།།འབྲུག་གློག་མེ་ལས་འཛིན།།
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/19/ 128 July 24, 2019

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

Subject: **Submission of Transmission System Performance Report for the month of April to June, 2019.**

Sir,

Kindly find enclosed with the transmission system performance report for the month of April to June, 2019. 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)
Manager, PSOD

Copy to:
1. Director, Operation & Maintenance Department, Druk Green Power Corporation, Thimphu
2. General Manager, TD, BPC for kind information
3. General Manager, DCSD, BPC for kind information.

Telephone: **+975-02-335631/337402/17129094/77764972**; Fax: **+975-02-335632**; Post Box: **580**;
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Bhutan Power Corporation Limited

Bhutan Power System Operator

Thimphu: Bhutan

Transmission System Performance Report

Second Quarterly Report – April to June, 2019

Table of Contents

1. Introduction

The electricity transmission network in Bhutan is solely owned by Bhutan Power Corporation limited (BPC) and electricity generation is solely owned by Druk Green Power Corporation Limited (DGPC). Bhutan Power System Operator (BPSO) under 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.

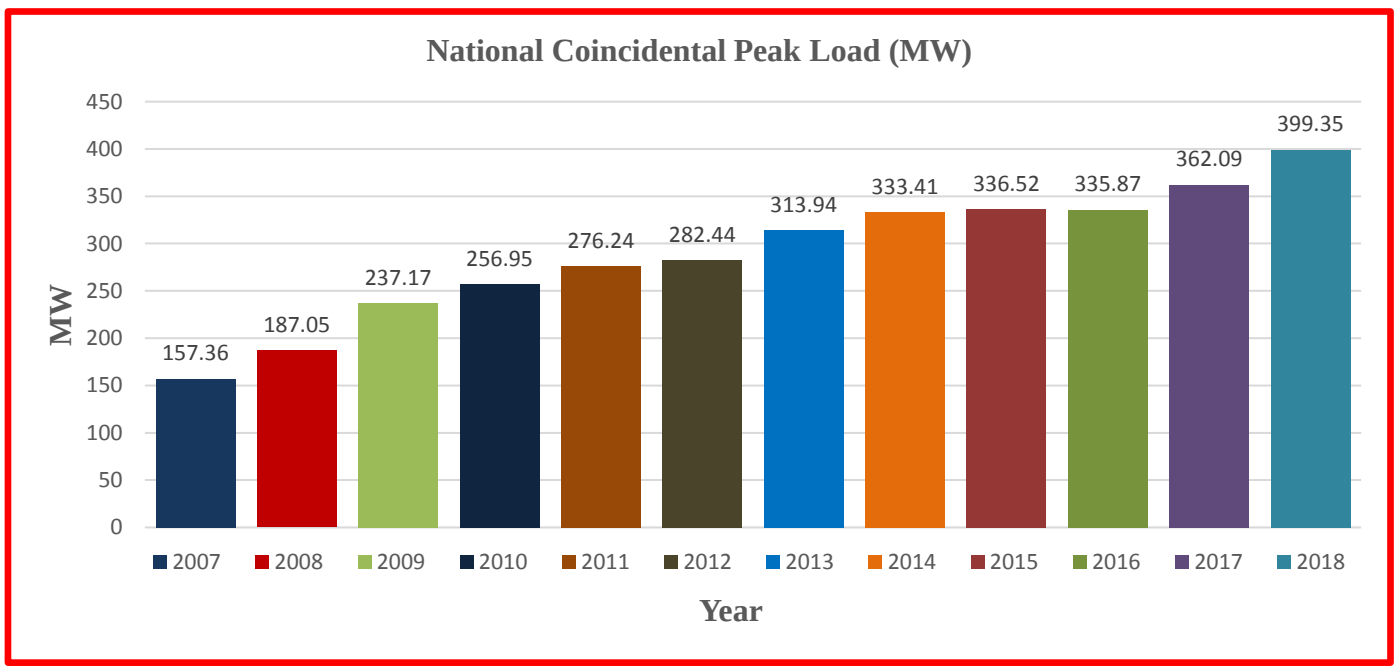
2. National Peak Demand

The national peak demand till now is recorded at **399.35MW** which was occurred on 27th December, 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
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
% 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

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.

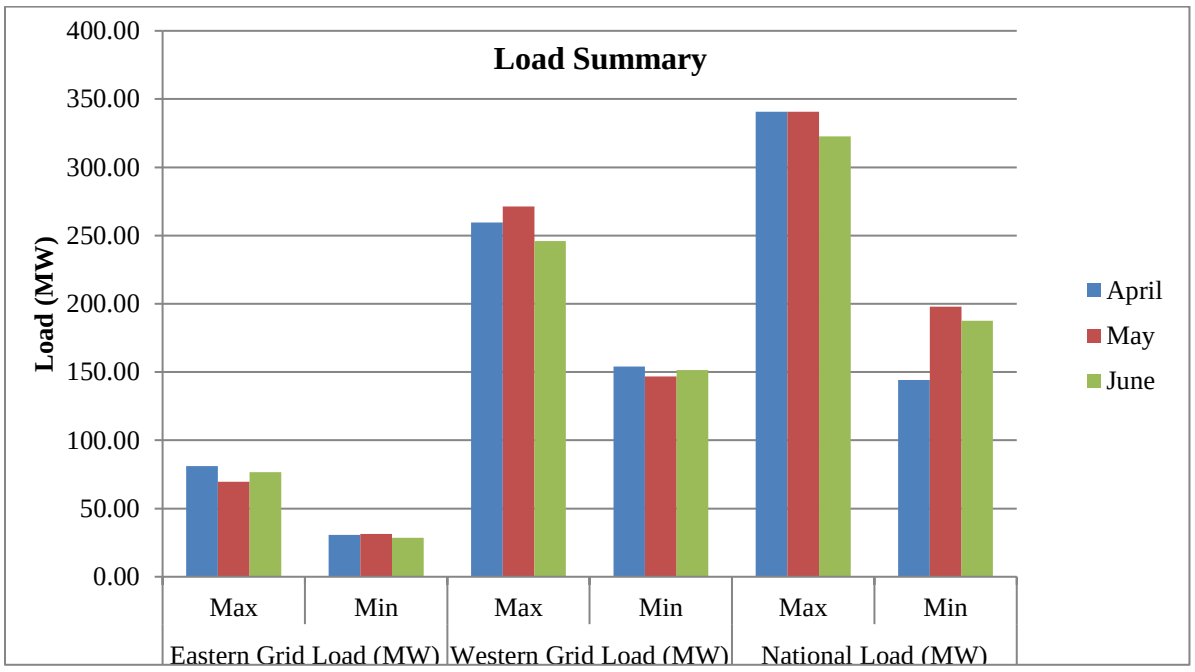
1. **National Demand** = (Sum of all total generation)-(Sum of all Export of Import)
2. **National Demand** = (Sum of all feeders loading at hydropower station) – (Sum of all Export/Import)
3. **National Demand** = (Sum of all substation loading)

For this report, the National Demand was calculated using method-2 and method-3.

Table 2.1.1. Domestic demand for Eastern Grid, Western Grid and National using method- 2

Grid	Eastern Grid Load (MW)		Western Grid Load (MW)		National Load (MW)	
Month	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**
April	81.19	30.56	259.51	154.04	340.70	144.21
May	69.64	31.45	271.20	146.67	340.84	198.01
June	76.62	28.50	245.94	151.44	322.56	187.49

Graph 2.1.1. Domestic demand for Eastern Grid, Western Grid and National using method- 2

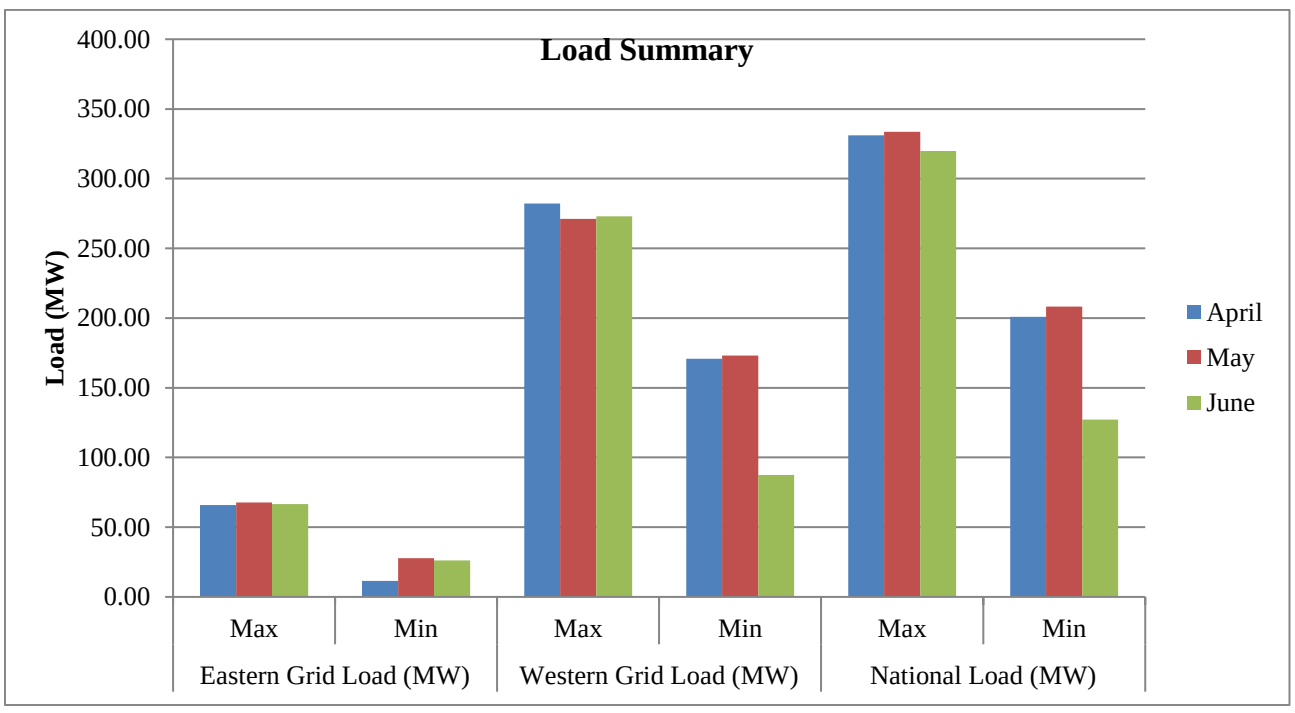


National load pattern for the month of April to June, 2019 calculated using method-2 is attached as **Annexure-II.**

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)	
Month	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**
April	65.91	11.47	282.13	170.80	330.99	200.95
May	67.61	27.88	271.22	173.19	333.54	208.22
June	66.68	26.16	273.06	87.46	319.74	127.08

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



3. Energy Availability and Requirement for the country

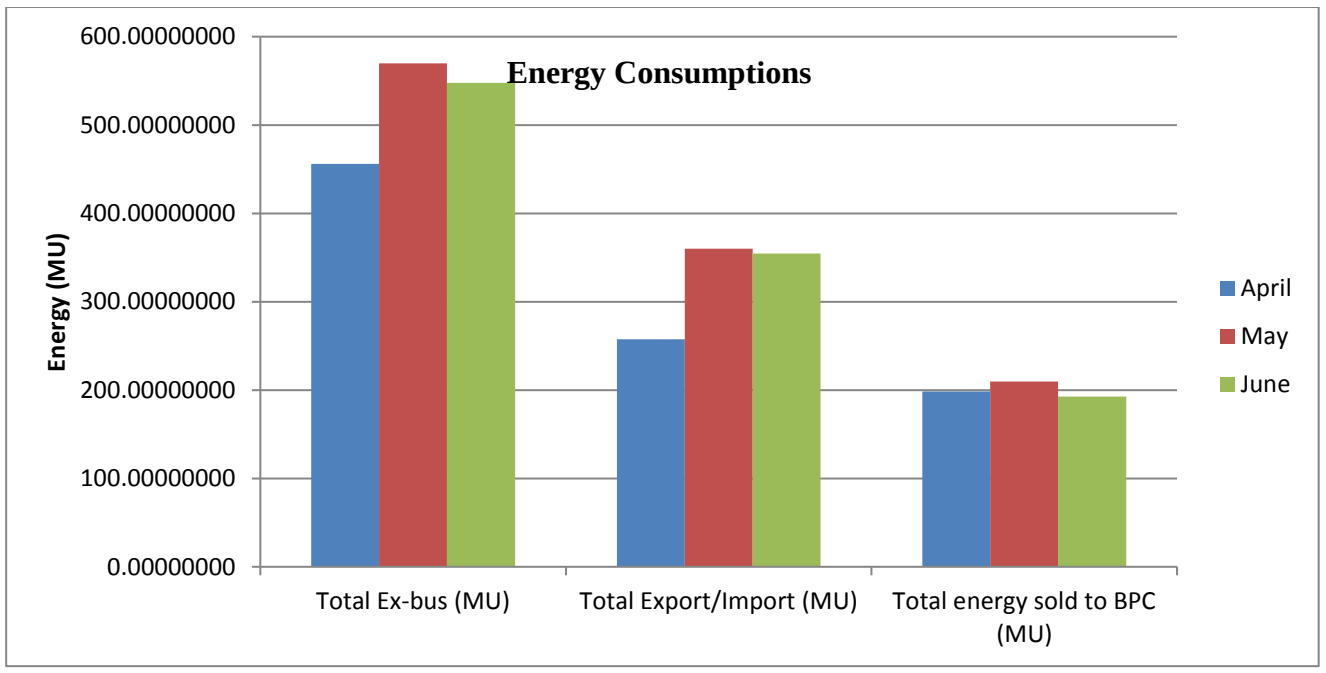
3.1. Energy (MU) consumed by Country

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. Energy (MU) consumed

Month	Total Ex-bus (MU)	Total Export/Import (MU)	Total energy sold to BPC (MU)
April	456.11500000	257.56900000	198.54600000
May	569.81400000	360.04600000	209.76800000
June	547.49800000	354.74700000	192.75100000

Graph 3.1.1. Energy (MU) consumed



4. Performance of generating plants

4.1. Power and Energy Generation

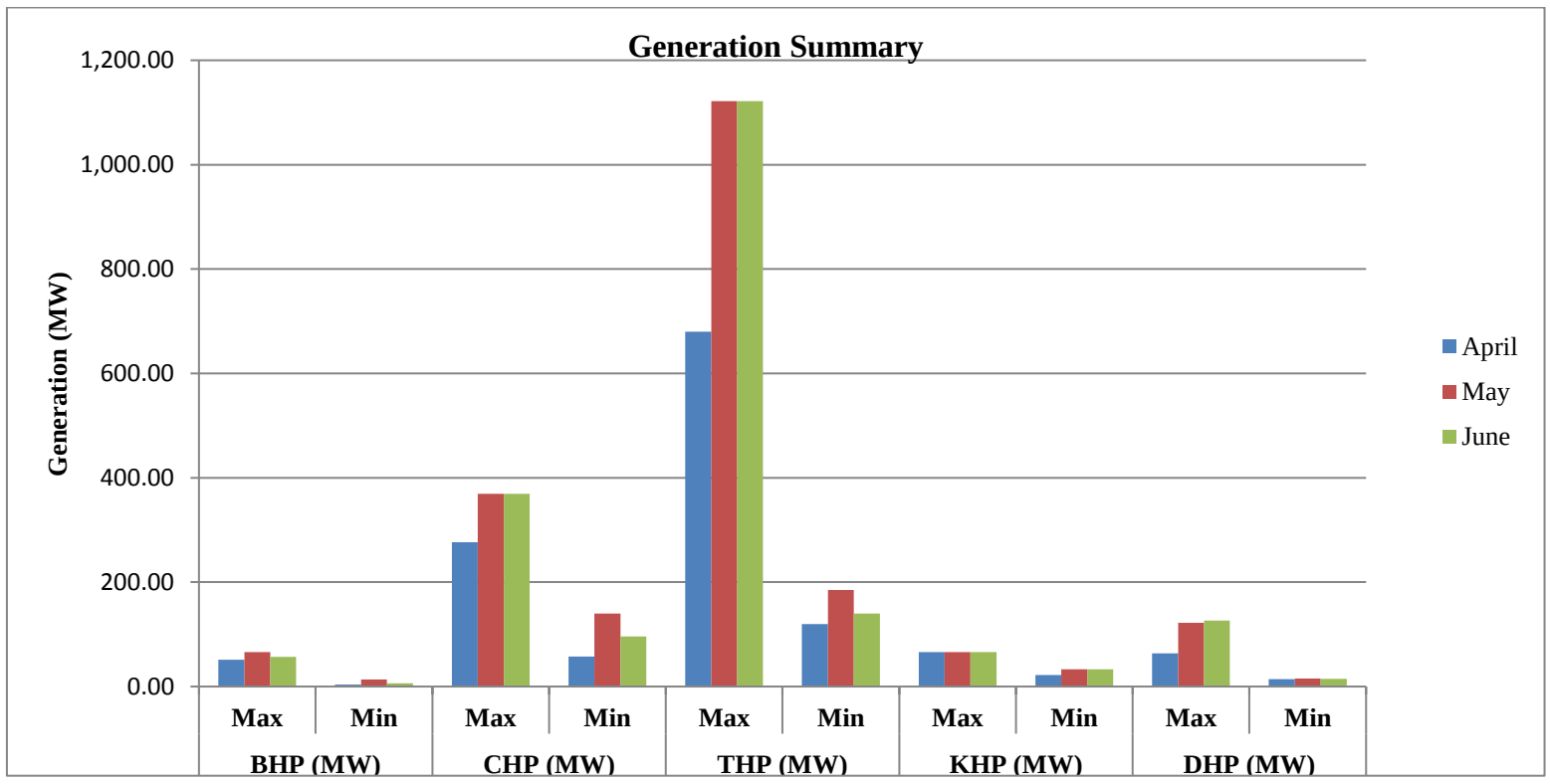
The maximum total generation for the Second quarter of year 2019 was 1745.63 MW in month of June and minimum generation was 1137.27 MW in the month of April, 2019.

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)		TOTAL (MW)	
Month	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
April	51.13	4.03	276.68	57.62	680.00	120.00	66.00	22.26	63.46	14.27	1,137.27	218.18
May	66.12	13.67	369.15	139.74	1,122.00	185.00	66.00	33.00	122.36	15.25	1,745.63	386.66
June	56.91	6.10	369.04	96.00	1,122.00	140.00	66.00	33.00	126.37	14.63	1,740.32	289.73

Source: Hydropower Plants (DGPC)

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 April to June, 2019 is attached as **Annexure-I.**

4.2.Plant Capacity Factor

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

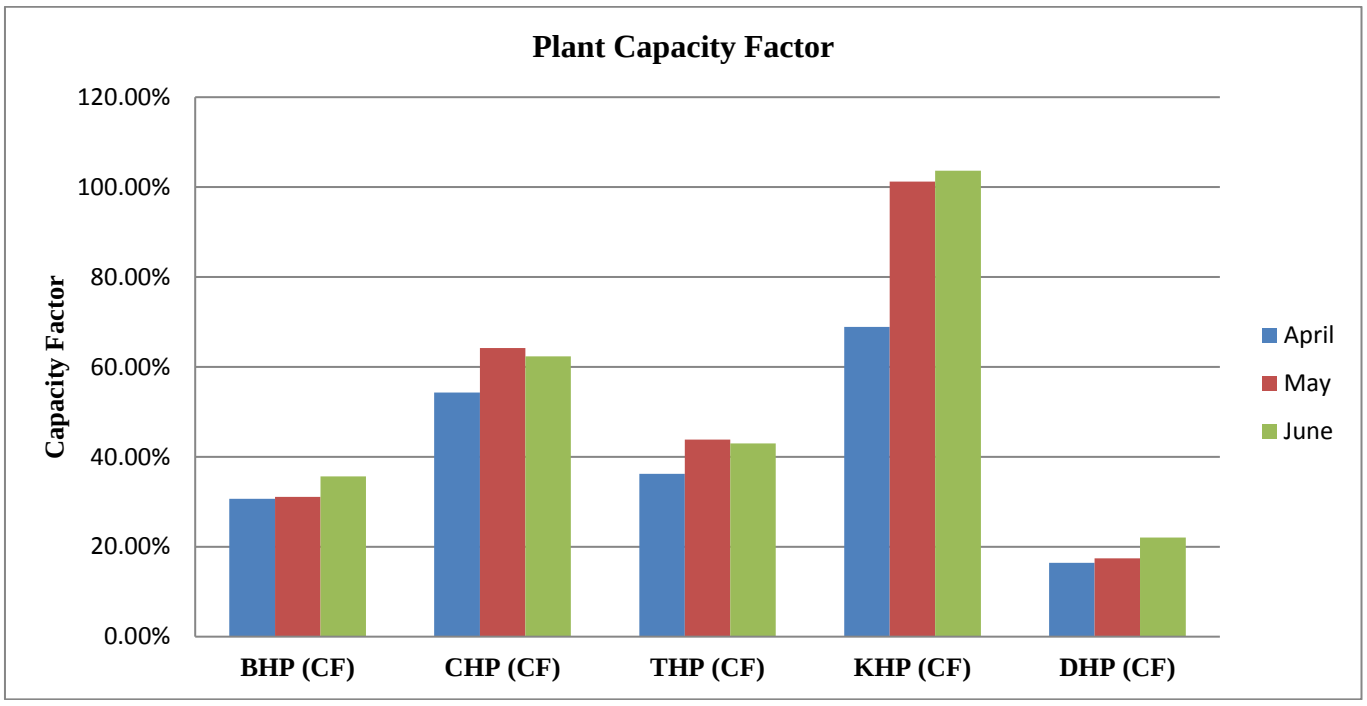
$$Capacity\ factor = \frac{Total\ energy\ plant\ has\ produce\ over\ a\ period}{Total\ energy\ plant\ would\ produce\ when\ operated\ at\ full\ capacity}$$

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)
April	14.13600	30.68%	131.40000	54.32%	265.911000	36.21%	29.769000	68.91%	14.902	16.43%
May	14.81400	31.11%	160.56300	64.23%	332.90400	43.87%	45.197000	101.25%	16.324	17.41%
June	16.43100	35.66%	150.80400	62.34%	315.46600	42.96%	44.787000	103.67%	19.998	22.04%

Source: TD, BPC

Graph 4.2.1: Capacity factor of various hydropower plants



5. Export and Import of Electricity

Maximum export for the Second quarter of year 2019 was 1107.00 MW in the month of May to Binaguri substation in India. The minimum export was 37.90 MW to Salakoti and Rangia substation in India during the month of April.

Table 5.1. Export of electricity to India

Export To	Binaguri (MW)		Birpara (MW)		Salakoti and Rangia (MW)	
Month	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**
April	648.00	18.00	154.10	0.10	37.90	0.10
May	1,107.00	89.00	297.50	0.89	86.30	2.30
June	1,056.00	52.00	277.80	0.40	99.03	0.30

Graph 5.1. Export of electricity to India

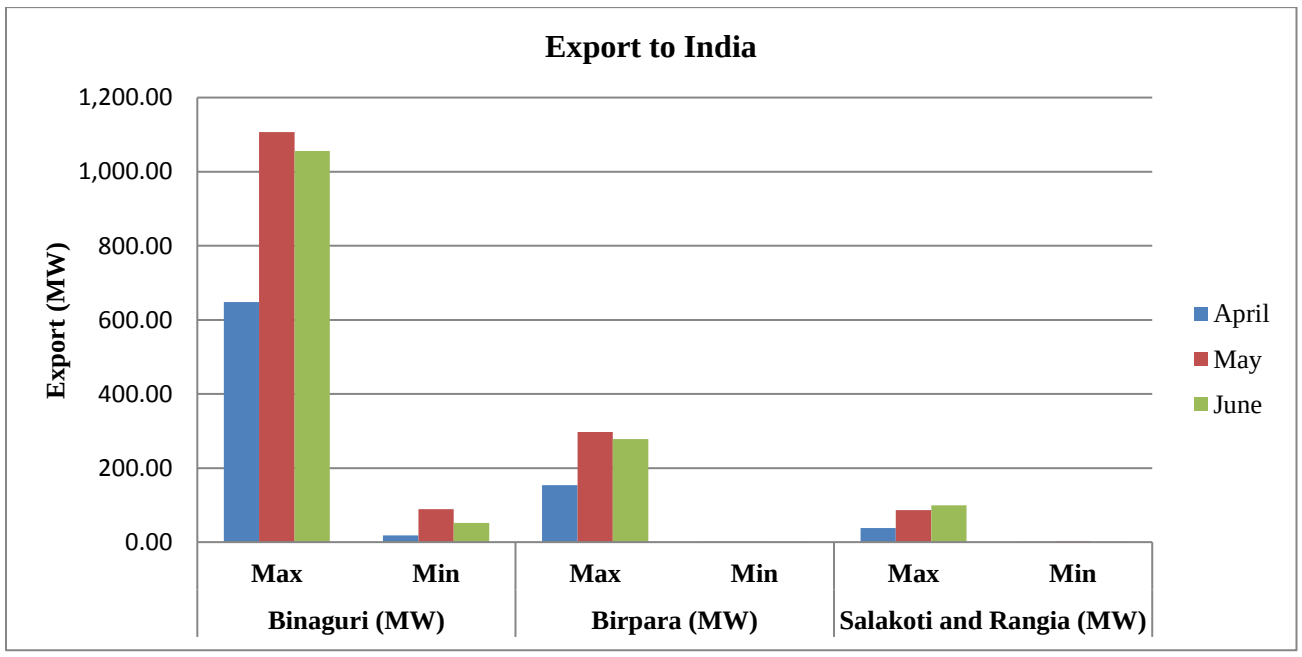
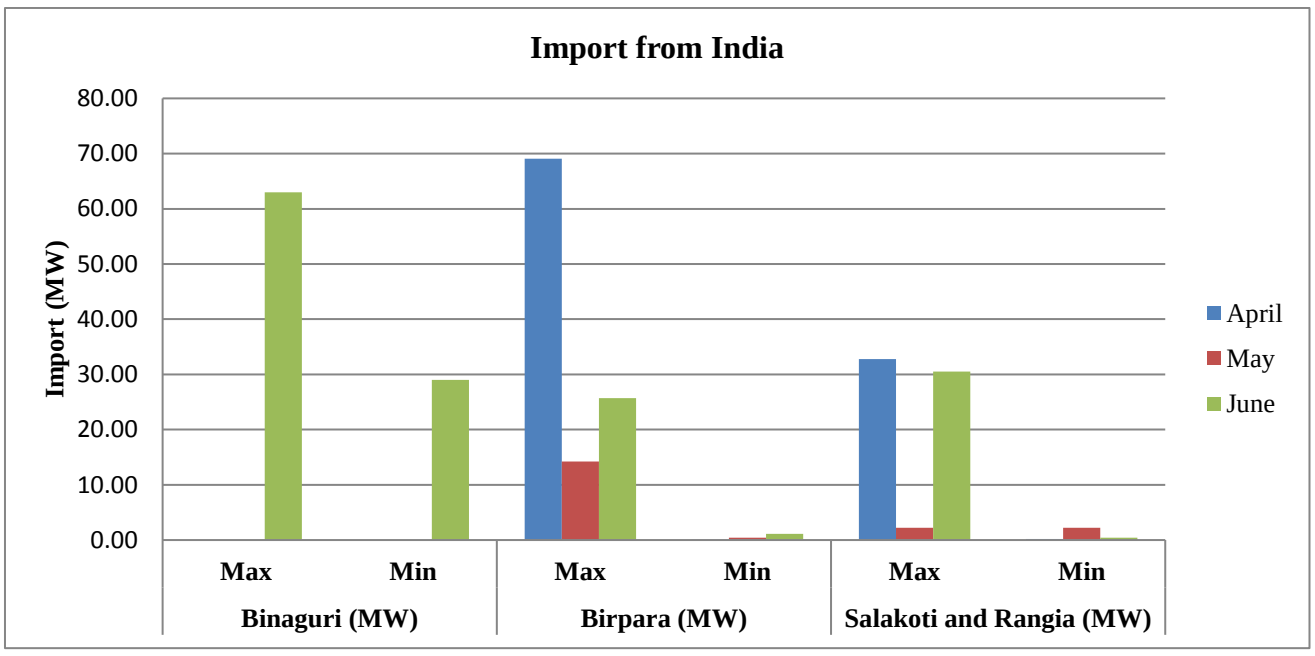


Table 5.2. Import of electricity from India.

Import From	Binaguri (MW)		Birpara (MW)		Salakoti and Rangia (MW)	
Month	Max	Min	Max	Min	Max	Min
April	0.00	0.00	69.10	0.01	32.80	0.20
May	0.00	0.00	14.20	0.40	2.20	2.20
June	63.00	29.00	25.70	1.10	30.53	0.40

Graph 5.2. Import of electricity from India



The maximum import of power for the Second quarter of year 2019 was 69.10 MW from Birpara substation, India in the month of April, 2019.

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 April, 2019

Table 6.1.1. Bus Frequency profile of Semtokha Substation

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

Graph 6.1.1. Bus Frequency of Semtokha Substation

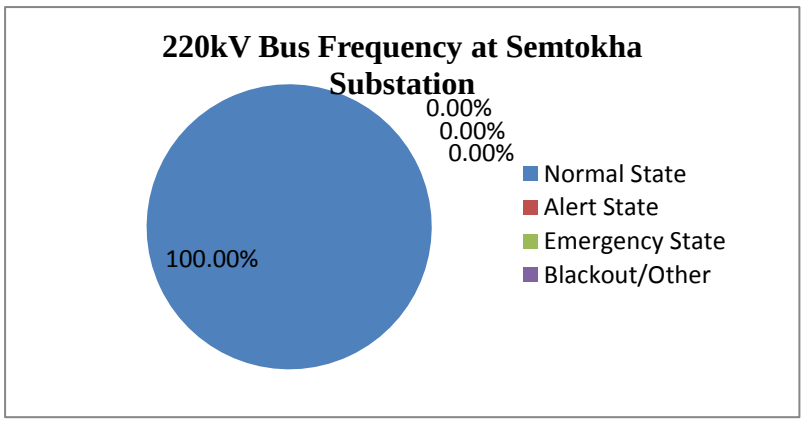
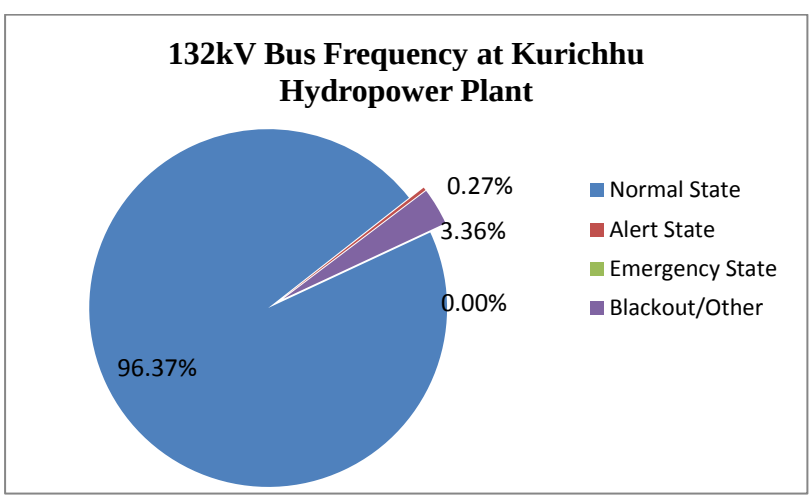


Table 6.1.2. Bus frequency of Kurichhu Hydro Power Plant

Sl. No.	Operating State	132kV Bus Voltage
1	Normal State	96.37%
2	Alert State	0.27%
3	Emergency State	0.00%
4	Blackout/Other	3.36%

Graph 6.1.2. Bus frequency of Kurichhu Hydro Power Plant



In the month of April, 2019, the Western grid was maintained within the normal operating limit of 100%. Eastern grid have operated 96.37% in operating limit and deviated 0.27% and 3.36% to alert state and blackout/others respectively.

6.2.Frequency for the month of May, 2019

Table 6.2.1. Bus frequency of Semtokha Substation

Sl. No.	Operating State	220kV Bus Voltage
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 Semtokha Substation

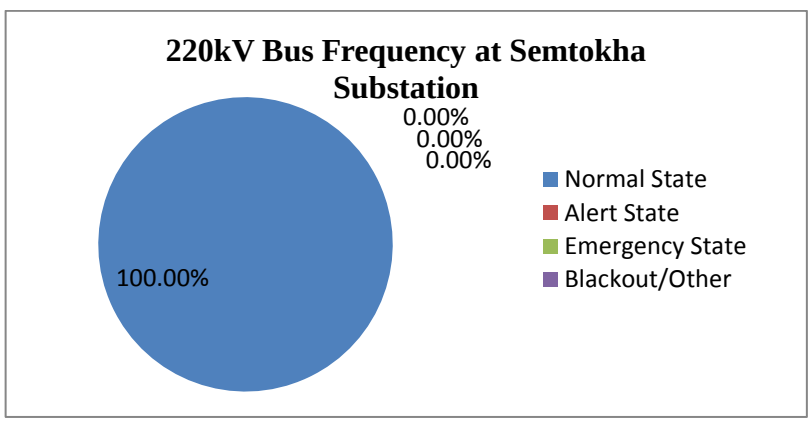
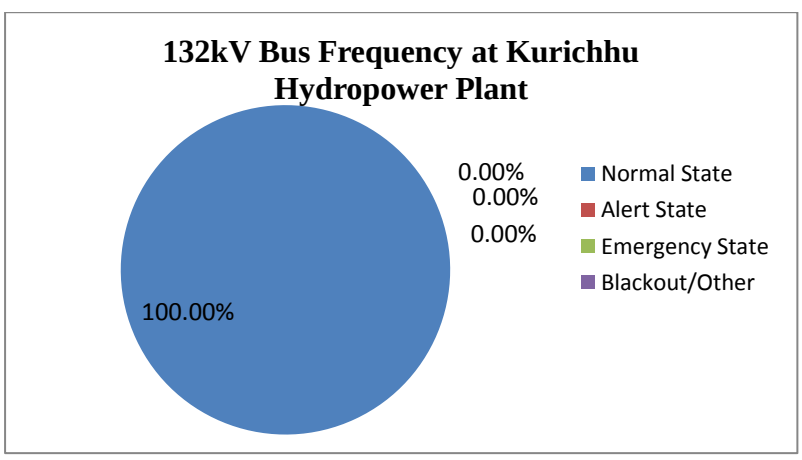


Table 6.2.2. Bus frequency of Kurichhu Hydro Power Plant

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 6.2.2. Bus frequency of Kurichhu Hydro Power Plant



In the month of May, 2019, both the grid (Western and Eastern) frequency was maintained within the normal operating range of 100%.

6.3.Frequency for the month of June, 2019

Table 6.3.1. Bus frequency of Semtokha Substation

Sl. No.	Operating State	220kV Bus Voltage
1	Normal State	99.19%
2	Alert State	0.13%
3	Emergency State	0.00%
4	Blackout/Other	0.67%

Graph 6.3.1. Bus frequency of Semtokha Substation

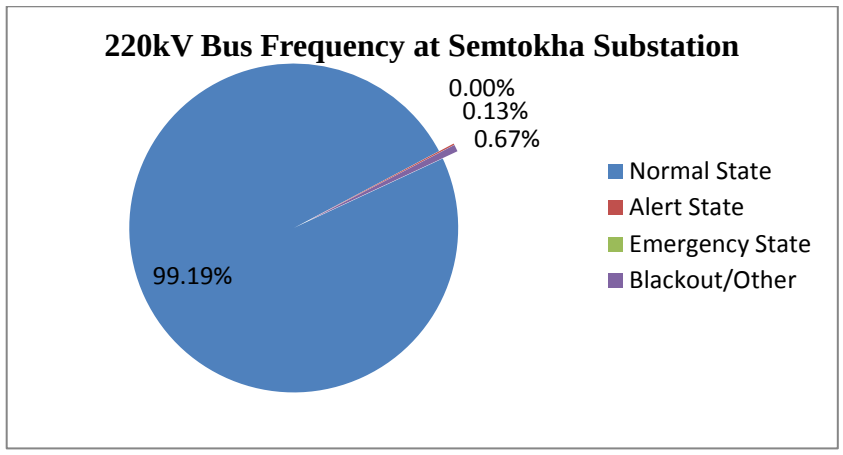
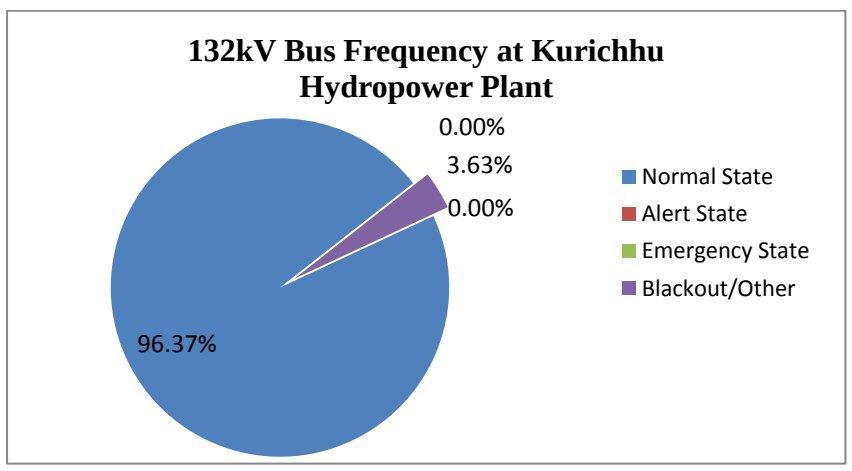


Table 6.3.2. Bus frequency of Kurichhu Hydro Power Plant

Sl. No.	Operating State	132kV Bus Voltage
1	Normal State	96.37%
2	Alert State	0.00%
3	Emergency State	0.00%
4	Blackout/Other	3.63%

Graph 6.3.2. Bus frequency of Kurichhu Hydro Power Plant



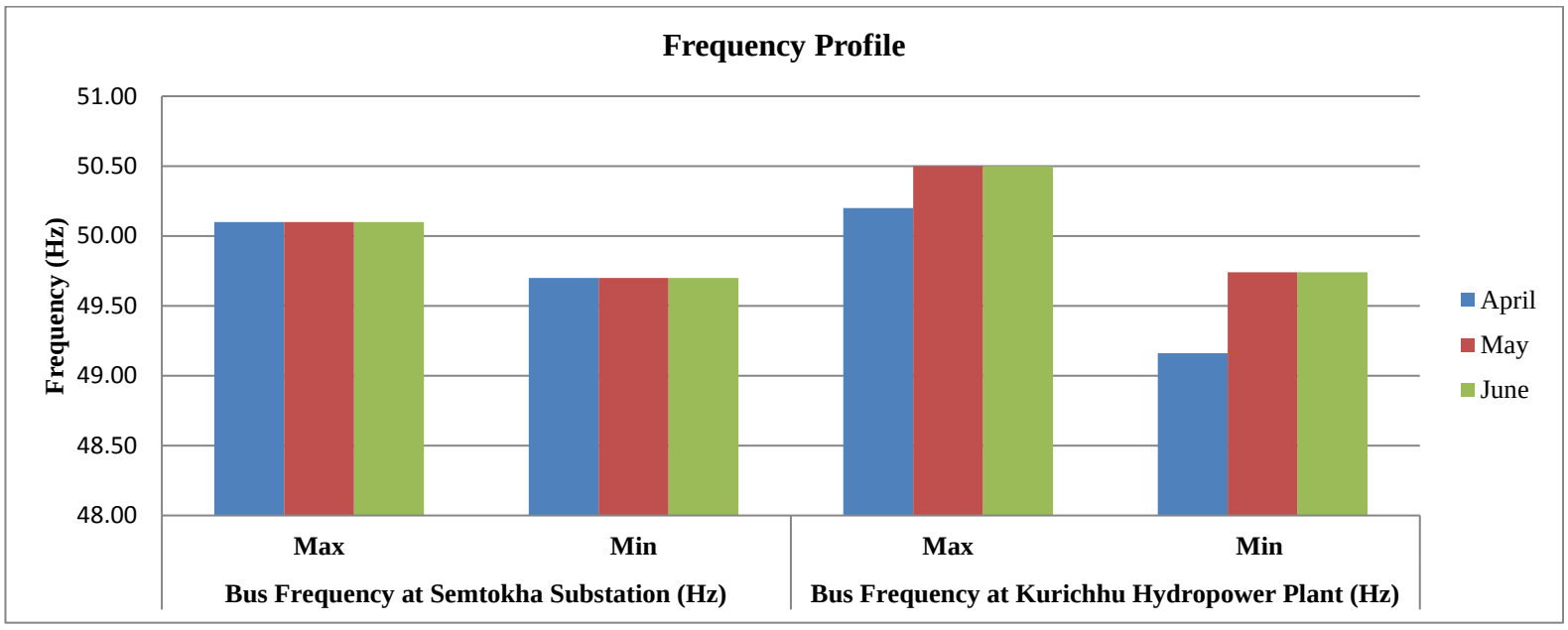
In the month of June, 2019, the Western gird frequency was maintained 99.19% within the normal operating range and deviated 0.13% to alert state and 0.67% was blackout/others. Eastern grid frequency was maintained within normal operating range of 96.37% and system frequency was deviated 3.63% to blackout/other state.

6.4.Frequency Summary for the month of April to June, 2019

Table 6.4.1. Frequency summary for the month of April to June, 2019

Substation/Plant	Bus Frequency at Semtokha Substation (Hz)		Bus Frequency at Kurichhu Hydropower Plant (Hz)	
Month	Max	Min	Max	Min
April	50.10	49.70	50.20	49.16
May	50.10	49.70	50.50	49.74
June	50.10	49.70	50.50	49.74

Graph 6.4.1. Frequency summary for the month of April to June, 2019



Daily maximum, minimum and average Frequency of Semtokha substation in western grid and Kurichhu Hydro Power Plant in eastern grid for the month of April to June, 2019 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.

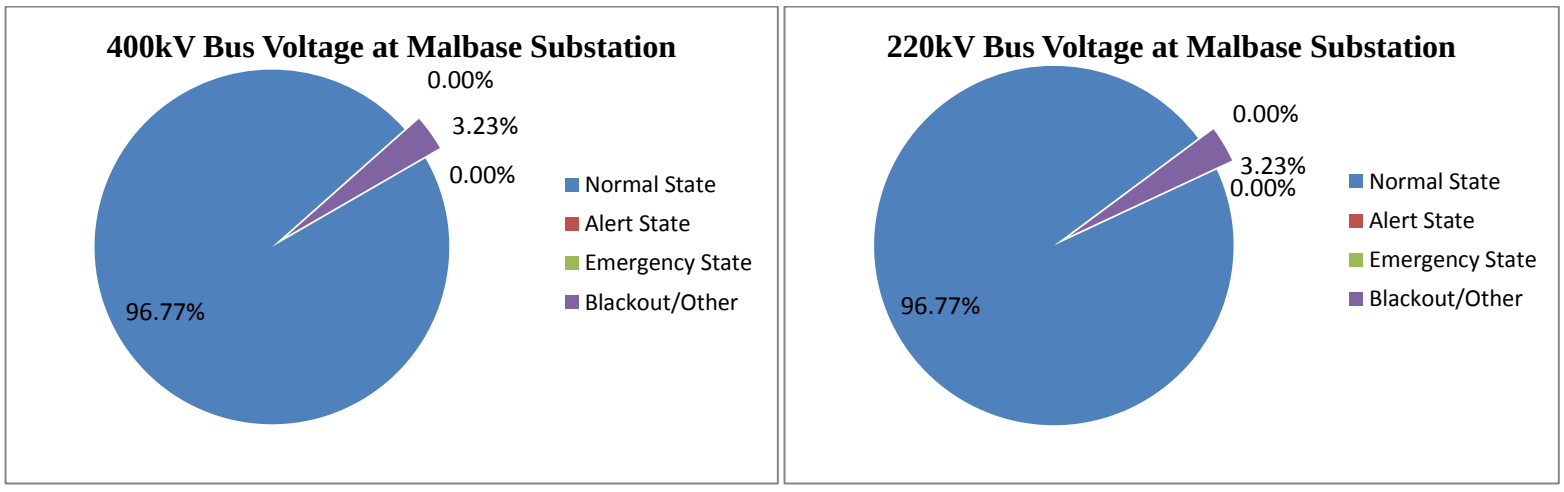
Due to the location of 400/22/66/11kV Malbase substation in western grid and 132/33/11kV Nangkhor substation in the eastern grid, the voltage profile of these substations are considered.

7.1.Voltage profile for the month of April, 2019

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	96.77%	96.77%	96.77%
2	Alert State	0.00%	0.00%	0.00%
3	Emergency State	0.00%	0.00%	0.00%
4	Blackout/Other	3.23%	3.23%	3.23%

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



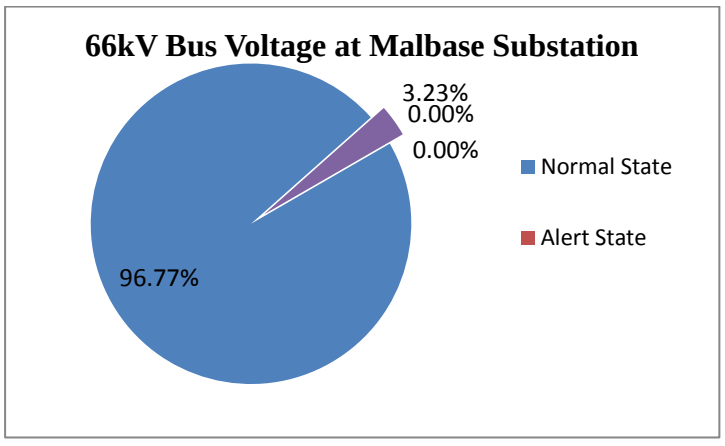
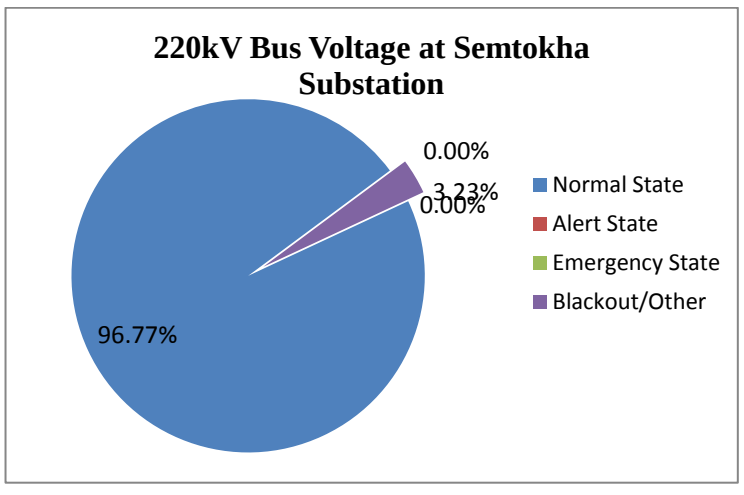


Table 7.1.2. Voltage Profile of 220/66/11kV Semtokha Substation

Sl. No.	Operating State	220kV Bus Voltage	66kV Bus Voltage
1	Normal State	96.77%	96.64%
2	Alert State	0.00%	0.00%
3	Emergency State	0.00%	0.13%
4	Blackout/Other	3.23%	3.23%

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



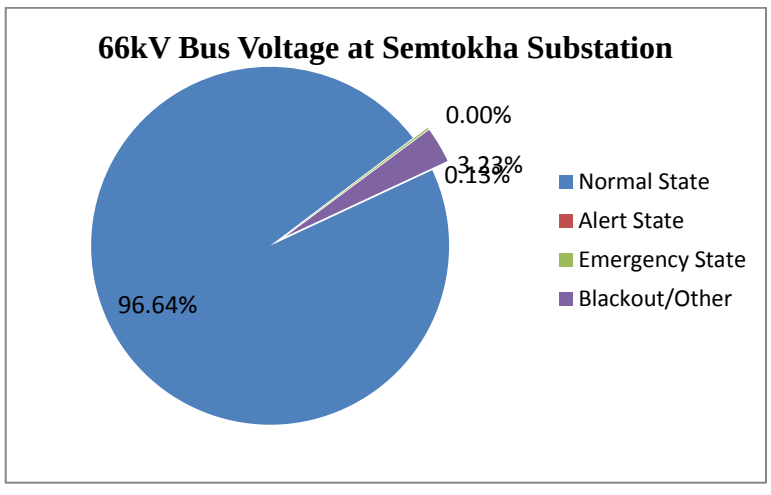
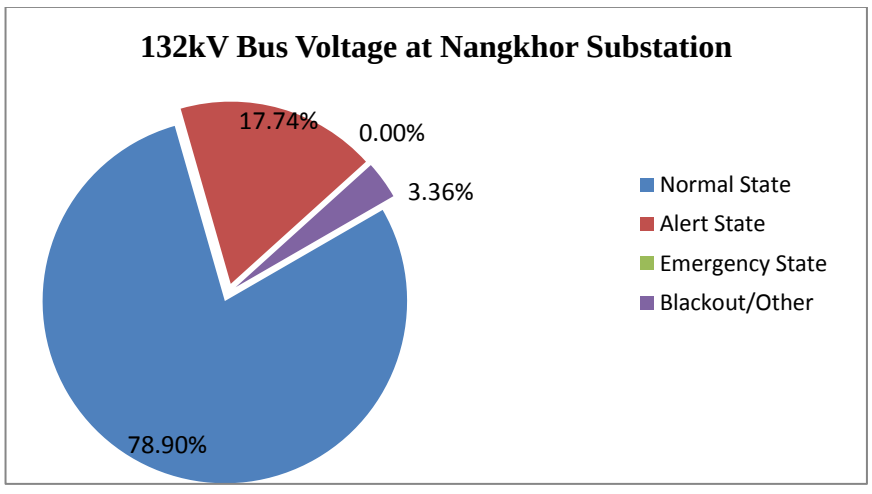


Table 7.1.3. Voltage Profile of 132/33/11kV Nangkhor Substation

Sl. No.	Operating State	132kV Bus Voltage
1	Normal State	78.90%
2	Alert State	17.74%
3	Emergency State	0.00%
4	Blackout/Other	3.36%

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



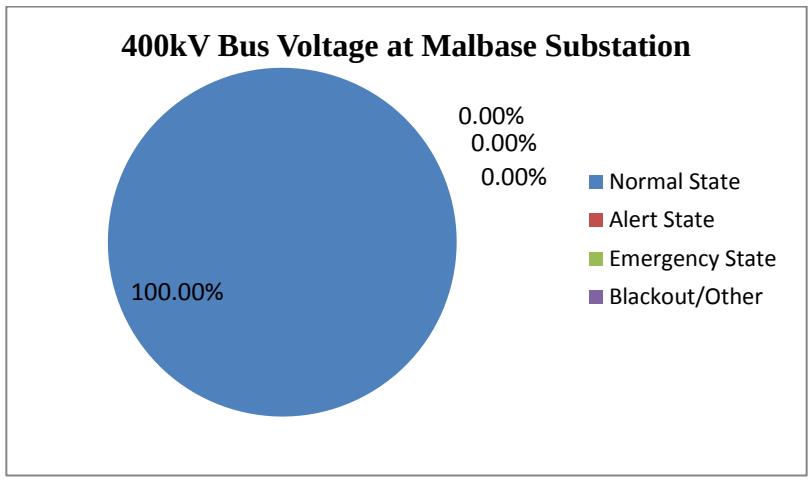
It had been observed that the eastern region is experiencing high voltage issue as clearly depicted in the above voltage profile. In order to control the issue, it is recommended to use the available voltage control measures such as reactor available at Jigmeling and KHP.

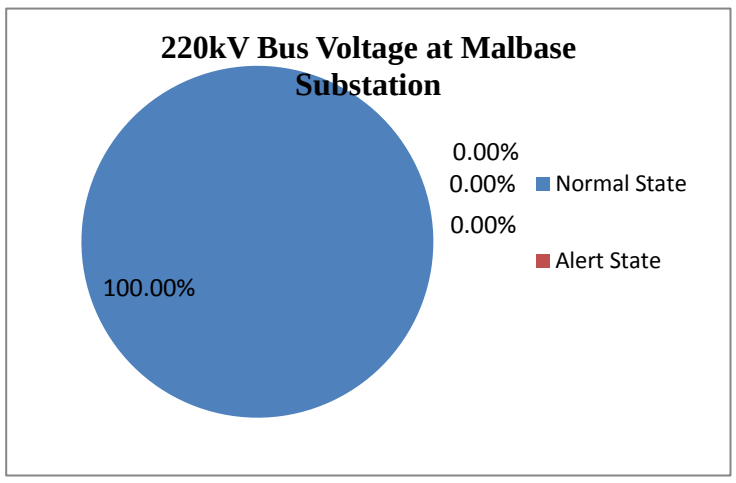
7.2.Voltage Profile for month of May, 2019

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





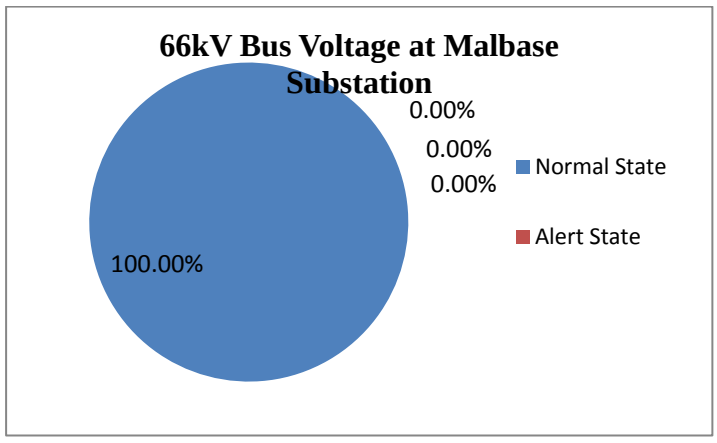
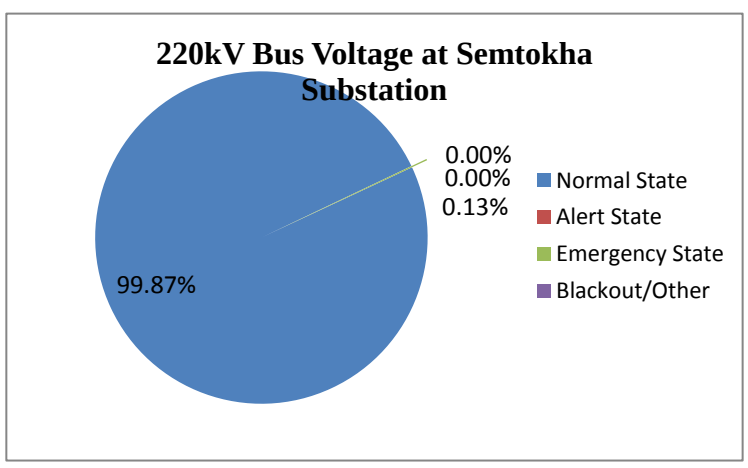


Table 7.2.2. Voltage Profile of 220/66/11kV Semtokha Substation

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

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



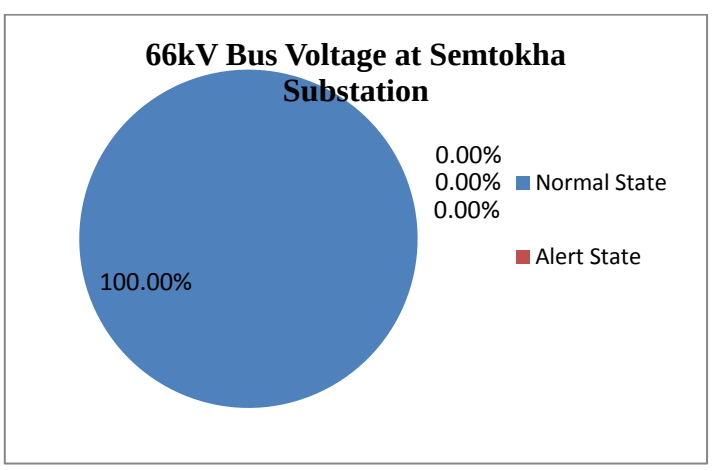
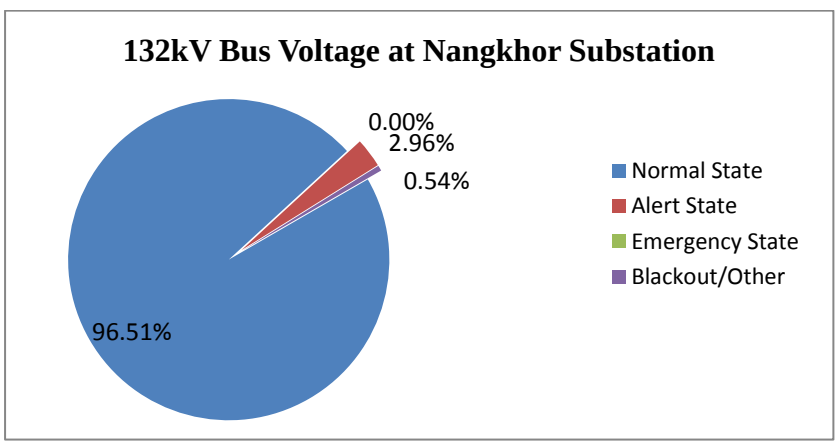


Table 7.2.3. Voltage Profile of 132/33/11kV Nangkhor Substation

Sl. No.	Operating State	132kV Bus Voltage
1	Normal State	96.51%
2	Alert State	2.96%
3	Emergency State	0.00%
4	Blackout/Other	0.54%

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

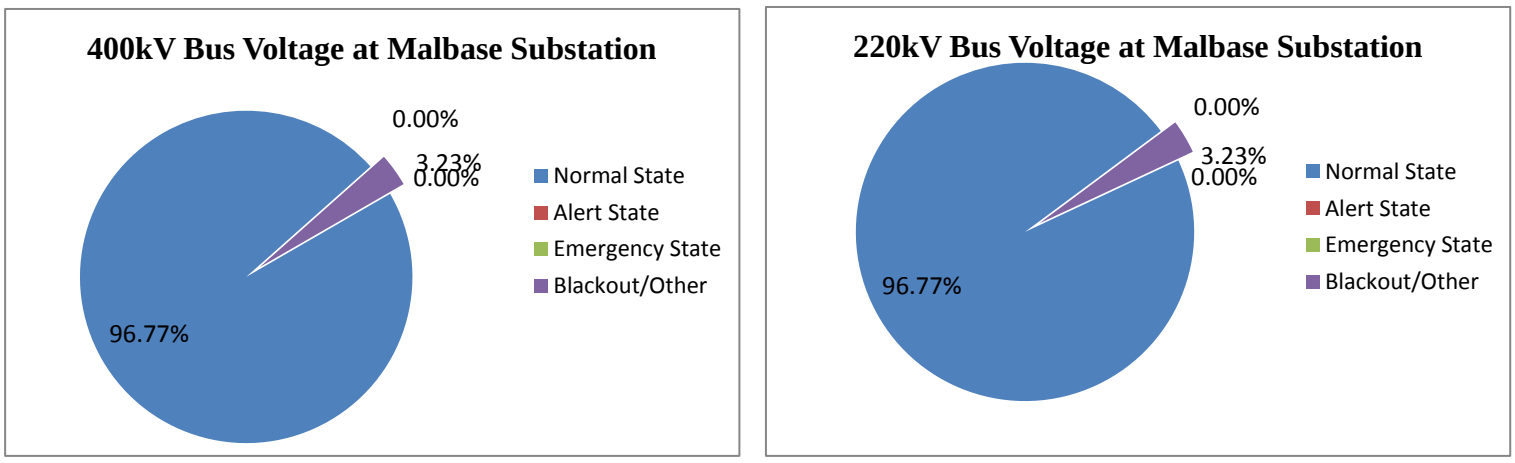


7.3.Voltage Profile for the month of June, 2019

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	96.77%	96.77%	96.77%
2	Alert State	0.00%	0.00%	0.00%
3	Emergency State	0.00%	0.00%	0.00%
4	Blackout/Other	3.23%	3.23%	3.23%

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



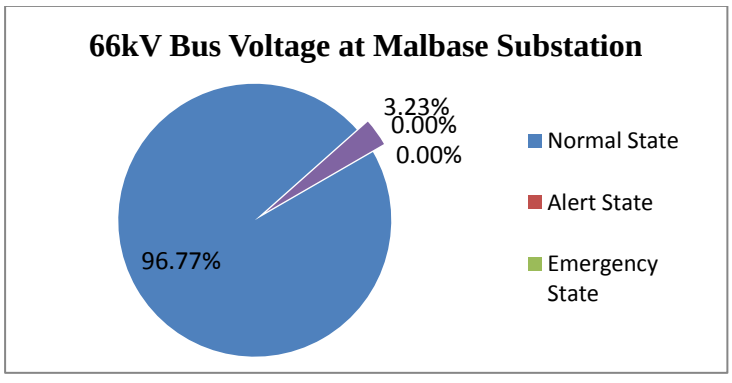


Table 7.3.2. Voltage Profile of 220/66/11kV Semtokha Substation

Sl. No.	Operating State	220kV Bus Voltage	66kV Bus Voltage
1	Normal State	96.64%	96.77%
2	Alert State	0.00%	0.00%
3	Emergency State	0.13%	0.00%
4	Blackout/Other	3.23%	3.23%

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

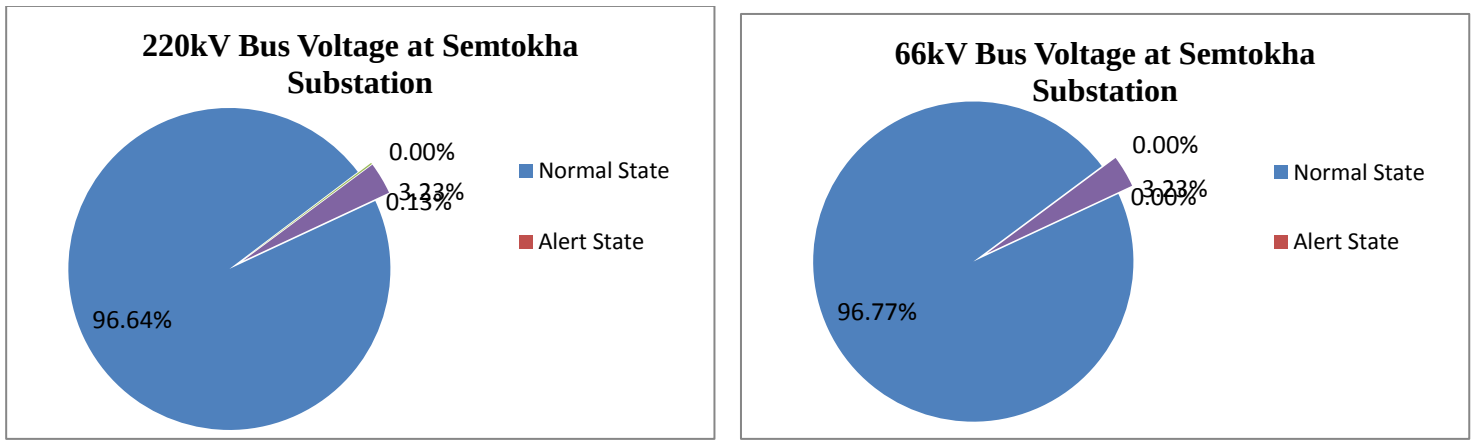
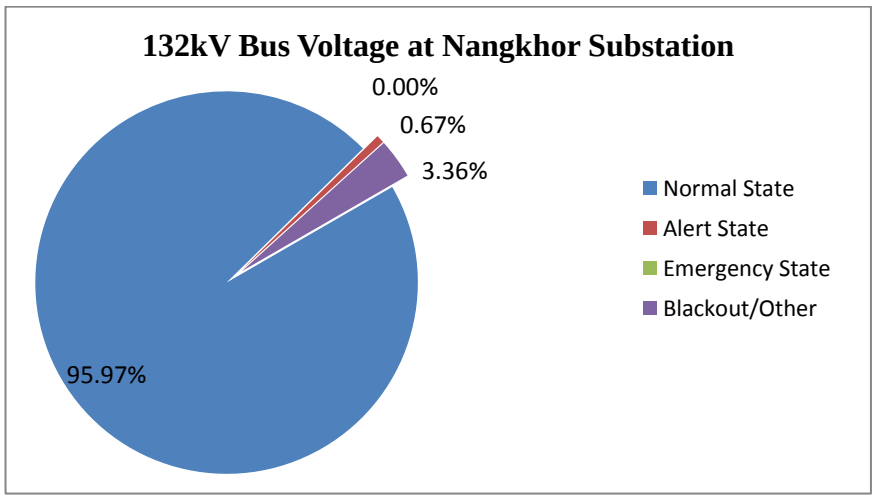


Table 7.3.3. Voltage Profile of 132/33/11kV Nangkhor Substation

Sl. No.	Operating State	132kV Bus Voltage
1	Normal State	95.97%
2	Alert State	0.67%
3	Emergency State	0.00%
4	Blackout/Other	3.36%

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

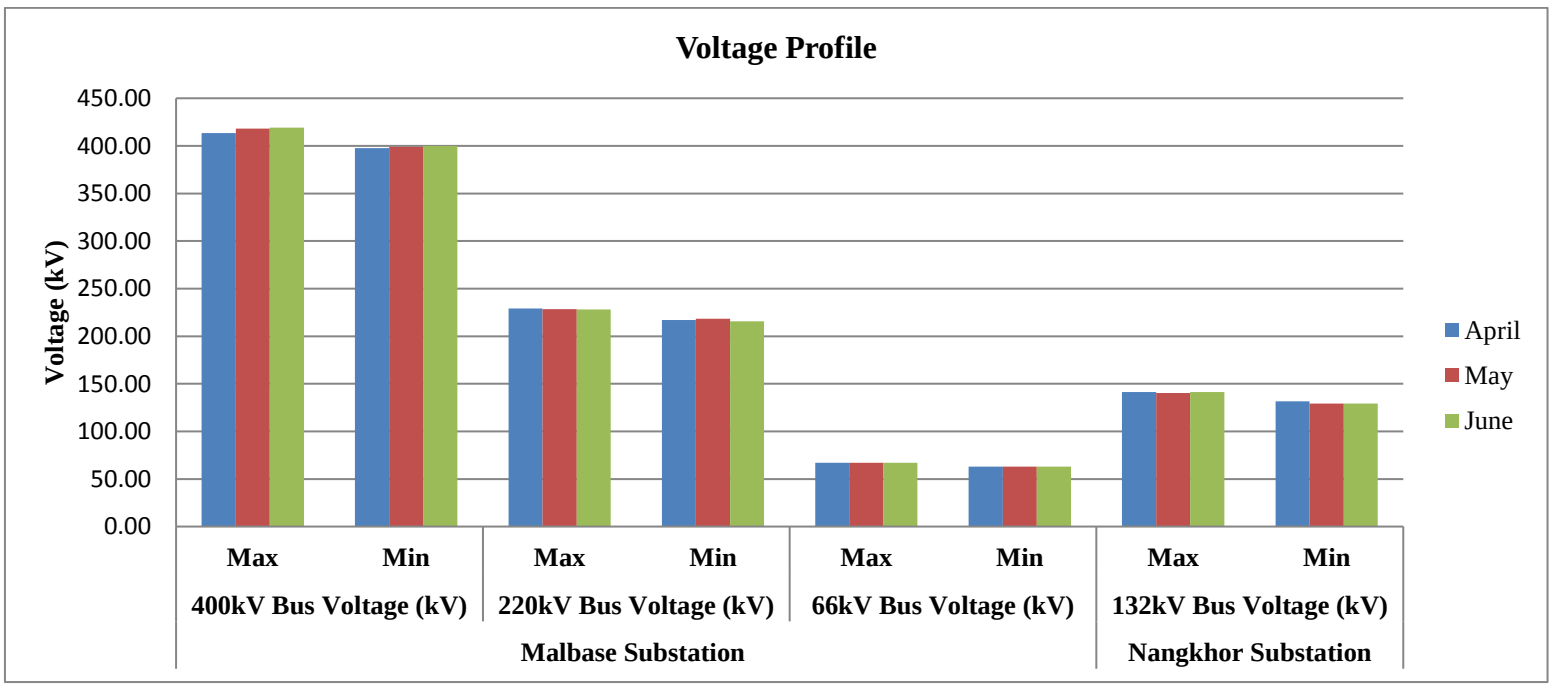


7.4.Voltage Summary for the Month of April to June, 2019

Table 7.4.1. Voltage Summary for the month of April to June, 2019

Substation	Malbase Substation						Nangkhor Substation	
Voltage Level	400kV Bus Voltage (kV)		220kV Bus Voltage (kV)		66kV Bus Voltage (kV)		132kV Bus Voltage (kV)	
Month	Max	Min	Max	Min	Max	Min	Max	Min
April	413.50	397.50	229.00	217.00	67.00	63.00	141.30	131.53
May	418.00	399.00	228.50	218.50	67.00	63.00	140.20	129.20
June	419.00	400.00	228.00	215.50	67.00	63.00	141.20	129.25

Graph 7.4.1. Voltage Summary for the month of April to June, 2019



Daily maximum, minimum and average bus voltage of Malbase substation in western grid and Nangkhor substation in eastern grid for the month of April to June, 2019 is attached as **Annexure-IV**

8. Major Outages of Feeders and Equipment

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

8.1.Major Outages in Eastern Grid

During the Second quarter of 2019, there was no prolong outages observed although there where multiple tripping occurred. Almost all the fault in the transmission line recorded are of temporary fault and transient fault in nature. Therefore, it is highly recommended for auto reclose to be implement in HV transmission lines.

The longest outage recorded for the second quarter in the eastern grid was 132 kV Gelephu-Salakati with the outage duration of almost 8 Hours. The main reason for such a long duration was due to severe weather condition at the area where they couldn't attain the fault.

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

8.2.Major Outages in Western Grid

As usual, it had been observed that, several tripping had occurred in the western grid and it was mainly due to the bad weather condition. Due to temporary and transient fault, major outage and blackout haven't experience in the second quarter of the year. However, some relay coordination issues where observed and raised to the concern stakeholder for rectification. The 200 MVA ICT at Malbase was under breakdown for about 3 Hours due to R-Phase LA puncture.

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

9. Annexures

Annexure-I

Table: Generation of April, 2019

Apr-19	BHP (MW)			CHP (MW)			THP (MW)			KHP (MW)			DHP (MW	
Date	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava	Max	Min
1	23.73	18.24	20.49	183.15	140.80	170.24	480.00	200.00	342.92	42.85	24.59	32.68	40.24	20.2
2	23.45	17.28	20.08	152.77	119.04	133.99	340.00	190.00	252.92	48.78	24.98	35.45	25.72	18.2
3	22.40	16.23	18.32	146.81	101.41	113.94	330.00	180.00	232.50	30.36	22.26	26.89	20.23	15.2
4	17.59	16.02	16.66	149.86	100.67	120.93	340.00	200.00	245.42	30.31	22.53	26.54	18.74	16.7
5	18.47	5.14	15.98	136.04	57.62	113.23	270.00	120.00	225.83	28.59	23.39	26.00	18.24	16.1
6	51.13	15.24	25.65	184.00	89.04	135.81	360.00	180.00	273.33	44.75	24.97	32.19	60.26	16.6
7	39.66	22.81	27.50	184.42	182.00	183.84	514.00	360.00	393.17	42.78	29.09	34.42	48.30	23.2
8	27.99	20.51	24.46	183.60	138.19	169.57	380.00	330.00	346.67	33.00	27.57	29.83	29.74	20.2
9	31.85	22.45	25.66	184.17	136.41	163.49	440.00	270.00	346.67	42.96	24.24	34.45	25.24	21.1
10	31.43	21.01	24.74	163.37	139.35	155.43	400.00	280.00	312.50	45.49	24.48	34.37	28.24	21.2
11	24.46	19.18	21.60	183.84	144.95	169.51	400.00	300.00	347.50	41.02	25.33	30.79	22.75	18.2
12	25.19	18.56	21.30	185.03	164.62	179.55	420.00	310.00	362.50	49.50	30.44	39.44	24.27	18.2
13	28.83	19.06	21.33	184.58	183.69	184.08	420.00	350.00	377.92	49.50	31.23	43.89	63.46	15.2
14	29.62	15.70	25.89	185.40	182.63	184.20	510.00	340.00	432.08	49.50	48.47	49.46	55.31	20.0
15	28.82	21.94	24.34	272.10	184.00	196.08	540.00	380.00	417.92	49.50	36.42	43.52	30.28	18.2
16	31.36	21.66	25.00	265.41	185.32	216.94	540.00	380.00	450.83	49.50	30.80	42.73	23.28	20.2
17	28.32	6.62	15.95	275.46	195.23	245.10	680.00	410.00	532.92	49.50	36.65	48.14	25.33	20.3
18	23.45	4.03	13.98	235.86	196.90	220.24	500.00	400.00	455.83	49.50	49.50	49.50	22.57	17.7
19	24.41	17.29	19.09	235.65	170.55	191.43	420.00	300.00	367.50	49.50	49.50	49.50	22.27	18.2
20	19.62	16.38	17.46	179.06	156.06	170.79	380.00	310.00	337.92	64.76	36.02	46.30	20.28	16.2
21	16.80	14.93	15.96	174.12	134.28	149.30	350.00	220.00	290.00	38.50	32.17	35.63	18.74	15.2
22	21.26	5.91	16.18	180.97	138.90	148.01	350.00	250.00	281.25	60.83	32.54	40.91	23.78	16.2
23	18.61	15.68	16.92	169.89	137.22	151.62	350.00	270.00	305.83	37.44	31.07	34.62	19.76	15.7
24	16.80	14.90	16.04	181.71	129.00	150.18	350.00	150.00	287.92	40.49	30.63	34.13	17.27	15.2
25	17.72	15.43	16.48	249.60	150.19	198.12	480.00	300.00	395.00	48.75	32.56	42.17	19.25	16.2
26	18.05	15.69	16.88	272.16	199.84	231.20	540.00	380.00	453.33	66.00	41.75	53.33	19.26	16.9
27	18.99	15.43	16.84	271.99	192.61	234.39	540.00	380.00	468.75	62.97	45.92	54.75	17.58	15.2
28	19.01	17.68	18.24	267.22	204.02	238.50	540.00	380.00	457.08	66.00	48.92	58.18	17.79	14.2
29	21.38	18.74	19.73	276.00	232.97	268.48	560.00	450.00	540.83	66.00	61.34	65.61	25.33	17.2
30	20.19	16.71	17.98	276.68	276.00	276.10	640.00	500.00	571.25	66.00	66.00	66.00	20.31	14.2
31	0.00	No Generatio	Error	0.00	No Generatio	Error	0.00	No Generatio	Error	0.00	No Generatio	Error	0.00	No Genera
Max	**51.13**			**276.68**			**680.00**			**66.00**			**63.46**	
Min		**4.03**			**57.62**			**120.00**			**22.26**			**14.2**
Source: THP, CHP, BHP, KHP (DGPC)														

Graph: Generation for the month of April, 2019

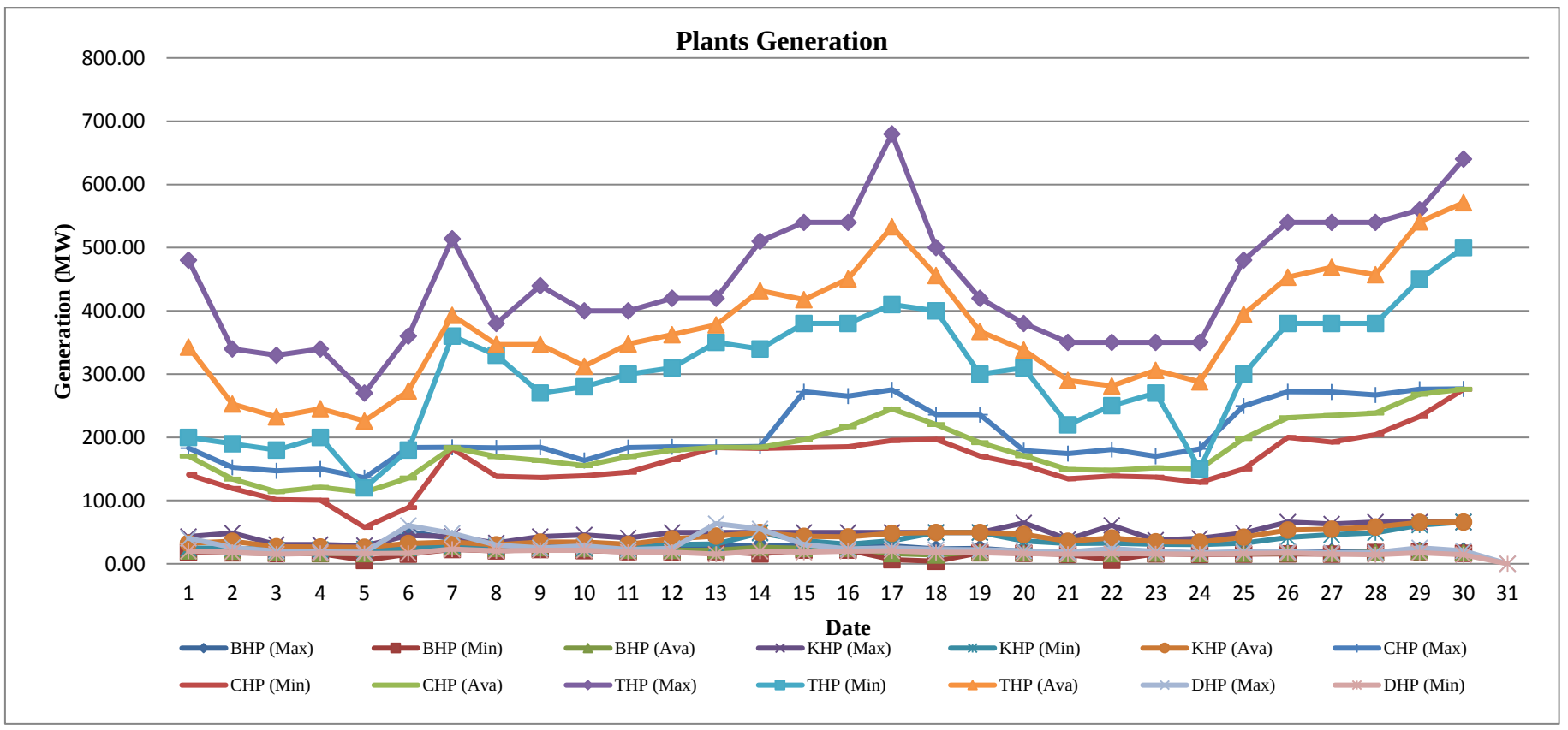


Table: Generation for the month of May, 2019

May-19	BHP (MW)			CHP (MW)			THP (MW)			KHP (MW)			DHP (MW)		
Date	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava
1	17.53	15.78	16.64	276.46	200.76	250.33	570.00	380.00	493.75	66.00	49.50	63.94	19.25	15.25	17.28
2	18.79	15.53	16.94	276.00	215.12	270.97	620.00	410.00	544.17	66.00	56.95	65.62	20.25	15.25	18.45
3	21.79	14.89	16.75	276.00	276.00	276.00	580.00	510.00	542.50	66.00	49.50	63.86	20.29	17.23	18.19
4	66.12	16.42	56.52	368.41	276.00	337.42	1,122.00	520.00	914.92	66.00	66.00	66.00	122.36	18.34	74.74
5	66.06	28.06	40.46	369.15	367.00	368.18	1,122.00	730.00	935.83	66.00	66.00	66.00	89.95	33.09	53.31
6	27.56	21.18	24.08	368.00	275.18	338.28	730.00	540.00	679.17	66.00	66.00	66.00	34.10	24.11	28.87
7	21.40	18.13	20.37	275.73	240.21	267.14	540.00	460.00	493.33	66.00	49.55	60.75	25.14	21.12	23.05
8	20.15	18.82	19.49	276.95	239.53	252.76	460.00	460.00	460.00	64.67	54.08	59.27	21.13	20.11	20.84
9	19.14	18.07	18.50	269.80	217.23	250.63	540.00	440.00	507.50	60.88	50.11	56.71	21.46	18.10	19.77
10	18.14	17.21	17.69	265.36	196.31	240.55	550.00	400.00	464.58	66.00	53.17	60.97	19.99	18.92	19.32
11	17.52	16.79	17.08	272.57	196.22	238.91	680.00	340.00	513.54	66.00	52.79	62.79	19.22	18.18	18.85
12	17.67	15.42	16.50	258.28	202.68	222.36	555.00	390.00	464.38	66.00	49.50	60.61	19.20	16.83	18.19
13	19.30	16.00	17.19	250.85	210.29	226.15	510.00	390.00	446.67	66.00	47.36	58.28	24.21	17.34	19.73
14	24.56	15.84	17.06	216.07	198.25	206.32	430.00	310.00	390.42	64.28	47.20	52.99	19.99	16.55	18.06
15	19.57	15.92	16.95	201.45	167.47	179.20	400.00	260.00	338.33	62.64	45.24	53.95	19.24	16.53	17.55
16	16.45	15.47	15.74	184.93	162.00	173.13	380.00	300.00	345.42	60.33	45.55	49.20	19.23	15.95	17.31
17	16.26	15.06	15.46	180.49	153.60	165.12	360.00	330.00	340.42	66.00	39.95	54.86	17.90	16.52	16.92
18	16.36	13.67	15.35	286.47	151.50	200.35	530.00	230.00	404.58	61.05	50.59	55.65	25.36	16.20	19.04
19	15.44	14.26	14.86	222.54	166.82	183.53	470.00	300.00	347.08	66.00	53.93	65.35	19.97	16.56	17.92
20	14.72	14.02	14.44	204.26	151.37	170.85	460.00	320.00	350.83	66.00	45.82	59.41	17.33	15.95	16.36
21	14.87	13.80	14.26	203.61	150.67	169.28	400.00	300.00	329.58	66.00	46.41	56.14	16.80	15.42	16.10
22	14.37	13.87	14.11	183.94	151.63	164.54	390.00	290.00	325.83	66.00	49.50	62.15	17.89	15.43	16.16
23	29.37	14.11	19.46	184.00	153.91	168.07	430.00	290.00	341.25	66.00	49.50	62.33	18.16	15.44	16.44
24	38.11	19.58	26.19	271.27	184.00	230.15	710.00	380.00	513.75	66.00	64.53	65.91	30.57	18.13	25.00
25	19.37	16.68	17.60	193.27	139.74	177.41	465.00	185.00	350.50	62.29	56.72	59.83	23.63	15.96	20.08
26	18.04	16.48	17.25	212.44	180.68	196.95	687.00	425.00	525.29	66.00	56.79	65.03	31.11	20.01	25.27
27	37.50	16.38	18.56	226.27	158.57	181.74	470.00	320.00	371.25	66.00	55.83	64.23	24.24	19.47	21.01
28	27.10	17.93	20.41	209.28	145.38	170.87	440.00	280.00	326.67	66.00	66.00	66.00	21.41	19.47	20.17
29	28.52	17.63	20.23	197.58	152.63	166.35	440.00	280.00	340.42	66.00	65.01	65.61	19.99	18.18	18.70
30	41.31	18.93	23.91	194.92	156.27	170.24	427.00	290.00	341.75	66.00	33.00	64.09	19.22	16.95	18.09
31	25.51	16.27	19.25	202.01	163.08	179.87	400.00	330.00	376.04	66.00	66.00	66.00	22.84	17.32	19.55
Max	**66.12**			**369.15**			**1,122.00**			**66.00**			**122.36**		
Min		**13.67**			**139.74**			**185.00**			**33.00**			**15.25**	
Source: THP, CHP, BHP, KHP (DGPC)															

Graph: Generation for the month of May, 2019

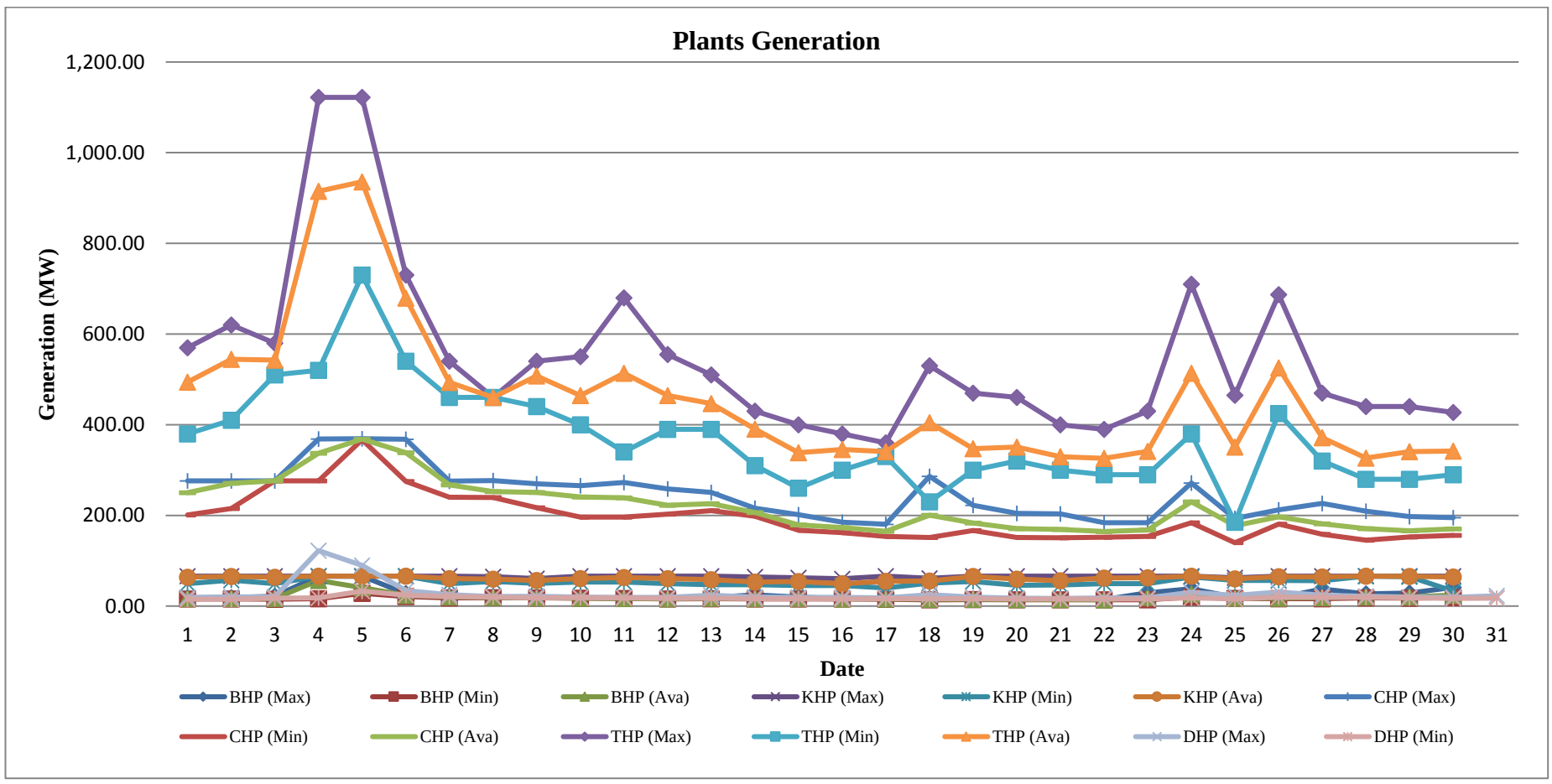


Table: Generation for the month of June, 2019

Jun-19	BHP (MW)			CHP (MW)			THP (MW)			KHP (MW)			DHP (MW)		
Date	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava
1	19.98	16.33	18.05	199.22	164.24	178.70	470.00	270.00	370.42	66.00	48.99	53.61	21.34	17.38	19.06
2	17.30	15.33	16.22	198.28	144.94	169.40	360.00	280.00	321.25	54.34	48.58	49.87	20.07	16.01	18.05
3	25.57	14.98	16.19	183.56	140.41	153.48	320.00	270.00	294.17	66.00	46.68	51.32	20.08	16.81	17.71
4	20.75	15.15	16.67	181.93	141.36	153.84	360.00	280.00	297.08	49.50	44.70	48.72	20.32	17.36	18.47
5	18.14	15.64	16.71	183.80	123.98	149.41	370.00	220.00	295.83	66.00	43.78	52.44	21.90	17.36	19.57
6	31.12	16.79	20.10	184.00	145.46	158.99	370.00	290.00	314.17	66.00	49.50	59.37	32.25	18.16	25.98
7	43.50	19.52	26.56	200.11	151.03	174.09	420.00	310.00	358.33	66.00	66.00	66.00	31.17	20.04	25.79
8	23.01	14.52	18.95	271.12	172.68	213.45	510.00	350.00	449.58	66.00	66.00	66.00	27.01	22.56	24.41
9	23.78	16.35	18.45	225.12	186.06	208.41	510.00	360.00	423.33	66.00	66.00	66.00	24.23	19.28	20.89
10	16.41	15.18	15.82	191.11	150.31	172.53	380.00	290.00	344.17	66.00	66.00	66.00	20.81	18.70	19.48
11	20.63	15.15	17.29	240.49	154.96	185.39	480.00	310.00	373.33	66.00	66.00	66.00	28.45	18.74	21.98
12	51.86	16.28	19.08	206.81	174.80	187.19	450.00	340.00	376.25	66.00	49.89	59.05	25.63	14.63	21.47
13	40.81	19.74	25.22	223.24	180.24	192.63	420.00	340.00	383.33	66.00	54.82	60.31	23.66	18.72	20.83
14	23.02	6.10	17.87	274.55	96.00	185.59	460.00	300.00	358.33	66.00	49.50	64.00	24.05	17.03	18.77
15	20.25	7.45	16.19	219.81	153.59	178.47	480.00	300.00	374.58	66.00	66.00	66.00	29.32	17.75	23.80
16	40.81	17.68	29.80	339.48	207.52	271.84	868.00	480.00	623.38	66.00	66.00	66.00	53.27	23.28	35.59
17	45.74	27.20	34.76	366.37	179.89	259.78	960.00	360.00	574.17	66.00	66.00	66.00	46.31	29.28	34.69
18	31.97	21.28	25.08	369.04	253.80	303.07	820.00	440.00	618.33	66.00	66.00	66.00	41.31	24.75	30.35
19	21.28	18.62	19.69	241.67	193.34	213.87	500.00	350.00	442.92	66.00	66.00	66.00	25.32	20.24	22.50
20	19.94	17.38	18.64	212.19	178.41	193.84	430.00	290.00	377.92	66.00	66.00	66.00	23.61	18.25	21.24
21	54.65	17.00	22.91	201.40	164.46	178.61	480.00	320.00	365.00	66.00	58.21	62.72	88.53	18.24	24.51
22	44.97	24.08	31.69	198.31	164.33	177.38	480.00	320.00	360.42	66.00	64.48	65.64	75.50	26.30	38.25
23	37.94	21.46	26.90	254.24	184.24	223.82	550.00	360.00	460.83	65.52	64.90	65.09	45.34	23.29	31.78
24	22.52	19.29	20.59	203.02	169.32	188.40	440.00	370.00	380.42	66.00	33.00	64.18	24.28	20.27	22.69
25	28.27	6.71	23.41	271.00	100.61	182.50	720.00	180.00	478.24	66.00	66.00	66.00	54.30	21.25	34.67
26	56.91	23.46	35.52	369.00	172.80	297.06	1,122.00	140.00	853.22	66.00	49.50	65.25	126.37	38.31	73.58
27	40.12	32.10	36.00	369.00	257.22	358.11	935.00	620.00	832.67	66.00	66.00	66.00	61.54	43.30	48.84
28	39.17	28.29	33.71	358.81	275.84	316.02	935.00	620.00	742.08	66.00	49.50	64.63	52.32	39.31	46.75
29	29.95	23.71	27.04	286.22	218.91	258.83	670.00	480.00	550.83	66.00	66.00	66.00	37.82	28.43	33.15
30	40.02	22.20	27.50	239.69	203.04	221.58	480.00	480.00	480.00	66.00	66.00	66.00	30.33	24.29	27.52
31	0.00	No Generati	Error	0.00	No Generati	Error	0.00	No Generati	Error	0.00	No Generati	Error	0.00	No Generati	Error
Max	**56.91**			**369.04**			**1,122.00**			**66.00**			**126.37**		
Min		**6.10**			**96.00**			**140.00**			**33.00**			**14.63**	
Source: THP, CHP, BHP, KHP (DGPC)															

Graph: Generation for the month of June, 2019

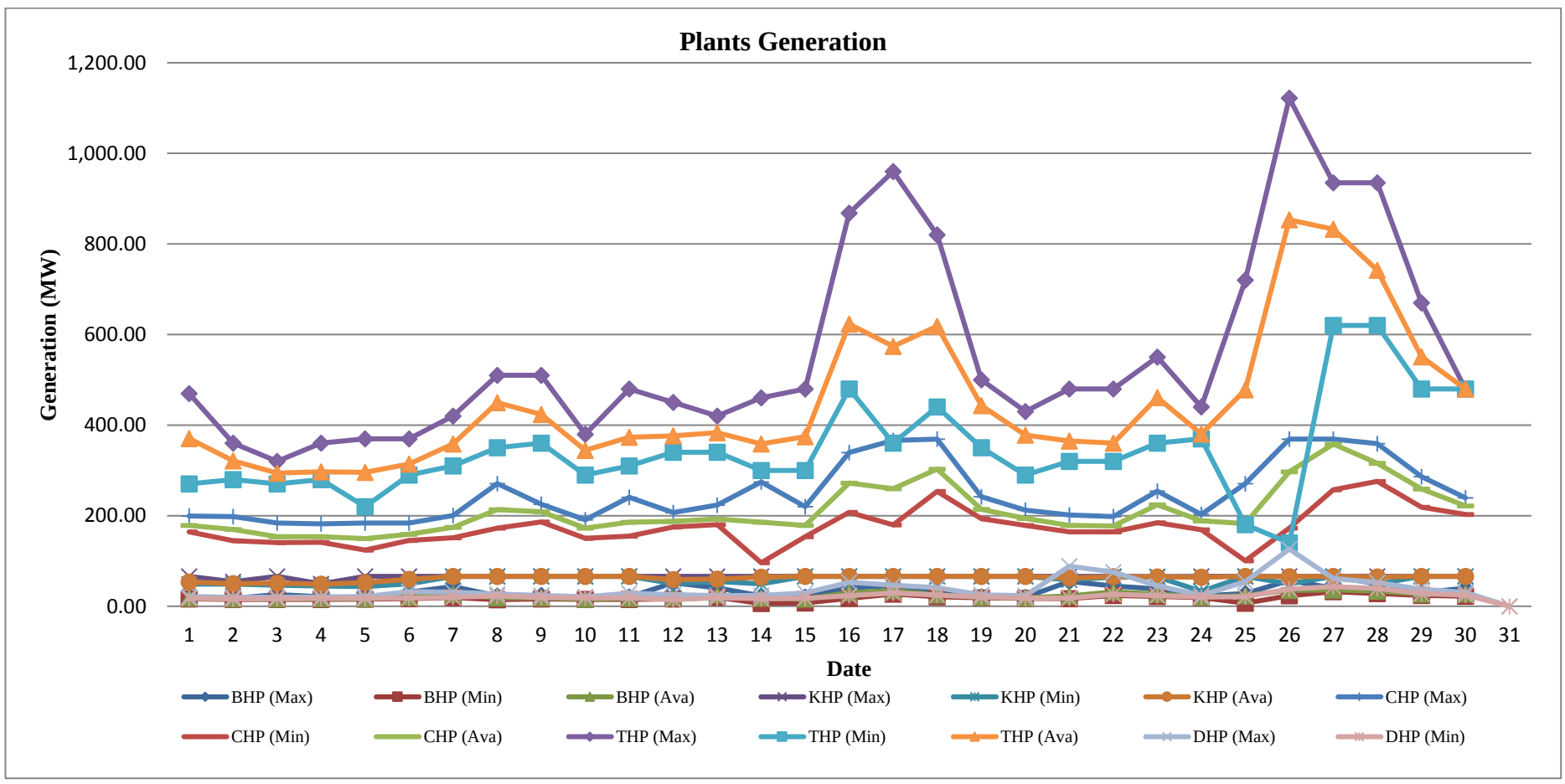


Table: National demand for April, 2019

Apr-19	Max.	Min.	Ava.
0:00	285.09	215.43	251.30
1:00	289.19	231.32	257.28
2:00	280.79	144.21	248.70
3:00	285.58	226.78	252.27
4:00	285.38	231.38	254.37
5:00	290.48	221.45	253.42
6:00	324.30	216.48	269.78
7:00	339.70	264.52	291.14
8:00	330.42	262.98	288.39
9:00	318.32	267.09	284.71
10:00	307.18	239.11	274.38
11:00	313.29	239.92	269.74
12:00	313.11	243.85	273.75
13:00	302.90	247.85	270.91
14:00	323.66	249.30	266.04
15:00	318.39	247.82	267.30
16:00	319.77	246.18	272.07
17:00	326.31	253.71	285.74
18:00	328.89	280.80	304.38
19:00	340.70	273.84	319.56
20:00	326.68	260.59	307.68
21:00	312.64	258.38	288.10
22:00	308.66	237.82	270.03
23:00	290.45	231.15	259.87
	340.70		
		144.21	

Graph: National Demand for April, 2019

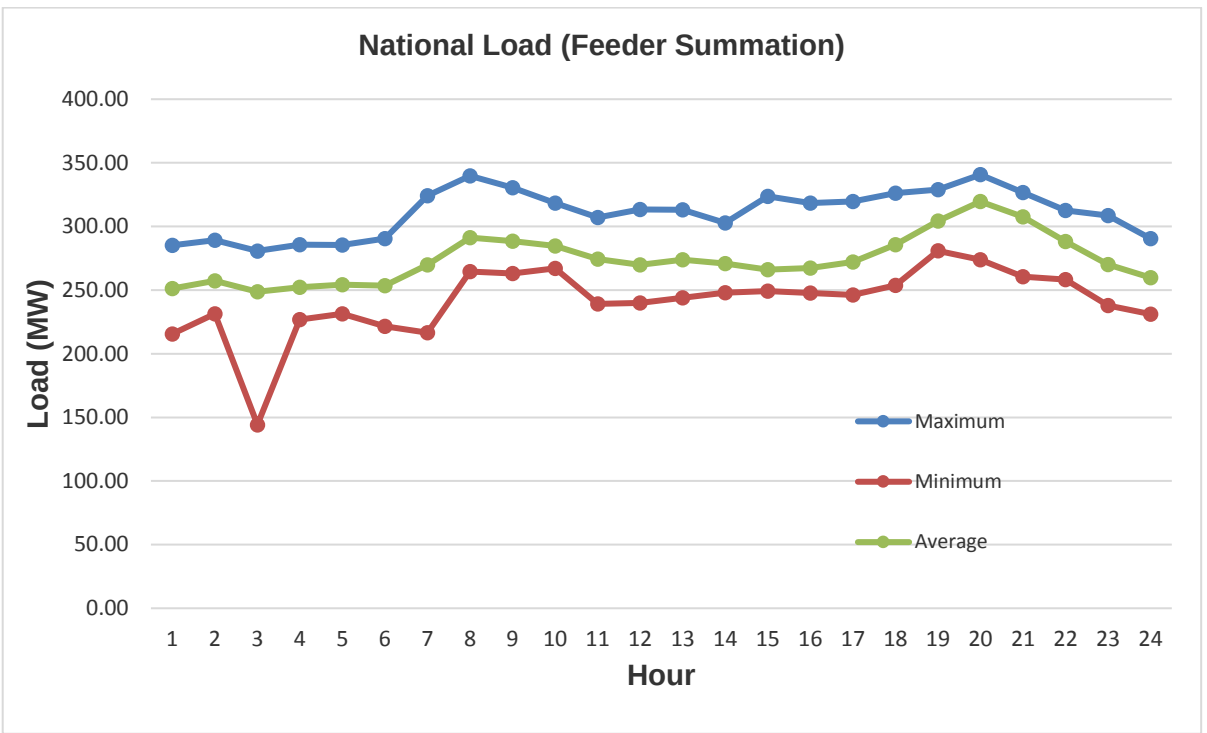
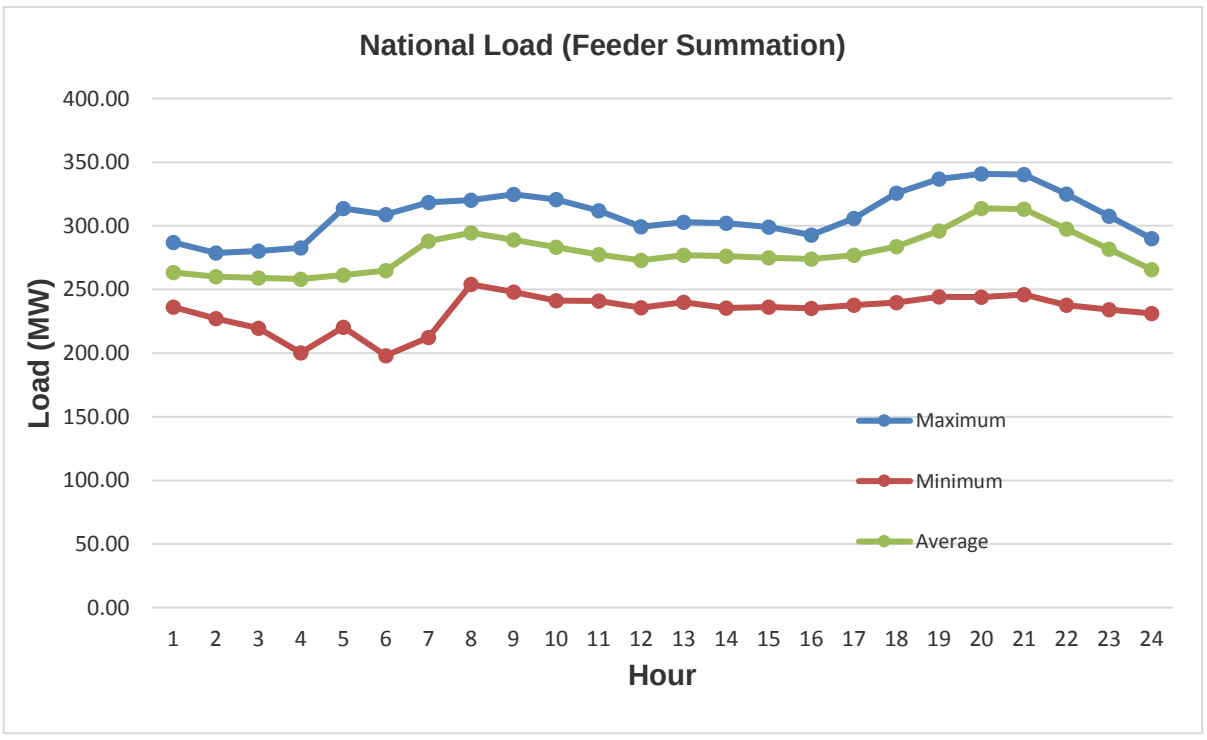


Table: National Demand for May, 2019

May-19	Max.	Min.	Ava.
0:00	287.08	236.31	263.26
1:00	278.71	227.25	260.13
2:00	280.30	219.55	259.17
3:00	282.75	200.22	258.20
4:00	313.73	220.34	261.42
5:00	308.96	198.01	264.98
6:00	318.36	212.30	287.91
7:00	320.33	253.98	294.68
8:00	324.70	248.03	289.13
9:00	320.65	241.28	283.12
10:00	312.00	241.00	277.46
11:00	299.25	235.82	272.81
12:00	302.78	239.97	276.97
13:00	302.09	235.34	276.18
14:00	298.96	236.29	275.00
15:00	292.86	235.11	273.82
16:00	305.75	237.76	276.94
17:00	325.71	239.67	283.74
18:00	336.71	244.32	295.99
19:00	340.84	243.90	313.73
20:00	340.34	246.02	313.19
21:00	324.88	237.79	297.59
22:00	307.60	234.09	281.81
23:00	290.09	231.07	265.51
	340.84		
		198.01	

Graph: National Demand for May, 2019

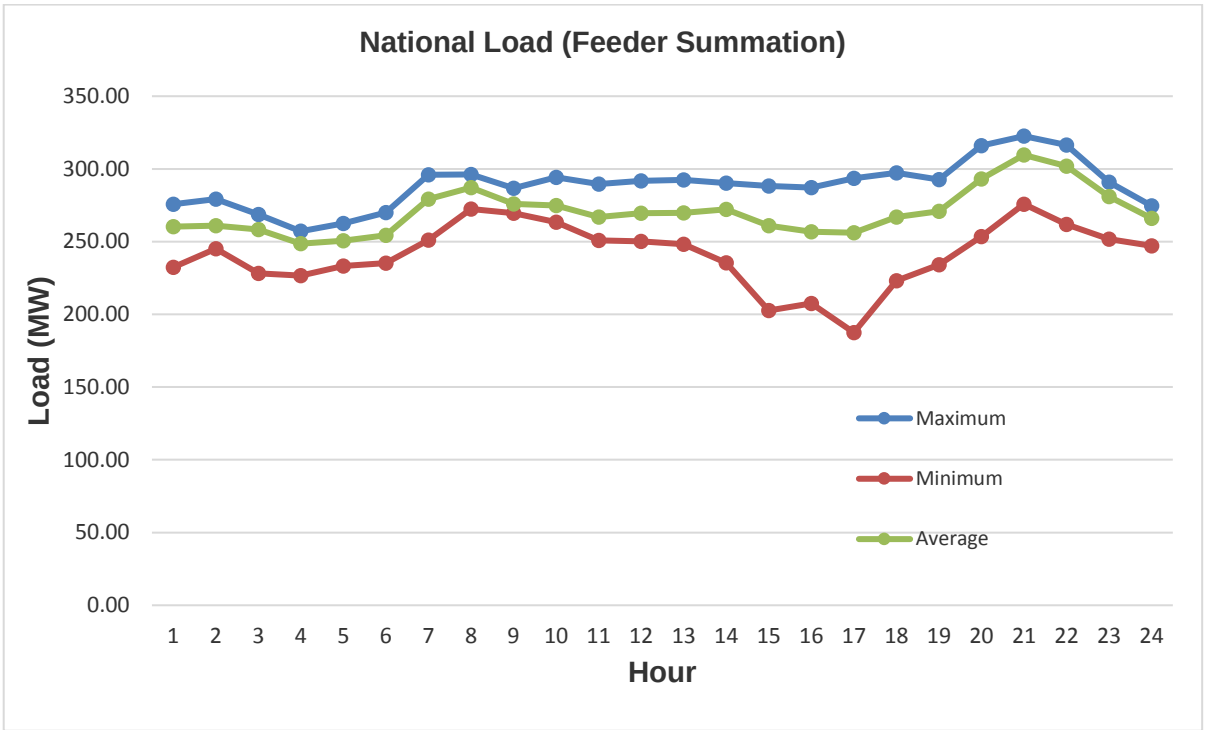


Annexure-II

Table: National Demand for June, 2019

Jun-19	Max.	Min.	Ava.
0:00	275.70	232.38	260.35
1:00	279.34	245.25	260.93
2:00	268.61	228.29	258.37
3:00	257.14	226.63	248.59
4:00	262.59	233.34	250.73
5:00	269.92	235.26	254.41
6:00	296.06	251.07	279.23
7:00	296.19	272.39	287.12
8:00	286.81	269.63	276.00
9:00	294.33	263.40	274.87
10:00	289.70	250.80	266.88
11:00	291.81	250.16	269.57
12:00	292.38	248.22	269.74
13:00	290.36	235.41	272.25
14:00	288.29	202.61	261.00
15:00	287.14	207.42	256.72
16:00	293.62	187.49	256.07
17:00	297.21	223.13	266.88
18:00	292.77	234.22	270.92
19:00	315.90	253.44	293.14
20:00	322.56	275.82	309.61
21:00	316.50	261.83	301.92
22:00	290.92	251.73	280.93
23:00	274.56	247.05	265.95
	322.56		
		187.49	

Graph: National Demand for June, 2019



Annexure-III

Table: Daily maximum, minimum and average frequency for the month of April, 2019

Apr-19	Bus Frequency at Semtokha Substation			Bus Frequency at Kurichhu Hydropower Plant		
Date	Max	Min	Ava	Max	Min	Ava
1	50.00	49.80	49.93	50.10	49.88	50.01
2	50.00	49.80	49.95	50.12	49.78	49.98
3	50.00	49.90	49.93	50.05	49.49	49.95
4	50.00	49.80	49.94	50.07	49.90	49.99
5	50.00	49.80	49.90	50.10	49.92	50.02
6	50.00	49.80	49.91	50.08	49.80	50.02
7	50.00	49.70	49.90	50.20	49.89	50.03
8	50.00	49.70	49.88	50.12	49.88	50.01
9	50.00	49.70	49.87	50.10	49.55	50.00
10	50.00	49.80	49.91	50.08	49.88	49.97
11	50.00	49.80	49.91	50.08	49.16	49.94
12	50.00	49.80	49.90	50.07	49.69	49.96
13	50.00	49.80	49.93	50.09	49.86	50.00
14	50.00	49.80	49.93	50.11	49.90	50.02
15	50.00	49.80	49.92	50.08	49.91	50.01
16	50.00	49.80	49.93	50.10	49.85	50.00
17	50.00	49.80	49.95	50.08	49.88	50.01
18	50.00	49.90	49.94	50.08	49.95	50.01
19	50.10	49.80	49.93	50.08	49.85	50.00
20	50.00	49.80	49.94	50.09	49.85	49.99
21	50.00	49.80	49.93	50.09	49.85	49.98
22	50.00	49.80	49.91	50.06	49.90	50.00
23	50.00	49.90	49.93	50.09	49.83	50.00
24	50.00	49.80	49.91	50.10	49.92	50.01
25	50.00	49.90	49.94	50.07	49.87	49.99
26	50.00	49.80	49.90	50.08	49.90	50.01
27	50.00	49.80	49.91	50.09	49.90	50.00
28	50.00	49.70	49.89	50.17	49.75	50.03
29	50.00	49.70	49.88	50.10	49.88	50.02
30	50.00	49.80	49.93	50.10	49.96	50.03
31	50.00	49.90	49.95	0.00	Error	Error
Max	**50.10**			**50.20**		
Min		**49.70**			**49.16**	
Source: TD (BPC), KHP (DGPC)						

Graph: Daily maximum, minimum and average frequency for the month of April, 2019

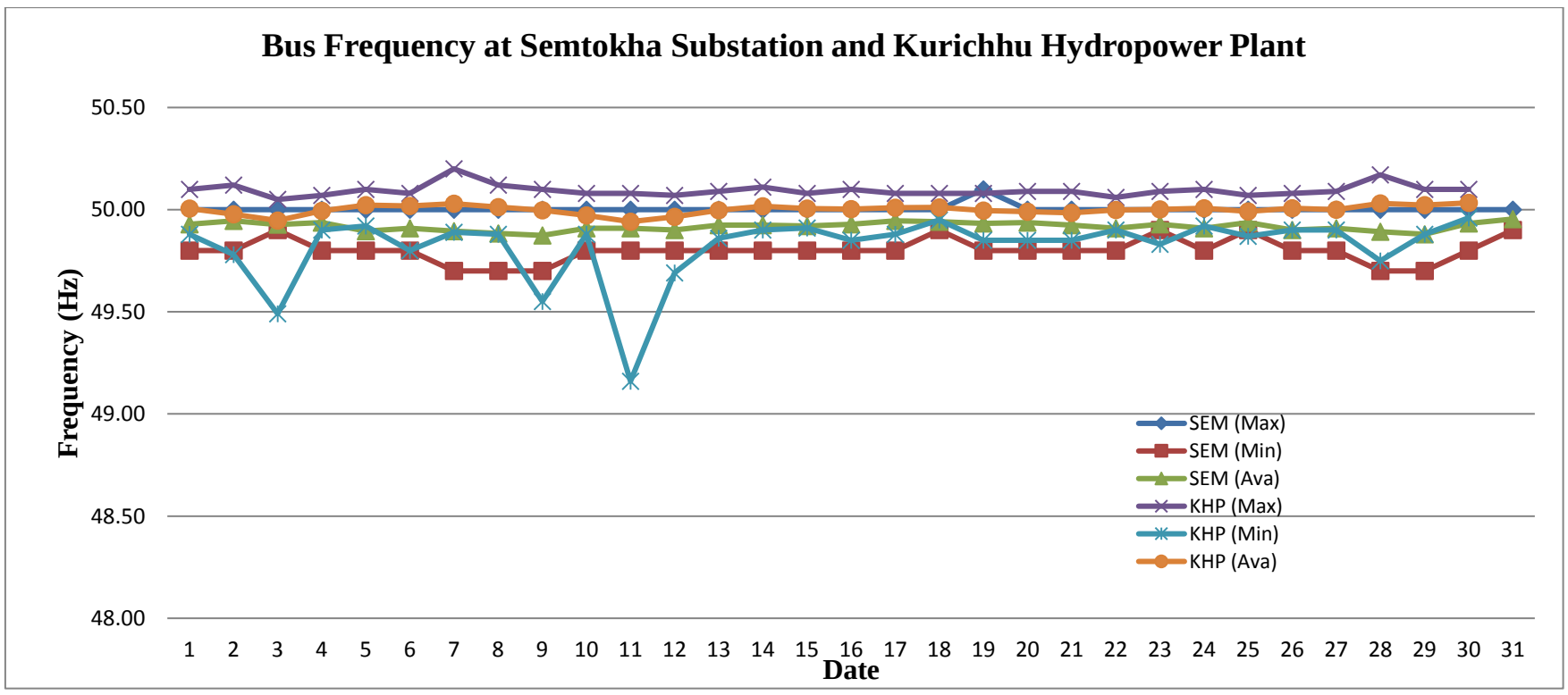


Table: Daily maximum, minimum and average frequency for the month of May, 2019

May-19	Bus Frequency at Semtokha Substation			Bus Frequency at Kurichhu Hydropower Plant		
Date	Max	Min	Ava	Max	Min	Ava
1	50.00	49.80	49.93	50.12	49.93	50.04
2	50.00	49.80	49.95	50.11	49.88	50.01
3	50.00	49.90	49.93	50.11	49.86	50.01
4	50.00	49.80	49.94	50.06	49.80	49.99
5	50.00	49.80	49.90	50.11	49.86	50.00
6	50.00	49.80	49.91	50.09	49.80	49.97
7	50.00	49.70	49.90	50.09	49.83	49.98
8	50.00	49.70	49.88	50.08	49.85	49.95
9	50.00	49.70	49.87	50.05	49.74	49.96
10	50.00	49.80	49.91	50.14	49.84	50.01
11	50.00	49.80	49.91	50.08	49.90	50.01
12	50.00	49.80	49.90	50.12	49.84	50.00
13	50.00	49.80	49.93	50.19	49.83	49.99
14	50.00	49.80	49.93	50.06	49.88	49.99
15	50.00	49.80	49.92	50.12	49.87	50.00
16	50.00	49.80	49.93	50.07	49.86	50.00
17	50.00	49.80	49.95	50.12	49.85	50.00
18	50.00	49.90	49.94	50.07	49.86	49.99
19	50.10	49.80	49.93	50.06	49.90	49.99
20	50.00	49.80	49.94	50.07	49.84	49.96
21	50.00	49.80	49.93	50.08	49.75	49.95
22	50.00	49.80	49.91	50.20	49.91	50.02
23	50.00	49.90	49.93	50.22	49.85	50.00
24	50.00	49.80	49.91	50.08	49.84	50.01
25	50.00	49.90	49.94	50.17	49.92	50.03
26	50.00	49.80	49.90	50.10	49.93	50.02
27	50.00	49.80	49.91	50.50	49.84	50.01
28	50.00	49.70	49.89	50.06	49.91	50.00
29	50.00	49.70	49.88	50.10	49.90	50.01
30	50.00	49.80	49.93	50.13	49.93	50.02
31	50.00	49.90	49.95	50.16	49.93	50.04
Max	**50.10**			**50.50**		
Min		**49.70**			**49.74**	
Source: TD (BPC), KHP (DGPC)						

Graph: Daily maximum, minimum and average frequency for the month of May, 2019

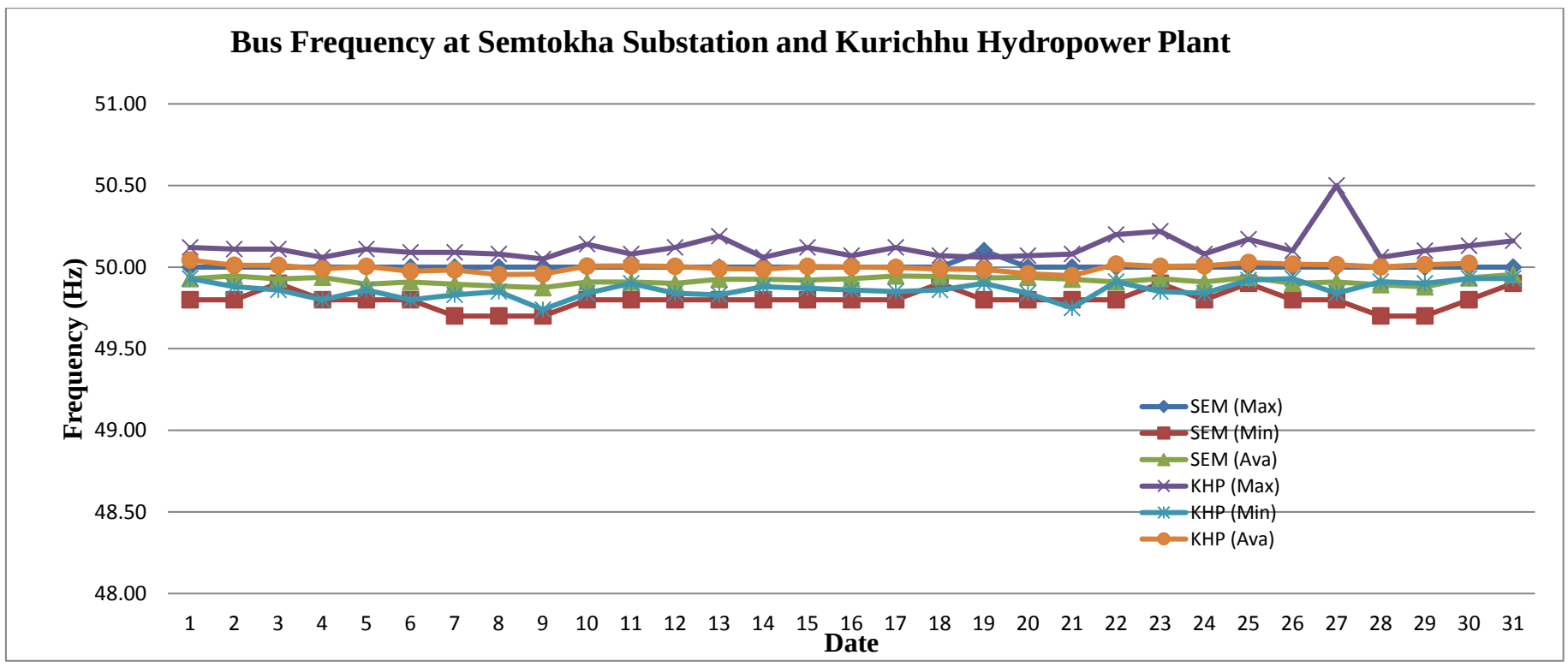
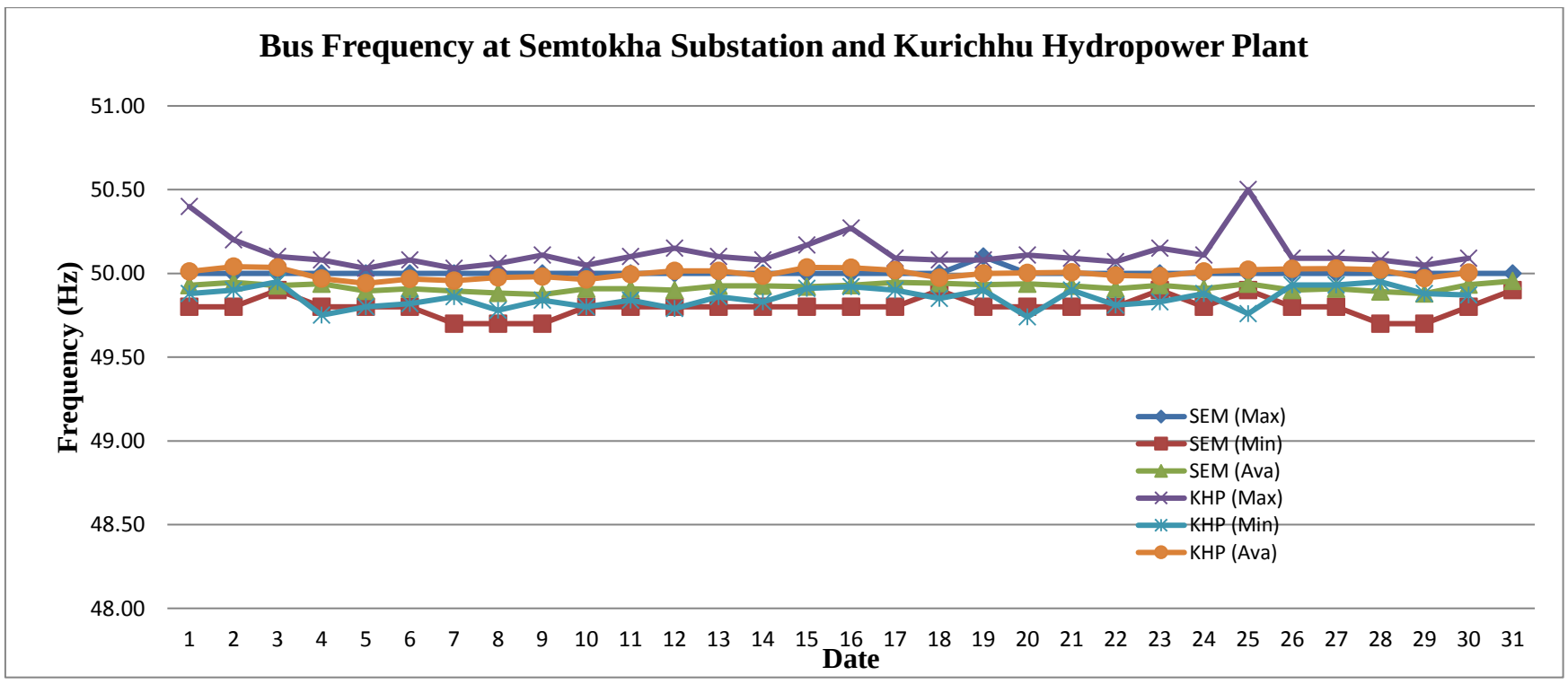


Table: Daily maximum, minimum and average frequency for the month of June, 2019

Jun-19	Bus Frequency at Semtokha Substation			Bus Frequency at Kurichhu Hydropower Plant		
Date	Max	Min	Ava	Max	Min	Ava
1	50.00	49.80	49.93	50.40	49.88	50.01
2	50.00	49.80	49.95	50.20	49.90	50.04
3	50.00	49.90	49.93	50.10	49.95	50.04
4	50.00	49.80	49.94	50.08	49.75	49.97
5	50.00	49.80	49.90	50.03	49.80	49.94
6	50.00	49.80	49.91	50.08	49.82	49.97
7	50.00	49.70	49.90	50.03	49.86	49.96
8	50.00	49.70	49.88	50.06	49.78	49.98
9	50.00	49.70	49.87	50.11	49.84	49.98
10	50.00	49.80	49.91	50.05	49.80	49.96
11	50.00	49.80	49.91	50.10	49.84	49.99
12	50.00	49.80	49.90	50.15	49.79	50.01
13	50.00	49.80	49.93	50.10	49.86	50.02
14	50.00	49.80	49.93	50.08	49.83	49.99
15	50.00	49.80	49.92	50.17	49.91	50.04
16	50.00	49.80	49.93	50.27	49.92	50.03
17	50.00	49.80	49.95	50.09	49.90	50.02
18	50.00	49.90	49.94	50.08	49.85	49.97
19	50.10	49.80	49.93	50.08	49.90	50.00
20	50.00	49.80	49.94	50.11	49.74	50.00
21	50.00	49.80	49.93	50.09	49.90	50.01
22	50.00	49.80	49.91	50.07	49.81	49.99
23	50.00	49.90	49.93	50.15	49.83	49.98
24	50.00	49.80	49.91	50.11	49.88	50.01
25	50.00	49.90	49.94	50.50	49.76	50.02
26	50.00	49.80	49.90	50.09	49.93	50.03
27	50.00	49.80	49.91	50.09	49.93	50.03
28	50.00	49.70	49.89	50.08	49.95	50.02
29	50.00	49.70	49.88	50.05	49.88	49.97
30	50.00	49.80	49.93	50.09	49.87	50.00
31	50.00	49.90	49.95	0.00	Error	Error
Max	**50.10**			**50.50**		
Min		**49.70**			**49.74**	
Source: TD (BPC), KHP (DGPC)						

Graph: Daily maximum, minimum and average frequency for the month of June, 2019



Annexure-IV

Table: Daily maximum, minimum and average Voltage for the month of April, 2019

Apr-19	Malbase Substation									Nangkhor Substation		
	400kV Bus Voltage (kV)			220kV Bus Voltage (kV)			66kV Bus Voltage (kV)			132kV Bus Voltage (kV)		
Date	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava
1	412.50	400.00	407.35	226.00	218.50	222.63	66.00	64.00	65.08	138.60	133.20	136.02
2	408.50	401.50	403.85	226.00	218.50	220.98	65.00	63.00	64.25	139.40	133.40	136.14
3	411.00	402.50	408.21	226.00	219.50	222.94	66.00	64.00	65.00	140.80	134.60	137.82
4	412.50	402.50	407.98	226.00	220.00	223.31	66.00	64.00	65.50	139.80	134.80	137.58
5	413.50	403.50	409.31	226.00	222.00	223.17	67.00	64.00	65.38	139.80	134.50	137.78
6	413.00	405.50	410.27	227.00	222.00	223.90	66.00	65.00	65.63	139.80	133.82	136.80
7	411.00	405.00	409.42	226.00	223.50	224.75	67.00	65.00	66.04	141.30	136.11	138.61
8	412.00	401.50	408.04	227.50	220.00	224.44	67.00	64.00	66.17	140.88	133.40	137.75
9	409.00	399.50	405.79	225.00	218.00	222.25	66.00	64.00	65.33	140.88	135.07	137.83
10	408.00	400.50	404.56	224.00	219.50	222.00	66.00	64.00	64.92	140.00	134.60	137.20
11	408.00	401.50	404.88	224.50	220.00	222.13	66.00	64.00	65.08	140.20	134.00	137.71
12	409.00	397.50	405.48	224.00	217.00	222.10	66.00	64.00	65.33	140.88	133.00	136.77
13	408.00	401.50	405.67	226.00	220.50	222.58	66.00	64.00	65.50	138.80	131.53	135.86
14	409.50	402.00	406.15	226.00	220.00	223.56	66.00	65.00	65.50	138.60	135.69	137.51
15	409.50	401.50	406.63	226.00	220.50	223.13	66.00	64.00	65.50	139.02	135.60	138.06
16	410.50	402.50	405.54	225.00	220.00	222.88	67.00	65.00	65.42	140.47	134.03	137.19
17	407.50	399.50	403.96	224.00	219.00	221.69	66.00	64.00	65.29	140.20	134.80	136.58
18	410.50	401.50	407.58	227.00	219.00	223.33	66.00	64.00	65.33	138.80	133.60	136.75
19	409.50	401.50	406.71	227.00	218.50	222.98	67.00	64.00	65.50	139.60	132.50	136.38
20	409.50	402.50	406.17	227.00	220.00	223.10	66.00	64.00	65.25	139.60	132.78	136.33
21	410.50	404.50	408.21	228.00	221.50	224.10	66.00	65.00	65.75	138.10	132.78	136.51
22	411.50	405.50	409.02	227.00	222.00	224.44	66.00	65.00	65.63	140.88	134.45	137.09
23	412.50	400.50	408.71	228.00	218.00	224.04	67.00	64.00	65.63	139.22	133.10	137.05
24	413.00	402.50	407.33	229.00	220.00	223.23	67.00	65.00	65.50	140.26	132.16	136.59
25	411.00	402.50	407.69	227.00	219.50	222.35	66.00	64.00	65.29	140.00	132.16	135.29
26	411.00	402.00	407.06	224.00	218.50	221.56	66.00	64.00	65.13	138.10	132.50	134.87
27	411.00	400.00	406.92	225.50	217.50	222.46	66.00	64.00	64.67	139.20	132.16	135.24
28	412.50	400.00	407.63	225.00	218.00	222.71	66.00	64.00	65.08	140.20	133.82	137.19
29	410.00	399.00	404.58	224.00	217.00	220.96	66.00	64.00	64.83	138.81	133.40	135.70
30	404.00	399.00	401.33	221.00	218.50	220.06	66.00	63.00	64.54	139.01	132.90	136.28
31	0.00	Error	Error	0.00	Error	Error	0.00	Error	Error	0.00	Error	Error
Max	**413.50**			**229.00**			**67.00**			**141.30**		
Min		**397.50**			**217.00**			**63.00**			**131.53**	
Source: TD, BPC												

Graph: Daily maximum, minimum and average Voltage for the month of April, 2019

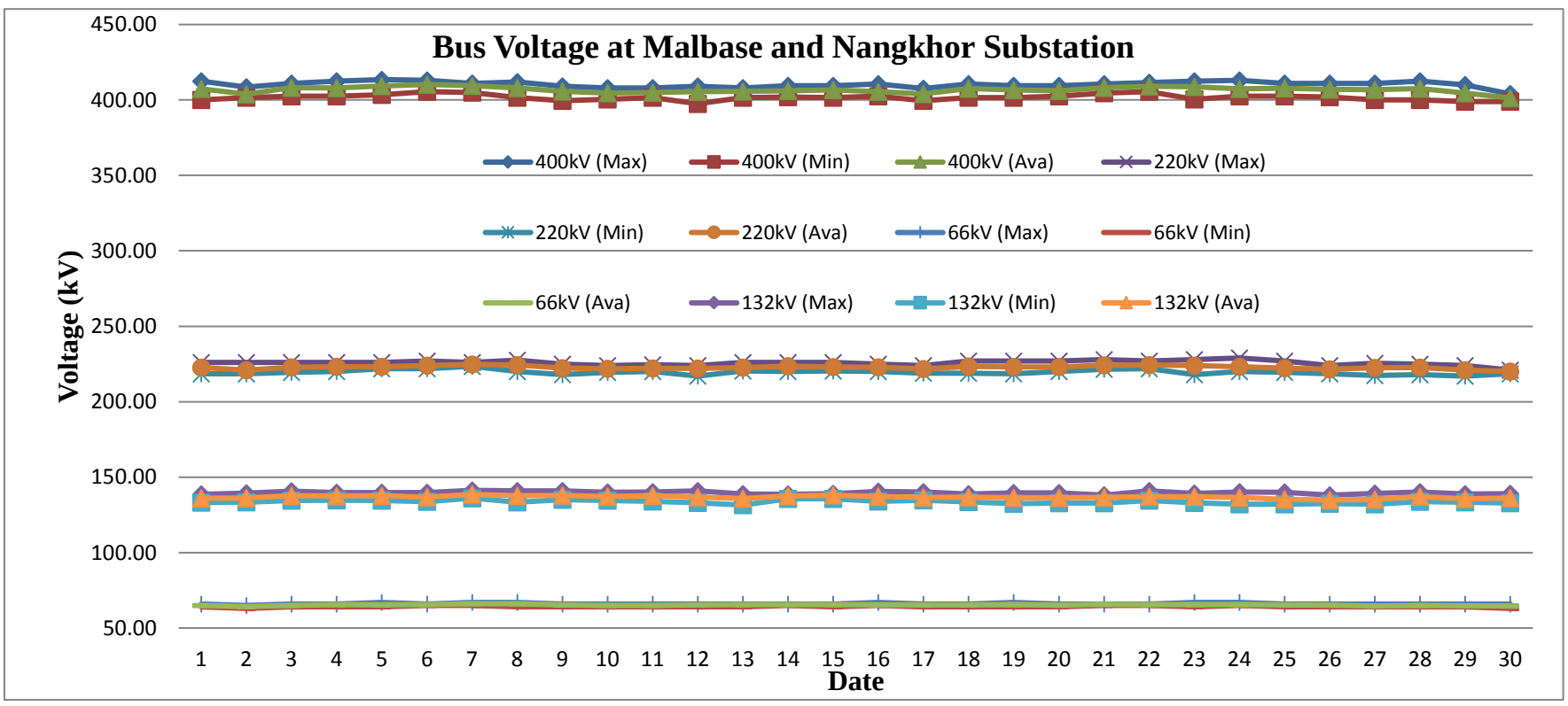


Table: Daily maximum, minimum and average Voltage for the month of May, 2019

May-19	Malbase Substation									Nangkhor Substation		
	400kV Bus Voltage (kV)			220kV Bus Voltage (kV)			66kV Bus Voltage (kV)			132kV Bus Voltage (kV)		
Date	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava
1	406.50	401.00	403.75	223.00	219.00	221.40	65.00	63.00	64.29	139.80	134.40	137.26
2	409.00	401.50	403.71	223.50	219.00	221.25	66.00	64.00	65.17	139.22	133.20	135.87
3	405.00	399.00	402.21	222.50	218.50	220.73	66.00	64.00	64.71	137.90	133.41	135.73
4	403.50	400.50	401.65	222.50	219.00	220.50	65.00	64.00	64.63	137.50	134.20	136.06
5	408.00	402.50	404.88	222.50	219.50	221.13	65.00	64.00	64.83	136.70	133.00	135.62
6	408.50	403.00	405.77	223.00	218.50	221.27	66.00	64.00	64.67	136.70	132.37	134.94
7	411.00	401.50	407.29	224.00	219.00	221.38	65.00	63.00	64.00	137.50	132.30	135.28
8	413.00	403.00	408.04	225.00	220.00	222.13	65.00	64.00	64.33	137.30	133.40	135.42
9	413.00	404.50	409.44	226.00	221.50	223.52	66.00	64.00	65.00	139.01	132.70	136.83
10	413.50	403.00	409.65	227.00	221.00	223.77	66.00	64.00	65.21	138.10	133.82	136.36
11	412.00	400.50	405.63	227.00	219.50	222.54	66.00	63.00	64.75	139.20	132.58	135.51
12	416.50	402.50	407.21	225.50	220.00	222.52	66.00	63.00	64.67	140.20	132.16	136.17
13	410.00	405.00	407.56	226.50	222.00	224.83	66.00	64.00	65.46	137.14	132.50	135.71
14	411.50	401.50	407.71	227.50	219.50	223.50	66.00	64.00	65.29	138.10	129.20	135.01
15	415.00	404.00	409.69	228.00	220.50	224.48	67.00	65.00	65.88	138.00	132.30	135.76
16	415.00	404.50	410.10	228.00	221.50	224.48	67.00	65.00	65.88	138.81	133.20	135.99
17	415.00	404.50	410.10	228.00	221.50	224.48	67.00	65.00	65.71	139.40	134.44	136.49
18	415.00	403.50	409.92	228.00	222.00	225.21	67.00	65.00	66.00	138.10	132.00	135.33
19	415.00	403.50	410.13	228.00	220.50	224.96	67.00	64.00	65.83	138.30	131.74	135.04
20	412.00	402.50	408.00	226.00	220.50	223.46	66.00	64.00	65.19	136.90	131.30	134.30
21	414.00	405.00	410.00	227.00	220.00	224.02	67.00	65.00	65.83	136.70	132.57	134.52
22	416.00	406.00	410.46	226.50	220.50	223.27	67.00	65.00	65.75	137.70	132.70	134.86
23	418.00	404.00	410.75	228.50	220.50	223.90	67.00	65.00	65.75	139.80	131.90	134.99
24	411.50	404.50	408.50	226.00	221.50	223.73	67.00	64.00	65.58	138.18	132.58	135.02
25	416.00	404.00	410.29	227.00	221.00	223.92	67.00	65.00	65.67	138.50	132.60	135.63
26	412.00	403.00	408.02	226.00	220.00	223.42	67.00	64.00	65.71	138.10	133.20	135.98
27	411.00	401.00	405.88	226.00	219.00	221.88	67.00	64.00	65.13	137.70	130.71	134.20
28	411.00	404.50	407.19	226.00	220.50	222.35	66.00	65.00	65.25	136.50	131.74	134.31
29	413.50	404.50	409.54	226.50	220.00	223.00	65.00	65.00	65.00	136.50	131.74	134.17
30	413.00	406.00	409.25	226.00	222.00	223.67	66.00	65.00	65.83	136.90	130.70	134.03
31	414.50	406.50	410.52	227.00	220.00	224.17	66.00	64.00	65.58	138.10	131.50	134.71
Max	**418.00**			**228.50**			**67.00**			**140.20**		
Min		**399.00**			**218.50**			**63.00**			**129.20**	
Source: TD, BPC												

Graph: Daily maximum, minimum and average Voltage for the month of May, 2019

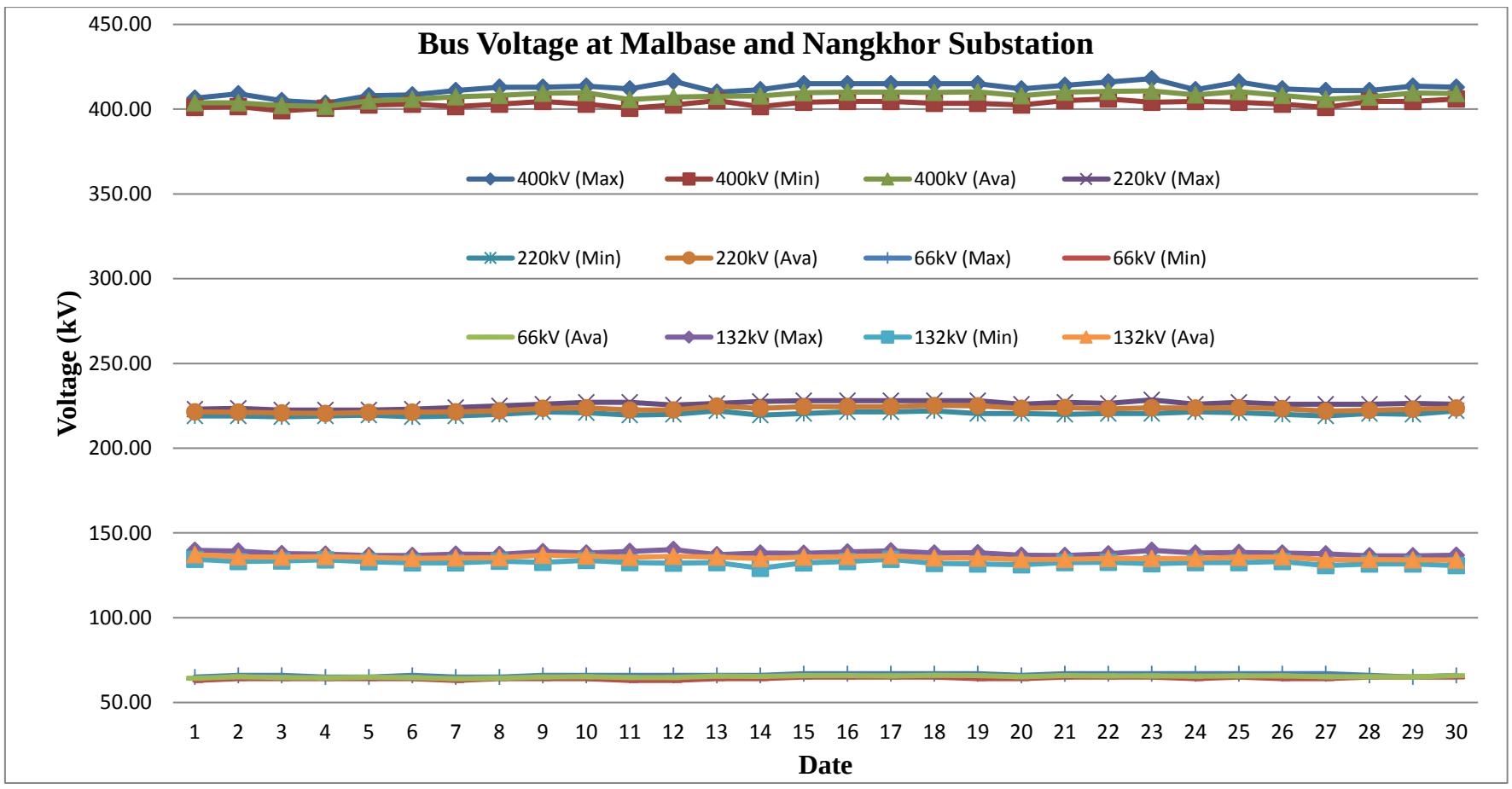
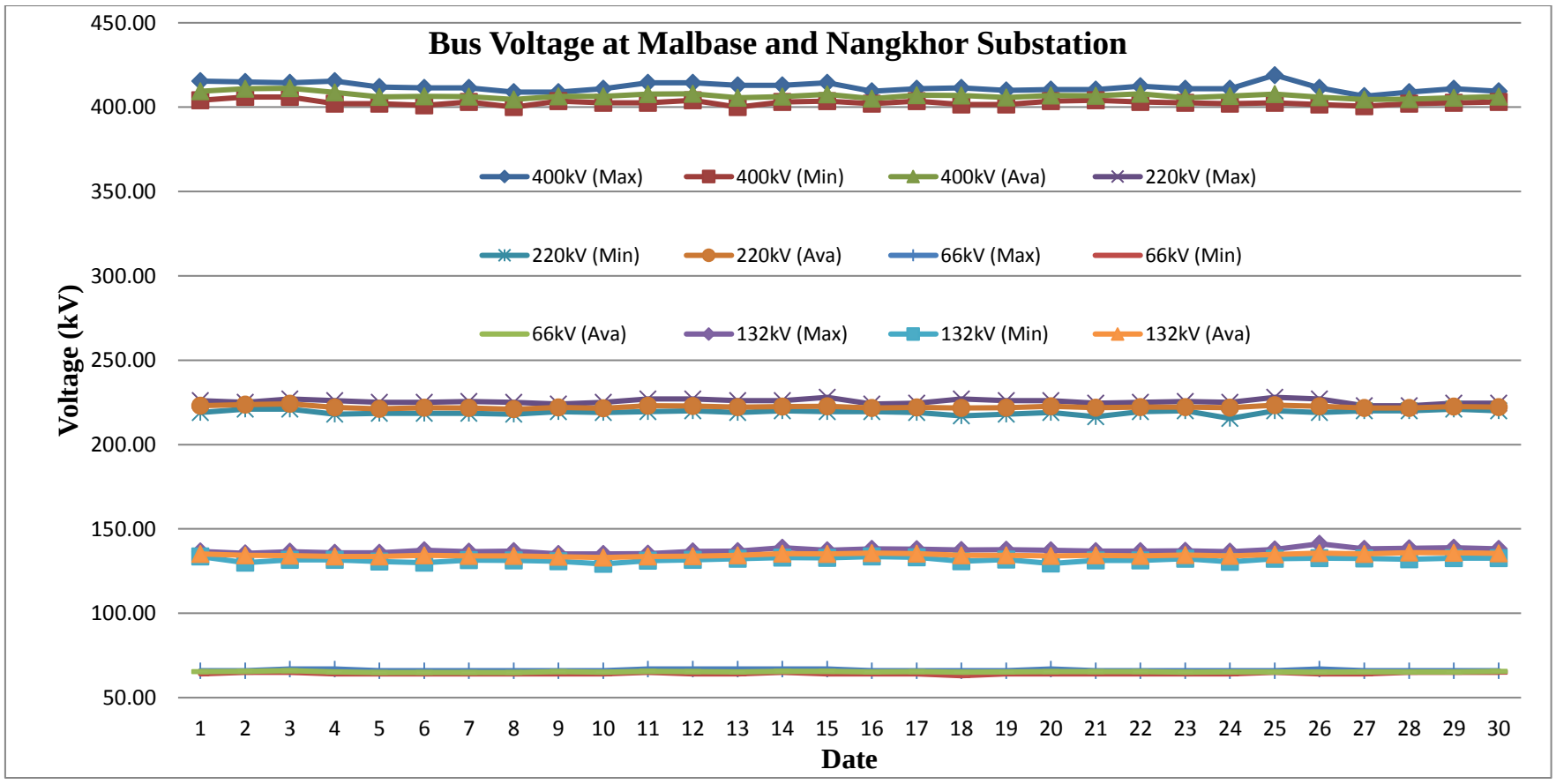


Table: Daily maximum, minimum and average Voltage for the month of June, 2019

Jun-19	Malbase Substation									Nangkhor Substation		
	400kV Bus Voltage (kV)			220kV Bus Voltage (kV)			66kV Bus Voltage (kV)			132kV Bus Voltage (kV)		
Date	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava	Max	Min	Ava
1	415.50	404.00	409.46	226.00	219.00	223.00	66.00	64.00	65.42	136.70	133.60	135.19
2	415.00	406.00	411.00	225.00	221.00	223.75	66.00	65.00	65.58	135.60	130.06	134.29
3	414.50	406.00	411.21	227.00	221.00	224.13	67.00	65.00	66.00	136.50	131.75	134.24
4	415.50	402.00	408.73	226.00	218.00	222.00	67.00	64.00	65.25	135.90	131.70	133.75
5	412.00	402.00	406.13	225.00	218.50	221.25	66.00	64.00	64.88	135.90	130.70	133.74
6	411.50	401.00	406.46	225.00	218.50	221.81	66.00	64.00	64.92	137.30	130.00	134.41
7	411.50	403.00	406.27	225.50	218.50	221.69	66.00	64.00	64.92	136.52	131.54	134.04
8	409.00	400.00	404.65	225.00	218.00	220.96	66.00	64.00	64.88	136.90	131.30	134.01
9	409.00	403.50	406.38	224.00	219.50	222.08	66.00	64.00	65.33	135.27	130.90	133.53
10	411.00	402.50	406.40	225.00	219.00	221.58	66.00	64.00	65.00	135.20	129.25	133.05
11	414.50	402.50	407.75	227.00	219.50	223.08	67.00	65.00	65.50	135.40	131.12	133.70
12	414.50	404.00	407.83	227.00	220.00	222.88	67.00	64.00	65.42	136.70	131.70	133.93
13	413.00	400.00	405.50	226.00	219.00	222.13	67.00	64.00	65.21	136.90	132.40	134.38
14	413.00	403.00	406.25	226.00	220.00	222.56	67.00	65.00	65.54	138.81	133.00	135.34
15	414.50	403.50	407.56	228.00	219.50	222.69	67.00	64.00	65.50	137.30	132.90	135.10
16	409.50	402.00	405.04	224.00	219.50	221.67	66.00	64.00	65.29	138.18	133.60	135.61
17	411.00	403.50	407.04	224.50	219.00	222.08	66.00	64.00	65.42	138.10	133.19	135.29
18	411.50	401.50	406.96	227.00	217.00	221.71	66.00	63.00	65.08	137.50	130.90	134.36
19	410.00	401.50	405.75	226.00	218.00	221.92	66.00	64.00	65.17	137.70	131.90	134.34
20	410.50	403.50	406.88	226.00	219.00	222.71	67.00	64.00	65.33	137.30	129.46	133.98
21	410.50	404.00	406.71	224.50	216.50	221.85	66.00	64.00	65.33	136.94	131.33	134.42
22	412.50	403.00	407.98	225.00	219.50	222.27	66.00	64.00	65.33	136.90	131.30	134.02
23	411.00	402.50	405.58	225.50	220.00	222.13	66.00	64.00	65.08	137.10	132.30	134.53
24	411.00	402.00	406.65	225.00	215.50	221.92	66.00	64.00	65.25	136.53	130.50	133.96
25	419.00	402.50	407.71	228.00	220.00	223.33	66.00	65.00	65.29	137.90	132.36	134.90
26	411.50	401.50	405.85	227.00	219.00	222.65	67.00	64.00	65.13	141.20	132.70	135.65
27	406.50	400.50	404.54	223.00	220.00	221.67	66.00	64.00	65.17	138.18	132.50	135.18
28	409.00	402.00	404.81	223.00	220.00	221.63	66.00	65.00	65.17	138.60	132.00	135.95
29	411.00	402.50	405.63	224.50	221.00	222.50	66.00	65.00	65.17	138.80	132.70	135.88
30	409.50	403.00	406.21	224.50	220.00	222.25	66.00	65.00	65.50	138.18	132.70	135.44
31	0.00	Error	Error	0.00	Error	Error	0.00	Error	Error	0.00	Error	Error
Max	**419.00**			**228.00**			**67.00**			**141.20**		
Min		**400.00**			**215.50**			**63.00**			**129.25**	
Source: TD, BPC												

Graph: Daily maximum, minimum and average Voltage for the month of June, 2019



Annexure-V

Eastern Grid Outages

April, 2019

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	14-Apr	9:57	14-Apr	10:05	8	4.390	132kV Kurichu I/C	All feeders	Tripped on fault	Nill	Nganglam end	Grid failed form Nganglam ss.
2	17-Apr	3:15	17-Apr	3:35	20	2.560	132kV Kurichu I/C	All feeders	Tripped on fault	Nill	Rangia end	Grid failed from Rangai end.
3	17-Apr	5:56	17-Apr	6:03	7	3.160	132kV Kurichu I/C	All feeders	Tripped on fault	Nill	Nganglam end	Grid failed from Nganglam ss
4	19-Apr	20.19	19-Apr	20.35	16	7.180	132kV Kurichu I/C	All feeders	Tripped on fault	Nill	Tingtibi end	Grid fail from Tingtibi end.
5	22-Apr	4.20	22-Apr	4.31	11	2.800	132kV Kurichu I/C	All feeders	Tripped on fault	Nill	Tingtibi end	Grid fail from Tingtibi end.
6	22-Apr	5.10	22-Apr	5.15	5	3.610	132kV Kurichu I/C	All feeders	Tripped on fault	Nill	Tingtibi end	Grid fail from Tingtibi end.

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	14-Apr	9:57	14-Apr	10:05	0:08	2.55	132kV Incomer	All outgoing feeders	Tripped on fault	NA	Nganglam ss	Supply failed from Nganglam end
2	17-Apr	3:15	17-Apr	3:31	0:21	1.34	132kV Incomer	All outgoing feeders	Tripped on fault	NA	Rangia ss	Grid failed from Rangia
3	17-Apr	5:57	17-Apr	6:03	0:06	1.48	132kV Incomer	All outgoing feeders	Tripped on fault	NA	Nganglam ss	Supply failed from Nganglam end
4	19-Apr	20:19	19-Apr	20:35	0:16	4.43	132kV Incomer	All outgoing feeders	Tripped on fault	NA	Tingtibi ss	Supply failed from Tintibe end
5	22-Apr	4:20	22-Apr	4:34	0:14	1.42	132kV Incomer	All outgoing feeders	Tripped on fault	NA	Tingtibi ss	Grid failed from Tintibe end
6	22-Apr	5:10	22-Apr	5:15	0:05	1.58	132kV Incomer	All outgoing feeders	Tripped on fault	NA	Tingtibi ss	Grid failed from Tintibe end

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	14-Apr	09:58 hrs	14-Apr	10:08 hrs	10	27.34	132kV Nangkhor-Nganglam feeder	All Feeders	NA	-	Nganglam end	Supply failed from Nganglam Substation.
2	17-Apr	03:18 hrs	17-Apr	03:36 hrs	18	15.62	Main Grid	All Feeders	NA	-	Rangia Substation	Supply failed from Rangia Substation.
3	17-Apr	06:01 hrs	17-Apr	06:05 hrs	4	24.91	132kV Nangkhor-Nganglam feeder	All Feeders	NA	-	Nganglam end	Supply failed from Nganglam Substation.
4	19-Apr	20:22 hrs	19-Apr	20:35 hrs	13	-3.88	132kV Nangkhor-Nganglam	All Feeders	NA	relay 86 operated at our end.	Tingtibi end	Supply failed from Tintibi Substation.
5	22-Apr	04:22 hrs	22-Apr	04:36 hrs	14	5.68	132kV Nangkhor-Nganglam feeder	All Feeders	NA	-	Tingtibi end	Supply failed from Tintibi Substation .
6	22-Apr	05:15 hrs	22-Apr	05:35 hrs	20	31.82	132kV Nangkor-Deothang feeder	All Feeders	NA	Distance Relay operated at our end.	Nangkor-Deothang Line	
7	22-Apr	05:15 hrs	22-Apr	05:35 hrs	20	9.79	132kV Nangkhor-Nganglam feeder	All Feeders	NA	-	Tingtibi end	Supply failed from Tintibi Substation.

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
1	6-Apr	13:58	6-Apr	14:10	12	6.55	132kV DCCl	DCCL line	HP motor problem	86&O/C (50C)	DCCL	
2	6-Apr	20:19	6-Apr	20:27	8	2.35	132kV DCCl	DCCL line	HP motor problem	86&O/C (50C)	DCCL	Feeder tripped when HP Motor restarts after maintenance.
3	14-Apr	09:58	14-Apr	10:06	8	-27.36	132kV Nangkhor-Ngnaglam feeder	Nangkhor- Nganglam feeder	Tripped on fault	86& E/F	Nganglam end	
4	17-Apr	03:10	17-Apr	03:35	25	11.55	132kV Nangkhor-Nganglam feeder	All Feeders	Tripped on fault	86&O/C (50C)	Rangia end	Grid failed from Rangia end.
5	17-Apr	05:58	17-Apr	06:05	7	25.35	132kV Nangkhor-Nganglam feeder	Nangkhor- Ngnaglam feeder	Tripped on fault	General alarm	Nganglam end	Circuit Breaker tripped our end & charged after informing to bpso.
6	19-Apr	20:20	19-Apr	20:30	19	3.02	132kV Tingtibi-Nganglam feeder	All Feeders	Tripped on fault	O/C 86opted	Tingtibi end	
7	22-Apr	0420	22-Apr	04.33	13	-0.97	132kV Nangkhor-Ngnaglam feeder	Nangkhor- Ngnaglam feeder	Tripped on fault	Nill	Tingtibi end	Grid failed from Tingtibi Substation.
8	22-Apr	04:20	22-Apr	04:33	13	-1.29	132kV Tingtibi-Nganglam feeder	Tingtibi-Nganglam feeder	Tripped on fault	Nill	Tingtibi end	
9	22-Apr	05:10	22-Apr	05:14	4	-9.79	132kV Nangkhor-Nganglam feeder	Nangkhor- Ngnaglam feeder	Tripped on fault	Nill	Tingtibi end	Grid failed from Tingtibi Substation.
10	22-Apr	05:10	22-Apr	05:14	4	7.17	132kV Tingtibi-Nganglam feeder	Tingtibi-Nganglam feeder	Tripped on fault	Nill	Tingtibi end	

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
1	14-Apr	9:58	14-Apr	10:07	9	-14.2	132kV Deothang fdr	All Feeders	Tripped on fault	Nill	Ngangalm ss	Grid failed from Nganglam ss.
2	14-Apr	9:58	14-Apr	10:26	28	17.0	132kV Rangia fdr	All Feeders	Tripped on fault	OC &EF	Rangia end	CB opened at our end due to OC & EF.Closing code 1288 NLDC Thimphu,iIndia 465,nerldc 321.
3	17-Apr	5:58	17-Apr	6:02	4	-5.6	132kV Deothang fdr	All Feeders	Tripped on fault	Nill	Ngangalm ss	Grid failed from Nganglam ss.
4	19-Apr	20:19	19-Apr	20:50	31	32.5	132kV Deothang fdr	Deothang line	Tripped on fault	Nill	Tingtibi end	Grid failed from Tingtibi end.

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	14-Apr	7:04	14-Apr	7:28	24	1.16	220 kV Dagachu Line	220 kV Dagachu line	Earth Fault at B-phase	Main 1. R,Y,B phase tripped, Main 2. B- phase tripped.	main 1. 12 km main 2. 11.06km	
2	14-Apr	7:04	14-Apr	7:40	36	11.94	220 kV Tsirang Line	220 KV Tsirang Line	Earth Fault at B-phase	main 1. B-phase tripped at zone 1.	9.1 km	

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
1	14-Apr	07:04hrs	14-Apr	07:15hrs	15	26.2	220kV Tsirang-Jigmeling Line	Na	OC Bphase	Both Dis. Relay Main-I&II Operated	at the distance of 26.8km	Feeder test cahred and withstand.

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	6-Apr	03.20hrs	6-Apr	03.55hrs	35	-5.4	132kV Gel-Sal fdr	Non	Line fault	General Trip, B Phase trip, Zone 1 & Dist; 34.16km towards Salakati end.	Unknown	**bad weather**

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	14-Apr	9:58	14-Apr	10:08	10	35.14	Main grid	All feeders	NA	Nill	Nganglam ss	Grid failed from Nganglam end.
2	17-Apr	3:18	17-Apr	3:36	18	-31.54	132kV incomer Nangkor	Nangkhor, Deothang and Montonga line	Tripped on fault	Nill	Rangia ss	
3	17-Apr	3:18	17-Apr	4:46	28	30.02	132kV Motonga fdr	Deothang to Motonga Line	Tripped on fault	Nill	Nganglam ss	
4	17-Apr	6:01	17-Apr	6:05	4	16.2	132kV incomer Nangkor	Nangkor, Deothang and Montonga line	due to bad weather	Nill	Nganglam ss	Supply failed from Nganlam Ss
5	19-Apr	20:20	19-Apr	20:38	18	-42.77	132kV Incomer Nangkor	Nangkor, Deothang and Montonga line	Tripped on fault	Nill	Tingtibi ss	Grid failed from Tingtibi ss
6	19-Apr	20:20	19-Apr	20:50	30	-39.38	132kV Motonga fdr	Deothang to Motonga Line	Tripped on fault	Nill	Breaker trip from Nangkor end	
7	22-Apr	4:21	22-Apr	4:36	15	-22.9	132kV Incomer Nangkor	Nangkor to Deothang line	Tripped on fault	Nill	Tingtibi ss	Grid fail from Tingtibe. At our end all Breakers are in normal condition
8	22-Apr	4:21	22-Apr	4:31	10	21.67	132kV Motonga fdr	Deothang to Motonga Line	Nill	Nill	Breaker trip from deothang end	No relay operateand only the breaker got tripped.Charge the Breaker as per the instruction from Mrs.Tshering Yangzom (BPSO) and found normal.
9	22-Apr	5:11	22-Apr	5:20	9	-23.93	132kV I/C Nangkor	Nangkor to Deothang line	Unknown	Tripping relay 86 & distance relay	Breaker trip from deothang end	Tripping relay 86 & distance relay operate at Nangkor s/s.
10	22-Apr	5:11	22-Apr	5:16	5	22.9	132kV Motonga fdr	Deothang to Motonga Line	Tripped on fault	Nill	Deothang end	No relay operateand only the breaker got tripped.Charge the bkr as per the instruction from Mrs.Tshering Yangzom (BPSO) and found normal.

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	22-Apr	4:22hrs	22-Apr	4:36hrs	14	3.10	132kV Tingtibi I/C	132/33kV Yurmoo Ss		Nill	Tingtibi Ss	Supply was fail from Tingtibi S/s

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	19-Apr	20:26 Hrs	19-Apr	20:32 Hrs	6	20.700	132kV Tingtibi-Nanlglam Fdr.	132kV Tingtibi-Nanglam Feeder	Transient Fault	Relay Operation (Distatnce protection relay) :Fault Location=115.4 KM, Fault zone-3, Fault resistance=2.581 ohms IA=752A,IB=196.6A,IC=842.5A, VAN=49.90kV,VBN=73.98kV, VCN=42.37kV,	132kV Tingtibi - Nanglam Feeder	
2	22-Apr	04:22 Hrs	22-Apr	04:36 Hrs	14	21.760	132kV Tingtibi-Jigmeling Fdr.	132kV Tingtibi-Jigmeling Feeder	Over current	Relay operation (Over current relay P14D):IA=248.2A.IB=675.2A,IC=2444.6A, VAB=109.7kV,VBC=107.1kV,VCA=104.4kV,IN measured:192.A,IN derived:191.8A,VAN=76.26kV, VBN=50.46kV,VCN=78.22kV.	132kV Tingtibi - Jigmeling Feeder	
3	22-Apr	04:22 Hrs	22-Apr	04:38Hrs	16	21.760	132kV Tingtibi-Nanglam Fdr.	132kV Tingtibi-Nanglam Feeder	Transient Fault	Relay Operation(Distance protection relay) : Fault Location=102.3 KM, Fault zone-3, Fault resistance=8.719 ohms IA=668.8A,IB=81.93A,IC=161.5A, VAN=48.8kV,VBN=80.26k	132kV Tingtibi - Nanglam Feeder	
4	22-Apr	05:10 Hrs	22-Apr	05:14 Hrs	4	8.460	132kV Tingtibi-Nanlglam Fdr.	132kV Tingtibi-Nanglam Feeder	Transient Fault	Relay Operation(Distance protection relay) : Fault Location=123.6 KM, Fault zone-3, Fault resistance=4.087ohms IA=233.1A,IB=708A,IC=233.2A, VAN=48.8kV,VBN=80.26kV, VCN=78.43kV, Relay operation (Over current relay): IA=235A.IB=712.2A,IC=236.2A, VAB=109.9kV,VBC=107.2kV,VCA=139.4kV,IN measured:192.A,IN derived:191.8A,VAN=75.93kV, VBN=50.83kV,VCN=77.88kV.	132kV Tingtibi - Nanglam Feeder	

May, 2019

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	12.05.2019	21:18	12.05.2019	21:26	0:08	5.360	132kV kurichu I/C.	All Feeders	Tripped on fault	Nill	Tingtibi end	Grid failed from Tingtibi end
2	15.05.2019	7:49	15.05.2019	7:59	0:10	6.910	132kV kurichu I/C.	All Feeders	Tripped on fault	Nill	Tingtibi end	Grid failed from Tingtibi end

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	12/5/2019	21:20	12/5/2019	21:29	0:09	3.75	132kV Incomer	All outgoing feeders	Tripped on Fault	Nill	Tingtibi ss	Supply fail from Tingtibi s/s.
2	15/5/2019	7:49	15/5/2019	7:59	0:10	4.78	132kV Incomer	All outgoing feeders	Tripped on Fault	Nill	Tingtibi ss	grid fail from Tingtibi

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	12.05.2019	21:22 hrs	12.05.2019	21:30 hrs	0:08	-4.2	Main Grid	All Feeders	NA	Distance Relay operated at our end showing fault at a distance of 26.52kM towards Nganglam, Zone-1	Location No. ND-14,15,16 & 21	
2	15.05.2019	07:51 hrs	15.05.2019	08:03 hrs	0:12	18.75	Main Grid	All Feeders	NA	-	Tintibi ss & Deothang Substation	None of the CB operated at our 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	12.05.2019	21:22	12.05.2019	21:26	0:04	45.83	132kV Motonga fdr	Deothang to Motonga Line	Due to bad weather condition	Distance relay	Deothang-Motonga line	Feeder tripped with the operation of distance relay with a fault distace of 95.419km fault Loop: L1-L2.
2	15.05.2019	7:47	15.05.2019	8:00	0:13	-32.11	132kV Nangkor incomer	Nangkor to Deothang line	Tripped on fault	Nill	Tingtibi substation	Supply fail from Tingtibi substation. At that time both the end breaker are in normal condition.
3	15.05.2019	7:47	15.05.2019	8:00	0:13	29.12	132kV Motonga fdr	Motonga fdr	Overcurrent on Y Phase and Earthfault	Z2 & Z3 operated,R,Y,B trip, Fault dist.=-1km, Fault loop= L2-L3	Motanga end	

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
1	06.05.2019	09;58	06.05.2019	10:00	0:02	0.486	5MVA Transformer-I	5MVA Transformer-I	Lightning Arrester Punctured	86&O/C (50A)	33kV DrukGYP Fdr	
2	12.05.2019	21:19	12.05.2019	21:28	0:09	5.11	Main Grid	Nangkor	Tripped on fault	O/C & 86 opted. Trip Zone-1 Dst. 11.53km Tripped ABC, Fault in Zone 1	Nangkhor-Nganglam Line	
3	15.05.2019	07:48	15.05.2019	08:05	0:17	0.61	132kV Nangkhor	Nangkhor	Tripped on fault	O/C & 86 opted. Trip Zone-1 Dst. 20.83km Tripped B-Ph, Fault in Zone 1	Nangkhor-Nganglam Line	
4	15.05.2019	07:48	15.05.2019	08:19	0:31	18.72	132kV Tingtibi	Tingtibi	Tripped on fault	Directional O/C(67C) opted.	Tingtibi- Ngnaglam Line	No Fault Values are recorded in Relay

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
1	5/26/2019	10:03	5/26/2019	10:25	0:22	37.5	132kV Rangia	Rangia line	Auto tripped	E/F	Motanga ss	

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	22.05.2019	6:46	22.05.2019	7:04	0:18	1.98	132 kV Tingtibi line	132kV Tingtibi line	Over current	Main 1. R, phase tripped, Main 2. R,Y, B- phase tripped.	Main1: 15.7 km Main2: 18.6km	
2	22.05.2019	6:46	22.05.2019	7:13	0:27	1.73	132kV Gelephu line	132kV Gelephu line	Over current	R Phase tripped at both main1 and main2.	Main1: 19.4km Main2: 13.49km	
3	22.05.2019	16:35	22.05.019	16:44	0:09	15	132kV Tingti bi line	132kV tingtibi line	Earth Fault at R-phase	R, Y, B-phase tripped both at main 1 & main 2.	main1: 15.7km main2: 18.6km	
4	29.05.2019	11:07	29.05.2019	11:21	0:14	-0.68	220kV Dagapela Line	Dagapela SS & 220 kV Dagapela Line	Over current	R, Y, B-phase tripped both at main 1 & main 2.	Main1: 15.7km Main2: 18.6km	

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	16.05.2019	19.15hrs	16.05.2019	20.25hrs	1:10	-5.2	132kV Gel-Sal fdr	Gelephu substation	Bad weather	General Trip, B Phase trip, Zone 1 & Dist; 17.12km towards Salakati end.	Salakati line	Heavy Rain, thunder & lightning (Supply was back feeded from Jigmeling)
2	20.05.2019	21.50hrs	20.05.2019	22.12hrs	1:22	-9.4	132kV Gel-Sal fdr	Gelephu substation	Bad weather	General Trip, R & B Phases trip, Zone 1 & Dist; 6.2km towards Salakati end.	Salakati line	Heavy Rain, thunder & lightning (Supply was back feeded from Jigmeling)

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	22.05.2019	04:22hrs	22.05.2019	04:36hrs	0:14	3.10	132kV Tingtibi I/C	132/33kV Yurmoo Ss	Transist fault	Nill	Tingtibi Ss	Supply was fail from Tingtibi S/s
2	22.05.2019	6:45hrs	22.05.2019	6:55hrs	0;10	4.80	132kV Tingtibi I/C	132/33kV Yurmoo Ss	Transist fault	Nill	Tingtibi Ss	Supply was fail from Tingtibi S/s
3	23.05.2019	5:16hrs	23.05.2019	5:25hrs	0;09	3.40	132kV Tingtibi I/C	132/33kV Yurmoo Ss	Grid fall	Nill	Tingtibi Ss	Supply was fail from Tingtibi S/s

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	5/10/2019	07:54 Hrs	5/10/2019	08:10Hrs	0:16	16.300	132kV Tingtibi-Nanglam Fdr.	132kV Tingtibi-Nanglam Feeder	Transient Fault	Relay operation (Directional O/C & E/F relay): Triped .	132kV Tingtibi - Nanglam Feeder	
2	5/10/2019	07:55Hrs	5/10/2019	08:03 Hrs	0:08	24.000	132kV Tingtibi- Jigmeling Fdr.	132kV Tingtibi-Jigmeling Feeder	Transient Fault	Directional O/C & E/F relay: Triped phase-N,Start phase-N,E/F-1 start IN1>12,E/F-1 Trip IN1>2,System frequency-50.04 HZ	132kV Tingtibi - Jigmeling Feeder	
3	5/12/2019	21:17Hrs	5/12/2019	21:22Hrs	0:05	23.070	132kV Tingtibi-Nanglam Fdr.	132kV Tingtibi-Nanglam Feeder	Transient Fault	(Distance Relay):System Frequency:50.02HZ,Fault duration:80.11msRelay trip time:0.00ms,Fault Loacation:92.91KM	132kV Tingtibi - Nanglam Feeder	
4	5/15/2019	07:47Hrs	5/15/2019	8:14Hrs	0:27	0.030	132kV Tingtibi-Nanglam Fdr.	132kV Tingtibi-Nanglam Feeder	Transient Fault	(Distance Relay):Fault Loacation:100.6KM	132kV Tingtibi - Nanglam Feeder	
5	5/22/2019	06:45Hrs	5/22/2019	06:55Hrs	0:10	4.250	132kV Tingtibi-Nanglam Fdr.	132kV Tingtibi-Nanglam Feeder	Transient Fault	Directional O/C & E/F relay):Active Group-1,System frequency:49.96HZ,IA=32.88	132kV Tingtibi - Nanglam Feeder	
6	5/22/2019	06:45Hrs	5/22/2019	07:00Hrs	0:15	9.000	132kV Tingtibi-Jigmeling Fdr.	132kV Tingtibi-Jigmeling Fdr	Transient Fault	Distance relay :Trip-R phase,Start phase-AN,Trip phase-A ,Fault Location=40.34KM, Fault zone-1	132kV Tingtibi - Jigmeling Feeder	
7	5/22/2019	16:30Hrs	5/22/2019	16:38Hrs	0:08	16.000	132kV Tingtibi-Jigmeling Fdr.	132kV Tingtibi-Jigmeling Fdr	Transient Fault	Distance protection relay :Trip phase-ABC,Start phase-ABCN,Fault Location=37.10KM, Fault zone-1, Fault duration:78.37ms,Relay trip time-80.03ms	132kV Tingtibi - Jigmeling Fdr	
8	5/23/2019	05:15Hrs	5/23/2019	05:20Hrs	0:05	3.520	132kV Tingtibi-Nanglam Fdr.	132kV Tingtibi-Nanglam Feeder	Transient Fault	Distance protection relay Actve Group-1 Location=69.98KM, Fault zone-2, Fault duration:184.6ms,Relay trip resistance:1.735ohms (Directional O/C & E/F relay):Trip phase:N,Earth fault-1 start-IN1>12,Earth fault-1 Trip IN1>2,Active Group-1,System frequency:50.05HZ	132kV Tingtibi - Nanglam Feeder	
9	5/23/2019	05:15Hrs	5/23/2019	05:25Hrs	0:10	10.000	132kV Tingtibi-JigmelingFdr.	132kV Tingtibi-Jigmeling Feeder	Transient Fault	(Directional O/C & E/F relay):Trip phase:N,Earth fault-1 start-IN1>12,Earth fault-1 Trip IN1>2,Active Group-1,System frequency:50.05HZ,	132kV Tingtibi - Jigmeling Feeder	

June, 2019

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	07.06.19	10:41	07.06.19	11:01	0:20	3.090	132kV Incommer	All Feeders	Tripped on fault	Nill	Rangia end	Grid failed from Rangia end
2	25.06.19	7:57	25.06.19	8:17	0:20	6.0100	132kV Incommer	All Feeders	Tripped on fault	OC operated at Kurichu end	Kurichu end	Supply failed from kurichu end.
3	26.06.19	4:42	26.06.19	5:08	0:26	2.550	132kV Incommer	All Feeders	Tripped on fault	Nill	Salakati	Grid failed from Salakati.
4	26.06.19	5:49	26.06.19	5:51	0:02	3.550	132kV Incommer	All Feeders	Tripped on fault	Nill	Salakati	Grid failed from Salakati.
5	26.06.19	6:50	26.06.19	6:59	0:09	6.330	132kV Incommer	All Feeders	Tripped on fault	Nill	Kurichu end	Supply failed fror Kurichu
6	28.06.19	9:07	28.06.19	9:21	0:14	3.780	132kV Incommer	All Feeders	Tripped on fault	Nill	Deothang end	Due to Disc insulator punctured at Deothang Ss.
7	29.06.19	6:40	29.06.19	6:48	0:08	5.79	132kV Incommer	All Feeders	Tripped on fault	EF operated at Kurichu end	Kurichu end	Supply failed from Kurichu due to E/F at Kurichu end.

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	7.06.2019	10:41	7.06.2019	11:01	0:20	1.86	132kV Incomer	All feeders	Tripped on fault	NA	Rangia end	Grid failled from rangia
2	25.06.2019	7:57	25.06.2019	8:17	0:20	3.04	132kV Incomer	All feeders	Tripped on fault	NA	Kurichu end	Grid failed from Kurichu due to O/C with T- 86 relay operated at Kurichu end
3	26.06.2019	4:42	26.06.2019	5:08	0:26	1.42	132kV Incomer	All feeders	Tripped on fault	NA	Salakati end	Grid failed from Salakati
4	26.06.2019	5:49	26.06.2019	5:51	0:02	1.42	132kV Incomer	All feeders	Tripped on fault	NA	Salakati end	Grid failed from Salakati
5	26.06.2019	6:50	26.06.2019	7:03	0:13	3.36	132kV Incomer	All feeders	Tripped on fault	NA	Salakati end	Supply failed from kurichu end.
6	28.06.2019	9:05	28.06.2019	9:16	0:11	1.87	132kV Incomer	All feeders	Tripped on fault	NA	Deothang end	Supply failed from Deothang end dur to disc punctured on 132kV Nangkhor line.
7	29.06.2019	6:40	29.06.2019	6:48	0:08	3.25	132kV Incomer	All feeders	Tripped on fault	NA	Kurichu end	Supply failed from kurichu end.

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
Motanga Substation is bypassed through ERS tower												

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	07.06.2019	10:43 hrs	07.06.2019	11:01 hrs	0:18	60.44	Main Grid	All feeders	-	-	Rangia Substation	Supply failed from Rangia Substation.
2	26.06.2019	04:41 hrs	26.06.2019	04:55 hrs	0:14	10.29	132kV Nangkor-Nganglam	Nangkor-Nganglam line	NA	Distance relay 86 trip relay operated at our end	Nangkor-Nganglam line	
3	26.06.2019	05:50 hrs	26.06.2019	05:55 hrs	0:05	30.16	132kV Nangkor-Deothang	Nangkor-Deothang line	NA	Distance relay & 86 trip relay operated at our end	Nangkor-Deothang	
4	28.06.2019	09:03hrs	28.06.2019	09:08 hrs	0:05	56.12	Main Grid	All feeders	NA	-	Tintibi Substation	Supply failed from Tintibi Substation & Deothang Substation.
5	28.06.2019	09:08 hrs	28.06.2019	09:11 hrs	0:03	56.12	132kV Nangkor-Nganglam	All feeders	NA	Distance relay & 86 trip relay operated at our end	Nangkor-Nganglam line	
6	28.06.2019	09:08 hrs	28.06.2019	09:15 hrs	0:07	-60.37	132kV Kurichu-Nangkor	All feeders	NA	Distance relay & 86 trip relay operated at our end	Kurichu-Nangkor line	
7	28.06.2019	09:08 hrs	28.06.2019	12:35 hrs	0:28	3.7	132kV Nangkor-Deothang	All feeders	Insulator punctured at their end on 'B' Phase of Nangkor-Deothang feeder.		Deothang Substation	
8	15.05.2019	07:51 hrs	15.05.2019	08:03 hrs	0:12	18.75	Main Grid	All Feeders	NA	-	Tintibi ss & Deothang Substation	None of the CB operated at our 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	03.06.2019	17:22	03.06.2019	17:40	0:18	-50.72	132 kV Nangkhor Incomer	Deothang - Nangkhor fdr	Tripped on fault	Non Dir.O/C ,E/F(50 N) & 86 relay optd.	Deothang-Nangkhor	
2	03.06.2019	18:09	03.06.2019	18:16	0:07	-39.13	132 kV Nangkhor Incomer	Deothang - Nangkhor fdr	Tripped on fault	Non Dir.O/C ,E/F(50 N) & 86 relay optd.	Deothang-Nangkhor	
3	07.06.2019	10:41	7.6.2019	11:02	0:21	57.56	132kV Deothang-Rangia	Deothang substation	Tripped on fault	Zone 1 2 3 operated at Deothang with a distance of 6.37km	Deothang to Motanga/Rangia	
4	26.06.2019	5:49	26.06.2019	6:00	0:11	-30.35	132kV Nangkhor Incomer	Nangkhor to Deothang	Tripped on fault	_	Salakati end	Grid fail from Salakati(India)
5	26.06.2019	5:49	26.06.2019	6:13	0:24	28.08	132kV Deothang-Rangia	Deothang -Rangia	Tripped on fault	Zone 1 2 3 operated at Deothang with a distance of 13.06km, Fault loop: L1-L2	Deothang-Rangia	
6	27.06.2019	19:12	27.06.2019	19:17	0:05	59.15	132kV Nangkhor Incomer	Nangkhor to Deothang	Tripped on fault	86 relay opt	Nangkhor-Deothang	
7	28.06.2019	9:02	28.06.2019	12:44	0:32	-56.05	132kV Nangkhor Incomer	Nangkhor to Deothang	Disc insulator punctured	Zone 1 opt, 86 opt and 50N opt.	Nangkhor-Deothang	
8	28.06.2019	9:03	28.06.2019	10:06	0:55	53.96	132kV Rangia	Deothang to Rangia	Tripped on fault	Zone I,II & III opt, RYB tripped, Fault dist: 0.49594km, Fault Loop: L3-N	Deothang-Rangia	

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
1	03.06.2019	10:50	03.06.2019	11:01	0:11	23.11	132kV Tingtibi	Nganglam-Tingtibi	Tripped on fault	67N & 86opted.	Nganglam-Tingtibi Line	No Supply Intteruption to Cunsumers.
2	03.06.2019	13:15	03.06.2019	13:22	0:07	12.54	132kV Tingtibi	Nganglam-Tingtibi	Tripped on fault	67N & 86opted.	Nganglam-Tingtibi Line	No Supply Intteruption to Cunsumers.
3	17.06.2019	03:30	17.06.2019	03:42	0:12	18.51	132kV Tingtibi	Nganglam-Tingtibi	Tripped on fault	O/C & 86opted. DPR opted.	Nganglam-Tingtibi Line	
4	17.06.2020	04:01	17.06.2020	07:15	0:14	16.45	132kV Tingtibi	Nganglam-Tingtibi	Tripped on fault	O/C & 86opted. DPR opted.	Nganglam-Tingtibi Line	
5	25.06.2019	11:20	25.06.2019	12:13	0:53	21.16	132kV Tingtibi	Nganglam-Tingtibi	Tripped on fault	O/C & 86opted. DPR opted.	Nganglam-Tingtibi Line	
6	26.06.2019	04:41	26.06.2019	04:50	0:09	14.58	Nganglam-Tingtibi/Nangkhor-Nganglam	Nganglam SS	Tripped on fault	Nill	Salakati end	Grid failed from both Sources.
7	26.06.2019	05:50	26.06.2019	05:53	0:03	33.91	Nganglam-Tingtibi/Nangkhor-Nganglam	Nganglam SS	Tripped on fault	Nill	Salakati end	Grid failed from both Sources.
8	28.06.2019	09:02	28.06.2019	09:07	0:05	1.58	Nganglam-Tingtibi/Nangkhor-Nganglam	Nganglam SS	Tripped on fault	Nill	Salakati end	Grid failed from both Sources.
9	28.06.2019	09:07	28.06.2019	09:10	0:03	1.58	Nangkhor-Nganglam	Nangkhor-Nganglam	Disc insulator punctured	O/C & 86opted.	Deothang end	

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	30.06.2019	10:26	30.06.2019	11.41	15	177.400	400kV Alipurduar Ckt.2	line segment	Direct trip (DT) received from Alipurduar	main 1, R,Y ,B phase tripped	line segment.	
2	30.06.2019	10:26	30.06.2019				400kV Mangdichu Line 1	Line segment	Direct trip (DT) received from Alipurduar	main 1 R&Y phase tripped	Line segment	
3	30.06.2019	10:26	30.06.2019	12:23	57	178.160	400kV Mangdichu line 2	line segment	Direct trip (DT) received from Alipurduar	main1 R&Y phase pick up	Line segment	
4	22.05.2019	6:46	22.05.2019	7:04	8	1.98	132 kV Tingtibi line	132kV Tingtibi line	Over current	Main 1. R, phase tripped, Main 2. R,Y, B- phase tripped.	Main1: 15.7 km Main2: 18.6km	
5	22.05.2019	6:46	22.05.2019	7:13	27	1.73	132kV Gelephu line	132kV Gelephu line	Over current	R Phase tripped at both main1 and main2.	Main1: 19.4km Main2: 13.49km	
6	22.05.2019	16:35		16:44	9	15	132kV Tingti bi line	132kV tingtibi line	Earth Fault at R-phase	R, Y, B-phase tripped both at main 1 & main 2.	main1: 15.7km main2: 18.6km	
7	29.05.2019	11:07	29.05.2019	11:21	14	-0.68	220kV Dagapela Line	Dagapela SS & 220 kV Da	Over current	R, Y, B-phase tripped both at main 1 & main 2.	Main1: 15.7km Main2: 18.6km	

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
1	14.06.2019	13:30hrs	14.06.2019	14:25hrs	55	Grid fail, Non of the 220kV Breaker opened at Tsirang end. As per the information collected from NLDC the cause of grid failure is due to the Machine /Unit tripped						
2	25.06.2019	03:14hrs	25.06.2019	03:20hrs	6	28.7	220kV Tsirang-Jigmeling	Dhajay Subsation	OC at R and Bphase	Distance relay main-I operated (Z1/Z1B) 29.2km	Line segnment	
3	25.06.2019	03:22hrs	25.06.2019	05:12hrs	50	27.2	220kV Tsirang-Jigmeling	Dhajay Subsation	OC at R and Bphase	Distance relay Main - Ioperated (Z1/Z1B) 23.8km	Line segnment	
4	25.06.2019	05:20hrs	25.06.2019	07:15hrs	55	0.12	220kV Tsirang-Jigmeling	Dhajay Subsation	OC at Bphase	Distance relay Main-I operated (Z1/Z1B) 10.9km	Line segnment	

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	11.06.2019	02.32hrs	11.06.2019	10.25hrs	57	8.2	132kV Gel-Sal fdr	Gelephu substation	Bad weather condition	General Trip,Y and B Phase trip, Zone 1 & Dist; 37.96km towards Salakati end.	Salakati feeder	
2	24.06.2019	06.50hrs	24.06.2019	07.32hrs	42	3.6	132kV Gel-Sal fdr	Gelephu substation	Bad weather condition	B Phase trip, Zone 1,REL 670,differential protection relay.	Salakati feeder	Supply extended from jigmeling.
3	25.06.2019	03.18hrs	25.06.2019	04.12hrs	54	24.8	132kV Gel-Sal fdr	Gelephu substation	Bad weather condition	General Trip, R and Y Phase trip, Zone 4.	Salakati feeder	Supply extended from jigmeling.

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	03.06.2019	10:50hrs	03.06.2019	10:55hrs	5	3.60	132kV Tingtibi I/C	132/33kV Yurmoo Ss	Grid fail	Nill	Tingtibi Ss	
2	03.06.2019	13:15hrs	03.06.2019	13:19hrs	4	2.90	132kV Tingtibi I/C	132/33kV Yurmoo Ss	Grid fail		Tingtibi Ss	
3	14.06.2019	13:35hrs	14.06.2019	14:02hrs	27	2.30	132kV Tingtibi I/C	132/33kV Yurmoo Ss	Grid fail	86 relay optd with the V>1 alarm,System freq. 49.96Hz Measure value VAN=79.95kV, VBN=80.44kV, VCN=79.59kV.	Tingtibi Ss & Yurmoo also	
4	25.06.2019	11:22hrs	25.06.2019	11:35hrs	13	4.00	132kV Tingtibi I/C	132/33kV Yurmoo Ss	Grid fall	Nill	Tingtibi Ss	

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	6/3/2019	10:49 Hrs	6/3/2019	11:00Hrs	11	23.200	132kV Tingtibi-Nanglam Fdr.	132kV Tingtibi-Nanglam Feeder	Bad weather	(Micom-P14D) E/F ,Trip Phase N	132kV Tingtibi - Nanglam Feeder	
2	6/3/2019	10:49 Hrs	6/3/2019	10:56Hrs	7	27.000	132kV Tingtibi-Jigmeling Fdr.	132kV Ting-Jigmeling Feeder	Bad weather	(Micom P14D) E/F, Trip Phase N	132kV Tingtibi - Jigmeling Feeder	
3	6/3/2019	13:15 Hrs	6/3/2019	13:21 Hrs	6	15.900	132kV Tingtibi-Nanglam Fdr.	132kV Tingtibi-Nanglam Feeder	Bad weather	Start pahse AN,Zone-1.Fault location:XY 34.58KM	132kV Tingtibi - Nanglam Feeder	
4	6/3/2019	13:15 Hrs	6/3/2019	13:19 Hrs	4	19.000	132kV Tingtibi-Jigmeling Fdr.	132kV Ting-Jigmeling Feeder	Bad weather	(Micom P14D) E/F, Trip Phase N	132kV Tingtibi - Jigmeling Feeder	
5	6/14/2019	13:28Hrs	6/14/2019	13:55Hrs	27	13.240	132kV Tingtibi-Nanglam Fdr.	132kV Tingtibi-Nanglam Feeder	Transient Fault	Start pahse ABC,Over voltage start V >1,Zone-1.Trip phase R,Y,B.	132kV Tingtibi - Nanglam Feeder	At same Time 132kV Tingtibi-Jigmeling supply fialed from Jigmeling Substation.
6	6/25/2019	01:21 Hrs	6/25/2019	01:35Hrs	14	29.000	132kV Tingtibi-Jigmeling Fdr.	132kV Ting-Jigmeling Feeder	Bad weather	Start pahse ACN,Zone-3.Fault Loaction:44.75KM.& (Micom P14D) Dirctional OC/EF optd.	132kV Tingtibi - Jigmeling Feeder	
7	6/25/2019	01:50 Hrs	6/25/2019	01:58Hrs	8	29.000	132kV Tingtibi-Jigmeling Fdr.	132kV Ting-Jigmeling Feeder	Bad weather	Trip Phasr-ABC ,Zone-1.Fault Loaction:35.75KM.& (Micom P14D) Dirctional OC/EF start IN1>12.	132kV Tingtibi - Jigmeling Feeder	
8	6/25/2019	02:05 Hrs	6/25/2019	05:33Hrs	28	29.000	132kV Tingtibi-Jigmeling Fdr.	132kV Ting-Jigmeling Feeder	Bad weather	Trip Phasr-ABC ,Zone-1.Fault Loaction:16.20 KM.& (Micom P14D) Dirctional OC/EF: start phase ABN,Start IN1>1.E/F statrt IN1>12.	132kV Tingtibi - Jigmeling Feeder	
9	6/25/2019	11:22 Hrs	6/25/2019	11:26Hrs	4	24.000	132kV Tingtibi-Jigmeling Fdr.	132kV Ting-Jigmeling Feeder	Transient Fault	(Micom P442) Distance protection relay: Fault phase ABN,Active Gr-1,Fault zone-None	132kV Tingtibi - Jigmeling Feeder	
10	6/25/2019	11:22 Hrs	6/25/2019	11:35Hrs	13	19.250	132kV Tingtibi-Nanglam Fdr.	132kV Ting-Nanglam Feeder	Transient Fault	. Start pahse ABN,Zone-2.Fault Loaction:70.86 KM.& (Micom P14D) Dirctional OC/EF: start phase ABN,Start IN1>1.E/F statrt I >1.	132kV Tingtibi - Nanglam Feeder	
11	6/26/2019	04:45 Hrs	6/25/2019	04:50Hrs	5	18.750	132kV Tingtibi-Nanglam Fdr.	132kV Tingtibi-Nanglam Feeder	Bad weather	(Micom P442) Distance protection relay optd. Start pahse CN,Fault Loacation:77.14KM,Zone-2.&(Micom P14D) Start hase-CN,O/C start I>1,Start IN1.12,Trip IN1>2.	132kV Tingtibi - Nanglam Feeder	
12	6/26/2019	05:50 Hrs	6/26/2019	05:53Hrs	3	32.000	132kV Tingtibi-Nanglam Fdr.	132kV Tingtibi-Nanglam Feeder	Bad weather	. Start pahse ABCN,Fault Zone-None & (Micom P14D) Start phase-ABC,O/C start I>1,Start IN1.Active Gr-I	132kV Tingtibi - Nanglam Feeder	
13	6/28/2019	09:03 Hrs	6/28/2019	09:07Hrs	7	4.750	132kV Tingtibi-Nanglam Fdr.	132kV Ting-Nanglam Feeder	insulator Fail at deothang substation	l OC/EF: start phase CN,Trip phase N,O/C start I > 1,Start IN1>1.E/F statrt IN1>12,Trip IN1 >2.	132kV Tingtibi - Nanglam Feeder	

Annexure-VI

Western grid Outages

April, 2019

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	9-Apr	15:15	9-Apr	15:20	5	8	220kV Malbase - Samtse Feeder	220kV Malbase - Samtse Feeder	Tripped.	Main-I trip,R,Y,B phase trip,Zone-I trip. Trip Values: R-Ph.= 2824A<272.8deg. Y-Ph.= 61.69A<202.8deg. B-Ph.= 3298A<53.34deg. Neutral =2158A<353.7deg.	Fault loop = L3-L1,Dist=36.9km	Windy weather at the time of event.
2	17-Apr	0:50	17-Apr	1:25	35	24	66kV Pasakha Feeder I	66kV Pasakha Feeder I	Tripped.	Trig signal,IEF -50N trip,General Trip,.51 START L3 & 86 OPTD. Trip Values: IL1=191.56A<21.16deg, IL2=346.76A<-139.16deg, IL3=278.04A<78.69deg, IL4= 32.49<-122.53deg.	Line	Stormy weather at the time of tripping. Restoration of Pasakha feeder I took time as spring got discharged and had to manually charge the spring.
3	17-Apr	0:50	17-Apr	1:05	15	24	66kV Pasakha Feeder II	66kV Pasakha Feeder II	Tripped.	Trig signal,IEF -50N trip,General Trip,.51 START L3 & 86 OPTD. Trip Values: IL1=374.34A<-13.17deg, IL2=684.72A<78.94deg, IL3=1206.16A<117.64deg.	Line	
4	17-Apr	0:50	17-Apr	1:05	15	26	66kV Pasakha Feeder IV	66kV Pasakha Feeder IV	Tripped.	IEF -50N trip,General Trip,.51 START L3,51N trip,IOC 50 trip & 86 OPTD. Trip Values: IL1=229.85A<-66.3deg, IL2=437.44A<-136.46deg, IL3=5707.25A<71.18deg.	Line	
5	26-Apr	9:45	26-Apr	9:50	5	28	66kV Pasakha Feeder IV	66kV Pasakha Feeder IV	Tripped.	General Trip, IEF 50N Trip, 86 Optd. Trip Values: ILI= 2025.60A<-42.11deg, IL2=185.18A<-127deg, IL3=301.74A<98.54deg. IL4=2025.60A<-42.11deg.		The feeder got tripped along with 66kV BFAL feeder at Singhigaon substation.

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
1	9-Apr	15:15	09.04.2019	16:05	50	1	220kV Singhigaon - Samtse Feeder	220kV Singhigaon - Samtse Feeder	Tripped	General trip,R,Y,B phase trip,Zone-II trip. Trip Values: R-Ph.= 2400A<272.3deg. Y-Ph.= 41.17A<177.1deg. B-Ph.= 1856A<52.40deg. Neutral =1518A<322.7deg.		
2	17-Apr	0:50	17-Apr	1:38	48	14	66kV Bhutan Concast Feeder.	66kV Bhutan Concast Feeder.	Tripped	Directional time overcurrent trip, IE>>Directional trip, I>>Directional trip Trip Values: IL1 = 0.04kA IL2 = 0.09kA IL3 = 0.66kA		
3	17-Apr	0:50	17-Apr	1:38	48	-	66kV Bus Coupler	66kV Bus Coupler	Tripped			
4	26-Apr	9:45	26-Apr	10:31	46	37.6	66kV BFAL Feeder	66kV BFAL Feeder	Tripped	IE>> Directional trip, DIR, I>> Directional trip Trip Values: ILI= 11.73kA, IL2=1.01kA, IL3=1.35A.		
5	26-Apr	9:45	26-Apr	9:56	11	-	66kV Bus Coupler II	66kV Bus Coupler II	Tripped	Time Over current trip,IEp TRIP Trip Values: ILI=0.10kA, IL2=0.09kA, IL3=.08A.		
6	26-Apr	9:45	26-Apr	9:56	11	-	66kV Bus Coupler I	66kV Bus Coupler I	Tripped	Time Over current trip ON,IEp TRIP Trip Values: ILI= 0.12kA, IL2=0.12kA, IL3= 0.14kA.		

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	9-Apr	4:06	9-Apr	4:23	17	-7.084	66kV Dhamdhum feeder	Gomtu substation	Fault on R & B phase	Genaral trip.Zone 4 Trip.R PH fault & B PH fault	NA	Charged the feeder after receiving charging code 1275 form BPSO and charge withstand.
2	17-Apr	0:43	17-Apr	5:40	57	0.16	66kV Pling feeder	Nil	Over current	O/C relay 51AX 51BX 51CX	NA	Charged the feeder after receiving charging code 1294 from BPSO. The line was charged after subsiding the thunder, lightning and rainfall.
3	21-Apr	05:30	21-Apr	05:35	5	1.27	66kV Pling feeder	Nil	Over current	O/C relay 51AX 51BX & 51CX	NA	Test charged the feeder after receiving the charging Code No. 1313 from BPSO and charge withstand.
4	30-Apr	16:39	30-Apr	16:50	11	-10.99	66kV Dhamdhum feeder	Nil	Fault on R phase & Y phase	Distance prot relay opd, General trip, Zone I trip, R phase fault & Y phase fault	NA	Test charged after receiving charging code 1333 from BPSO and charge withstand.

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	9-Apr	4:09	9-Apr	4:15	6	-5.760	66kV Chukha-Pling	66kV Chukha-Pling	Tripped	Dist prot, general zone 1	Line	Weather condition: lightning. Got tripped from chukha end and Gomtu end. (Pling black out) CB for 66kV Pling-Malbase feeder is kept opened as per instruction from BPSO. At 04:15hrs supply was restore from chukha end with charging code 1274.
2	9-Apr	4:09	9-Apr	4:15	6	-2.430	66kV Pling-Gomtu	66kV Pling-Gomtu	Tripped	Dist prot opt	Line	
3	17-Apr	0:45	17-Apr	5:40	55	0.360	66kV Pling-Gomtu feeder	66kV Pling-Gomtu feeder	Tripped	Dist prot opt	Line	66kV Pling-Gomtu feeder got tripped at out end and 66kV Chukha-Pling feeder got tripped at chukha and causing phuentsholing area black out. At 00:55hrs normalised 66kV Chukha-Pling from chukha end.
4	20-Apr	18:15	20-Apr	18:20	5	-4.580	66kV Chukha-Pling	66kV Chukha-Pling	Tripped	86	Line	At 18:20hrs normalised the feeder
5	21-Apr	5:28	21-Apr	5:37	9	-4.890	66kV Chukha-Pling	66kV Chukha-Pling	Tripped	Dist prot optd	Line	Tripped from chukha end. At 05:37hrs normalised from chukha end.
6	21-Apr	5:28	21-Apr	5:38	10	0.670	66kV Pling-Gomtu	66kV Pling-Gomtu	Tripped at both end.	1.Dist prot (Fault imp-1.81, fault current - 282A, fault angle-17 deg, fault location- 3.3%	Line	Tripped both the end (Gomtu and Pling ss). At 05:38hrs normalised the with charging code 1313 from BPSO.
7	30-Apr	9:07	30-Apr	9:22	15	-6.380	66kV Chukha-Pling	66kV Chukha-Pling	Tripped	1.Dist prot o ptd 2.86	Line	Tripped from both the end. At 09:22hrs normalised the feeder.

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
1	9-Apr	4:06	9-Apr	4:23	17	6.89	Gomtu feeder	Gomtu substation	Due to thunder and lightning in Samtse and Gomtu area.	REL-670 (Distance relay) Indication : Y phase fault & Zone -1 tripped	66 kV Gomtu Line	
2	9-Apr	15:15	9-Apr	15:20	5	-9.18	220 kV Mabase feeder	Damdum Substation	Trip from Malbase end.	REL-670 (Distance relay) Indication: TUV (over voltage)	Malbase Substation	
3	9-Apr	15:15	9-Apr	15:21	6	-0.72	220 kV Singyegoan fdr.	Damdum Substation	Trip from Malbase end.	REL-670 (Distance relay) Indication: Zone 1 , Y phase Fault	Malbase Substation	
4	26-Apr	5:21	26-Apr	5:28	7	5.63	66 kV Gomtu feeder	Gomtu substation	Due to thunder and lightning in Samtse and Gomtu area.	REL 670 (Distance relay) following indication : Zone 1, R Phase fault	66 kV Gomtu Line	
5	30-Apr	16:39	30-Apr	16:47	8	11.32	66 kV Gomtu feeder	Gomtu substation	Due to thunder and lightning in Samtse and Gomtu area.	REL 670 (Distance relay) following indication : Zone 1, R and B Phase fault	66 kV Gomtu Line	

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	9-Apr	4:06	9-Apr	4:15	9	1.160	66kV Chukha-P/ling supply.	Black out.		General Zone-1, Distance relay Opted & Master relay tripped. (At Chukha end)	Line Segment	At 04:15Hrs 66kV supply resume from Chukha.
2	17-Apr	0:44	17-Apr	0:53	9	1.520	66kV Chukha-P/ling supply.	Black out.		General Zone-1, Distance relay Opted & Master relay tripped. (At Chukha end)	Line Segment	At 00:53Hrs 66kV supply resume from Chukha.
3	17-Apr	2:43	17-Apr	2:50	7	1.08	66kV Chukha-P/ling supply.	Black out.		Distance relay Opted, Master relay tripped.& Distance Pickup L2 & L3.(At Chukha end)	Line Segment	At 20:50Hrs 66kV supply resume from Chukha.
4	21-Apr	5:30	21-Apr	5:36	6	1.31	66kV Chukha-P/ling	Black out.		Tripped from both end	Line Segment	At 5:36Hrs 66kV supply resume from Chukha.
5	30-Apr	9:10	30-Apr	9:21	11	1.88	66kV Chukha-P/ling	Black out.		Tripped from both end	Line Segment	At 9:21Hrs 66kV supply resume from Chukha.

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	22-Apr	01:44hrs	22-Apr	01:53hrs	0:09	0.750	66kV Lobeysa to Semtokha feeder	Lobeysa ss	Line fault	Dir O/C & E/F(IA--1.066kA IB-176A IC-162.5A IN-741.2A)	NA	
2	22-Apr	01:44hrs	22-Apr	01:53hrs	0:09	3.740	66kV Lobeysa to Gewathang feeder	Nill	Line fault	Dir O/C & E/F(IA--1.220kA IB-148A IC-88.5A IN-990.4A)	NA	
3	22-Apr	05:50hrs	22-Apr	08:58hrs	0:08	7.320	66kV Lobeysa to Semtokha feeder	Lobeysa ss	Line fault	Dir O/C & E/F(IA-81.2A IB-94.48A IC-351.8A IN-304.9A)	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	22-Apr	1245hrs	22-Apr	1316hrs	31.00	0.000	220kV Buscoupler	Nil	Backup earth fault	Backup earth fault relay operated	Not known	

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
1	7-Apr	23:28	7-Apr	23:30	0:02	3.164	10 mVA (I+II)	Black Out	Over Current at B phase	50 B, 86 A HV, 86 B HV	_	
2	7-Apr	23:28	7-Apr	23:30	0:02	3.164	10 mVA (I+II)	Black Out	Over Current at B	50 B, 86 A HV, 86 B HV	_	

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
No Tripping												

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	6-Apr	11:18hrs	6-Apr	11:22hrs	0:04	0.646	66kV SF6 breaker	Feeder I and II	over current and Earthe fault on RYB phase	O/C and E/F relay operated	Fdr. I wanakha/dawakha	

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
1	01.05.2019	14:17	01.05.2019	19:17	0	42.7	66kV Bhutan Concast Feeder.	66kV Bhutan Concast Feeder.	Tripped			No tripping data availiable due to communication fault.
2	02.05.2019	19:45	02.05.2019	20:02	17	2.1	220kV Singhigaon - Samtse Feeder.	220kV Singhigaon - Samtse Feeder.	Tripped	General trip,R,Y,B phase trip,Zone-I trip.	Fault loop: L1-N, Distance = 34.6KM.	Light rainfall with thunder and lightning at the time of event.
3	02.05.2019	22:57	02.05.2019	23:28	31	33	66kV BFAL Feeder	66kV BFAL Feeder	Tripped			No tripping data availiable due to communication fault.
4	11.05.2019	10:52	11.05.2019	11:14	22	15	66kV Bhutan Concast Feeder.	66kV Bhutan Concast Feeder.	Tripped			No tripping data availiable due to communication fault.
5	11.05.2019	17:21	11.05.2019	18:52	31	1.2	220kV Singhigaon - Samtse Feeder.	220kV Singhigaon - Samtse Feeder.	Tripped	General trip, 86 optd.		Stormy weather at the time of event
6	12.05.2019	17:10	12.05.2019	17:52	42	23	66kV Bhutan Concast Feeder.	66kV Bhutan Concast Feeder.	Tripped			No tripping data availiable due to communication fault.
7	12.05.2019	17:17	12.05.2019	18:44	27	1	220kV Singhigaon - Samtse Feeder.	220kV Singhigaon - Samtse Feeder.	Tripped	Trip R,Y,B PHASE		Stormy weather with hail strom at the time of event.
8	14.05.2019	4:31	14.05.2019	5:52	21	1.93	220kV Singhigaon - Samtse Feeder.	220kV Singhigaon - Samtse Feeder.	Tripped	General trip,Zone1 trip, 86 optd.	Fault Loop L1-L2.Dist.40.5 km	

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	11.05.2019	10:44	11.05.2019	10:57	13	0.790	66kV Incomer	Whole Gedu			Line segment	66 kV Supply resumed from Chukha
2	11.05.2019	15:49	11.05.2019	16:32	43	0.970	66kV Incomer	Whole Gedu			Line segment	66 kV Supply resumed from Chukha
3	12.05.2019	17:50	12.05.2019	18:02	12	1.30	66kV Incomer	Whole Gedu			Line segment	66kV supply failed due to bad weather.
4	12.05.2019	18:13	12.05.2019	18:40	27	1.30	66kV Incomer	Whole Gedu			Line segment	66kV supply failed due to bad weather.
5	13.05.2019	11:17	13.05.2019	11:21	4	1.79	66kV Incomer	Whole Gedu			Line segment	66 kV Supply resumed from Chukha
6	11.05.2019	19:15	11.05.2019	19:16	1	0.42	8MVA 66/33kV Transformer	33kV Gurungdara I		Diff.relay & Tripping 86.	Line segment	Test charged and stood normal.

May, 2019

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	11.05.2019	10:38	11.05.2019	10:54	0:16	154	400kV Siliguri Feeder	400kV Siliguri Feeder	O/C on R phase to Neutral.	Main 1 & 2 trip, Zml trip,Fuse fail, M1-CAR-SEND Trip Values: IL1=5377A<284.1deg, IL2=815.3A<274.6deg,	L1 - N, Dist =8.1km	Heavy Rainfall with lightning, thundering & Windy.
2	11.05.2019	10:50	11.05.2019	11:10	20	20	66kV Feeder, Pasakha IV	66kV Feeder, Pasakha IV	Overcurrent on R-phase ,Y-phase to Neutral.	IEF -50N trip,General Trip,& 86 OPTD,51 Start, IOC 50 trip, 51N Trip,51N Start L1-L2-L3. Trip Values: IL1=807.99A<-69.02deg,		Stormy weather at the time of tripping.
3	11.05.2019	10:52	11.05.2019	11:10	18	19	66kV Feeder, Pasakha I	66kV Feeder, Pasakha I	Overcurrent on B- phase to Neutral	IEF -50N trip,General Trip,& 86 OPTD. Trip Values: IL1=428.93A<69.65deg, IL2=224.23A<-173.3deg,		
4	11.05.2019	10:51	11.05.2019	11:10	19	19	66kV Feeder, Pasakha II	66kV Feeder, Pasakha II	Overcurrent on B- phase.	IEF -50N trip,General Trip,& 86 OPTD,51 Start, IOC 50 trip, 51N Trip,51N Start L3. Trip Values: IL1=320.97A<46.84deg,		
5	11.05.2019	16:02	11.05.2019	16:05	3	109	200MVA ICT	200MVA ICT	Bad Weather	RET 521 operated, Main CB trip,Tie CB trip,86 optd. Trip Values: ILI= 241.8A,		Stormy weather at the time of tripping.
6	11.05.2019	16:02	11.05.2019	16:18	16	94	220kV Chhukha Feeder.	220kV Chhukha Feeder.	Bad Weather	General trip, Zone-1 trip,86 optd. Trip Values: ILI= 164.6A/162.3deg. IL2=360.6A/49.51deg.	Fault Loop=L3 - N Dist.=8.9 km	
7	11.05.2019	18:22	11.05.2019	18:32	10	333	400kV Tala Feeder	400kV Tala Feeder	Bad Weather	Zone-1 trip,86 optd. Trip Values: ILI= 730.7A. IL2= 222.3A.	Fault Loop=XY Dist.=18.61 km	Stormy weather at the time of tripping.
8	11.05.2019	20:05	11.05.2019	20:44	39	118	200MVA ICT	200MVA ICT	Bad Weather	Main CB trip,TIE CB trip,86 optd. Trip Values: ILI= 186.8A. IL2= 1273A.		Stormy weather at the time of tripping.
9	11.05.2019	20:05	11.05.2019	20:40	35	34	50/63MVA Transformer I	50/63MVA Transformer I	Bad Weather	27 trip,Diff. trip,86 optd. Trip Values: ILI= 152.23A/0.00deg. IL2= 69.63A/-17.62deg.		
10	11.05.2019	20:05	11.05.2019	20:41	36	36	50/63MVA Transformer III	50/63MVA Transformer III	Bad Weather	27 trip,Diff. trip,86 optd. Trip Values: ILI= 183.41A/2.77deg. IL2= 90.50A/-7.67deg.		
11	11.05.2019	20:15	12.05.2019	19:13	58	243	400kV Tala Feeder	400kV Tala Feeder		Zone-1 trip,86 optd. Trip Values: ILI= 31.67A. IL2=32.35A.	Fault Dist.14.14 km	The feeder was test charged at 20:20 Hrs but didn't withstand. Later again test chage was done
12	12.05.2019	17:07	12.05.2019	17:12	5	62	200MVA ICT	200MVA ICT	Bad Weather	Main CB trip,TIE CB trip,86 optd. Trip Values: ILI= 394 IL2= 321A,		Heavy Rainfall accompanied by hailstorm at the time of event.
13	12.05.2019	17:10	12.05.2019	17:20	10	9	220kV Samtse Feeder.	220kV Samtse Feeder.	Bad Weather	Main 1 trip Trip Values: ILI= 88A<341deg, IL2=2079A<163deg,		
14	12.05.2019	17:39	12.05.2019	17:49	10	62	200MVA ICT	200MVA ICT	Bad Weather	Main CB Trip,TIE CB Trip, 86 optd. Trip Values: ILI= .039<22.26deg, IL2=.009A<168.5deg,		
15	12.05.2019	17:39	12.05.2019	17:55	16	37	50/63MVA Transformer III	50/63MVA Transformer III	Bad Weather	OLTC Buch Trip, Diff Trip, 27 Trip. Trip Values: ILI= 164.5A<3.4deg, IL2=56.18A<-40.69deg,		
16	13.05.2019	10:58	13.05.2019	11:01	3	76	200MVA ICT	200MVA ICT	Bad Weather	Main CB trip,TIE CB trip,86 optd. Trip Values: ILI= 157.5A. IL2= 195A.		
17	13.05.2019	10:58	13.05.2019	11:16	18	11	220kV Birpara Feeder.	220kV Birpara Feeder.	Bad Weather	AR OPTD, Main I trip,Zone I trip. Trip Values: ILI= 405.3A. IL2=320.5A. IL3= 3.96kA. VAN=128.1kV, VBN= 128.6kV, VCN= 54.31kV.	L3-N Distance= 19.43km	
18	13.05.2019	10:58	13.05.2019	11:08	10	31	50/63MVA Transformer III	50/63MVA Transformer III	Bad Weather	Diff. trip,86 optd. Trip Values: ILI= 97.61A<-32.9deg, IL2= 142.32A<-112.79deg, IL3= 52.64A<-131.08deg, IL4= 224.12A<-92deg.		Heavy rainfall with lightning & thunder at the time of event.
19	13.05.2019	11:16	13.05.2019	11:26	10	201	400kV Siliguri Feeder	400kV Siliguri Feeder	Bad Weather	Zone I trip.Trig Signal= MI-CAR- SEND,LINE CB open,R-CAR-RCV-MI. Trip Values: IA= 4.486kA, IB= 723.7A, IC=423.9A, VAN= 54.38kV, VBN=249.4kV, VCN= 248.9kV.	L1-N Distance= 18.64km	
20	14.05.2019	4:31	14.05.2019	4:47	16	11	220kV Samtse Feeder.	220kV Samtse Feeder.		Main-1trip,Zone-1 trip,86 optd. Trip Values: ILI= 3524A/294.6deg, IL2=3825A/151.0deg, IL3= 84.53A/59.52deg, IL4=2181A/212.5deg.	Fault Loop L1-L2.Dist.29.8 km.	
21	14.05.2019	4:31	14.05.2019	4:58	27	81	200MVA ICT	200MVA ICT		Main CB trip,TIE CB trip,86 optd. Trip Values: ILI= 1128A. IL2= 985.2A. IL3= 160.0A. IL4=627.7A		Light rainfall at the time of

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	01.05.2019	10:15	01.05.2019	16:13	58	2.65	66/11kV 10MVA Transformer	11kV Lhaki and Samtse feeder	Seepage of water in Transformer OSR chamber	Relay: 30D OLTC Buch Trip & 86. Indication: Transformer trouble trip & Breaker Auto trip	Gomtu substation	Charge the Transformer after removing the stagnant water from OSR chamber and charge withstand.
2	03.05.2019	1:10	03.05.2019	1:16	6	-8.18	66kV Dhamdhum feeder	Nil	Nil	Nil	NA	Tripped from Dhamdhum end and charged from dhamdhum end against charging code 1346 given by BPSO
3	11.05.2019	10:42	11.05.2019	10:59	17	-8.02	66kV Dhamdhum feeder	Nil	Over current	General trip, R phase fault	NA	Breaker tripped at both the end (Dhamdhum & Gomtu). Charged the feeder and charge withstood.
4	14.05.2019	3:41	14.05.2019	3:53	12	-9.986	66 kV Dhamdhum feeder	Nil	Over current	Zone one,R & Y phase	NA	

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
1	02.05.2019	19:48	02.05.2019	19:54	6	-5.22	220 kV Singyegoan feeder	220 kV Singyegoan substation	Tripped from Malbase end	REL 670(Distance relay),Relay indication: General tripped,Zone 1 trip,R phase fault,VT fuse fail.	Tripped from Malbase end	
2	03.05.2019	1:09	03.05.2019	1:15	6	8.24	66kV Gomtu feeder	66kV Gomtu substation	N/A	REL 670 (Distance Relay) , Relay Indication : General tripped, zone 1, VT fuse fail.	N/A	
3	11.05.2019	10:43	11.05.2019	10:58	15	8.14	66kV Gomtu feeder	66kV Gomtu substation	N/A	REL 670 (Distance Relay) , Relay Indication : General tripped, DIR.E/F,R PH and B PH Fault.	N/A	
4	11.05.2019	17:26	11.05.2019	17:50	24	-9.02	220 kV Malabase feeder	Damdum s/s	N/A	REL 670 (Distance Relay) , Relay Indication : General tripped, ZONE 1 TRIP and B PHASE fault.	N/A	
5	11.05.2019	17:26	11.05.2019	18:52	26	-0.54	220 kV Singyegoan feeder	Damdum s/s	N/A	REL 670 (Distance Relay) , Relay Indication : General tripped, ZONE 1 TRIP and B PHASE fault.	N/A	
6	12.05.2019	16:33	12.05.2019	16:41	8	8.46	66 kV Gomtu feeder	66kV Gomtu substation	N/A	REL 670 (Distance Relay) , Relay Indication : General tripped, R PH and B PH Fault.	N/A	
7	12.05.2020	17:05	12.05.2020	17:31	26	6.5	66 kV Gomtu feeder	66kV Gomtu substation	N/A	REL 670 (Distance Relay) , Relay Indication : General tripped, R PH and B PH Fault.	N/A	
8	12.05.2021	17:10	12.05.2021	17:20	10	-8.02	220 kV Malabase feeder	Damdum s/s	N/A	REL 670 (Distance Relay) , Relay Indication : General tripped, ZONE 1 TRIP and Y PHASE fault.	N/A	
9	12.05.2022	17:17	12.05.2022	18:43	26	0.34	220 kV Singyegoan feeder	Damdum s/s	N/A	REL 670 (Distance Relay) , Relay Indication : General tripped, ZONE 1 TRIP and B PHASE fault.	N/A	
10	13.05.2019	11:00	13.05.2019	11:04	4	8.86	66 kV Gomtu feeder	Gomtu line	Due to the lightning and thundering	REL 670(Distance relay)Relay indication: Zone 1 trip(11.01 Km),General trip,R-phase fault,86 TRP RLY OPTD,CB trouble	N/A	
11	13.05.2019	11:17	13.05.2019	11:21	4	8.86	66 kV Gomtu feeder	Gomtu line	Due to the lightning and thundering	REL670(Dstance relay)Relay indication: General trip, DIR.EF trip,Y-PH Fault,VT fuse fail,86 TRP RLY OPTD,CB trouble	N/A	
12	14.05.2019	3:38	14.05.2019	3:44	6	9.51	66 kV Gomtu feeder	Gomtu line	Due to heavy lightning, thundering and Raining	REL670(Distance relay),Relay indication: General trip, Zone 1 trip(1.41 Km).R and B phase Fault,VT fuse fail.	N/A	
13	14.05.2019	4:32	14.05.2019	4:43	11	-7.76	220Kv Malbase feeder	Damdum s/s	Tripped from Malbase end	REL 670 (Distance relay),Relay indication: General tripped,Zone 1 trip(10.74 Km),Y phase fault,VT fuse fail.	Tripped from Malbase end	
14	14.05.2019	4:32	14.05.2019	5:42	10	0.36	220 kV Singyegoan feeder	Damdum s/s	Tripped from Malbase end	REL 670(Distance relay)Relay indication: General tripped,Zone 1 trip,Y phase fault,VT fuse fail.	Tripped from Malbase end	
15	30.04.2019	16:39	30.04.2019	16:47	8	11.32	66 kV Gomtu feeder	Gomtu substation	Due to thunder and lightning in Samtse and Gomtu area.	REL 670 (Distance relay) following indication : Zone 1, R and B Phase fault	66 kV Gomtu Line	

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	5/4/2019	11:53hrs	5/4/2019	11:57hrs	4	0.750	66kV Lobeysa to Semtokha feeder	Lobeysa ss	Line fault	Dir O/C & E/F(IA-000A, IB-93.62A IC-164.8A IN-153.5A)	Jumper out at Dead end tower at Semtokha end	
2	5/4/2019	12:00hrs	5/4/2019	12:06hrs	6	0.750	66kV Lobeysa to Semtokha feeder	Lobeysa ss	Line fault	(IR-2.356A, IY-83.71,A IB-83.20A IN-45.59A)Indication:Broken conductor	Jumper out at Dead end tower at Semtokha end	
3	5/12/2019	13:59hrs	5/12/2019	08:58hrs	8	7.320	66kV Lobeysa to Semtokha feeder	Lobeysa ss	Line fault	Dir O/C & E/F(IA-81.2A IB-94.48A IC-351.8A IN-304.9A)	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	5/12/2019	1340hrs	5/12/2019	1400hrs	20.00	-22.41	220kV Semtokha-Chukha feeder	feed from 220kV Rurichu feeder	Zone-1 trip	Distance relay operated, but tripping relay 86 not operated.	Distance=29.7km	
2	5/4/2019	1200hrs	5/4/2019	1206hrs	6.00	-0.090	66kV Semtokha-Lobesa feeder	feed from 220kV feeders	Jumpering out at dead end tower at Semtokha	broken conductor, line was idle charge till Lobesa substation end.	Dead end tower at 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
1	5/4/2019	14:36	5/4/2019	14:40	4	5.8	66/33kV 20MVA, Transformer I	Supply was not effected as the Transformer I I, 20 MVA had feted	Transformer was tripped due to tripping of 33kV Chubachu Fdr.IV	1.TRAFO DIFFL PROTN. RELAY 87. .Indication 1,3,4&5. 1.Device Trip 3.y phase Differential Trip 4.B phase differential Trip 5.Differenttial Trip. # DIR O/C & EF PROTN RELAY	Lungtenphu Area	
2	12/5/2019	1:39	12/5/2019	1:57	18	5.3	66kV Olakha-Jemina Line	Jemina Substation	Supply failed from Chhukha end	1.TRAFO DIFFL PROTN. RELAY 21. .Indication 1,2,&8. 1.Device Trip 2.Distance protection R E trip.8.Distance protection Zone 1Trip # DIR O/C & EF PROTN RELAY 86, Trip relay 86 opted.	Chukha end	

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
1	12.05.2019	13:38hr	12.05.2019	13:55Hr	17 min	3.51	66KV Chundo fdr	Both 66KV fdr tripped	Tripped on Earthfault	Relay Optd; IN>>trip. 86BU Tripped phase N. Earth fault	Not known	
2	12.05.2019	13:38hr	30.05.2019	10:12Hrs	14min	-5.40	66KV Olakha fdr.	Both 66KV fdr	Tripped on	Relay Optd; IN>>trip. 86BU	Not known	

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	12.05.2019	1345hrs	12.05.2019	1355hrs	10min	(-)3.15MW	66KV both I/C trip	Paro, Pangbasa s/s	trip	3phase	Incomer end	
2	30.05.2019	1205hrs	30.05.2019	1213hrs	8Min	3.18MW	66kV Pangbesa line	66kV Pangbsea and Haa SS	Trip	General Trip	-	

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
1	5/12/2019	13.45	5/12/2019	13.55	10	6.69	66kV Chumdo-Paro line	66kV Paro Substation and it's 33kV outgoing feeders	Tripped from Chukha Power Hosue	Tripped from Generation Unit, Chukha	Chukha Power House	

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	5/15/2019	16:20	5/15/2019	16:28	8minutes	-1.252	66kV Incomer	66kV Incomer	Source fail	Earth fault relay optd at Chumdo end.	Chumdo switching station	
2	5/30/2019	12:04	5/30/2019	12:12	8minutes	-1.57	66kV Incomer	All outgoing feeders	Unknown	Nil	Chumdo switching 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	12/5/2019	11:03hrs	12/5/2019	11:08hrs	5min	.365MW	66kV SF6 breaker	Feeder I and II	Over Current on B phase	O/C relay operated	Fdr. I wanakha/dawakha	
2	12/5/2019	13:51hrs	12/5/2019	14:01hrs	10min	.504MW	66kv Incommer	Feeder I and II	66kV incomer fail from chukha end	No relay operated at watsa end	66kV incomer fail from chukha end	
3	15/5/2019	5:40hrs	15/5/2019	5:48hrs	8min	.554MW	66kV SF6 breaker	Feeder I and II	Over current and Earth fault	Over current and Earth fault relay operated	Fdr. Dawakha (Jumper out at chuzom as per ESD Dawakha)	
4	15/5/2019	10:35hrs	15/5/2019	10:38hrs	3min	.101MW	66kV SF6 breaker	Feeder I and II	Over current and Earth fault	Over current and Earth fault relay operated	Fdr. Dawakha (Jumper out at chuzom as per ESD Dawakha)	

June, 2019

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	14.06.2019	13:32	14.06.2019	13:37	0	85	200MVA ICT	200MVA ICT	Tripped	400kV side B/U O/C E/F protection trip		
2	14.06.2019	13:32	14.06.2019	14:30	0	22	50/63MVA Transformer III	50/63MVA Transformer III	Tripped	OLTC BUCH trip		Heavy Rainfall with lightning & thunder at the time of event.
3	14.06.2019	13:32	14.06.2019	13:41	0	10	220kV Samtse Feeder.	220kV Samtse Feeder.	Tripped	Main I trip, trip R phase,trip Y phase,Trip B phase,Start Bphase, Start Neutral, zone 2 start, zone 3 start, zone 2 trip. Trip Values:		
4	19.06.2019	15:05	19.06.2019	18:05	3	100	200MVA ICT	200MVA ICT	Tripped	Diff.trip,Main CB trip,TIE CB trip,86 optd.		The LA of R-Phase got punctured and the transformer was charged after changeover where R-
5	25.06.2019	1:00	25.06.2019	1:09	0	110	200MVA ICT	200MVA ICT	Tripped	67/67N		
6	25.06.2019	1:12	25.06.2019	1:18	0	75	220kV Malbase - Chhukha Feeder	220kV Malbase - Chhukha Feeder	Tripped	Distance relay operated.	Fault loop L3-N Distance=3.6KM	
7	25.06.2019	1:51	25.06.2019	15:46	13	27	50/63MVA Transformer III	50/63MVA Transformer III	Tripped			Heavy Rainfall with lightning & thunder at the time of event. 50/63MVA transformer III was test charged at 1:55 but the transformer didn't hold and since the weather was very bad, operators were not able to check the breaker physically and close locally.
8	25.06.2019	2:06	25.06.2019	2:11	0	8	220kV Malbase - Samtse Feeder.	220kV Malbase - Samtse Feeder.	Tripped	M1-Trip	Faultloop=L2-L3 Distance=30.1KM	
9	25.06.2019	2:06	25.06.2019	2:14	0	-42	220kV Malbase - Chhukha Feeder	220kV Malbase - Chhukha Feeder	Tripped			
10	25.06.2019	2:22	25.06.2019	2:26		-42	220kV Malbase - Chhukha Feeder	220kV Malbase - Chhukha Feeder	Tripped			
11	25.06.2019	2:56	25.06.2019	3:00	0	29	50/63 MVA Transformer I	50/63 MVA Transformer I	Tripped			Heavy rainfall with thunder and lightning at the time of event. Due to continuous tripping of many feeders at a time, were not able to download the the fault data.
12	25.06.2019	4:20	25.06.2019	5:09	0	16	66kV Pasakha Feeder I	66kV Pasakha Feeder I	Tripped			
13	25.06.2019	4:20	25.06.2019	5:09	0	16	66kV Pasakha Feeder II	66kV Pasakha Feeder II	Tripped			
14	25.06.2019	4:20	25.06.2019	5:09	0	18	66kV Pasakha Feeder IV	66kV Pasakha Feeder IV	Tripped			
15	25.06.2019	4:20	25.06.2019	5:09	0	-	66kV Bus Coupler	66kV Bus Coupler	Tripped			
16	25.06.2019	4:49	25.06.2019	5:20	0	9	220kV Malbase - Birpara	220kV Malbase - Birpara	Tripped	General trip,Trip - R Phase.	Fault loop LI -N, Distance 18.3 KM.	
17	25.06.2019	6:25	25.06.2019	6:35	0	-190	400kV Tala Feeder	400kV Tala Feeder	Tripped	Zone 1 trip,	Distance 13.7 KM	
18	25.06.2019	3:38	25.06.2019	6:57	3	-	66kV Malbase-Phuentsholing Feeder.	66kV Malbase-Phuentsholing Feeder.	Tripped			As soon as feeder was charged at 6:57Hrs, feeder got tripped at 6:59Hrs as LA got punctured at Phuentsholing end.
19	25.06.2019	17:42	25.06.2019	18:40	0	23	66kV Pasakha Feeder I	66kV Pasakha Feeder I	Tripped	General trip,IEF-50N-trip 86 optd.,IOC-50 trip.		The feeder took time to restore as verbal information was received that there was a heavy spark on multicircuit tower at Gurungdara side. The feeder was charged after isolating of 66kV Phuentsholing feeder.
20	25.06.2019	17:42	25.06.2019	18:40	0	23	66kV Pasakha Feeder II	66kV Pasakha Feeder II	Tripped	General trip,IEF-50N-trip 86 optd.		
21	25.06.2019	17:42	25.06.2019	18:40	0	25	66kV Pasakha Feeder IV	66kV Pasakha Feeder IV	Tripped	50N-trip 86 optd.		
22	26.06.2019	2:25	26.06.2019	2:32	0	93	200MVA ICT	200MVA ICT	Tripped	RET521 optd., 86 opdt.		Heavy rainfall with thunder and lightning at the time of event.
23	26.06.2019	2:25	26.06.2019	2:34	0	6	220kV Samtse Feeder.	220kV Samtse Feeder.	Tripped	General trip,Trip - B phase. Zone 2 trip		
24	26.06.2019	2:25	26.06.2019	14:30	12	26	50/63MVA Transformer III	50/63MVA Transformer III	Tripped			
25	26.06.2019	2:44	26.06.2019	3:30	0	33	220kV Birpara Feeder.	220kV Birpara Feeder.	Tripped	General trip,Trip - R Phas,trip Y phase.		Heavy rainfall with thunder and lightning at the time of event. The feeders got tripped frequently.
26	26.06.2019	2:44	26.06.2019	3:06	0	93	200MVA ICT	200MVA ICT	Tripped			
27	26.06.2019	4:04	26.06.2019	4:31	0	33	220kV Birpara Feeder.	220kV Birpara Feeder.	Tripped	General trip,trip Y phase. zone 1 trip,	distance 26.78km	
28	26.06.2019	4:07	26.06.2019	4:31	0	97	200MVA ICT	200MVA ICT	Tripped			
29	26.06.2019	4:07	26.06.2019	4:34	0	1	220kV Samtse Feeder.	220kV Samtse Feeder.	Tripped	General trip,Trip - R and Y and B phase.		
30	26.06.2019	4:07	26.06.2019	4:52	0	221	400kV Siliguri Feeder	400kV Siliguri Feeder	Tripped	zone 1 trip,	distance 24.73km	
31	26.06.2019	4:15	26.06.2019	4:39	0	29	50/63MVA Transformer I	50/63MVA Transformer I	Tripped			
32	26.06.2019	4:15	26.06.2019	4:24	0	-72	220kV Chhukha Feeder.	220kV Chhukha Feeder.	Tripped			
33	26.06.2019	6:17	26.06.2019	6:35	0	63	400kV Siliguri Feeder	400kV Siliguri Feeder	Tripped		L2 - N distance 29.2km	
34	26.06.2019	10:11	26.06.2019	10:20	0	174	400kV Siliguri Feeder	400kV Siliguri Feeder	Tripped	Zone-I trip,trip R,Y,B phase,86optd.		Raining with thunder and lightning.
35	26.06.2019	10:32	26.06.2019	10:36	0	21	66KV Pasakha Feeder I	66KV Pasakha Feeder I	Tripped	General Trip, IEF 50N Trip, 86 Optd,IOC50		Feeder got tripped while charging 66kV Malbase - Phuentsholing feeder.
36	26.06.2019	10:32	26.06.2019	10:36	0	21	66KV Pasakha Feeder II	66KV Pasakha Feeder II	Tripped	General Trip, IOC 50 trip, 51N Trip, 86 Optd.		
37	26.06.2019	10:32	26.06.2019	10:36	0	22	66KV Pasakha Feeder IV	66KV Pasakha Feeder IV	Tripped	General Trip, IEF 50N Trip, 86 Optd.		
38	28.06.2019	17:00	30.06.2019	14:00	45	27	220kV Birpara Feeder.	220kV Birpara Feeder.	Tripped	Dist. tripp ,Zone 1 tripp,pole discrepancy ,	Dist = 8.685KM	

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
1	15.06.2019	1:16	15.06.2019	2:36	1	2.9	220kV Singhigaon - Samtse Feeder.	220kV Singhigaon - Samtse Feeder.	Tripped	General trip, Zone-1 Trip,86 optd.	Fault Loop=L3-Neutral. Dist.=9.3 km.	Heavy rainfall with thunder and lightning at the time of event.
2	25.06.2019	2:02	25.06.2019	3:09	1	0.3	220kV Singhigaon - Samtse Feeder.	220kV Singhigaon - Samtse Feeder.	Tripped	No data available		
3	25.06.2019	6:58	25.06.2019	7:00	0	18	66kV Bhutan Concast Feeeder.	66kV Bhutan Concast Feeeder.	Tripped	No data available		
4	25.06.2019	6:58	25.06.2019	7:00	0	-	66kV Bus Coupler	66kV Bus Coupler	Tripped	No data available		
5	25.06.2019	17:42	25.06.2019	18:56	1	3	66kV Bhutan Concast Feeder.	66kV Bhutan Concast Feeder.	Tripped	No data available		
6	26.06.2019	2:25	26.06.2019	3:59	1	0.48	220kV Singhigaon - Samtse Feeder.	220kV Singhigaon - Samtse Feeder.	Tripped	No data available		
7	26.06.2019	4:07	26.06.2019	6:06	1	-2	220kV Singhigaon - Samtse Feeder.	220kV Singhigaon - Samtse Feeder.	Tripped	No data available		

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	12.06.2019	14:37	12.06.2019	14:41		-4.83	66kV Chukha-Pling	66kV Chukha-Pling	Tripped	Overcurrent, 86	Line	
2	14.06.2019	13:17	14.06.2019	13:20		-6.19	66kV Chukha-Pling	66kV Chukha-Pling	Tripped	86 & 186	Line	
3	14.06.2019	13:29	14.06.2019	13:35		-6.19-2.95	66kV Chukha-Pling 66kV Pling-Gomtu	66kV Chukha-Pling 66kV Pling-Gomtu	Tripped	86 & 186	Line	
4	14.06.2019	13:45	14.06.2019	13:49		-6.19-2.95	66kV Chukha-Pling 66kV Pling-Gomtu	66kV Chukha-Pling 66kV Pling-Gomtu	Tripped	86 & 186	Line	
5	15.06.2019	1:06	15.06.2019	1:14		-0.62	66kV Pling-Gomtu	66kV Pling-Gomtu	Tripped	Dist prot, 86 & 186	Line	
6	15.06.2019	2:25	15.06.2019	2:37		-5.41	66kV Chukha-Pling 66kV Pling-Gomtu	66kV Chukha-Pling 66kV Pling-Gomtu	Tripped	86 & 186	Line	
7	21.06.2019	13:35	21.06.2019	13:42		-6.28	66kV Chukha-Pling 66kV Pling-Gomtu	66kV Chukha-Pling 66kV Pling-Gomtu	Tripped	86 & 186	Line	
8	22.06.2019	9:56	22.06.2019	12:46	2	idle charge	66kV Pling- Malbase	66kV Pling-Malbase		Nill	Nill	
9	24.06.2019	22:56	24.06.2019	23:02		-5.16	66kV Chukha-Pling	66kV Chukha-Pling	Tripped	Dist prot, 86 & 186	Line	
10	25.06.2019	0:26	25.06.2019	0:34		-5.13	66kV Chukha-Pling	66kV Chukha-Pling	Tripped	Dist prot, 86 & 186	Line	
11	25.06.2019	1:02	25.06.2019	1:12		0.88	66kV Pling-Gomtu	66kV Pling-Gomtu	Tripped	86 & 186	Line	
12	25.06.2019	1:34	25.06.2019	1:41		-4.51	66kV Chukha-Pling	66kV Chukha-Pling	Tripped	1.Dist prot (Fault imp-3.4, fault current - 3.29A, fault angle-54 deg, fault voltage- 0.218 & fault location- 18.3%	Line	
13	25.06.2019	1:54	25.06.2019	2:03		0.74	66kV Pling-Gomtu	66kV Pling-Gomtu	Tripped	Tripped from Gomtu end.	Line	
14	25.06.2019	1:54	25.06.2019	3:48	1	-4.51	66kV Chukha-Pling	66kV Chukha-Pling	Tripped	Dist prot, 86 & 186	Line	
15	25.06.2019		25.06.2019	2:08		-3.41	66kV Pling-Malbase	66kV Pling-Malbase				
16	25.06.2019	2:06	25.06.2019	2:11		-3.41	66kV Pling-Gomtu	66kV Pling-Gomtu	Tripped	Tripped from Gomtu end.	Line	
17	25.06.2019	2:53	25.06.2019	3:42		-3.41	66kV Pling-Gomtu	66kV Pling-Gomtu	Tripped	1.Dist prot (Fault imp-1.3, fault current - 14.60A, fault angle-56 deg, fault voltage- 0.378 & fault location- 10.4%		
18	25.06.2019	6:06	25.06.2019	6:12		-3.62	66kV Pling-Gomtu	66kV Pling-Gomtu	Tripped	Tripped from Gomtu end.		
19	25.06.2019	6:16	25.06.2019	18:44	12	0.27	66kV Chukha-Pling	66kV Chukha-Pling	Tripped	1.Dist prot (Fault imp-1.95, fault current -4.33A, fault angle-47 deg, fault voltage- 0.143 & fault location- 9.5%	Line	
20	25.06.2019	6:45	25.06.2019	6:49		-3.62	66kV Pling-Gomtu	66kV Pling-Gomtu	Tripped	Tripped from Gomtu end.		
21	25.06.2019	6:52	25.06.2019	7:20		-3.62	66kV Pling-Gomtu	66kV Pling-Gomtu	Tripped	Tripped from Gomtu end.		
22	25.06.2019	6:52	25.06.2019	12:12	5	0.7	10MVA Transformer (66/33kV) Voltamps	All 33kV feeders	Overcurrent & E/F	50R, 50N, 86	Substation	
23	25.06.2019	7:31	25.06.2019	7:33		-1.59	66kV Pling-Gomtu	66kV Pling-Gomtu	Tripped	Tripped from Gomtu end.		
24	25.06.2019	17:43	25.06.2019	17:51		-5.66	66kV Pling-Gomtu	66kV Pling-Gomtu	Tripped	Tripped at our end.		
25	26.06.2019	2:31	26.06.2019	2:39		1.17	66kV Pling-Gomtu	66kV Pling-Gomtu	Tripped	Tripped from Gomtu end.		
26	26.06.2019	2:31	26.06.2019	3:07		-5.07	66kV Chukha-Pling	66kV Chukha-Pling	Tripped	Tripped from Chukha end.		
27	26.06.2019	2:57	26.06.2019	12:21	9	1.17	66kV Pling-Gomtu	66kV Pling-Gomtu	Tripped	Tripped from Gomtu end.		
28	26.06.2019	4:23	26.06.2019	4:29		-3.04	66kV Chukha-Pling	66kV Chukha-Pling	Tripped	Tripped from chukha end.	Line	

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
1	14.06.2019	13:28	14.06.2019	13:49	0	9.41	220kV Malbase and Samtse line	220/66/33kV Dhamdum Substation	NA	**REL-(distance relay)** General Trip: Zone1 Trip (faultabs dist=-1000 and fault Rel dist=-100000%) -B-phase fault -VT fuse fail	NA	
2	14.06.2019	13:28	14.06.2019	14:41	1	3.47	220kV Singhagaon and Dhamdum line	220/66/33kV Dhamdum Substation	NA	**REL (Distance relay)** -General Trip -Zone1 Trip (faultabs dist=20.72 km) -B-phase fault -VT fuse fail	NA	
3	15.06.2019	1:16	15.06.2019	2:36	1	-2.41	220kV Singhagaon and Dhamdum line	220/66/33kV Dhamdum Substation	NA	**REL 670** (distance relay) **GENERAL TRIP**: 1)Zone -1. 2)B Phase. 3) I =3.10A. 4)Fault Abs Distance = 25.49. 5) RE Distance 63.73%	NA	
4	21.06.2019	13:35	21.06.2019	13:41	0	13.42	66 kV Gomtu fdr.	Gomtu	NA	**REL 670**(distance relay) General trip 1)Zone 2 Trip(15km) 2)B Phase.	NA	
5	22.06.2019	10:07	22.06.2019	12:05	1	10.39	66 kV Gomtu fdr.	Gomtu	NA	NA	NA	
6	22.06.2019	10:07	22.06.2019	12:05	1	6.31	5 MVA trasformer II		NA	NA	NA	
7	25.06.2019	2:02	25.06.2019	2:08	0	-8.09	220kV Malbase	220/66/33kV Dhamdum Substation	NA		NA	
8	25.06.2019	2:52	25.06.2019	3:00	0	6.82	66kv Gomtu fdr.	66kv Gomtu	NA	REL 670(distance relay) General trip: 1)Zone 1 trip 2)R &B Phase. 3) DIR. E/F TRIP	NA	
9	25.06.2019	3:01	25.06.2019	3:12	0	-0.33	220kv Singhagaon	220/66/33kV Dhamdum Substation	NA	REL 670 (distance relay, 21M2) General trip: 1)Zone 1 Trip 2)B Phase	NA	
	25.06.2019	7:16	25.06.2019	7:20	0	-2.57	220 kV Malbase	220/66/33kV Dhamdum Substation	NA	Grid fail from malabase end	NA	
	25.06.2019	7:23	25.06.2019	7:26	0	-2.57	220 kV Malbase	220/66/33kV Dhamdum Substation	NA	Grid fail from malabase end	NA	
	25.06.2019	7:29	25.06.2019	7:34	0	-2.57	220 kV Malbase	220/66/33kV Dhamdum Substation	NA	Grid fail from malabase end	NA	
	26.06.2019	2:25	26.06.2019	2:39	0	-6.85	220 kV Malbase	220/66/33kV Dhamdum Substation	NA	REL 670(Distance relay(21M1) 1) Zone 1 trip. (32.06km) 2) O/C on' B' phase	NA	ICT tripped at Malbase end
	26.06.2019	2:25	26.06.2019	2:39	0	-0.25	220 kV Singhagaon	220/66/33kV Dhamdum Substation	NA	REL670(Distance relay(21M1) 1) Zone 1 trip. (32.06km) 2)O/C on' B' phase	NA	ICT tripped at the Malbase end
	26.06.2019	4:07	26.06.2019	4:35	0	-5.02	220 kV Malbase	220/66/33kV Dhamdum Substation	NA	REL 670(distance relay, 21M2) General trip: 1)Zone 1 trip 2)R,Y&B phase fault 3)VT Fuse fail	NA	Supply failed from Malbase end.
10	26.06.2019	4:07	26.06.2019	6:15	2	0	220kV Singhagaon	220/66/33kV Dhamdum Substation	NA	REL 670(distance relay, 21M2) General trip: 1)Zone 1 trip 2)R,Y&B phase fault 3)VT Fuse fail	NA	Supply failed from Malbase end.
11	26.06.2019	4:02	26.06.2019	4:38	0	2.56	50/63 MVA TRAfo 1&2	220/66/33kV Dhamdum Substation	NA	86A&86B TRP relay OPTD	NA	Due to thunder and lightning.
12	26.06.2019	4:02	26.06.2019	4:41	0	4.37	66 kV Gomtu fdr.	220/66/33kV Dhamdum Substation	NA	General trip,Zone1 trip,Yand B Phase Fault,VT fuse fail	NA	Due to thunder and lightning.
13	26.06.2019	4:02	26.06.2019	4:39	0	2.54	5MVA Trafo 1&2	220/66/33kV Dhamdum Substation	NA	NA	NA	Due to thunder and lightning.
14	26.06.2019	11:07	26.06.2019	11:18	0	4.12	50/63 MVA Trafo. 1&2	220/66/33kV Dhamdum Substation	NA	RET 670 (87T) over current and Earth fault on Bphase.	NA	
15	26.06.2019	11:07	26.06.2019	11:21	0	5.88	66 kV Gomtu fdr.	Gomtu substation	NA	REL 670 (21L) over current and Earth fault on Bphase. Distance 8.05km	NA	

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	25.06.2019	19:32	26.06.2019	11:35	16	0.36	8MVA 66/33kV tx.	33kV Gurungdara feeder-I		Differential relay trip on R and B phase and tripping relay 86.	Line segment	
2	24.06.2019	23:28	25.06.2019	1:15	1	0.16	5MVA 66/33kV tx.	V Gurungdara feede	Earth fault.	E/F relay & Tripping relay 86.	Line segment	Feeder stood normal only after weather got clear.
3	26.06.2019	11:45	26.06.2019	14:.04	2	0.25	5MVA 66/33kV tx.	V Gurungdara feede	Heavy flashover on 33kV Busbar.		Substation	
4	26.06.2019	11:45	26.06.2019	12:12		0.36	5MVA 66/11kV tx.-I	All 11kV feeders	Heavy flashover on 33kV Busbar.		Substation	
5	26.06.2019	11:45	26.06.2019	12:12		0.36	5MVA 66/11kV tx-II	All 11kV feeders	Heavy flashover on 33kV Busbar.		Substation	
6	11.05.2019	19:15	11.05.2019	19:16	1	0.42	8MVA 66/33kV Transformer	33kV Gurungdara I		Diff.relay & Tripping 86.	Line segment	Test charged and stood normal.

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	6/14/2019	13:29hrs	6/14/2019	13:36hrs	7	5.470	66kV Lobeysa to Basochu feeder	Lobeysa ss	Line fault	NA	220kV Chukha-Bilpara feeder -I & II tripped	
2	6/14/2019	13:29hrs	6/14/2019	13:36hrs	7	0.930	66kV Lobeysa to Semtokha feeder	Lobeysa ss	Line fault	NA	220kV Chukha-Bilpara feeder -I & II tripped	
3	6/14/2019	13:45hrs	6/14/2019	14:04hrs	19	5.470	66kV Lobeysa to Basochu feeder	Lobeysa ss	Line fault	NA	220kV Chukha-Bilpara feeder -I & II tripped	
4	6/14/2019	13:45hrs	6/14/2019	14:04hrs	19	0.930	66kV Lobeysa to Semtokha feeder	Lobeysa ss	Line fault	NA	220kV Chukha-Bilpara feeder -I & II tripped	

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	6/14/2019	1329hrs	6/14/2019	1336hrs	7.00	-16.01	220kV Semtokha-Chukha feeder	Whole western substations	Whole units trip at Chukha end due to tripping of feeder I&II and Rurichu in isolation mode	No tripping at Semtokha substation	Trip 220kV Chukha-Birpara feeder-I&II	
2	6/14/2019	1345hrs	6/14/2019	1405hrs	20.00	-33.51	220kV Semtokha-Chukha feeder	Whole western substations	Whole units trip at Chukha end due to tripping of feeder I&II and Rurichu in isolation mode	No tripping at Semtokha substation	Trip 220kV Chukha-Birpara feeder-I&II	

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
1	06.06.19	13:58	06.06.19	14:04	6	2.732 each	10 MVA I & II	Black Out	EF	EF	_	
2	13.06.19	7:15	13.06.19	7:39	24	3.804 & 3.802	10 MVA I & II	Black Out	OC & EF	OC & EF	33 kV O/G III t/phu mini hydel	

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	13/6/2019	8:03	13/6/2019	8:05	2	4.2	66/33kV, 20MVA TR.I	All the 33kV Outgoing Feeders was effected	Due to tripping of 33kV DPH II	TRAFO DIFFL PROTN RELAY-87: DIR.O/C&EF OROTN RELAY-86.	RICB at Thimphu	Transformer tripped due to tripping of 33KV outgoing feeder VI (DPH II).Reset all Relay and test charge and hold normal.
2	15/6/2019	7:41	15/6/2019	7:43	2	3.3	66/33kV, 20MVA TR.I	Only 33kV outgoing feeders DPH I	Due to Tripping of DPH I	TRAFO DIFFL PROTN RELAY-87	Line Segments	Transformer tripped due to tripping of 33KV outgoing feeder V(DPH I).Reset all Relay and test charge and hold normal.

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	14.06.2019	1330hrs	14.06.2019	1625hrs	55min	(-)3.60MW	66KV both I/C trip	Paro, Pangbasa s/s	trip	No operatio at Chumdo end	Incomer end	
2	24.06.2019	1347hrs	24.06.2019	1506hrs	19min	1.42MW	66kV Pangbasa Fdr	Pangbasa, Haa	trip	Over Current& E/fault relay	Transient fault	After line didn't stand after test charging
3	30.06.2019	1444hrs	30.06.2019	1555hrs	11min	1.11MW						

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
1	6/14/2019	13.30	6/14/2019	13.35	5	4.65		66kV Chumdo-Paro Line	Tripped from Generation unit, Chukha	Tripped from Chukha Power House	Chukha Power House	
2	6/14/2019	13.45	6/14/2019	14.05	20	4.65		66kV Chumdo-Paro Line	Tripped from Generation unit, Chukha	Tripped from Chukha Power House	Chukha Power House	

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	6/14/2019	13:28	6/14/2019	13:36	8minutes	1.139	66kV Incomer	66kV Incomer,with all the outgoing feeders.	Source fail	Nil	Chuhukha power house	
2	6/14/2019	13:45	6/14/2019	14:04	19minutes	1.139	66kV Incomer	66kV Incomer,with all the outgoing feeders.	Source fail	Nil	Chuhukha power house	
3	6/19/2019	15:46	19:06/2019	16:08	22minutes	0.954	66kV Incomer	66kV Incomer,with all the outgoing feeders.	Unknown	O/C relay optd. at Pangbasa end.	Pangbasa Ss.	
4	6/24/2019	12:47	6/24/2019	12:54	7minutes	1.23	66kV Incomer	66kV Incomer,with all the outgoing feeders.	Source fail	Nil	Chhukha power house.	
5	6/24/2019	13:37	6/24/2019	14:14	37minutes	2.23	66kV Incomer	66kV Incomer,with all the outgoing feeders.	Unknown	B phase O/C and three phase relay optd, at Chumdo substation.	Chumdo switching station	
6	6/30/2019	14:39	30:06/2019	15:14	35minutes	0.84	66kV Incomer	66kV Incomer,with all the outgoing feeders.	Source fail	Nil	Chhukha power house.	

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	14/6/2019	13:28hrs	14/6/2019	13:36hrs	8min	.285MW	66KV IC	Feeder I and II	66kV incomer fail from chukha end	66KV Incommer fail from chukha end	66kV incomer fail from chukha end	
2	14/6/2019	13:44hrs	14/6/2019	13:49hrs	5min	.285MW	66KV IC	Feeder I and II	66kV incomer fail from chukha end	66KV Incommer fail from chukha end	66kV incomer fail from chukha end	