འབྲུག་གློག་ཁུག་རིང་ལུགས་བས་སྡེད་པ།

Bhutan Power System Operator

རྒྱལ་ཁུགས་དང་རང་བཞིན་ཐོན་སྐྱེད་ལྟན་བཀ

Ministry of Energy and Natural Resources

Power System Operation Division

Transmission Performance System Report

First Quarterly Report 2026

April 2026

Contents

1 Introduction

The electricity transmission network in Bhutan is solely owned by Bhutan Power Corporation limited (BPC) and electricity generation is solely owned by Druk Green Power Corporation Limited (DGPC). Bhutan Power System Operator (BPSO) under Ministry of Energy and Natural Resource is responsible for safe, secure and efficient operation of Bhutan transmission network and generation.

This quarterly report is prepared in compliance to the Grid Code Regulation (GCR) 2024, clause 153, and "System Operator has to submit a quarterly report covering the performance of the Transmission System to all Licensees, Authority and Ministry". This transmission performance report contains summary of growth of peak demand, performance of generating stations (power and energy generation), energy availability and requirement for the country, export and import of electricity to/ from India, frequency profile of selected substation and voltage profile of few important substations. All the index and other calculations in this report have been executed based on the data received from SCADA, substations and generating plants.

2 Generation Capacity

Although in full swing at various sites, the first quarter saw no generation addition. The installed capacity remained at **3499.38 MW** only. Details are as given below.

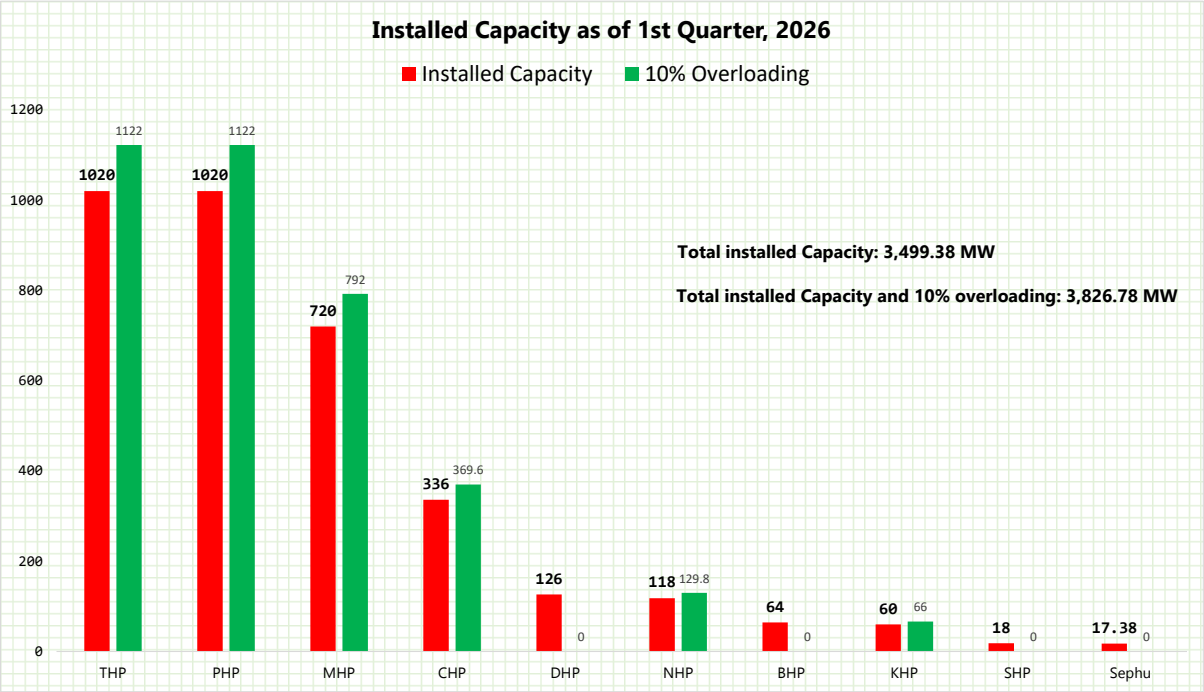


Figure 1 *Installed Capacity and Overloading Capacity*

2.1 Upcoming generation capacity

The first-phase small hydropower project, totalling to 104 MW, covers three projects – 18 MW Suchhu (SHP) and the following two are under advanced stage of completion. SHP, commissioned in 2025, is in full operation, though limited by the evacuation constraint.

Table 1 *Upcoming Capacities*

Plant	Capacity (MW)	No. of Units
Yungichhu	32	2
Burgangchhu	54	2
Total	**86**	-

Following the commissioning and declaration of COD for these two plants, expected anytime this second quarter, the total capacity would rise to 3590.38 MW.

2.2 Performance of generating plants for the First quarter 2026:

Table 2 *Performance of the generating plants:*

Sl.No	Generating Station	Installed Capacity (MW)	Maximum Generation (MW)	Average Generation (MW)	Average Availability (%)	Remarks
1	SSP (Solar)	17.38	17.88	3.91	100.00%	Normal operation
2	SHP	18.00	10.00	4.81	100.00%	Normal operation
3	KHP	60.00	49.50	25.71	100.00%	Normal operation
4	BHP	64.00	33.00	20.77	100.00%	Normal operation
5	DHP	126.00	0.00	0.00	0.00%	Under shutdown due to flood
6	NHP	118.00	50.02	25.38	100.00%	Normal operation
7	CHP	336.00	184.24	104.29	100.00%	Normal operation
8	MHP	720.00	512.32	158.96	100.00%	Normal operation
9	THP	1,020.00	618.00	235.83	100.00%	Normal operation
10	PHP-Ⅱ	1,020.00	330.90	40.13	100.00%	Normal operation

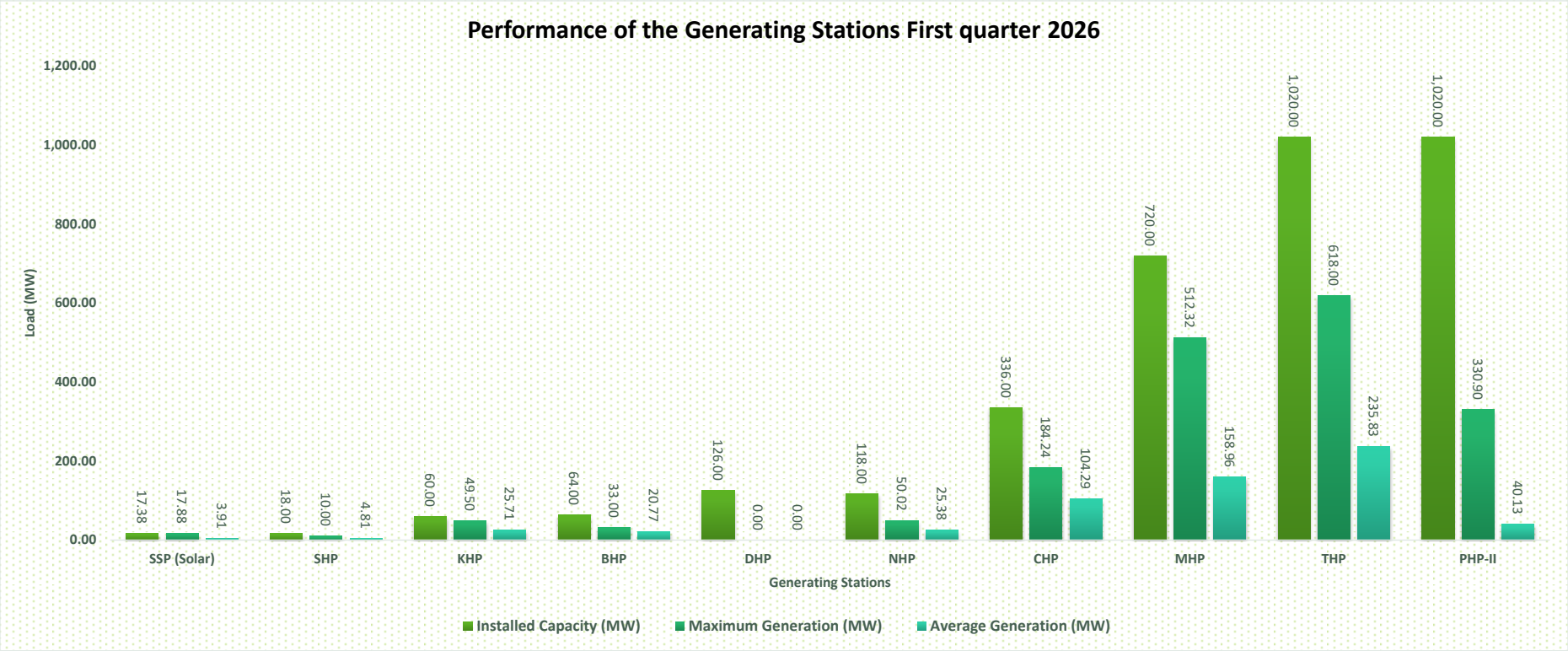


Figure 2 *Installed Capacity and Maximum Generation and Average Generation.*

3. Power and Energy Generation

The maximum total generation for the First quarter of year 2026 was 1098.53.68 MW in month of March and minimum generation was 105.51 MW in the month of January.

Table 3 *Summary of maximum and minimum generation by various hydropower plant*

Generation By	SSP (MW)		SHP (MW)		KHP (MW)		BHP (MW)		NHP(MW)		DHP (MW)		CHPC (MW)		MHP (MW)		THP(MW)		PHP-II(MW)		TOTAL (MW)	
Month	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
January	17.75	0.00	7.70	0.02	28.44	15.24	24.20	17.20	40.04	22.00	0.00	0.00	181.38	26.20	393.47	36.02	560.00	41.00	309.80	23.40	**1,002.78**	**140.08**
February	17.88	0.00	4.30	0.75	30.43	11.18	21.20	15.50	28.01	15.02	0.00	0.00	182.30	41.00	391.52	21.30	618.00	31.00	330.90	0.75	**1,006.54**	**105.51**
March	17.75	0.00	10.00	0.70	49.50	12.40	33.00	9.80	50.02	15.00	0.00	0.00	184.24	40.88	512.32	30.33	561.00	31.00	241.70	42.70	**1,098.53**	**151.81**

Source: Hydropower Plants (DGPC)

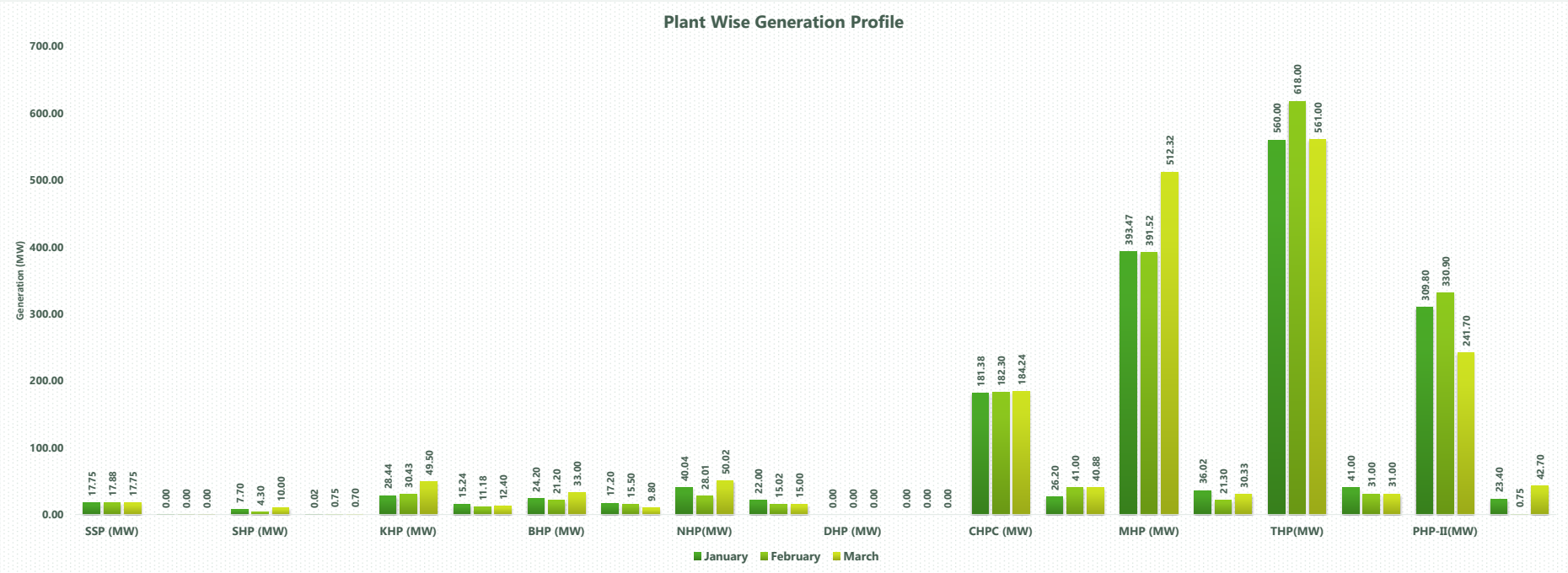


Figure 3 *Summary of maximum and minimum generation by various hydropower plant*

3.1 The capacity factor of each generating plant was calculated as below:

$$Capacity\ factor = \frac{Total\ energy\ plant\ has\ produce\ over\ a\ period}{Total\ energy\ plant\ would\ produce\ when\ operated\ at\ full\ capacity}$$

Table 4 *Total generation and capacity factor of various hydropower plants*

	Plant Capacity Factor																			
Month	**SSP (MU)**	**SSP(CF)**	**SHP (MU)**	**SHP(CF)**	**KHP (MU)**	**KHP(CF)**	**BHP (MU)**	**BHP(CF)**	**NHP(MU)**	**NHP(CF)**	**DHP (MU)**	**DHP(CF)**	**CHPC (MU)**	**CHPC(CF)**	**MHP (MU)**	**MHP(CF)**	**THP(MU)**	**THP(CF)**	**PHP-II(MU)**	**PHP-II(CF)**
January	0.00	0.21	3.50	0.25	14.70	0.34	15.32	0.32	17.41	0.17	0.00	0.00	51.00	0.21	103.81	0.19	161.42	0.21	127.51	0.05
February	0.00	0.22	2.50	0.21	11.55	0.29	11.27	0.26	13.71	0.15	0.00	0.00	53.07	0.23	78.57	0.16	117.38	0.17	94.74	0.01
March	0.00	0.21	3.62	0.27	18.85	0.43	14.35	0.31	17.35	0.17	0.00	0.00	77.33	0.31	124.22	0.22	175.79	0.23	128.74	0.03

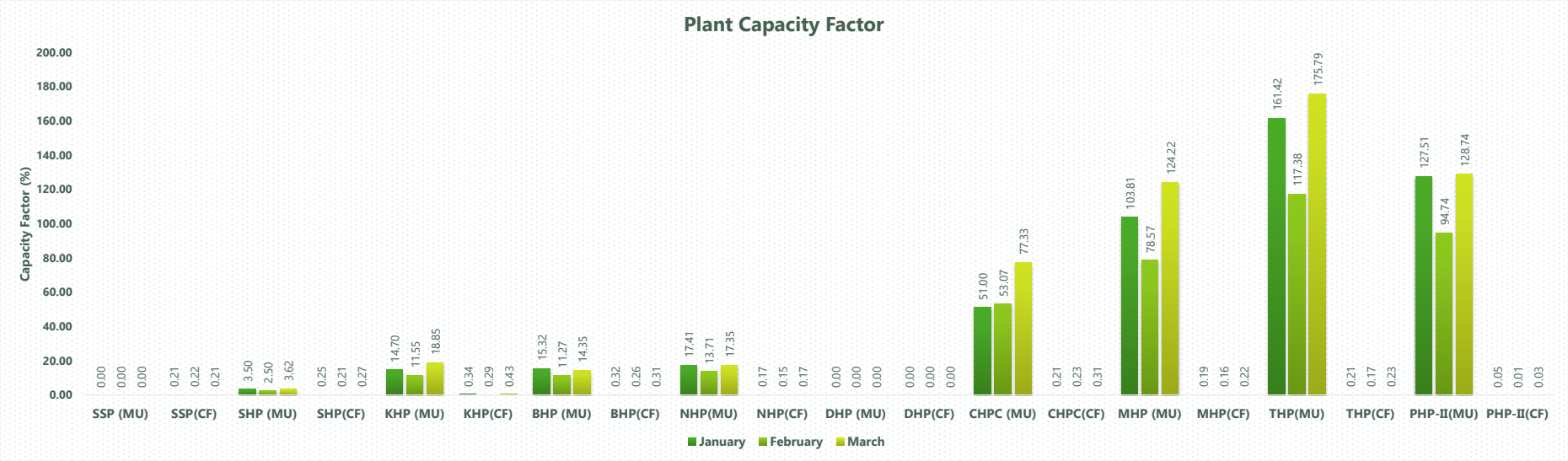


Figure 4 *Plant Capacity Factor*

4. Energy Availability and Requirement for the country

4.1. Energy (MU) consumed by Country

The total energy consumed within Bhutan is computed from the total energy DGPC had sold to BPC including the royalty energy. The energy (MU) consumed by the country is calculated through scheduling.

Table 5 *Energy purchased by BPC from DGPC*

Month	Total Ex-bus (MU)	Total energy sold to BPC (MU)
January	498.33	478.34
February	385.61	372.89
March	562.77	502.65

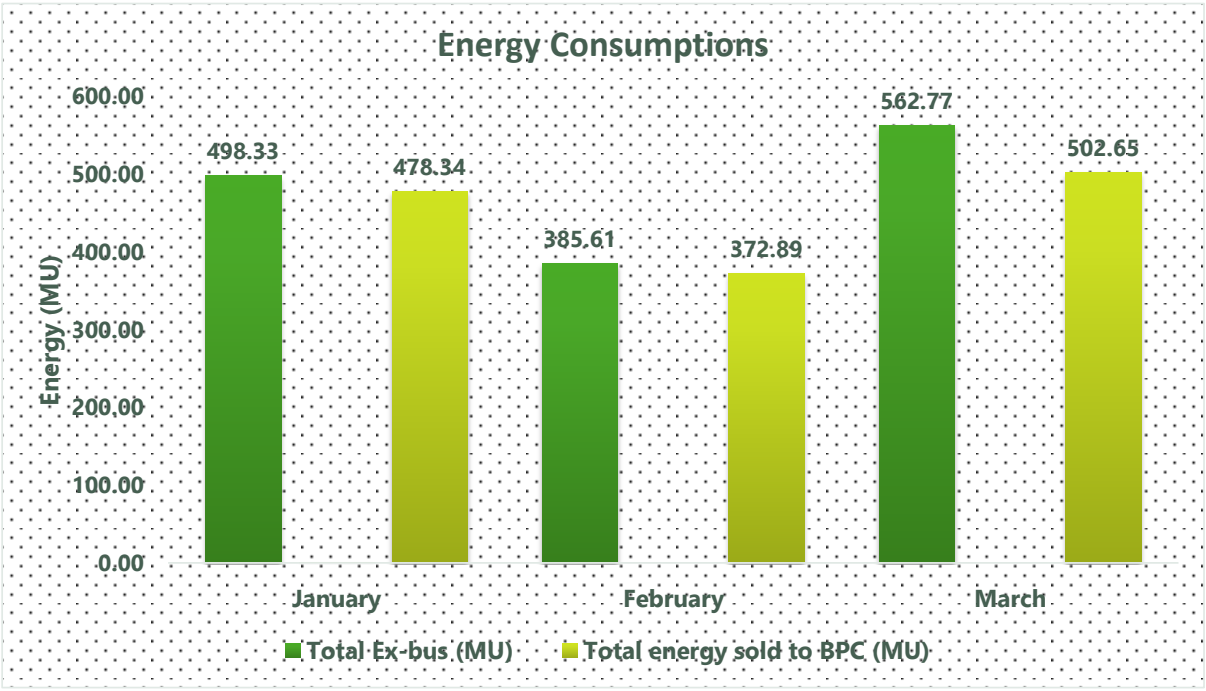


Figure 5 *Energy Consumptions*

4.1.1. Scheduling

In exercise of the power conferred by the Clause 14 of the Grid Code Regulation 2024, BPSO schedules the following:

a) Generation, to plants;

b) Demand, to BPC;

4.1.2. Generation Scheduling

Based on the forecasts received from plants and BPC, BPSO determines the block-wise generation ex-bus schedules and load. The revenue for the plants is based on the schedules finalized by BPSO. In the same way, BPSO finalizes the demand and the revenue for BPC is based on the finalized demand schedules. Therefore, finalization of

generation schedule by BPSO is very important. The excess, if any, are earmarked for export. Deficit, if any, are submitted for import.

4.1.3. For January

The total ex-bus generation schedule for January, 2026, as given below is **498.33 MUs.**

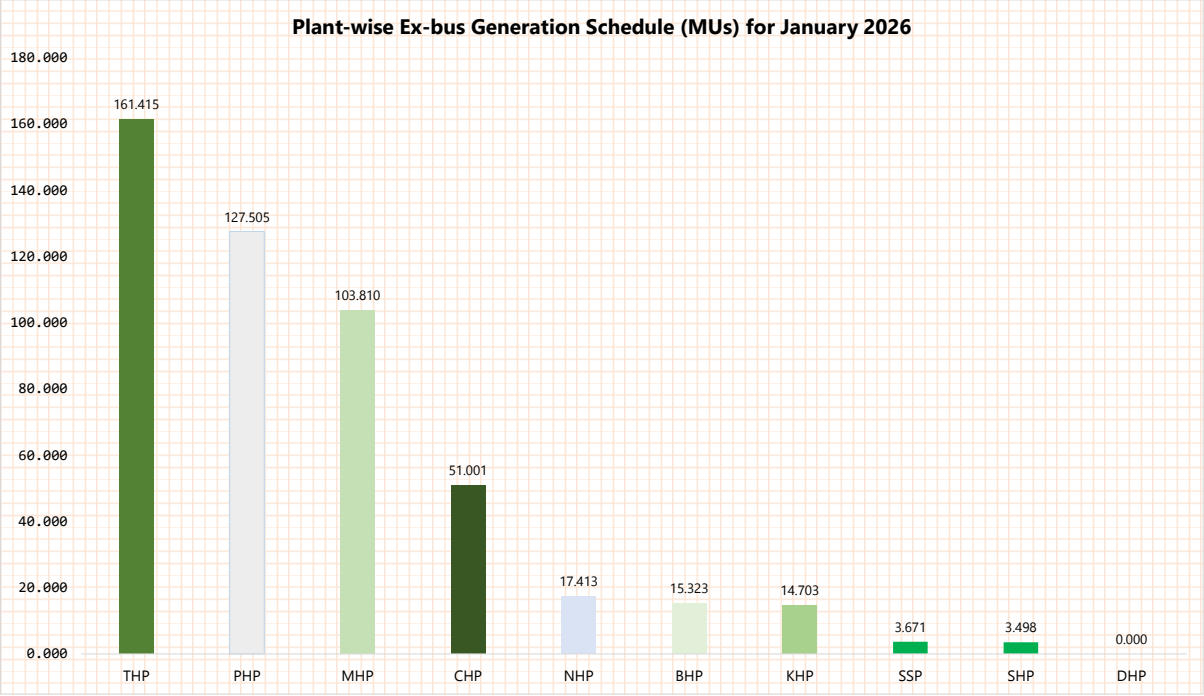


Figure 6 *Generation Schedule for January*

4.1.4. For February

The total ex-bus generation schedule for Feb, 2026, as given below is **385.61 MUs.**

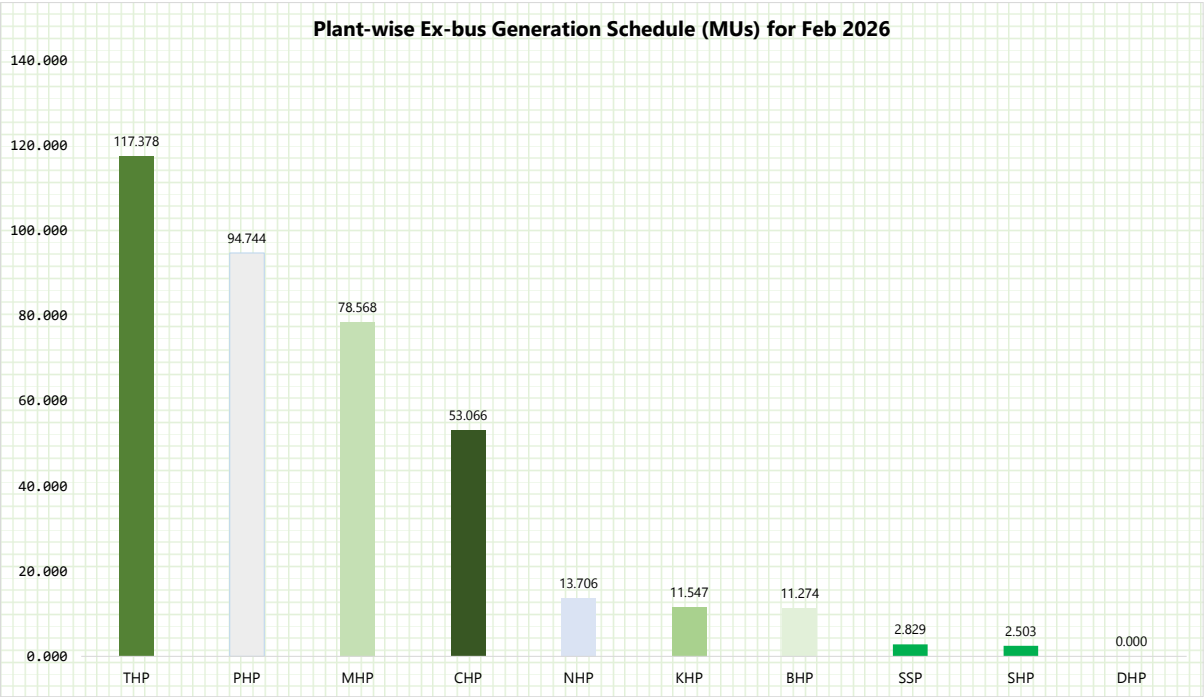


Figure 7 *Generation Schedule for February*

4.1.5. For March

The total ex-bus generation schedule for Mar, 2026, as given below is 562.77 MUs.

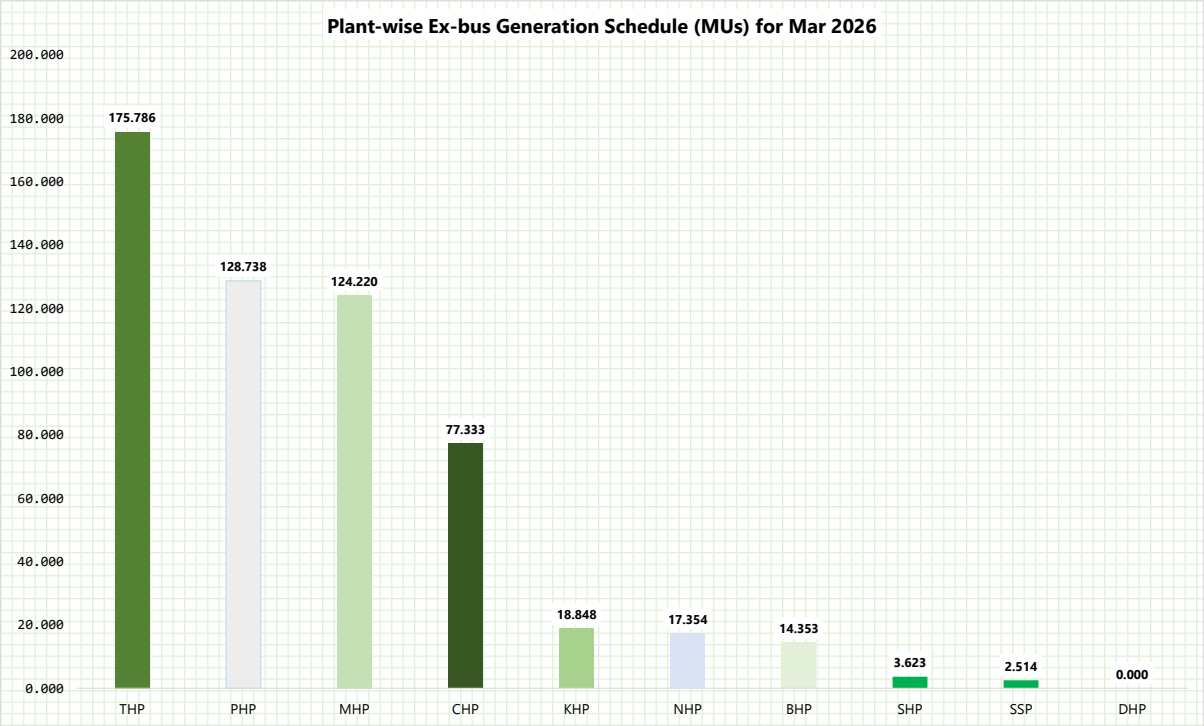


Figure 8 *Generation Schedule for March*

4.1.6. Consolidated Generation Schedule for 1st Quarter

The total Ex-bus generation schedule for the 1st Quarter totals to around **1,446.72 MUs**, as given below.

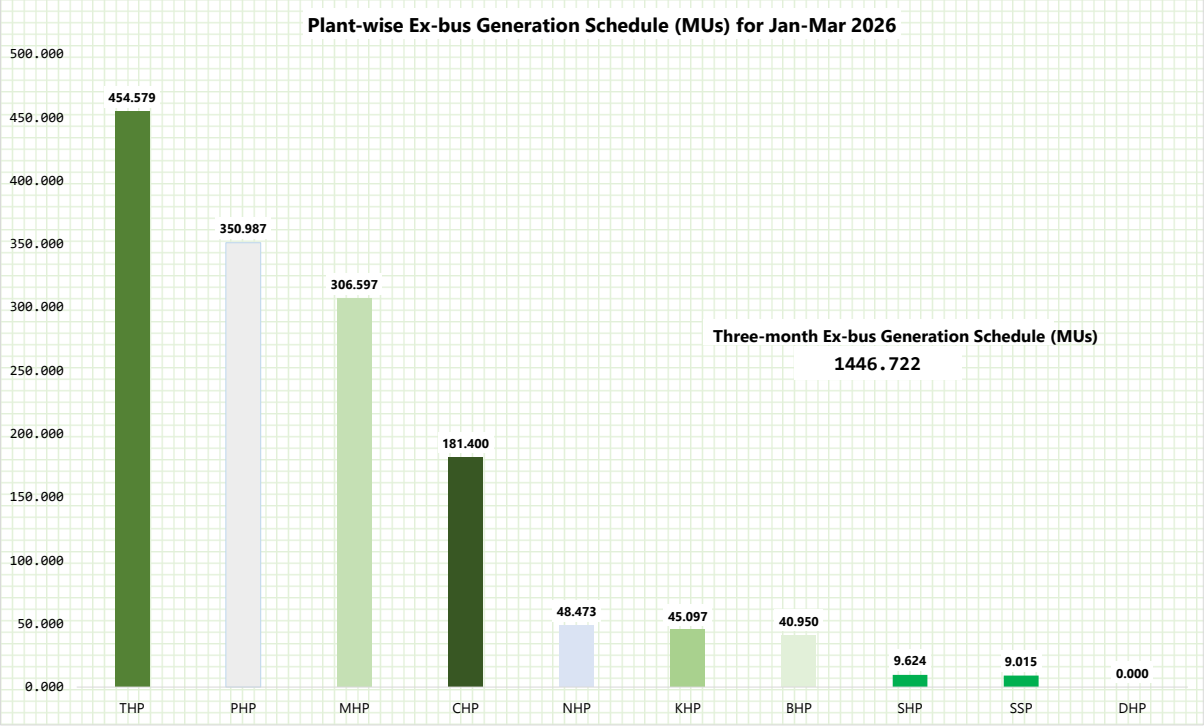
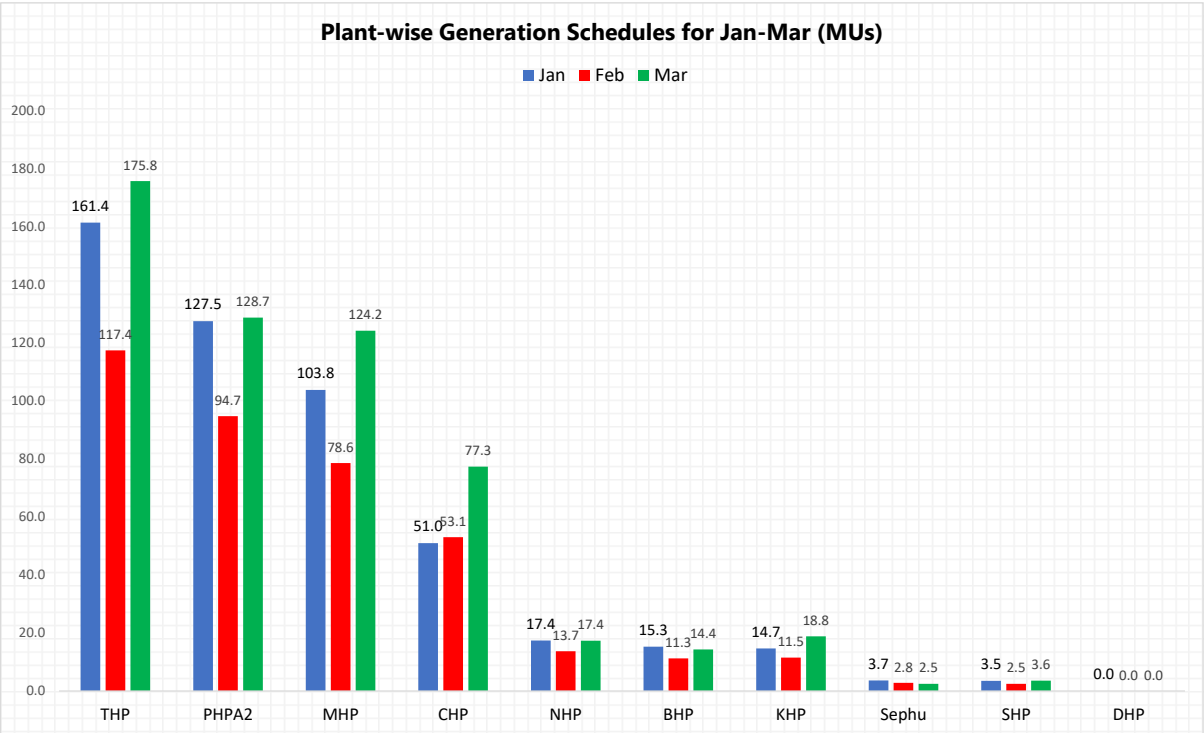


Figure 9 *Consolidated Generation Schedule*

4.1.7. Plant-wise, month-wise generation schedules

As it can be seen from the following, February is the leanest of all for all the plants, except for Solar Sephu.



5. National Peak Demand

The national peak demand for First Quarterly report for the year 2026 is recorded at **1474.94 MW** which occurred on March 29th, 2026 at 19:00 hours. This is calculated by (Sum of all total generation)- (Sum of all Export or Import).

Table 6 *The National Peak Demand since 2008*

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Peak Load (MW)	187.05	237.17	256.95	276.24	282.44	313.94	333.41	336.52	335.87	362.09	399.35	387.66	374.53	435.35	629.61	955.51	1026.4	1477	1474.94
% Growth over previous Year	18.87	26.79	8.34	7.51	2.24	11.15	6.20	0.93	-0.19	7.81	10.29	-2.93	-3.39	16.24	44.62	51.76	7.42	43.90	-0.14

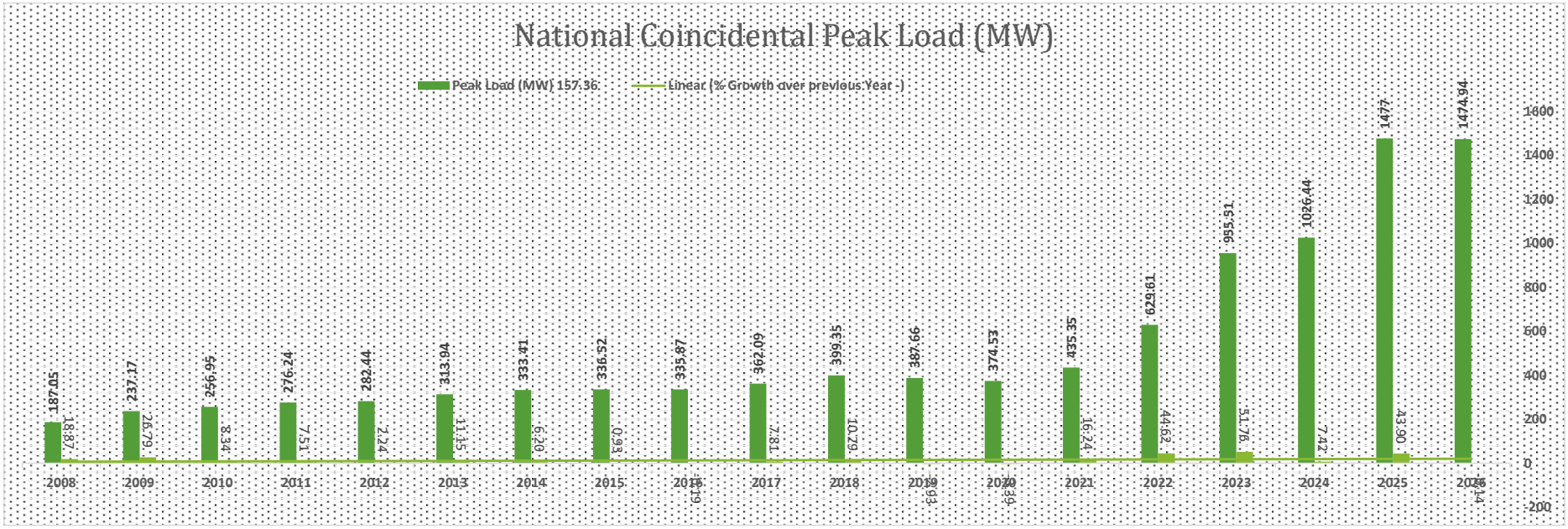


Figure 10 *National Coincidental Peak Load (MW)*

5.1. Power (MW) consumed by country

Following methods are used to calculate peak demand for the Eastern Grid, Western Grid and National demand.

1. **National Demand** = (Sum of all total generation)- (Sum of all Export or Import)
2. **National Demand** = (Sum of all feeders loading at hydropower station) – (Sum of all Export/Import)
3. **National Demand** = (Sum of all substation loading)

5.1.1. Peak Load from Generation-Export/Import.

Table 7 *Bhutan's national demand load using method- 1*

Month	National Load Max	Min
January	1,474.06	802.46
February	1,461.83	836.01
March	1,474.94	805.06

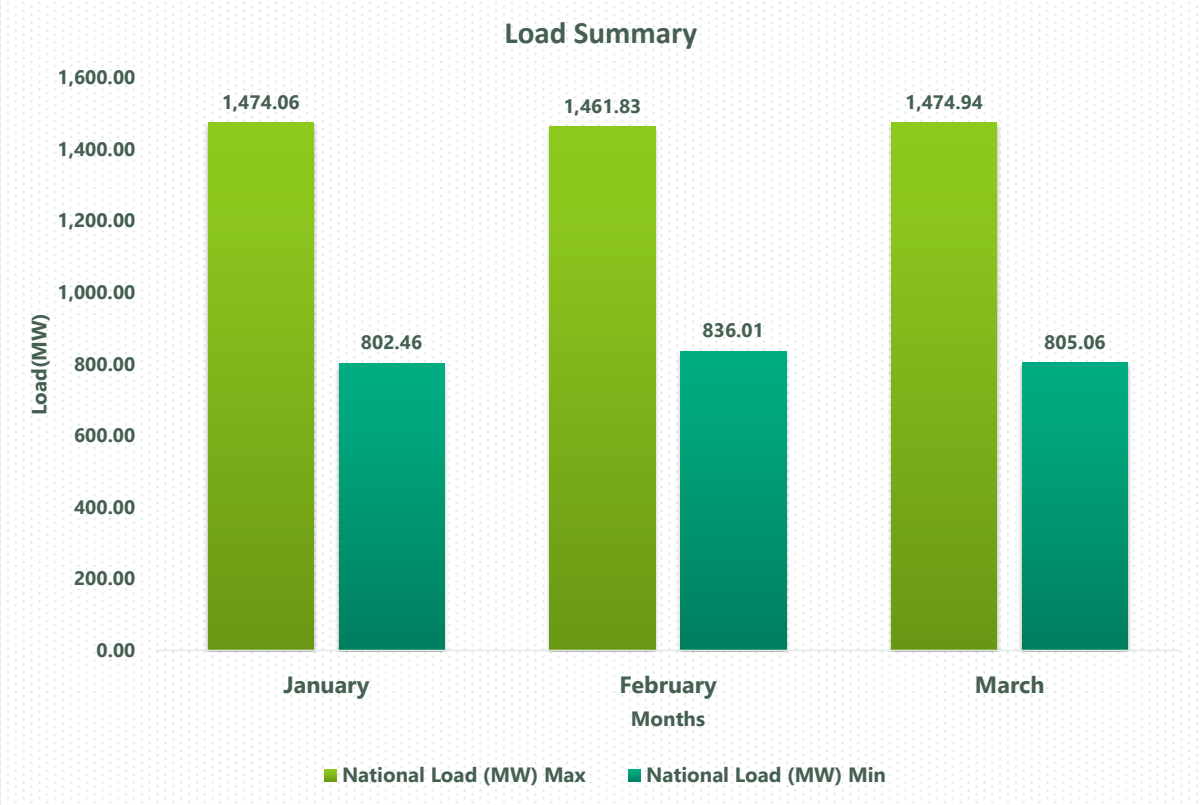


Figure 11 *Bhutan's national demand load using method -1*

5.1.2. Peak Load from Submission of Stations. This is based on individual stations reports:

Table 8 *Bhutan's National Demand Load using method-3*

Month	National Load Max	Min
January	1,301.23	787.33
February	1,301.23	1,022.06
March	1,301.23	944.26

Figure 12 *Bhutan's National Demand Load using method-3*

5.1.3. Main Reason for Difference between the above two Load:

It has been observed that there is a difference in the peak load values obtained from:

1. Generation and Export/Import data and
2. Submission of peak load as submitted by individual station.

The peak load derived from generation data is calculated as:
Peak Load=Total Generation – Net Export/Import.

Whereas, the station based peak load is obtained by summing the loads reported by all the stations.
The variation between the two values maybe attributed to the following factors:

- Transmission and transformation losses within the grid, which inherently included in generation-based calculation but not

fully reflected in station submission.

- Difference in metering accuracy at generation points, interconnections, and stations data.
- Time mismatch in peak recordings, as system peaks may not occur at the exact same time.
- Reporting inconsistencies, including possible omission or duplication in station submissions.

In general, the peak load calculated from generation minus export/import represents the actual system demand, as it reflects the total power supplied to meet the load including system losses.
Therefore, for system level analysis and reporting, the generation-based peak load is considered more accurate and reliable. However, station-wise data remains essential for operational analysis and validation purpose.

6. Export and Import of Electricity

Maximum export for the First quarter of year 2026 was 674 MW to Binaguri substation in India. The minimum export recorded was
0.00 MW to Birpara substation.

Table 9 *Export of electricity to India*

Export To	Binaguri (MW)		Birpara (MW)		Salakoti and Rangia (MW)		Alipurduar (MW)	
Month	Max	Min	Max	Min	Max	Min	Max	Min
January	674.00	0.48	0.00	0.00	73.90	0.08	94.82	74.82
February	529.38	10.19	0.00	0.00	0.00	0.00	0.00	0.00
March	586.00	0.81	0.00	0.00	1.79	0.03	242.18	1.45

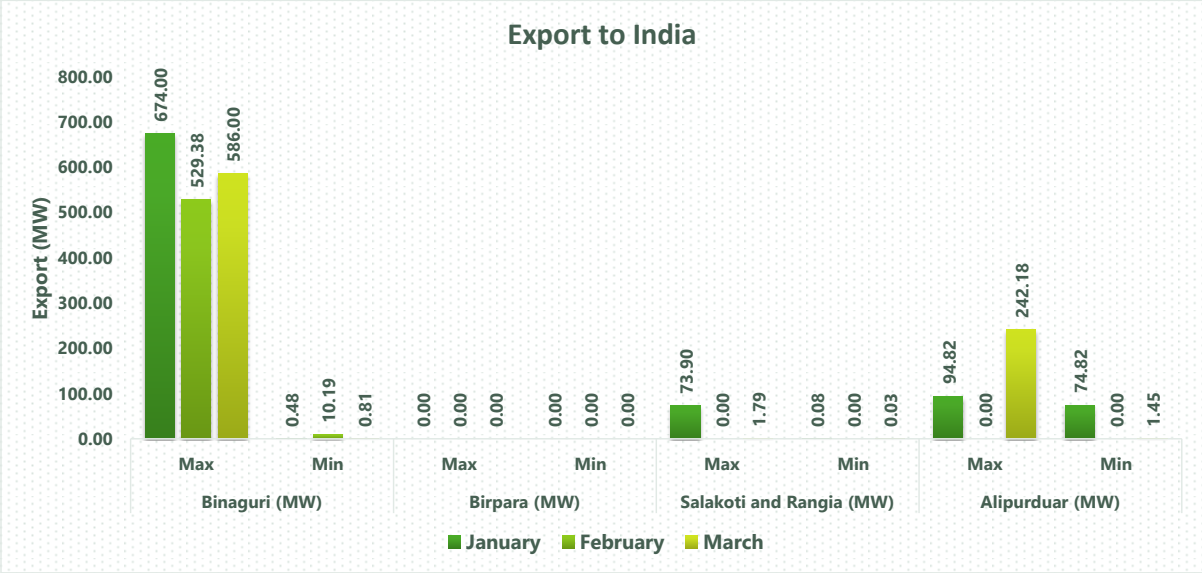


Figure 13 *Export of electricity to India*

Table 10 *Import of electricity from India*

Import From	Binaguri (MW)		Birpara (MW)		Salakoti and Rangia (MW)		Alipurduar (MW)	
Month	Max	Min	Max	Min	Max	Min	Max	Min
January	354.93	0.97	327.58	72.00	37.95	0.23	535.28	436.22
February	344.45	1.35	300.10	36.00	110.82	14.89	745.45	448.73
March	327.27	0.32	370.20	2.78	92.61	0.03	493.09	221.81

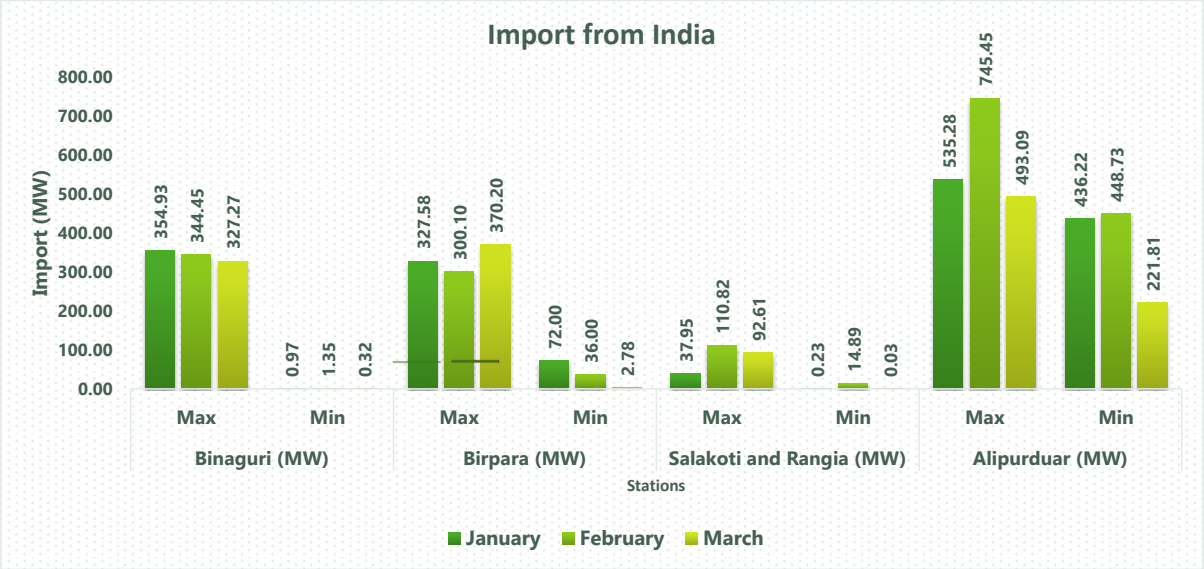


Figure 14 *Import of electricity from India*

7. Frequency profile

The nominal allowed frequency range shall be 50Hz ± 1% in Bhutan. The system is normally managed such that frequency is maintained within operational limit of 49.5 Hz to 50.5 Hz. However, frequency may move outside these limits under faulty condition.

As per the Grid Code 2024, the frequency is classified into three different bands as follows:

a. Normal state
   The transmission System frequency is within the limit of 49.5Hz to 50.5Hz.
b. Alert state
   The Transmission System frequency is beyond the normal operating limit but within 49.0Hz to 50.0Hz.
c. Emergency state
   There is generation deficiency and frequency are below 49.0Hz.

The national grid frequency for Bhutan is taken with reference to 220/66/11kV Semtokha substation.

7.1. Frequency Summary for the month of January to March 2026

Table 12 *Frequency summary for the month of January to March 2026*.

Month	Grid Frequency	
	Max	Min
January	50.10	49.70
February	50.00	49.70
March	50.20	49.70

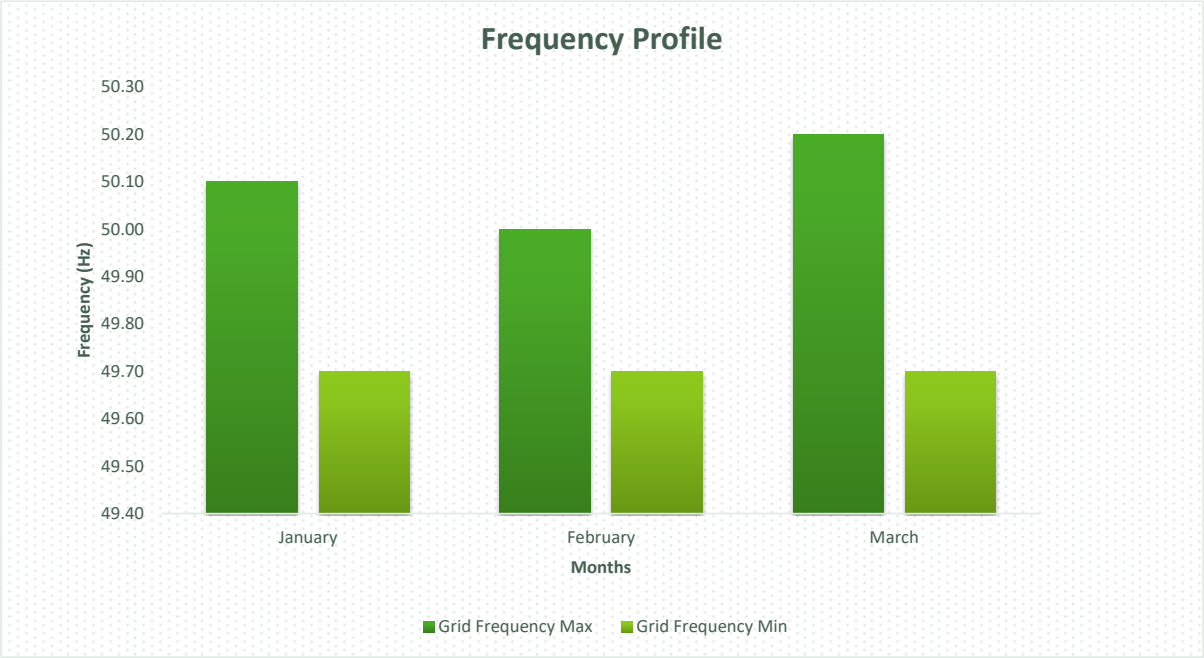


Figure 15 *Frequency summary for the month of January to March 2026*

8. Voltage Profile of selected substation

As per the Grid Code 2024, the voltage at all connection points is classified into three different bands as follows:

1. Normal State
   The voltage at all connection points is within the limits of 0.95 times and 1.05 times of the normal values
2. Alert State
   The voltage at all connection points is outside the normal limit but within the limits of 0.9 times and 1.1 times of the nominal values.
3. Emergency State
   Transmission system voltages are outside the limit of 0.9 times and 1.1 times of nominal values.

Due to the location the voltage level for 400kV, 220kV, and 66kV is taken with reference to 400/220/66/11kV Malbase substation and for 132kV voltage level with reference to 132/33/11kV Nangkhor substation, the voltage profile of these substations is considered.

8.1. Voltage Summary for the Month of January to March 2026

Table 13 *Voltage Summary for the month of January to March 2026*

Grid Voltage								
Voltage Level	**400kV Bus Voltage (kV)**		**220kV Bus Voltage (kV)**		**66kV Bus Voltage (kV)**		**132kV Bus Voltage (kV)**	
Month	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**
January	412.50	394.50	227.50	212.00	67.85	64.00	135.28	125.36
February	416.50	393.00	227.50	212.00	68.35	63.50	135.07	127.38
March	410.50	391.00	225.50	210.00	67.90	62.80	135.90	127.38

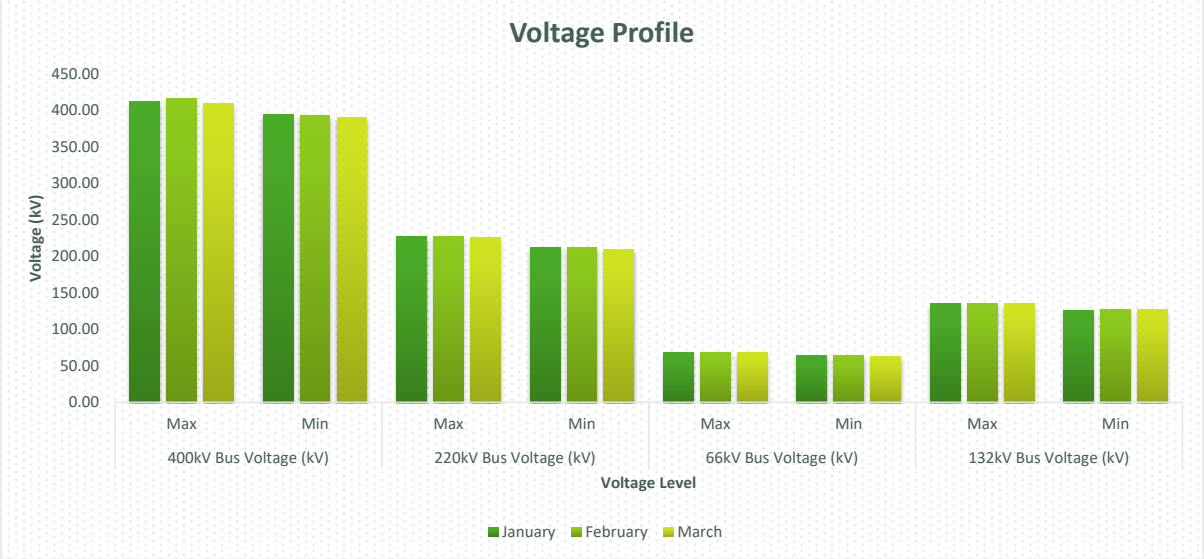


Figure 16 *Voltage Summary for the month of January to March 2026*