

# Annual Report 2022-23



Bhutan Electricity Authority (BEA)





**ANNUAL REPORT 2022-2023**



**Bhutan Electricity Authority**



## FOREWORD BY CHAIRMAN



I am honored to present the Bhutan Electricity Authority (BEA) Annual Report for the fiscal year 2022-2023. The Annual Report covers our achievements and outcomes during the year.

In the pursuit of diversifying our energy sources and enhancing energy security, BEA facilitated the development of solar projects by granting license exemptions for 13.5kW solar power project at Gunitsawa School, 70kW rooftop grid-tied solar to Bhutan Trust Fund for Environmental Conservation (BT FEC) and 500 kW ground mounted and 250 kW roof top solar project to Bhutan Solar Initiative Project. The Authority also granted construction licenses to 54MW Burgangchu at Zhemgang, 32MW Yungichhu at Lhuentse, and 18MW Suchhu hydro project at Haa under the Phase I of the small hydro project development initiated by the Druk Green Power Corporation to meet the growing demand in the country. The BEA also renewed the construction licenses for 118 MW Tangsebj Hydroelectric Project and 600 MW Kholongchhu Hydroelectric Project.

In line with the provision of Electricity Act 2001, BEA facilitated the transfer of the embedded generation license from Bhutan Power Corporation (BPC) to Druk Green Power Corporation (DGPC), and granting DGPC the license to operate embedded plants from July 1, 2022 consolidate the generation-licensed activities under the DGPC.

During the year, the BEA also reviewed the Guaranteed Service Level and Compensation Mechanism, Distribution Code 2022 in order to enhance customer service delivery and operational efficiency of BPC. A review of the BPC customer service delivery was also carried out as part of the system performance review.

In order to enhance power reliability, the BEA also initiated a daily monitoring of outages and root cause analysis of the outages to identify areas for improvement and set measurable targets for reduction in power outages in the country.

Furthermore, BEA has also initiated the revision of Grid Code Regulation 2008 considering the growing expansion of Bhutan's national grid and due to the growing import of power from India during lean season that has increased the complexities in the operation of the grid. Therefore, the proposed amendments to the Grid Code Regulations, 2008 covered the review of transmission operating criteria, such as operating margin, demand control, system voltage, reactive power requirements, outage planning, and grid recovery procedure. It focused on enhancing generation forecasting



and scheduling as well as load forecasting.

To reinforce compliance, BEA has also reviewed the Rules for Fines and Penalties in 2023, establishing a more stringent penalty structure to uphold standards.

Lastly, we developed guidelines to streamline internal workflows and external interactions ensuring operational efficiency and transparency.

We take this opportunity to extend our heartfelt gratitude to our esteemed stakeholders, and the invaluable guidance of His Excellency Tengye Lyonpo. His unwavering support has been instrumental in these accomplishments.

Tashi Delek

A handwritten signature in blue ink, appearing to read 'Bharat Tamang Yonzon', with a horizontal line underneath.

Bharat Tamang Yonzon  
Chairman  
Bhutan Electricity Authority

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## 1. ABOUT US

The Section 11.1 of the Electricity Act of Bhutan 2001 mandates the BEA with the following functions:

- To develop regulations, standards, codes, principles and procedures for performance standards, tariff setting, subsidies, Licensee reporting and accounting, system operation and charges among others;
- To process applications and issue, modify and revoke licenses for generation, transmission, system operation, export, import, distribution and sale of electricity;
- To monitor the performance of Licensees and their compliance with provision of this Act, regulations, standards, codes, licenses and contracts approved by the Authority and concession agreements entered into between the Minister and Licensees;
- To determine, or approve tariffs proposed by the Licensees, and review existing tariffs;
- To prescribe and collect fees, charges or royalties from Licensees;
- To impose any fines, sanctions or penalties for any breach of provisions of this Act, regulations, standards, codes, licenses or contracts to be approved by the Authority, and concession agreements entered into between Licensees and the Government;
- To establish a dispute resolution process and settle disputes between Licensees and between Licensees and customers relating to the enforcement of this Act, regulations, codes, standards and licenses issued under this Act, contracts approved by the Authority and concession agreements entered into between the Minister and Licensees, or otherwise any other arrangement for settlement of disputes which are not determined by the mentioned legal instruments; and
- Any other duties or responsibilities delegated by the Minister.



## 2. AUTHORITY

### 2.1 Member of the Authority



**Dasho Bharat Tamang Yonzon (Chairman)**  
Royal Privy Council



**Dasho Ugen T Dorji (Member)**  
Chairman, Singay Group Companies



**Mr. Yeshe Tenzin (Member)**  
Director, DGPC



**Mr. Loknath Chapagai (Member)**  
Specialist, MoEA



**Mr. Sonam Penjor (Member)**  
Chief, Ministry of Finance



**Mr. Ugyen (Member)**  
Engineer, MoEA



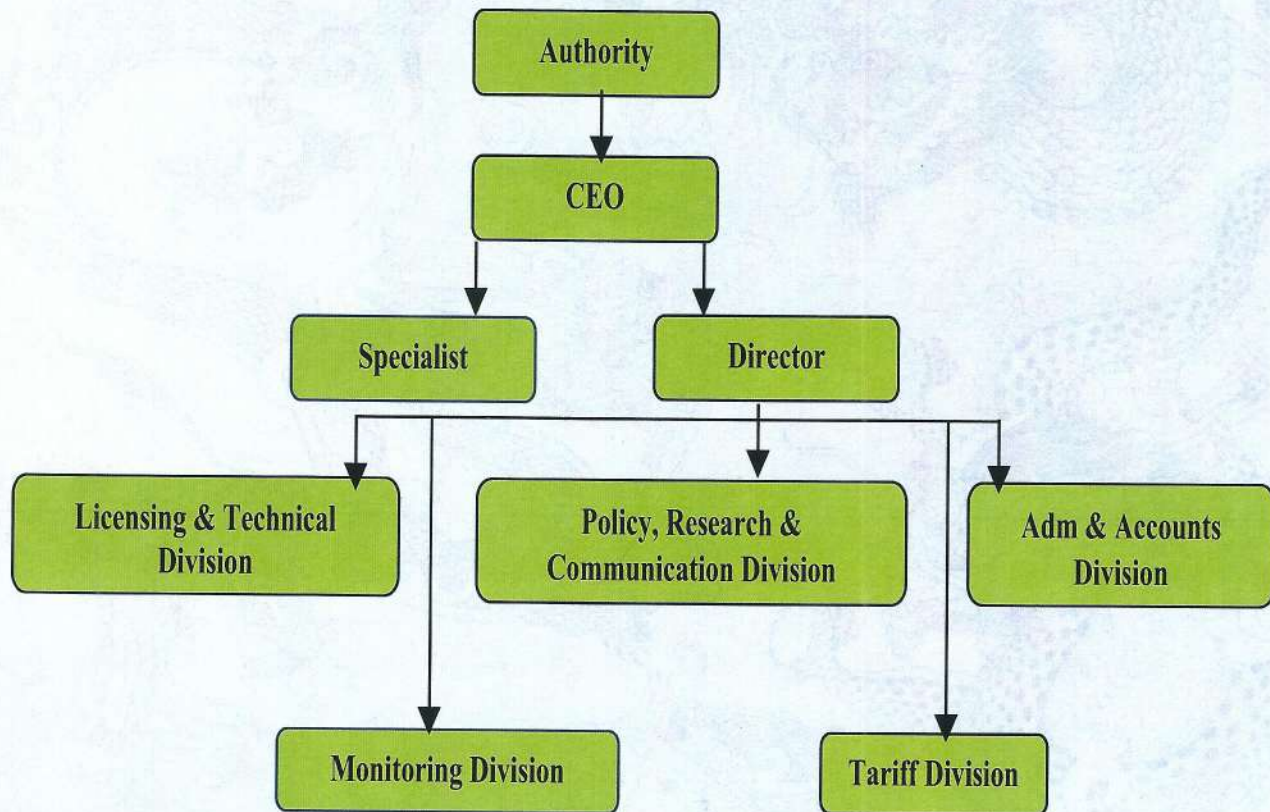
**Mr. Samdrup K Thinley (Member Secretary)**  
Chief Executive Officer, BEA





### 3. THE SECRETARIAT

#### 3.1 Organogram



#### 3.2 Staff Strength

In accordance with the approved organizational structure, BEA presently has 31 employees as including 5 employees on extraordinary and study leave.





## 4. FINANCIAL STATEMENT

### 4.1 Revenue (in Million)

Licensees	Particulars	2022-2023
Bhutan Power Corporation	Annual License Fee	29.79
Druk Green Power Corporation	Annual License Fee	14.80
Dagachhu Hydro Power Corporation	Annual License Fee	1.26
Mangdechhu Hydro Power Authority	Annual License Fee	7.20
Bhutan Power System Operator	Annual License Fee	0.09
Druk Hydro Energy Limited	Annual License Fee	0.25
<b>Total</b>		<b>53.39</b>

### 4.2 Annual Expenditure (in Million)

Particulars	2021-2022	2022-2023
Pay and Allowance	22.620	17.446
Travel In-country	1.254	0.857
Travel Out country	0.033	0.118
Utilities-Telephone, Fax, Internet, Telex	0.582	0.332
Utilities-Wireless, Transmission & Postage	0.003	0.001
Utilities-Electricity, Water & Sewage	0.050	0.049
Rental- Building	1.015	1.066
S&M - Office Supplies, Printing & Publication	0.711	0.638
S&M - Uniforms, Extension Kits	0.050	0.000
S&M - Others (Newspaper, Books & Magazines)	0.023	0.015
Maintenance of Properties - Building	0.240	0.000
Maintenance of Properties - Vehicle	0.789	0.739
Maintenance of Properties - Equipment	0.073	0.035
Maintenance of Properties - Computer	0.300	0.042
Operating Expenses - Advertising	0.662	0.264
Operating Expenses - Taxes, Bank Charges etc.	0.002	0.002





## 5. ACHIEVEMENTS

### 5.1 Reviewed Grid Code Regulation 2008

The Grid Code Regulation 2008 was reviewed in view of the expansion of the national grid and import of power during the lean season resulting in increased complexity in the operation of the Grid. The review resulted in several observations on the existing gaps in the Grid Code Regulation 2008. The proposed amendments were consulted with the stakeholders on 17 May 2023. Based on the findings and review, amendments to the Grid Code Regulation 2023 have been submitted for approval.

### 5.2 Review of the Guaranteed Service Level and Compensation Mechanism, Distribution Code 2022

The Guaranteed Service Level and Compensation Mechanism prescribed by the Distribution Code 2022 was reviewed in view of the existing BPC customer service delivery and Guaranteed Service Levels in other countries. The review resulted in several observations on the existing gaps and based on the findings, amendments to the GSL and compensation mechanism have been submitted for approval.

### 5.3 Developed Mechanism for Reduction of Power Outage in the Distribution

The BEA started collecting the daily power outages of the distribution system with effect from 12 July 2022 to assess the status of power reliability in the country. The BEA also established the reporting formats for the outage reporting and analyzed the outage data in collaboration with BPC. Based on the analysis, the time series of the outages, causes of outages, ESD wise preliminary SAIFI and SAIDI figures are provided below:



Figure 1. Time series-Frequency & Duration



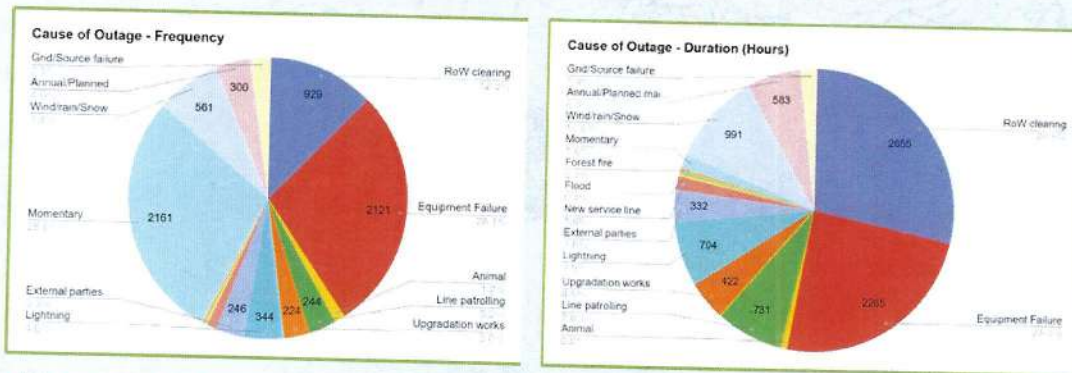


Figure 2. Outages categorized based on causes

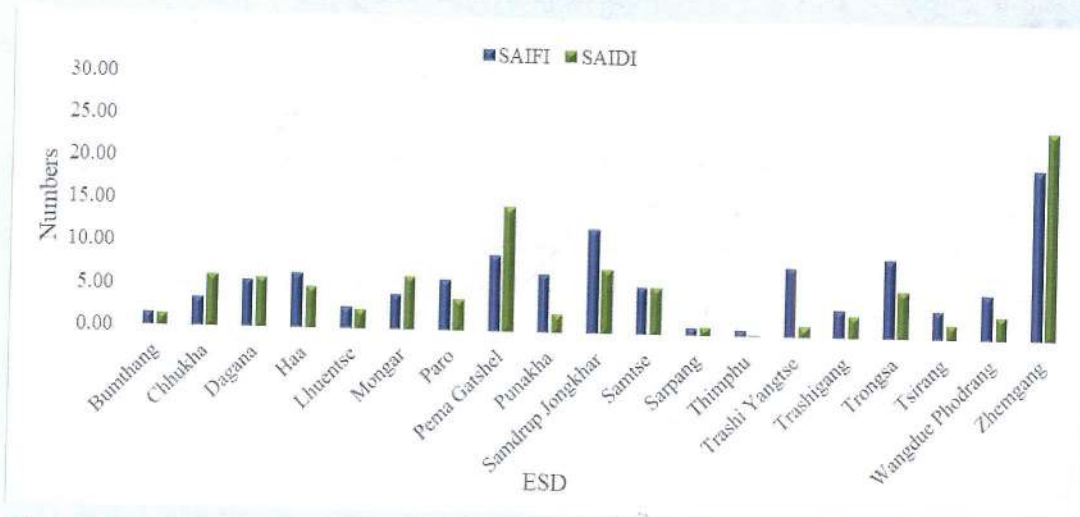


Figure 3. Reliability Indices

In consultation with the BPC, the BEA Secretariat has updated the reporting formats and developed a mechanism for monitoring and reduction of power outages.

### 5.4 Assessed BPC Consumer Service Delivery

BEA assessed BPC consumer service delivery against the Guaranteed Service Levels stipulated in the Distribution Code regulation 2022. Further, BEA scrutinized BPC's customer complaint recording system, analyzing the data to identify areas for enhancing customer service delivery. After a thorough assessment of BPC's service delivery, recommendations on data reporting, complaint handling and resolution, monitoring and enforcement mechanism for the Guaranteed Service Level were submitted.

### 5.5 Amended Rules for Fines and Penalties, 2020

To enhance the fine and penalty system, BEA developed fine guidelines in





2011 which was updated to Rules for Fines and Penalties in 2020. However, non-compliance continued despite penalties, lacking deterrent effect. Therefore, during the fiscal year, BEA reviewed the Rules for Fines and Penalties 2020 and proposed the Penalty Rules and Regulations 2023 for approval.

#### **5.6 Developed SOP for Internal Management and External Interfacing**

The BEA Secretariat developed Standard Operating Procedures (SOPs) and Turn-Around Time (TAT) guidelines to streamline its internal working system and processes. The SOPs and TATs were formulated for internal workflow management and external interactions in various domains, including license processing and issuance, compliance monitoring and enforcement, tariff determination and economic regulations, safety, and quality standard regulations, as well as general administration and management.

#### **5.7 Granted License Exemption**

The license exemption for 500kW ground-mounted solar project at Dechenchholing and solar rooftop projects of 250kW in Centenary Farmers Market, 70kW BT FEC building and 13.5kW Gunitsawa hostel in Paro were granted to facilitate the development of solar projects.

#### **5.8 Renewed construction license of THyE and KHEL**

The Tangsibji Hydro Energy Limited (THyE) applied for the renewal of their construction license. Accordingly, THyE's construction license was renewed until 30 June 2024. Similarly, Khollongchhu Hydro Energy Limited (KHEL) also applied for the renewal of their construction license and was subsequently renewed until 31 December 2028.

#### **5.9 Granted construction license**

In the fiscal year, Druk Hydro Energy Limited (DHyE), a subsidiary company of DGPC, applied for the construction license of Phase I of the small hydropower projects, namely 54 MW Burgangchu, 32 MW Yungichhu, and 18 MW Suchhu hydro project. Accordingly, BEA issued the construction licenses to the 3 small hydropower projects.

#### **5.10 Granted transfer of embedded generation license to DGPC**

Druk Green Power Corporation applied for the transfer of embedded generation license from BPC to DGPC, in line with Section 32 of the Electricity Act 2001. Accordingly, the license to operate embedded generation was granted to DGPC on July 1, 2022.



## 6. OPERATIONAL PLAN FOR 2023-2024

### 6.1 Review of Regulatory Frameworks for Improvement of the Business Ecosystem

Considering the national vision to achieve “Developed Bhutan” by 2034 and in acknowledgment of the Royal Government’s endeavors to address constraints hindering the country’s economic growth, ERA is embarking on a thorough assessment of the prevailing regulatory framework. This evaluation includes a detailed analysis of existing regulations, the identification of current challenges, and the identification of potential areas for impactful reform. The primary objective is to establish a supportive and conducive environment for the private sector to attract investments, generate employment opportunities, and consequently, bolster the national economy.

### 6.2 Established preliminary baseline for power reliability indices

The Electricity Regulatory Authority (ERA) as the sector regulator is mandated to ensure the efficient business operation of the power sector in meeting the national objective to drive the country’s economic transformation in a sustainable manner. As electricity is one of the key factors to foster economic development, it is critical for the power sector Licensees to enhance their performance to deliver safe, reliable and efficient supply of electricity to the consumers in Bhutan. To optimize the energy and service efficiency of the licensees, the ERA shall carry out Root Cause Analysis of the Transmission and Distribution power outages and set the preliminary baselines for power reliability indices during the fiscal year 2023-2024.

### 6.3 Formulation of Regulation on Grid Discipline Mechanism

The Department of Energy, in collaboration with ERA, DGPC, and BPC has formulated the Guideline on Grid Discipline Mechanism 2023 to enhance the discipline of national power system operation through commercial mechanisms requiring grid users to adhere to the scheduled electricity generation or drawal. Based on the Policy Guideline, ERA will formulate the Grid Discipline Mechanism Regulation covering commercial and technical aspects to ensure grid users to provide accurate forecasting of generation and loads and adhere to its schedule while penalizing any deviations.

### 6.4 Development of Strategy Document of BEA

In fiscal year 2023-2024, a five-year Strategy Document will be developed to align the organizational strategy with the 13th FYP and the government’s long-term plan. Implementation of this operational plan will involve revisiting ERA’s vision, reviewing licensing principles, technical regulation and addressing challenges, and embracing





opportunities for effective regulation in the evolving electricity sector landscape.

### **6.5 Amend Services Rules and Regulations 2018**

In 2018, BEA issued the Service Rules and Regulations, covering HR aspects like structure, ethics, recruitment, training, benefits, and more. These aim to promote merit, equity, and uniformity. However, gaps were identified, leading to implementation challenges. To address this, ERA will review and update these rules for comprehensiveness and relevance.

### **6.6 Formulation of Non Hydro Renewable Energy Tariff Regulation**

In order to enhance the energy security, RGoB intends to diversify energy sources through the completion of solar, wind, and biomass projects, including hybrid systems of hydro, solar, wind and storage, as well as the piloting of new technologies including energy storage. The Royal Government of Bhutan (RGoB) intends to develop 1000 MW of solar capacity and around 30MW of wind capacity by 2034.

In order to facilitate RGoB's plans of non-hydro renewable energy project development and engagement of the private sector for promotion of energy security and country's economic enhancement, ERA will formulate tariff determination regulation for non-hydro renewable energy projects in line with the Energy Policy of the Royal Government.

### **6.7 Formulation of Grievance Redressal Mechanism document**

A Grievance Redressal Mechanism shall be developed to address and resolve complaints or grievances raised by employees and provide an avenue for individuals to express their concerns, seek justice, and obtain a fair resolution to their grievances.





## 7 LICENSED HYDROPOWER PLANTS IN OPERATION

The following table shows the detail of licensed hydropower plants which are in operation in the country.

SL. No	Name of Plant	Year of Com. Operation	Date of License	Validity of License
1	CHP	1998	Jan 1, 2009	March 27, 2037
2	KHP	2002	Jan 1, 2009	March 27, 2037
3	BHP	2005	Jan 1, 2009	March 27, 2037
4	THP	2007	April 1, 2009	March 31, 2039
5	DHP	2015	Feb 20, 2015	Feb 19, 2045
6	MHP	2019	Mar 8, 2019	Mar 7, 2049

*Table 1. Hydropower plants in operation*





## 8. LICENSED HYDROPOWER PROJECTS UNDER CONSTRUCTION

The BEA issued a construction license to following hydropower plants in accordance with the provision of Electricity Act of Bhutan, 2001.

SL. No	Name of Plant	Date of License Issued	Date of Renewal	Validity of License
1	PHPA-I	November 11, 2008	March 31, 2023	Temporary License
2	PHPA-II	Feb 9, 2012	December 13, 2021	Mar 31, 2024
4	KHEL	July 14, 2015	June 21, 2023	Dec 31, 2028
5	THyE	April 15, 2016	June 21, 2023	June 30, 2024
6	DHyE (Yungichhu Hydropower plant)	August 18, 2022	NA	March 18, 2025
7	DHyE Burgangchhu Hydropower plant)	September 19, 2022	NA	December 19, 2024
8	DHyE (Suchhu Hydropower plant)	September 19, 2022	NA	July 19, 2024

Table 2. Hydropower plant under construction





## 9. PERFORMANCE OF THE LICENSEES

### 9.1 Technical performance

#### 9.1.1 Generation

The figure below depicts the power generation plants over the last five years.

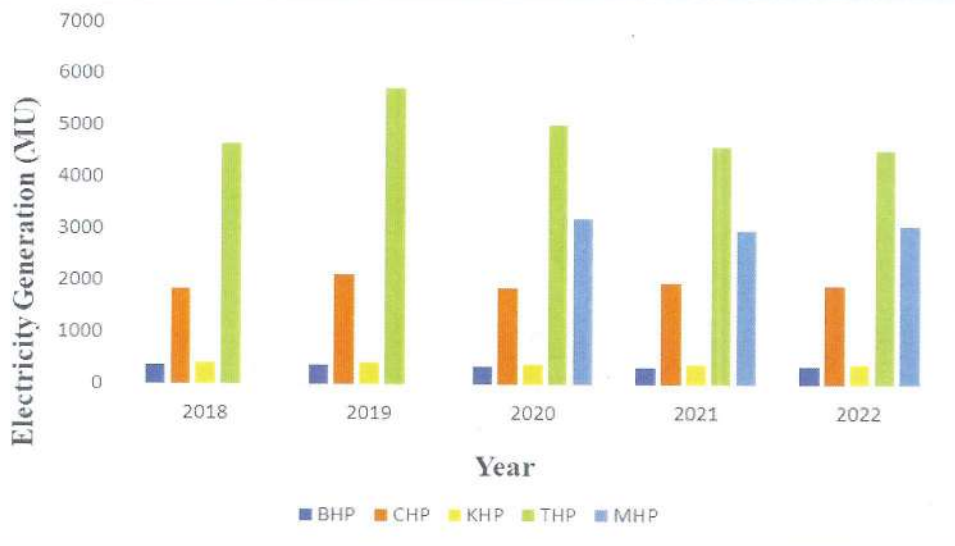


Figure 1. Electricity generation plants in the country

The availability factor of a power plant measures the proportion of time it can generate electricity during a specific timeframe, divided by the total duration of that timeframe. The table below illustrates the availability of power plants in the country over the last five years.

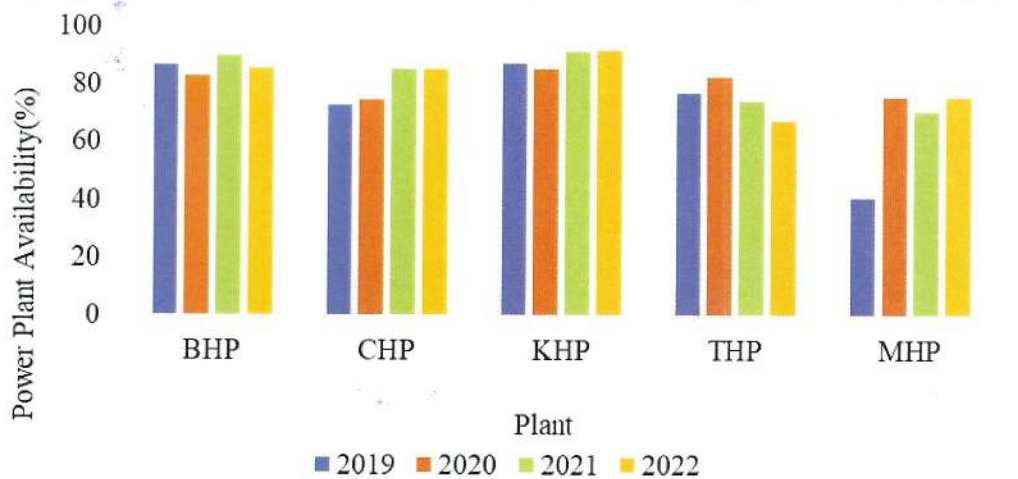


Figure 2. Power Plant Availability





The plant load factor is the relationship between the average power generated by the plant and the maximum power it could have generated during a specific period. The graph provided below displays the plant load factor over the last five years.

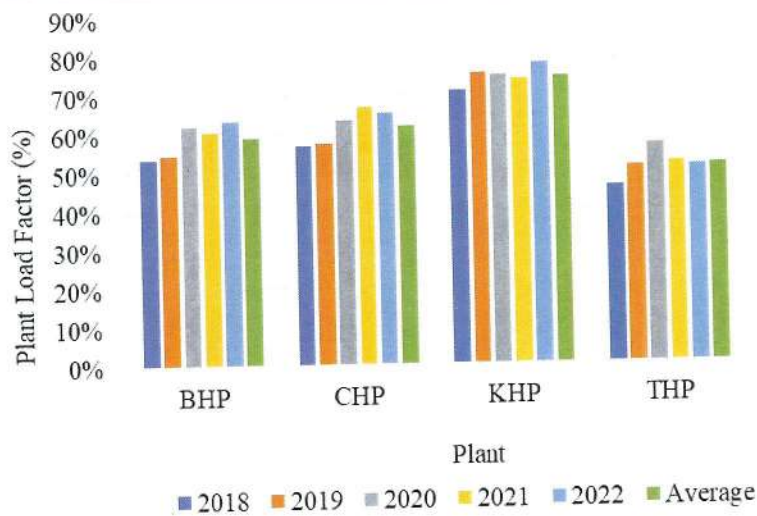


Figure 3. Plant Load Factor (%)

## 9.1.2 Transmission

### 9.1.2.1 Tripping Frequency of Overall Generating Unit

The table below shows the total number of generating units that experienced tripping throughout 2022. The highest number of tripping incidents occurred in July, with 48 cases taken place over the last five years, based on the capacity of various transformers.



Figure 4. Tripping Frequency of Overall Generating Unit



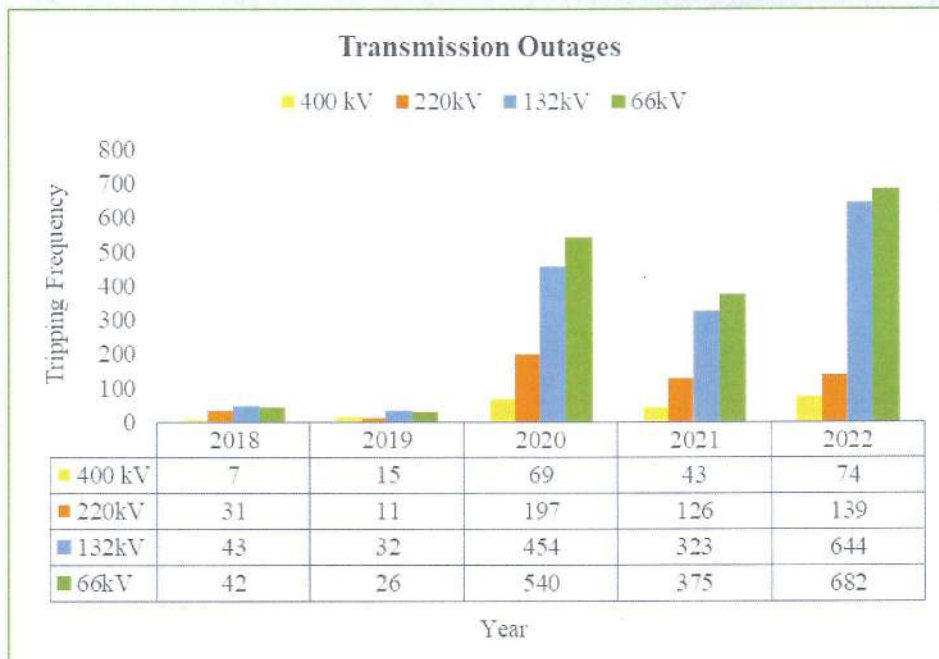


Figure 5. Transmission Outages

### 9.1.3 Distribution

The BEA conducted a comprehensive analysis of daily power outages data from July 12, 2022, to June 30, 2023. The analysis focused on the frequency and duration of these outages. The ESD offices in Phuntsholing recorded the highest number of outages, followed by those in Samdrupjongkhar, Pemagatshel, Zhemgang, and Paro. The frequency and duration of these outages are outlined in the graph given below.

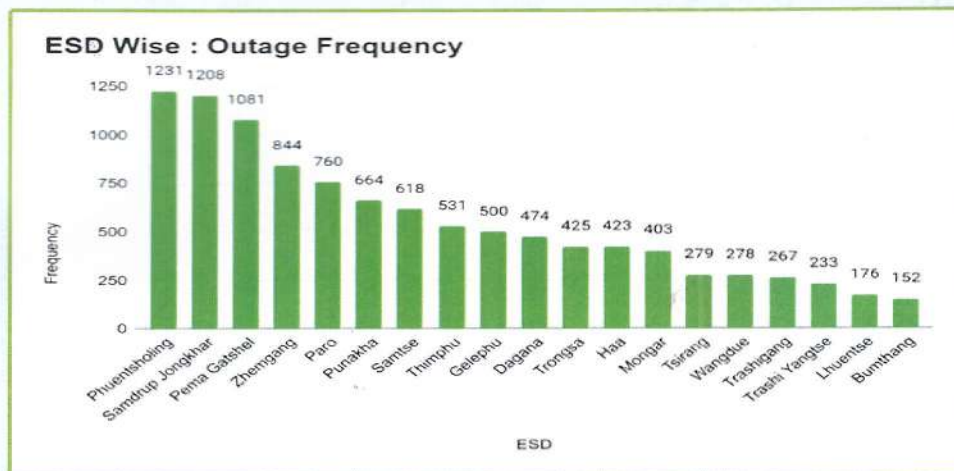


Figure 6. ESD Wise Outage Frequency





Regarding the length of power outages, the ESD office in Phuntsholing documented the long duration of outage with ESD offices in Thimphu, Pemagatshel, Paro, and Samdrupjongkhar subsequently reporting their outage durations.

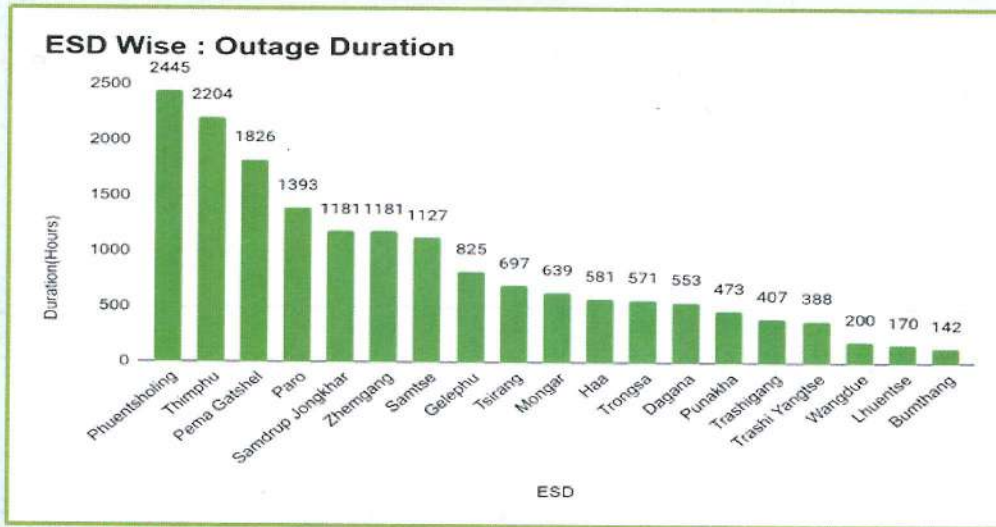


Figure 7. ESD Wise Outage Duration

**9.1.3.1 Tripping Frequency of Overall Transmission Lines**

The table below provides a breakdown of the number of tripping incidents that took place in transmission lines throughout 2022. In total, there were 669-recorded instances of transmission line tripping, with the highest number occurring in July, followed by September, and the lowest in December as illustrated in the graph.

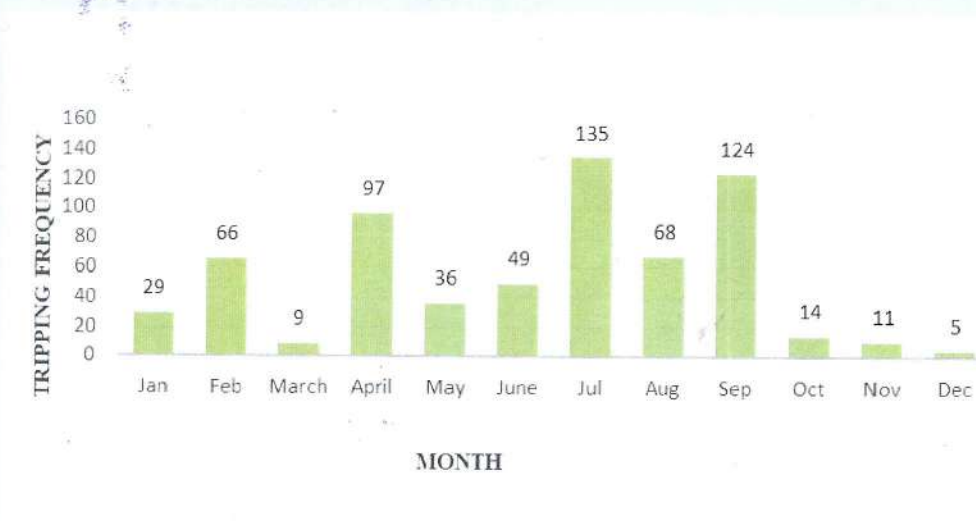


Figure 8. Over All Tripping Frequency





### 9.1.3.2 Tripping Frequency of Overall Generating Unit

The table below shows the total number of generating units that experienced tripping throughout 2022. The highest number of tripping incidents occurred in July, with 48 cases.

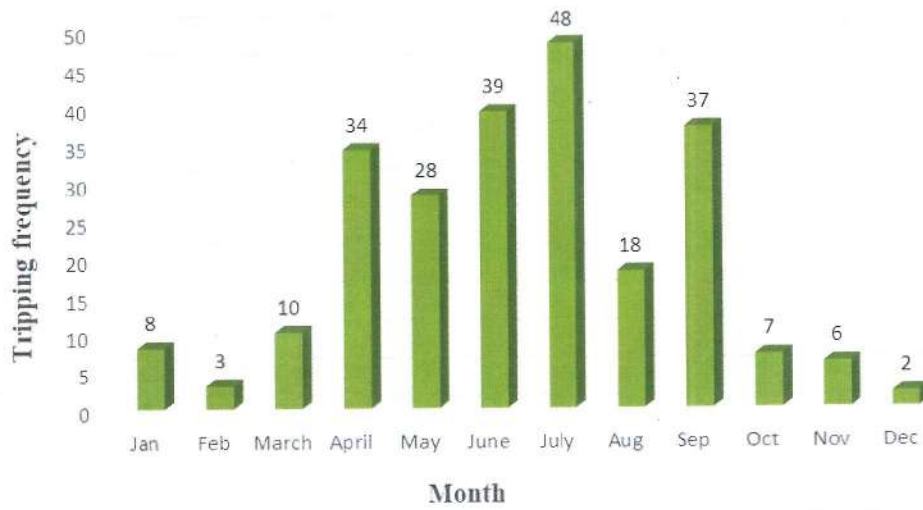


Figure 9. Overall Generating Unit Frequency

### 9.1.3.3 Transmission and Distribution Losses

The graph below indicates the transmission and distribution losses from the year 2018 to 2022.



Figure 10. Transmission and Distribution Losses





### 9.1.3.4 Peak Demand

The graph below shows the highest demand of electricity over the course of the last five years. Among these five years, 2022 marked the year with the most substantial peak demand.

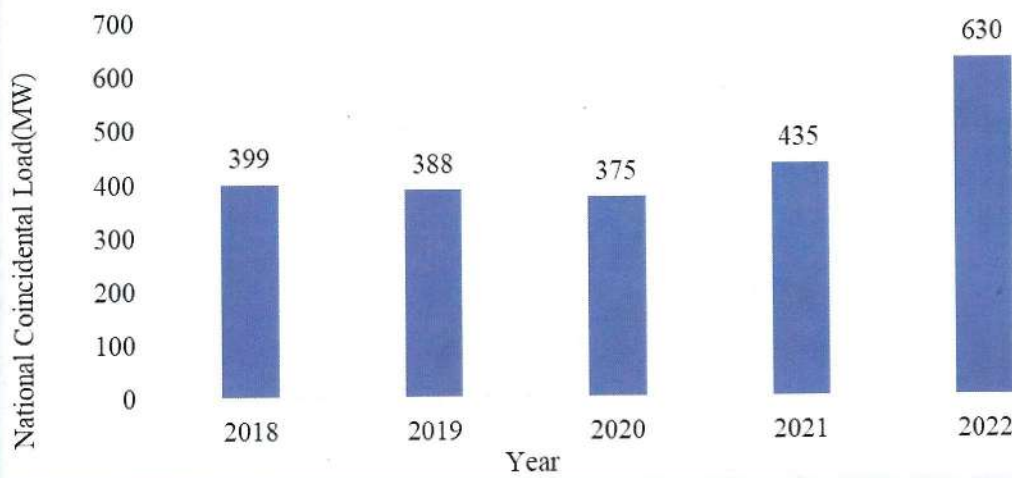


Figure 11. Peak Demand

### 9.1.4 Energy Sales

The figure below displays the year-wise total energy sales over the past five years.

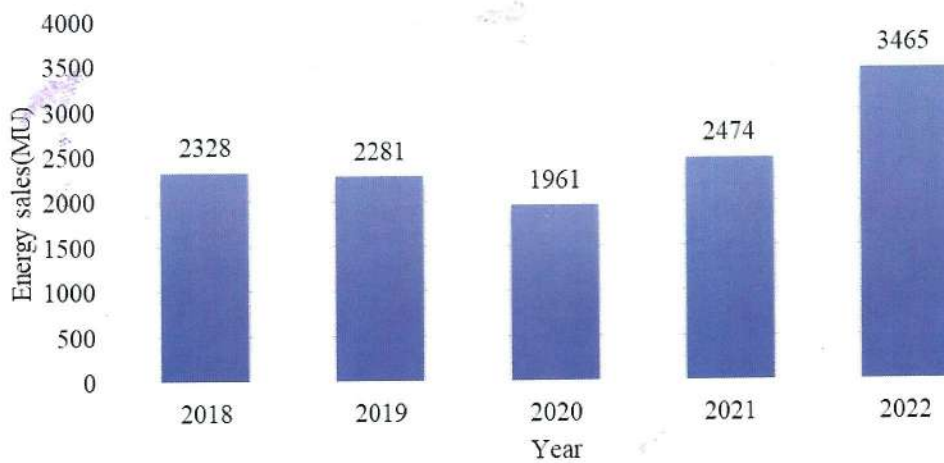


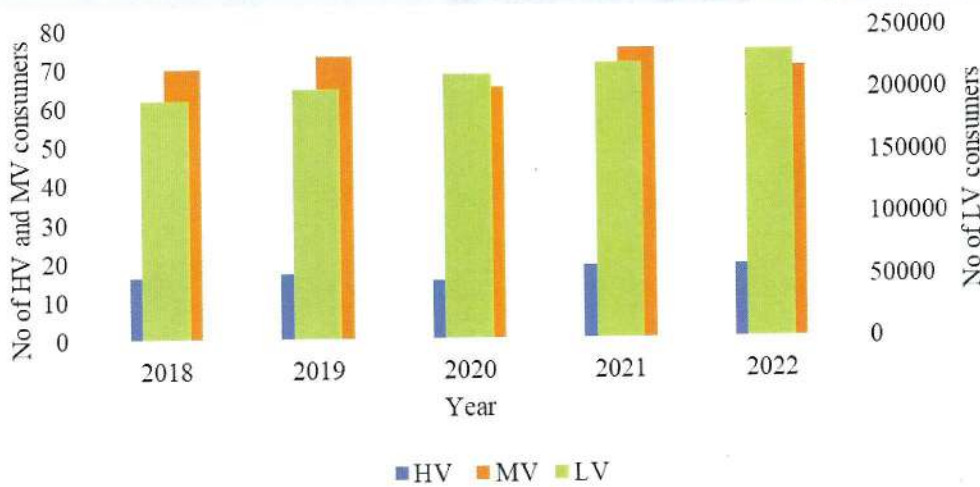
Figure 12. Energy Sales





### 9.1.5 Number of Consumers

The graph below illustrates the electricity consumers according to different blocks.



### 9.1.6 Supply and Demand Profile

The supply and demand of electricity for the five years are shown in the following graphs.

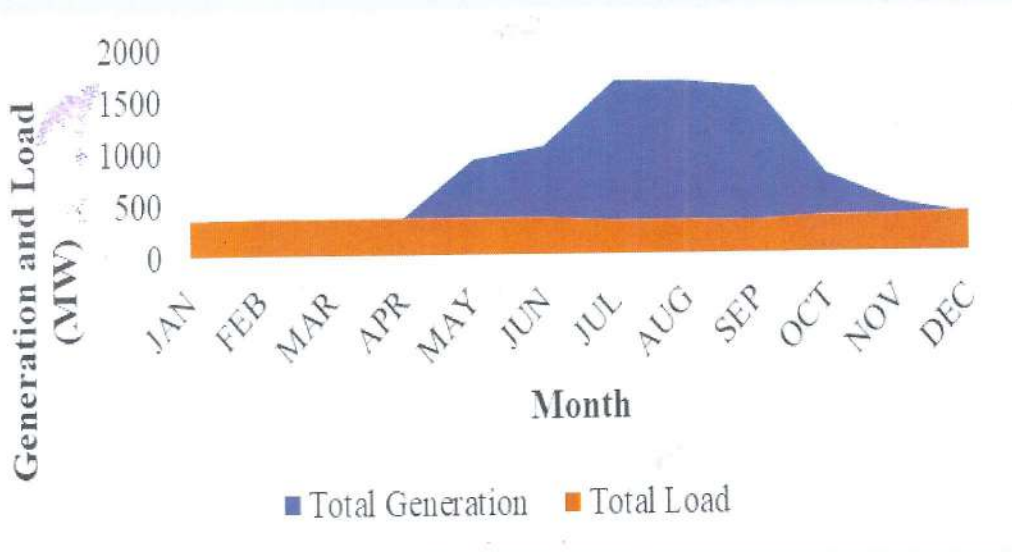


Figure 14. Supply and Demand 2018



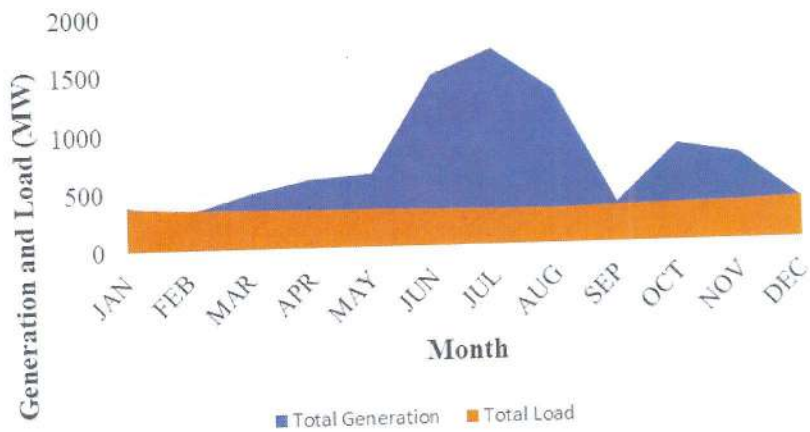


Figure 14A. Supply and Demand 2019

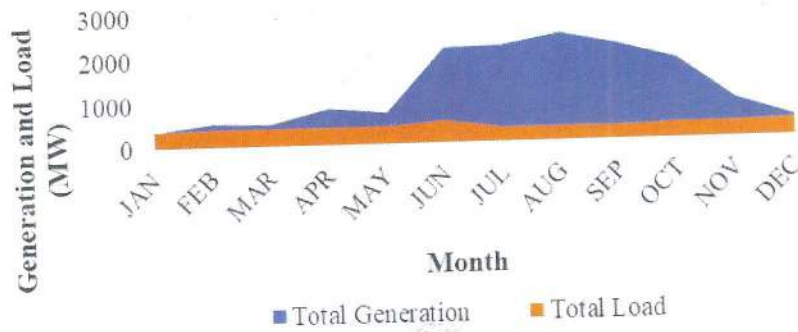


Figure 14B. Supply and Demand 2020

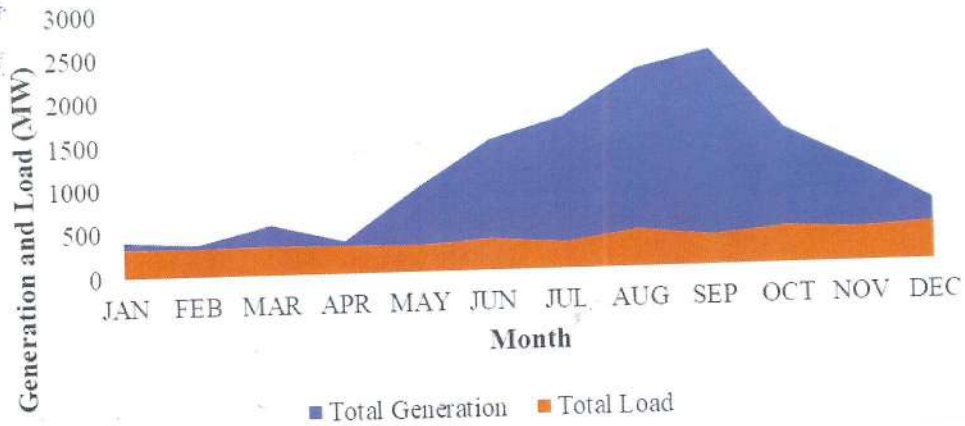


Figure 14C. Supply and Demand 2021



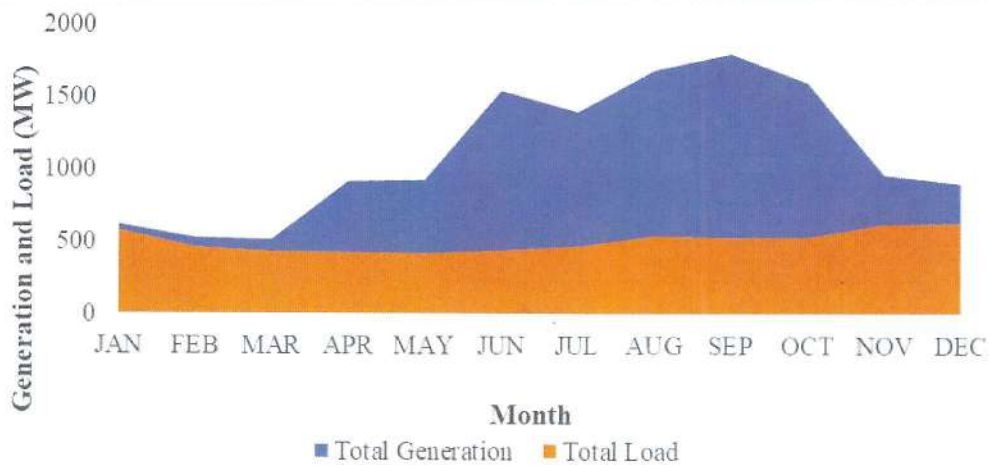


Figure 14D. Supply and Demand 2022

### 9.1.7 Electrical Safety Incidents

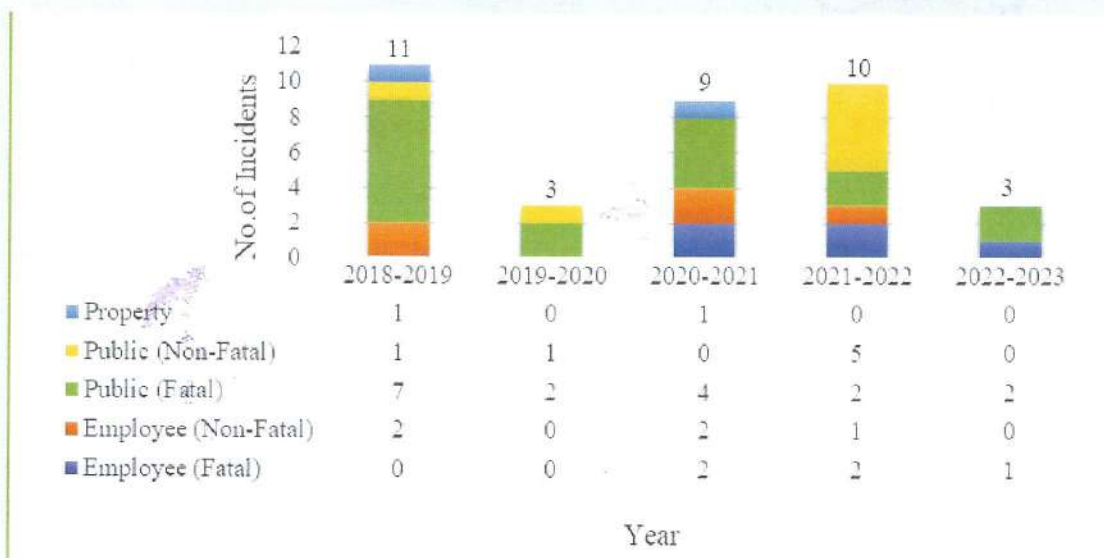


Figure 15. Electrical Safety Incidents





## 10. FINANCIAL PERFORMANCE

### 10.1 Bhutan Power Corporation

The Financial Statement of the BPC for the past five years.

Particulars	For the year-end				
	31.12.2018	31.12.2019	31.12.2020	31.12.2021	31.12.2022
	Nu. Million				
<b>Total Revenue</b>	9648	9533	9040	10877	14851
<b>Total Expenditure</b>	8495	7881	8041	9203	13660
<b>Net Profit</b>	762	1184	555	1150	830

### 10.2 Druk Green Power Corporation

The Financial Statement of DGPC for past five years.

Particulars	For the year-end				
	31.12.2018	31.12.2019	31.12.2020	31.12.2021	31.12.2022
	Nu. Million				
<b>Total Revenue</b>	11682	11919	13341	12552	12026
<b>Total Expenditure</b>	5003	4866	6031	5223	5483
<b>Net Profit</b>	4497	4947	5058	5097	4624

**11. GLOSSARY**

<b>BEA</b>	<b>Bhutan Electricity Authority</b>
MoEA	Ministry of Economic Affairs
BPC	Bhutan Power Corporation
DGPC	Druk Green Power Corporation
MHPA	Mangdechhu Hydro Power Authority
BPSO	Bhutan Power System Operator
DHEL	Druk Hydro Energy Limited
PHPA-I	Punatshangchu Hydro Power Project Authority-I
PHPA-II	Punatshangchu Hydro Power Project Authority-II
RENEW	Respect, Educate, Nurture and Empower Women
KHEL	Kholongchhu Hydro Energy Limited
THyE	Tangsibji Hydro Energy Limited (THyE)
CHP	Chukha Hydropower Plant
KHP	Kurichhu Hydropower Plant
BHP	Basochhu Hydropower Plant
THP	Tala Hydropower Plant
DHP	Dagachhu Hydropower Plant