



# Agenda for **55<sup>th</sup> PCC meeting**

**Date: 25.05.2017**  
**Eastern Regional Power Committee**  
**14, Golf Club Road, Tollygunge**  
**Kolkata: 700 033**

# **EASTERN REGIONAL POWER COMMITTEE**

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## **AGENDA FOR 55<sup>TH</sup> PROTECTION SUB-COMMITTEE MEETING TO BE HELD AT ERPC, KOLKATA ON 25.05.2017 (THURSDAY) AT 11:00 HOURS**

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### **PART – A**

#### **ITEM NO. A.1: Confirmation of minutes of 54<sup>th</sup> Protection sub-Committee Meeting held on 20<sup>th</sup> April, 2017 at ERPC, Kolkata.**

The minutes of 54<sup>th</sup> Protection Sub-Committee meeting held on 20.04.17 circulated vide letter dated 26.04.17.

**Members may confirm the minutes of 54<sup>th</sup> PCC meeting.**

### **PART – B**

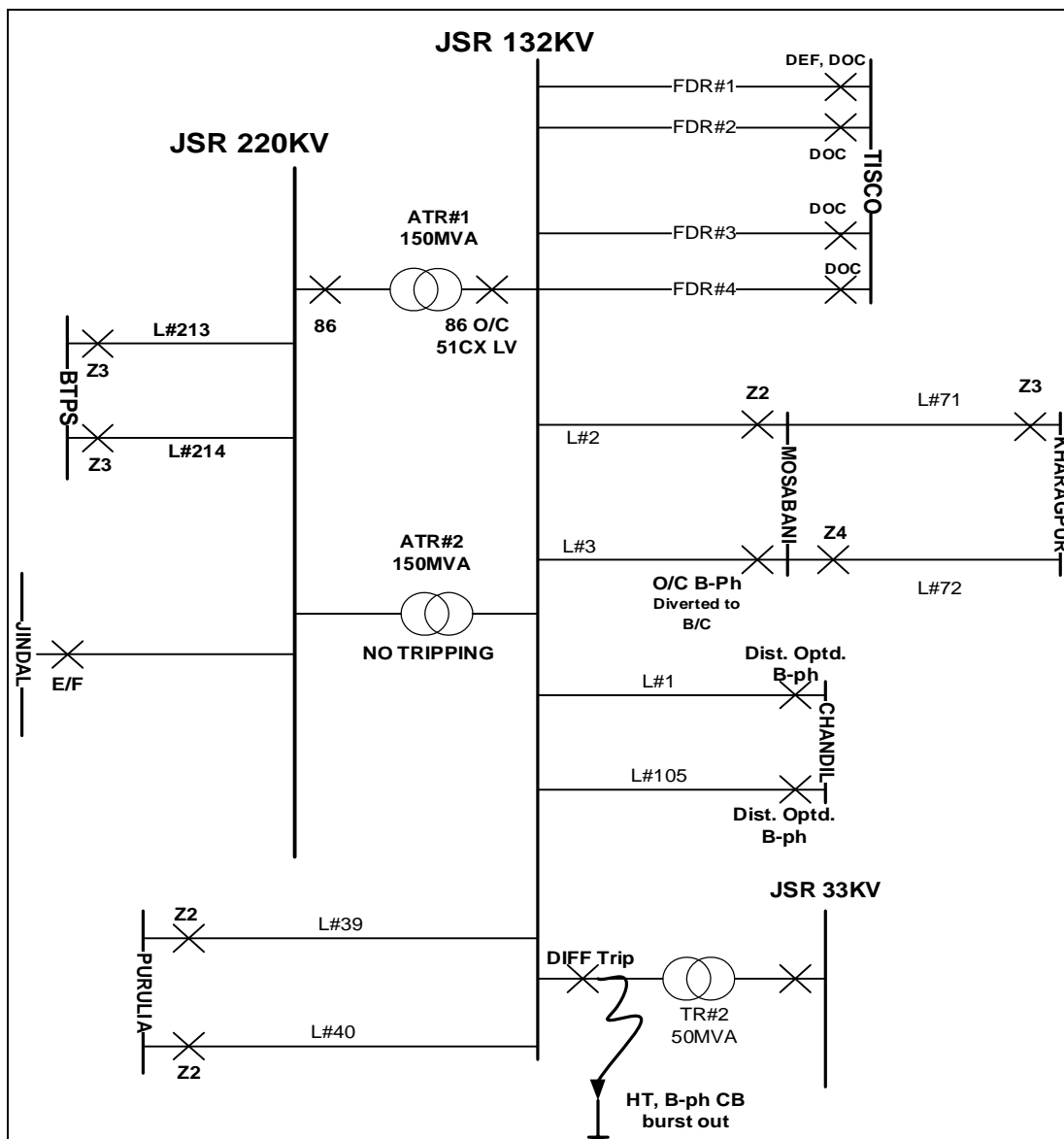
#### **ANALYSIS & DISCUSSION ON GRID INCIDENCES OCCURRED IN APRIL, 2017**

#### **ITEM NO. B.1: Total power failure at 132 KV JAMSHEDPUR & MOSABANI S/S on 25.04.17.**

- 1. Single line diagram:** Submitted
- 2. Detailed analysis of tripping incident:** Submitted

On 25<sup>th</sup> April 2017 at 19:08 hrs HT (132KV), B-phase CB bushing of 50 MVA TR# 2 at Jamshedpur S/S has caused total power failure at both 220KV & 132KV Jamshedpur Sub-station and 132KV Mosabani Sub-station.

1. 132KV B-phase CB of 50 MVA TR#2 burst out at Jamshedpur S/S causing B-Phase Earth Fault and further evolved into Y-B Phase fault, due to which Tr # 2 tripped from 132KV side with Differential protection. However, fault was not cleared as the fault was in breaker itself.
2. To clear the fault, all the 132 KV lines connected to JSR tripped from remote end correctly except L # 2 from Mosabani end. It is seen from the DR of L # 2 at Mosabani end that the breaker of the said line had failed to trip in spite of the relay issuing its Distance Zone 2 trip signal.
3. As the fault persisted, Line # 71 tripped through distance protection Zone 3 from KGP end at 600ms (Zone 3 time) & Line # 72 tripped through distance protection Zone 4 from Mosabani end at 1.5 seconds as the distance relay AREVA make P442 of Line # 72 at KGP end was out of order. As the fault current recorded by L # 72 Mosabani end distance relay was quite less, the backup D/O/C & D/E/F protection at KGP end would have taken around greater than 1.5 seconds to operate (as seen in ASPEN software) before which the Mosabani end relay operated to clear the fault from 132KV network.
4. Due to tripping of all lines to Mosabani S/S, there was total power failure at 132 KV Mosabani Sub-station.
5. On the 220KV Side, Line # 213 and Line # 214 tripped through Distance Protection Zone3 from BTPS end before ATR#1 tripped through LV Side Phase O/C. It was seen that the ATR # 2 LV O/C relay would take around 1.25 sec to trip by simulating a similar resistive fault in ASPEN software.
6. However, ATR # 2 did not trip along with ATR # 1 because ATR # 2 has LV O/C plug setting of 0.75(600A Primary; CTR used = 800/1) whereas ATR # 1 has 1.25(500A primary; CTR used = 400/1). Moreover it was seen in ASPEN that due to difference in percentage impedances of both ATRs, the fault current contributed by ATR # 2 was lesser than that of ATR # 1 causing ATR # 1 to trip faster than ATR # 2.
7. Before ATR # 2 tripped, the fault was cleared with the tripping of Line # 215 (JSR-Jindal) through Earth Fault protection from Jindal end, causing total power failure at 220KV JSR sub-Station.



### **STUDIES DONE REGARDING TRIPPING OF ATRs:**

The tripping of 220KV lines from remote end took place as the ATRs did not have dedicated E/F protection and the fault was a resistive one. The resistive nature of the fault had reduced the fault current so that the ATR # 1 (P/U = 500A) took more time than Distance Zone 3 of 220KV network and ATR # 2 (P/U = 600A) would have taken even more time for the said fault. It is felt that the existing pickup of O/C relays of ATRs should not be made more sensitive to allow for necessary overloading during power system crisis situations.

The relay Indications are as follows:

Equipment detail	Relay indications at Jamshedpur end	Relay indications at remote end
TISCO Feeder # 1	No trip	DEF, DOC
TISCO Feeder # 2,3,4	No trip	DOC
Line # 1 & 105 (JSR-Chandil)	No trip	Distance Protection Operated, B-Phase
Line # 39 & 40 (JSR-Purulia)	No trip	Distance Zone2, Y & B Phase

Line # 2 (JSR-Mosabani)	No trip	Distance Zone 2, Y & B phase
Line # 3 (JSR-Mosabani)	No trip	Non Directional O/C, B Phase
ATR # 1	LV Side B Phase O/C	
ATR # 2	No trip	
220KV L # 213, 214 (JSR-BTPS B)		Distance Zone 3
220KV L # 215		D/E/F
L # 72 (Mosabani-KGP)	Mosabani End – Dist Zone 4	
L # 71 (Mosabani-KGP)		KGP end – Distance Zone 3

**3. Disturbance record:** Submitted

**4. Remedial action taken :** Submitted

1. The faulty distance relay of L # 72 at KGP end needs to be replaced by a healthy one. DVC has already intimated Transmission division to arrange for a replacement relay.
2. Earth Fault Protection needs to be introduced for all ATRs where not present.
3. Proper operation of the Circuit Breaker of Line # 2 at Mosabani end should be ensured.

**DVC and WBSETCL may explain the following:**

- 132kV Kharagpur-Mosabani line II should trip from Kharagpur end (Atleast directional O/C, E/F protection should operate) WBSETCL may place the details of relays installed at Kharagpur end
- Zone 4 reach setting of Line # 72 is over reaching at Mosabani end, the reach setting should be reviewed
- Dedicated earth fault protection should be installed for 220/132kV ATRs
- The over current relays setting for 220/132kV ATRs should be selected considering the percentage impedances of the ATRs

**ITEM NO. B.2: Disturbance at 132kV Bandel S/s on 28-04-17 at 17:23 Hrs.**

**1. Single line diagram:** Not Submitted

**2. Pre fault conditions:** Submitted

Disposition of the feeders of 132kV Bus at Bandel S/s:

<i><b>EAST BUS</b></i>	<i><b>WEST BUS</b></i>
<i><b>1. Dharampur #1</b></i>	<i><b>1. Liluah #1</b></i>
<i><b>2. Dharampur #2</b></i>	<i><b>2. Liluah #2</b></i>
<i><b>3. Bighati #1</b></i>	<i><b>3. Khanyan</b></i>
<i><b>4. Bighati #2</b></i>	<i><b>4. Satgachhia</b></i>
<i><b>5. Adisaptagram #1</b></i>	<i><b>5. Dharampur #3</b></i>
<i><b>6. Adisaptagram #2</b></i>	<i><b>6. Kalyani</b></i>
<i><b>7. Unit #2</b></i>	<i><b>7. Unit #4</b></i>
<i><b>8. 25 MVA Plant Transformer #1</b></i>	<i><b>8. 25MVA Resv. Transformer</b></i>
<i><b>9. 25 MVA Plant Transformer #2</b></i>	<i><b>9. Unit #5</b></i>

### 3. Detailed analysis of tripping incident: Submitted

At 17=30 hrs, flashover occurred at Y phase Differential CT located at 132 KV West Side Main Bus. The CT had caught fire and flames engulfed the associated cables of the CT.

As a result, all the lines connected to 132 kV East and West buses tripped on operation of east bus differential relay( Y-Phase) & West Bus Differential protection (87B) along with Busbar protection relay (86IA & 86IB).

Unit#2, Unit #4, Unit#5 alongwith 25 MVA Reserve Transformer, 25 MVA Plant #1 Transformer, 25 MVA Plant #2 Transformer got tripped.

**4. Remedial action taken :** Submitted

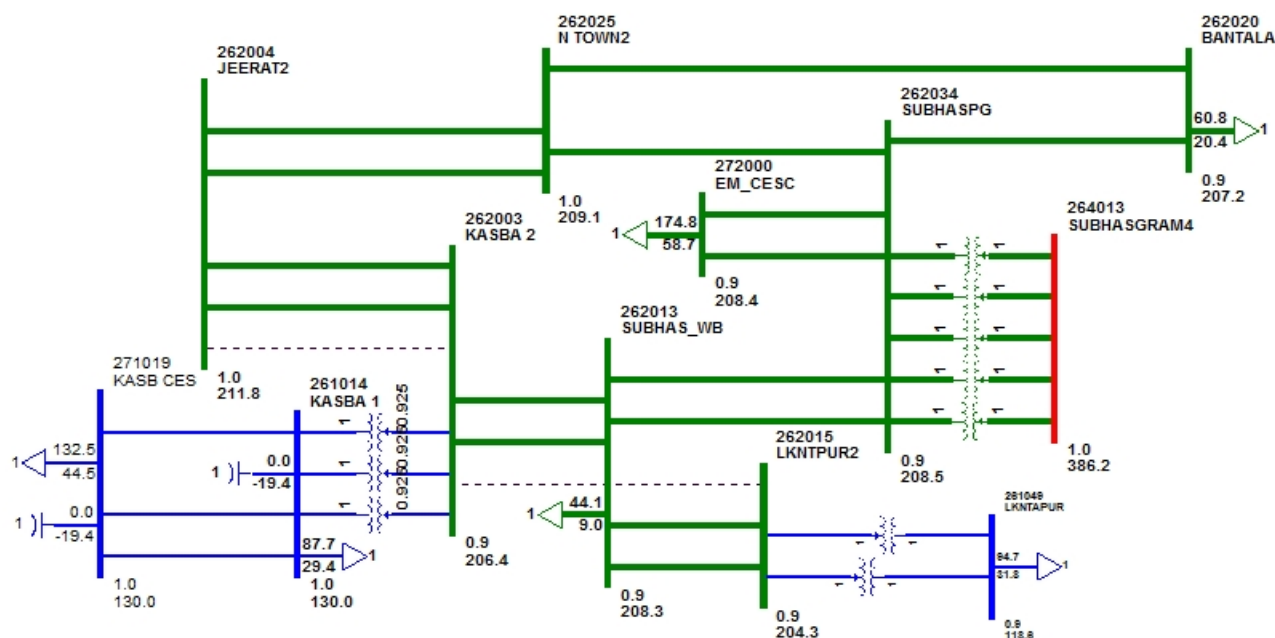
- Checking of condition of CT ( physical & electrical checks).
- Replacement of CT which have aged more then 10 years or have low oil level or have poor electrical test report.

**WBDPCL may explain the following:**

- Reason for bus bar protection operation of both 132kV buses for a fault in 132 KV West Side Main Bus with SLD and bus bar protection scheme.

**ITEM NO. B.3: Disturbance at 220/132 kV Lakhikantapur S/s (WBSETCL) on 26-04-17 at 16:16 Hrs.**

**1. Single line diagram: Submitted**



**2. Pre fault conditions:** Not Submitted

### 3. Detailed analysis of tripping incident: Submitted

All 220/132 kV ATRs at Lakhikantapur tripped when 132 kV string bus of 220/132 kV ATR - II fell on 132 kV main bus due to failure of tension disk insulator string. As Lakhikantapur was being radially fed from 220 kV Subhashgram S/s, power interruption occurred at Lakhikantapur, Joka, Sirakol, Falta, and Kakdeep.

First fault was in Y phase and it was cleared within 100 ms. Second fault was observed in all three phases. Fault duration was nearly one second. During the second fault, oscillation was observed in power flow through various 400 kV transmission lines such as 400 kV Jeerat – Subhasgram S/C and 400 kV Durgapur – Maithon – I.

The relay Indications are as follows:

Time	Name of the element	Relay at HV side	Relay at LV side
16:16 hrs	220/132 kV ATR – I at Lakhikantapur	O/C &E/F	Inter-tripped
	220/132 kV ATR – II at Lakhikantapur	Differential Trip	O/C &E/F
	220/132 kV ATR – III at Lakhikantapur	O/C &E/F	Inter-tripped

**4. Disturbance record:** Submitted

**5. Remedial action taken :** Not Submitted

#### Analysis of PMU plots:

- First fault was in Y phase and it was cleared within 100 ms.
- Second fault was observed in all three phases. Fault duration was nearly one second.

#### Status of Reporting:

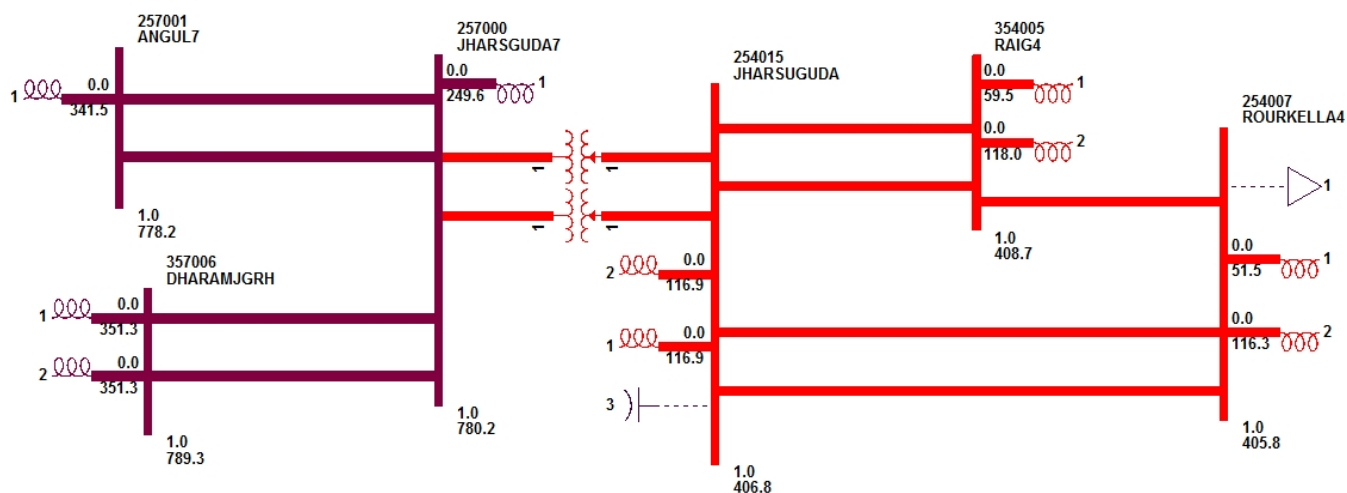
- Tripping report received from WBSETCL on 28-04-17

#### WBSETCL may explain the following:

- Reason for delayed fault clearing of 1 s

#### ITEM NO. B.4: Disturbance at 765 kV Jharsuguda (PG) S/s on 19-04-17 at 15:45 Hrs.

**1. Single line diagram:** Submitted



**2. Pre fault conditions:** Submitted

Bus configuration at 765kV Jharsuguda:

Bus - I	Bus - II
765/400 kV ICT - I	765 KV B/R - I
765/400 kV ICT - II	765 KV B/R - II
765 KV Dharamjaigarh - I	Future
766 KV Dharamjaigarh - II	Future
Future	765 KV Angul - I
Future	766 KV Angul - II

Prefault power flow:

Name of the line	Active Power	Reactive Power
1. 765KV SNG-DRGH # I	-216.59 MW	-212.05 MVar
2. 765 KV SNG -DRGH # II	-219.23 MW	-209.40 MVar
3. 765 KV SNG -ANGUL # I	194.20 MW	-25.44 MVar
4. 765 KV SNG -ANGUL # II	194.24 MW	-28.51 MVar
5. 400KV SNG- RKL # I	72.09 MW	-55.01 MVar
6. 400 KV SNG -RKL # II	67.97 MW	-54.11 MVar
7. 400KV SNG – RGH#I	-47.68 MW	-74.36 MVar
8. 400 KV SNG - RGH # II	-47.06 MW	-74.42 MVar
9. 765/400KV 1500MVA ICT#I	24.89 MW	-7.96 MVar
10. 765/400KV 1500MVA ICT#II	-24.57 MW	-7.94 MVar

### 3. Detailed analysis of tripping incident: Submitted

Due to high wind and cyclonic storm, multiple faults occurred at 765kV Jharsuguda S/S and all 765 kV feeders along with 765/400 kV ICT – I & II and 765 kV B/R – I tripped. 765 kV switchyard of 765/400 kV Jharsuguda S/S was severely affected. Around 19 connectors were found in broken condition after the storm.

It was found B/B protection did not operate due to problem in DC system. (DC Earth fault occurred in both DC-1 & DC-2 system on previous day. During rectification work, this multiple tripping incident occurred). 765/400 kV ICT – I & II and 765 kV B/R – I tripped on differential protection and 765 kV Jharsuguda – Angul – I & II and 765 kV Jharsuguda – Dharamjaigarh – I & II tripped from remote end (Fault clearing time 500 ms). 400 kV side was unaffected during the disturbance.

Though 765 kV Angul and Dharamjaigarh feeders didn't trip from Jharsuguda end, voltage and current data was recorded by disturbance recorder. The voltage and current characteristics at Jharsuguda end is same as the one recorded by remote end disturbance recorder. Initially fault was in R & Y phase. After 450 ms, current increased in all three phases.

The relay Indications are as follows:

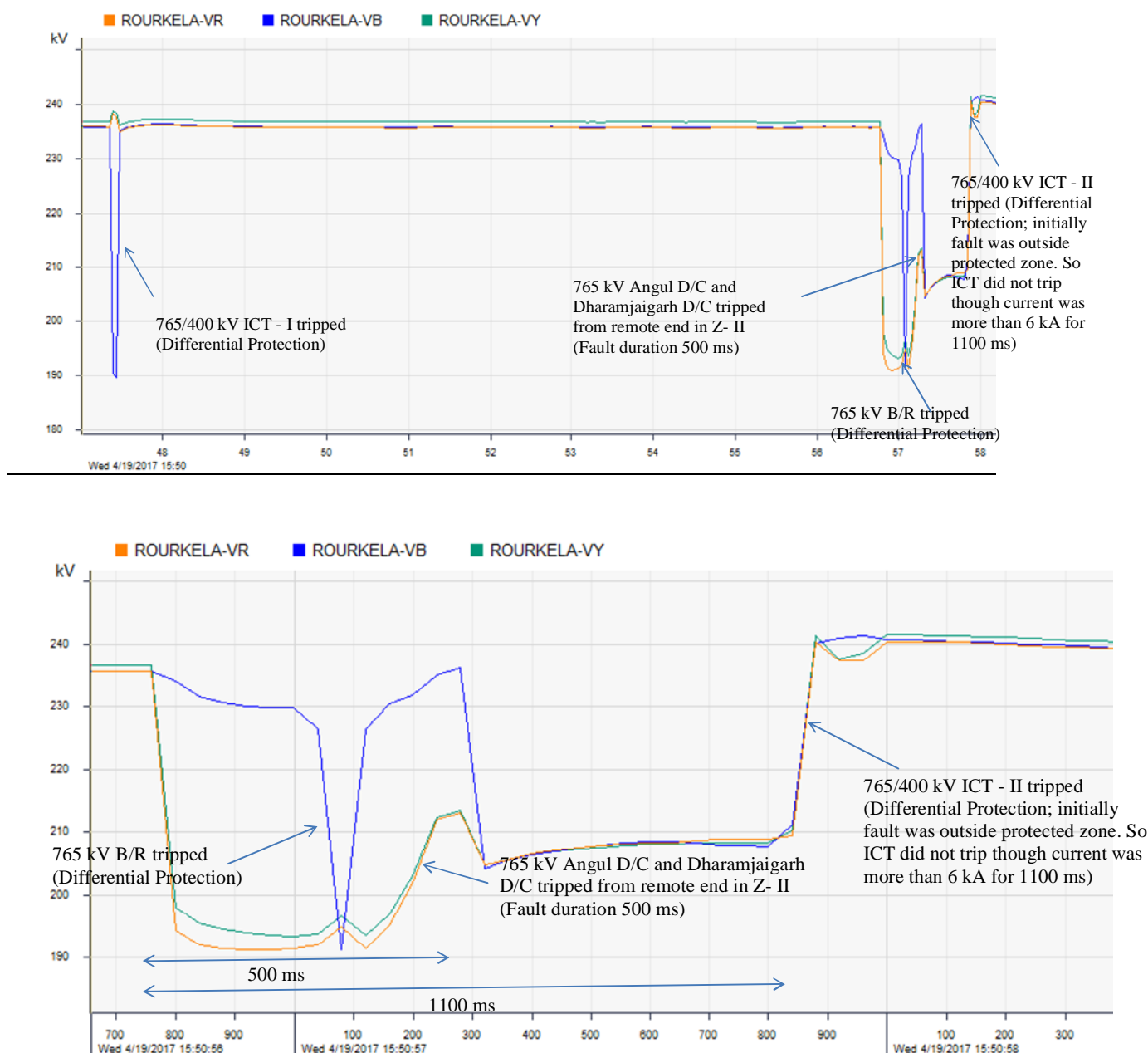
Time	Name of the element	Relay at local end	Relay at remote end
15:50 hrs	765/400 kV ICT – I	Ir-4.29 I/I <sub>n</sub> , Iy-4.29 I/I <sub>n</sub> , Ib-8.58 I/I <sub>n</sub> & Ib-1.48kA, Differential & Directional Over current (HV side) protection	
	765/400 kV ICT – II	Ir-8.22kA, Iy-8.48kA, Ib-8.72kA, Differential protection	
	765 kV B/R - I	Ir-11.56 I/I <sub>n</sub> , Iy-11.54 I/I <sub>n</sub> , Ib-23.1 I/I <sub>n</sub> , Differential protection	
	765 kV B/R - II	Did not trip	
	765 kV Jharsuguda – Angul – I & II	Did not trip	R-Y, Z-II, Ir = 2.25 kA, Iy =2.34 kA, 281.1 km from Angul (Fault duration 500 ms)
	765 kV Jharsuguda – Angul – I & II	Did not trip	R-Y, Z-II, (Fault duration 500 ms)

#### 4. Disturbance record: Submitted

#### 5. Remedial action taken : Not Submitted

#### Analysis of PMU plots:

In PMU data, at 19:56:47.360 hrs, one B-N fault has been observed (765/400 kV ICT – I tripped due during this fault). This fault has been cleared within 100 ms. At 15:50:56.760 hrs, fault has been observed in R & Y phase which persisted for 1100 ms (cleared after tripping of 765/400 kV ICT – II). At 15:50:57.040 hrs and at 15:50:57.280 hrs two voltage dip are observed in PMU data. During first dip (765 kV B/R at Jharsuguda tripped at this moment), fault was temporary in nature. During second dip fault was cleared after tripping of 765/400 kV ICT – II (Fault duration 600 ms).



#### Status of Reporting:

- Detail report along with DR has been received from POWERGRID on 01-05-17



**Powergrid may explain the following:**

- It was informed that bus differential protection at 765kV Jharsuguda did not operate due to problem in DC system. How ICT and Bus reactor tripped at 765kV Jharsuguda on differential protection.
- 765 kV Jharsuguda – Angul – I & II and 765 kV Jharsuguda – Dharamjaigarh – I & II tripped from remote end on zone 2 in 500 ms. Zone 2 time should be 300 ms.

**ITEM NO. B.5: Repeated Disturbances at 400 KV Darbhanga S/s**

**1. At 12:35 hrs on 18-04-2017**

400 kV Muzaffarpur - Darbhanga - II tripped on B-N fault resulting load loss at radially connected area such as Darbhanga, Sitamari, Pandual, Madhubani etc.

400 kV Muzaffarpur - Darbhanga - I was under s/d.

**2. At 22:56 hrs on 19-04-2017**

400/220 kV ICT - I tripped at 400kV Darbhanga. Load at Samastipur, Motipur, Musari and Darbhanga (including 15 MW traction load) were interrupted.

400 KV Muzaffarpur-Darbhang-I was under breakdown.

**3. At 04:54 hrs on 20-04-2017**

400/220 kV ICT - I tripped at 400kV Darbhanga. Load at Samastipur, Motipur, Musari and Darbhanga were interrupted.

400 KV Muzaffarpur-Darbhang-I and 400 kV bus - I at Darbhanga were under breakdown.

**4. At 15:27 hrs on 20-04-2017**

400/220 kV ICT - I tripped at 400kV Darbhanga. Load at Samastipur, Motipur, Musari and Darbhanga were interrupted.

400 KV Muzaffarpur-Darbhang-I and 400 kV bus - I at Darbhanga were under breakdown.

**5. At 09:42 hrs on 24-04-2017**

400/220 kV ICT-II at Darbhanga along with 400 kV Muzaffarpur - Darbhanga - II tripped due to LBB operation at Darbhanga.

400/220 kV ICT - I at Darbhanga was out of service.

**Darbhang may explain.**

**ITEM NO. B.6: Disturbance at 400/220 kV Biharsharff S/s on 09-04-17 at 18:49 hrs.**

**1. Single line diagram:** Submitted

**2. Pre fault conditions:** Submitted

Loading on 315 MVA, 400/220kV ICT –I, II and III was 230 MW each.



### Analysis of PMU plots:

- In Biharshariff PMU data, 2 kV voltage dip in B phase observed at 18:49:51 hrs.
- Biharshariff PMU data was unavailable from 18:58:37 hrs.

### Status of Reporting:

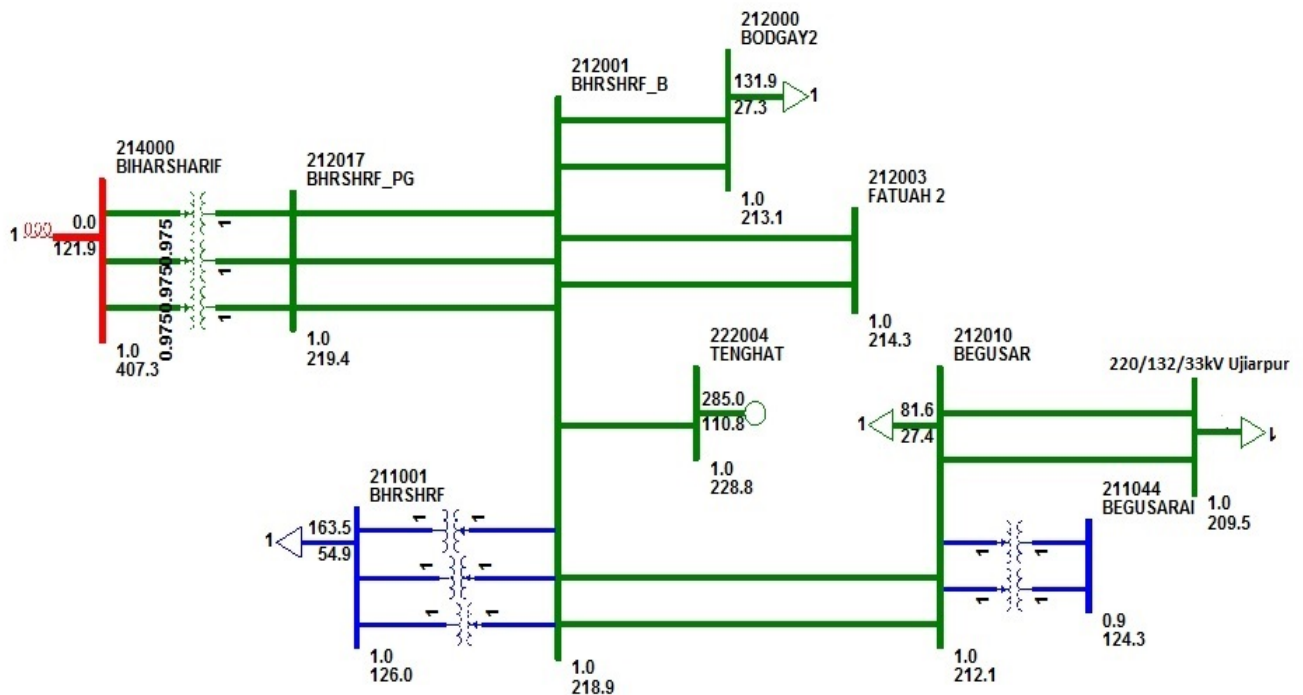
- DR & EL was received from POWERGRID on 12-04-17.
- Detail report from BSPTCL is yet to be received.

### Powergrid and BSPTCL may explain the following:

- Location and nature of fault
- Reason for not clearing the fault from downstream end
- 400/220 KV ICTs over current setting with 600A, 600 ms is low and Powergrid may review the settings with IDMT characteristics so that downstream protection can operate
- SPS may be implemented to avoid the unwanted tripping of ICTs on over load
- Reason for non-availability of PMU & SCADA data at Biharshariff may be explained
- Bihar SLDC may furnish amount of energy un-served and duration of disturbance.

### ITEM NO. B.7: Disturbance at 400/220 kV Biharshariff S/s on 26-04-17 at 20:24 Hrs.

#### 1. Single line diagram: Submitted



#### 2. Pre fault conditions: Submitted

Name of feeder	AT 20:00 Hrs.
220kv bus voltage	221 KV
220kv ICT 1	200 MW
220 KV ICT 2	200 MW
220 KV ICT 3	200 MW
220 KV TTPS	110 MW
150 MVA T1-T2-T3	84 MW (EACH)
220 KV FATUHA I-II	145 MW (EACH)

220 KV BIHARSHARIF-BEGUSARAI I	82 MW
220 KV BIHARSHARIF-BEGUSARAI II	82 MW
220 KV BIHARSHARIF-BODHGAYA I-II	0 MW
132 KV SYSTEM VOLTAGE	128 KV
132 KV BIHARSHARIF- BARIPAHARI I-II	45 MW (EACH)
132 KV NALANDA (L-28)	20 MW
132 KV RAJGIR (L-29)	20 MW
132 KV BIHARSHARIF- NAWADA	61 MW
132 KV BIHARSHARIF- EKANGARSARI	54 MW

### 3. Detailed analysis of tripping incident: Submitted

At 20:24hrs, one 315 MVA 400KV/220 KV ICT at 400kV Biharshariff S/s tripped during bus changeover. As a result other ICTs got overloaded and tripped on overcurrent protection.

There was no tripping at BSPTCL 220/132/33 KV GSS biharsharif S/s and there was continuous power flow through 220KV TTPS line incomer source to BSPTCL.

#### Analysis of PMU plots:

- No fault observed in PMU data

#### Status of Reporting:

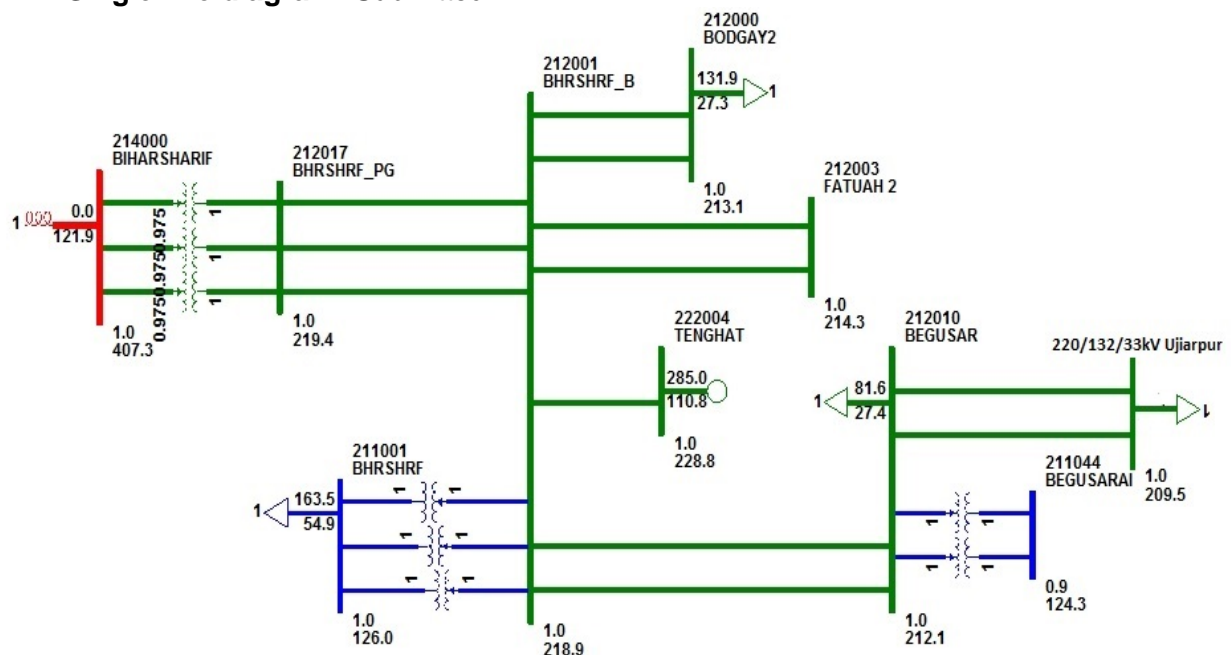
- Detail report was not received from POWERGRID.

#### Powergrid may explain the following:

- Since the total loading is 600 MW, the other two ICTs should not trip on over current.
- 400/220 KV ICTs over current setting with 600A, 600 ms, DMT is low and Powergrid may review the settings with IDMT characteristics so that downstream protection can operate
- SPS may be implemented to avoid the unwanted tripping of ICTs on over load

### ITEM NO. B.8: Disturbance at 400/220 kV Biharsharff S/s on 28-04-17 at 00:02 Hrs.

#### 1. Single line diagram: Submitted



## 2. Pre fault conditions: Submitted

Name of feeder	AT 23:00 Hrs.
220kv bus voltage	227 KV
220kv ICT 1	170 MW
220 KV ICT 2	170 MW
220 KV ICT 3	170 MW
220 KV TTPS	80 MW
150 MVA T1-T2-T3	66 MW (EACH)
220 KV FATUHA I-II	140 MW (EACH)
220 KV BIHARSHARIF-BEGUSARAI I	60 MW
220 KV BIHARSHARIF-BEGUSARAI II	60 MW
220 KV BIHARSHARIF-BODHGAYA I-II	0 MW
132 KV SYSTEM VOLTAGE	133 KV
132 KV BIHARSHARIF- BARIPAHARI I-II	40 MW (EACH)
132 KV NALANDA (L-28)	20 MW
132 KV RAJGIR (L-29)	20 MW
132 KV BIHARSHARIF- NAWADA	45 MW
132 KV BIHARSHARIF- EKANGARSARI	33 MW

## 3. Detailed analysis of tripping incident: Submitted

At 00:02 hrs, bursting of Y Phase CT of 132 kV side of 220/132 kV ATR - III at Fatua resulted in tripping of all 315\*3 MVA 400/220 kV ICTs at Biharshariff in back up O/C. At same time, 220 kV Biharshariff - Fatua line-1 tripped from Biharshariff end on zone 3 (fault distance 104.1 km).

There was continuous power flow through 220KV TTPS line incomer source to BSPTCL, BSF and hence there was no total power failure here.

In PMU data, fault has been observed in all three phases. Fault clearing time is 700 ms. Prior to tripping of ICTs, power flow through 400/220 kV ICTs was almost 510 MW. After tripping of ICTs, power flow in 220 kV Tenughat – Biharshariff S/C increased from 90 MW to 190 MW to feed local load at Biharshariff and Begusarai.

The relay Indications are as follows:

Time (Hrs)	Details of tripping	Relay at local end
00:02 hrs	400/220 kV ICT – I, II & III	O/C at 400 kV side
00:02 hrs	220 KV Biharsharif-Fatuha I	Distance protection P442-Active group-01, started phase ABC, Trip phase ABC, Z3, fault location-104.1km from BSF.

## 4. Disturbance record: Submitted

## 5. Remedial action taken : Submitted

- Y-Ph CT of 132 KV side of 100 MVA ATR-03 was replaced at GSS Fatuha.
- Primary Injection Test was carried out for all the 3-Phases for confirming healthiness and connected CT Ratio at Fatuha GSS end.
- All the three isolators of the same bay were also replaced due to alignment problem.

**Analysis of PMU plots:** Fault clearing time was 700 ms.

### Status of Reporting:

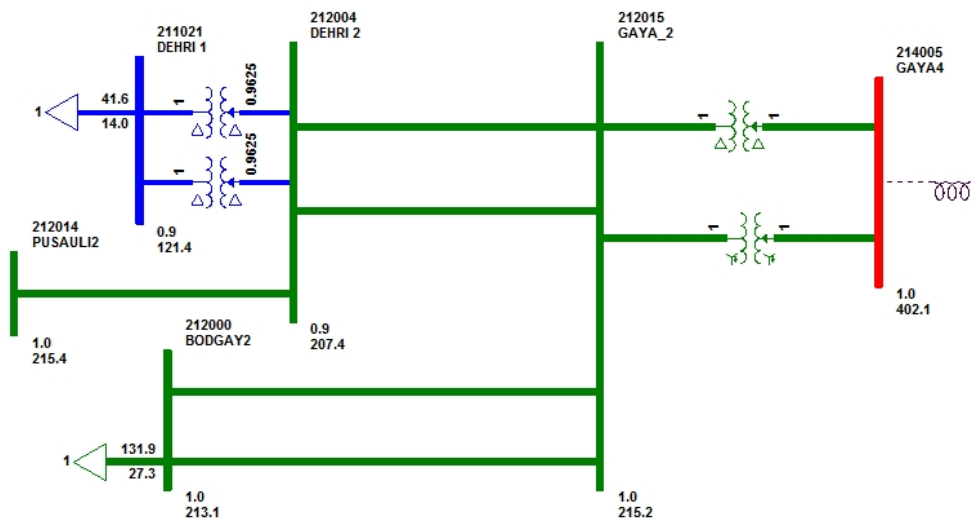
- Detail report from POWERGRID is yet to be received.
- Relay indication has been received from BSPTCL on 28-04-17.

### BSPTCL may explain the following:

- Reason for delayed fault clearing 700 ms
- Reason for not clearing fault from 220kV side of 220/132 kV ATRs at Fatua end and 220 KV Biharsharif-Fatuha line-II

### ITEM NO. B.9: Disturbance at 220 kV Bodhgaya S/s (BSPTCL) on 29-04-2017 at 20:38 Hrs.

#### 1. Single line diagram: Submitted



#### 2. Pre fault conditions: Submitted

- 220 kV Biharshariff – Bodhgaya D/C was out of service
- Bodhgaya was radially fed from Gaya.

#### 3. Detailed analysis of tripping incident: Submitted

At 20:38 hrs, all 220/132 KV ICTs at Bodhgaya due to CT failure of 220/132 kV ICT at Bodhgaya resulting load loss at Gaya, Bela, Wajirgunj, Dehta, Ataula and Sherghati.

The relay Indications are as follows:

CIRCUIT	Relay indication at Bodhgaya end
220/132 KV 150 MVA Tr. No. 04	Micom P632,Micom P127,Micom P122 86 A1,86 A2,86 B1,86 B2,Differential optd. ,Dir.E/F.
220/132 KV 150 MVA Tr. No. 01	Micom P632,Micom P127,Micom P122 86,Dir,E/F
220/132 KV 150 MVA Tr. No. 02	Micom P632,Micom P127,Micom P122 86,Dir,E/F
220/132 KV 150 MVA Tr. No. 03	Micom P643,P141 86,Dir,E/F
220/132 KV 160 MVA Tr. No. 05	GE 650,GE D60 86,Dir,E/F

4. **Disturbance record:** Submitted

5. **Remedial action taken :** Submitted

- Replacement work of faulty CT Has been carried out

**Analysis of PMU plots:**

- In Sasaram PMU data, 13 kV voltage dip observed in Y & B phases and 7.5 kV voltage dip observed in R phase.
- Fault clearance time 350 ms.

**Status of Reporting:**

- Detail report received from BSPTCL on 11-05-17.

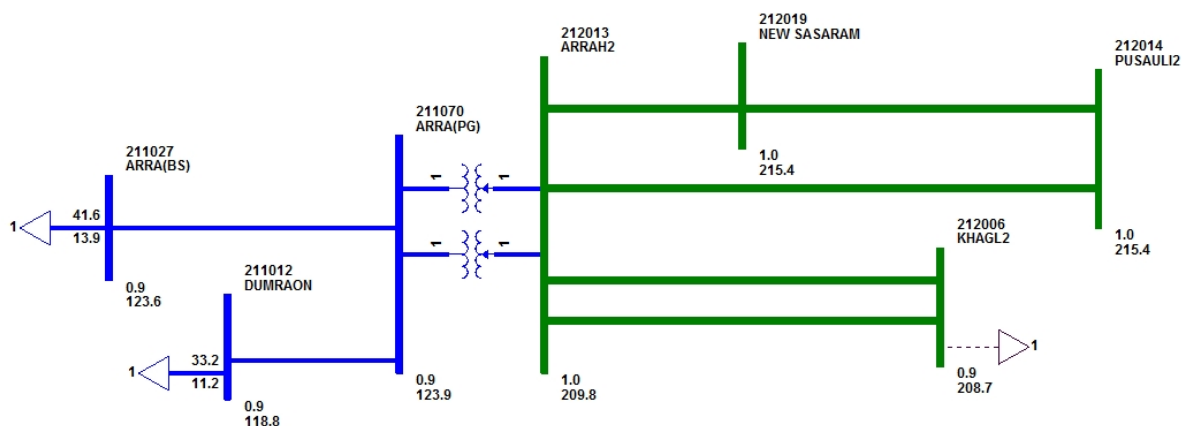
**BSPTCL may explain.**

**ITEM NO. B.10: Tripping of 220 kV Muzzaffarpur - Hazipur D/C line on 13-04-17 at 15:03 hrs.**

220 kV Muzzaffarpur - Hazipur D/C line tripped from Muzzaffarpur end at the instant of charging of newly constructed 220 KV Hajipur -Amnaur ckt 2 transmission line by BGCL. Phase to phase fault found in said transmission line.

**Powergrid and BSPTCL may explain.**

**ITEM NO. B.11: Tripping of 220 kV Arrah - Nandokhar line on 19-04-17 at 11:50 Hrs.**

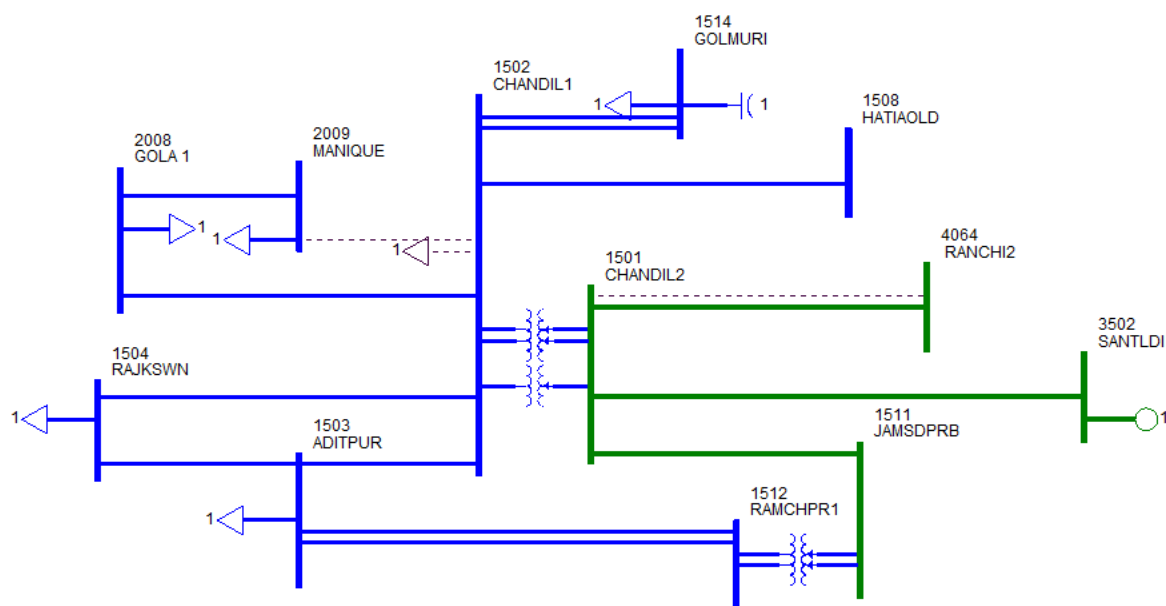


At 11:50 hrs, 220 kV Nandokhar – Arrah S/C tripped from Nandokhar end due to high voltage at Nandokhar.

220 kV Arrah - Sasaram S/C and 220 kV Arrah - Khagul D/C were in opened condition.

**BSPTCL may explain.**

**1. Single line diagram:** Not Submitted



**2. Pre fault conditions:** Not Submitted

### 3. Detailed analysis of tripping incident: Submitted

At 19:01 hrs, 132 kV Ramchandrapur – Adityapur D/C along with 220/132 kV ATR II & III and 220 kV B/C at Ramchandrapur tripped due to B-N fault at 132 kV Adityapur – Ramchandrapur – I (B phase insulator string was completely broken). At the same time, 132 kV Adityapur – Chandil S/C, 132 kV Adityapur – Rajkarswan S/C & 132 kV Chandil – Rajkarswan S/C tripped resulting load loss of 250 MW.

In PMU data, delayed fault clearance has been observed.

- As per the relay flags, there was a B-N fault in 132 kV Ramchandrapur – Adityapur line-I at 50% of the line and Ramchandrapur end cleared the fault in zone 1 but Adityapur end failed to clear the fault.
- As a result the fault got feed from 132 kV Ramchandrapur – Adityapur line-II and Ramchandrapur end failed/delayed fault clearing hence the 220/132 kV ATR II & III tripped from 132kV end.
- The other fault feeding lines 132 kV Adityapur – Chandil S/C, 132 kV Adityapur – Rajkarswan S/C & 132 kV Chandil – Rajkarswan S/C also tripped to clear the fault.

The relay Indications at 132kV Ramchandrapur S/s are as follows:

S.No .	NAME OF FEEDER	TRIPPING TIME	CLOSING TIME	RELAY [RCP End]	RELAY [Remote End]	REMARK S
1.	132KV Adityapur Circuit 1 –	19:02 Hrs.	10:28 Hrs. 03.04.17	B phase fault,power swing, Zone 1, 4.424KM, 5.461KA in B phase		Due to fault in Adityapur circuit-1
2.	132KV Adityapur Circuit 2 –	19:02 Hrs.	19:37Hrs.	O/C start I>1 ,O/V start V>1 ,power swing		



3.	220/132KV Transformer No. II	19:02 Hrs.	19:27 Hrs.	O/C in B-phase LV side		
4.	220/132KV Transformer No. III	19:02 Hrs.	19:36 Hrs.	O/C in B-phase LV side		
5.	220KV Bar coupler	19:34 Hrs.	20:42 Hrs.	None directional O/C and E/F ,master trip		
6.	220/132KV Transformer No. II	19:34 Hrs.	19:46 Hrs.	O/C in B-phase LV side		

**4. Disturbance record:** Not Submitted

**5. Remedial action taken :** Submitted

- During line patrolling of 132KV Ramchandrapur-Adityapur-I line, it was found that B-phase insulator string was broken completely.
- The line was charged at 10:28hrs on dated 03.04.17 after maintenance.

#### Analysis of PMU plots:

- At 19:01 hrs, B phase fault has been observed in PMU data.
- Fault clearing time 350 ms.

#### Status of Reporting:

- Tripping report from JUSNL was received on 18-04-17.

#### JUSNL may explain the following:

- Reason for not clearing the fault in 132 kV Ramchandrapur – Adityapur line-I from Adityapur end
- JUSNL to place the relay indications and explain the tripping incident with disturbance recorder
- How 132 kV Adityapur – Chandil S/C, 132 kV Adityapur – Rajkarswan S/C & 132 kV Chandil – Rajkarswan S/C lines tripped within 350 ms as these line relay should see the fault in zone 3
- Jharkhand SLDC may provide details regarding duration of disturbance and amount of energy un-served during the disturbance.

#### ITEM NO. B.13: Disturbance at 220 kV Chandil S/s (JUSNL) on 05-04-17 at 15:52 hrs.

- 1. Single line diagram:** Not Submitted
- 2. Pre fault conditions:** Not Submitted
- 3. Detailed analysis of tripping incident:** Submitted

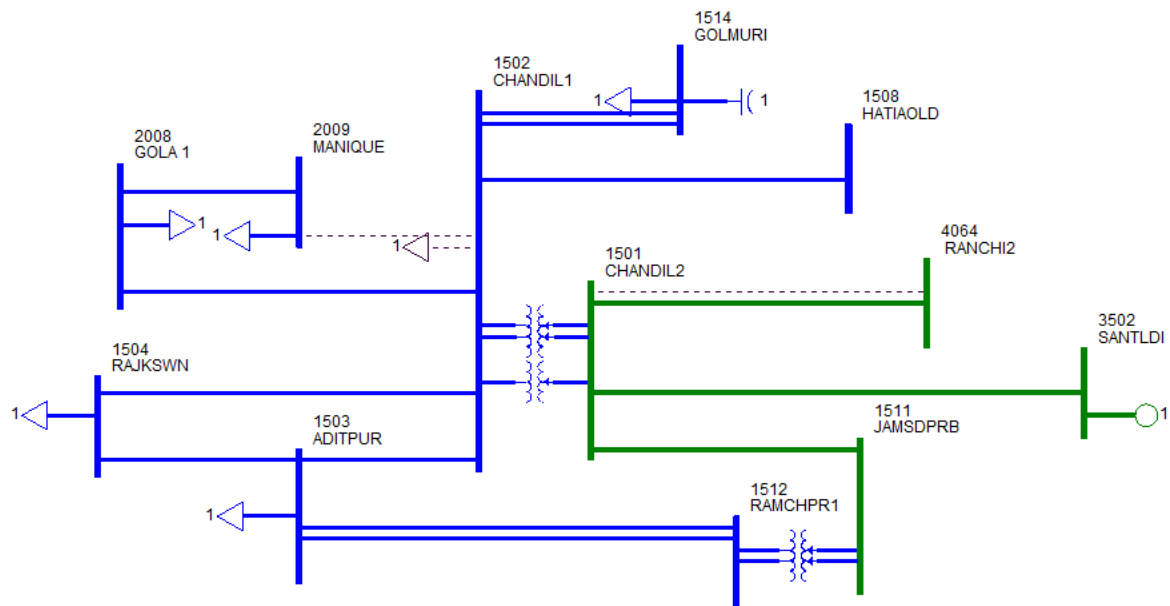
Total power failure occurred at 220kV Chandil due to heavy storm and lightning.

**At 15:37 hrs**, 220 kV Ranchi – Chandil tripped due to B-N fault. Post insulators of 220kV main bus isolator of PT along with jumper in B-ph has fallen on the ground with its female contact. R-ph pipe between line isolator and T/B isolator of 220kV Ranchi feeder has bent and its connector was broken. As per PMU data, fault clearance time is 500 ms.

**At 15:52 hrs**, all connectors of pipe between line isolator and TB isolator in all three phases of 220kV RCP feeder have broken and all pipes of three phases are hanging along with gantry column of Ramchandrapur feeder. 220 kV Ramchandrapur – Chandil and 220 kV STPS – Chandil S/C tripped resulting power loss at Chandil and its adjacent areas.

As per STPS, 220 kV STPS – Chandil tripped from STPS end in B-N, Z-II. (Fault distance 102.9 km).  
As per JUSNL, 220 kV STPS – Chandil S/C tripped from STPS end only.

At 15:52 hrs bus fault at 220kV Chandil S/s has caused the tripping of 220 kV STPS – Chandil S/C line on zone 2.



**4. Disturbance record:** Submitted

**5. Remedial action taken :** Not Submitted

#### Analysis of PMU plots:

- At 15:37 hrs, B phase fault has been observed in PMU data.
- Fault clearing time 500 ms.
- At 15:52 hrs, multiple voltage dip observed in PMU data.

#### Status of Reporting:

- JUSNL has sent DR of Ramchandrapur on 07-04-17

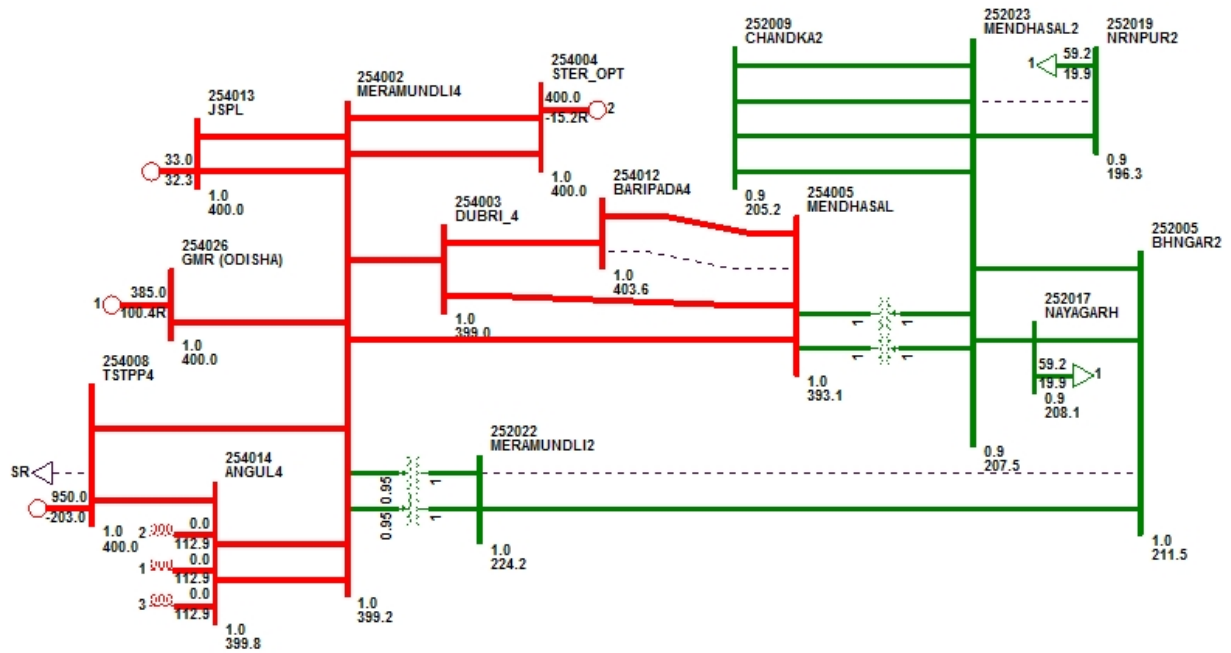
#### JUSNL and Powergrid may explain the following:

- Place the relay indications of both ends of 220 kV Ranchi – Chandil line tripping and explain the reason for delayed fault clearing 500 ms at least the fault should be cleared within zone 2 time
- Place the relay indications of Ramchandrapur end of 220 kV Ramchandrapur – Chandil line tripping
- Jharkhand SLDC may provide details regarding duration of disturbance and amount of energy un-served during the disturbance.



**ITEM NO. B.15: Disturbance at 400 kV Meramundali (OPTCL) S/s on 21-4-17 at 20:17 Hrs.**

**1. Single line diagram: Not Submitted**



**2. Pre fault conditions: Submitted**

400/220 kV ICT – I at Meramundali was under shut down

400 kV Bus configuration of Meramundali S/S:

Bus I	Bus II	Tie-Breaker ON
Vedanta-II	Angul-I	401-ON
Mendhsal-I	Duburi-II	402-ON
Angul-II	Vedanta-I	403-ON
Duburi-I	Mendhasal-II(Not in Service)	404-not in service
JSPL-I	KANIHA	405-ON
ICT-I (B/D)	Future	406- not in service
Future-7	ICT-II	407-OFF
GKEL	JSPL-II	408-ON

**3. Detailed analysis of tripping incident: Submitted**

At 20:17 hrs, 400 kV Meramundali – Angul D/C, 400 kV Meramundali – Mendasal S/C, 400 kV Meramundali – Vedanta D/C and 400/220 kV ICT – II at Meramundali tripped due to R phase LA failure of 400 kV Meramundali – Angul – II at Meramundali end. In Talcher PMU data, two voltage dip in R phase has been observed. In both cases, fault clearing time is 450 ms approximately.

The relay Indications are as follows:

Time (Hrs)	Name of the element	Relay at Meramundali end	Relay at remote end
20:17 hrs	400 kV Meramundali – Angul - II	R-N, F/C 24.16 kA, 20.6 km (R phase LA failure)	Yet to be received
	400 kV Meramundali – Angul - I	R-N, Z-II, DT sent	Did not trip
	400 kV Meramundali – Talcher S/C	Did not trip	R-N, Z-II, 49 km from Talcher, F/C 7.57 kA
	400 kV Meramundali – Vedanta - I	R-N, D/P, F/C 0.17 kA, 15.8 km, DT sent	R-N, Z-II, F/C 1.3 kA, 100% distance
	400 kV Meramundali – Vedanta - II	R-Y-B, D/P, 176.6km, DT sent	R-N, Z-II, F/C 1.5 kA
	400 kV Meramundali – Mendasal S/c	Did not trip	R-N, Z-I, D/P, DT received
	400/220 kV ICT – II at Mendasal	LBB on both side and O/C at 400 kV side (I <sub>y</sub> 2.86 kA)	

**4. Disturbance record:** Not Submitted

**5. Remedial action taken :** Not Submitted

#### Analysis of PMU plots:

- In Talcher PMU data, two voltage dip in R phase has been observed.
- In both cases, fault clearing time is 450 ms approximately

#### Status of Reporting:

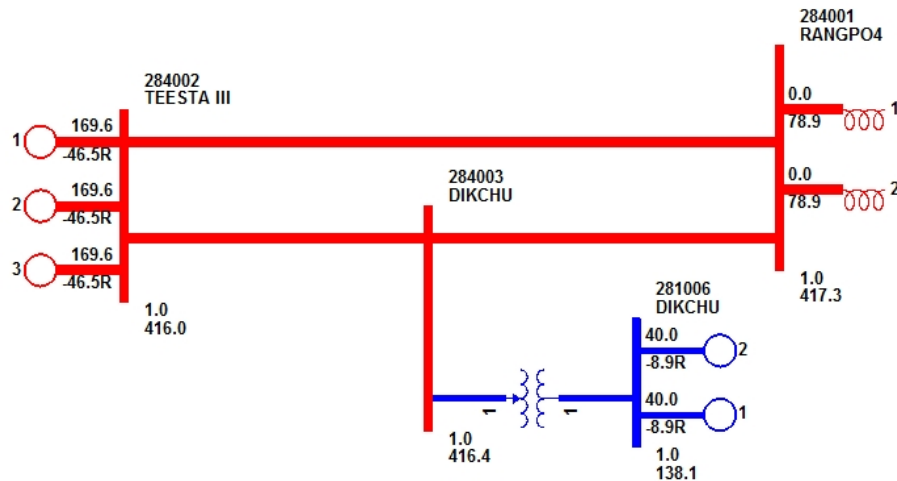
- Detail tripping report from OPTCL is received on 24-04-17.
- Detail report along with DR & EL were received from Talcher on 22-04-17

#### OPTCL and Powergrid may explain the following:

- As per PMU data, two faults (duration 450 ms approx.) occurred in R phase within 1.3 second.
- 400 kV Meramundali – Mendasal S/c should trip from Mendasal end on zone 2, zone 1 reach should be reviewed
- Tripping of 400 kV Meramundali – Angul – I at Meramundali end at Z-II may be investigated as fault was at Meramundali S/s. As per relay indication DT was sent to Angul end. But line did not trip at Angul.
- Fault current recorded at Meramundali end for 400 kV Vedanta – I feeder (0.17kA) is less than remote end (1.3 kA).
- Tripping of 400/220 kV ICT – II at Meramundali on LBB may be explained.

**ITEM NO. B.16: Tripping of 400 kV Teesta III - Dikchu S/C and 400 kV Teesta III - Rangpo S/C on 29-04-2017 at 15:57 Hrs.**

**1. Single line diagram: Submitted**



**2. Pre fault conditions: Not Submitted**

**3. Detailed analysis of tripping incident: Submitted**

At 15:57 hrs, 400 kV Teesta III – Rangpo S/C and 400 kV Teesta – III – Dikchu S/C tripped along with 400/132 kV ATR at Dikchu resulting tripping of all running units at Teesta 3 and Dikchu due to loss of evacuation path.. At the same time, 400 kV Rangpo – Binaguri – II successfully auto reclosed at both ends.

**Analysis of the tripping at Dikchu:** 400/132 kV ATR at Dikchu tripped at 15:57 hrs due to REF protection on HV side. 400 kV Teesta III – Dikchu S/C tripped at 16:04 hrs (As per DR and EL data). Reason for tripping of Teesta III feeder is not recorded in DR. This feeder tripped from Teesta III end in differential protection (87C) at 15:57 hrs.

**Analysis of the tripping at Teesta III:** Both 400 kV Teesta III – Rangpo S/C and 400 kV Teesta III – Dikchu S/C tripped at 15:57 hrs due to differential protection (87C). In case of Teesta III – Dikchu S/C digital status of opening of only R and Y phase breaker is available in DR recorded at Teesta III end. Same line tripped from remote end at 16:04 hrs. In case of Rangpo feeder, Picking up of Z-II (15:57:08.862 hrs) and sending DT signal (15:57:08.862 hrs) is recorded before picking up of Z-III (15:57:08.887 hrs) (though line tripped on 87C at 15:57:08.890 hrs)

**Analysis of the tripping at Rangpo:** 400 kV Teesta III – Rangpo S/C tripped at 15:57:09.446 hrs on receipt of DT signal at 15:57:09.417 hrs from remote end. Before receiving of DT signal, carrier signal was also received at 15:57:09.345 hrs. At 15:57:09.320 hrs, Z-IV was picked up. At the same time (15:57:09.318 hrs), R phase breaker of 400 kV Rangpo – Binaguri -II opened due to operation of Z-I protection. After 1 sec, 400 kV Rangpo – Binaguri –II successfully auto-reclosed at both ends.

**4. Disturbance record: Submitted**

**Analysis of PMU plots:**

- R-N fault has been observed at 15:57:09 hrs.
- Fault clearing time is less than 100 ms.
- No fault has been observed at 15:57:08 hrs.

**Status of Reporting:**

- DR from Dikchu, Teesta III and POWERGRID has been received by 01-05-17

### **Teesta 3, Dikchu and Powergrid may explain the following:**

- As per DR, there were three different faults at same time (REF at 400/132 kV ATR at Dikchu, 87C at Teesta III, Transient fault at 400 kV Rangpo – Binaguri – II). As per PMU data, there was only one R-N fault at 15:57:09 hrs (Transient fault at 400 kV Rangpo – Binaguri – II). So reason for operation of REF protection at Dikchu and Differential protection (87C) at Teesta III may be explained.
- 400 kV Teesta III – Dikchu tripped at Teesta III end at 15:57 hrs and Dikchu end at 16:04 hrs. Teesta III and Dikchu may explain.
- Dikchu may explain the reason for opening of breakers of Teesta III feeder as it was not recorded in DR.
- Reason for non-opening of B phase breaker (As per digital status of DR) of 400 kV Teesta – III – Dikchu – S/C at Teesta – III end may be explained by Teesta III.
- Reason for sending DT signal and picking up Z-II before Z-III for 400 kV Teesta III – Rangpo S/C at Teesta - III end may be explained by Teesta – III.

### **ITEM NO. B.17: Tripping of 400 kV HEL - Subhasgram D/C on 22-04-17 at 20:04 Hrs.**

During inclement weather condition, 400 kV HEL – Subhasgram D/C tripped due to B-N fault resulting tripping of both running units at HEL due to loss of evacuation path. Both distance and differential protection operated for both the circuits. Both the lines were charged by 21:13 hrs.

But the lines tripped again on B fault at 21:18 hrs and 21:23 hrs respectively. As per PMU data, all the faults has been cleared within 100 ms Unsuccessful attempt of auto-reclose operation has been observed in PMU data for all the tripping incidents except the event of tripping of Circuit I at 22:18 hrs.

The relay Indications are as follows:

Time	Name of the element	Relay at local end	Relay at remote end
22:04hrs	400 kV HEL – Subhasgram - I	B-N, Z-I, 59 km, F/C 2.96 kA,	Yet to received
	400 kV HEL – Subhasgram - I	B-N, Z-I, 64 km, F/C 4.39 kA	Yet to received
	Unit I & II at HEL	Tripped due to Loss of Evacuation Path	

### **Analysis of PMU plots:**

- B-N fault has been observed in Durgapur PMU data at 20:04hrs, 21:18 hrs and 21:23 hrs.
- All faults were cleared within 100 ms
- Unsuccessful attempt of auto-reclose operation has been observed in PMU data for all the tripping incidents except the event of tripping of Circuit I at 22:18 hrs

### **Status of Reporting:**

- DR data from HEL has been received on 24-04-17

### **HEL and Powergrid may explain the following:**

- A/R operation has not been found in PMU data at the time of tripping of 400 kV HEL – Subhasgram – I at 21:18 hrs.
- As per DR, unsuccessful A/R operation took place at Subhasgram end. HEL may explain the status of A/R operation at their end.

**ITEM NO. B.18: Tripping of 132 kV Chujachen - Gangtok S/C and 132 kV Rangpo Gangtok S/C lines on 15-04-17 at 08:48 Hrs.**

Due to increment weather condition, 132 kV Chujachen - Gangtok and 132 kV Rangpo Gangtok tripped on R-N fault. 132 kV Rangpo-Gangtok tripped from Rangpo only.

**Powergrid and Sikkim may explain.**

**PART- C:: OTHER ITEMS**

**FOLLOW-UP OF DECISIONS OF THE PREVIOUS PROTECTION SUB-COMMITTEE MEETING(S)**

**(The status on the follow up actions is to be furnished by respective constituents)**

**ITEM NO. C.1: Disturbance at 400kV Vedanta S/s on 17-03-17 at 10:22 Hrs.**

- All the three 400 kV SEL internal smelter feeders tripped on E/F resulting increase in 400 kV SEL – Raigarh S/C flow to 1400 MW.
- Though SPS has been implemented to limit the MW flow through 400 kV SEL – Raigarh S/C to 650 MW, more than 800 MW power was flowing through 400 kV SEL – Raigarh S/C for the duration of 17 minutes as per ERLDC SCADA data.
- Reason for non-operation of SPS of 400 kV SEL-Raigarh should be reviewed.

*In 54<sup>th</sup> PCC, members felt that SPS scheme should operate as and when power flow in any of the 400 kV SEL-Raigarh or 400 kV SEL-Rourkela line is greater than 650 MW as per the designed SPS scheme and generation backing down of Vedanta units should be initiated in this case.*

*Vedanta informed that as per the present setting the SPS will be initiated if power flow in 400 kV line exceeds 800 MW. After this disturbance, SPS scheme at Vedanta end has been modified from summation logic to Individual line loading logic.*

*CE, NPC opined that the SPS settings should not be changed without detail discussion in PCC forum.*

*PCC took serious note of modifying the SPS settings without intimating ERPC /ERLDC and advised OPTCL & Vedanta to submit present SPS details immediately for further discussion in OCC/PCC meetings.*

**OPTCL may update.**

**ITEM NO. C.2: Multiple elements tripping at 220/132 kV Lalmatia (JUSNL) S/s on 06-02-17 at 16:40 Hrs.**

At 16:40hrs, blasting of 132 kV Y & B phase CTs of 132 kV bus sectionalizer at 220/132kV Lalmatia S/s resulted in following events:

- 132 kV Lalmatia - Kahalgaon and 132 kV Lalmatia - Dumka – II tripped from Lalmatia end on zone IV protection.
- 132 kV Lalmatia -Dumka – I feeder tripped from both end.
- Farakka end of 220 kV Farakka Lalmatia line, remain picked up the fault in zone 1 for 880 ms but no line breaker was tripped.



The relay Indications are as follows:

Time	Name of the element	Relay at Lalmatia	Relay at remote end
16:40 hrs	220 kV Lalmatia - Farakka feeder	Did not trip	R-Y-B phase Z-I started, B phase relay picked at 16:40:28.504 hrs, Y phase relay picked at 16:40:28.664 hrs, R phase relay picked at 16:40:28.905 hrs, F/C 1.5 kA in all three phases. All the relay were in picked condition till the end of time frame captured by NTPC end DR (DR is attached)
	132 kV Lalmatia - KhSTPP feeder	B-N, Z-IV, O/C, IA 0.7kA, IB – 0.9 kA, IC – 3kA, Fault duration 183.8 ms.	Did not trip
	132 kV Lalmatia Dumka – I	E/F	D/P
	132 kV Lalmatia Dumka – II	E/F, Z-IV	Did not trip
	220/132 KV ATR, 132/33 KV ATR – I & II at Lalmatia	E/F protection at Lalmatia	

#### Analysis of PMU plots:

- At 16:40 hrs, 4 kV voltage dip observed in all three phases.
- Fault clearance time is 700 ms. Though the voltage fully recovered to pre-fault value after 600 ms of the fault.

In 53<sup>rd</sup> PCC, NTPC informed that 132 kV Y & B phase CTs of 132 kV bus sectionalizer were busted at 220/132kV Lalmatia S/s and Bus bar protection was failed to operate. One 220/132kV ATR at Lalmatia (under NTPC control area) tripped on backup E/F protection other ATR which is under JUSNL control area was failed to clear the fault. As a result, 220kV Lalmatia-Farakka line tripped from Farakka end on directional E/F protection.

JUSNL informed that 132kV Lalmatia-Dumka D/C line and 132kV Lalmatia-Khahalgau S/C line tripped from Lalmatia end on non directional over current protection. The 220/132kV ATR at Lalmatia under their control area also tripped on over current E/F protection.

PCC observed that 220kV Lalmatia-Farakka line tripped from Farakka end after 6 sec which is not acceptable and tripping of 220/132kV ATRs is not clear.

PCC advised the following:

- NTPC should check the reason for non-operation of busbar protection at 132kV Lalmatia S/s.
- NTPC and JUSNL should jointly test the healthiness of the busbar protection at 132kV Lalmatia S/s
- NTPC and JUSNL should place the details of ATR tripping along the relevant DR.
- JUSNL should disable the non-directional over current protection feature in all 132kV lines and enable directional over current protection with proper relay coordination.

PCC advised JUSNL and NTPC to submit the action taken report to ERPC and ERLDC within a week.

*In 54<sup>th</sup> PCC, NTPC and JUSNL informed that they will test the healthiness of the busbar protection at 132kV Lalmatia S/s in May 2017.*

*JUSNL informed they have not yet disabled the non-directional over current protection feature in all*

132kV lines.

PCC advised JUSNL and NTPC to comply the observations at the earliest.

**NTPC and JUSNL may update.**

### ITEM NO. C.3: Third Party Protection Audit

#### 1. Status of 1<sup>st</sup> Third Party Protection Audit:

The compliance status of 1<sup>st</sup> Third Party Protection Audit observations is as follows:

Name of Constituents	Total Observations	Complied	% of Compliance
<b>Powergrid</b>	54*	46	85.19
<b>NTPC</b>	16	14	87.50
<b>NHPC</b>	1	1	100.00
<b>DVC</b>	40	26	65.00
<b>WB</b>	68	27	39.71
<b>Odisha</b>	59	38	64.41
<b>JUSNL</b>	34	16	47.06
<b>BSPTCL</b>	16	5	31.25
<b>IPP (GMR, Sterlite and MPL)</b>	5	5	100.00

\* Pending observations of Powergrid are related to PLCC problems at other end.

The substation wise status of compliance are available at ERPC website (Observations include PLCC rectification/activation which needs a comprehensive plan).

**Members may update.**

#### 2. Schedule for 2<sup>nd</sup> Third Party Protection Audit:

The latest status of 2<sup>nd</sup> Third Party Protection audit is as follows:

1) Jeerat (PG)	Completed on 15 <sup>th</sup> July 2015
2) Subashgram (PG)	Completed on 16 <sup>th</sup> July 2015
3) Kolaghat TPS (WBPDCCL)-	Completed on 7 <sup>th</sup> August 2015
4) Kharagpur (WBSETCL) 400/220kV -	Completed on 7 <sup>th</sup> August 2015
5) Bidhannagar (WBSETCL) 400 & 220kV	Completed on 8 <sup>th</sup> September, 2015
6) Durgapur (PG) 400kV S/s	Completed on 10 <sup>th</sup> September, 2015
7) DSTPS(DVC) 400/220kV	Completed on 9 <sup>th</sup> September, 2015
8) Mejia (DVC) TPS 400/220kV	Completed on 11 <sup>th</sup> September, 2015
9) 400/220/132kV Mendhasal (OPTCL)	Completed on 2 <sup>nd</sup> November, 2015
10) 400/220kV Talcher STPS (NTPC)	Completed on 3 <sup>rd</sup> November, 2015
11) 765/400kV Angul (PG)	Completed on 4 <sup>th</sup> November, 2015
12) 400kV JITPL	Completed on 5 <sup>th</sup> November, 2015
13) 400kV GMR	Completed on 5 <sup>th</sup> November, 2015
14) 400kV Malda (PG)	Completed on 23 <sup>rd</sup> February, 2016
15) 400kV Farakka (NTPC)	Completed on 24 <sup>th</sup> February, 2016
16) 400kV Behrampur(PG)	Completed on 25 <sup>th</sup> February, 2016
17) 400kV Sagardighi (WBPDCCL)	Completed on 25 <sup>th</sup> February, 2016
18) 400kV Bakreswar (WBPDCCL)	Completed on 26 <sup>th</sup> February, 2016
19) 765kV Gaya(PG)	Completed on 1 <sup>st</sup> November, 2016
20) 400kV Biharshariff(PG)	Completed on 3 <sup>rd</sup> November, 2016
21) 220kV Biharshariff(BSPTCL)	Completed on 3 <sup>rd</sup> November, 2016

It was informed that the third party protection audit observations are available in the ERPC website in important documents.

PCC advised all the constituents to comply the observations at the earliest.

Third party protection audit of the following sub-stations is scheduled from 17-05-2017 to 19-05-2017:

1. 400kV Maithon (PG)
2. 132kV Gola (DVC)
3. 132kV Barhi (DVC)
4. 132kV Koderma (DVC)
5. 132kV Kumardhubi (DVC)
6. 132kV Ramkanali (DVC)

**Members may update.**

**ITEM NO. C.4: Zone-2 setting of long line followed by short line**

As per ERPC/CEA protection guidelines Zone-2 time setting of two adjacent lines needs to be properly co-ordinated to avoid undesirable trippings on account of racing between relays. In the past major disturbances occurred due to lack of proper coordination in Zone-2 time setting.

For proper coordination of operation of Zone-2 Distance Protection, an effort has been made to list out the adjacent shortest line for 400 kV transmission lines, and all the lines whose Zone-2 reach is overlapping with that of adjacent lines have been highlighted. The details are given in **Annexure-C4**.

Concerned transmission utilities are requested to review the same and share the present Zone-2 time setting and update in case of mismatch.

In 48<sup>th</sup> PCC, all the constituents were advised to go through the Annexure and review the settings with intimation to ERPC and ERLDC.

*In 54<sup>th</sup> PCC, Powergrid ER-I, ER-II and Powergrid-Odisha have submitted the details.*

**Members may update.**

**ITEM NO. C.5: Line over voltage protection settings for 400 kV and 765 kV Lines in Eastern Region**

Last year over voltage protection setting for all 400 kV and above lines was collected from the constituents. However, in the meantime many changes took place in the system, which includes commissioning of new lines as well as LILO of existing line.

Further CEA guidelines suggest that the following should be considered while setting over voltage protection in transmission line.

**FOR 400kV LINES:** Low set stage (Stage-I) may be set in the range of 110% - 112% (typically 110%) with a time delay of 5 seconds. High set stage (Stage-II) may be set in the range 140% - 150% with a time delay of 100milliseconds.

**FOR 765kV LINES:** Low set stage (Stage-I) may be set in the range of 106% - 109% (typically 108%) with a time delay of 5 seconds. High set stage (Stage-II) may be set in the range 140% - 150% with a time delay of 100milliseconds.

*However, for over voltage Stage-I protection, a time grading of 1 to 3 seconds may be provided between overvoltage relays of double circuit lines. Grading on overvoltage tripping for various lines emanating from a station may be considered and same can be achieved using voltage as well as*

*time grading. Longest timed delay should be checked with expected operating time of Over-fluxing relay of the transformer to ensure disconnection of line before tripping of transformer.*

*It is desirable to have Drop-off to pick-up ratio of overvoltage relay better than 97% (Considering limitation of various manufacturers relay on this aspect).*

Present overvoltage setting record available at ERLDC is given in **Annexure-C5**. Concerned transmission utilities are requested to provide the missing information and updated the exiting one (if any).

In 48<sup>th</sup> PCC, all the constituents were advised to go through the Annexure and update the settings, if any.

In 52<sup>nd</sup> PCC, Powergrid ER-I has submitted the over voltage settings. PCC advised all other constituents to update the settings.

*In 54<sup>th</sup> PCC, Powergrid ER-I, ER-II and Powergrid-Odisha have submitted the details.*

**Members may update.**

#### **ITEM NO. C.6: Implementation of Protection Database Management System Project.**

ERPC proposal for “Creation & Maintenance of web based protection database management system and desktop based protection calculation tool for Eastern Regional Grid” has been approved by the Ministry of Power for funding from Power System Development Fund (PSDF) vide No-10/1/2014-OM dated 07.03.2016.

In 49<sup>th</sup> PCC, PRDC informed that data collection for West Bengal is in progress and it will be completed by December, 2016.

In 50<sup>th</sup> PCC, It was informed that Software Acceptance Tests are in progress.

In 51<sup>st</sup> PCC, PRDC informed that data collection of Odisha and Jharkhand has been completed. Data collection in West Bengal and Bihar is in progress. Data collection of Eastern Region will be completed by 15<sup>th</sup> February 2017.

PRDC added that software acceptance trails of PSCT phase-I have been completed and phase-II will be done from 19<sup>th</sup> to 21<sup>st</sup> January 2017. Software acceptance trails of web based PDMS system have been completed and observations will be implemented at the earliest.

It was informed that a format for on-line reporting of tripping incidence has been prepared in PDMS and PRDC will present details in next PCC meeting.

In 52<sup>nd</sup> PCC, PRDC explained the format for on-line reporting of tripping incidence.

PCC suggested PRDC to include details of the elements under shutdown before the disturbance.

In 53<sup>rd</sup> PCC, PRDC informed that data survey and modeling has been completed and PDMS will be operational by 31<sup>st</sup> March 2017. The login id will be provided soon.

PRDC presented the format for on-line reporting of tripping incidence.

PCC in principle agreed with the format and advised PRDC to include a summery sheet for the each tripping incidence.

*In 54<sup>th</sup> PCC, PRDC informed that summery sheet for on-line tripping incidence reporting has been prepared. The PDMS is operational and constituents can access the data. Login credentials were given to all the constituents.*

*It was decided that a separate meeting will be convened in May 2017 to finalize the procedure for on-line reporting and data updation.*

**PRDC may update.**

**ITEM NO. C.7: Non-commissioning of PLCC / OPGW and non-implementation of carrier aided tripping in 220kV and above lines.**

According to CEA technical standard for construction of electric plants and electric lines -Clause 43(4) (c), transmission line of 220 KV and above should have single-phase auto-reclosing facility for improving the availability of the lines. However, from the tripping details attached June-August, 2016 it is evident that the some of 220kV above Inter & Intra-Regional lines do not having auto-reclose facility either at one end or at both ends. Out of these for some of the lines even PLCC/OPGW is not yet installed and carrier aided protection including Autorecloser facility is not yet implemented. Based on the trippings of June- August, 2016 and PMU analysis a list of such lines has been prepared and as given below:

List of line where auto reclose facility is not available(Information based on PMU data analysis)							
S. No	Transmission Lines name	Date of Tripping	Reason of Tripping	Owner Detail		Present Status	
				End-1	End-2	OPGW/PLCC Link available	AR facility functional
10	400KV PATNA-BALIA-II	21.06.16	B-N FAULT	PGCIL	PGCIL		
12	400KV PATNA-BALIA-I	21.06.16	R-N FAULT	PGCIL	PGCIL	PLCC available	
13	<a href="#">220KV BUDIPADAR-KORBA-II</a>	23.06.16	Y-N FAULT	OPTCL	CSEB	PLCC available	will be activated in consultation with Korba
14	400 KV ARAMBAGH - BIDHANNAGAR	02.07.16	Y-N FAULT	WBSET CL	WBSET CL	PLCC available	AR in service but some problem in y-ph pole
16	400 KV NEW RANCHI - CHANDWA - I	13.07.16	B-N FAULT	PGCIL	PGCIL	PLCC available	
17	<a href="#">220 KV TSTPP-RENGALI</a>	17.07.16	EARTH FAULT	NTPC	OPTCL		
18	<a href="#">220KV BUDIPADAR-RAIGARH</a>	21.07.16	EARTH FAULT	OPTCL	PGCIL	PLCC defective	
19	400 KV KOLAGHAT-KHARAGPUR	03.08.16	Y-N FAULT	WBPDC L	WBSET CL		
20	<a href="#">220 KV FARAKKA-LALMATIA</a>	03.08.16	B-N FAULT .	NTPC	JUNSL	Yes	Old Relay and not functional. 7-8 months required for auto re-close relay procurement.
21	400 KV PURNEA-MUZAFARPUR-I	03.08.16	R-N FAULT	PGCIL	PGCIL	PLCC available	

23	<a href="#">220 KV MUZAFFARPUR - HAZIPUR - II</a>	10.08.16	B-N FAULT	PGCIL	BSPTCL		
24	<a href="#">220 KV ROURKELA - TARKERA-II</a>	11.08.16	B-N FAULT	PGCIL	OPTCL	OPGW available	Expected to install protection coupler by Jan 17
25	<a href="#">220 KV CHANDIL-SANTALDIH</a>	25.08.16	R-N FAULT	JUSNL	WBPDC L	not available	
26	400 KV MPL-RANCHI-II	02.09.16	R-N FAULT	MPL	PGCIL	PLCC available	
27	<a href="#">220 KV BIHARSARIF-TENUGHAT</a>	07.09.16	B-N FAULT	BSPTCL	TVNL		
28	400KV MERAMANDALI-STERLITE-II	10.09.16	Y-N FAULT	OPTCL	SEL	OPGW not commissioned	
29	<a href="#">220 KV RAMCHANDRAPUR - CHANDIL</a>	22.09.16	B-N FAULT	JUSNL	JUNSL		
30	400KV SEL MERAMUNDALI-I	22.09.16	B-N FAULT	SEL	OPTCL	OPGW not commissioned	
31	400 KV KOLAGHAT - CHAIBASA	28.09.16	B-N FAULT	WBPDC L	PGCIL	PLCC available	

34<sup>th</sup> TCC advised all the respective members to update the above list along with the last tripping status in next PCC meeting.

TCC further advised all the constituents to give the latest status of PLCC of other 220kV and above lines under respective control area.

TCC advised to review the status of above in lower forums report back in next TCC.

PCC advised Powergrid, DVC, NTPC, WBSETCL, WBPDC, JUSNL, BSPTCL, MPL and SEL to communicate the latest status along with the last tripping status to ERPC and ERLDC.

**Members may update the status.**

#### **ITEM NO. C.8: Non-commissioning / non-functional status of bus-bar protection at important 220 kV Sub-stations.**

It has been observed that at many 220 kV substations particularly that of STU, bus-bar protection is either not commissioned or non-functional. The non-availability / non-functionality of bus bar protection, results in delayed, multiple and uncoordinated tripping, in the event of a bus fault. This in turn not only results in partial local black out but also jeopardises the security of interconnected national grid as a whole. The matter was also pointed out during the third party protection audit which is being carried out regularly. Constituents are required to meet the audit compliance and commission or make bus –bar protection functional where ever it is not available. A list of such important 220 kV sub-stations as per the first third party audit is placed in the meeting.

*In 34<sup>th</sup> TCC, members updated the status as follows:*

**Bus Bar Protection not available (reccord as per third party protection audit)**

<b>Bihar</b>				
<b>Sl No</b>	<b>Name of Substation</b>	<b>Bus protection status</b>	<b>Date of audit</b>	<b>Present Status</b>
1	220 kV Bodhgaya	Not available	28-Dec-12	<i>Single bus and there is no space available for busbar protection</i>
<b>Jharkhand</b>				
1	220 kV Chandil	Not available	29-Jan-13	<i>LBB available</i>
2	220 kV Tenughat	Not available	12-Apr-13	
<b>DVC</b>				
1	220 kV Jamsedpur	Not available	10-Apr-13	<i>Single bus. Bus bar will be commissioned under PSDF.</i>
<b>West Bengal</b>				
1	220 kV Arambah	Not available	24-Jan-13	<i>Available in alarm mode. Planning to replace with numerical relay</i>
2	220 kV Jeerat	Not available	20-Dec-12	<i>Relays have been received at site. Installation is in progress.</i>

TCC further advised all the constituents to give the latest status of Bus Bar protection of other 220KV S/S under respective control area.

TCC advised to review the status of above in lower forums report back in next TCC.

**Members may update.**

**ITEM NO. C.9: Members may update the following:**

1. OPTCL may please update the latest status on following substations:

In last PCC, OPTCL informed that

- OPTCL informed that they will review the logic of all the newly installed LBB protection
- Old distance protection relays in 132kV system at 220kV Tarkera S/s will be replaced after replacing old relays at 220kV level
- In 48<sup>th</sup> PCC, OPTCL was advised to change non directional over current E/F relays in 132 KV lines at 220/132kV Tarkera S/s with directional relays.

*In 52<sup>nd</sup> PCC, OPTCL updated the status as follows:*

- *Numerical Distance protection Relays are provided at 220kV Tarkera S/s except 132kV Rourkela-1 feeder. As new relay released is not fitting with the existing panel. REL670 relay of Kaunga feeder in is being interchanged.*
- *Procurement of numerical O/C & E/F are under process. On receipt of the same, EM relays will be replaced.*

**OPTCL may update.**

2. Disturbance at 400/220kV Indravati (PG) and 400/220kV Indravati (OPTCL) S/s on 11-06-16 at 19:59 hrs.

In 45<sup>th</sup> PCC, OHPC, was advised the following:

- OHPC should check and restore the bus bar protection at 220 kV Indravati (OHPC) S/s.--- *OHPC informed that they will test the bus bar protection of 220 kV Indravati (OHPC) S/s on 25<sup>th</sup> Aug, 2016.*
- PCC felt that 400/220kV ICT-I&II should clear the fault on backup overcurrent protection before tripping of 400kV lines from PG end and advised OHPC to install directional O/C relays at both HV & LV side of 400/220kV ICT-I&II. Proper time coordination should be done with the adjacent line relays.

**OHPC may update.**

## **PART- D**

### **Item No D.1 Tripping incidences in the month of April, 2017**

Other tripping incidences occurred in the month of April 2017 which needs explanation from constituents of either of the end is given at **Annexure- D1**.

**Members may discuss.**

### **Item No D.2 Any other issues.**

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# Annexure-C4

SL No	Zone-2 timer setting at	For line	No of circuits	Length (km)	Zone-2 Reach in %	Zone-2 reach of protected line length (km)	Shortest line at remote end	Length (km)	Considering Ideal Zone-1 reach i.e Upto 80%			Considering Zone-1 under reaches by 30% i.e. Zone -1 reach is only upto 50% (as per ERPC/CEA philosophy)		
									Zone-2 reach (Beyond 80% upto 120/150%) of the shortest line Starts at (km)	Zone -2 Overlap ?	Zone-2 Time setting	Zone-2 reach (Beyond 50% upto 120/150%) of the shortest line Starts at (km)	Zone -2 Overlap ?	Zone-2 Time setting
1	Muzaffarpur	Gorakhpur	D/C	261	150%	392	Gorakhpur-Gorakhpur-UP D/C	46	37	Y	0.5 to 0.6	23	Y	0.5 to 0.6
		Biharshariff	D/C	133	150%	200	Biharsariff Lakhisarai D/C	89	71	N	0.35	45	Y	0.5 to 0.6
		Purnea	D/C	242	150%	363	Purnea-Kishanganj D/C	71	57	Y	0.5 to 0.6	36	Y	0.5 to 0.6
2	Purnea	Muzzafarpur	D/C	242	150%	363	Muzzafarpur-Biharsariff D/C	133	107	Y	0.5 to 0.6	67	Y	0.5 to 0.6
		Kishanganj	D/C	71	150%	107	Kishanganj-Purnea other ckt	71	57	N	0.35	36	N	0.35
		Biharsariff	D/C	231	150%	347	Biharsaiff-Lakhisarai D/C	89	71	Y	0.5 to 0.6	45	Y	0.5 to 0.6
		Malda	D/C	167	150%	251	Malda-Farraka D/C	40	32	Y	0.5 to 0.6	20	Y	0.5 to 0.6
		Binaguri	D/C	168	150%	252	Binaguri-Kishanhanj D/C	98	78	Y	0.5 to 0.6	49	Y	0.5 to 0.6
3	Kishanganj	Purnea	D/C	71	150%	107	Purnea Kishangaj other ckt	71	57	N	0.35	36	N	0.35
		Patna	D/C	348	150%	521	Patna-Barh D/C	69	55	Y	0.5 to 0.6	34	Y	0.5 to 0.6
		Binaguri	D/C	98	150%	147	Binaguri-Kishanhanj other ckt	98	78	N	0.35	49	N	0.35
4	Barh	Patna	D/C	93	150%	140	Patna-Barh D/C	69	55	N	0.35	34	Y	0.5 to 0.6
		Patna	D/C	69	150%	103	Patna-Barh other ckt	69	55	N	0.35	34	N	0.35
		Gorakhpur	D/C	349	150%	524	Gorakhpur-Gorakhpur-UP D/C	46	37	Y	0.5 to 0.6	23	Y	0.5 to 0.6
		Kahalgaon	D/C	217	150%	326	Khalgaon-BankaD/C	48	38	Y	0.5 to 0.6	24	Y	0.5 to 0.6
5	Patna	Kishanganj	D/C	348	150%	521	Kishangaj-Purnea D/C	71	57	Y	0.5 to 0.6	36	Y	0.5 to 0.6
		Barh	D/C	93	150%	140	Barh-Patna D/C	69	55	N	0.35	34	Y	0.5 to 0.6
		Barh	D/C	69	150%	103	Barh-Patna other ckt	69	55	N	0.35	34	N	0.35
		Balia	D/C	185	150%	278	Balia-Mau D/C	9	7	Y	0.5 to 0.6	5	Y	0.5 to 0.6
		Balia	D/C	195	150%	293	Balia-Mau D/C	9	7	Y	0.5 to 0.6	5	Y	0.5 to 0.6
6	Sasaram	Biharsariff	D/C	210	150%	315	Biharsaiff-Lakhisarai D/C	89	71	Y	0.5 to 0.6	45	Y	0.5 to 0.6
		Nabinagar	D/C	82	150%	123	Sasaram-Nabinagar D/C	82	66	N	0.35	41	N	0.35
		Varanasi	S/C	143	120%	172	Varansi-Saranathi S/C	70	56	N	0.35	35	N	0.35
		Allahabad	S/C	212	120%	254	Allahabad-Varanasi S/C	98	78	N	0.35	49	N	0.35
7	Gaya	Maithon	D/C	276	150%	414	Maithon-MPL D/C	32	25	Y	0.5 to 0.6	16	Y	0.5 to 0.6
		Chandwa	D/C	117	150%	176	Chandwa-N.Ranchi D/C	68	54	Y	0.5 to 0.6	34	Y	0.5 to 0.6
		Koderma	D/C	125	150%	188	Koderma-Bokaro D/C	100	80	N	0.35	50	Y	0.5 to 0.6
8	Biharsariff	Muzzafarpur	D/C	133	150%	200	Muzzafarpur-Biharsariff D/C	133	107	N	0.35	67	N	0.35
		Purnea	D/C	231	150%	347	Purnea Kishangaj D/C	71	57	Y	0.5 to 0.6	36	Y	0.5 to 0.6
		Sasaram	D/C	210	150%	315	Sasaram-Nabinagar D/C	82	65	Y	0.5 to 0.6	41	Y	0.5 to 0.6
		Lakhisari	D/C	89	150%	134	Lakhisarai-Biharsaiff Other ckt	89	71	N	0.35	45	N	0.35
		Banka	D/C	185	150%	277	Banka-Khalgaon D/C	48	38	Y	0.5 to 0.6	24	Y	0.5 to 0.6
		Koderma	D/C	111	150%	166	Koderma-Bokaro D/C	100	80	N	0.35	50	Y	0.5 to 0.6
		Balia	D/C	241	150%	362	Balia-Mau D/C	9	7	Y	0.5 to 0.6	5	Y	0.5 to 0.6
9	Lakhisari	Biharsariff	D/C	89	150%	134	Biharsaiff-Lakhisarai D/C	89	71	N	0.35	45	N	0.35
		Kahalgaon	D/C	145	150%	218	Khalgaon-BankaD/C	48	38	Y	0.5 to 0.6	24	Y	0.5 to 0.6
10	Banka	Biharsariff	D/C	185	150%	277	Biharsaiff-Lakhisarai D/C	89	71	Y	0.5 to 0.6	45	Y	0.5 to 0.6
		Kahalgaon	D/C	48	150%	72	Khalgaon-BankaD/C	48	38	N	0.35	24	N	0.35
		Lakhisari	D/C	145	150%	218	Lakhisarai-Biharsaiff D/C	89	71	Y	0.5 to 0.6	45	Y	0.5 to 0.6
		Banka	D/C	48	150%	72	Banka-Khalgaon Other ckt	48	38	N	0.35	24	N	0.35

11	Kahalgaon	Farraka	D/C	95	150%	143	Farraka -Malda D/C	40	32	Y	0.5 to 0.6	20	Y	0.5 to 0.6
		Farraka	D/C	95	150%	143	Farraka -Malda D/C	40	32	Y	0.5 to 0.6	20	Y	0.5 to 0.6
		Maithon	D/C	172	150%	258	Maithon-MPL D/C	32	25	Y	0.5 to 0.6	16	Y	0.5 to 0.6
12	Farraka	Kahalgaon	D/C	95	150%	143	Khalgaon-BankaD/C	48	38	Y	0.5 to 0.6	24	Y	0.5 to 0.6
		Kahalgaon	D/C	95	150%	143	Khalgaon-BankaD/C	48	38	Y	0.5 to 0.6	24	Y	0.5 to 0.6
		Malda	D/C	40	150%	60	Malda-Farraka D/C	40	32	N	0.35	20	N	0.35
		Bahrapur	S/C	71	120%	85	Bahrapur-Sagardighi D/C	26	21	N	0.35	13	Y	0.5 to 0.6
		Sagardighi	S/C	72	120%	86	Sagardighi-Bahrapur D/C	26	21	N	0.35	13	Y	0.5 to 0.6
		Durgapur	D/C	146	150%	219	Durgapur-Bidhannagar D/C	11	9	Y	0.5 to 0.6	6	Y	0.5 to 0.6
		Purnea	D/C	167	150%	251	Purnea Kishangaj D/C	71	57	Y	0.5 to 0.6	36	Y	0.5 to 0.6
13	Malda	Farraka	D/C	40	150%	60	Farraka -Malda D/C	40	32	N	0.35	20	N	0.35
		Purnea	D/C	168	150%	252	Purnea Kishangaj D/C	71	57	Y	0.5 to 0.6	36	Y	0.5 to 0.6
14	Binaguri	Kishanganj	D/C	98	150%	147	Kishangaj-Purnea D/C	71	57	N	0.35	36	Y	0.5 to 0.6
		Rangpo	D/C	12	150%	18	Rangpo-Binaguri D/C	12	9	N	0.35	6	N	0.35
		Bongaigaon	D/C	218	150%	327	Bongaigaon-BTPS D/C	3.12	2	Y	0.5 to 0.6	2	Y	0.5 to 0.6
		Bongaigaon	D/C	221	150%	332	Bongaigaon-BTPS D/C	3.12	2	Y	0.5 to 0.6	2	Y	0.5 to 0.6
		Tala	D/C	145	150%	218	Tala -Malbase S/C	24	19	Y	0.5 to 0.6	12	Y	0.5 to 0.6
		Tala	S/C	140	120%	168	Tala -Malbase S/C	24	19	Y	0.5 to 0.6	12	Y	0.5 to 0.6
		Malbase	S/C	125	120%	150	Malbase -Tala S/C	24	19	Y	0.5 to 0.6	12	Y	0.5 to 0.6
15	Bahrapur	Farraka	S/C	71	120%	85	Farraka -Malda D/C	40	32	N	0.35	20	N	0.35
		Sagardighi	D/C	26	150%	39	Sagardighi-Bahrapur D/C	26	21	N	0.35	13	N	0.35
		Jeerat	S/C	165	120%	198	Jeerat-Subhasgram S/C	63	50	N	0.35	32	Y	0.5 to 0.6
		Bheramara	D/C	100	150%	150	Bheremara-Bahrapur other ckt	100	80	N	0.35	50	N	0.35
16	Sagardighi	Farraka	S/C	72	120%	86	Farraka -Malda D/C	40	32	N	0.35	20	N	0.35
		Bahrapur	D/C	26	150%	39	Bahrapur-Sagardighi D/C	26	21	N	0.35	13	N	0.35
		Durgapur	D/C	128	150%	192	Durgapur-Bidhannagar D/C	11	9	Y	0.5 to 0.6	6	Y	0.5 to 0.6
		Subhasgram	S/C	246	120%	295	Subhasgram-Jeerat S/C	63	50	N	0.35	32	Y	0.5 to 0.6
17	Durgapur	Farraka	D/C	146	150%	219	Farraka -Malda D/C	40	32	Y	0.5 to 0.6	20	Y	0.5 to 0.6
		Sagardighi	D/C	128	150%	192	Sagardighi-Bahrapur D/C	26	21	Y	0.5 to 0.6	13	Y	0.5 to 0.6
		Bidhannagar	D/C	11	150%	17	Bidhannagar-Durgapur D/C	11	9	N	0.35	6	N	0.35
		Jamsedpur	S/C	177	120%	212	Jamsedpur - Adhunik D/C	1	0	Y	0.5 to 0.6	0	Y	0.5 to 0.6
		Maithon	D/C	71	150%	106	Maithon-MPL D/C	32	25	Y	0.5 to 0.6	16	Y	0.5 to 0.6
18	Bidhannagar	Durgapur	D/C	11	150%	17	Durgapur-Bidhannagar D/C	11	9	N	0.35	6	N	0.35
		PPSP	D/C	185	150%	278	PPSP-Bidhannagar D/C	185	148	N	0.35	93	N	0.35
		Arambagh	S/C	114	120%	137	Arambag-Kolaghat S/C	64	51	N	0.35	32	N	0.35
19	PPSP	Bidhannagar	D/C	185	150%	278	Bidhannagar-Durgapur D/C	11	9	Y	0.5 to 0.6	6	Y	0.5 to 0.6
		Arambagh	D/C	210	150%	315	Arambag-Kolaghat S/C	64	51	Y	0.5 to 0.6	32	Y	0.5 to 0.6
20	Arambagh	Bidhannagar	S/C	114	120%	137	Bidhannagar-Durgapur D/C	11	9	Y	0.5 to 0.6	6	Y	0.5 to 0.6
		PPSP	D/C	210	150%	315	PPSP-Bidhannagar D/C	185	148	N	0.35	93	Y	0.5 to 0.6
		Bakreswar TPS	S/C	130	120%	156	Arambag-Bakreswar S/C	130	104	N	0.35	65	N	0.35
		Kolaghat TPS	S/C	64	120%	77	Kolaghat-Arambagh S/C	64	51	N	0.35	32	N	0.35
21	Bakreswar TPS	Arambagh	S/C	130	120%	156	Arambag-Kolaghat S/C	64	51	N	0.35	32	N	0.35
		Jeerat	S/C	162	120%	194	Jeerat-Subhasgram S/C	63	50	N	0.35	32	Y	0.5 to 0.6
22	Jeerat	Bahrapur	S/C	165	120%	198	Bahrapur-Sagardighi D/C	26	21	Y	0.5 to 0.6	13	Y	0.5 to 0.6
		Bakreswar TPS	S/C	162	120%	194	Arambag-Bakreswar S/C	130	104	N	0.35	65	N	0.35
		Subhasgram	S/C	63	120%	76	Subhasgram-Jeerat S/C	63	50	N	0.35	32	N	0.35
		Kolaghat TPS	S/C	134	120%	161	Kolaghat-Arambagh S/C	64	51	N	0.35	32	N	0.35
23	Subhasgram	Sagardighi	S/C	246	120%	295	Sagardighi-Bahrapur D/C	26	21	Y	0.5 to 0.6	13	Y	0.5 to 0.6
		Jeerat	S/C	63	120%	76	Jeerat-Subhasgram S/C	63	50	N	0.35	32	N	0.35
		Haldia TPS	D/C	90	150%	135	Haldia-Subhasgram other ckt	90	72	N	0.35	45	N	0.35
24	Kolaghat TPS	Arambagh	S/C	64	120%	77	Arambag-Kolaghat S/C	64	51	N	0.35	32	N	0.35
		Jeerat	S/C	134	120%	161	Jeerat-Subhasgram S/C	63	50	N	0.35	32	N	0.35

24	Kolaghat TPS	Kharagpur	S/C	98	120%	118	Kharagpur-Baripada S/C	98	78	N	0.35	49	N	0.35
		Chaibasa	S/C	240	120%	288	Chaibasa-Jamsedpur S/C	46	37	Y	0.5 to 0.6	23	Y	0.5 to 0.6
25	Kharagpur	Kolaghat TPS	S/C	98	120%	118	Kolaghat-Arambagh S/C	64	51	N	0.35	32	N	0.35
		Baripada	S/C	98	120%	118	Baripada-Kharagpur S/C	98	78	N	0.35	49	N	0.35
		Chaibasa	S/C	161	120%	193	Chaibasa-Jamsedpur S/C	46	37	N	0.35	23	Y	0.5 to 0.6
26	Baripada	Kharagpur	S/C	98	120%	118	Kharagpur-Baripada S/C	98	78	N	0.35	49	N	0.35
		N. Duburi	S/C	190	120%	228	N. Duburi-Meeramandali D/C	90	72	N	0.35	45	N	0.35
		Pandiabilli	S/C	302	120%	362	Pandiabilli-Mendasal D/C	28	22	Y	0.5 to 0.6	14	Y	0.5 to 0.6
		Keonjhar	S/C	156	120%	187	Keonjhar-Rengali S/C	100	80	N	0.35	50	N	0.35
		Jamsedpur	S/C	108	120%	130	Jamsedpur - Adhunik D/C	1	0	Y	0.5 to 0.6	0	Y	0.5 to 0.6
		TISCO	S/C	140	120%	168	TISCO-Baripada S/C	33	26	Y	0.5 to 0.6	16	Y	0.5 to 0.6
27	N. Duburi	Baripada	S/C	190	120%	228	Baripada-Kharagpur S/C	98	78	N	0.35	49	N	0.35
		Pandiabilli	S/C	143	120%	172	Pandiabilli-Mendasal D/C	28	22	Y	0.5 to 0.6	14	Y	0.5 to 0.6
		Meramandali	D/C	90	150%	135	Meramandali-GMR S/C	8	6	Y	0.5 to 0.6	4	Y	0.5 to 0.6
28	Pandiabilli	Baripada	S/C	302	120%	362	Baripada-Kharagpur S/C	98	78	N	0.35	49	Y	0.5 to 0.6
		N. Duburi	S/C	143	120%	172	N. Duburi-Meeramandali D/C	90	72	N	0.35	45	N	0.35
		Mendasal	D/C	28	150%	42	Mendasal Pandiabilli D/C	28	22	N	0.35	14	N	0.35
29	Mendasal	Pandiabilli	D/C	28	150%	42	Pandiabilli-Mendasal D/C	28	22	N	0.35	14	N	0.35
		Meramandali	S/C	98	120%	118	Meramandali-GMR S/C	8	6	Y	0.5 to 0.6	4	Y	0.5 to 0.6
30	Meramandali	Mendasal	S/C	98	120%	118	Mendasal Pandiabilli D/C	28	22	N	0.35	14	Y	0.5 to 0.6
		Angul	S/C	25	120%	30	Angul-Mermandali S/C	19	15	N	0.35	9	N	0.35
		Angul	S/C	19	120%	22	Angul-Mermandali S/C	19	15	N	0.35	9	N	0.35
		TSTPS	S/C	51	120%	61	TSTPS-Rengali D/C	24	19	N	0.35	12	N	0.35
		JSPL	D/C	38	150%	57	JSPL-Meramandali Other ckt	38	30	N	0.35	19	N	0.35
		GMR	S/C	8	120%	10		999	799	N	0.35	500	N	0.35
		SEL	D/C	220	150%	330	SEL-Meramandali Other ckt	220	176	N	0.35	110	N	0.35
31	Angul	Meramandali	S/C	25	120%	30	Meramandali-GMR S/C	8	6	N	0.35	4	Y	0.5 to 0.6
		Meramandali	S/C	19	120%	22	Meramandali-GMR S/C	8	6	N	0.35	4	N	0.35
		Bolangir	S/C	196	120%	235	Bolangir-Angul S/C	196	157	N	0.35	98	N	0.35
		TSTPS	S/C	68	120%	82	TSTPS-Rengali D/C	24	19	N	0.35	12	Y	0.5 to 0.6
		JITPL	D/C	80	150%	120	JITPL-Angul Other Ckt	80	64	N	0.35	40	N	0.35
		GMR	D/C	31	150%	47	GMR-Angul Other Ckt	31	25	N	0.35	16	N	0.35
32	Bolangir	Angul	S/C	196	120%	235	Angul-Mermandali S/C	19	15	Y	0.5 to 0.6	9	Y	0.5 to 0.6
		Jeypore	S/C	287	120%	344	Jeypore-Indravati S/C	71	57	Y	0.5 to 0.6	36	Y	0.5 to 0.6
33	Jeypore	Bolangir	S/C	287	120%	344	Bolangir-Angul S/C	196	157	N	0.35	98	N	0.35
		Indravati	S/C	71	120%	85	Indravati-Indravti (O) S/C	4	3	Y	0.5 to 0.6	2	Y	0.5 to 0.6
		Gazuwaka	D/C	220	150%	330	Gazuwaka-Jeypore other ckt	220	176	N	0.35	110	N	0.35
34	Indravati	Jeypore	S/C	71	120%	85	Jeypore-Indravati S/C	71	57	N	0.35	36	N	0.35
		Rengali	S/C	356	120%	427	Rengali-TSTPS D/C	24	19	Y	0.5 to 0.6	12	Y	0.5 to 0.6
35	Indravati (o)	Indravati (o)	S/C	4	120%	4		999	799	N	0.35	500	N	0.35
		Indravati	S/C	4	120%	4	Jeypore-Indravati S/C	71	57	N	0.35	36	N	0.35
36	Rengali	Indravati	S/C	356	120%	427	Indravati-Indravti (O) S/C	4	3	Y	0.5 to 0.6	2	Y	0.5 to 0.6
		Keonjhar	S/C	100	120%	120	Keonjhar-Rengali S/C	100	80	N	0.35	50	N	0.35
		TSTPS	D/C	24	150%	36	TSTPS-Rengali D/C	24	19	N	0.35	12	N	0.35
37	Keonjhar	Baripada	S/C	156	120%	187	Baripada-Kharagpur S/C	98	78	N	0.35	49	N	0.35
		Rengali	S/C	100	120%	120	Rengali-TSTPS D/C	24	19	Y	0.5 to 0.6	12	Y	0.5 to 0.6
38	TSTPS	Meramandali	S/C	51	120%	61	Meramandali-GMR S/C	8	6	Y	0.5 to 0.6	4	Y	0.5 to 0.6
		Angul	S/C	68	120%	82	Angul-Mermandali S/C	19	15	N	0.35	9	Y	0.5 to 0.6
		Rengali	D/C	24	150%	36	Rengali-TSTPS D/C	24	19	N	0.35	12	N	0.35
		Rourkela	D/C	171	150%	257	Rourkela-Chaibasa D/C	131	105	N	0.35	66	Y	0.5 to 0.6
		TSTPS	D/C	171	150%	257	TSTPS-Rengali D/C	24	19	Y	0.5 to 0.6	12	Y	0.5 to 0.6
		Jharsuguda	D/C	145	150%	218	Jharsuguda-Rourkela S/C	63	50	Y	0.5 to 0.6	31	Y	0.5 to 0.6

39	Rourkela	SEL	S/C	135	120%	162	SEL-Rourkela S/C	135	108	N	0.35	68	N	0.35
		Chaibasa	S/C	131	120%	158	Chaibasa-Jamsedpur S/C	46	37	N	0.35	23	Y	0.5 to 0.6
		Jamsedpur	S/C	182	120%	218	Jamsedpur - Adhunik D/C	1	0	Y	0.5 to 0.6	0	Y	0.5 to 0.6
		Ranchi	D/C	144	150%	217	Ranchi-N.Ranchi D/C	79	63	Y	0.5 to 0.6	39	Y	0.5 to 0.6
		Raigarh	S/C	139	120%	167	Raigarh-Raigarg Polling D/C	6	5	Y	0.5 to 0.6	3	Y	0.5 to 0.6
40	Jharsuguda	Rourkela	D/C	145	150%	218	Rourkela-Chaibasa D/C	131	105	N	0.35	66	Y	0.5 to 0.6
		Raigarh	S/C	115	120%	137	Raigarh-Raigarh Polling D/C	6	5	Y	0.5 to 0.6	3	Y	0.5 to 0.6
		IBEUL	S/C	63	120%	75	IBEUL-Raigrah S/C	63	50	N	0.35	31	N	0.35
41	IBEUL	Jharsuguda	S/C	63	120%	75	Jharsuguda-Raigarh S/C	115	92	N	0.35	58	N	0.35
		Raigarh	S/C	91	120%	109	Raigarh-Raigarg Polling D/C	6	5	Y	0.5 to 0.6	3	Y	0.5 to 0.6
42	SEL	Raigarh	S/C	147	120%	176	Raigarh-Raigarg Polling D/C	6	5	Y	0.5 to 0.6	3	Y	0.5 to 0.6
		Rourkela	S/C	135	120%	162	Rourkela-Chaibasa S/C	131	105	N	0.35	66	N	0.35
43	Chaibasa	Kolaghat TPS	S/C	240	120%	288	Kolaghat-Arambagh S/C	64	51	N	0.35	32	Y	0.5 to 0.6
		Kharagpur	S/C	161	120%	193	Kharagpur-Baripada S/C	98	78	N	0.35	49	N	0.35
		Rourkela	S/C	131	120%	158	Rourkela-Chaibasa S/C	131	105	N	0.35	66	N	0.35
		Jamsedpur	S/C	46	120%	55	Jamsedpur - Adhunik D/C	1	0	Y	0.5 to 0.6	0	Y	0.5 to 0.6
44	Jamsedpur	Durgapur	S/C	177	120%	212	Durgapur-Bidhannagar D/C	11	9	Y	0.5 to 0.6	6	Y	0.5 to 0.6
		Baripada	S/C	108	120%	130	Baripada-Kharagpur S/C	98	78	N	0.35	49	N	0.35
		Rourkela	S/C	182	120%	218	Rourkela-Chaibasa D/C	131	105	N	0.35	66	N	0.35
		Chaibasa	S/C	46	120%	55	Chaibasa-Jamsedpur S/C	46	37	N	0.35	23	N	0.35
		Mejia B	S/C	168	120%	201	Mejia B- Maithon D/C	59	47	N	0.35	30	Y	0.5 to 0.6
		Maithon	S/C	153	120%	184	Maithon-MPL D/C	32	25	Y	0.5 to 0.6	16	Y	0.5 to 0.6
		DSTPS	D/C	157	150%	235	DSTPS-Jamsedpur D/C	69	55	Y	0.5 to 0.6	35	Y	0.5 to 0.6
		TISCO	S/C	33	120%	39	TISCO-Baripada S/C	33	26	N	0.35	16	N	0.35
45	Mejia B	Adhunik	D/C	1	150%	2	Jamsedpur - Adhunik D/C	1	0	Y	0.5 to 0.6	0	Y	0.5 to 0.6
		Jamsedpur	S/C	168	120%	201	Jamsedpur - Adhunik D/C	1	0	Y	0.5 to 0.6	0	Y	0.5 to 0.6
		Maithon	S/C	84	120%	100	Maithon-MPL D/C	32	25	N	0.35	16	Y	0.5 to 0.6
		Maithon	D/C	59	150%	89	Maithon-MPL D/C	32	25	Y	0.5 to 0.6	16	Y	0.5 to 0.6
46	Maithon	Gaya	D/C	276	150%	414	Gaya-Chandwa D/C	117	94	Y	0.5 to 0.6	59	Y	0.5 to 0.6
		Kahalgaon	D/C	172	150%	258	Khalgaon-Bankad/C	48	38	Y	0.5 to 0.6	24	Y	0.5 to 0.6
		Durgapur	D/C	71	150%	106	Durgapur-Bidhannagar D/C	11	9	Y	0.5 to 0.6	6	Y	0.5 to 0.6
		Jamsedpur	S/C	153	120%	184	Jamsedpur - Adhunik D/C	1	0	Y	0.5 to 0.6	0	Y	0.5 to 0.6
		Mejia B	S/C	84	120%	100	Mejia B- Maithon D/C	59	47	N	0.35	30	N	0.35
		Mejia B	D/C	59	150%	89	Mejia B- Maithon D/C	59	47	N	0.35	30	N	0.35
		MPL	D/C	32	150%	47	MPL-Maithon D/C	32	25	N	0.35	16	N	0.35
		Raghunatpur	S/C	55	120%	65	Raghunathpur-Maithon S/C	55	44	N	0.35	27	N	0.35
47	MPL	Ranchi	S/C	200	120%	240	Ranchi-N.Ranchi D/C	79	63	N	0.35	39	Y	0.5 to 0.6
		Maithon	D/C	32	150%	47	Maithon-MPL D/C	32	25	N	0.35	16	N	0.35
		Ranchi	D/C	188	150%	281	Ranchi-N.Ranchi D/C	79	63	Y	0.5 to 0.6	39	Y	0.5 to 0.6
48	DSTPS	Jamsedpur	D/C	157	150%	235	Jamsedpur - Adhunik D/C	1	0	Y	0.5 to 0.6	0	Y	0.5 to 0.6
		Raghunatpur	D/C	69	150%	104	Raghunathpur-Maithon S/C	55	44	N	0.35	27	Y	0.5 to 0.6
49	Raghunathpur	Maithon	S/C	55	120%	65	Maithon-MPL D/C	32	25	N	0.35	16	N	0.35
		DSTPS	D/C	69	150%	104	DSTPS-Jamsedpur D/C	69	55	N	0.35	35	N	0.35
		Ranchi	S/C	166	120%	199	Ranchi-N.Ranchi D/C	79	63	N	0.35	39	N	0.35
50	Ranchi	Rourkela	D/C	144	150%	217	Rourkela-Chaibasa D/C	131	105	N	0.35	66	Y	0.5 to 0.6
		Maithon	S/C	200	120%	240	Maithon-MPL D/C	32	25	Y	0.5 to 0.6	16	Y	0.5 to 0.6
		MPL	D/C	188	150%	281	MPL-Maithon D/C	32	25	Y	0.5 to 0.6	16	Y	0.5 to 0.6
		Raghunatpur	S/C	166	120%	199	Raghunathpur-Maithon S/C	55	44	N	0.35	27	Y	0.5 to 0.6
		N. Ranchi	D/C	79	150%	118	N. Ranchi-Chandwa D/C	68	54	N	0.35	34	Y	0.5 to 0.6
		N. Ranchi	D/C	79	150%	118	N. Ranchi-Chandwa D/C	68	54	N	0.35	34	Y	0.5 to 0.6
		Sipat	D/C	405	150%	608	Sipat-Korba S/C	100	80	Y	0.5 to 0.6	50	Y	0.5 to 0.6
		Ranchi	D/C	79	150%	118	Ranchi-N.Ranchi D/C	79	63	N	0.35	39	Y	0.5 to 0.6

51	N. Ranchi	Ranchi	D/C	79	150%	118	Ranchi-N.Ranchi D/C	79	63	N	0.35	39	N	0.35
		Chandwa	D/C	68	150%	102	Chandwa-N.Ranchi D/C	68	54	N	0.35	34	N	0.35
52	Chandwa	Gaya	D/C	117	150%	176	Gaya-Chandwa D/C	117	94	N	0.35	59	N	0.35
		N. Ranchi	D/C	68	150%	102	N. Ranchi-Chandwa D/C	68	54	N	0.35	34	N	0.35
53	Koderma	Gaya	D/C	125	150%	188	Gaya-Chandwa D/C	117	94	N	0.35	59	Y	0.5 to 0.6
		Biharsariff	D/C	111	150%	166	Biharsaiff-Lakhisarai D/C	89	71	N	0.35	45	Y	0.5 to 0.6
		Bokaro	D/C	100	150%	150	Koderma-Bokaro D/C	100	80	N	0.35	50	N	0.35
54	Bokaro	Koderma	D/C	100	150%	150	Koderma-Bokaro D/C	100	80	N	0.35	50	N	0.35
55	Rangpo	Binaguri	D/C	110	150%	165	Binaguri-Kishanhanj D/C	98	78	N	0.35	49	Y	0.5 to 0.6
		Teesta V	D/C	12	150%	18	Rangpo-Teesta D/C	12	10	N	0.35	6	N	0.35
56	TISCO	Baripada	S/C	140	120%	168	Baripada-Kharagpur S/C	98	78	N	0.35	49	N	0.35
		Jamsedpur	S/C	33	120%	39	Jamsedpur - Adhunik D/C	1	0	Y	0.5 to 0.6	0	Y	0.5 to 0.6
57	Teesta V	Rangpo	D/C	12	150%	18	Rangpo-Teesta D/C	12	10	N	0.35	6	N	0.35
58	GMR	Angul	D/C	31	150%	47	Angul-Meramandali S/C	19	15	Y	0.5 to 0.6	10	Y	0.5 to 0.6
59	GMR(0)	Meramandali	S/C	8	120%	10	Meramandali-Angul S/C	19	15	N	0.35	10	N	0.35
60	JITPL	Angul	D/C	80	150%	120	Angul-Meramandali S/C	19	15	Y	0.5 to 0.6	10	Y	0.5 to 0.6

## Annexure-C5

Name of the substation	NAME OF LINE	OVERVOLTAGE % SETTING					REMARK
		LOCAL END(STAGE-I)			REMOTE END(STAGE-I)		
		VOLTAGE GARDIENT(% setting)	TIME DELAY(sec)	Drop Off to Pickup ratio	VOLTAGE GARDIENT(% setting)	TIME DELAY(sec)	
Binaguri	400KV BINAGURI-RANGPO-I	110	5		112	7	
	400KV BINAGURI-RANGPO-II	112	5		112	7	
	400KV BINAGURI-TALA-I	110	5		105	5	
	400KV BINAGURI-TALA-II	112	5		105	5	
	400KV BINAGURI-MALABASE-III	110	5		105	5	
	400KV BINAGURI-TALA-IV	112	5		105	5	
	400 KV BINAGURI-PURNEA- I	110	5		112	5	
	400 KV BINAGURI-PURNEA- II	112	5		110	5	
	400 KV BINAGURI-KISHANGANJ- I	110	5		112	5	Need to be updated after LILO at Kishanganj
	400 KV BINAGURI-KISHANGANJ- II	112	5		110	7	
	400KV BINAGURI-BONGAIGAON-I	110	5		OTHER REGION		May be submitted by ER - II, Powergrid
	400KV BINAGURI-BONGAIGAON-II	110	6				
	400KV BINAGURI-BONGAIGAON-III	110	5				
	400KV BINAGURI-BONGAIGAON-IV	110	6				
Kishanganj	400 KV KISHANGANJ-PURNEA-I						
	400 KV KISHANGANJ-PURNEA-II						
	400 KV KISHANGANJ-BINAGURI-I						
	400 KV KISHANGANJ-BINAGURI-II						
	400 KV KISHANGANJ-PATNA-I						
	400 KV KISHANGANJ-PATNA-II						
Rangpo	400KV RANGPO-TEESTA-I	112	7		110	7	
	400KV RANGPO-TEESTA-II	112	7		112	5	
	400KV RANGPO-BINAGURI-I	112	7		110	5	
	400KV RANGPO-BINAGURI-II	112	7		112	5	
Tala	400KV TALA-BINAGURI-I	105	5		110	5	
	400KV TALA-BINAGURI-II	105	5		112	5	
	400KV TALA-MALABASE-III	105	5		110	5	
	400KV TALA-BINAGURI-IV	105	5		112	5	
Teesta	400KV TEESTA-RANGPO-I	110	7		112	7	
	400KV TEESTA-RANGPO-II	112	5		112	7	
PURNEA	400 KV PURNEA - MALDA - I	110	7		110	5	
	400 KV PURNEA - MALDA - II	112	5		110	6	
	400 KV PURNEA- BINAGURI - I	112	5		110	5	
	400 KV PURNEA- BINAGURI - II	110	5		112	5	
	400 KV PURNEA- KISHANGANJ - I	112	5		110	5	Need to be updated after LILO at Kishanganj
	400 KV PURNEA- KISHANGANJ - II	112	5		112	5	
	400 KV PURNEA-MUZAFFARPUR-I	110	7		110	7	
	400 KV PURNEA-MUZAFFARPUR-II	112	7		112	7	
	400 KV PURNEA-BIHARSHARIFF-I	110	5		110	5	
	400 KV PURNEA-BIHARSHARIFF-II	110	7		110	7	
MALDA	400 KV MALDA - PURNEA - I	110	5		110	7	
	400 KV MALDA - PURNEA - II	110	6		112	5	
	400 KV MALDA - FARAKKA - I	110	5		110	5	
	400 KV MALDA - FARAKKA - II	110	6		110	5	
	400 KV FSTPP-MALDA-I	110	5		110	5	
	400 KV FSTPP-MALDA-II	110	5		110	6	
	400 KV FSTPP-DURGAPUR-I	112	7		110	5	

FARAKKA	400 KV FSTPP-DURGAPUR-II	110	5		112	5		
	400 KV FSTPP-KhSTPP-I	110	5		110	5		
	400 KV FSTPP-KhSTPP-II	112	5		112	5		
	400 KV FSTPP-KhSTPP-III	110	7		110	7		
	400 KV FSTPP-KhSTPP-IV	112	7		112	7		
	400 KV FSTPP-BEHRAMPUR	110	12		110	6		
	400 KV FSTPP-SAGARDIGHI	112	7		140	0.1		
Behrampur	400 KV BEHRAMPUR-BHERAMARA -I	110	5		110	4		
	400 KV BEHRAMPUR-BHERAMARA -II	110	10		110	5		
	400 KV BEHRAMPUR - FARAKKA	110	6		110	12		
	400KV BERHAMPORE-SAGARDIGHI-I	110	5		110	5		
	400KV BERHAMPORE-SAGARDIGHI-II	110	6		110	7		
	400 KV BEHRAMPUR - JEERAT	110	7		110	7		
	400KV JEERAT-SUBHASHGRAM	112	5		112	5		
Jeerat	400 KV JERAT - BERHAMPUR	110	7		110	7		
	400 KV Jeerat-Bakreswar	110	5		110	5		
	400 KV Jeerat-Kolaghat	NOT INSTALLED AT BOTH ENDS					Present status may be updated	
	400 KV SUBHASHSHGRAM-SAGARDIGHI	112	5		112	5		
Subhashgram	400KV SUBHASHGRAM-HALDIA-I	110	5		110	3		
	400KV SUBHASHGRAM-HALDIA-II	110	6		110	5		
	400 KV SUBHASHGRAM-JEERAT	112	5		112	5		
	400KV HALDIA-SUBHASHGRAM-I	110	3		110	5		
HALDIA	400KV HALDIA-SUBHASHGRAM-II	110	5		110	6		
	400 KV SAGARDIGHI - FARAKKA	140	0.1		112	7		
SAGARDIGHI	400 KV SAGARDIGHI - DURGAPUR-I	110	5		110	5		
	400 KV SAGARDIGHI - DURGAPUR-II	110	6		110	6		
	400KV SAGARDIGHI-BERHAMPORE-I	110	5		110	5		
	400KV SAGARDIGHI-BERHAMPORE-II	110	7		110	6		
	400 KV SAGARDIGHI - SUBHASHGRAM	112	5		112	5		
	400 KV DURGAPUR - SAGARDIGHI-I	110	5		110	5		
	400 KV DURGAPUR - SAGARDIGHI-II	110	6		110	6		
Durgapur	400 KV DURGAPUR-FSTPP-I	110	5		112	7		
	400 KV DURGAPUR-FSTPP-II	112	5		110	5		
	400 KV DURGAPUR-MAITHON-I	110	5		110	5		
	400 KV DURGAPUR-MAITHON-II	110	6		110	6		
	400 KV DURGAPUR-JAMSHEDPUR	110	5		112	5		
	400 KV DURGAPUR - BIDHANNAGAR-I	110	5		110	5		
	400 KV DURGAPUR - BIDHANNAGAR-II	110	5		110	5		
	400 KV BIDHANNAGAR-PPSP-I	110	5		110	5		
	400 KV BIDHANNAGAR-PPSP-II	110	5		110	5		
BIDHANNAGAR	400 KV BIDHANNAGAR - DURGAPUR-I	110	5		110	5		
	400 KV BIDHANNAGAR - DURGAPUR-II	110	5		110	5		
	400 KV BIDHANNAGAR-ARAMBAG	110	5		110	5		
	400 KV PPSP-BIDHAN NAGAR-I	110	5		110	5		
	400 KV PPSP-BIDHAN NAGAR-II	110	5		110	5		
PPSP	400 KV PPSP-ARAMBAG-I	110	5		110	5		
	400 KV PPSP-ARAMBAG-II	110	5		110	5		
	400 KVARAMBAG-PPSP-I	110	5		110	5		
	400 KV ARAMBAG-PPSP-II	110	5		110	5		
Arambag	400 KV ARAMBAG-KOLAGHAT	110	5		NOT INSTALLED AT KOLAGHAT END		Present status may be updated	
	400 KV ARAMBAG-BAKRESWAR	110	5		110	5		
	400 KV ARAMBAG-BIDHANNAGAR	110	5		110	5		
	400 KV BAKRESWAR-JEERAT	110	5		110	5		
BAKRESWAR	400 KV BAKRESWAR-ARAMBAG	110	5		110	5		

KOLAGHAT	400 KV KOLAGHAT-JEERAT	NOT INSTALLED AT BOTH ENDS					Present status may be updated
	400 KV KOLAGHAT-ARAMBAG	NOT INSTALLED TA KOLAGHAT END			110	5	Present status may be updated
	400 KV KOLAGHAT-KHARAGPUR-I	110	5		110	5	
	401 KV KOLAGHAT-CHAIBASA-I	110	5		110	5	Need to be updated after Chaibasa connectivity
KHARAGPUR	400 KV KHARAGPUR-KOLAGHAT-I	110	5		110	5	
	400 KV KHARAGPUR-CHAIBASA-I	110	5		110	5	Need to be updated after Chaibasa connectivity
	400KV KHARAGPUR-BARIPADA	110	5		112	7	
BARIPADA	400 KV BARIPADA-KEONJHAR	110	3		110	5	
	400 KV BARIPADA- TISCO(JAMSHEDPUR)	111	5		110	4	
	400 KV BARIPADA-N. DUBURI -I	112	6		110	5	Needs to be upgated after LILO at N. Duburi
	400 KV BARIPADA-PANDAIABILLI-I	112	6		110	5	Needs to be updated after LILO at Pandiabilli
	400 KV BARIPADA-KHARAGPUR	112	7		110	5	
	400 KV BARIPADA-JAMSHEDPUR	111	5		110	4	
Jamshedpur	400 KV JAMSHEDPUR-CHAIBASA - I	112	5		112	5	
	400 KV JAMSHEDPUR-CHAIBASA- II	110	7		110	6	
	400 KV JAMSHEDPUR - MEJIA	112	5		117	2.5	
	400 KV JAMSHEDPUR - DSTPS(ANDAL)-I	110	5		117	2.5	
	400 KV JAMSHEDPUR - DSTPS(ANDAL)-II	112	5		117	2.5	
	400KV JAMSHEDPUR - APNRL-I	110	5		115	5	
	400KV JAMSHEDPUR - APNRL-II	110	5		115	5	
	400 KV JAMSHEDPUR - DURGAPUR	112	5		110	5	
	400 KV JAMSHEDPUR - TISCO	112	7		112	7	
	400 KV JAMSHEDPUR-MAITHON	110	5		110	5	
	400 KV JAMSHEDPUR-BARIPADA	110	4		111	5	
CHAIBASA	400KV CHAIBASA-JAMSHEDPUR-I	112	5		112	5	
	400KV CHAIBASA-JAMSHEDPUR-II	110	6		110	7	
	400KV CHAIBASA-KHARAGPUR-II						Need to be updated after Chaibasa connectivity
	400KV CHAIBASA-KOLAGHAT-II						Need to be updated after Chaibasa connectivity
	400KV CHAIBASA-ROURKELA-I	112	7		110	5	
APNRL	400KV CHAIBASA-ROURKELA-II				110	6	
	400 KV APNRL-JAMSHEDPUR-I	115	5		110	5	
	400 KV APNRL-JAMSHEDPUR -II	115	5		110	5	
TISCO	400 KV TISCO-JAMSHEDPUR	112	7		112	7	
	400 KV TISCO-BIRPADA	110	4		111	5	
Maithon	400 KV MAITHON-RANCHI	112	5		112	5	
	400 KV MAITHON-KAHALGAON-I	110	5		112	5	
	400 KV MAITHON-KAHALGAON-II	110	6		110	5	
	400 KV MAITHON -MAITHON RB-I	110	5		110	7	
	400 KV MAITHON -MAITHON RB-II	112	5		112	7	
	400 KV MAITHON -GAYA - I	110	5		110	5	
	400 KV MAITHON -GAYA-II	110	6		110	5	
	400 KV MAITHON-JAMSHEDPUR	110	5		110	5	
	400 KV MAITHON -MEJIA- I	110	5		117	2.5	
	400 KV MAITHON -MEJIA- II	112	5		117	2.5	
	401 KV MAITHON -MEJIA- III	110	5		117	2.5	
	400 KV MAITHON - DURGAPURR - I	110	5		110	5	
	400 KV MAITHON - DURGAPURR - II	110	6		110	6	
	400 KV MAITHON -RAGHUNATHPUR	112	6		113	5	
Ranchi	400 KV RANCHI-MAITHON	112	5		112	5	
	400 KV RANCHI-NEW RANCHI-I	110	5		110	5	
	400 KV RANCHI-NEW RANCHI-II	110	5		110	5	
	400 KV RANCHI-NEW RANCHI-III	110	5		110	5	
	400 KV RANCHI-NEW RANCHI-IV	110	5		110	5	
	400 KV RANCHI-RAGHUNATHPUR	110	5		113	5	
	400 KV RANCHI-MAITHON RB-I	112	7		112	7	



	400 KV RANCHI - SIPAT - I	110	7		OTHER REGION		May be submitted by ER - I, Powergrid
	400 KV RANCHI - SIPAT - II	112	5				
	400 KV RANCHI-ROURKELA- I	110	5		110	5	
	400 KV RANCHI-ROURKELA - II	112	7		110	6	
765/400 KV NEW RANCHI S/S	400 KV NEW RANCHI- RANCHI-I	110	5		110	5	
	400 KV NEW RANCHI- RANCHI-II	110	5		110	5	
	400 KV NEW RANCHI- RANCHI-III	110	5		110	5	
	400 KV NEW RANCHI- RANCHI-IV	110	5		110	5	
	400 KV NEW RANCHI- CHANDWA-I						
	400 KV NEW RANCHI- CHANDWA-II						
	765 KV KV NEW RANCHI-DHARMJAYGARH-I	107	5		OTHER REGION		May be submitted by ER - I, Powergrid
	765 KV KV NEW RANCHI-DHARMJAYGARH-II						
CHANDWA	400 KV CHANDWA-N.RANCHI-I						
	400 KV CHANDWA-N.RANCHI-II						
	400 KV CHANDWA-GAYA-I						
	400 KV CHANDWA-GAYA-II						
MAITHON RIGHT BANK	400 KV MAITHON RB-RANCHI-I	112	7		112	7	
	400 KV MAITHON RB-RANCHI-II	110	7		110	7	
	400 KV MAITHON RB-MAITHON-I	110	7		110	5	
	400 KV MAITHON RB-MAITHON-II	112	7		112	5	
DSTPS	400 KV DSTPS-JAMSHEDPUR-I	117	2.5		110	5	
	400 KV DSTPS-JAMSHEDPUR-II	117	2.5		112	5	
	400 KV DSTPS-RAGHUNATHPUR-I	117	2.5		113	5	
	400 KV DSTPS-RAGHUNATHPUR-II	117	2.5		113	5	
KODERMA	400 KV KODERMA-GAYA-I	113	5		110	5	
	400 KV KODERMA-GAYA-II	113	5		110	5	
	400 KV KODERMA-BIHARSHARIFF-I	113	5		112	7	
	400 KV KODERMA-BIHARSHARIFF-II	113	5		110	5	
	400KV KODERMA-BOKARO-A-I	113	5		110	6	
	400KV KODERMA-BOKARO-A-II	113	5		110	6	
BOKARO-A	400KV BOKARO-A-KODERMA-I	110	6		113	5	
	400KV BOKARO-A-KODERMA-II	110	6		113	5	
Mejia	400 KV MEJIA-MAITHON -I	117	2.5		110	5	
	400 KV MEJIA-MAITHON -II	117	2.5		112	5	
	400 KV MEJIA-MAITHON -III	117	2.5		110	5	
	400 KV MEJIA-JAMSHEDPUR	117	2.5		112	5	
RAGHUNATHPUR	400 KV RAGHUNATHPUR-MAITHON	113	5		112	6	
	400 KV RAGHUNATHPUR-RANCHI	113	5		110	5	
	400 KV RAGHUNATHPUR-DSTPS-I	113	5		117	2.5	
	400 KV RAGHUNATHPUR-DSTPS-II	113	5		117	2.5	
MENDHASAL	400 KV MENDHASAL-PANDIABILLI-I	110	5		112	6	Needs to be updated after LILO at Pandiabilli
	400 KV MENDHASAL-PANDIABILLI-II	110	5		112	6	Needs to be updated after LILO at Pandiabilli
	400 KV MENDHASAL-MEERAMUNDALI	110	5		110	5	
PANDIABILLI	400 KV PANDIABILLI-MENDASAL-I						
	400 KV PANDIABILLI-MENDASAL-II						
	400 KV PANDIABILLI-N.DUBURI						
	400 KV PANDIABILLI - BARIPADA						
N. DUBURI	400 KV N.DUBURI-PANDIABILLI						
	400 KV N.DUBURI-BARIPADA						
	400 KV N.DUBURI-MERAMANDALI-I						
	400 KV N.DUBURI-MERAMANDALI-II						
	400 KV MEERAMUNDALI-TALCHER	110	5		110	5	
	400 KV MEERAMUNDALI-ANGUL-II	112	5		110	5	
	400 KV MEERAMUNDALI-JINDAL-I	110	5		110	5	
	400 KV MEERAMUNDALI-JINDAL-II	110	5		110	5	
	400 KV MEERAMUNDALI-ANGUL-I	112	5		110	5	

MEERAMUNDALI	400 KV MEERAMUNDALI-MENDHASAL	110	5		110	5		
	400KV MERAMUNDALI-GMR	110	5		110	5		
	400 KV MERAMUNDALI-STERLITE -I							
	400 KV MERAMUNDALI-STERLITE -II							
	400 KV MERAMUNDALI-N.DUBURI -I							
	400 KV MERAMUNDALI-N.DUBURI -I							
JINDAL	400 KV JINDAL-MEERAMUNDALI-I	110	5		110	5		
	400 KV JINDAL-MEERAMUNDALI-II	110	5		110	5		
GMR	400 KV GMR-ANGUL-I	110	2		110	5		
	400 KV GMR-ANGUL-II	110	2		110	6		
	400KV GMR-MERAMUNDALI	110	5		110	5		
ANGUL	400 KV ANGUL-MEERAMUNDALI-I	110	5		112	5		
	400KV ANGUL-BOLANGIR	110	5		110	5		
	400KV ANGUL-TSTPP	110	5		110	5		
	400 KV ANGUL-MERAMUNDALI-II	110	5		112	5		
	400 KV ANGUL-JITPL-II	110	5		110	5		
	400 KV ANGUL-JITPL-I	110	5		110	5		
	400KV ANGUL-GMR-I	110	5		110	2		
	400KV ANGUL-GMR-II	110	6		110	2		
	765kV Angul-Jharsuguda-I	110	4		110	4		
	765kV Angul-Jharsuguda-II	110	4		110	4		
JITPL	400 KV JITPL-ANGUL-I	110	5		110	5		
	400 KV JITPL-ANGUL-II	110	5		110	5		
BOLANGIR	400 KV BOLANGIR-ANGUL	110	5		110	5		
	400 KV BOLANGIR-JEYPORE	112	5		112	5		
Jeypore	400 KV JEYPORE-BOLANGIR	112	5		112	5		
	400 KV JEYPORE-GAZUWAKA-I	110	5		110	9		
	400 KV JEYPORE-GAZUWAKA-II	110	10		110	10		
	400KV JEYPORE-INDRAVATI	112	5		110	5		
INDRAVATI(PG)	400 KV INDRAVATI-JEYPORE	110	5		112	5		
	400 KV INDRAVATI-INDRAVATI	115	5		115	5		
	400 KV INDRAVATI-RENGALI	113	5		110	5		
INDRAVATI(GR)	400 KV INDRAVTI(GR)-INDRAVATI(PG)	115	5		115	5		
Rengali	400 KV RENGALI-INDRAVATI(PG)	110	5		113	5		
	400 KV RENGALI-KEONJHAR	110	5		110	5		
	400 KV RENGALI-TALCHER-I	110	5		110	5		
	400 KV RENGALI-TALCHER-II	110	6		112	5		
KEONJHOR	400 KV KEONJHAR-RENGALI	110	5		110	5		
	400 KV KEONJHAR-BIRPADA	110	3		110	5		
Talcher	400 KV Talcher-Rourkela-I	110	5		110	5		
	400 KV Talcher-Rourkela-II	112	5		110	6		
	400 KV Talcher-Rengali-I	110	5		110	5		
	400 KV Talcher-Rengali-II	112	5		110	6		
	400 KV Talcher-MERAMUNDALI	110	5		110	5		
	400 KV Talcher-ANGUL	110	5		110	5		
Rourkela	400 KV ROURKELLA-JHARSHUGUDA-I	110	5		110	10		
	400 KV ROURKELLA-JHARSHUGUDA-II	110	6		110	6		
	400 KV ROURKELLA-RAIGARH	112	5		OTHER REGION			May be submitted by Odisha Project, Powergrid
	400 KV ROURKELLA-STERLITE-II	110	6		115	5		
	400 KV ROURKELA-TALCHER-I	110	5		110	5		
	400 KV ROURKELA-TALCHER-II	110	6		112	5		
	400 KV ROURKELA-CHAIBASA-I	110	5		112	7		
	400 KV ROURKELA-CHAIBASA-II	110	6					
	400 KV ROURKELA-RANCHI-I	110	5		110	5		
	400 KV ROURKELA-RANCHI-II	110	6		112	7		
	400 KV STERLITE - ROURKELA - II	115	5		110	6		

STERLITE	400 KV STERLITE - RAIGARH - II	115	5		OTHER REGION		May be submitted by Odisha Project, Powergrid
	400 KV STERLITE-MERAMANDALI-I						
	400 KV STERLITE-MERAMANDALI-II						
Jharshuguda	400KV JHSUGUDA-ROURKELA-I	110	10		110	5	
	400KV JHSUGUDA-ROURKELA-II	110	6		110	6	
	400 KV JHARSHUGUDA-IBEUL	110	10		110	5	
	765kV Jharsuguda-ANGUL-I	110	4		110	4	
	765kV Jharsuguda-ANGUL-II	110	4		110	4	
	400 KV JHARSHUGUDA-RAIGARH -II	110	6		111	7	
Jharsguda 765KV S/s	765kv Jharsuguda-Dharmjaygarh-I	108	5		OTHER REGION		May be submitted by Odisha Project, Powergrid
	765kv Jharsuguda-Dharmjaygarh-II	108	7		OTHER REGION		May be submitted by Odisha Project, Powergrid
	765kV Jharsuguda-Angul-I	110	4		110	4	
	765kV Jharsuguda-Angul-II	110	4		110	4	
IBEUL	400kV IBEUL-Raigarh	110	5		OTHER REGION		May be submitted by Odisha Project, Powergrid
	400kV IBEUL-Jharsuguda	110	5		110	10	
APNRL	400 KV APNRL-JAMSHEDPUR-I	115	5		110	5	
	400 KV APNRL-JAMSHEDPUR -II	115	5		110	5	
BIHARSHARIFF	400 KV BIHARSHARIFF-BANKA-I	112	7		112	7	
	400 KV BIHARSHARIFF-BANKA-II	110	6		110	6	
	400 KV BIHARSHARIFF - PUSAULI - I	110	5		110	5	
	400 KV BIHARSHARIFF - PUSAULI- II	112	5		112	5	
	400 KV BIHARSHARIFF - VARANASI- I	112	7		112	7	
	400 KV BIHARSHARIFF - VARANASI- II	110	7		110	7	
	400 KV BIHARSHARIFF - BALIA - I	110	5		OTHER REGION		May be submitted by ER-I, Powergrid
	400 KV BIHARSHARIFF - BALIA - II	112	5				
	400 KV BIHARSHARIFF-KODERMA-I	112	7		113	5	
	400 KV BIHARSHARIFF-KODERMA-II	110	5		113	5	
	400 KV BIHARSHARIFF-PURNEA-I	110	5		110	5	
	400 KV BIHARSHARIFF-PURNEA-II	110	7		110	7	
	400 KV BIHARSHARIFF-LAKHISARAI-I	110	7		110	5	
	400 KV BIHARSHARIFF-LAKHISARAI-II	112	5		110	5	
	400 KV BIHARSHARIFF-MUZAFFARPUR-I	110	5		110	5	
	400 KV BIHARSHARIFF-MUZAFFARPUR-II	112	5		112	5	
Kahalgaon	400 KV KhSTPP-BANKA -I	110	6		110	6	
	400 KV KhSTPP-BANKA - II	112	7		112	7	
	400 KV KhSTPP - LAKHISARAI- I	110	7		110	7	
	400 KV KhSTPP - LAKHISARAI- II	112	5		112	5	
	400 KV KhSTPP-MAITHON -I	112	5		110	5	
	400 KV KhSTPP-MAITHON -II	110	5		110	6	
	400 KV KhSTPP-BARH - I	112	6		112	6	
	400 KV KhSTPP-BARH- II	112	6		112	6	
	400 KV KHSTPP-FSTPP-I	110	5		110	5	
	400 KV KHSTPP-FSTPP-II	112	5		112	5	
	400 KV KHSTPP-FSTPP-III	110	7		110	7	
	400 KV KHSTPP-FSTPP-IV	112	7		112	7	
Barh	400 KV BARH-KAHALGAON-I	112	6		112	6	
	400 KV BARH-KAHALGAON-II	112	6		112	6	
	400 KV BARH - PATNA-I	112	6		112	6	
	400 KV BARH - PATNA-II	112	7		112	7	
	400 KV BARH - PATNA-III	110	4		110	4	
	400 KV BARH - PATNA-IV	110	5		110	5	
	400 KV BARH - GORAKHPUR-I						
	400 KV BARH - GORAKHPUR-II						
	400 KV PATNA-BARH-I	112	6		112	6	
	400 KV PATNA-BARH-II	112	7		112	7	
	400 KV PATNA-BARH-III	110	4		110	4	

PATNA	400 KV PATNA-BARH-IV	110	5		110	5		
	400 KV PATNA-KISHANGANJ-I							
	400 KV PATNA-KISHANGANJ-II							
	400 KV PATNA - BALIA - I	110	4		OTHER REGION			May be submitted by ER-I, Powergrid
	400 KV PATNA - BALIA - II	110	5					
	400 KV PATNA - BALIA - III	112	6					
	400 KV PATNA- BALIA - IV	112	7					
Sasaram	765KV SASARAM-FATEHPUR	108	5		108	5		
	400 KV PUSAULI - VARANASI	112	5		OTHER REGION			May be submitted by ER-I, Powergrid
	400 KV PUSAULI - ALLAHABAD	112	7					
	400 KV PASAULI-BIHARSHARIFF-I	110	5		110	5		
	400 KV PASAULI-BIHARSHARIFF-II	112	5		112	5		
	400KV PUSAULI-NABINAGAR-I	110	5					
Gaya	400KV PUSAULI-NABINAGAR-II	110	6					
	400 KV GAYA-KODERMA-I	110	5		113	5		
	400KV GAYA-KODERMA-II	110	5		113	5		
	400KV GAYA-MAITHON-I	110	5		110	5		
	400KV GAYA-MAITHON-II	110	5		110	6		
	765 KV GAYA-VARANASI-I							
BANKA	765 KV GAYA-VARANASI-II							
	765 KV GAYA-BALIA	110	5		OTHER REGION			May be submitted by ER-I, Powergrid
	400 KV BANKA-BIHARSHARIFF-I	112	7					
	400 KV BANKA-BIHARSHARIFF-II	110	6		110	6		
	400 KV BANKA-KAHALGAON-I	110	6		110	6		
	400 KV BANKA-KAHALGAON-II	112	7		112	7		
Muzaffarpur	400 KV MUZAFFARPUR - NEW PURNEA - I	110	7		110	7		
	400 KV MUZAFFARPUR - NEW PURNEA - II	112	7		112	7		
	400 KV MUZAFFARPUR - GORAKHPUR - I	110	7		OTHER REGION			May be submitted by ER-I, Powergrid
	400 KV MUZAFFARPUR - GORAKHPUR - II	112	5					
	400 KV MUZAFFARPUR - BIHARSHARIFF - I	110	5		110	5		
	400 KV MUZAFFARPUR - BIHARSHARIFF - II	112	5		112	5		
LAKHISARAI	400 KV LAKHISARI-BIHARSHARIFF-I	110	5		110	7		
	400 KV LAKHISARI-BIHARSHARIFF-II	110	5		112	5		
	400 KV LAKHISARAI-KAHALGAON-I	110	5		110	7		
	400 KV LAKHISARI-KAHALGAON-II	110	5		112	5		

# Annexure D1

S.NO	LINE NAME	TRIP DATE	TRIP TIME	RESTORATION DATE	RESTORATION TIME	Reason	Fault Clearance time in msec	Relay Indication LOCAL END	Relay Indication REMOTE END	Auto Recloser status	DR/EL received within 24 Hrs	DR/EL received after 24 Hrs	Remarks
<b>Fault clearing time is violating protection standard (As per PMU data)</b>													
1	<a href="#">220KV PATRATU - TENUGHAT</a>	02.04.17	11:07	02.04.17	13:47	Y-N FAULT	350 ms approx	Y-N, Z-II	Y-N, Z-I, 43.67 km from TVNL, F/C 4.9 kA	No autoreclose operation observed in PMU data	No	Yes	Tenughat unit I also tripped at same time on operation of Y phase differential class A
2	<a href="#">220 KV PTPS - HATIA D/C</a>			02.04.17	13:48	Y-N FAULT	350 ms approx	Information yet to be received	Information yet to be received	No autoreclose operation observed in PMU data	No	No	
3	<a href="#">400KV BIHARSHARIFF-SASARAM-I</a>	05.04.17	13:03	05.04.17	20:24	B PHASE LA FAILURE AT SASARAM END	500 ms approx	B-N, Z-II, F/C 2.29 kA, F/D 222.1 km, Carrier not received, Main was CB	B-N, Z-I, F/C 7.94 kA, 100 m from Sasaram	No autoreclose operation observed in PMU data	No	No	
4	<a href="#">220KV WARIA - BIDHANNAGAR-I</a>	11.04.17	10:24	11.04.17	17:11	R-PHASE LA BLAST AT BIDHANNAGAR	350 ms approx	R-N, Z-II	R-N, Z-I	No autoreclose operation observed in PMU data	No	No	
5	<a href="#">400KV MERAMUNDALI-STERLITE-II</a>	22.04.17	12:44	22.04.17	17:39	B-N FAULT	200 ms approx	B-N, 125 km from Meramundali	Information yet to be received	No autoreclose operation observed in PMU data	No	No	Main bay of 400 kV Meramundali - Angul - I at Meramundali end was out of service and the line was charged through tie bay of 400 kV Meramundali -SEL- II. So 400 kV Meramundali - Angul - I tripped after tripping of 400 kV Meramundali -SEL- II
6	<a href="#">400KV MERAMUNDALI-STERLITE-II</a>	26.04.17	13:17	26.04.17	14:20	B-N FAULT	<100	Y-N, Z-I, F/C 2.3 kA, 101.5 Km from Mera	Y-N,Z-I, 63.5 Km from SEL, F/C-3.3 KA	No autoreclose operation observed in PMU data	No	No	Main bay of 400 kV Meramundali - Angul - I at Meramundali end was out of service and the line was charged through tie bay of 400 kV Meramundali -SEL- II. So 400 kV Meramundali - Angul - I tripped after tripping of 400 kV Meramundali -SEL- II
7	<a href="#">220 KV TENUGHAT - BIHARSHARIFF S/C</a>	29.04.17	11:57	29.04.17	12:44	R-N FAULT	1500 ms approx	R-N, Z-I	R-N, Z-I	--	Yes	No	
<b>Multiple tripping at same time</b>													
1	<a href="#">400 KV STERLITE-ROURKELA S/C</a>	02.04.17	21:32	02.04.17	23:43	Y-B-N FAULT	<100	Y-B-N, Z-I, F/C 17.68 kA, 17.6 km from SEL	Y-B-N, Z-II, 129 km from RKL, F/C ly- 3.75kA; lb- 4.12 kA	--	Yes	Yes	
2	<a href="#">400 KV STERLITE-MERAMUNDALI D/C</a>			02.04.17	21:58	Y-B-N FAULT	<100	Did not trip	Information yet to be received	--	--	No	

S.NO	LINE NAME	TRIP DATE	TRIP TIME	RESTORATION DATE	RESTORATION TIME	Reason	Fault Clearance time in msec	Relay Indication LOCAL END	Relay Indication REMOTE END	Auto Recloser status	DR/EL received within 24 Hrs	DR/EL received after 24 Hrs	Remarks
3	<a href="#">400KV JAMSHEDPUR-ADHUNIK-II</a>	05.04.17	15:56	10.04.17	13:27	R-N FAULT	<100	Line differential protection operated at Jamshedpur	DT Received	No autoreclose operation observed in PMU data	No	<a href="#">Yes</a>	R Phase LA failure of 400 kV Adhunik - Jamshedpur - II at Jamshedpur end. Adhunik unit I also tripped at same time
4	<a href="#">400KV JAMSHEDPUR-ANDAL-I</a>			05.04.17	16:55	R-N FAULT	<100	DT received	Did not trip	No autoreclose operation observed in PMU data	No	--	
5	<a href="#">400KV JAMSHEDPUR-CHAIBASA-I</a>			06.04.17	9:10	R-N FAULT	<100	R-N, Z-I, F/C 18kA, 1km from JMSD	R-N, Z-II, F/C - 2.8 kA, 48.5 km from Chaibasa	No autoreclose operation observed in PMU data	No	No	
6	<a href="#">220 MUZAFFARPUR - HAZIPUR - I</a>	09.04.17	12:58	09.04.17	13:27	B-N FAULT	<100	Information yet to be received	Did not trip	No autoreclose operation observed in PMU data	No	--	
7	<a href="#">220 MUZAFFARPUR - HAZIPUR - II</a>			09.04.17	13:46	B-N FAULT	<100	Information yet to be received	Y-B, Z-I, 22.5 km from Hazipur	No autoreclose operation observed in PMU data	No	<a href="#">Yes</a>	
8	<a href="#">400KV TEESTA-3 - RANGPO</a>	14.04.17	23:19	15.04.17	1:33	B-N FAULT	<100	87C (Differential), DT Received, DEF	DT Received	No autoreclose operation observed in PMU data	<a href="#">Yes</a>	No	
9	<a href="#">400KV TEESTA-3 - DIKCHU</a>			15.04.17	19:00	B-N FAULT	<100	B-N, Z-I, F/D - 14 Km, F/C -3.6 KA	Information yet to be received	No autoreclose operation observed in PMU data	<a href="#">Yes</a>	No	Dikchu unit II also tripped due to loss of evacuation path
10	<a href="#">400KV JHARSUGUDA-ROURKELA-I</a>	18.04.17	16:22	18.04.17	16:36	R-B FAULT	<100	Did not trip	R-B, Z-III	--	--	No	Fault was at 400 kV Jharsuguda - IBEUL - II
11	<a href="#">400KV JHARSUGUDA-ROURKELA-II</a>			18.04.17	16:39	R-B FAULT	<100	Did not trip	R-B, Z-III	--	--	No	
12	<a href="#">400 KV FARAKKA - MALDA - I</a>	20.04.17	7:40	20.04.17	8:15	Y-N FAULT	<100	Did not trip	O/V	No autoreclose operation observed in PMU data	--	<a href="#">Yes</a>	No distance relay picked up at Malda end though F/C was more than 3.6 kA and voltage was less than 120 kV in Y phase
13	<a href="#">400 KV FARAKKA - MALDA - II</a>			20.04.17	8:42	Y-N FAULT	<100	Did not trip	DEF	No autoreclose operation observed in PMU data	--	<a href="#">Yes</a>	
14	<a href="#">400 KV FARAKKA-GOKORONO-I</a>	30.04.17	17:26	30.04.17	23:05	R-N FAULT	<100	VT Fuse Fail	R-N, Z-I, 14.8 KM from Gokarno, F/C 3.5 kA	No autoreclose operation observed in PMU data	No	No	
15	<a href="#">400 KV FARAKKA-GOKORONO-II</a>			01.05.17	18:30	R-N FAULT	<100	VT Fuse Fail	R-N, Z-I, 14.8 KM from Gokarno, F/C 3.5 kA	No autoreclose operation observed in PMU data	No	No	
Fault Not observed in PMU data													
1	<a href="#">220KV BIHARSHARIFI-TENUGHAT</a>	03.04.17	12:47	03.04.17	13:41	E/F	--	O/C, E/F	E/F, Master Trip	--	No	<a href="#">Yes</a>	
2	<a href="#">220KV KISHANGUNJ (B)- KISHANGUNJ (B) T/C</a>	03.04.17	19:03	03.04.17	20:20	LBB OPERATED AT BSPTCL END	--	LBB Operated	Information yet to be received	--	<a href="#">Yes</a>	No	
3	<a href="#">220KV MUZAFAR-GOPLGUNG - II</a>	08.04.17	12:24	08.04.17	13:02	B-N FAULT	--	Information yet to be received	Information yet to be received	--	No	No	
4	<a href="#">220 KV MUZAFAR-GOPLGUNG -I</a>	08.04.17	12:24	08.04.17	17:18	B-N FAULT	--	Information yet to be received	Information yet to be received	--	No	No	
5	<a href="#">400KV ALIPURDUAR- BONGAIGAOIN-II</a>	08.04.17	21:51	08.04.17	22:23	SPURIOUS TRIPPING	--	DT Received	Breaker opened at Bongaigaon end during opening of 400 kV Balipara- Bongaigaon - IV	--	No	--	Code was issued to open 400 kV Balipara-Bongaigaon - IV. But due to mal operation breaker of 400 kV Alipurduar - Bongaigaon - II opened at Bongaigaon end
6	<a href="#">400 KV JEYPORE - GAZUWAKA - II</a>	17.04.17	10:14	17.04.17	10:23	SPURIOUS TRIPPING	--	Information yet to be received	Information yet to be received	--	No	No	No code was taken from ERLDC for charging of this line

S.NO	LINE NAME	TRIP DATE	TRIP TIME	RESTORATION DATE	RESTORATION TIME	Reason	Fault Clearance time in msec	Relay Indication LOCAL END	Relay Indication REMOTE END	Auto Recloser status	DR/EL received within 24 Hrs	DR/EL received after 24 Hrs	Remarks
7	<a href="#">220KV DARBHANGA-MOTIPUR-I</a>	19.04.16	15:36	19.04.17	16:16	SPURIOUS TRIPPING	--	LBB Operated	Information yet to be received	--	No	No	
8	<a href="#">400KV GMR-ANGUL-I</a>	19.04.19	16:59	19.04.17	17:20	SPURIOUS TRIPPING	--	DT received	Did not trip	--	<a href="#">Yes</a>	--	
9	<a href="#">220KV DARBHANGA-MOTIPUR-I</a>	24.04.17	21:32	24.04.17	22:16	SPURIOUS TRIPPING	--	DT received	Information yet to be received	--	No	No	
10	<a href="#">400 KV ALIPURDUAR - BONGAIGAOON - II</a>	25.04.17	10:40	25.04.17	11:05	SPURIOUS TRIPPING	--	Information yet to be received	--	--	No	--	Tripping occurred during testing of converter transformer bay of pole - IV at Alipurduar
11	<a href="#">400 KV KAHALGAON-LAKHISARAI-II</a>	30.04.17	19:14	30.04.17	21:51	SPURIOUS TRIPPING	--	DT received	Information yet to be received	--	No	No	
<b>No autorecloser operation observed in PMU data</b>													
1	<a href="#">400KV JEERAT-BAHARAMPUR</a>	03.04.17	15:40	03.04.17	16:17	R-N FAULT	<100	R-N, Z-I, F/C 2.4 kA, 95 km from Jeerat	R-N, Z-I, F/C 4.21 kA, 61 km from Baharampur	No autoreclose operation observed in PMU data	<a href="#">No</a>	No	
2	<a href="#">400 KV PATNA - BARH - IV</a>	09.04.17	13:07	09.04.17	13:21	R-N FAULT	<100	R-N, 0.10 km from Patna, F/C 14.63 kA, A/R successful	R-N, Z - III, F/C 2.9 kA	No autoreclose operation observed in PMU data	No	No	
3	<a href="#">400 KV BIHARSHARIFF - SASARAM -I</a>	15.04.17	15:02	15.04.17	15:23	R-N FAULT	<100	R-N, Z-I, F/C 4.12 KA, 86.07 KM from BSF	Information yet to be received	No autoreclose operation observed in PMU data	No	No	
4	<a href="#">400KV ARAMBAG-KOLAGHAT</a>	19.04.19	20:38	19.04.17	20:47	R-N FAULT	<100	R-N, Z-I, 47.2KM from Arambag	R-N, Z-I, F/C 8.37 kA, 18.25 km from KTHP	No autoreclose operation observed in PMU data	No	<a href="#">Yes</a>	
5	<a href="#">400 KV FARAKKA - GOKORNO - II</a>	19.04.17	22:00	20.04.17	0:04	R-N FAULT	<100	R-N, 119.7 KM from FRK, F/C 2.7 KA, A/R blocked at Farakka end	A/R successful at Gokarno end	No autoreclose operation observed in PMU data	<a href="#">Yes</a>	No	400 kV Farakka - Gokarno - I successfully A/Reclosed at same time
6	<a href="#">400 KV HEL - SUBHASGRAM - I</a>	22.04.16	21:18	22.04.17	21:39	B-N FAULT	<100	Information yet to be received	Information yet to be received	No autoreclose operation observed in PMU data	No	No	
7	<a href="#">400 KV ARAMBAG - NEW RANCHI</a>	23.04.17	15:19	23.04.17	15:48	B-N FAULT	<100	B-N, Z-I, 192.7 km from Arambag, F/C 1.807 kA	B-N, 75.9 km from New Ranchi, F/C 3.16 kA	No autoreclose operation observed in PMU data	No	No	
8	<a href="#">400KV DARBHANGA-MUZAFFARPUR-II</a>	24.04.17	3:06	24.04.17	4:10	B-N FAULT	<100	B-N, 50.12 KM from Darbhanga	Information yet to be received	No autoreclose operation observed in PMU data	No	No	400/220 KV ICT - I at Darbhanga was hand tripped
9	<a href="#">400 KV KODERMA-BOKARO-I</a>	30.04.17	17:38	30.04.17	18:06	B-N FAULT	<100	B-N, Z-I, 20.5 KM from Koderma, F/C 9.9 kA	A/R successful at Bokaro end	No autoreclose operation observed in PMU data	No	No	
10	<a href="#">400 KV KOLAGHAT-JEERAT</a>	30.04.17	20:10	30.04.17	20:42	Y-N FAULT	<100	Y_N, Z-I, 109.5 KM from KTHP, F/C 4.08 kA	Y-N, Z-I, 74.5 km from Jeerat, F/C - 3.47 kA, A/R successful at Jeerat end	No autoreclose operation observed in PMU data	<a href="#">Yes</a>	No	A/R successful at Jeerat end