce distribution loss and to maintain power factor near to unity BYPL has installed sufficient shunt capacitors at different EHT/HT feeders and distribution transformers. The power factor is also monitored in real time.

### 8.5.11 Earthing System

To avoid electrical hazard all electrical system, need to be earthed properly. Keeping this in mind BYPL is following all the guidelines of CERC and IS codes of practice for earthing. The main objective of earthing should be:

- The impedance to ground should be as low as possible and it should be as per standards.
- The electrode or earth conductor and earthing strips should be capable enough to carry fault current so that electrical hazard can be avoided.

## 8.6 Annexure 6: Electrical Distribution System

DISCOM is an organization whose sole responsibility is to procure the electrical power from power generating company through Transmission Company at EHV level and distribute it to end user at appropriate voltage level.

Power received by DISCOM from Transmission Company at 220KV/132KV/66KV/33KV/11 KV level and same is supplied to different customer as per their required voltage level. Type of consumer and their voltage level are shown as under:

- Individual Residential Consumer: 230 V Single Phase / 400 V Three Phase
- Group Housing Society : 11 KV Three Phase
- Commercial Consumer : 230 V Single Phase/ 400 V Three Phase/ 11 KV Three Phase/ . 33 KV Three Phase/ 66 KV Three Phase
- Industrial LT Consumer : 230 V Single Phase and 400 V Three Phase
- Industrial HT Consumer : 11 KV/33 KV/66 KV/132 KV Three Phase
- Agriculture Consumer : 230 V Single Phase and 400 V Three Phase
- Street Light/Pump House : 400 V Three Phase/ 11 KV Three Phase

*Note: Voltage Specified is as per DERC Supply code and performance Standards Regulations 2017, with +/- 6% variation is admissible in case of Low-Tension voltage level.*

As per EC Act 2001 DISCOM is an energy intensive organization, due to its nature of operation. A large amount of energy is being distributed by DISCOM and during the process a significant amount of energy is lost known as T&D loss. The T&D loss percentage is having a wide variation among various DISCOM.

During financial year 2013-14, T&D loss was as low as 12.08% in Himachal Pradesh DISCOM and it was as high as 46.36% in J& K DISCOM with an India level average of 20.68 % which is equivalent to 193750 MU causing revenue loss of 96875 Crores (@Rs 5/unit). The equivalent Co2 emission is about 1589 Lakh MT. The gap between world average and India average is more than 10%.

System Element Power Losses (%)

**Table 46 System Element Power Loss**

| Sr no | Description | Minimum | Maximum |
|---|---|---|---|
| 1 | Step UP Transformer & EHV Transmission | 0.5 | 1.0 |
| 2 | Transformation to Intermediate Voltage Level | 1.5 | 3.0 |
| 3 | Transmission System and step down to sub transmission voltage level | 2.0 | 4.5 |
| 4 | Distribution Line & Service Connection | 3.0 | 7.0 |
| Total | | 7.0 | 15.5 |

## 8.7 Annexure 7: Power Purchase Details

- The electrical energy is supplied by Delhi Transco & Power Grid Corporation Ltd. at 400 KV, 220 KV, 66 KV, 33 KV and same is supplied to customers at 66 KV, 33 KV, 11 KV, 400 V and 230 V single phase.

**Table 47 Source of Power**

| Sr. No | Source | Energy in MU |
|---|---|---|
| 1 | Long-Term Conventional | 7279 |
| 2 | Short Term Conventional & others | 1118 |
| 3 | Banking | 825 |
| 4 | Long-Term Renewable energy | 3751 |
| 5 | Medium and Short-Term RE | 1581 |
| 6 | Captive, open access input | 497 |
| 7 | Sale of surplus power | 1698 |
| 8 | Quantum of inter-state transmission loss | 547 |

| | | |
|---|---|---|
| 9 | **Power procured from inter-state sources** | - |
| 10 | **Power at state transmission boundary** | 12417 |
| 11 | Renewable Energy Procurement | - |
| 12 | Sales Migration Input | - |
| 13 | **Energy Embedded within DISCOM wires network** | 108 |
| 14 | **Total Energy Available/ Input** | 12964 |

Note: Sample power purchase details attached as attachment 5.0

### 8.7.1 Input Purchase power for FY 2022-23

In addition to the details specified below, the audit firm may provide source wise/ generating station wise power purchase, contracted capacity, RPO obligation met by the DISCOM, etc.

BYPL purchase the power from the power generators the month wise purchase units are shown in below table:

**Table 48 Month wise power purchase**

| Sr.No. | Month | Energy(in MUS) |
|---|---|---|
| 1 | Apr-22 | 781 |
| 2 | May-22 | 938 |
| 3 | Jun-22 | 1015 |
| 4 | Jul-22 | 1006 |
| 5 | Aug-22 | 911 |
| 6 | Sep-22 | 849 |
| 7 | Oct-22 | 568 |
| 8 | Nov-22 | 495 |
| 9 | Dec-22 | 545 |
| 10 | Jan-23 | 609 |
| 11 | Feb-23 | 481 |
| 12 | Mar-23 | 506 |
| | Total | 8704 |

### 8.7.2 Circle wise monthly Input Energy for FY2022-23

The Month wise break up of input energy (MUs) parameter for all the circle is given below:

Table 49Circle wise monthly input energy (MU)

| Circle Name | Central | North-East | South-East |
|---|---|---|---|
| Apr-22 | 191 | 259 | 259 |
| May-22 | 223 | 293 | 309 |
| Jun-22 | 234 | 310 | 323 |
| Jul-22 | 233 | 308 | 321 |
| Aug-22 | 219 | 295 | 300 |
| Sep-22 | 203 | 270 | 270 |
| Oct-22 | 138 | 184 | 195 |
| Nov-22 | 110 | 147 | 162 |
| Dec-22 | 112 | 152 | 168 |
| Jan-23 | 126 | 175 | 188 |
| Feb-23 | 98 | 137 | 150 |
| Mar-23 | 114 | 156 | 171 |
| Total | 2000 | 2734 | 2770 |

## 8.8 Annexure 8: Line Diagram (SLD)

### 8.8.1 SLD of East Zone

Figure 10 SLD of East Zone

Attached as Attachment 6

### 8.8.2 SLD of Central Zone

Figure 11 SLD of Central Zone

Attached as Attachment 7

## 8.9 Annexure 9: Category of service details (With Consumer and voltage-wise)

Energy balance of BSES Yamuna is shown in following table

Table 50 Energy Balance BSES Yamuna

| Sr.No. | Type of Consumers | Category of Consumers (HT/LT) | Voltage Level | No of Consumers | Total Consumption (In MU) |
|---|---|---|---|---|---|
| 1 | Domestic | LT | 415V | 2488841 | 7403 |
| 2 | Commercial | LT | 415V | 349682 | 1624 |
| 3 | IP Sets | LT | 415V | 6128 | 20 |
| 4 | Water Supply | LT | 415V | 3847 | 86 |
| 5 | Public Lighting | LT | 415V | 7012 | 130 |
| 6 | HT Water Supply | HT | 11KV | 77 | 142 |
| 7 | HT Industrial | HT | 11KV | 163 | 178 |
| 8 | Industrial (Small) | LT | 415V | 5191 | 283 |
| 9 | HT Commercial | HT | 11KV | 1272 | 736 |
| 10 | HT Commercial | EHV | 33/66 KV | 13 | 117 |
| 11 | Applicable to Government Hospitals & Hospitals | LT | 415V | 19 | 28 |
| 12 | HT Res. Apartments Applicable to all areas | LT | 415V | 200 | 180 |
| 15 | Others-1 (Delhi Metro) | HT | 33/66 KV | 9 | 288 |
| 16 | Others-2 (Delhi Airport) | HT | 33/66 KV | 1 | 26 |
| 17 | Others-3 (if any , specify in remarks) | LT | 415V | 5936 | 245 |
| | **TOTAL** | | | **2868391** | **11486** |

## 8.10 Annexure 10: Field verification Data and Reports

The field inspection details are shown in the below table:

Table 51 Field inspection details

| Date & Time | Activity | Description of work done/ key points identified |
|---|---|---|
| 10/07/2023 | Visit & sample data download for DTs | Sample data (Time-slot wise) downloaded & deliberations with BYPL officials |

| | | |
|---|---|---|
| 17/07/2023 | Visit & sample data download for feeders | Sample data (Time-slot wise) downloaded & deliberations with BYPL officials |
| 18/07/2023 | Checking of consumer meter data | Discussion with BYPL Officials |

## 8.11 Annexure 11: List of documents verified with each parameter

The documents verified are listed in the below table:

Table 52 List of documents verified with each parameter

| Sr.No. | Parameter | Data Source/Documents verified | Remarks of Energy Auditor, if any | Response of Discom, if any |
|---|---|---|---|---|
| 1 | Time-slot wise DT data | Downloaded data of meter | Data analysed for DT loss level calculation | Discussions done with BYPL officials |
| 2 | Time-slot wise feeder data | Downloaded data of Feeder meter | Data analysed for feeder loading | Discussions done with BYPL officials |

- Third Party audited Power Purchase Certificate (Attachment 5.0)
- Input energy at Discom Periphery verified by DTL Bill. (Attachment 8.0)
- Third Party audited Sale Certificate (Attachment 9.0)
- Third Party audited Subsidy Certificate (Attachment 10.0)

## 8.12 Annexure 13: List of Parameters arrived through calculation or formulae with list of documents as source of Data

Ideally, reduction of technical losses should be the parameter for evaluation of performance of Discom sector. However, the technical losses of the Discom are not available and it involves a Cumbersome process to calculate the technical losses, which varies based on various factors like loading pattern etc.

Now, only the T&D losses and AT&C losses are available as the performance parameter for achieving energy efficiency by DISCOMs

It was decided that out the two parameters, T&D loss parameter seems to be appropriate parameter which reflects energy saving to a greater extent as compared to AT&C losses

Table 53 Formulas used to derive the Parameters

| Parameter | Formula | Data SOURCE |
|---|---|---|
| AT&C Losses | (1-(Billing efficiency*collection efficiency))*100 | SAP data |
| T&D Losses | (1-(Total Energy Billed/Total energy Input to the System))*100 | DTL bill & SAP data |
| Billing efficiency | Total unit billed/Total unit input | SAP data |
| Collection efficiency | Revenue Collected/ Amount Billed | SAP data |

## 8.13 Annexure 14: Details of attachment

Following (8.13.1 to 8.13.12) attached as attachment 12

### 8.13.1 General Information

### 8.13.2 Summary Sheet

### 8.13.3 Infrastructure Details

### 8.13.4 Details of Input Energy and Sales

### 8.13.5 Details of Input Energy

### 8.13.6 Details Of Received Sources

### 8.13.7 Details Of Consumer

### 8.13.8 Division Wise Loss

### 8.13.9 Details Of Feeder Wise Losses

### 8.13.10 Details Of Subsidy

### 8.13.11 DT Metering and AMR Status

### 8.13.12 DT Wise Loss Report

## 8.14 Attachment 1: Details of Energy audit Cell – Shared

## 8.15 Attachment 2: Drawing of outgoing feeder *(GIS to suggest name of feeder)*

## 8.16 Attachment 3: Sample Test certificate for 3 cases

## 8.17 Attachment 4: Form 3 FY 2022-23

## 8.18 Attachment 5: Power Purchase Certificate

## 8.19 Attachment 6: SLD East Zone