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Bhutan Power Corporation Limited

(An ISO 9001:2015, ISO 14001:2015 & OHSAS 18001:2007 Certified Company)

Registered Office, Thimphu

Bhutan Power System Operator

Thimphu: Bhutan



02/BPC/BPSO/PSOD/Vol-I/20/ 32

April 10, 2020

Chief Executive Officer,
Bhutan Electricity Authority,
Thimphu: Bhutan.

Subject: Submission of Transmission System Performance Report for the month of January to March, 2020.

Sir,

Kindly find enclosed with the transmission system performance report for the month of January to March, 2020. The report incorporate energy figure along with other Power System Parameters as per the Grid Code Regulation, 2008 Clause No: 6.14.1. Soft copy of the report is available in the BPSO website: <http://bpso.bpc.bt>.

Thanking you,

Yours faithfully,


(Ugyen Tshering)
Senior Manager

Copy to:

1. Director, Operation & Maintenance Department, Druk Green Power Corporation, Thimphu
2. Director, TS, BPC for kind information
3. Director, DS, BPC for kind information.

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Bhutan Power Corporation Limited

Bhutan Power System Operator

Thimphu: Bhutan



Transmission System Performance Report

Fourth Quarterly Report – January to March, 2020



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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 BPC 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) 2008, clause 6.14.1, “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 substations and generating plants.

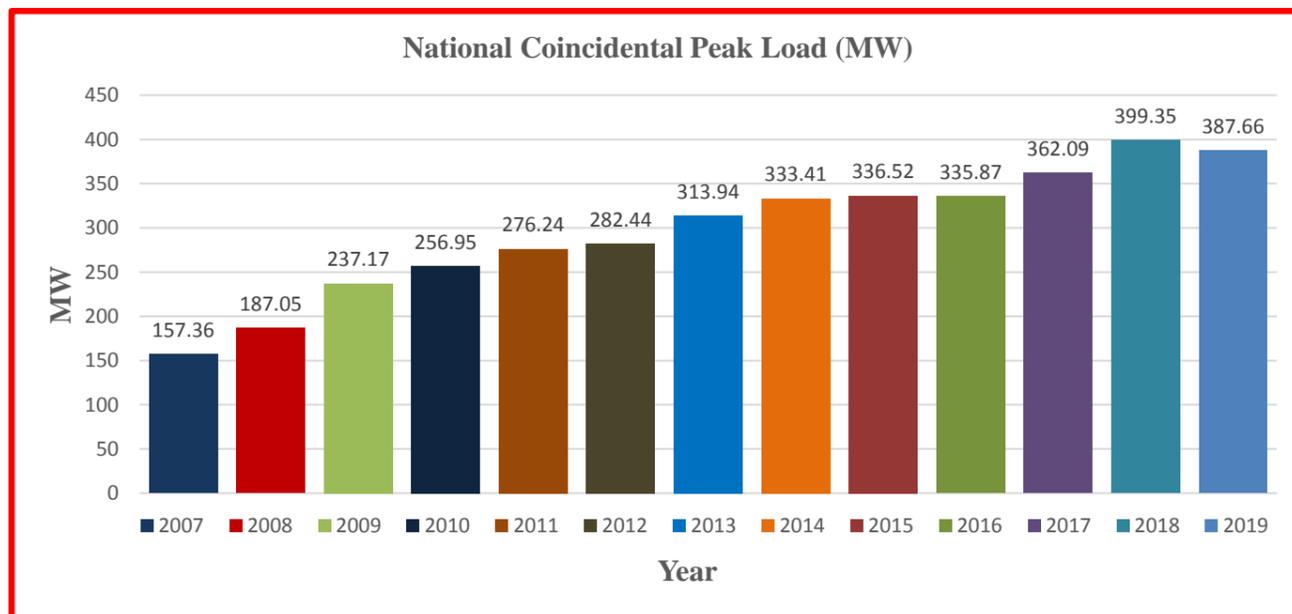
2. National Peak Demand

The national peak demand till now is recorded at **399.35MW** which was occurred on December 27, 2018 at 18:18 hours. This is calculated by summation of Feeder Loading at Plants minus Export.

Table 2.1. The National Peak Demand since 2007

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Peak Load (MW)	157.36	187.05	237.17	256.95	276.24	282.44	313.94	333.41	336.52	335.87	362.09	399.35	387.66
% 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

Graph 2.1. The growth in National Peak Demand since 2007



2.1. Power (MW) consumed by country

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

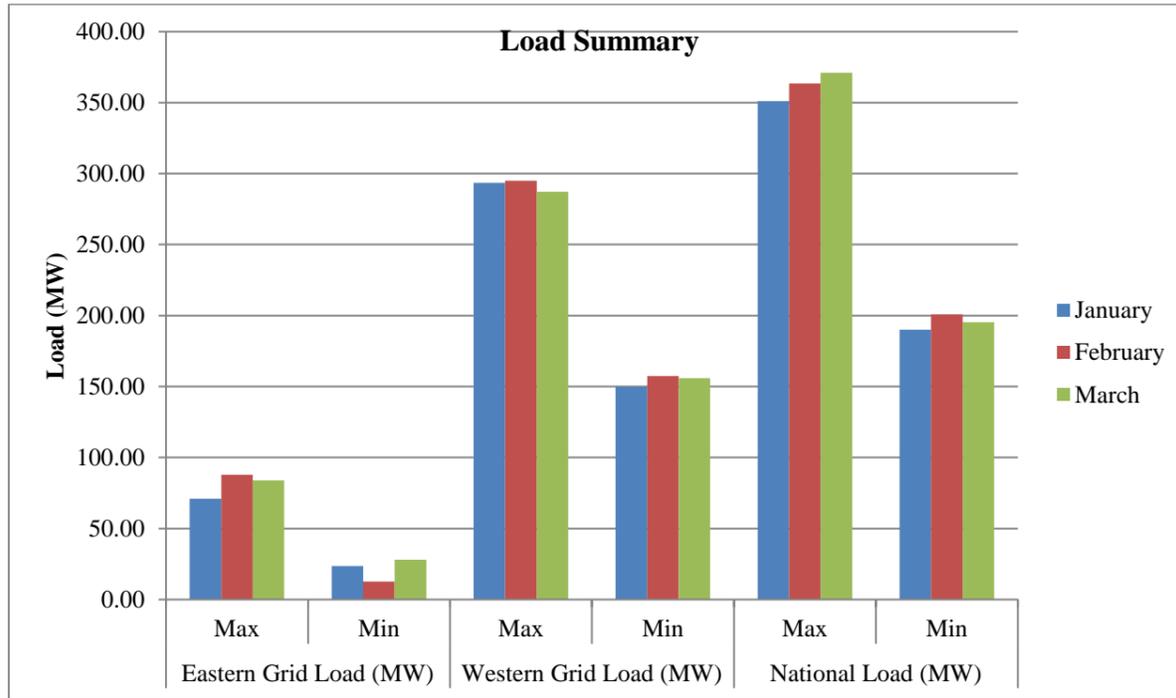
1. **National Demand** = (Sum of all total generation)-(Sum of all Export of Import)
2. **National Demand** = (Sum of all feeders loading at hydropower station) – (Sum of all Export/Import)
3. **National Demand** = (Sum of all substation loading)

For this report, the National Demand was calculated using method-3.

Table 2.1.2. Domestic demand for Eastern Grid, Western Grid and National using method- 3

Grid	Eastern Grid Load (MW)		Western Grid Load (MW)		National Load (MW)	
	Max	Min	Max	Min	Max	Min
January	70.92	23.61	294.30	149.74	351.94	190.09
February	87.78	12.70	295.05	157.50	363.47	200.73
March	83.92	27.99	287.18	155.88	371.10	195.42

Graph 2.1.2. Domestic demand for Eastern Grid, Western Grid and National using method- 3



The national load pattern for the month of January to March, 2020 calculated using method-3 is attached as **Annexure-II**

3. Energy Availability and Requirement for the country

3.1. 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.

Table 3.1.1. Total Energy (MU) consumed

Month	Total Ex-bus (MU)	Total Export/Import (MU)	Total energy sold to BPC (MU)
January	309.99000000	108.26958812	201.72048843
February	250.91100000	47.48400000	203.42700000
March	306.24600000	103.02300000	213.04700000

Graph 3.1.1. Total Energy (MU) consumed

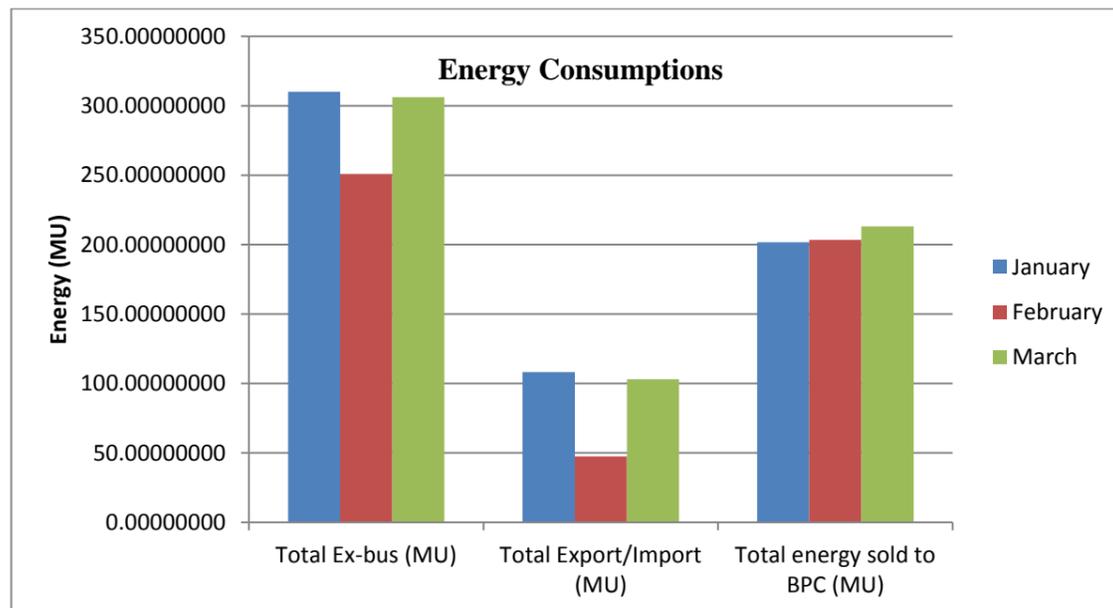
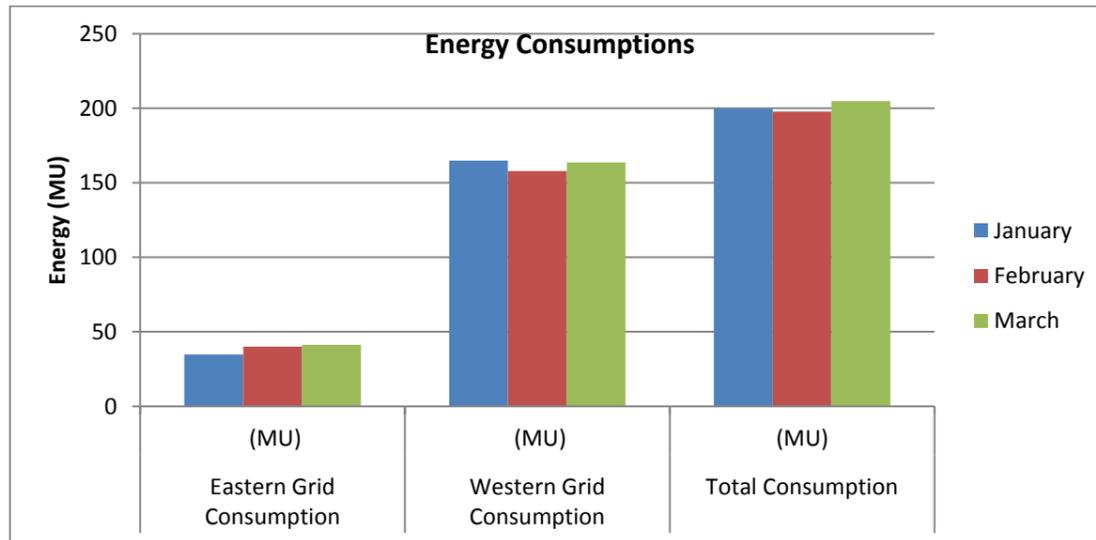


Table 3.1.2. Energy (MU) consumed

Grid	Eastern Grid Consumption	Western Grid Consumption	Total Consumption
Month	(MU)	(MU)	(MU)
January	34.9102015	164.9325267	199.8427282
February	39.956104	157.8362759	197.7923799
March	41.26893	163.6219569	204.8908869

Graph 3.1.2. Energy (MU) consumed



4. Performance of generating plants

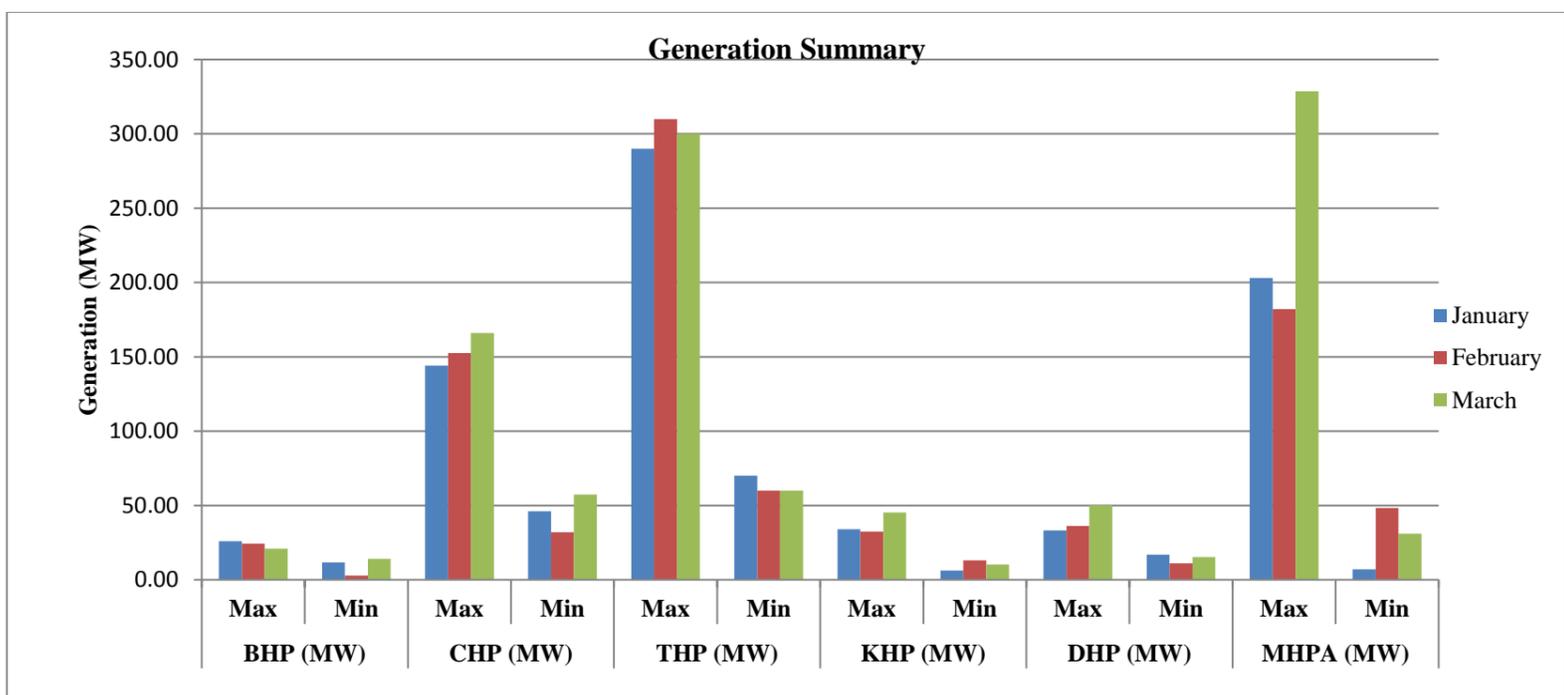
4.1. Power and Energy Generation

The maximum total generation for the first quarter of year 2020 was 910.79 MW in month of March and minimum generation was 730.26 MW in the January month.

Table: 4.1.1 Summary of maximum and minimum generation by various hydropower plant

Generation By	BHP (MW)		CHP (MW)		THP (MW)		KHP (MW)		DHP (MW)		MHPA (MW)		TOTAL (MW)	
	Max	Min	Max	Min	Max	Min								
January	25.90	11.60	144.16	46.00	290.00	70.00	33.92	6.20	33.16	16.97	203.12	7.12	730.26	157.89
February	24.30	2.78	152.50	31.90	310.00	60.00	32.48	13.00	36.16	10.99	182.10	48.29	737.54	166.96
March	20.90	14.00	165.96	57.35	300.00	60.00	45.27	10.29	50.06	15.21	328.60	30.98	910.79	187.83

Graph: 4.1.1 Summary of maximum and minimum generation by various hydropower plant



Daily maximum, minimum and average generation by each generating plant for the month of January to March, 2020 is attached as **Annexure-I**.

4.2.Plant Capacity Factor

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

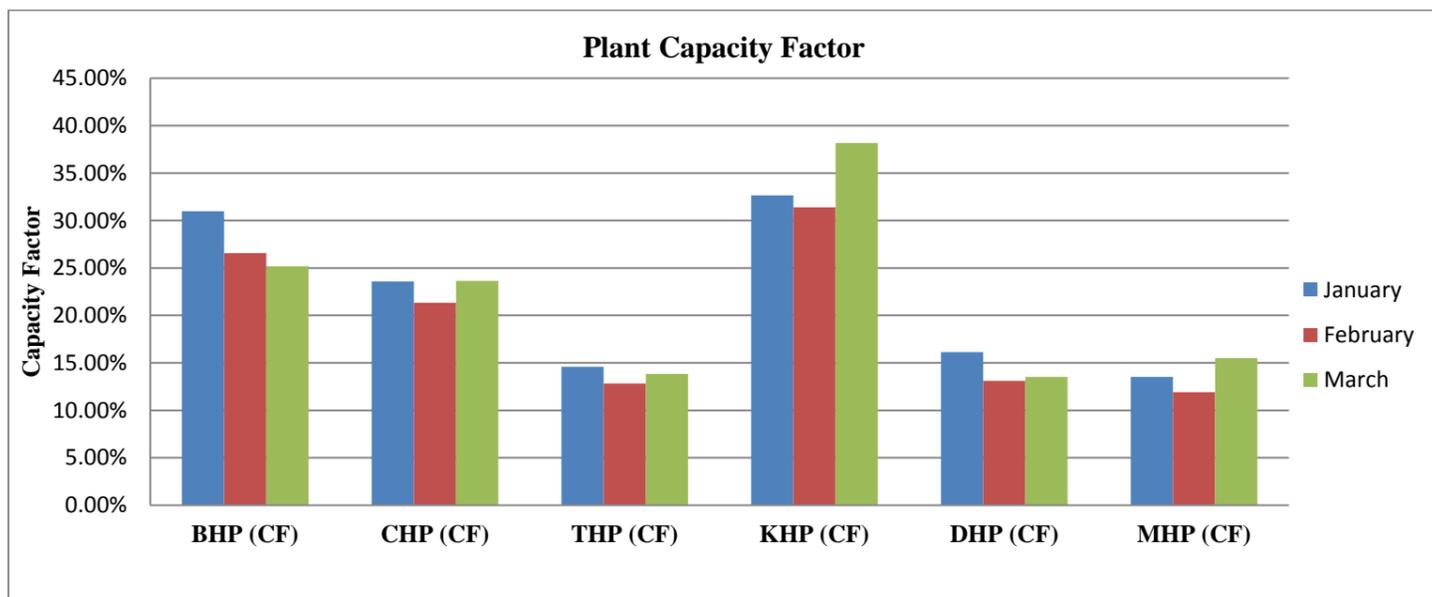
$$Capacity\ factor = \frac{Total\ energy\ plant\ has\ produce\ over\ a\ period}{Total\ energy\ plant\ would\ produce\ when\ operated\ at\ full\ capacity}$$

Table 4.2.1: Total generation and capacity factor of various hydropower plants

Month	BHP (MU)	BHP (CF)	CHP (MU)	CHP (CF)	THP (MU)	THP (CF)	KHP (MU)	KHP (CF)	DHP (MU)	DHP (CF)	MHP (MU)	MHP (CF)
January	14.74600	30.97%	58.93600	23.58%	129.185000	14.59%	14.576000	32.65%	15.122	16.13%	72.422	13.52%
February	11.42900	26.57%	48.15800	21.33%	102.63600	12.83%	12.654000	31.38%	12.293	13.11%	63.738	11.90%
March	11.98700	25.17%	59.08900	23.64%	122.44700	13.83%	17.040000	38.17%	12.681	13.53%	83	15.49%

Source: TD BPC

Graph 4.2.1: Capacity factor of various hydropower plants



5. Export and Import of Electricity

Maximum export for the First quarter of year 2020 was 228.00 MW in the month of March to Binaguri substation in India. The minimum export recorded was 0.01 MW to Salakoti and Rangia substation in India during the month of January.

Table 5.1. Export of electricity to India

Export To	Binaguri (MW)		Birpara (MW)		Salakoti and Rangia (MW)	
	Max	Min	Max	Min	Max	Min
January	174.00	8.00	17.00	0.40	46.56	0.01
February	256.00	1.00	28.70	3.20	55.51	0.29
March	228.00	1.00	46.00	0.50	18.57	0.24

Graph 5.1. Export of electricity to India

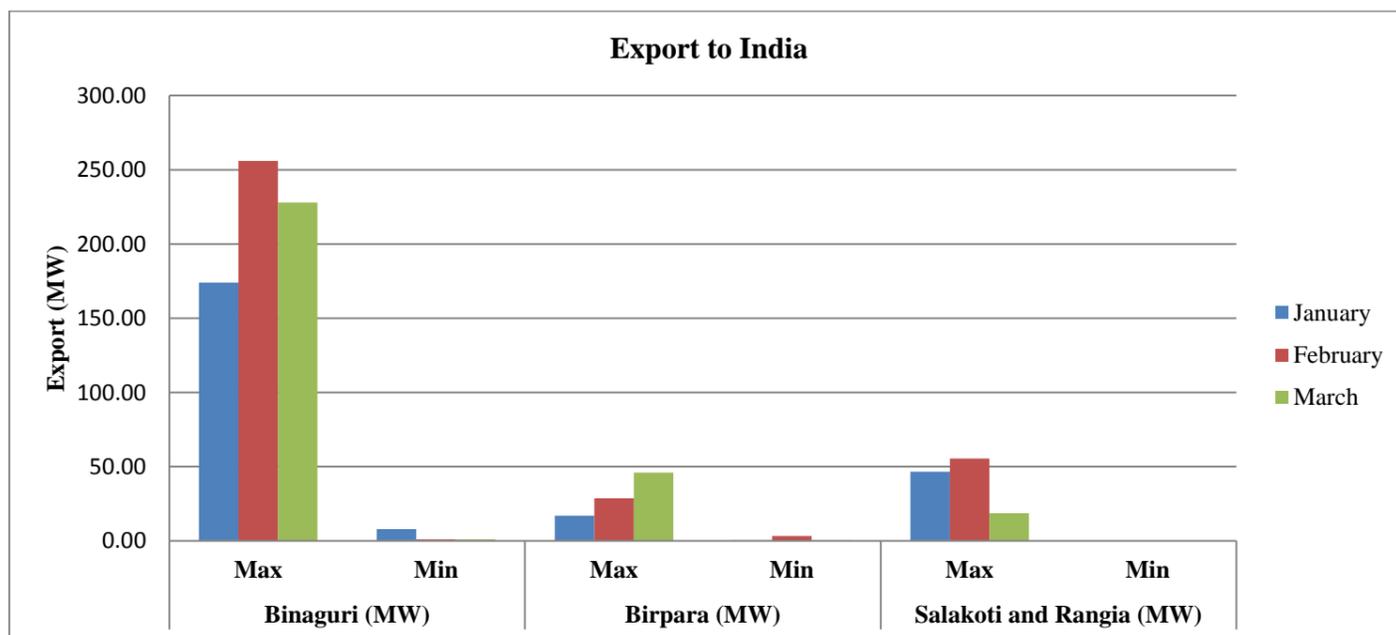


Table 5.2. Import of electricity from India.

Import From	Binaguri (MW)		Birpara (MW)		Salakoti and Rangia (MW)	
	Max	Min	Max	Min	Max	Min
January	0.00	0.00	109.30	0.20	45.80	0.01
February	8.00	1.00	85.31	0.40	67.98	0.05
March	33.00	1.00	120.80	0.10	61.84	0.05

6. 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 limit under faulty condition.

As per the Grid Code 2008, clause 6.4.1 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 is below 49.0Hz.

The frequency at 220kV Bus at 220/66/11kV Semtokha substation in the western grid and 132kV Bus at 60MW Kurichhu Hydropower Plant in the eastern grid is considered.

6.1.Frequency for the month of January, 2020

Table 6.1.1. Bus Frequency profile of Singhegoan Substation

Sl. No.	Operating State	220kV Bus Frequency
1	Normal State	99.73%
2	Alert State	0.00%
3	Emergency State	0.00%
4	Blackout/Other	0.27%

Graph 6.1.1. Bus Frequency of Singhegoan Substation

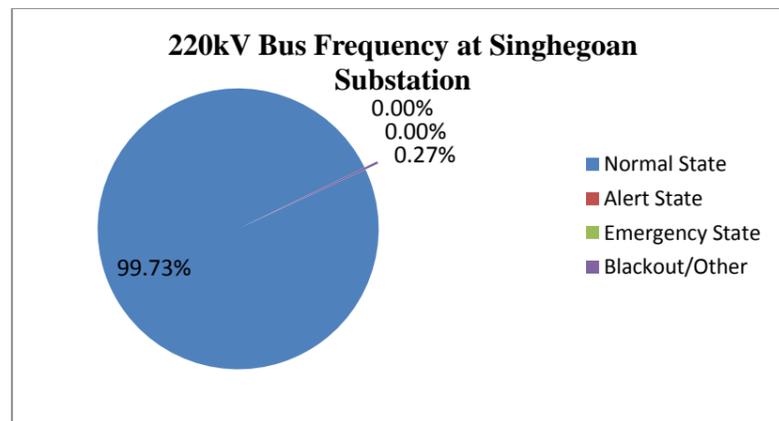
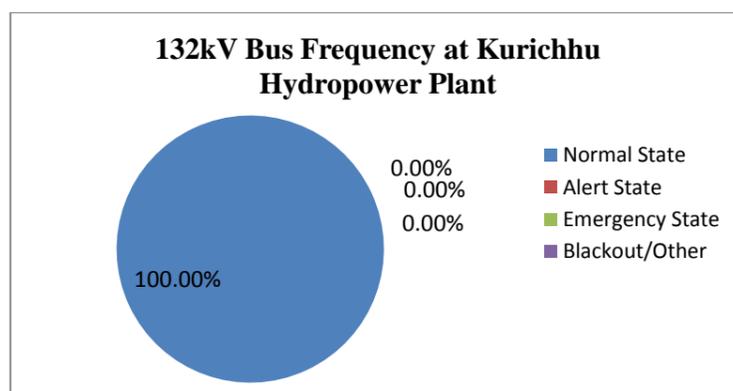


Table 6.1.2. Bus frequency of Kurichhu Hydro Power Plant

Sl. No.	Operating State	132kV Bus Frequency
1	Normal State	100.00%
2	Alert State	0.00%
3	Emergency State	0.00%
4	Blackout/Other	0.00%

Graph 6.1.2. Bus frequency of Kurichhu Hydro Power Plant



In the month of January, 2020, the Western grid was maintained within the normal operating limit of 99.73% whereas 0.27% was deviated to blackout/others and Eastern grid have managed to operate 100% in operating limit.

6.2.Frequency for the month of February, 2020

Table 6.2.1. Bus frequency of Singhegoan Substation

Sl. No.	Operating State	220kV Bus Frequency
1	Normal State	100.00%
2	Alert State	0.00%
3	Emergency State	0.00%
4	Blackout/Other	0.00%

Graph 6.2.1. Bus frequency of Singhegoan Substation

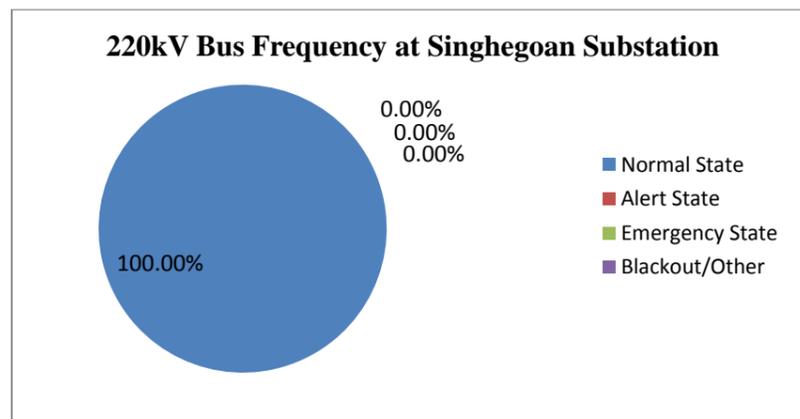
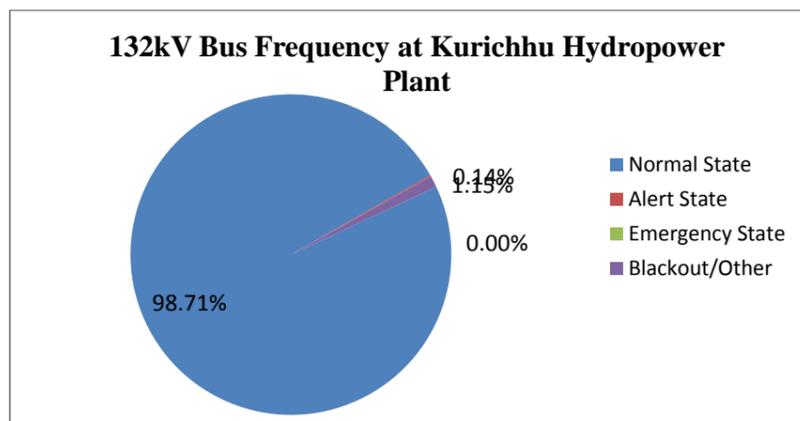


Table 6.2.2. Bus frequency of Kurichhu Hydro Power Plant

Sl. No.	Operating State	132kV Bus Frequency
1	Normal State	98.71%
2	Alert State	0.14%
3	Emergency State	0.00%
4	Blackout/Other	1.15%

Graph 6.2.2. Bus frequency of Kurichhu Hydro Power Plant



In the month of February, 2020, the western grid frequency was maintained at normal operating range of 100% whereas Eastern grid was maintained 98.71% in normal operating range and deviated 0.14% and 1.15% to alert and blackout/others respectively.

6.3.Frequency for the month of March, 2020

Table 6.3.1. Bus frequency of Singhegoan Substation

Sl. No.	Operating State	220kV Bus Frequency
1	Normal State	100.00%
2	Alert State	0.00%
3	Emergency State	0.00%
4	Blackout/Other	0.00%

Graph 6.3.1. Bus frequency of Singhegoan Substation

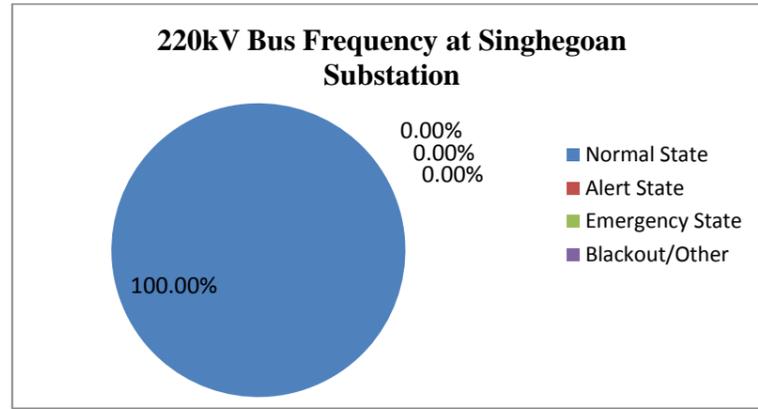
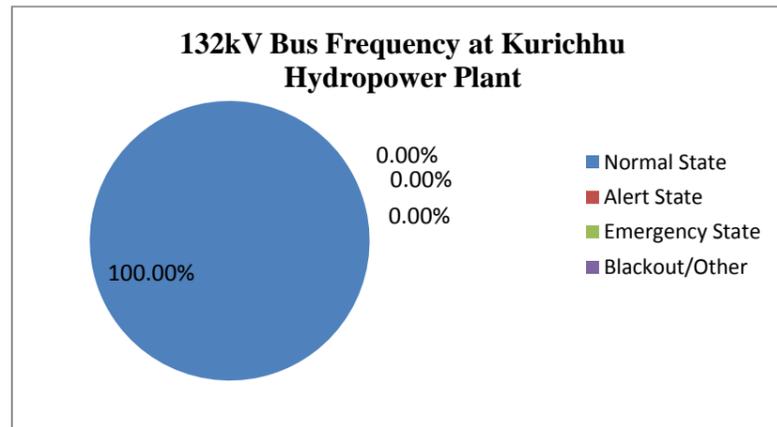


Table 6.3.2. Bus frequency of Kurichhu Hydro Power Plant

Sl. No.	Operating State	132kV Bus Voltage
1	Normal State	100.00%
2	Alert State	0.00%
3	Emergency State	0.00%
4	Blackout/Other	0.00%

Graph 6.3.2. Bus frequency of Kurichhu Hydro Power Plant



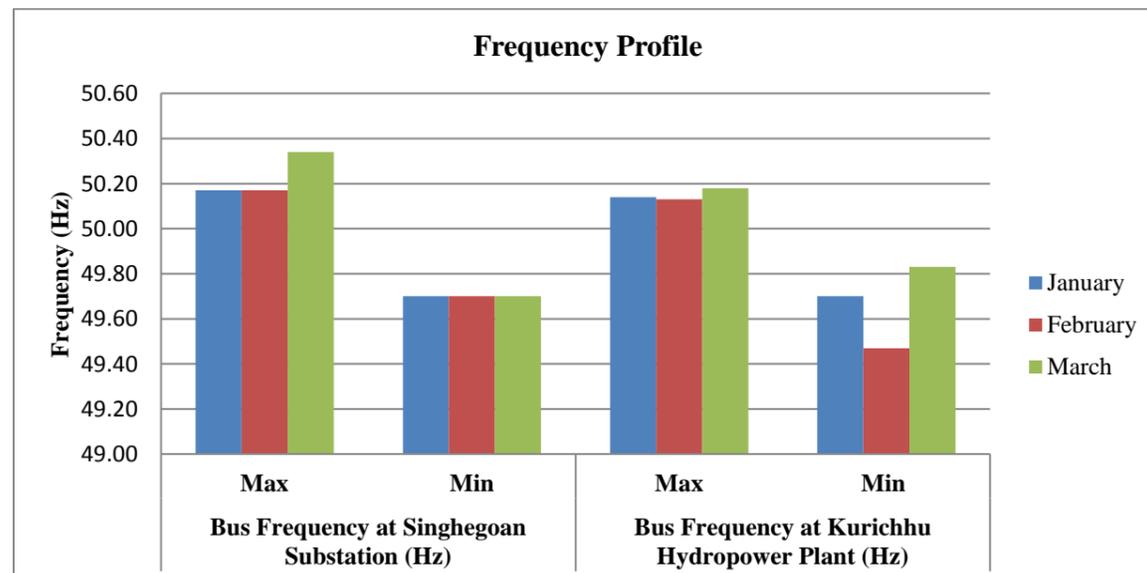
In the month of March, 2020, both grid frequency was maintained at 100% within the normal operating range.

6.4.Frequency Summary for the month of January to March, 2020

Table 6.4.1. Frequency summary for the month of January to March, 2020.

Substation/Plant	Bus Frequency at Singhegoan Substation (Hz)		Bus Frequency at Kurichhu Hydropower Plant (Hz)	
	Max	Min	Max	Min
January	50.17	49.70	50.14	49.70
February	50.17	49.70	50.13	49.47
March	50.34	49.70	50.18	49.83

Graph 6.4.1. Frequency summary for the month of January to March, 2020



Daily maximum, minimum and average Frequency of Singhegoan substation in western grid and Kurichhu Hydro Power Plant in eastern grid for the month of January to March, 2020 is attached as **Annexure-III**

7. Voltage Profile of selected substation

As per the Grid Code 2008, clause 6.4.1 the voltage at all connection point is classified into three different bands as follows:

1. *Normal State*

The voltage at all connection points are within the limits of 0.95 times and 1.05 times of the normal values

2. *Alert State*

The voltage at all connection points are 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 of 400/22/66/11kV Malbase substation in western grid and 132/33/11kV Nangkhor substation in the eastern grid, the voltage profile of these substations are considered.

7.1. Voltage profile for the January, 2020

Table 7.1.1. Voltage Profile for 400/220/66kV Malbase Substation

Sl. No.	Operating State	400kV Bus Voltage	220kV Bus Voltage	66kV Bus Voltage
1	Normal State	100.00%	100.00%	99.87%
2	Alert State	0.00%	0.00%	0.13%
3	Emergency State	0.00%	0.00%	0.00%
4	Blackout/Other	0.00%	0.00%	0.00%

Graph 7.1.1. Voltage Profile for 400/220/66kV Malbase Substation

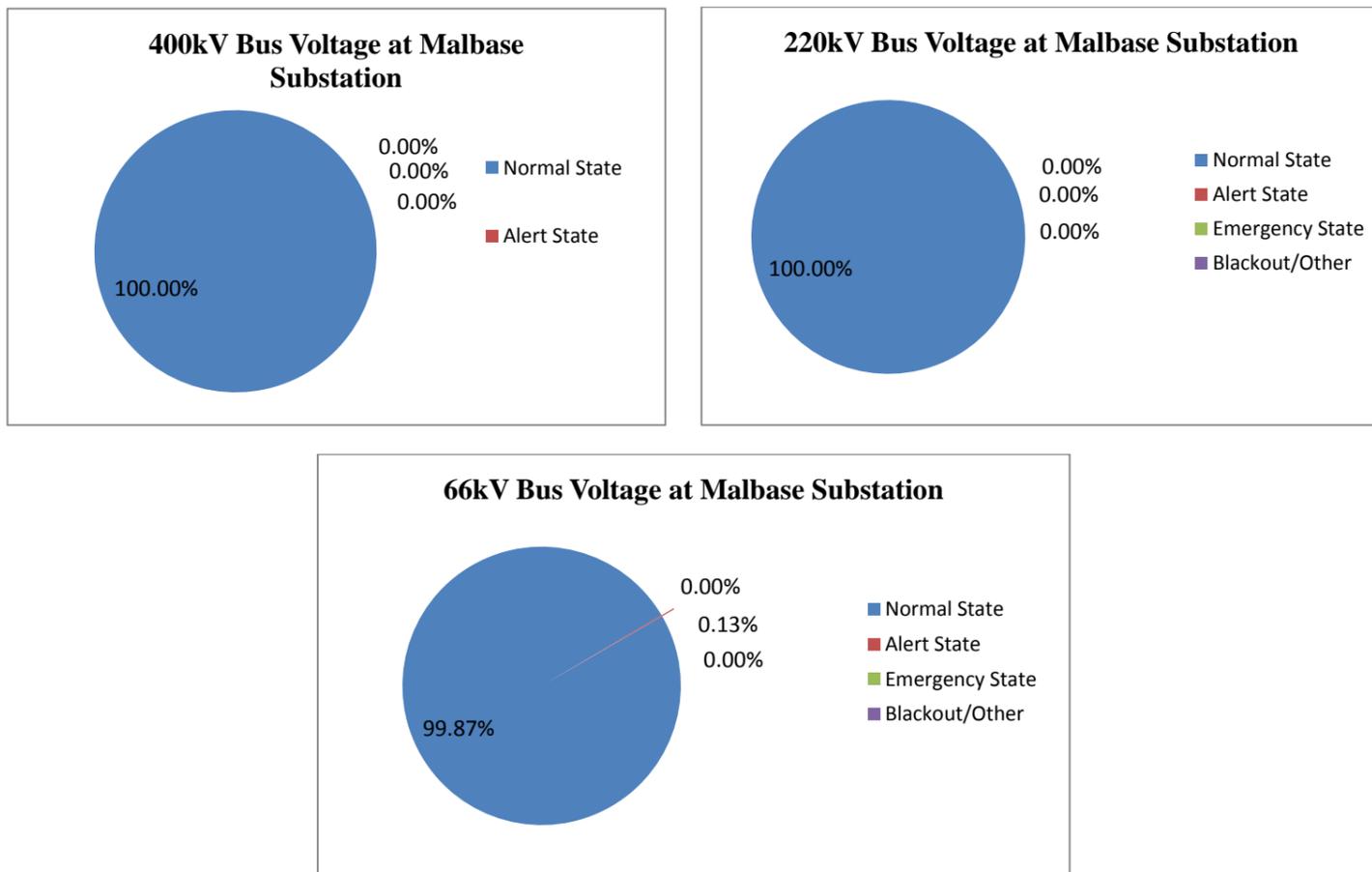


Table 7.1.2. Voltage Profile of 220/66/11kV Semtokha Substation

Sl. No.	Operating State	220kV Bus Voltage	66kV Bus Voltage
1	Normal State	100.00%	99.87%
2	Alert State	0.00%	0.00%
3	Emergency State	0.00%	0.13%
4	Blackout/Other	0.00%	0.00%

Graph 7.1.2. Voltage Profile of 220/66/11kV Semtokha Substation

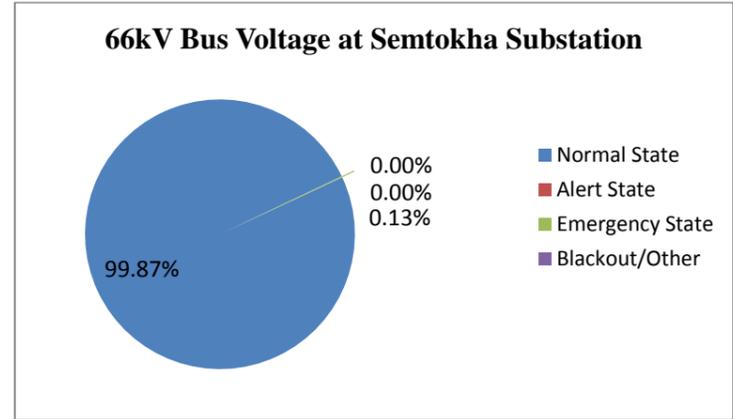
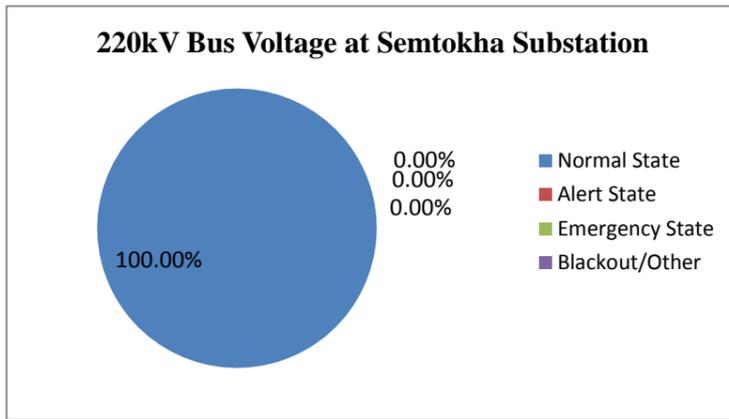
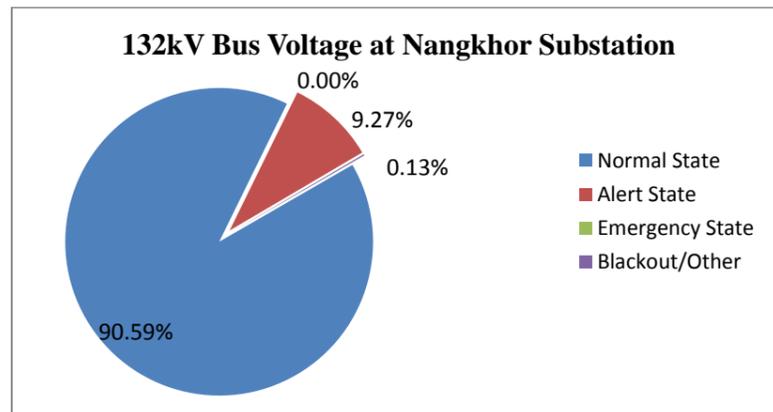


Table 7.1.3. Voltage Profile of 132/33/11kV Nangkor Substation

Sl. No.	Operating State	132kV Bus Voltage
1	Normal State	90.59%
2	Alert State	9.27%
3	Emergency State	0.00%
4	Blackout/Other	0.13%

Graph 7.1.3. Voltage Profile of 132/33/11kV Nangkor Substation

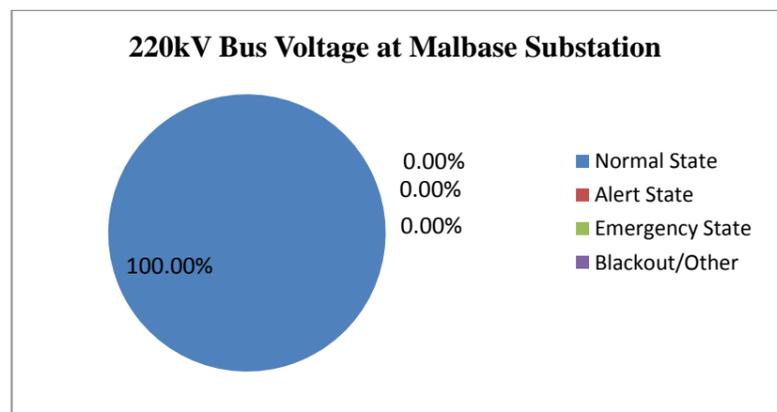
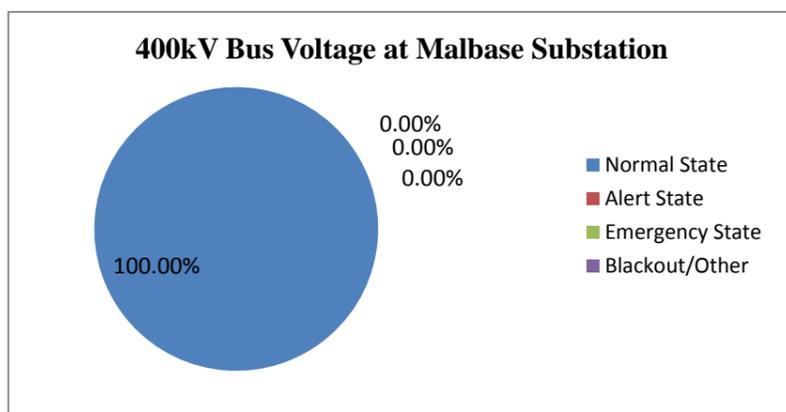


7.2. Voltage Profile for month of February, 2020

Table 7.2.1. Voltage Profile for 400/220/66kV Malbase Substation

Sl. No.	Operating State	400kV Bus Voltage	220kV Bus Voltage	66kV Bus Voltage
1	Normal State	100.00%	100.00%	100.00%
2	Alert State	0.00%	0.00%	0.00%
3	Emergency State	0.00%	0.00%	0.00%
4	Blackout/Other	0.00%	0.00%	0.00%

Graph 7.2.1. Voltage Profile for 400/220/66kV Malbase Substation



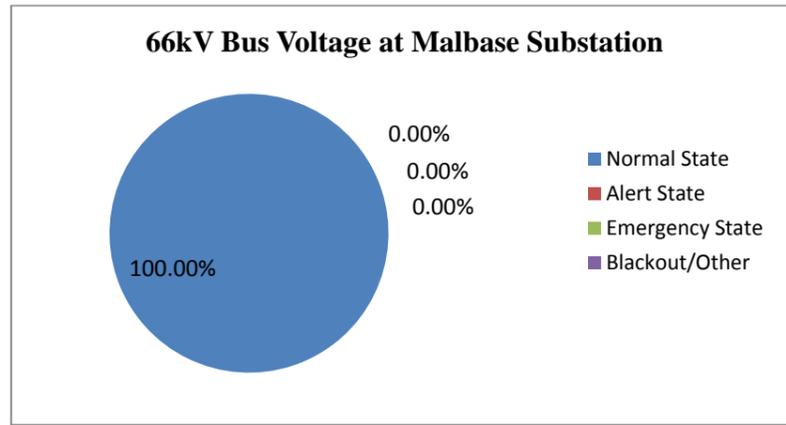


Table 7.2.2. Voltage Profile of 220/66/11kV Semtokha Substation

Operating State	220kV Bus Voltage	66kV Bus Voltage
Normal State	100.00%	100.00%
Alert State	0.00%	0.00%
Emergency State	0.00%	0.00%
Blackout/Other	0.00%	0.00%

Graph 7.2.2. Voltage Profile of 220/66/11kV Semtokha Substation

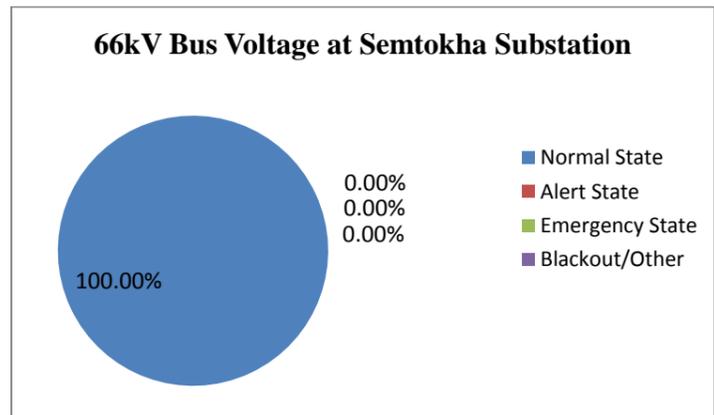
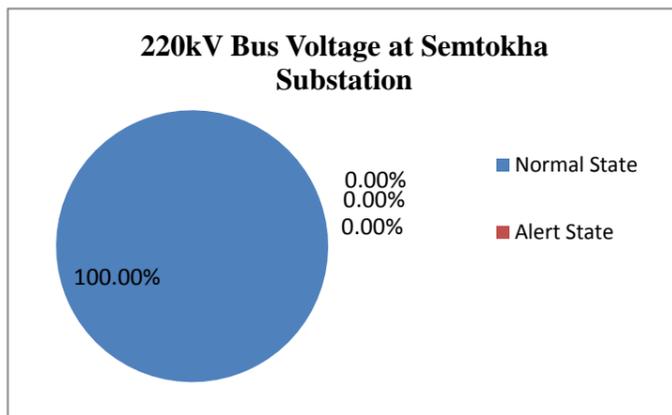
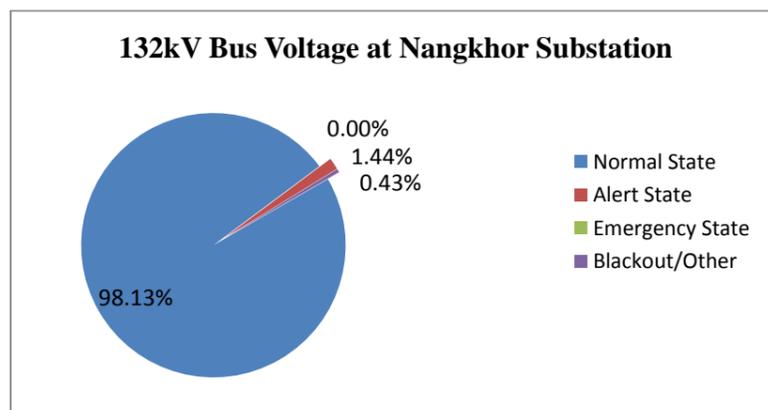


Table 7.2.3. Voltage Profile of 132/33/11kV Nangkor Substation

Sl. No.	Operating State	132kV Bus Voltage
1	Normal State	98.13%
2	Alert State	1.44%
3	Emergency State	0.00%
4	Blackout/Other	0.43%

Graph 7.2.3. Voltage Profile of 132/33/11kV Nangkor Substation



7.3. Voltage Profile for the month of March, 2020

Table 7.3.1. Voltage Profile for 400/220/66kV Malbase Substation

Sl. No.	Operating State	400kV Bus Voltage	220kV Bus Voltage	66kV Bus Voltage
1	Normal State	100.00%	99.73%	100.00%
2	Alert State	0.00%	0.27%	0.00%
3	Emergency State	0.00%	0.00%	0.00%
4	Blackout/Other	0.00%	0.00%	0.00%

Graph 7.3.1. Voltage Profile for 400/220/66kV Malbase Substation

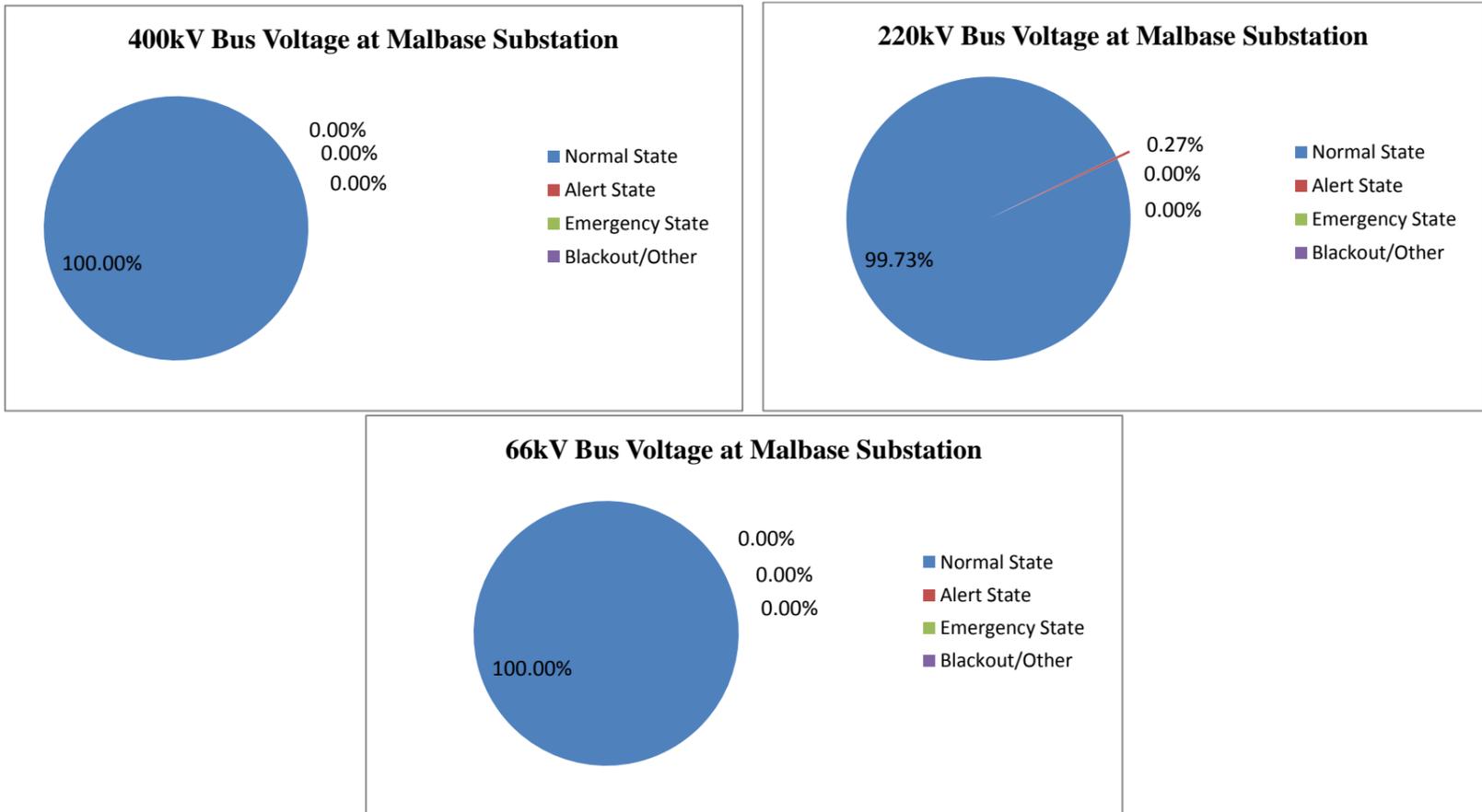


Table 7.3.2. Voltage Profile of 220/66/11kV Semtokha Substation

Sl. No.	Operating State	220kV Bus Voltage	66kV Bus Voltage
1	Normal State	100.00%	100.00%
2	Alert State	0.00%	0.00%
3	Emergency State	0.00%	0.00%
4	Blackout/Other	0.00%	0.00%

Graph 7.3.2. Voltage Profile of 220/66/11kV Semtokha Substation

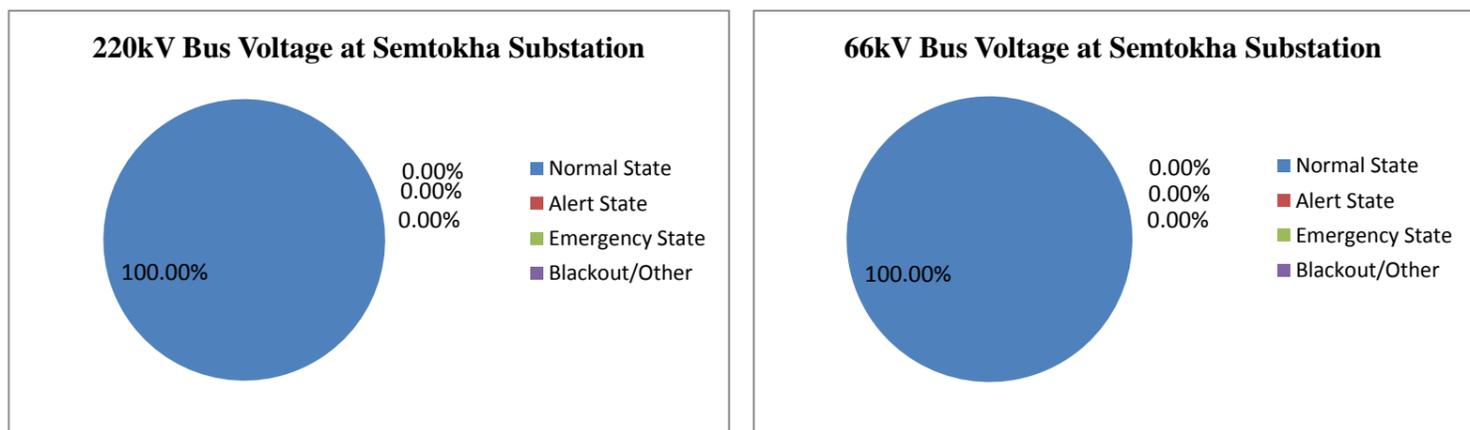
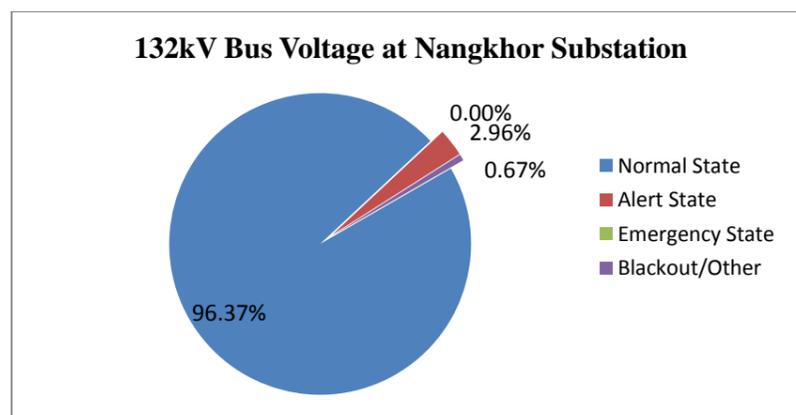


Table 7.3.3. Voltage Profile of 132/33/11kV Nangkhor Substation

Sl. No.	Operating State	132kV Bus Voltage
1	Normal State	96.37%
2	Alert State	2.96%
3	Emergency State	0.00%
4	Blackout/Other	0.67%

Graph 7.3.3. Voltage Profile of 132/33/11kV Nangkhor Substation

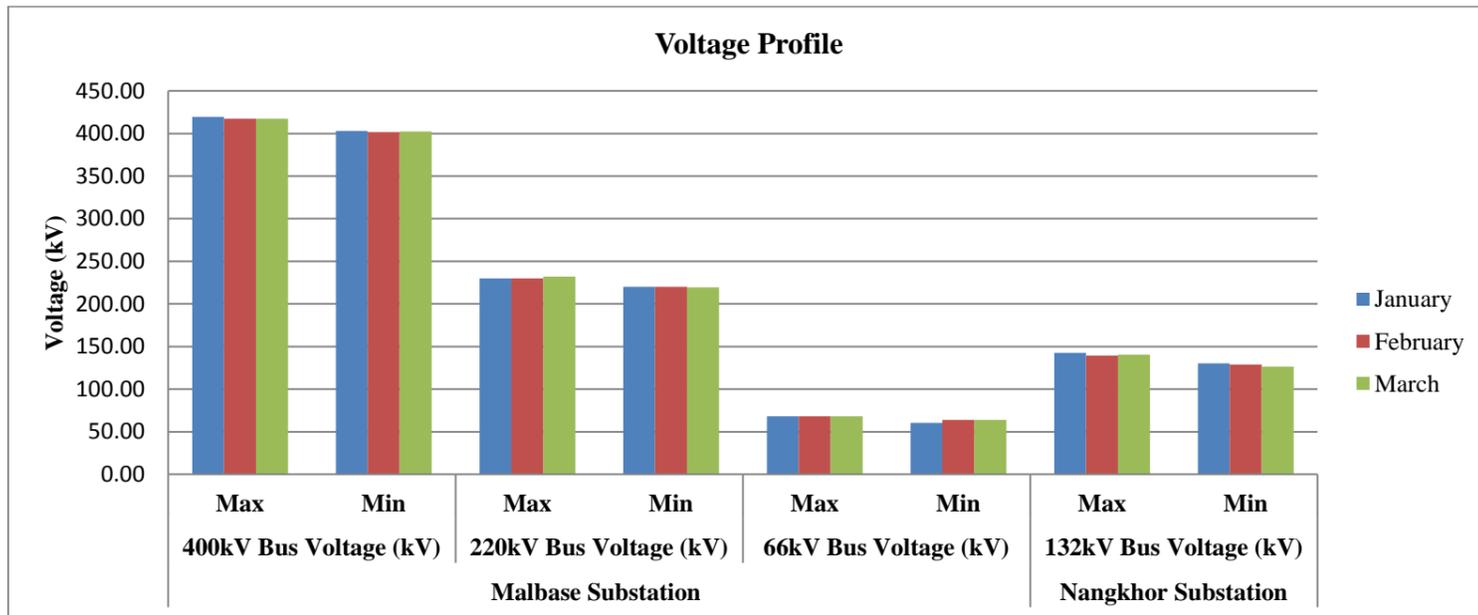


7.4.Voltage Summary for the Month of January to March, 2020

Table 7.4.1. Voltage Summary for the month of January to March, 2020

Substation	Malbase Substation						Nangkhor Substation	
	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	419.50	403.00	230.00	220.00	68.00	60.50	142.50	130.20
February	417.50	401.50	230.00	220.00	68.00	64.00	139.40	129.00
March	417.50	402.50	232.00	219.50	68.00	64.00	140.26	126.30

Graph 7.4.1. Voltage Summary for the month of January to March, 2020



Daily maximum, minimum and average bus voltage of Malbase substation in western grid and Nangkhor substation in eastern grid for the month of January to March, 2020 is attached as **Annexure-IV**

8. Major Outages of Feeders and Equipment

The transmission lines and equipment which were shut down for annual maintenance and hand/force trip are not considered in the report.

8.1.Major Outages in Eastern Grid

It had been observed that there was not much fault tripping during the first quarter of the year except during the month of January. Almost all the tripping occurred are of transient in nature or temporary fault which have been restored within few minutes. The 132kV Nangkor-Deothang feeder had taken almost 3 days to restore in the month of January due to the snapping of B-phase conductor.

The feeders and equipment outages for the Eastern grid is attached as **Annexure-V**.

8.2.Major Outages in Western Grid

During the first quarter of the year, there was no major outage occurred in western grid except for 66kV Chumdo-Haa feeder which was out for about an hour.

The feeders and equipment outages for the Western grid is attached as **Annexure-VI**.



9. Annexures

Annexure-I

Table: Generation of January, 2020

Jan-20 Date	BHP (MW)			CHP (MW)			THP (MW)			KHP (MW)			DHP (MW)			MHP (MW)		
	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava
1	22.10	20.70	21.27	106.94	70.99	94.35	240.00	160.00	213.33	24.54	15.16	21.05	22.66	21.06	21.70	117.82	103.61	109.35
2	21.90	20.90	21.41	122.87	72.05	84.47	230.00	150.00	167.08	24.48	15.77	19.11	22.16	21.65	21.91	109.64	106.57	107.93
3	23.00	20.90	21.61	124.45	78.00	93.34	260.00	150.00	179.58	28.47	10.08	19.26	22.88	21.63	21.94	111.10	102.86	107.14
4	25.30	22.20	23.83	136.34	79.92	96.17	270.00	170.00	197.50	25.01	16.10	21.18	33.16	23.15	27.19	118.10	105.47	114.22
5	25.90	14.40	22.56	126.08	82.39	100.27	270.00	160.00	211.67	30.64	14.96	21.39	28.15	21.16	24.83	130.10	112.80	113.73
6	22.60	19.90	21.55	126.30	79.81	92.40	260.00	160.00	192.92	32.50	15.94	19.81	24.17	20.11	22.24	129.83	106.31	116.88
7	22.20	20.80	21.48	129.24	80.14	94.11	270.00	160.00	183.75	33.00	15.14	21.77	22.68	21.16	22.20	118.37	108.79	113.02
8	21.80	20.70	21.23	126.34	81.28	91.67	240.00	160.00	188.33	24.40	14.46	20.74	22.65	21.08	21.65	110.44	107.11	109.40
9	22.20	21.30	21.85	123.11	80.53	93.14	260.00	160.00	188.75	23.72	16.20	20.76	23.16	21.26	22.35	110.60	110.05	110.30
10	21.80	20.20	21.12	124.98	82.84	94.45	250.00	140.00	199.58	31.54	16.12	20.08	25.19	18.18	21.83	110.79	107.97	109.27
11	21.50	20.20	20.76	127.84	74.87	91.11	250.00	170.00	186.67	26.89	16.10	21.42	22.19	16.97	21.41	110.15	103.12	107.36
12	21.30	19.50	20.65	144.16	82.95	96.57	280.00	170.00	192.92	26.30	16.04	19.95	22.15	20.64	21.19	106.99	106.66	106.77
13	21.30	19.50	20.65	123.04	46.00	106.94	240.00	150.00	165.83	32.38	15.24	21.42	22.16	20.93	21.25	110.30	86.36	106.74
14	20.90	19.60	20.37	105.25	69.76	83.58	240.00	140.00	188.33	23.61	16.21	21.08	20.68	20.12	20.56	109.85	105.09	107.89
15	20.60	19.70	20.14	110.10	68.56	76.50	220.00	150.00	174.58	24.10	16.04	19.62	20.68	20.12	20.56	109.79	104.40	107.63
16	16.33	15.30	15.61	106.86	68.15	73.95	220.00	150.00	179.58	22.91	16.25	20.79	21.16	20.11	20.40	109.80	103.10	105.76
17	20.40	19.60	19.94	118.10	70.56	79.11	240.00	150.00	172.50	23.01	16.23	21.30	21.37	19.14	20.25	108.00	103.08	104.87
18	20.80	19.90	20.31	102.47	70.62	78.29	240.00	150.00	174.58	22.96	16.10	19.25	22.66	19.46	20.72	104.90	103.80	104.44
19	20.10	19.10	19.55	111.36	77.18	89.30	260.00	150.00	183.75	24.67	16.16	20.10	20.65	19.66	20.16	104.87	97.93	102.03
20	19.90	18.30	19.16	110.51	71.72	80.21	240.00	150.00	180.42	23.53	16.14	20.03	20.64	19.14	19.92	99.63	97.85	98.48
21	19.50	18.70	19.06	108.30	63.94	76.61	230.00	150.00	163.33	22.94	16.28	18.74	20.16	19.15	19.57	100.91	97.80	99.56
22	19.40	18.30	18.95	109.83	63.88	75.39	290.00	150.00	164.58	22.73	16.12	19.63	19.85	18.84	19.44	98.84	95.63	97.76
23	19.30	18.70	18.89	102.82	65.34	73.90	220.00	140.00	157.08	23.21	16.19	18.82	19.65	18.86	19.34	98.90	96.11	97.67
24	19.20	18.20	18.79	134.67	61.56	75.47	220.00	140.00	160.83	33.92	15.90	19.44	19.46	18.64	19.30	99.90	97.08	98.59
25	19.00	11.60	12.85	103.53	67.56	74.43	200.00	150.00	161.25	22.53	16.03	19.37	19.16	18.13	18.81	98.39	85.02	92.38
26	19.50	17.40	18.38	102.41	55.64	72.56	210.00	140.00	155.83	22.15	15.20	18.24	19.65	18.14	18.99	98.29	75.03	86.86
27	18.70	17.90	18.31	101.12	63.02	72.94	230.00	70.00	163.33	29.50	12.99	18.82	19.38	18.15	18.97	97.16	7.12	69.08
28	18.40	18.00	18.22	106.64	64.82	74.61	220.00	150.00	161.67	25.11	13.86	18.86	19.64	18.16	18.56	99.94	69.94	75.05
29	18.60	17.80	18.10	102.78	57.06	72.45	220.00	140.00	157.50	23.63	13.90	18.48	20.13	18.06	18.64	102.01	78.23	98.84
30	18.20	17.50	17.94	106.59	63.06	70.59	220.00	140.00	156.67	23.50	6.20	18.05	19.17	18.13	18.51	102.50	91.02	100.60
31	18.00	17.50	17.81	105.13	59.57	70.95	140.00	140.00	140.00	23.64	14.99	17.17	18.77	18.16	18.53	150.60	90.30	103.64
Max	25.90			144.16			290.00			33.92			33.16			150.60		
Min		11.60			46.00			70.00			6.20			16.97			7.12	

Source: THP, CHP, BHP, KHP (DGPC)

Graph: Generation for the month January, 2020

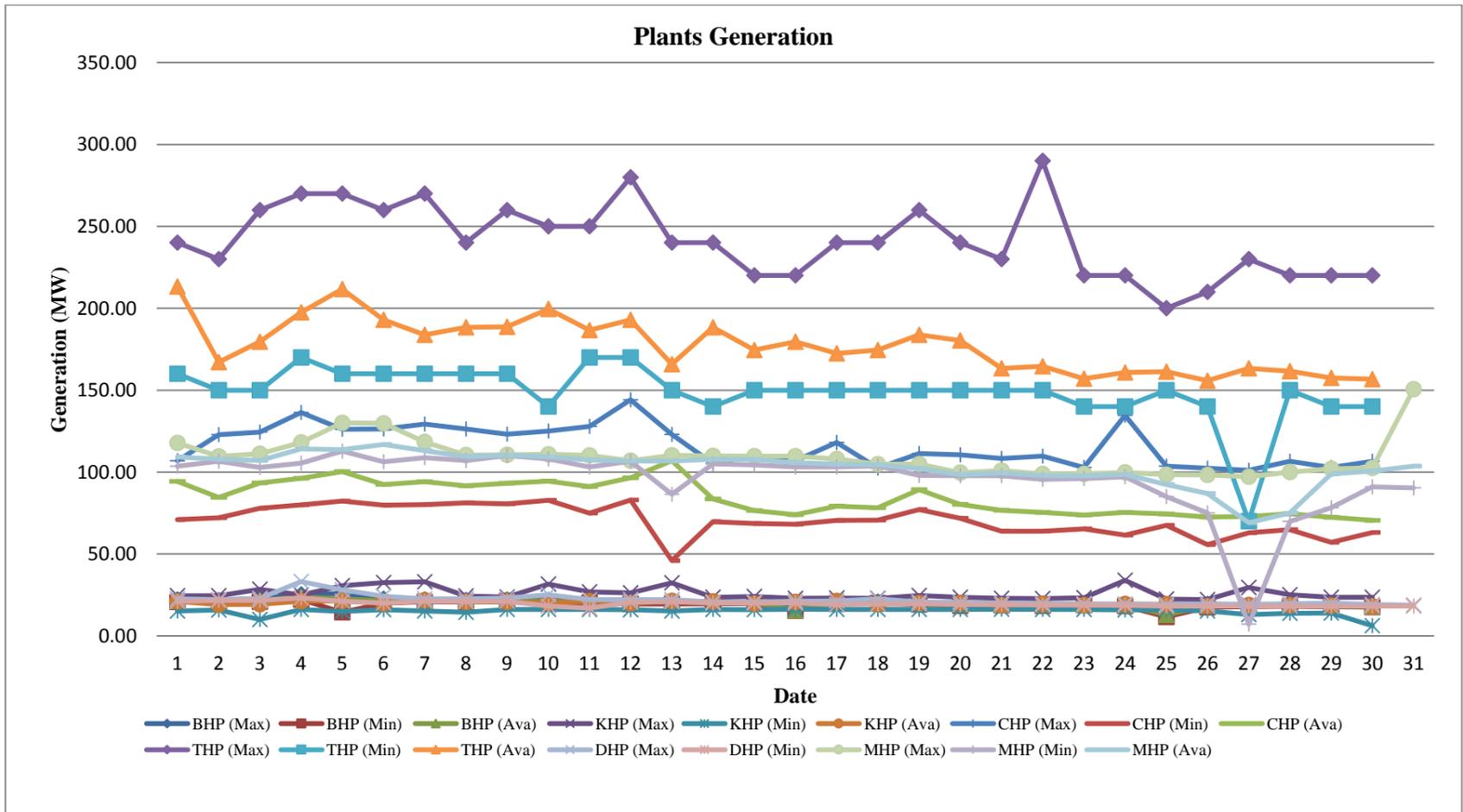




Table: Generation for the month of February, 2020

Feb-20 Date	BHP (MW)			CHP (MW)			THP (MW)			KHP (MW)			DHP (MW)			MHP (MW)			
	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava	
1	17.90	17.40	17.67	104.67	62.20	70.99	220.00	140.00	160.87	22.76	14.78	19.21	18.77	17.64	18.42	101.30	89.80	92.37	
2	17.70	16.80	17.37	101.35	52.83	67.15	220.00	120.00	151.25	23.18	14.01	17.66	18.68	16.14	17.98	101.50	80.38	90.91	
3	17.90	16.80	17.30	98.78	55.12	65.37	200.00	130.00	147.50	27.48	15.13	16.97	18.93	16.16	18.17	80.39	79.27	80.06	
4	17.60	16.80	17.22	99.34	56.37	65.00	200.00	130.00	150.00	22.62	15.11	18.30	17.98	17.60	17.92	115.77	86.24	91.08	
5	17.50	16.40	17.08	96.84	55.59	65.53	190.00	120.00	142.92	22.86	16.18	17.91	18.18	17.51	17.63	89.81	87.02	88.80	
6	22.70	5.70	16.92	96.23	56.18	66.97	240.00	120.00	154.58	22.40	15.71	17.45	18.62	17.15	18.16	141.51	84.64	78.06	
7	19.70	15.90	17.01	99.57	55.40	68.00	240.00	60.00	143.33	22.69	15.41	17.76	17.96	17.11	17.62	182.10	80.99	97.94	
8	17.50	16.40	16.89	102.72	55.85	66.16	200.00	120.00	145.83	23.30	15.57	17.65	17.97	17.10	17.45	123.30	84.82	88.81	
9	17.90	13.30	16.41	101.41	55.07	66.29	200.00	120.00	139.17	23.15	15.06	17.26	17.65	16.14	17.00	86.66	84.29	85.37	
10	17.10	15.80	16.45	104.02	55.57	65.10	190.00	120.00	139.58	22.84	15.05	17.28	18.16	16.12	17.09	85.10	79.86	84.14	
11	18.60	2.78	11.96	106.72	58.35	72.68	220.00	120.00	157.92	26.12	13.00	16.64	18.14	16.61	17.23	90.35	79.99	85.72	
12	18.60	2.78	11.96	89.99	56.28	69.82	190.00	120.00	145.83	23.11	14.99	17.77	18.17	16.62	17.18	90.41	89.74	90.07	
13	17.30	13.10	16.41	88.76	56.22	69.98	200.00	130.00	146.25	28.16	15.47	18.76	18.16	16.63	17.19	100.08	89.84	95.89	
14	17.30	16.60	16.84	96.06	58.86	73.08	210.00	130.00	155.00	32.48	15.49	21.37	18.25	17.14	17.32	97.64	90.19	96.02	
15	18.00	16.70	17.27	100.81	59.00	73.43	210.00	130.00	150.83	31.24	15.13	24.34	18.15	16.60	17.32	97.64	90.19	96.02	
16	17.00	16.30	16.74	105.00	59.52	68.39	220.00	130.00	147.92	28.16	15.08	19.54	11.02	10.99	11.00	97.61	85.28	92.42	
17	17.20	14.60	16.60	83.98	59.40	72.42	200.00	120.00	151.67	23.09	15.01	18.82	17.95	16.61	17.08	90.70	85.42	87.79	
18	16.70	16.10	16.40	107.31	60.27	69.96	210.00	130.00	143.33	26.49	16.11	20.16	17.17	16.62	16.92	129.79	90.43	94.39	
19	16.70	16.10	16.40	104.03	60.62	68.38	190.00	130.00	145.00	24.70	15.01	19.43	17.17	16.63	16.94	180.22	49.96	110.83	
20	16.60	16.00	16.26	103.22	58.90	68.67	210.00	120.00	142.50	24.67	15.01	18.69	17.19	16.61	16.73	179.88	48.29	95.42	
21	16.60	15.40	16.15	101.22	60.40	67.74	200.00	120.00	136.67	23.49	15.00	19.41	16.68	16.63	16.65	180.24	70.23	85.66	
22	16.60	15.80	16.23	101.02	60.83	70.12	200.00	120.00	141.67	26.00	15.89	19.14	16.66	16.62	16.64	100.20	86.76	93.69	
23	16.30	15.40	15.96	106.05	65.33	75.01	200.00	130.00	150.83	22.99	15.10	18.04	16.68	16.15	16.33	94.79	86.91	90.10	
24	16.60	15.60	15.89	109.08	64.81	73.03	200.00	140.00	154.17	22.70	15.01	17.89	18.17	16.15	17.13	90.00	86.50	87.65	
25	18.30	15.40	16.16	108.83	64.69	72.13	200.00	140.00	150.00	25.97	15.16	16.77	19.40	16.61	17.37	87.14	83.10	86.13	
26	24.30	18.40	21.10	152.50	60.75	77.46	310.00	130.00	171.25	31.06	16.02	20.83	36.16	20.15	28.08	85.12	80.22	83.52	
27	24.30	18.40	21.10	89.85	65.35	80.58	230.00	70.00	164.17	26.70	15.08	20.51	29.16	18.13	22.05	130.26	83.40	97.34	
28	19.80	16.20	17.91	103.48	65.05	71.74	200.00	120.00	150.00	23.08	15.30	19.67	22.14	17.22	19.69	120.62	85.26	97.10	
29	18.80	16.10	17.43	110.06	60.47	69.43	220.00	120.00	141.67	22.89	15.01	18.78	22.30	17.16	19.46	85.69	80.21	84.89	
30	0.00	No Generation	Error	37.60	31.90	33.70	130.00	130.00	130.00	0.00	No Generation	Error	0.00	No Generation	error	0.00	No Generation	0.00	
31	0.00	No Generation	Error	0.00	No Generation	Error	0.00	No Generation	Error	0.00	No Generation	Error	0.00	No Generation	Error	0.00	No Generation	Error	
Max	24.30			152.50			310.00			32.48			36.16			182.10			
Min		2.78			31.90			60.00			13.00			10.99			48.29		

Graph: Generation for the month of February, 2020

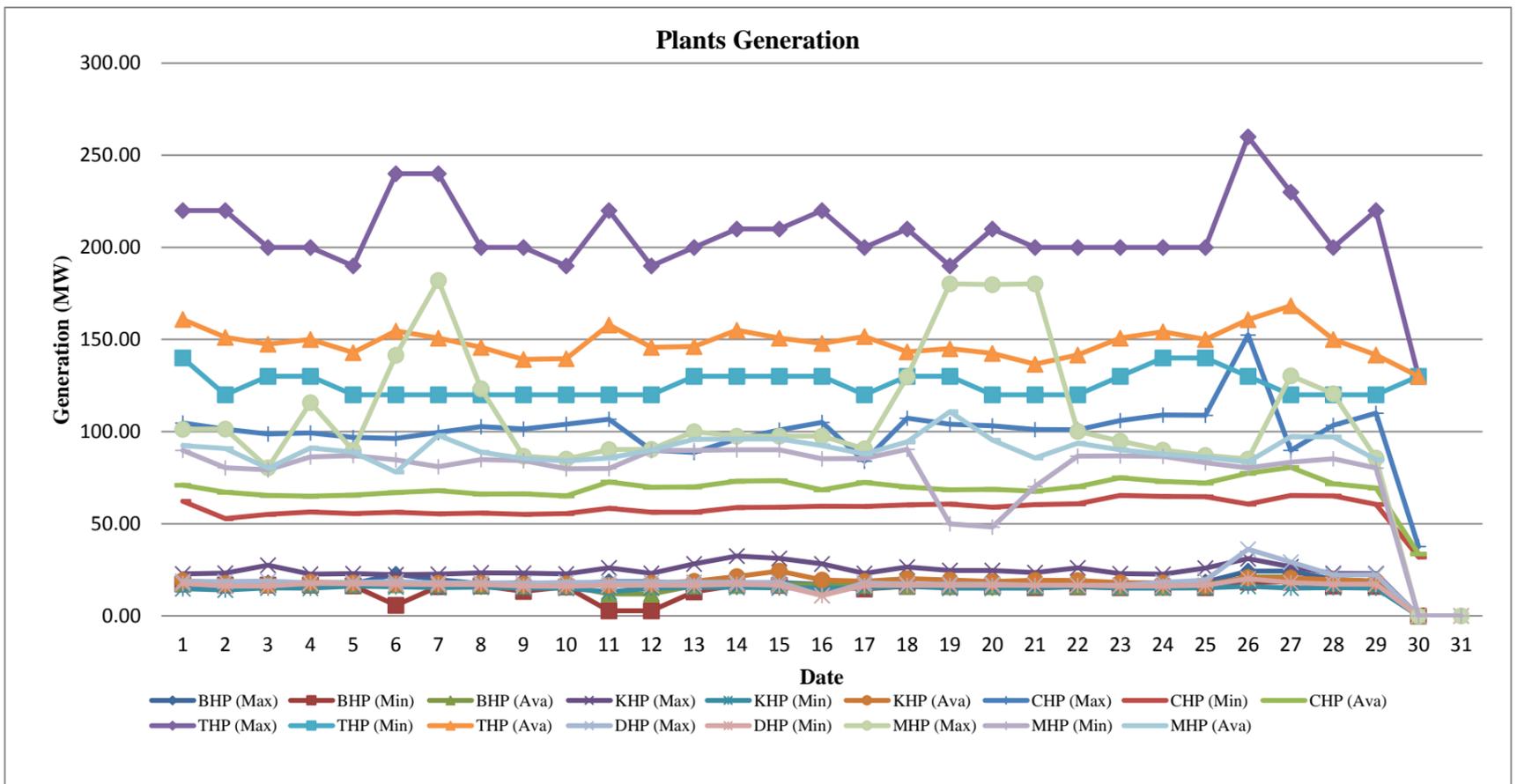




Table: Generation for the month of March, 2020

Mar-20 Date	BHP (MW)			CHP (MW)			THP (MW)			KHP (MW)			DHP (MW)			MHP (MW)			
	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava	
1	18.80	15.90	17.16	110.13	57.35	71.16	220.00	120.00	141.25	23.84	14.28	19.68	20.09	16.08	18.48	178.52	75.55	101.25	
2	18.00	16.50	17.15	114.94	61.19	76.78	240.00	130.00	161.67	22.67	16.15	19.92	50.06	17.07	20.18	85.43	30.98	0.00	
3	18.40	16.50	17.44	118.83	65.46	93.15	240.00	130.00	195.83	22.68	16.00	19.20	19.72	18.21	19.12	125.41	35.85	0.00	
4	18.50	16.50	17.21	118.80	72.50	82.36	240.00	130.00	170.83	22.68	15.25	19.07	20.24	17.21	18.81	164.38	89.66	0.00	
5	16.80	15.60	16.31	103.92	60.34	68.40	220.00	130.00	145.00	22.85	15.04	20.43	23.20	15.21	17.85	209.55	89.74	0.00	
6	16.70	15.80	16.36	107.77	58.41	71.31	220.00	120.00	142.92	32.55	15.01	20.11	21.21	17.21	18.14	110.05	89.98	0.00	
7	17.20	15.50	16.14	109.44	58.18	68.06	220.00	120.00	144.58	22.69	14.91	18.99	20.29	17.21	18.55	100.10	86.99	0.00	
8	17.60	15.60	16.50	109.29	58.97	72.56	230.00	120.00	150.00	22.64	15.00	19.69	19.75	17.13	18.29	100.36	85.36	0.00	
9	16.20	15.40	15.79	109.33	62.20	70.43	230.00	130.00	152.92	31.01	15.45	20.53	17.74	16.21	17.05	100.68	85.61	0.00	
10	16.30	15.30	15.78	106.20	62.68	70.64	220.00	130.00	145.00	24.98	11.31	18.77	17.56	15.23	16.87	98.59	95.39	0.00	
11	15.90	14.80	15.44	115.84	62.90	74.18	220.00	130.00	148.75	27.32	15.49	20.43	17.74	15.24	16.64	100.08	44.79	0.00	
12	16.20	14.80	15.49	102.45	63.76	78.44	220.00	130.00	173.75	27.49	15.15	20.85	17.26	16.21	16.78	99.98	99.30	0.00	
13	17.40	14.90	16.02	106.68	63.81	72.63	220.00	130.00	145.00	29.90	15.00	22.87	18.42	16.21	16.97	119.94	99.68	0.00	
14	20.90	14.00	17.47	105.36	61.02	75.40	210.00	130.00	166.25	33.00	15.01	25.10	19.66	16.53	17.63	150.25	99.53	0.00	
15	20.80	16.20	17.95	102.81	60.49	76.54	210.00	130.00	163.33	33.00	22.68	31.80	22.93	17.05	19.70	169.73	99.36	0.00	
16	18.90	14.60	16.23	101.71	62.81	78.83	230.00	130.00	161.67	33.00	20.41	23.22	17.91	16.44	17.56	106.74	88.04	0.00	
17	15.90	14.50	15.08	104.41	62.41	70.47	200.00	130.00	150.00	23.24	16.22	19.87	16.59	15.76	16.07	104.78	88.08	0.00	
18	16.30	14.20	15.17	103.07	60.44	68.06	210.00	130.00	146.67	22.58	15.86	17.96	16.07	15.43	15.92	95.92	94.19	0.00	
19	15.60	14.60	14.91	104.55	60.25	69.54	210.00	60.00	136.67	22.68	15.01	20.29	17.79	15.47	15.87	104.57	89.95	0.00	
20	17.20	14.60	15.96	104.99	60.36	74.51	220.00	120.00	154.17	26.39	14.92	19.30	17.36	15.75	16.26	100.09	99.71	0.00	
21	16.10	14.90	15.51	140.42	63.50	84.29	290.00	120.00	182.08	22.68	15.38	19.15	17.35	15.50	16.50	105.02	90.21	0.00	
22	16.30	14.70	15.43	146.67	85.62	96.73	180.00	120.00	162.50	24.09	15.01	19.29	16.59	15.50	16.03	110.25	90.33	0.00	
23	18.40	15.30	16.10	159.40	65.57	86.43	190.00	120.00	131.67	27.31	15.05	19.61	17.06	15.76	16.09	105.60	100.30	0.00	
24	20.10	15.10	16.85	100.75	73.80	82.53	200.00	120.00	158.33	33.44	10.29	22.84	20.18	16.28	18.15	125.06	100.18	0.00	
25	17.30	15.10	16.17	109.18	60.25	77.68	220.00	130.00	157.08	26.36	15.36	22.00	17.08	15.81	16.36	125.94	100.43	0.00	
26	16.90	14.90	15.96	116.66	65.22	77.54	220.00	130.00	160.42	33.00	15.29	27.54	16.93	15.76	16.43	145.22	110.33	0.00	
27	16.90	15.80	16.25	126.22	68.90	90.35	250.00	130.00	178.75	33.00	24.17	30.44	17.12	15.73	16.65	160.15	110.41	0.00	
28	19.60	16.60	17.28	165.96	78.16	115.76	290.00	160.00	231.67	33.00	16.50	27.86	18.43	16.29	17.36	198.02	51.17	0.00	
29	20.60	15.80	18.38	162.19	92.62	115.40	290.00	210.00	237.50	33.00	33.00	33.00	22.65	17.09	19.13	254.49	45.16	0.00	
30	20.20	15.00	17.09	143.12	95.78	112.09	300.00	200.00	231.67	33.00	33.00	33.00	19.70	16.29	17.92	254.34	119.99	0.00	
31	20.20	15.30	16.77	118.90	99.43	103.89	230.00	200.00	203.75	45.27	33.00	36.49	17.74	15.74	16.59	209.86	134.02	168.07	
Max	20.90			165.96			300.00			45.27			50.06			254.49			
Min		14.00			57.35			60.00			10.29			15.21			30.98		

Source: THP, CHP, BHP, KHP (DGPC)

Graph: Generation for the month of March, 2020

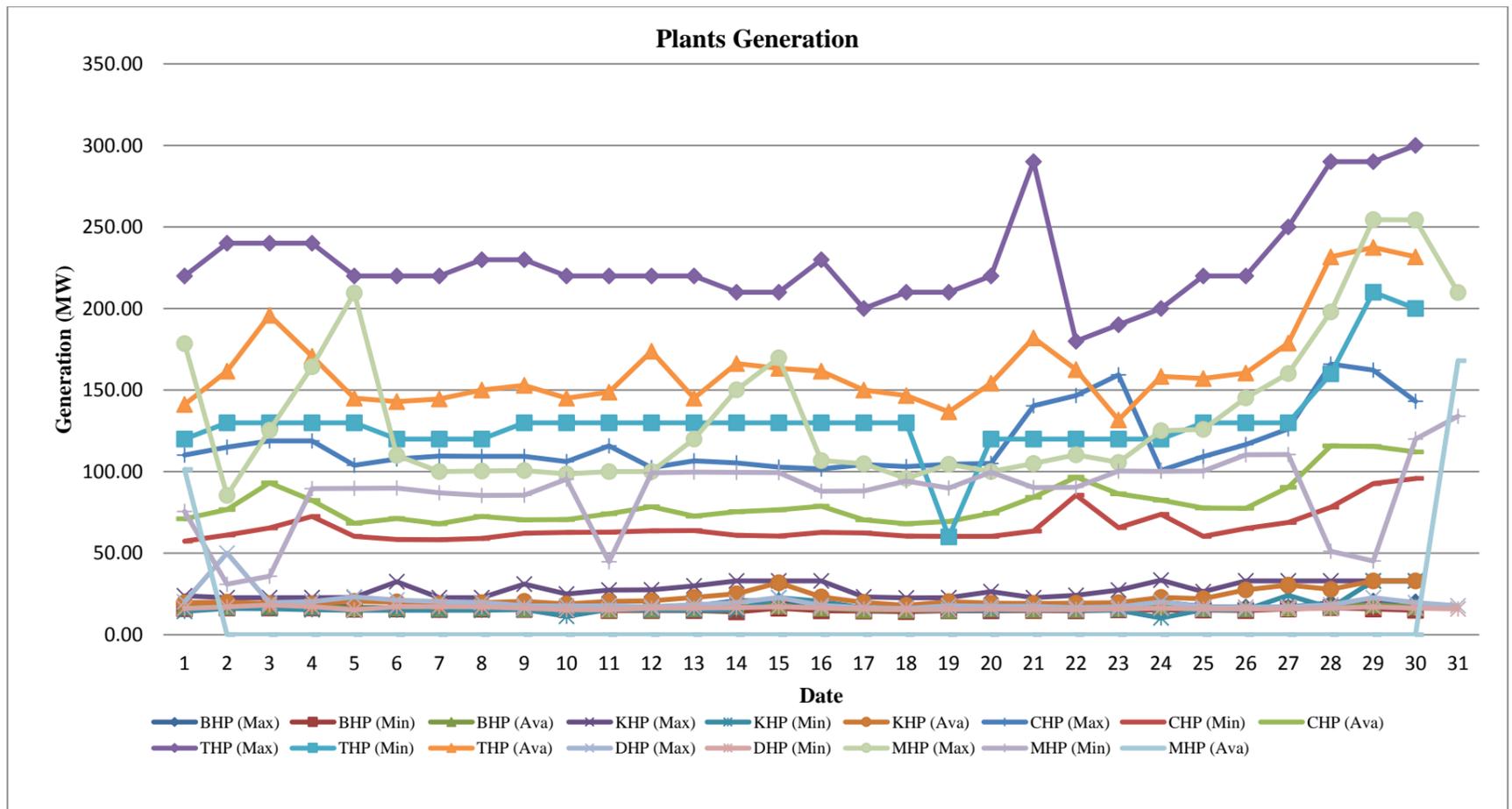




Table: National demand for January, 2020

Graph: National Demand for January, 2020

Annexure-II

Jan-20	Max	Min	Ava
0:00	286.50	207.77	243.19
1:00	278.84	195.65	236.05
2:00	273.00	202.21	230.88
3:00	267.01	192.34	228.02
4:00	262.21	190.09	229.49
5:00	267.22	211.30	234.75
6:00	269.05	216.04	240.82
7:00	289.41	232.21	262.97
8:00	320.17	258.72	286.22
9:00	319.74	245.37	282.54
10:00	317.25	238.97	276.80
11:00	324.02	222.32	272.27
12:00	321.85	225.86	275.03
13:00	321.32	217.30	269.38
14:00	315.91	226.72	265.21
15:00	308.59	224.87	263.60
16:00	308.78	228.02	268.23
17:00	320.81	245.57	280.37
18:00	346.86	267.08	310.95
19:00	351.94	277.83	315.39
20:00	341.60	279.26	306.31
21:00	341.29	278.38	300.41
22:00	324.24	252.23	280.59
23:00	294.55	224.32	256.98
	351.94		
		190.09	

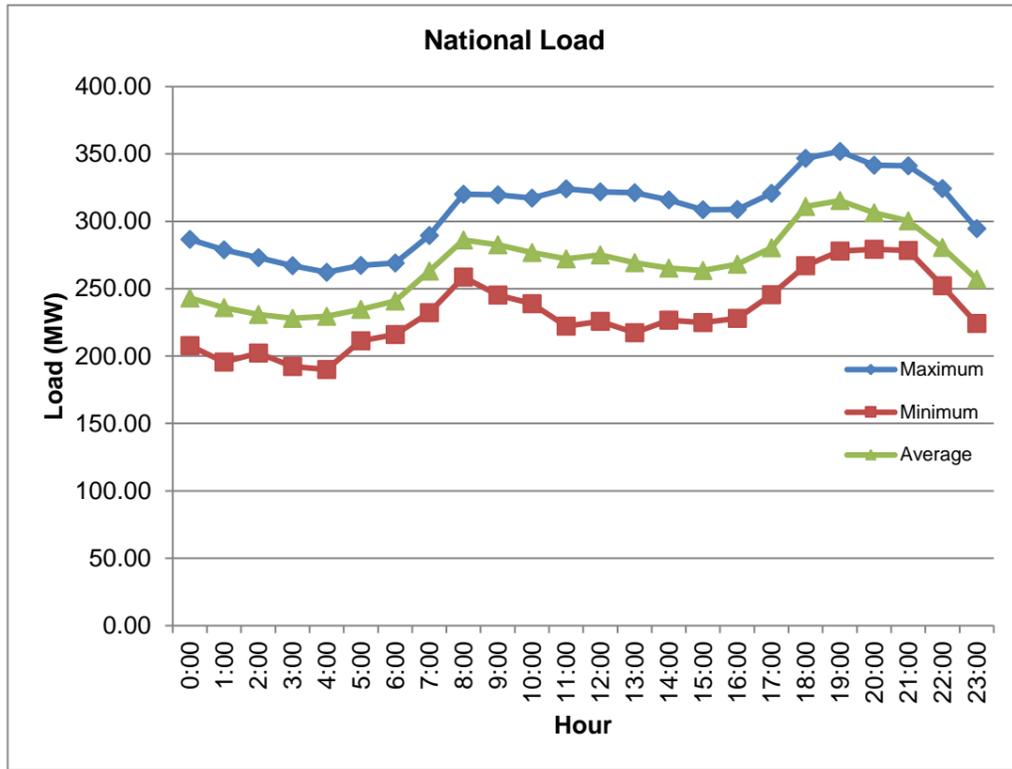


Table: National Demand for February, 2020

Graph: National Demand for February, 2020

Feb-20	Max	Min	Ava
0:00	279.92	228.53	238.81
1:00	271.30	218.00	231.60
2:00	266.93	210.64	230.45
3:00	266.03	206.17	228.51
4:00	266.42	200.73	226.94
5:00	268.70	209.95	231.48
6:00	283.55	224.66	243.81
7:00	320.87	242.82	274.37
8:00	332.32	257.28	285.52
9:00	337.04	264.07	283.86
10:00	332.22	265.86	279.43
11:00	325.80	253.10	272.76
12:00	321.73	252.84	275.52
13:00	317.04	240.21	269.72
14:00	323.95	242.77	263.67
15:00	319.17	241.46	264.21
16:00	327.69	248.77	267.82
17:00	326.50	271.45	276.90
18:00	345.74	287.92	298.59
19:00	363.47	301.61	314.88
20:00	357.15	304.27	307.43
21:00	342.40	287.97	292.26
22:00	320.47	265.75	274.77
23:00	295.56	247.23	252.30
	363.47		
		200.73	

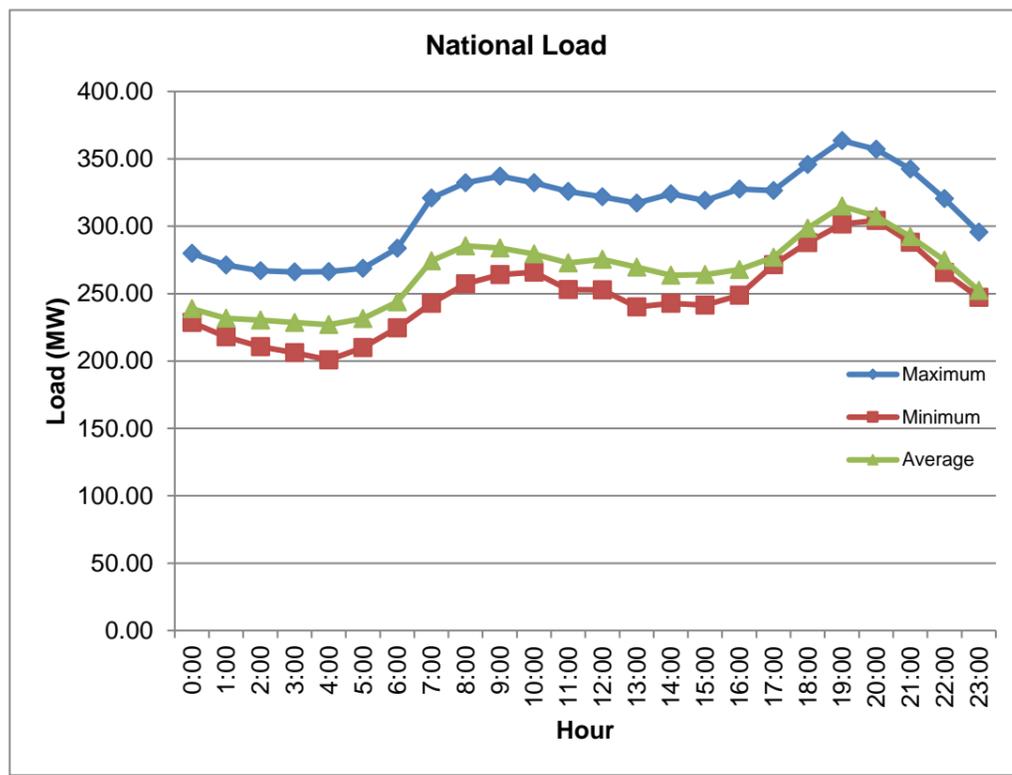




Table: National Demand for March, 2020

Graph: National Demand for March, 2020

Mar-20	Max	Min	Ava
0:00	278.91	201.05	243.95
1:00	270.21	197.29	237.97
2:00	266.39	197.64	234.98
3:00	266.41	195.42	234.27
4:00	271.54	201.01	236.21
5:00	279.08	202.19	241.46
6:00	295.42	212.18	254.12
7:00	338.81	230.32	283.30
8:00	336.61	235.95	286.51
9:00	321.35	231.39	284.08
10:00	325.01	234.19	281.27
11:00	322.84	238.97	279.07
12:00	325.41	228.61	281.96
13:00	322.76	221.13	274.65
14:00	322.42	223.22	268.48
15:00	317.78	220.48	268.24
16:00	318.78	219.92	269.87
17:00	323.28	227.15	277.71
18:00	349.76	239.13	298.37
19:00	371.10	266.73	322.21
20:00	360.16	258.69	313.79
21:00	348.48	241.30	298.22
22:00	331.35	227.02	278.34
23:00	307.88	214.45	258.75
	371.10		
		195.42	

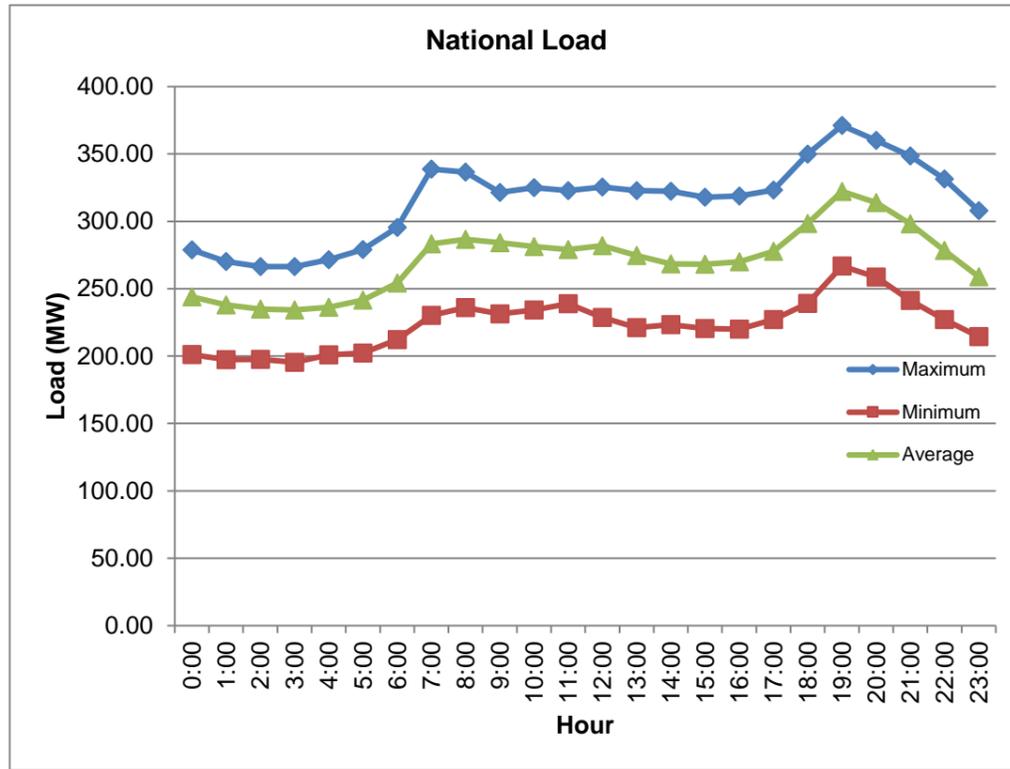




Table: Daily maximum, minimum and average frequency for the month of January, 2020

Jan-20 Date	Bus Frequency at Singhrgoan Substation			Bus Frequency at Kurichhu Hydropower Plant		
	Max	Min	Ava	Max	Min	Ava
1	50.07	49.70	49.97	50.11	49.70	50.00
2	50.11	49.70	49.97	50.12	49.82	49.99
3	50.07	49.91	50.00	50.07	49.91	50.00
4	50.05	49.93	49.99	50.11	49.83	50.01
5	50.07	49.93	50.00	50.11	49.88	50.01
6	50.07	49.92	50.00	50.12	49.79	49.98
7	50.06	49.91	50.00	50.09	49.90	50.01
8	50.11	49.91	50.01	50.11	49.92	50.02
9	50.09	50.00	50.01	50.08	49.90	50.02
10	50.09	50.00	50.02	50.10	49.88	50.03
11	50.04	49.99	50.01	50.09	49.91	50.02
12	50.10	49.86	50.00	50.09	49.80	50.01
13	50.10	49.92	50.00	50.10	49.92	50.00
14	50.02	49.95	49.99	50.09	49.84	50.00
15	50.07	49.98	50.01	50.08	49.94	50.02
16	50.07	49.85	50.00	50.14	49.85	50.00
17	50.05	49.85	49.99	50.07	49.89	49.99
18	50.08	49.85	50.00	50.10	49.89	50.01
19	50.14	49.91	50.00	50.11	49.91	50.02
20	50.07	49.92	50.00	50.10	49.93	50.02
21	50.04	49.94	50.01	50.09	49.93	50.01
22	50.06	49.94	50.00	50.09	49.93	50.02
23	50.04	49.90	50.00	50.13	49.87	50.00
24	50.17	49.90	50.00	50.06	49.89	50.00
25	50.01	49.91	49.98	50.06	49.88	49.99
26	50.05	49.70	49.98	50.08	49.90	50.00
27	50.06	49.70	49.98	50.12	49.80	50.01
28	50.07	49.88	50.00	50.06	49.80	50.01
29	50.15	49.96	50.01	50.09	49.92	50.01
30	50.09	49.88	49.99	50.08	49.91	50.00
31	50.04	49.70	49.95	50.09	49.84	50.01
Max	50.17			50.14		
Min		49.70			49.70	

Source: TD (BPC), KHP (DGPC)

Graph: Daily maximum, minimum and average frequency for the month of January, 2020

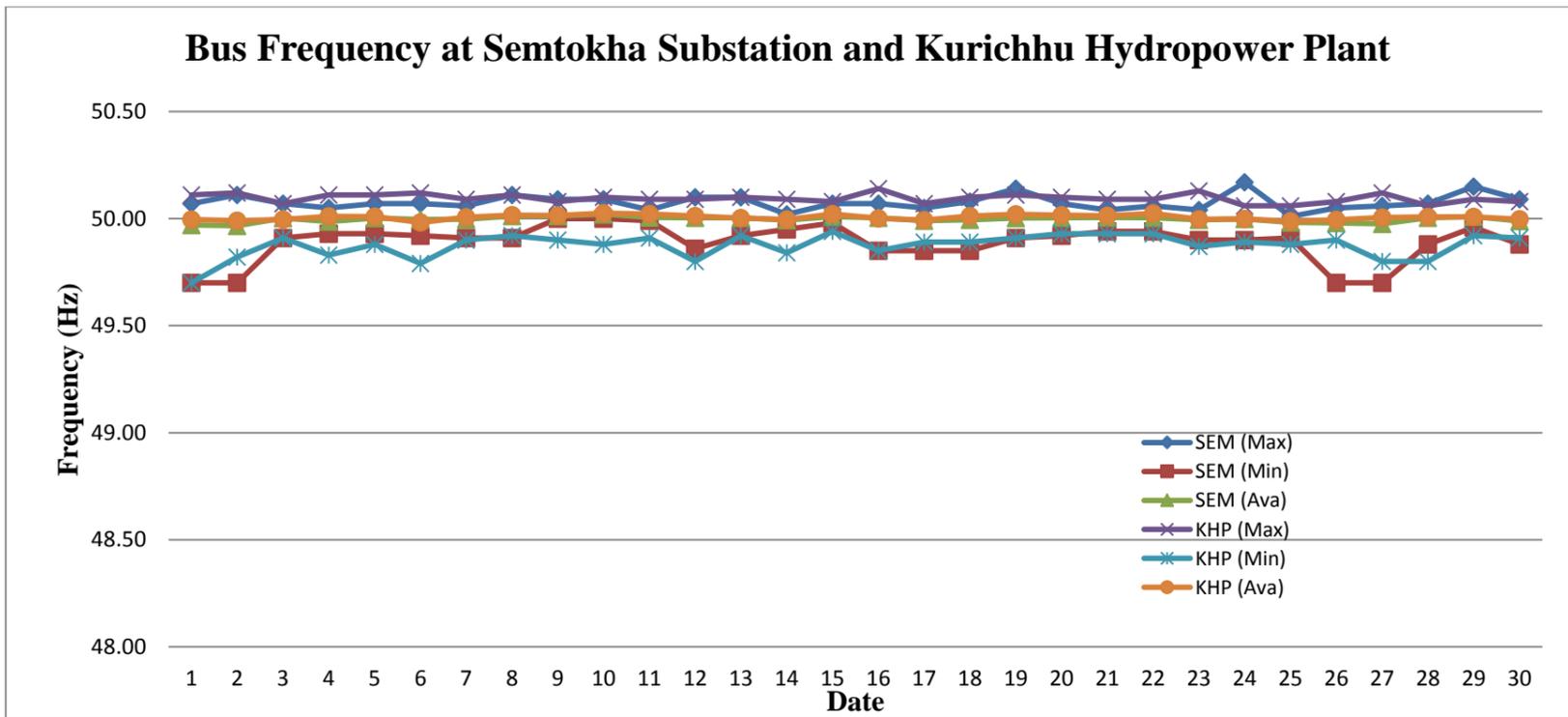




Table: Daily maximum, minimum and average frequency for the month of February, 2020

Date	Bus Frequency at Singhegoan Substation			Bus Frequency at Kurichhu Hydropower Plant		
	Max	Min	Ava	Max	Min	Ava
1	50.06	49.97	50.00	50.10	49.91	50.02
2	50.00	49.80	49.98	50.13	49.92	50.03
3	50.00	49.70	49.89	50.06	49.87	49.98
4	50.01	49.88	49.98	50.07	49.88	49.98
5	50.09	49.87	49.98	50.06	49.89	50.01
6	50.05	49.94	50.00	50.07	49.85	50.00
7	50.04	50.00	50.01	50.10	49.90	50.02
8	50.07	49.95	49.99	50.08	49.87	50.02
9	50.03	49.80	49.99	50.07	49.90	50.01
10	50.09	49.96	50.02	50.08	49.96	50.04
11	50.06	49.91	50.00	50.10	49.47	49.99
12	50.08	49.97	50.00	50.09	49.91	50.02
13	50.02	49.92	49.98	50.07	49.89	49.99
14	50.01	49.99	50.00	50.09	49.88	50.00
15	50.10	49.70	49.95	50.08	49.92	50.01
16	50.08	49.90	50.00	50.09	49.50	50.00
17	50.11	49.91	50.00	50.10	49.90	50.01
18	50.05	49.90	49.99	50.08	49.89	50.00
19	50.06	49.70	49.99	50.11	49.87	50.00
20	50.03	49.95	50.00	50.12	49.91	50.01
21	50.05	49.89	49.99	50.09	49.87	50.01
22	50.05	49.81	49.98	50.11	49.88	50.02
23	50.05	49.99	50.02	50.08	49.93	50.01
24	50.08	49.91	50.00	50.12	49.89	50.01
25	50.05	49.70	49.95	50.07	49.85	49.98
26	50.08	49.88	49.97	50.09	49.85	50.01
27	50.09	49.95	50.02	50.08	49.92	50.02
28	50.14	49.93	50.01	50.10	49.90	50.01
29	50.17	49.97	50.02	50.09	49.90	50.02
30	0.00	Error	Error	0.00	Error	Error
31	0.00	Error	Error	0.00	Error	Error
Max	50.17			50.13		
Min		49.70			49.47	

Source: TD (BPC), KHP (DGPC)

Graph: Daily maximum, minimum and average frequency for the month of February, 2020

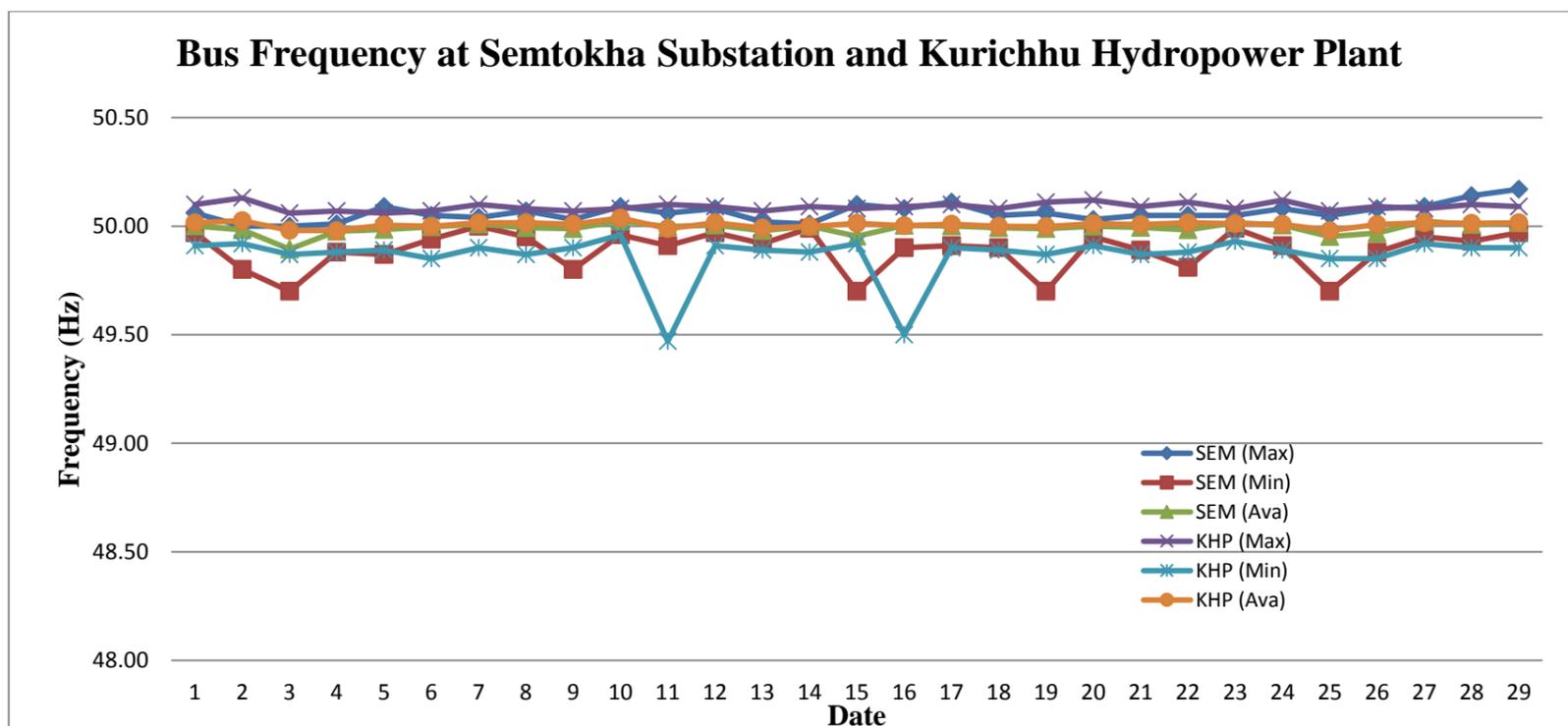




Table: Daily maximum, minimum and average frequency for the month of March, 2020

Date	Bus Frequency at Singhegoan Substation			Bus Frequency at Kurichhu Hydropower Plant		
	Max	Min	Ava	Max	Min	Ava
1	50.04	49.94	50.01	50.09	49.95	50.02
2	50.00	49.84	49.98	50.07	49.83	50.01
3	50.10	49.96	50.01	50.15	49.90	50.02
4	50.12	49.70	49.99	50.15	49.90	50.03
5	50.04	49.90	49.99	50.09	49.92	50.01
6	50.06	49.91	50.00	50.11	49.91	50.02
7	50.02	50.00	50.00	50.07	49.87	49.99
8	50.09	50.00	50.01	50.07	49.90	50.01
9	50.06	50.00	50.01	50.08	49.95	50.02
10	50.08	50.00	50.01	50.17	49.97	50.05
11	50.06	50.00	50.01	50.08	49.88	50.01
12	50.08	49.92	50.01	50.08	49.85	50.01
13	50.13	49.98	50.01	50.12	49.90	50.01
14	50.04	49.90	49.99	50.11	49.90	50.02
15	50.17	49.97	50.01	50.11	49.94	50.01
16	50.10	49.90	49.97	50.09	49.87	49.99
17	50.05	49.92	50.00	50.10	49.92	50.03
18	50.34	49.90	50.02	50.08	49.91	50.00
19	50.03	49.90	50.00	50.08	49.92	50.01
20	50.10	49.98	50.01	50.18	49.97	50.02
21	50.09	49.94	50.00	50.09	49.94	50.03
22	50.20	50.00	50.02	50.12	49.86	50.02
23	50.06	49.98	50.01	50.11	49.87	50.00
24	50.11	50.00	50.03	50.13	49.90	50.03
25	50.13	49.70	50.00	50.09	49.90	50.02
26	50.06	49.90	50.00	50.10	49.88	50.01
27	50.05	49.97	50.00	50.10	49.87	50.01
28	50.14	49.90	50.02	50.10	49.84	50.02
29	50.04	49.96	50.00	50.10	49.87	50.01
30	50.11	49.84	50.00	50.08	49.90	50.00
31	50.16	49.70	49.99	50.09	49.84	50.00
Max	50.34			50.18		
Min		49.70			49.83	

Source: TD (BPC), KHP (DGPC)

Graph: Daily maximum, minimum and average frequency for the month of March, 2020

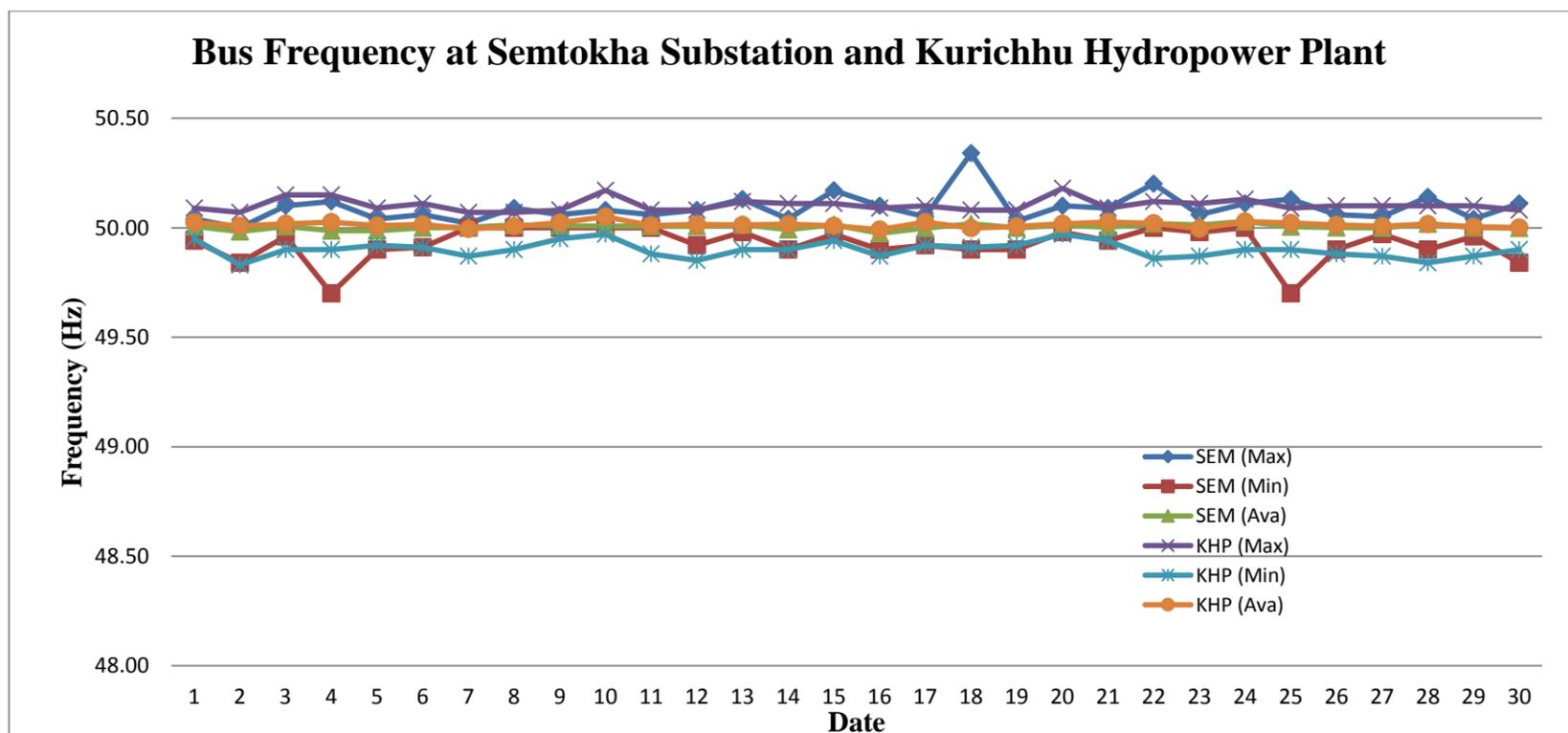




Table: Daily maximum, minimum and average Voltage for the month of January, 2020

Jan-20 Date	Malbase Substation									Nangkhor Substation		
	400kV Bus Voltage (kV)			220kV Bus Voltage (kV)			66kV Bus Voltage (kV)			132kV Bus Voltage (kV)		
	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava
1	417.00	407.00	412.98	228.00	222.50	225.65	67.00	65.00	66.04	136.80	132.50	134.85
2	418.50	409.00	413.92	229.00	223.00	225.83	67.00	65.00	66.04	137.50	132.36	135.36
3	416.50	407.50	412.52	227.50	222.00	224.83	67.00	65.00	66.13	136.73	132.30	135.30
4	416.50	406.50	411.83	227.50	220.50	224.04	66.00	65.00	65.50	136.73	131.50	134.49
5	416.50	409.50	413.52	227.00	222.50	225.44	67.00	65.00	65.77	137.56	135.00	136.30
6	418.50	407.50	413.21	229.00	221.50	225.79	68.00	65.00	66.67	139.60	131.50	135.73
7	419.50	404.50	410.63	229.00	220.50	223.90	67.00	65.00	65.75	137.90	132.78	135.66
8	416.50	404.50	408.42	227.50	221.00	223.67	67.00	65.00	65.83	138.80	130.20	135.78
9	413.00	404.50	408.54	226.50	221.00	223.90	67.00	65.00	65.88	139.00	132.50	135.49
10	412.00	403.50	407.75	226.50	222.00	224.27	67.00	65.00	66.08	138.10	131.90	135.25
11	414.50	403.50	409.58	227.00	221.50	224.29	67.00	65.00	65.88	138.60	132.30	135.25
12	414.50	404.00	409.50	227.00	221.50	224.71	67.00	65.00	65.92	137.70	132.99	135.54
13	412.50	403.00	408.33	228.00	221.00	224.83	68.00	65.00	66.38	137.70	132.30	135.59
14	413.50	403.00	408.38	229.00	222.00	225.33	68.00	66.00	67.04	138.60	132.40	134.96
15	413.50	403.50	408.42	228.00	221.50	224.73	67.00	65.00	66.08	136.90	132.70	135.03
16	412.50	406.50	410.06	227.00	222.00	225.21	67.00	60.50	66.10	137.30	132.57	135.34
17	415.50	405.50	411.10	227.00	220.50	224.60	67.00	65.00	66.04	137.90	131.53	135.02
18	415.50	405.50	411.04	229.00	221.50	226.00	68.00	66.00	66.75	139.60	133.40	136.20
19	414.50	406.50	411.44	228.00	223.50	225.83	67.00	65.00	66.38	139.60	134.40	136.98
20	416.50	406.50	410.63	229.50	223.00	225.63	67.00	65.00	66.17	138.39	131.20	135.25
21	416.50	405.50	410.25	229.50	222.00	225.27	67.00	65.00	66.17	138.18	133.80	135.68
22	416.00	405.50	411.35	229.00	223.50	226.06	68.00	65.00	66.67	139.00	132.90	135.80
23	415.50	406.50	411.77	229.00	223.00	226.00	68.00	66.00	66.88	137.20	132.36	135.01
24	414.50	407.00	410.40	228.50	222.00	225.21	68.00	66.00	66.50	139.00	132.99	135.22
25	415.50	408.00	411.79	228.50	222.50	225.79	67.00	66.00	66.42	138.18	132.90	135.83
26	415.50	408.50	412.13	228.00	224.00	226.29	67.00	66.00	66.83	139.22	133.50	136.08
27	417.00	407.50	411.96	230.00	223.00	226.08	68.00	65.00	66.67	142.50	133.80	136.95
28	414.50	406.50	410.33	228.50	221.50	225.19	67.00	65.00	66.04	142.30	136.50	139.37
29	415.50	407.50	411.38	228.50	222.50	225.17	67.00	65.00	66.00	141.90	134.20	138.60
30	415.50	406.50	411.50	229.00	222.00	225.25	67.00	65.00	66.08	139.40	133.19	136.62
31	415.50	403.50	409.96	229.00	220.00	224.52	67.00	64.00	65.67	139.20	132.00	135.38
Max	419.50			230.00			68.00			142.50		
Min		403.00			220.00			60.50			130.20	

Source: TD, BPC

Graph: Daily maximum, minimum and average Voltage for the month of January, 2020

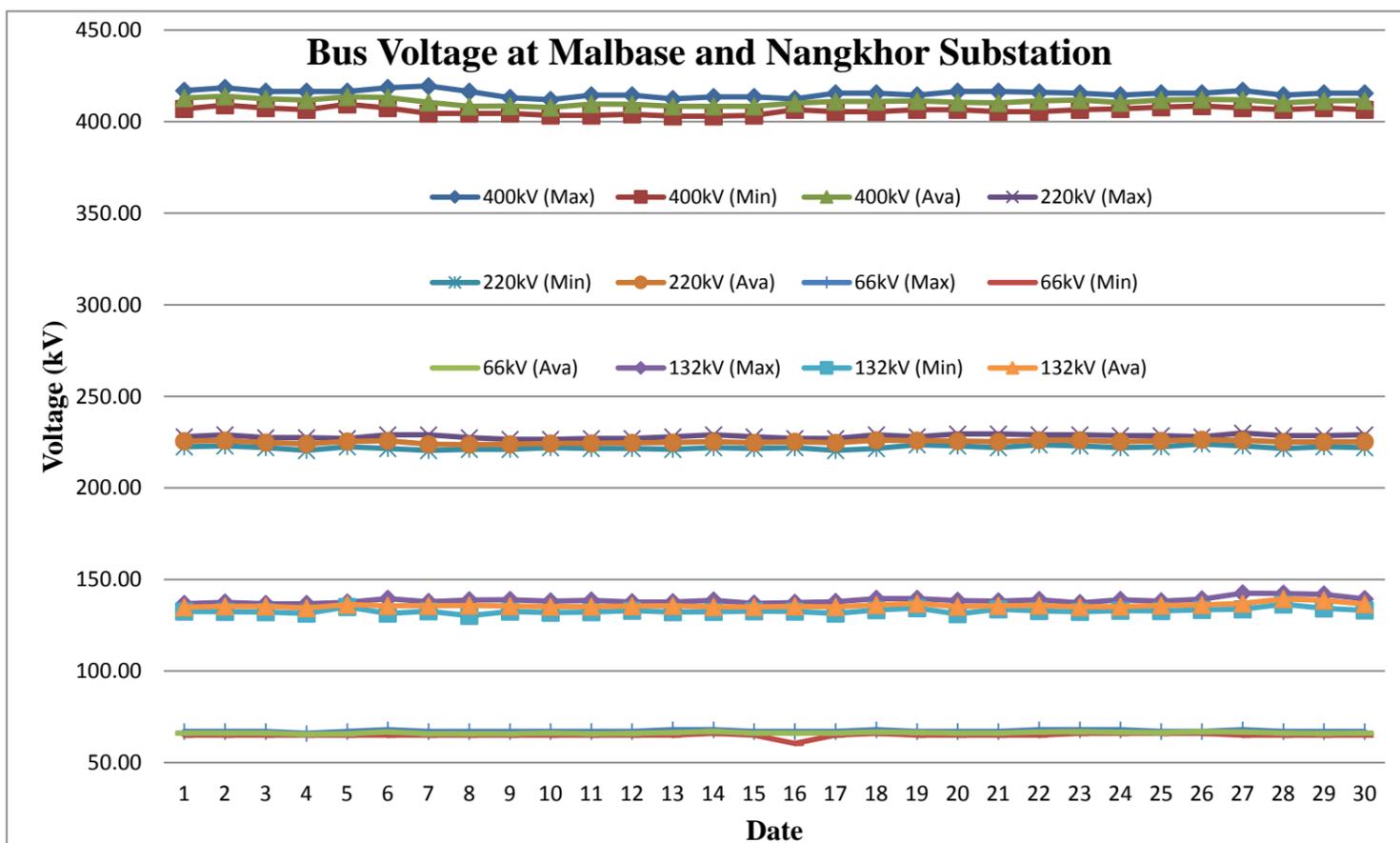




Table: Daily maximum, minimum and average Voltage for the month of February, 2020

Feb-20 Date	Malbase Substation									Nangkor Substation		
	400kV Bus Voltage (kV)			220kV Bus Voltage (kV)			66kV Bus Voltage (kV)			132kV Bus Voltage (kV)		
	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava
1	414.00	408.00	410.75	227.50	223.00	225.31	67.00	65.00	66.13	139.20	132.50	135.55
2	414.50	407.50	411.48	228.50	223.50	226.06	68.00	65.00	66.17	139.01	133.20	136.17
3	413.50	405.50	409.69	227.50	222.50	224.44	67.00	65.00	66.00	139.00	131.32	135.70
4	413.50	404.50	409.42	227.00	220.50	223.92	67.00	65.00	65.83	136.70	130.70	133.66
5	415.50	404.50	410.88	227.50	221.50	224.77	67.00	65.00	66.25	136.50	131.10	134.13
6	413.50	404.50	409.46	228.00	221.50	224.92	67.00	65.00	66.21	136.73	130.70	134.34
7	413.50	404.50	410.08	228.50	222.00	225.17	67.00	65.00	66.13	138.10	129.60	134.62
8	412.50	405.50	409.33	227.00	221.50	224.67	67.00	65.00	66.25	135.90	131.70	134.28
9	413.50	405.00	409.48	228.50	222.00	224.83	67.00	64.00	65.83	137.30	131.95	134.99
10	414.00	403.50	408.35	229.00	222.00	224.25	67.00	65.00	65.79	137.30	131.95	134.77
11	413.50	404.50	408.29	228.00	221.50	223.88	67.00	65.00	65.75	138.10	131.50	134.60
12	414.50	405.50	408.90	229.00	222.50	224.42	67.00	65.00	65.75	137.30	131.70	134.79
13	413.50	404.50	408.75	227.00	221.00	223.94	66.00	65.00	65.33	138.10	133.20	135.64
14	414.50	404.00	408.65	228.00	221.00	223.60	67.00	65.00	65.63	136.94	130.80	133.32
15	414.50	404.50	409.17	227.50	220.50	224.50	67.00	65.00	65.83	136.10	129.00	133.17
16	413.50	405.00	409.10	227.50	220.50	225.10	67.00	65.00	66.17	136.20	130.87	133.51
17	414.50	401.50	408.83	228.00	220.00	224.79	68.00	65.00	66.25	137.10	129.45	133.26
18	414.00	405.50	409.08	228.00	221.00	224.33	67.00	65.00	65.88	136.31	130.00	134.55
19	412.50	404.50	408.46	226.00	221.00	223.88	66.00	65.00	65.50	137.70	132.20	134.95
20	416.50	405.50	410.38	230.00	222.00	225.33	68.00	65.00	66.50	137.56	130.70	133.54
21	416.50	405.50	410.21	230.00	222.50	225.23	68.00	65.00	66.04	137.50	130.60	134.17
22	415.50	403.00	409.58	229.00	222.00	225.63	67.00	65.00	66.08	135.90	129.66	133.56
23	415.50	404.00	409.71	230.00	222.00	225.58	68.00	65.00	66.42	136.60	131.32	133.85
24	416.50	405.50	410.77	230.00	221.50	225.44	67.00	65.00	65.92	138.10	130.90	134.91
25	415.50	405.00	410.63	230.00	221.50	225.04	68.00	64.00	65.92	137.70	131.10	133.89
26	415.50	408.00	412.02	228.00	222.50	225.31	67.00	65.00	65.75	138.39	130.70	134.18
27	417.50	404.50	411.35	230.00	221.50	225.94	68.00	65.00	66.58	137.30	130.40	134.50
28	415.50	404.00	409.88	229.00	222.00	225.46	67.00	65.00	65.92	139.40	131.12	135.31
29	415.50	406.50	411.13	230.00	222.00	225.42	68.00	65.00	66.00	138.30	130.00	134.53
30	0.00	Error	Error	0.00	Error	Error	0.00	Error	Error	0.00	Error	Error
31	0.00	Error	Error	0.00	Error	Error	0.00	Error	Error	0.00	Error	Error
Max	417.50			230.00			68.00			139.40		
Min		401.50			220.00			64.00			129.00	

Source: TD, BPC

Graph: Daily maximum, minimum and average Voltage for the month of February, 2020

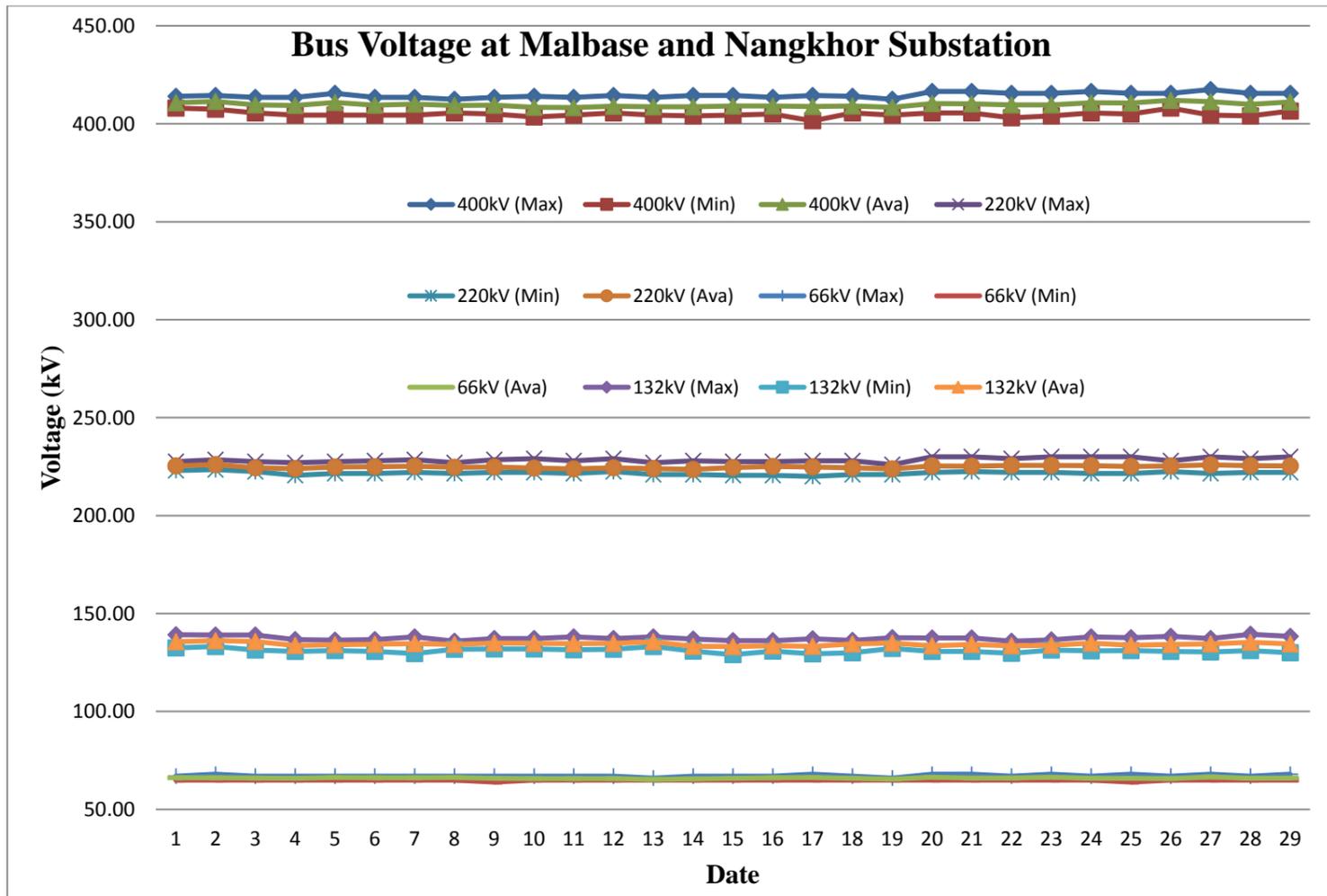


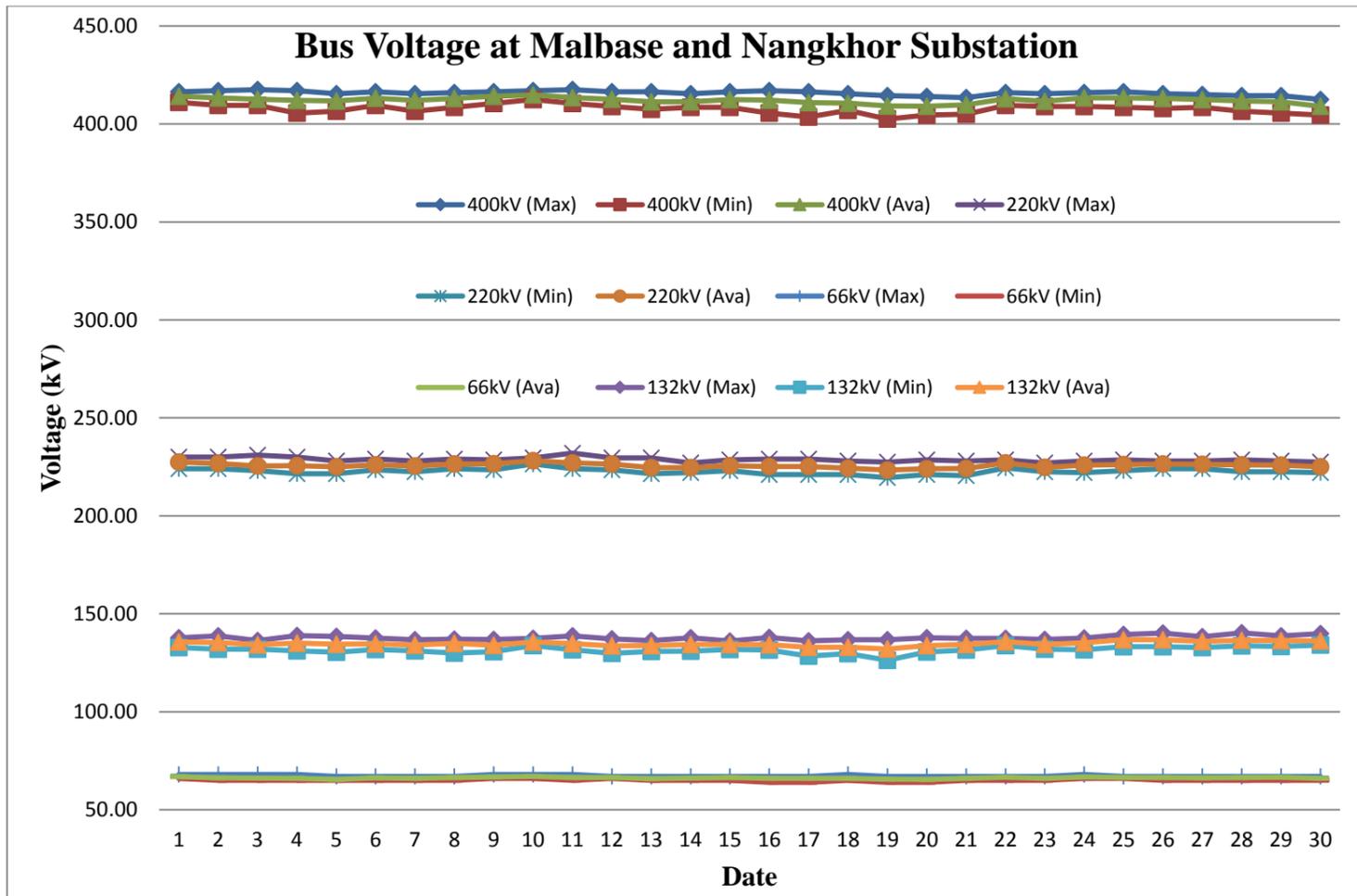


Table: Daily maximum, minimum and average Voltage for the month of March, 2020

Date	Malbase Substation									Nangkhor Substation		
	400kV Bus Voltage (kV)			220kV Bus Voltage (kV)			66kV Bus Voltage (kV)			132kV Bus Voltage (kV)		
	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava
1	416.50	411.00	414.17	230.00	224.00	227.50	68.00	66.00	66.83	137.79	132.78	135.65
2	417.00	409.50	413.38	230.00	224.00	226.71	68.00	65.00	66.33	138.80	132.00	135.37
3	417.50	409.50	412.67	231.00	223.00	225.50	68.00	65.00	66.13	136.30	131.95	134.17
4	417.00	405.50	412.04	230.00	221.50	225.63	68.00	65.00	66.00	138.90	131.12	135.03
5	415.50	406.50	411.73	228.00	221.50	225.08	67.00	65.00	65.50	138.50	130.40	134.42
6	416.50	409.50	413.13	229.00	223.50	226.06	67.00	65.00	66.25	137.56	131.74	134.58
7	415.50	406.50	412.10	228.00	222.50	225.46	67.00	65.00	66.04	136.70	131.10	134.13
8	416.00	408.50	413.08	229.00	224.00	226.38	67.00	65.00	66.42	137.10	130.00	134.89
9	416.50	410.50	414.15	228.50	223.50	226.65	68.00	66.00	66.67	136.90	130.70	133.99
10	417.00	412.50	414.83	229.50	226.50	228.17	68.00	66.00	67.00	137.50	133.82	135.64
11	417.50	410.50	413.42	232.00	224.00	227.04	68.00	65.00	66.42	138.80	131.70	134.79
12	416.50	409.00	412.63	229.50	223.50	226.42	67.00	66.00	66.42	137.14	129.80	133.61
13	416.50	407.50	411.33	229.50	221.50	224.54	67.00	65.00	65.92	136.31	130.87	133.79
14	415.50	408.50	411.33	227.00	222.00	224.58	67.00	65.00	66.17	137.70	130.90	134.33
15	416.50	408.50	412.50	228.50	223.00	225.56	67.00	65.00	66.50	136.10	131.74	134.32
16	417.00	405.50	412.13	229.00	221.00	225.17	67.00	64.00	65.96	137.90	131.50	134.19
17	416.50	403.50	410.92	229.00	221.00	225.17	67.00	64.00	65.96	136.20	128.40	132.88
18	415.50	407.00	410.63	228.00	221.00	224.38	68.00	65.00	66.00	136.73	129.67	132.86
19	414.50	402.50	409.17	227.50	219.50	223.38	67.00	64.00	65.58	136.70	126.30	132.03
20	414.00	404.50	409.04	228.50	221.00	224.04	67.00	64.00	65.50	137.70	130.50	133.84
21	413.50	405.00	409.81	228.00	220.50	224.19	67.00	65.00	66.04	137.50	131.50	134.32
22	416.00	409.50	412.92	228.50	224.50	226.98	67.00	65.00	66.56	137.45	133.82	135.76
23	415.50	409.00	411.63	227.00	222.50	224.81	67.00	65.00	66.08	136.90	131.90	134.40
24	416.00	409.00	413.25	228.00	222.00	225.83	68.00	66.00	66.67	137.56	131.70	135.26
25	416.50	408.50	413.29	228.50	223.00	226.17	67.00	66.00	66.42	139.43	133.19	136.80
26	415.50	408.00	413.08	228.00	224.00	226.38	67.00	65.00	66.42	140.20	133.20	136.69
27	415.00	408.50	412.46	228.00	224.00	226.25	67.00	65.00	66.33	138.30	132.80	135.97
28	414.50	406.50	411.79	228.50	222.50	226.08	67.00	65.00	66.38	140.26	133.61	136.44
29	414.50	405.50	411.35	228.00	222.50	225.88	67.00	65.00	66.58	138.80	133.40	136.36
30	412.50	404.50	409.02	227.50	222.00	225.04	67.00	65.00	66.00	139.80	134.00	136.18
31	411.50	405.50	409.13	227.50	223.00	225.04	67.00	65.00	66.08	138.20	133.19	135.88
Max	417.50			232.00			68.00			140.26		
Min		402.50			219.50			64.00			126.30	

Source: TD, BPC

Graph: Daily maximum, minimum and average Voltage for the month of March, 2020





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Annexure-V

Eastern Grid Outages

January, 2020												
132/33/11kV, Kilikhar substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	01.01.2020	13:05	01.01.2020	13:23	0:18	5.07	132kV O/G Corlung Feeder	132kV O/G Corlung Feeder only	Tripped on fault	Relay 86	Corlung end	
2	03.01.2020	2:47	03.01.2020	2:49	0:02	7.16	132kV O/G Corlung Feeder	132kV O/G Corlung Feeder only	Tripped on fault	Relay 86	Corlung end	
3	03.01.2020	19:45	03.01.2020	19:59	0:14	7.12	132kV O/G Corlung Feeder	132kV O/G Corlung Feeder only	Tripped on fault	Relay 86	Corlung end	
4	04.01.2020	2:51	04.01.2020	2:53	0:02	7.29	132kV O/G Corlung Feeder	132kV O/G Corlung Feeder only	Tripped on fault	Relay 86	Corlung end	
5	04.01.2020	3:57	04.01.2020	3:59	0:02	7.52	132kV O/G Corlung Feeder	132kV O/G Corlung Feeder only	Tripped on fault	Relay 86	Corlung end	
6	05.01.2020	17:35	05.01.2020	17:42	0:07	5.22	132kV O/G Corlung Feeder	132kV O/G Corlung Feeder only	Tripped on fault	Relay 86	Corlung end	
7	05.01.2020	19:19	05.01.2020	19:24	0:05	6.66	132kV O/G Corlung Feeder	132kV O/G Corlung Feeder only	Tripped on fault	Relay 86	Corlung end	
8	05.01.2020	19:25	06.01.2020	19:54	0:29	6.66	132kV O/G Corlung Feeder	132kV O/G Corlung Feeder only	Tripped on fault	Relay 86	Corlung end	Tripped on fault
9	13.01.2020	8:20	13.01.2020	8:39	0:19	12.38	132kV O/G Corlung Feeder	132kV O/G Corlung Feeder only	Tripped on fault	86 relay operated	Corlung end	Tripped on fault
10	13.01.2020	8:45	13.01.2020	8:53	0:08	12.38	132kV O/G Corlung Feeder	132kV O/G Corlung Feeder only	Tripped on fault	86 relay operated	Corlung end	Tripped on fault
11	13.01.2020	13:46	13.01.2020	15:48	0:02	14.68	132kV O/G Corlung Feeder	132kV O/G Corlung Feeder only	Tripped on fault	86 relay operated	Corlung end	
132/33/11kV, Deothang substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	03.01.2020	7:42	03.01.2020	8:03	0:21	1.33 & 1.3	132/33 5MVA Transformer I and II	Deothang substation	Tripped by 33kV s/jongkhor fdr	Tripped on fault	Deothang	
2	05.01.2020	17:13	05.01.2020	17:30	0:17	7.23	132kV Motanga	Motanga fdr	Tripped on fault	Zone I,II & III trip, Fault Loop: L1-L2, Fault Dist: 42.840km	Unknown	
3	05.01.2020	17:45	05.01.2020	17:59	0:14	7.23	132kV Motanga	Motanga fdr	Tripped on fault	Zone I & III trip, Fault Loop: L2-L3, Fault Dist: 4.9192km	Unknown	
4	27.01.2020	15:19	30.01.2020	13:45	71:05	-21.28	132kV Nangkhor	Nangkhor -Deothang line	Tree fallen on B phase conductor	Tripping relay 86	Unknown	
5	29.1.2020	7:08	29.1.2020	7:26	0:18	-2.74	132kV Motanga	Motanga - Deothang line	Tripped from Rangia substation	-	Rangia substation	Tripped on fault
132/33/11kV, Nangkhor substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	05.01.2020	17:05 hrs	05.01.2020	17:10 hrs	0:05	-5.79	132kV Nangkhor-Nganglam	Nangkhor-Nganglam line	Transient fault	Distance relay operated	Nangkhor-Nganglam line	
2	05.01.2020	17:45 hrs	05.01.2020	17:48 hrs	0:03	15.01	132kV Nangkhor-Deothang	Nangkhor-Deothang line	Transient fault	Distance relay operated	Nangkhor-Deothang line	
3	27.01.2020	15:20 hrs	30.01.2020	13:44 hrs	71:04	21.48	132kV Nangkhor-Deothang	Nangkhor-Deothang line	Tripped on fault/B'Ø Conductor snapped	Distance relay operated	Between ND#35 & ND#36	
4	27.01.2020	15:30 hrs	27.01.2020	15:51 hrs	21	-6.76	132kV Nangkhor-Nganglam	Nangkhor-Nganglam line	Tripped on fault	Distance relay operated	Between ND#35 & ND#36	
132/33/11kV, Kanglung substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	05.01.2020	17:31	05.01.2020	17:37	0:06	4.87	132kV Corlung Feeder	Corlung Feeder	Tripped on fault	O/C	Corlung end	
2	13.01.2020	8:24	13.01.2020	8:37	0:13	8.48	132kV Corlung Feeder	Corlung Feeder	Tripped on fault	O/C	Corlung end	
3	13.01.2020	8:46	13.01.2020	8:53	0:07	8.48	132kV Corlung Feeder	Corlung Feeder	Tripped on fault	O/C	Corlung end	
4	29.01.2020	8:15	29.01.2020	8:21	0:06	15.94	132kV Corlung Feeder	Corlung Feeder	Tripped on fault	-	KHPC end	



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220/132/33kV, Jigmeling substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	05.01.2020	16:06	05.01.2020	16:54	0:48	106.900	400kV Interim Jigmeling to Alipurduar	400kV Interim Jigmeling to Alipurduar line segment	earth fault	distance relay main 1 and main 2 optd.	main 1=18.5km main 2=18.47km	
2	05.01.2020	15:29	05.01.2020	15:39	0:10	17.68	132kV Jigmeling to Tingtibi line	132kV Jigmeling to Tingtibi line segment	Bad weather	distance realy 1 and distance relay 2 optd.	main 1=3.4km main 2=3.5km	
220/66/33kV, Dhajay substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No tripping												
132/66/33/11kV, Gelephu substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No tripping												
132/33/11kV, Tingtibi substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	1/5/2020	15:29 Hrs	2/5/2020	15:40Hrs	0:11	17.000	132kV Tingtibi-Jigmeling fdr.	132kV Tingtibi-Jigmeling fdr.	Over current	Distance relay operated Zone-1.Fault location:39.49kM.	132kV Tingtibi-Jigmeling fdr.	
2	1/5/2020	17:06 Hrs	2/5/2020	17:11Hrs	0:05	14.610	132kV Tingtibi-Nanglam fdr.	132kV Tingtibi-Nanglam fdr.	Over current	Distance relay operated Zone-3.Fault location:110.4kM.	132kV Tingtibi-Nanglam fdr.	
132/33kV, Yurmoo substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	24.01.2020	17:56hrs	24.01.2020	18:13hrs	0:17	-19.70	MHPA Line -2	Nil	Sf6 gas was leaked from R-Phase breaker	O/C I>I Tripped Phase B/auto tripped	Yurmoo Ss	
132/33/11kV, Nanglam substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	05.01.2020	17:07	05.01.2020	17:09	0:02	7.27	132kV Nanglam-Tingtibi	Nanglam-Tingtibi	Tripped on Fault	NA	Tingtibi Substation	
2	27.01.2020	15:26	27.01.2020	15:39	0:13	7.27	132kV Nanglam-Tingtibi	Nanglam-Tingtibi	Tripped on Fault	86opted & O/C, DPR relay optd.	Nanglam-Tingtibi	
3	27.01.2020	15:28	27.01.2020	15:47	0:19	5.72	132kv Nangkor-Nanglam	Nangkor-Nanglam	Tripped on Fault	86opted & O/C, DPR relay optd.	Nanglam-Tingtibi	
132kV, Motanga substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												



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132/33/11kV, Kilikhar substation

Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												

132/33/11kV, Kanglung substation

Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	26/02/20	19:16	26/02/20	19:20	0:04	9.5	Corlung Incomer	All O/G feeder	Trip on Fault	Nil	Kurichu end	

132/33/11kV, Nangkhori substation

Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												

132/33/11kV, Deothang substation

Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												

132/33/11kV, Nganglam substation

Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												

132kV, Motanga substation

Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												

220/132/33kV, Jigmeling substation

Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	25.02.2020	20:00hrs	25.02.2020	21:40hrs	40	44.27	132kV Gelephu feeder	Jigmeling S/S and Gelephu S/S	Earth fault	Main-I: Yph trip, 47T optd, Main-II: Yph trip, Z1 optd.	Main-I = 22.1km, Main-II = 12.47km	

220/66/33kV, Dhajay substation

Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No tripping												

132/66/33/11kV, Gelephu substation

Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	25.02.2020	19.58hrs	25.02.2020	20.25hrs	0:27	13.2	132Kv Gel-Sal fdr	132Kv Gel-Sal fdr	Heavy rain and thunder and lightning	General trip, Y and B phase trip, zone1, Dist-20.07kms towards Salakati	Line segment	

132/33/11kV, Tingtibi substation

Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	2/25/2020	19:59 Hrs	2/25/2020	21:44Hrs	0:45	43.000	132kV Tingtibi-Jigmeling fdr.	132kV Tingtibi-Jigmeling fdr.	Over current	Distance protection relay:Active Gr-I,Start phaseABN,Ia-177.2A,IB-549.9A,IC-158.8A,Van-65.19kV,Vbn-32.78Kv,Vcn-72.06kV,Fault resistance:1.877 ohms,Fault zone:none.fault duration:43.32ms.	132kV Tingtibi-Jigmeling fdr.	

132/33kV, Yurmoo substation

Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												

132/33kV, Dagapela substation

Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												



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March, 2020												
132/33/11kV, Kilikhar substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
132/33/11kV, Kanglung substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
132/33/11kV, Nangkhor substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
132/33/11kV, Deothang substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
132/33/11kV, Nganglam substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
132kV, Motanga substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
220/132/33kV, Jigmeling substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
220/66/33kV, Dhajay substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No tripping												
132/66/33/11kV, Gelephu substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No tripping												
132/33/11kV, Tingtibi substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
132/33kV, Yurmoo substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												



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Annexure-VI

Western grid Outages

January, 2020												
400/220/66/11kV Malbase substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	05.01.2020	14:38	05.01.2020	14:55	17	-36	220kV Chukha-Malbase Feeder	220kV Chukha-Malbase Feeder	tripped	Distance start,Distance Trip A,B,C.Zone 1 Trip, Trip values IL1=5.846kA IL2= 5.962kA IL3=4.884 kA	9.405km	
2	05.01.2020	14:38	05.01.2020	15:40	2	93	200MVA ICT	200MVA ICT	tripped	67(H.V),O/C Optd Trip Values: IL1=1505A IL2=1483A IL3=1290A IE= 237.2		
220/66/11kV Singhgaon substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
66/33/11kV Phuentsholing substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	05.01.2020	14:46	05.01.2020	14:55	9	2.26	66kV Chukha feeder	66kV Chukha-Pling feeder	Overcurrent	IA- 1.097kA, IB- 1.114kA, IC- 1.096kA, VAB- 16.33kV, VCA- 14.79kV, VBC- 15.30kV. INM- 32.07A, IND- 32.09A	Substation	
2	16.01.2020	9:21	16.01.2020	14:42	21	idle	66kV Malbase feeder	66kV Malbase feeder		Nil	Substation	
3	18.01.2020	9:11	18.01.2020	13:27	16	idle	66kV Malbase feeder	66kV Malbase feeder	nil	Nil	Substation	
4	31.01.2020	9:37	31.01.2020	11:12	35	idle	66kV Malbase feeder	66kV Malbase feeder	nil	Nil	Substation	
66/33/11kV Gomtu substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
220/66/33kV Dhamdum substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
66/33/11kV Gedu substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	05.01.2020	14:45	05.01.2020	15:00	15	1.25	66kV Chukha-Phuntsholing	Black out	Heavy lightening with hailstone		Line segment	
66/33/11kV Lobeysa substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No tripping												
220/66/11kV Semtokha substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	1/24/2020	1742hrs	1/24/2020	1752hrs	10.00	25.090	220/66kV, 50/63MVA-I transformer	220/66kV, 50/63MVA-I transformer	Trip along with 11kV incommer-I, Y-phase cable blust	Back-up O/C & E/F operated	Semtokha substation	
2	1/25/2020	0927hrs	1/25/2020	0936hrs	9.00	26.730	220/66kV, 50/63MVA-I transformer	220/66kV, 50/63MVA-I transformer	Trip along with 11kV incommer-I, R-phase cable blust	Back-up O/C & E/F operated	Semtokha substation	
3	1/24/2020	1742hrs	1/24/2020	1750hrs	8.00	25.130	220/66kV, 50/63MVA-II transformer	220/66kV, 50/63MVA-II transformer	Trip along with 11kV incommer-I, Y-phase cable blust	Back-up O/C & E/F operated	Semtokha substation	
4	1/25/2020	0927hrs	1/25/2020	0937hrs	10.00	26.790	220/66kV, 50/63MVA-II transformer	220/66kV, 50/63MVA-II transformer	Trip along with 11kV incommer-I, R-phase cable blust	Back-up O/C & E/F operated	Semtokha substation	
66/33/11kV Dechenchholing substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
66/33kV Olakha substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												



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66/33/11kV Jemina substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
66kV Chumdo switching station												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	04.01.2020	1319hrs	04.01.2020	1325hrs	6min	2.71MW	66KV O/G Pangbasa Feeder	Pangbasa Substation	Transient Fault	C.B open, E/F	Chumdo substation	
2	23.01.2020	1515hrs	23.01.2020	1528hrs	13min	2.05MW						
3	24.01.2020	1039hrs	24.01.2020	1039hrs	14min	2.62MW						
4	29.01.2020	1215hrs	29.01.2020	1225hrs	10min	2.77MW						
5		1338hrs		1348hrs	10min	2.53MW						
6	30.01.2020	1415hrs	30.01.2020	1423hrs	8min	2.53MW						
66/33/11kV Paro substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
66/11kV Haa substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	04.01.2020	1:18	04.01.2020	1:57	39minutes	-1.24	66kV Incomer	All feeders	Fault at 33kV feeder at Pangbesa SS	No relay operation	Pangbesa SS	
2	23.01.2020	15:15	23.01.2020	15:29	14minutes	-1.95	66kV Incomer	All feeders	Fault at 33kV feeder at Pangbesa SS	No relay operation	Pangbesa SS	
3	24.01.2020	10:39	24.01.2020	10:53	14minutes	-2.01	66kV Incomer	All feeders	Fault at 33kV feeder at Pangbesa SS	No relay operation	Pangbesa SS	
4	26.01.2020	11:10	26.01.2020	11:33	23minutes	-1.68	66kV Incomer	All feeders	Fault at 33kV feeder at Pangbesa SS	No relay operation	Pangbesa SS	
5	29.01.2020	12:07	29.01.2020	12:20	13minutes	-2	66kV Incomer	All feeders	Fault at 33kV feeder at Pangbesa SS	No relay operation	Pangbesa SS	
6	29.01.2020	13:38	29.01.2020	13:48	10minutes	-1.91	66kV Incomer	All feeders	Fault at 33kV feeder at Pangbesa SS	No relay operation	Pangbesa SS	
7	29.01.2020	13:55	29.01.2020	13:59	4minutes	-1.91	66kV Incomer	All feeders	Fault at 33kV feeder at Pangbesa SS	No relay operation	Pangbesa SS	
8	29.01.2020	15:17	29.01.2020	15:21	4minutes	-1.82	66kV Incomer	All feeders	Fault at 33kV feeder at Pangbesa SS	No relay operation	Pangbesa SS	
9	30.01.2020	14:13	30.01.2020	14:20	7minutes	-1.93	66kV Incomer	All feeders	Fault at 33kV feeder at Pangbesa SS	No relay operation	Pangbesa SS	
66/33kV Watsa substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
66/33kV Pangbesa substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	4/1/2020	13:19:00hrs	4/1/2020	13:25:00hrs	6	2.79	Chumdo line IN	HAA line and Pangbesa SS	Transient Fault	CB did not operate as there was some OC & EF setting issues.	33kV OG-4.Fault has occurred from this feeder and it has effected the whole lines till chumdo.	
2	23/1/20	15:15:00hrs	23/1/20	15:27:00hrs	13	2.13	Chumdo line IN					
3	24/1/20	10:39:00hrs	24/1/20	10:39:00hrs	14	2.61	Chumdo line IN					
4	29/1/20	12:15:00hrs	29/1/20	12:25:00hrs	10	2.74	Chumdo line IN					
5		13:38:00hrs		13:48:00hrs	10	2.6						
6	30/1/20	14:15:00hrs	30/1/20	14:23:00hrs	8	2.31	Chumdo line IN					
400/220/66/11kV Malbase substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
220/66/11kV Singhigaon substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
66/33/11kV Phuntsoling substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	24.02.2020	6:09	24.02.2020	6:16	0:07	-2.47	66kV Chukha-Pling	66kV Chukha-Pling	Tripped	186 & 86	Line	
2	29.02.2020	17:47	29.02.2020	17:52	0:05	-0.91	66kV Chukha-Pling	66kV Chukha-Pling	Tripped	186 & 86	Line	
66/33/11kV Gomtu substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	24.02.2020	06:05	24.02.2020	06:08	0:03	0.64	66kV Gomtu-Phuntsoling	Nil	Over Current	IDMTL O/C 51CX	P/ling Sub Station	
2	29.02.2020	17:50	29.02.2020	17:54	0:04	4.4	66kV Gomtu-Phuntsoling	Nil	Over Current	IDMTL O/C 51CX	Gomtu Sub Station	



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220/66/33kV Dhamdum substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
66/33/11kV Gedu substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
66/33/11kV Lobeysa substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	2/26/2020	11:25hrs	2/26/2020	11:35hrs	0:10	2.230	66kV LSA-Semtokha feeder	NA	Snow fall at Dochula	OC/EF relay(IA-8.223A IB-938.2A IC-928.7A IN-11.67A)	NA	
220/66/11kV Semtokha substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	2/26/2020	11:25hrs	2/26/2020	11:35hrs	0:10	-2.230	66kV Semtokha-Lobesa feeder	Nil feed from 220kv feeders	Transient fault	Main distance relay operated, trip on zone-1	Distance shown in relay 10.4km	
2	2/4/2020	18:06hrs	2/4/2020	18:14hrs	0:08	49.730	66kV Semtokha-Olakha feeder	66kv Olakha Substation	Overloading	Backup overcurrent relay operated	Chukha end, The CT terminal damage for 20MVA transformer. So 66kV Chumdo-Chukha kept idle charge	
66/33/11kV Dechenchholing substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
66/33kV Olakha substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	2/4/2020	17:40	2/4/2020	17:44	0:04	45.4	66KV Tie line	66KV Olakha substation	Over load at Semtokha Substation	Nil	Semtokha substation	Tripped at Semtokha end
2	2/4/2020	18:04	2/4/2020	18:13	0:09	38.3	66KV Tie line	66KV Olakha substation	Over load at Semtokha Substation	Nil	Semtokha substation	Tripped at Semtokha
3	2/4/2020	18:18	2/4/2020	18:20	0:02	38.3	66KV Tie line	66KV Olakha substation	Over load at Semtokha Substation	Nil	Semtokha substation	Tripped at Semtokha
4	2/4/2020	18:36	2/4/2020	18:40	0:04	38.3	66KV Tie line	66KV Olakha substation	Over load at Semtokha Substation	Nil	Semtokha substation	Tripped at Semtokha
66/33/11kV Jemina substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
66kV Chumdo switching station												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
66/33/11kV Paro substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
66/11kV Haa substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	07.02.2020	14:36	07.02.2020	14:58	24minutes	-2.05	66kV Incomer	all the feeders	Unknown	Nil	Pangbesa station	
2	27.02.2020	14:54	27.02.2020	15:06	12minutes	-1.86	66kV Incomer	all the feeders	Unknown	Nil	Pangbesa station	
66/33kV Watsa substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	2/16/2020	12:12hrs	2/16/2020	12:18hrs	6min	.390MW	SF6 breaker	Fdr. I and II	Earth fault & Over current	E/F and O/C relay operated	Fdr. II shemagangkha	
66/33kV Pangbesa substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	27/2/2020	14:54	27/2/2020	14:59	0:05	1.84	HA line	HAA line and Pangbesa SS	Transient Fault	Overcurrent		



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March, 2020												
400/220/66/11kV Malbase substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	02.03.2020	20:37	02.03.2020	20:47	0:10	-14	220kV Chukha feeder	-	Tripped	General trip, Trip B phase, zone 1 trip & CARR-send. Tripped values: I1=7.956A<264.5deg, I2=120.3A<64.84deg, I3=5314A<43.31deg, 5414A<44.67deg.	L3-N=6.8KM	
2	02.03.2020	20:37	02.03.2020	20:50	0:13	130	200MVA ICT	-	Tripped	400kV Main & Tie CB open I1=219.8A I2=287.8A, I3=1334A, I4=1083A.	-	
3	28.03.2020	15:36	28.03.2020	16:24	0:48	80	400kV Siiguri feeder	-	Tripped	Main & Tie CB open, Main 1 trip, General trip. IL1=173.6 A< 65.22deg, IL2=1232A<208.1deg, IL3=367.3A<186.2 deg, IL4=2895A< 198.3 deg.	-	
4	28.03.2020	15:36	28.03.2020	15:47	0:11	-	220kV Bus Coupler	-	Tripped	There was no display of data in the relay penal.	-	
5	28.03.2020	16:47	28.03.2020	17:01	0:14	-	66kV Bus Coupler (GIS, Singyegoan)	-	Tripped	General trip,time overcurrent trip, IEP trip, I1=0.24KA, I2=0.06KA, I3=0.18KA	-	
6	28.03.2020	16:47	28.03.2020	16:57	0:10	-	66kV Bhutan Concast Feeder. (GIS, singyegoan)	-	Tripped	General trip, Directional time overcurrent trip, IEP Directional trip, I1=0.24KA, I2=0.06KA, I3=0.18KA	-	
220/66/11kV Singhigaon substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
66/33/11kV Phuentsholing substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	03.03.2020	10:53	03.03.2020	10:56	0:03	2.48	10MVA Transformer (66/33kV Voltamp)	All 33kV feeders		86	Substation	
2	03.03.2020	22:24	03.03.2020	22:27	0:03	2.57	66kV Chukha-Pling	66kV Chukha-Pling	Tripped	Dist Protection Opt,186 & 86	Line	
3	23.03.2020	12:35	23.03.2020	12:53	0:18	-1.6	66kV Chukha-Pling	66kV Chukha-Pling	Tripped	Dist Protection Opt,186 & 86, Fault imp: 6.35, fault angle:57, fault current: 2.9	Line	
4	23.03.2020	14:03	23.03.2020	14:17	0:14	-1.98	66kV Chukha-Pling	66kV Chukha-Pling	Tripped	Dist Protection Opt,186 & 86	Line	
66/33/11kV Gomtu substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
220/66/33kV Dhandum substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
66/33/11kV Gedu substation												
Sl. No	Date of Tripping	Time of Outage (Hrs)	Date of Normalization	Time of Fault cleared (Hrs)	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	23.03.2020	12:35	23.03.2020	12:51	0:16	2.110	66kV Incomer	Black out	Tripped due lightning and thundering		Line segment	
2	23.03.2020	14:04	23.03.2020	14:14	0:10	1.880	66kV Incomer	Black out	Tripped due lightning and thundering		Line segment	



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66/33/11kV Lobeysa substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No tripping												
220/66/11kV Semtokha substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
66/33/11kV Dechenchholing substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
66/33kV Olakha substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
66/33/11kV Jemina substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
66kV Chumdo switching station												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
66/33/11kV Paro substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
No Tripping												
66/11kV Haa substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	26.03.2020	16:09	26.03.2020	14:21	12minutes	-1.87	66kV Incomer	all the feeders	Unknown	Nil		
2	28.03.2020	10:53	28.03.2020	11:49	56minutes	-1.72	66kV Incomer	all the feeders	due to heavy windfall, 1.5mm wire got in contact with 66KV line causing 66KV line to touch the ground.	Nil	near substation colony.	
66/33kV Watsa substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	20/3/2020	15:13hrs	20/3/2020	16:34hrs	21min	.350MW	66KV breaker	Fdr. I and II	O/C and EFH	O/C, EFH RYB phase	8MVA transformer	
2	31/3/2020	16:37hrs	31/3/2020	16:58hrs	21min	.335MW	66KV breaker	Fdr. I and II	Over Current on Phase A, B	Over Current relay operated	Fdr. I & II	
66/33kV Pangesa substation												
Sl. No	Date of Tripping	Time of Outage	Date of Normalization	Time of Fault cleared	Duration of Outages (hh:mm)	Load before Outage (MW)	Name of Feeders/Equipment Tripped	Name of Substations/Line affected by fault	Reason of Fault	Relay indication and operation	Exact location of fault (Line segment/substation)	Remarks
1	26/3/2020	16:11hrs	26/3/2020	16:21hrs	10	1.66	66kV HA O/G feeder	66kV HA Substation and it's outgoing feeder	Tripped	86A & 86B optd		
2	28/3/2020	10:53hrs	28/3/2020	11:49hrs	56	1.71	66kV HA O/G feeder	66kV HA Substation and it's outgoing feeder	Tripped	Earth fault relay optd		