



Minutes
of
55th PCC meeting

Date: 05.06.2017
Eastern Regional Power Committee
14, Golf Club Road, Tollygunge
Kolkata: 700 033

EASTERN REGIONAL POWER COMMITTEE

MINUTES OF 55TH PROTECTION SUB-COMMITTEE MEETING HELD AT ERPC, KOLKATA ON 25.05.2017 (THURSDAY) AT 11:00 HOURS

List of participants is enclosed at **Annexure-A**.

Member Secretary, ERPC welcomed all the members. He stressed upon the furnishing of DR files in timely manner for each tripping so that the detail analysis can be done for each disturbance of ER. He requested all the constituents to send the comtrade files (namely .DAT and .CFG extension files) to the following e-mail ids of ERPC/ERLDC:

- erpcprotection@gmail.com
- erldcprotection@gmail.com
- ereb_cea@yahoo.co.in

PART – A

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

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

Members may confirm the minutes of 54th PCC meeting.

Deliberation in the meeting

Members confirmed the minutes of 54th 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.

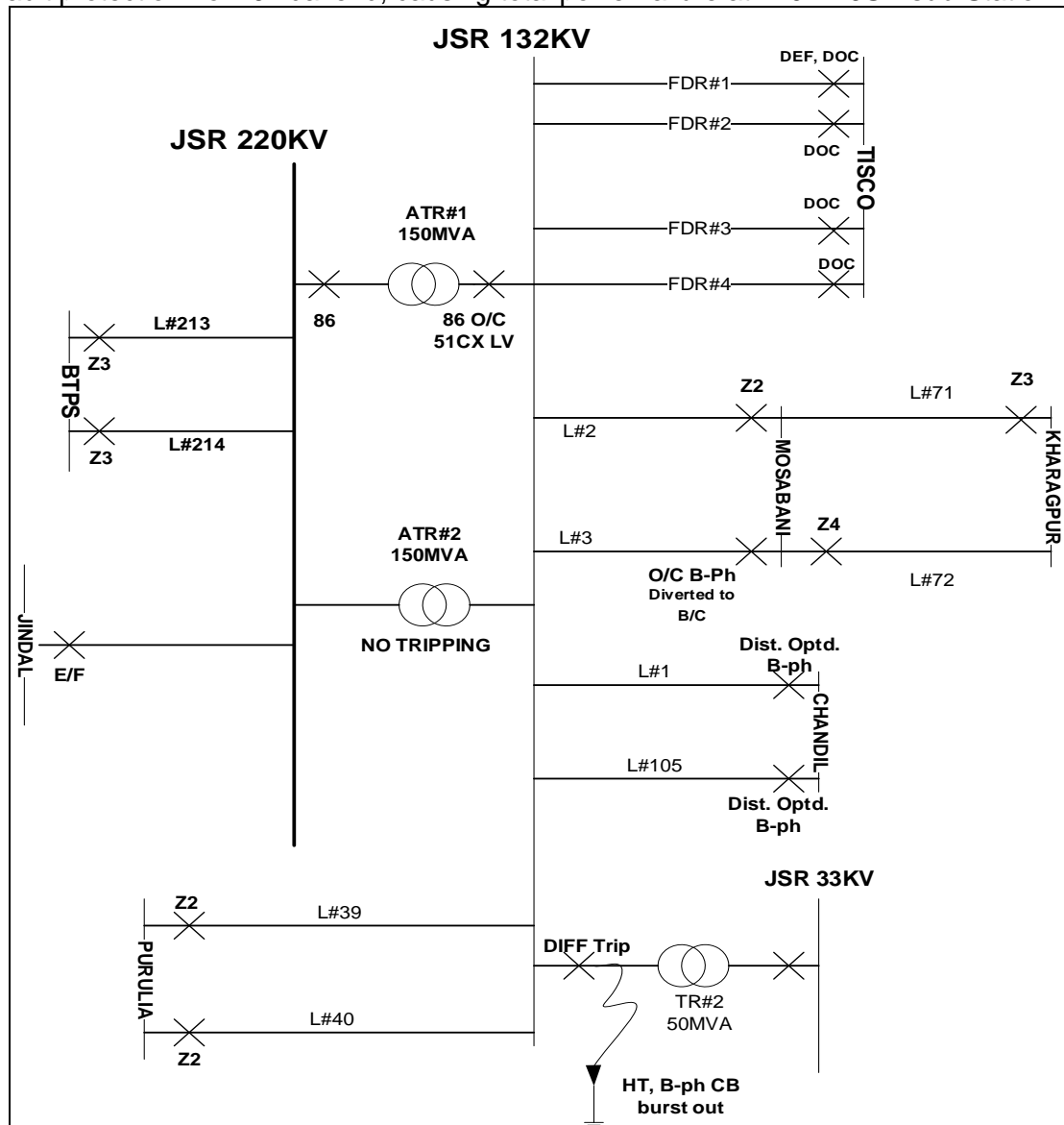
- 1. Single line diagram:** Submitted
- 2. Detailed analysis of tripping incident:** Submitted

On 25th 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 may explain the following:

- 132kV Kharagpur-Mosabani line II should trip from Kharagpur end (Atleast directional O/C, E/F protection should operate) DVC 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

Deliberation in the meeting

DVC informed that distance protection (P442) of 132kV Kharagpur-Mosabani line-II at Kharagpur end was out of service and directional earth fault protection took more time to operate as per the characteristic curve. Prior to that the zone 4 from Mosabani end was operated. DVC explained that zone 4 setting was kept 120% with time delay of 1.5 sec as it is being used for carrier blocking.

DVC added that the CB of 50 MVA ATR# 2 has been replaced and CB of 132kV Kharagpur-Mosabani line I at Mosabani end has been tested and found satisfactory.

PCC advised DVC to implement the following:

- Dedicated earth fault protection is essential for ATRs and it should be installed for all 220/132kV ATRs in DVC system

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:

| EAST BUS | WEST BUS |
|--------------------------------|----------------------------|
| 1. Dharampur #1 | 1. Liluah #1 |
| 2. Dharampur #2 | 2. Liluah #2 |
| 3. Bighati #1 | 3. Khanyan |
| 4. Bighati #2 | 4. Satgachhia |
| 5. Adisaptagram #1 | 5. Dharampur #3 |
| 6. Adisaptagram #2 | 6. Kalyani |
| 7. Unit #2 | 7. Unit #4 |
| 8. 25 MVA Plant Transformer #1 | 8. 25MVA Resv. Transformer |
| 9. 25 MVA Plant Transformer #2 | 9. Unit #5 |

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.

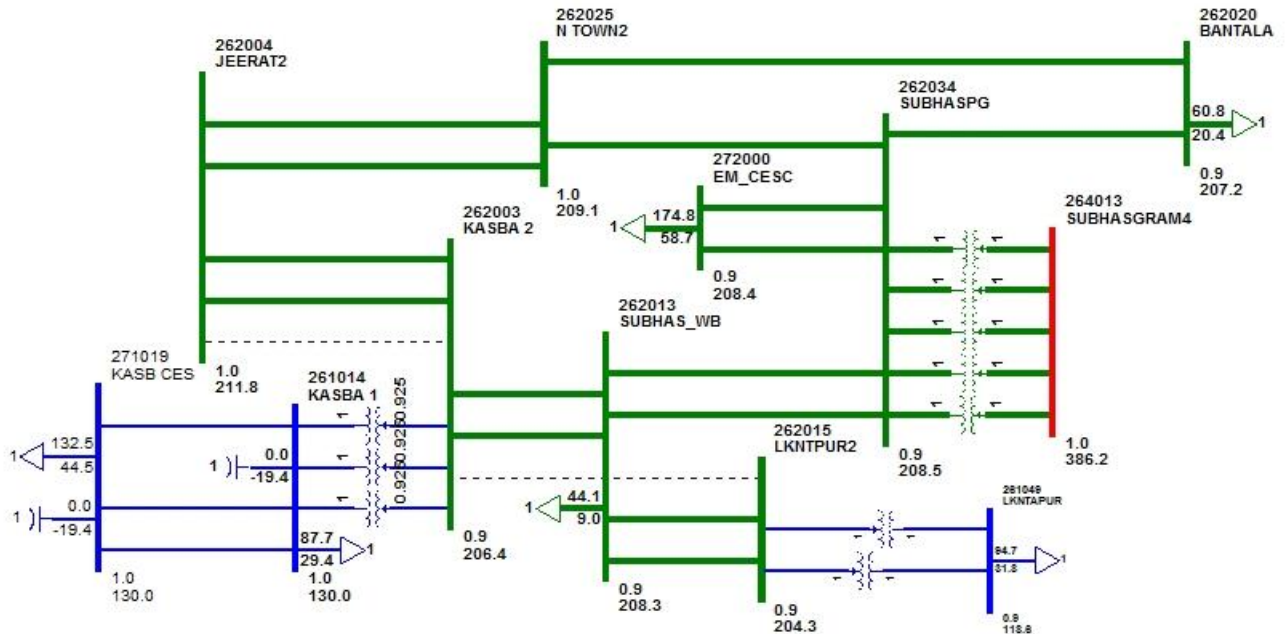
Deliberation in the meeting

WBDPCL informed that bus scheme at 132kV Bandel is one main and two transfer bus. Y phase

CT located at 132 KV West side of common bus was busted therefore both East and West Bus protection operated and tripped all the lines connected to 132kV Bus.

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 strung 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 – Subhashgram 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

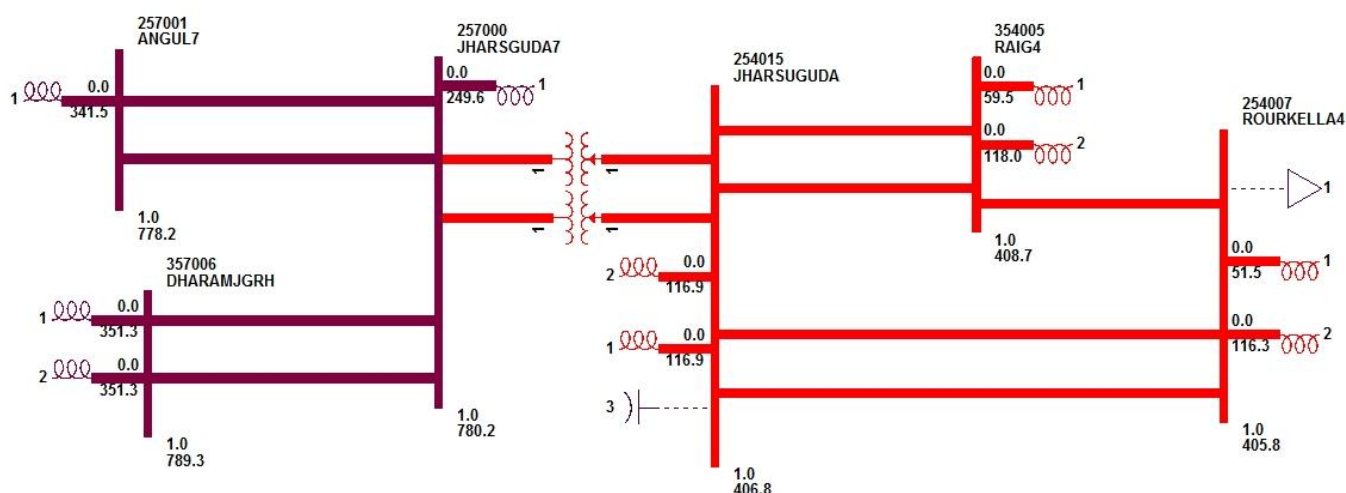
Deliberation in the meeting

WBSETCL explained that first a Y-ph fault initiated at 132kV Lakhikantapur due to failure of tension disk insulator and 220/132 kV ATR - II cleared the fault on differential protection within 100 ms. Later jumper fell on 132 kV main bus resulted in three phase fault. The fault got isolated by over current E/F protection at HV side of 220/132 kV ATR –I & III in 900 msec. WBSETCL added that 2500 A fault current was observed by each ATR and the O/C, E/F protection operated correctly as per the IDMT characteristics.

ERLDC informed that damped power flow oscillations were observed in 400 kV Jeerat – Subhasgram S/C and 400 kV Durgapur – Maithon – I for around 5 sec after the fault clearance.

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 _n , Iy-4.29 I/I _n , Ib-8.58 I/I _n & 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 _n , Iy-11.54 I/I _n , Ib-23.1 I/I _n , 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) |

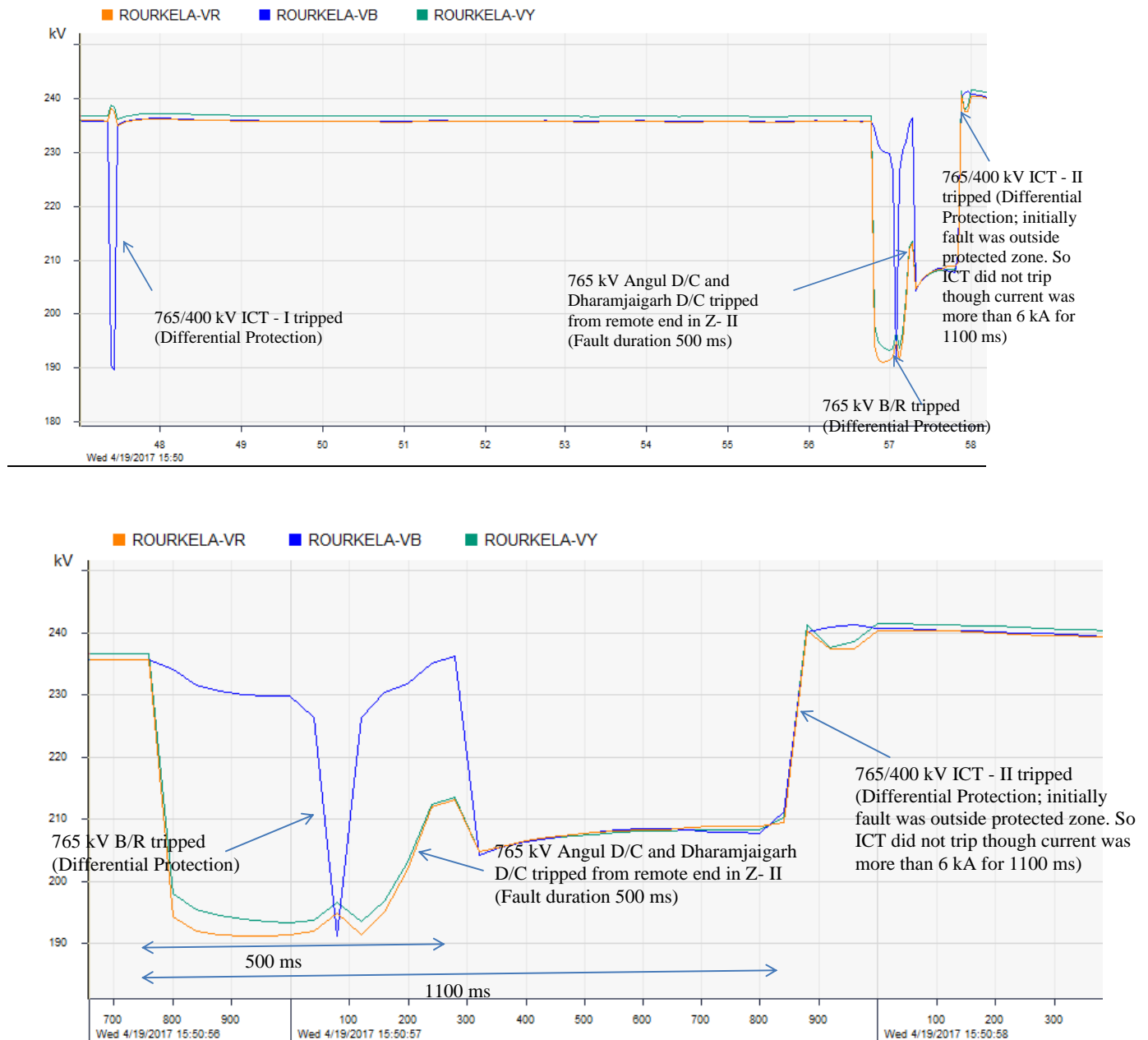
4. Disturbance record: Submitted

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.

Deliberation in the meeting

Powergrid explained the bus bar protection master control units (MCUs) were changed to error mode while interchanging the DC incoming cable of 724 RA/RB panel by isolating both DC-1 and DC-2 from DCDB. As a result bus bar protection was not operated.

Powergrid informed that zone 2 time settings 765 kV Jharsuguda – Angul – I & II lines at Jharsuguda end was kept at 500 ms to coordinate with adjacent short line.

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.

Deliberation in the meeting

DMTCL representative was not available in the meeting for discussion.

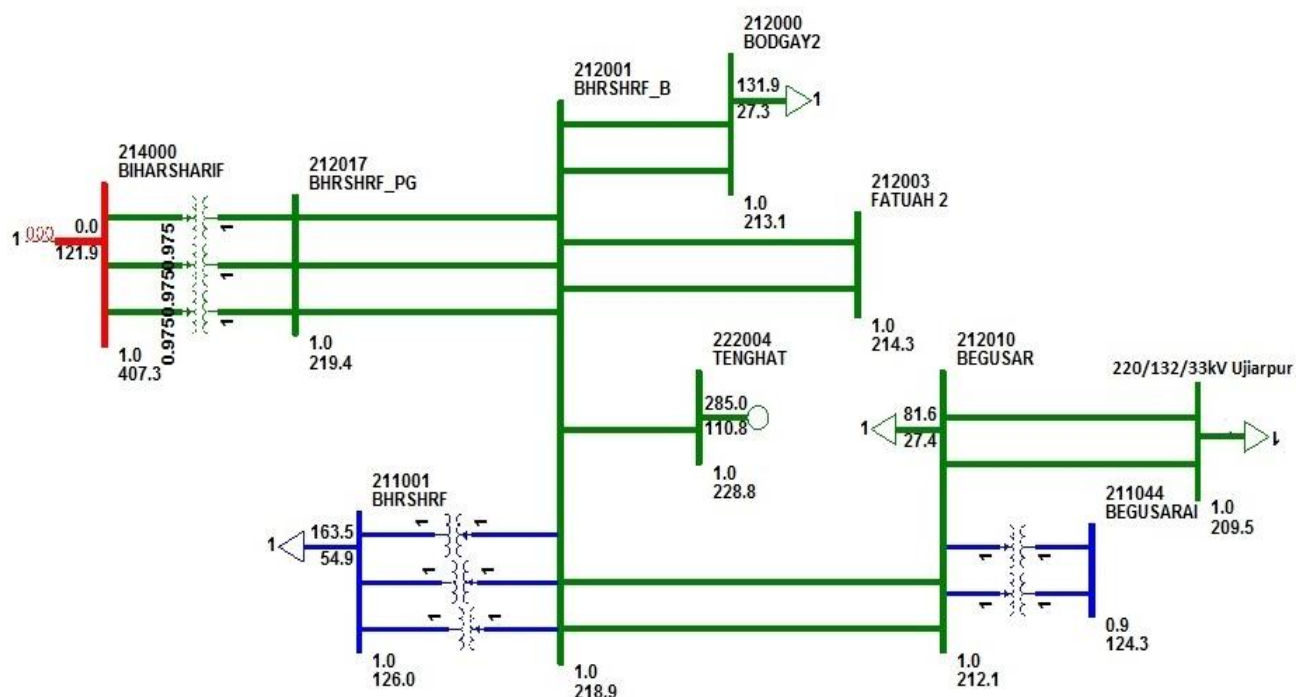
It was informed that the protection settings of line protection of 400 kV Muzaffarpur - Darbhanga – I & II and 400/220 kV ICT - I & II were not proper. As a results the above trippings were initiated.

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.



3. Detailed analysis of tripping incident: Submitted

At 18:49:50.54 hrs, 400/220 kV ICT – III at Biharshariff tripped from 400 kV side due to operation of o/c protection (RET 521). As a result, other two ICTs overloaded and tripped on over current protection from HV side.

From PMU data and DR plots of 315MVA, 400/220 kV ICT – I, II and III it seems there was a Blue-phase to ground fault in downstream network. 2 kV voltage dip in Blue phase is observed in Biharshariff PMU data. The blue phase current was high in all three 400/220 kV ICTs as observed from DR.

As per O/C setting of ICT, pick up current is 600Amp with time delay 600 ms and drop to pick up ratio is 85%. 400 kV side O/C relay of 400/220 kV ICT - III picked up for Blue phase and remained picked up condition as Blue phase current was more than ($600 * 0.85 = 510$ Amp).

Power flow in 220 kV Tenughat Biharshariff S/C, changed from 92 MW to 265 MW and power flow remained more than 240 MW at Tenughat end.

The relay Indications are as follows:

| Time (Hrs) | Details of tripping | Relay at HV end |
|------------|------------------------------|--------------------|
| 18:49 hrs | 400/220 kV ICT – I, II & III | O/C at 400 kV side |

4. Disturbance record: Submitted

5. Remedial action taken : Submitted

- The RET 521 Relay is not time synchronized hence there is mismatch in the event and DR timings.
- The Relay RET 521 is already phased out, and due to non availability of support for this

model from manufacturer, replacement for this relay is already under process.

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:

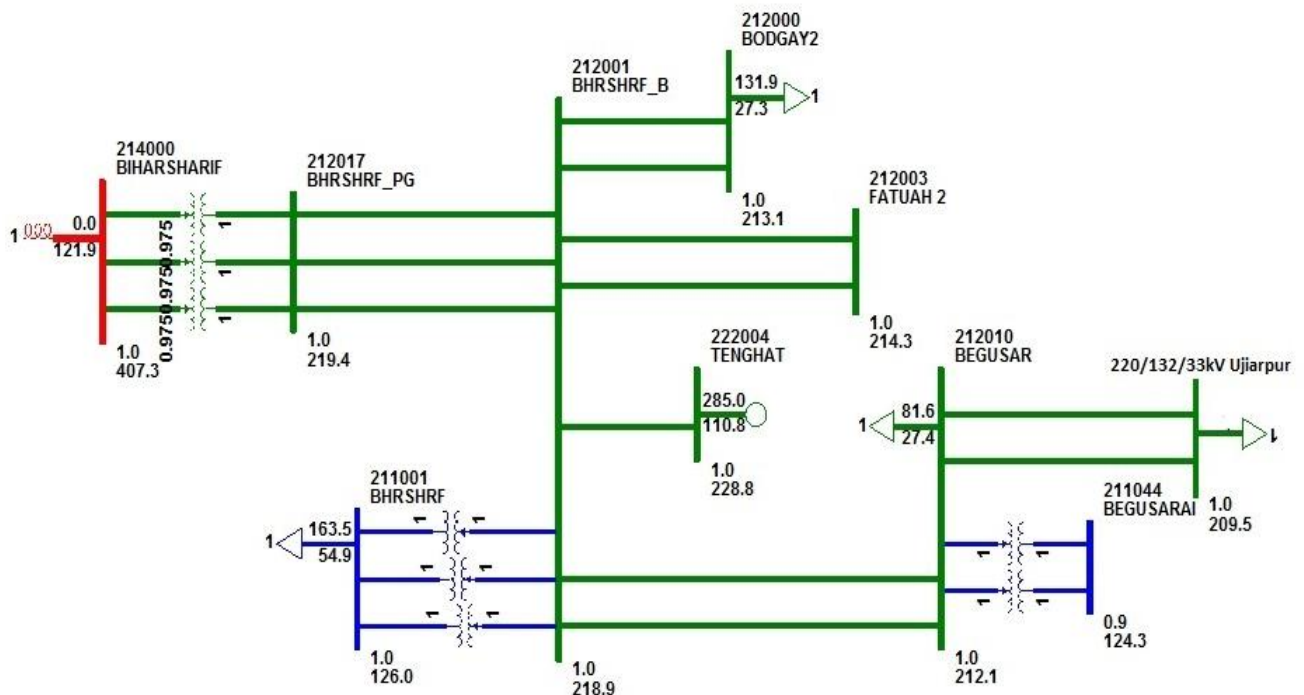
- Location and nature of fault
- Reason for not clearing the fault from downstream end
- 400/220 KV ICTs over current setting with 600A, 600 ms is low and Powergrid may review the settings with IDMT characteristics so that downstream protection can operate
- SPS may be implemented to avoid the unwanted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

Deliberation in the meeting

BSPTCL and Powergrid informed that there was no fault in 220kV and downstream system.

ITEM NO. B.7: Disturbance at 400/220 kV Biharsharff 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

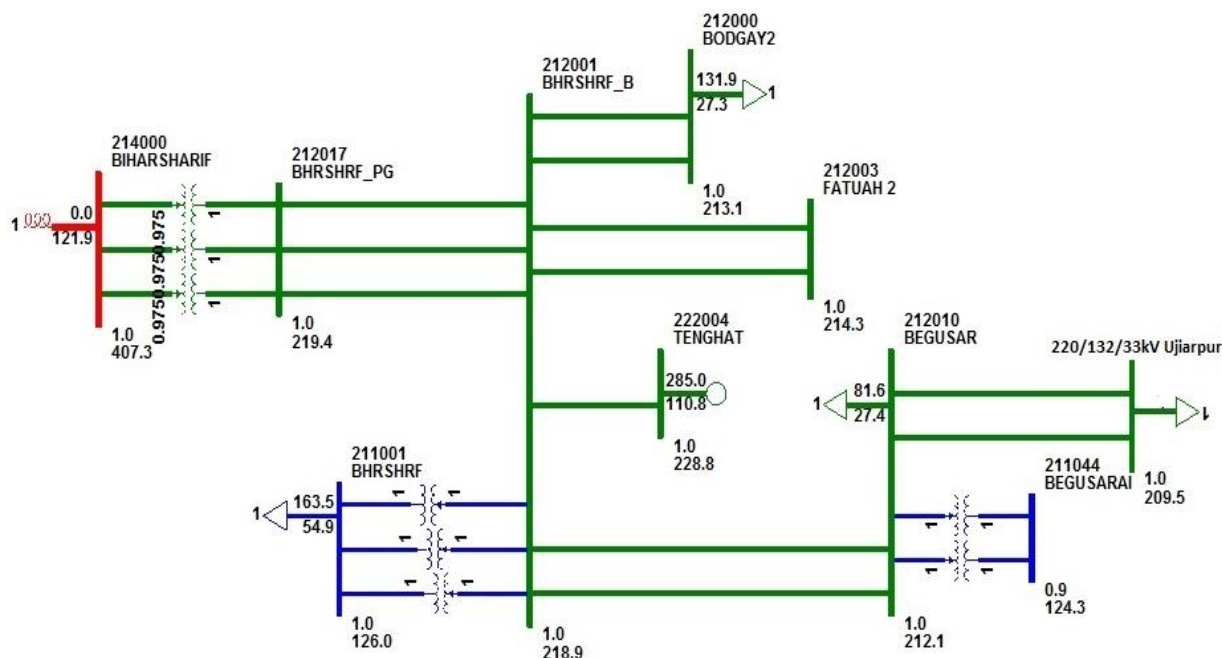
Deliberation in the meeting

Powergrid explained that 315 MVA 400KV/220 KV ICT at 400kV Biharshariff S/s tripped during bus changeover. There was no fault in the system.

PCC advised Powergrid to take care in future.

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

Deliberation in the meeting

BSPTCL informed that there was Y-N fault in 132kV bus at Fatua due to bursting of Y Phase CT of 132 kV side of 220/132 kV ATR – III. Since the IDMT characteristics for over current E/F protection for 220/132 kV ATRs have been implemented to coordinate with downstream network, the protection relay took more time to operate. In the mean time, 220 KV Biharsharif-Fatuha-I tripped from Biharshariff end on zone 3 and 400/220 kV ICT – I, II & III at Biharsharif tripped from HV end on Over current protection.

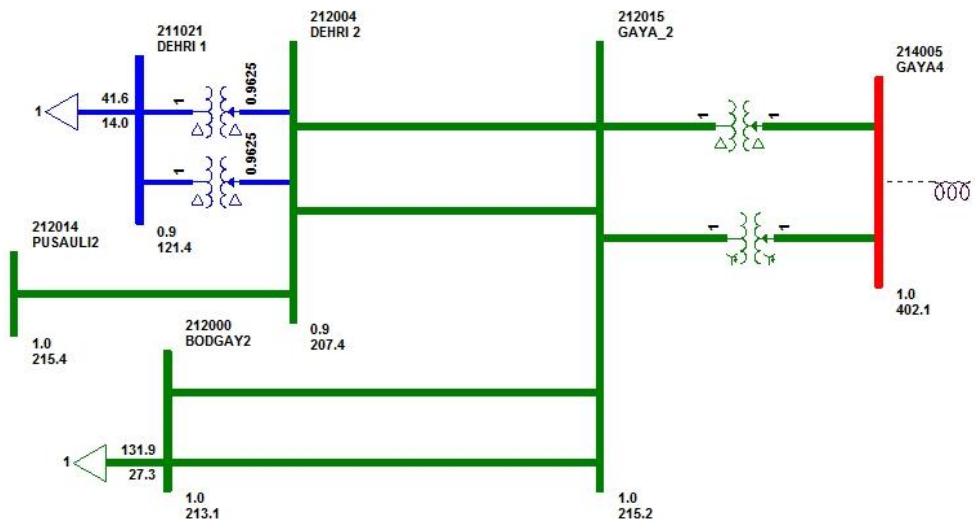
PCC felt that in this case the fault should be cleared from 220/132 kV Fatua ATR and advised BSPTCL to implement the following:

- *High set over current tripping should be implemented for 220/132 kV ATRs immediately within 2 days and report to ERPC and ERLDC.*
- *The directional over current E/F protection settings of transmission lines should be coordinated with 400/220 kV ICT – I, II & III settings so that for any fault in 220kV transmission line and downstream system, the 220kV lines should trip first and then 400/220 kV ICT – I, II & III. The time should be greater than zone 2 timing of the distance relay for better coordination. BSPTCL was advised to change the settings accordingly in coordination with Powergrid.*

PCC felt that over current setting of 400/220 KV ICTs at Biharshariff S/s with 600A, 600 ms(DMT) is low and it is difficult to coordinate downstream relays with this setting and advised Powergrid to review the time setting for proper time coordination with BSPTCL system.

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.

Deliberation in the meeting

BSPTCL informed that there was a fault in 132kV bus at Bodhgaya due to CT failure of 220/132 kV ATR.

All the 220/132 kV ATRs tripped on high set over current protection and successfully cleared the fault. There were no tripping of 220kV lines during this incidence.

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

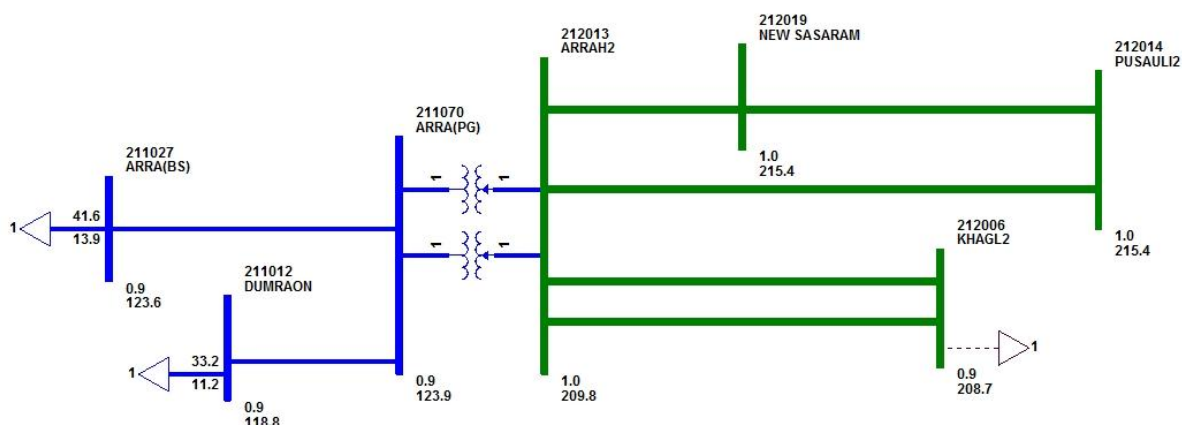
220 kV Muzzaffarpur - Hazipur D/C line tripped from Muzzaffarpur end at the instant of charging of newly constructed 220 KV Hajipur -Amnaur ckt 2 transmission line by BGCL. Phase to phase fault found in said transmission line.

Powergrid and BSPTCL may explain.

Deliberation in the meeting

Powergrid informed that 220 kV Muzzaffarpur - Hazipur D/C line tripped from Muzzaffarpur end on zone 2 due to phase to phase fault at the instant of charging of newly constructed 220 KV Hajipur - Amnaur ckt-2 transmission line.

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 - Khaqul D/C were in opened condition.

BSPTCL may explain.

Deliberation in the meeting

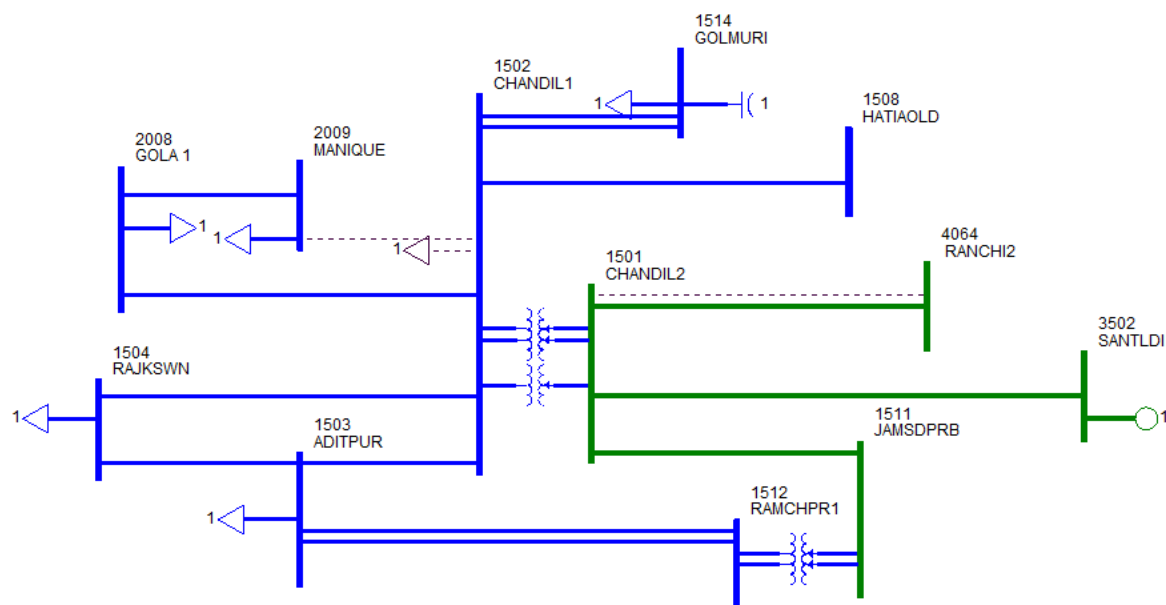
BSPTCL informed that 220 kV Nandokhar – Arrah S/C tripped from Nandokhar end on Stage-I over voltage protection. Voltage was 240 kV at the instant of tripping.

PCC advised BSPTCL to implement the second stage over voltage protection also as 220kV Nanokhar S/s is experiencing high voltage.

ERLDC informed that a study has been carried out and it was observed that the over voltage and over loading of transmission lines will be resolved after commissioning of 220kV Patna-Sipara line – III. ERLDC added that study results and conclusions will be placed in 133rd OCC meeting.

ITEM NO. B.12: Disturbance at 220 kV Ramchandrapur S/s (JUSNL) on 02-04-17 at 19:01 hrs.

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.

Deliberation in the meeting

JUSNL explained that

- *There was a B-N fault at 132 kV Adityapur – Ramchandrapur line– I 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 on over current protection.*

- 132 kV Adityapur – Chandil S/C line tripped from Chandil on zone 3 and 132 kV Chandil – Rajkarswan S/C line tripped from Chandil end on Over current E/F protection
- 132 kV Adityapur – Rajkarswan S/C was not tripped

PCC felt that the fault should be cleared from 132 kV Adityapur S/s and advised JUSNL to carry out the following:

- Test the protection relays of 132 kV Adityapur – Ramchandrapur line– I at 132 kV Adityapur S/s
- Check the zone 3 time setting of 132 kV Adityapur – Chandil S/C at Chandil end as the line tripped within 350 ms.

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

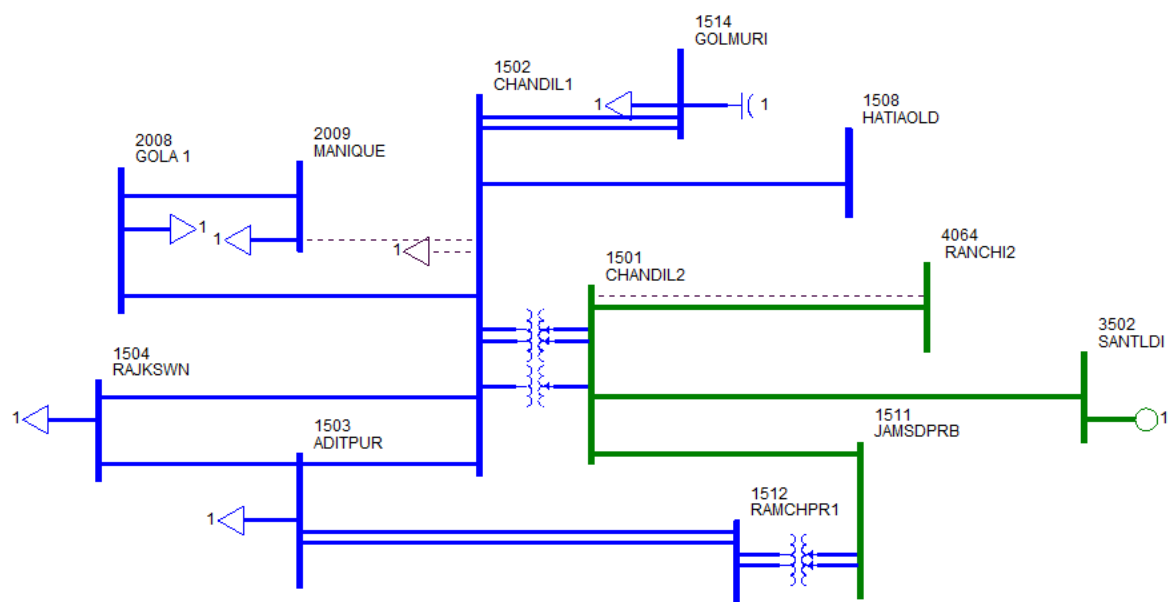
Total power failure occurred at 220kV Chandil due to heavy storm and lightning.

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.

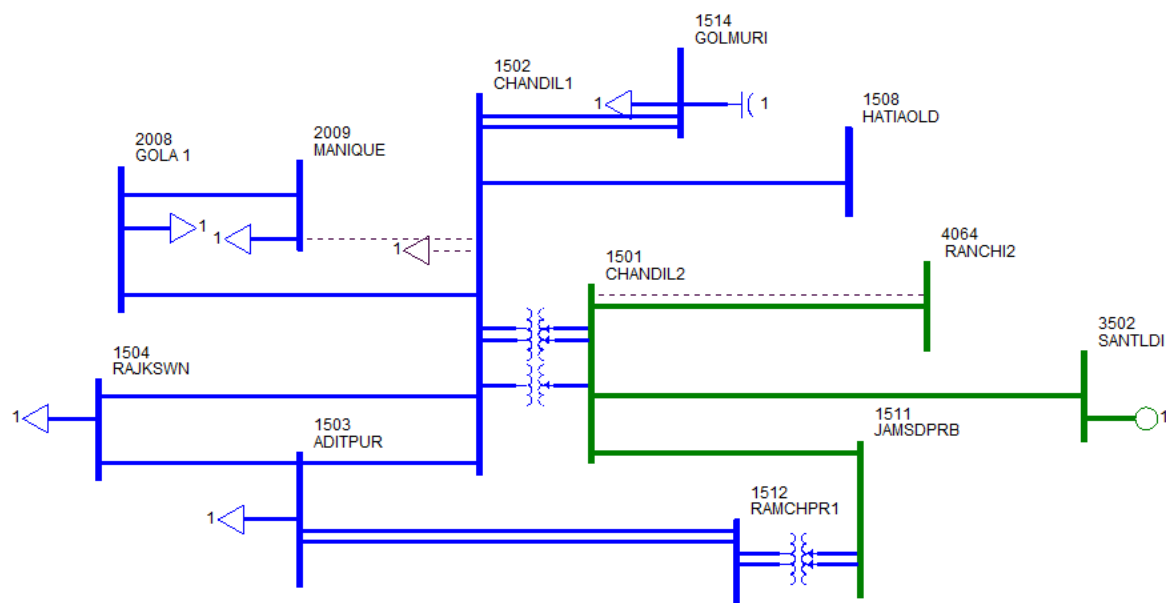
Deliberation in the meeting

JUSNL explained that during heavy storm and lightning, 220 kV Ranchi – Chandil tripped from Chandil end on zone 1 due to B-N fault and Ranchi end tripped on zone 2.

Later at 15:52 hrs, 220 kV Ramchandrapur – Chandil and 220 kV STPS – Chandil S/C tripped from remote end on zone 2 due to bus fault in 220 kV Chandil S/s.

ITEM NO. B.14: Disturbance at 220 kV Chandil S/s (JUSNL) on 13-04-17 at 14:05 hrs.

1. Single line diagram: Not Submitted



2. Pre fault conditions: Not Submitted

3. Detailed analysis of tripping incident: Submitted

At 14:05 hrs, 220 kV Ranchi – Chandil and 220 kV Chandil – STPS S/C tripped from Chandil end during checking of 220/132 kV ATR – IV relay at 220kV Chandil S/s. Local load at Chandil was unaffected as it was being fed through 132 kV Manique – Chandil S/C.

220 kv Chandil- Ramchandrapur is under s/d from 05.4.17.

4. Disturbance record: Not Submitted

5. Remedial action taken : Not Submitted

Analysis of PMU plots:

- No fault has been observed in PMU data.

Status of Reporting:

- Report from JUSNL is yet to be received

JUSNL and Powergrid may explain the following:

- Location and nature of the fault
- Place the relay indications of 220 kV Ranchi – Chandil and 220 kV Chandil – STPS S/C lines at Chandil end.

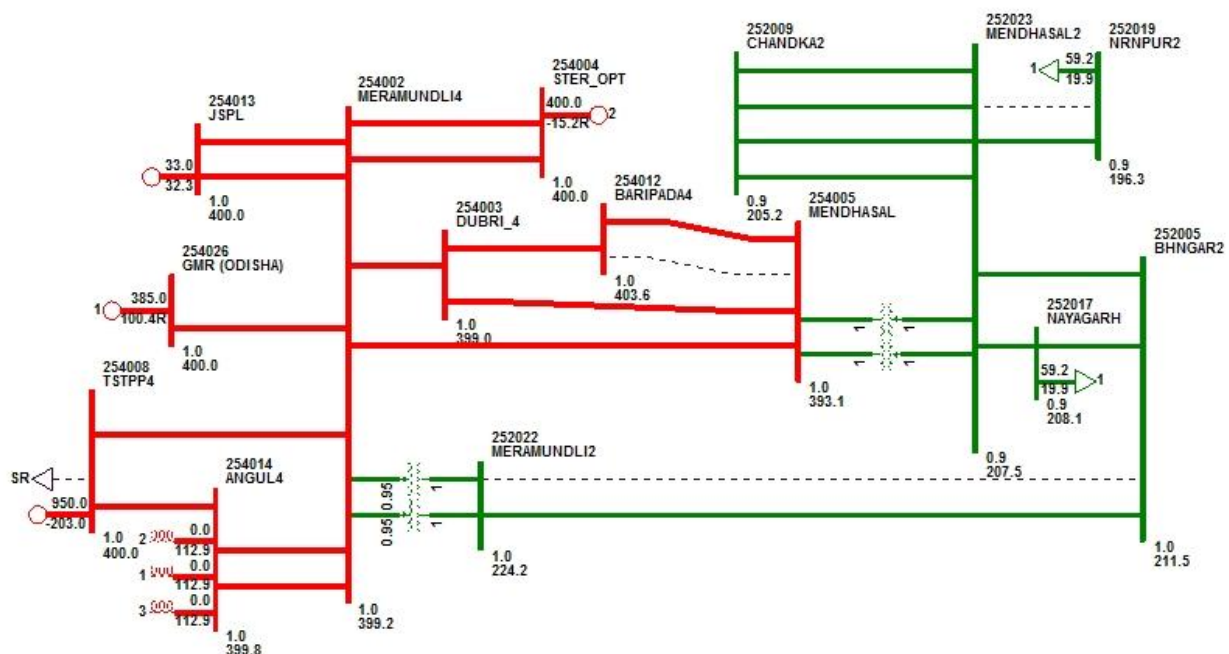
Deliberation in the meeting

JUSNL informed that there was no fault in the system. LBB operated at 220kV Chandil S/s during checking of 100 MVA, 220/132 kV ATR – IV relay.

PCC advised JUSNL to take care in future.

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) | Zone 2 |
| | 400 kV Meramundali – Angul - I | R-N, Z-IV, 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 Meramundali | O/C high set at 400 kV side (I _y 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.

Deliberation in the meeting

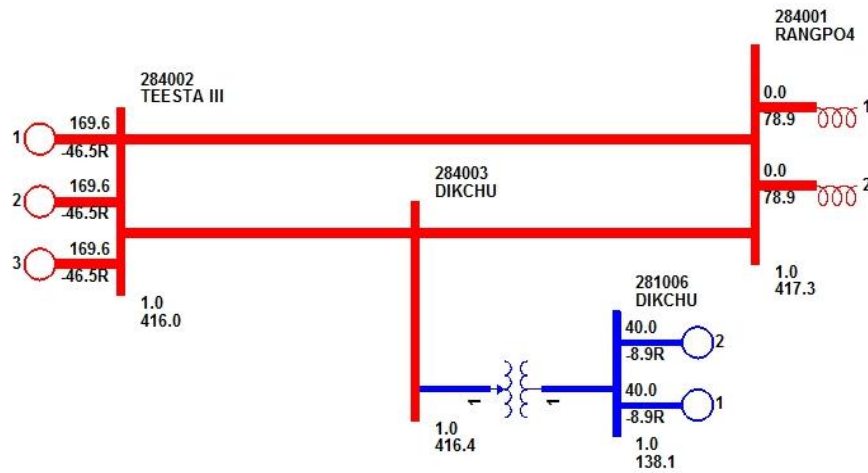
OPTCL explained that R-N fault was initiated at 400 kV Meramundali due to LA failure of 400 kV Meramundali – Angul – II at Meramundali end. Meramundali end distance protection identified the fault but CB failed to clear fault. As a result following elements tripped:

- 400 kV Meramundali – Talcher S/C and 400 kV Meramundali – Vedanta – I & II tripped from remote end on zone 2.
- 400/220 kV ICT – II at Meramundali tripped on high set over current protection
- 400 kV Meramundali – Mendasal S/c tripped from Mendhasal end on zone 1
- 400 kV Meramundali – Angul – I tripped from Meramundali on zone 4 angul end tripped on DT receipt

PCC felt that 400 kV Meramundali – Mendasal S/c line should trip from Mendhasal end on zone 2 and advised OPTCL to review the settings. OPTCL was also advised to check the CB of 400 kV Meramundali – Angul – II at Meramundali end.

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.

Deliberation in the meeting

Teesta-III and Dikchu representatives were not available for discussion.

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.

Deliberation in the meeting

Powergrid informed that at 21:18 hrs Subashgram end attempted the Autoreclose but unsuccessful.

PCC advised HEL to check the Autoreclose attempt at HEL 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.

Deliberation in the meeting

Powergrid informed that 132 kV Chujachen - Gangtok and 132 kV Rangpo Gangtok lines tripped on over current E/F protection.

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 54th 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.

Deliberation in the meeting

PCC advised OPTCL to submit the existing SPS settings to ERPC and ERLDC immediately.

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 53rd 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-Kahalgaon 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 54th 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.

Deliberation in the meeting

JUSNL informed that work is in progress.

ITEM NO. C.3: Third Party Protection Audit

1. Status of 1st Third Party Protection Audit:

The compliance status of 1st Third Party Protection Audit observations is as follows:

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

Deliberation in the meeting

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

2. Schedule for 2nd Third Party Protection Audit:

The latest status of 2nd Third Party Protection audit is as follows:

| | |
|--------------------------------------|--|
| 1) Jeerat (PG) | Completed on 15 th July 2015 |
| 2) Subashgram (PG) | Completed on 16 th July 2015 |
| 3) Kolaghat TPS (WBPDC)- | Completed on 7 th August 2015 |
| 4) Kharagpur (WBSETCL) 400/220kV - | Completed on 7 th August 2015 |
| 5) Bidhannagar (WBSETCL) 400 & 220kV | Completed on 8 th September, 2015 |

| | |
|------------------------------------|---|
| 6) Durgapur (PG) 400kV S/s | Completed on 10 th September, 2015 |
| 7) DSTPS(DVC) 400/220kV | Completed on 9 th September, 2015 |
| 8) Mejia (DVC) TPS 400/220kV | Completed on 11 th September, 2015 |
| 9) 400/220/132kV Mendhasal (OPTCL) | Completed on 2 nd November, 2015 |
| 10) 400/220kV Talcher STPS (NTPC) | Completed on 3 rd November, 2015 |
| 11) 765/400kV Angul (PG) | Completed on 4 th November, 2015 |
| 12) 400kV JITPL | Completed on 5 th November, 2015 |
| 13) 400kV GMR | Completed on 5 th November, 2015 |
| 14) 400kV Malda (PG) | Completed on 23 rd February, 2016 |
| 15) 400kV Farakka (NTPC) | Completed on 24 th February, 2016 |
| 16) 400kV Behrampur(PG) | Completed on 25 th February, 2016 |
| 17) 400kV Sagardighi (WBPDL) | Completed on 25 th February, 2016 |
| 18) 400kV Bakreswar (WBPDL) | Completed on 26 th February, 2016 |
| 19) 765kV Gaya(PG) | Completed on 1 st November, 2016 |
| 20) 400kV Biharsharif(PG) | Completed on 3 rd November, 2016 |
| 21) 220kV Biharsharif(BSPTCL) | Completed on 3 rd 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.

Deliberation in the meeting

Members noted.

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

In 54th PCC, Powergrid ER-I, ER-II and Powergrid-Odisha have submitted the details.

Members may update.

Deliberation in the meeting

PCC advised all the other constituents to submit the details to ERLDC.

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 48th PCC, all the constituents were advised to go through the Annexure and update the settings, if any.

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

In 54th PCC, Powergrid ER-I, ER-II and Powergrid-Odisha have submitted the details.

Members may update.

Deliberation in the meeting

PCC advised all the other constituents to submit the details to ERLDC.

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 49th PCC, PRDC informed that data collection for West Bengal is in progress and it will be

completed by December, 2016.

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

In 51st 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 15th February 2017.

PRDC added that software acceptance trails of PSCT phase-I have been completed and phase-II will be done from 19th to 21st 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 52nd 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 53rd PCC, PRDC informed that data survey and modeling has been completed and PDMS will be operational by 31st 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 54th 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.

Deliberation in the meeting

PRDC informed that collection of relay settings 97 out of 112 substations were completed in Bihar. Rest are in progress.

Pending relay setting file collection of JUSNL substations are in progress. Relay setting file collection of Sikkim substations are pending.

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 | 220KV BUDIPADAR-KORBA-II | 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 | 220 KV TSTPP-RENGALI | 17.07.16 | EARTH FAULT | NTPC | OPTCL | | |
| 18 | 220KV BUDIPADAR-RAIGARH | 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 | 220 KV FARAKKA-LALMATIA | 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 | 220 KV MUZAFFARPUR - HAZIPUR - II | 10.08.16 | B-N FAULT | PGCIL | BSPTCL | | Voice established. For carrier required shutdown |
| 24 | 220 KV ROURKELA - TARKERA-II | 11.08.16 | B-N FAULT | PGCIL | OPTCL | OPGW available | Expected to install protection coupler by Jan 17 |
| 25 | 220 KV CHANDIL-SANTALDIH | 25.08.16 | R-N FAULT | JUNSL | WBPDC L | not available | |
| 26 | 400 KV MPL-RANCHI-II | 02.09.16 | R-N FAULT | MPL | PGCIL | PLCC available | |
| 27 | 220 KV BIHARSARIF-TENUGHAT | 07.09.16 | B-N FAULT | BSPTCL | TVNL | | |
| 28 | 400KV MERAMANDALI-STERLITE-II | 10.09.16 | Y-N FAULT | OPTCL | SEL | OPGW commissioned | Carrier in service |

| | | | | | | | |
|----|---|----------|-----------|------------|-------|--------------------------|-----------------------|
| 29 | <u>220 KV RAMCHANDRAPUR - CHANDIL</u> | 22.09.16 | B-N FAULT | JUSNL | JUNSL | | |
| 30 | 400KV SEL - MERAMUNDALI-I | 22.09.16 | B-N FAULT | SEL | OPTCL | OPGW commissi oned | Carrier service in |
| 31 | 400 KV KOLAGHAT - CHAIBASA | 28.09.16 | B-N FAULT | WBPDC L | PGCIL | PLCC available | |

34th 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.

Deliberation in the meeting

OPTCL and Bihar updated sl 23, 28 and 30 as mentioned in above table.

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 made 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 34th TCC, members updated the status as follows:

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

| Bihar | | | | |
|------------------|---------------------------|------------------------------|----------------------|---|
| SI No | Name of Substation | Bus protection status | Date of audit | Present Status |
| 1 | 220 kV Bodhgaya | Not available | 28-Dec-12 | <i>Single bus and there is no space available for busbar protection</i> |
| Jharkhand | | | | |
| 1 | 220 kV Chandil | Not available | 29-Jan-13 | <i>LBB available</i> |
| 2 | 220 kV Tenughat | Not available | 12-Apr-13 | |
| DVC | | | | |
| 1 | 220 kV Jamsedpur | Not available | 10-Apr-13 | <i>Single bus. Bus bar will</i> |

| | | | | |
|--------------------|----------------|---------------|-----------|--|
| | | | | <i>be commissioned under PSDF.</i> |
| West Bengal | | | | |
| 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.

Deliberation in the meeting

Members noted.

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 48th 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 52nd 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.

Deliberation in the meeting

OPTCL informed that work is in progress.

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

In 45th 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 25th 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.

Deliberation in the meeting

OHPC informed that work is in progress.

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.

Deliberation in the meeting

*Constituents explained the tripping incidences. The updated status is enclosed at **Annexure- D1**.*

Item No D.2 Any other issues.

Meeting ended with vote of thanks to the chair.

Participants in 55th PCC Meeting of ERPC

Venue: ERPC Conference Room, Kolkata

Time: 11:00 hrs

Date: 25.05.2017 (Thursday)

| Sl No | Name | Designation/ Organization | Contact Number | Email | Signature |
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| 17 | DEEPAK KUMAR | BSPTCL | 9472218038 | dkumar27107@gmail.com | Deepak Kumar |
| 18 | Ch. Mohan Rao | Powergrid adista | 9437962193 | mohan.rao@powergrid india.com | Ch. Mohan Rao |
| 19 | S. A. Ansari | Philly, Putna | 9431820252 | stabbir.bit@gmail.com | S. A. Ansari |
| 20 | T.R. Mohapatra | POSOCO | 9433041823 | trmohapatra@posoco.in | T.R. Mohapatra |

"Coming together is a beginning, staying together is progress, and working together is success." —Henry Ford

Participants in 55th PCC Meeting of ERPC

Venue: ERPC Conference Room, Kolkata

Time: 11:00 hrs

Date: 25.05.2017 (Thursday)

| Sl No | Name | Designation/ Organization | Contact Number | Email | Signature |
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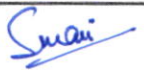


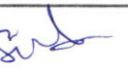
"Coming together is a beginning, staying together is progress, and working together is success." –Henry Ford

Participants in 55th PCC Meeting of ERPC

Venue: ERPC Conference Room, Kolkata

Time: 11:00 hrs

Date: 25.05.2017 (Thursday)

| Sl No | Name | Designation/ Organization | Contact Number | Email | Signature |
|-------|---------------------|------------------------------|-------------------|-------------------------|---|
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"Coming together is a beginning, staying together is progress, and working together is success." –Henry Ford

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 |

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|----|---------------|--------------|-----|-----|------|-----|----------------------------|-----|-----|---|------------|-----|---|------------|
| 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 | S/C | 4 | 120% | 4 | | 999 | 799 | N | 0.35 | 500 | 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 KV ARAMBAG-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 | | |
| | 400 KV BAKRESWAR-ARAMBAG | 110 | 5 | | 110 | 5 | | |

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|------------|-------------------------------------|-------------------------------|---|--|-----|-----|--|
| 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 | |

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|---------------------------|--------------------------------------|-----|-----|--|--------------|-----|---|
| | 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 | |

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|---------------|-----------------------------------|-----|----|--|--------------|----|--|---|
| 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 | | |

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|---------------------|------------------------------------|-----|----|--|--------------|----|---|
| 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 | |

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| 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 | | | | | |
| Sasaram | 400 KV PATNA- BALIA - IV | 112 | 7 | | | | | |
| | 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 | | | | | | | |
| | 765 KV GAYA-VARANASI-II | | | | | | | |
| BANKA | 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 |
|---|--|-----------|-----------|------------------|------------------|-----------------------------------|------------------------------|---|---|---|------------------------------|-----------------------------|--|
| Fault clearing time is violating protection standard (As per PMU data) | | | | | | | | | | | | | |
| 1 | 220KV PATRATU - TENUGHAT | 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. No PLCC is available |
| 2 | 220 KV PTPS - HATIA D/C | | | 02.04.17 | 13:48 | Y-N FAULT | 350 ms approx | Tripped | Not tripped | No autoreclose operation observed in PMU data | No | No | |
| 3 | 400KV BIHARSHARIFF-SASARAM-I | 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 | Powergrid may check zone 2 timing as the fault got cleared in 500 ms. |
| 4 | 220KV WARIA - BIDHANGANAR-I | 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 | No PLCC is available |
| 5 | 400KV MERAMUNDALI-STERLITE-II | 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 | 400KV MERAMUNDALI-STERLITE-II | 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 | 220 KV TENUGHAT - BIHARSHARIFF S/C | 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 | |
| Multiple tripping at same time | | | | | | | | | | | | | |
| 1 | 400 KV STERLITE-ROURKELA S/C | 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 Iy- 3.75kA; Ib- 4.12 kA | -- | Yes | Yes | |
| 2 | 400 KV STERLITE-MERAMUNDALI D/C | | | 02.04.17 | 21:58 | Y-B-N FAULT | <100 | Did not trip | Zone 1 | -- | -- | No | |
| 3 | 400KV JAMSHEDPUR-ADHUNIK-II | 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 | Yes | R Phase LA failure of 400 kV Adhunik - Jamshedpur - II at Jamshedpur end. Adhunik unit I also tripped at same time. PLCC problem in 400kV Jamshedpur-Andal-I |
| 4 | 400KV JAMSHEDPUR-ANDAL-I | | 15:57 | 05.04.17 | 16:55 | R-N FAULT | <100 | DT received | Did not trip | No autoreclose operation observed in PMU data | No | -- | |
| 5 | 400KV JAMSHEDPUR-CHAIBASA-I | | 15:59 | 06.04.17 | 09:10 | 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 | |

| S.NO | LINE NAME | TRIP DATE | TRIP TIME | RESTORATIO N DATE | RESTORATIO N 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 |
|--------------------------------|---|-----------|-----------|----------------------|----------------------|----------------------------|---------------------------------------|--------------------------------------|--|---|---------------------------------------|--------------------------------------|---|
| 6 | 220 MUZAFFARPUR - HAZIPUR - I | 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 | -- | Transient fault < 100 ms Ph-Ph fault |
| 7 | 220 MUZAFFARPUR - HAZIPUR - II | | | 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 | Yes | |
| 8 | 400KV TEESTA-3 - RANGPO | 14.04.17 | 23:19 | 15.04.17 | 01:33 | B-N FAULT | <100 | 87C (Differential), DT Received, DEF | DT Received | No autoreclose operation observed in PMU data | Yes | No | Dikchu unit II also tripped due to loss of evacuation path |
| 9 | 400KV TEESTA-3 - DIKCHU | | | 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 | Yes | No | |
| 10 | 400KV JHARSUGUDA-ROURKELA-I | 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 | 400KV JHARSUGUDA-ROURKELA-II | | | 18.04.17 | 16:39 | R-B FAULT | <100 | Did not trip | R-B, Z-III | -- | -- | No | |
| 12 | 400 KV FARAKKA - MALDA - I | 20.04.17 | 07:40 | 20.04.17 | 08:15 | Y-N FAULT | <100 | F/F start | O/V | No autoreclose operation observed in PMU data | -- | Yes | 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 | 400 KV FARAKKA - MALDA - II | | | 20.04.17 | 08:42 | Y-N FAULT | <100 | Zone 3 start | DEF | No autoreclose operation observed in PMU data | -- | Yes | |
| 14 | 400 KV FARAKKA-GOKORONO-I | 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 | Permanent fault, A/R disabled. |
| 15 | 400 KV FARAKKA-GOKORONO-II | | | 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 | 220KV BIHARSHARIFF-TENUGHAT | 03.04.17 | 12:47 | 03.04.17 | 13:41 | E/F | -- | O/C, E/F | E/F, Master Trip | -- | No | Yes | Line tripped on Fault |
| 2 | 220KV KISHANGUNJ (B) - KISHANGUNJ (B) T/C | 03.04.17 | 19:03 | 03.04.17 | 20:20 | LBB OPERATED AT BSPTCL END | -- | LBB Operated | Information yet to be received | -- | Yes | No | LBB malfunction due to CT mismatch |
| 3 | 220KV MUZAFAR-GOPLGUNG - II | 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 | Transient fault |
| 4 | 220 KV MUZAFAR-GOPLGUNG - I | 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 | Already in break down |
| 5 | 400KV ALIPURDUAR-BONGAIGAON-II | 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-Bongaigoan - IV. But due to mal operation breaker of 400 kV Alipurduar - Bongaigaon - II opened at Bongaigaon end |
| 6 | 400 KV JEYPORE - GAZUWAKA - II | 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. Gajuwaka end tripped. |
| 7 | 220KV DARBHANGA-MOTIPUR-I | 19.04.16 | 15:36 | 19.04.17 | 16:16 | SPURIOUS TRIPPING | -- | LBB Operated | Information yet to be received | -- | No | No | DMTCL end LBB operated. |
| 8 | 400KV GMR-ANGUL-I | 19.04.19 | 16:59 | 19.04.17 | 17:20 | SPURIOUS TRIPPING | -- | DT received | Did not trip | -- | Yes | -- | |

| 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 |
|---|---|-----------|-----------|------------------|------------------|-------------------|------------------------------|--|--|---|------------------------------|-----------------------------|--|
| 9 | 220KV DARBHANGA-MOTIPUR-I | 24.04.17 | 21:32 | 24.04.17 | 22:16 | SPURIOUS TRIPPING | -- | DT received | Information yet to be received | -- | No | No | DMTCL end LBB operated. |
| 10 | 400 KV ALIPURDUAR - BONGAIGAON - II | 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 | 400 KV KAHALGAON-LAKHISARAI-II | 30.04.17 | 19:14 | 30.04.17 | 21:51 | SPURIOUS TRIPPING | -- | DT received | Information yet to be received | -- | No | No | Reactor protection maloperated. |
| No autorecloser operation observed in PMU data | | | | | | | | | | | | | |
| 1 | 400KV JEERAT-BAHARAMPUR | 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 | No | No | |
| 2 | 400 KV PATNA - BARH - IV | 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 | 400 KV BIHARSHARIFF - SASARAM - I | 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 | 400KV ARAMBAG-KOLAGHAT | 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 | Yes | Main-I did not pickup and A/R enabled in Main-I |
| 5 | 400 KV FARAKKA - GOKORNO - II | 19.04.17 | 22:00 | 20.04.17 | 00:04 | 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 | Yes | No | 400 kV Farakka - Gokarno - I successfully A/Reclosed at same time |
| 6 | 400 KV HEL - SUBHASGRAM - I | 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 | DT recieved from HEL |
| 7 | 400 KV ARAMBAG - NEW RANCHI | 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 | A/R diabled as OPGW work is in progress. |
| 8 | 400KV DARBHANGA-MUZAFFARPUR-II | 24.04.17 | 03:06 | 24.04.17 | 04:10 | 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 | 400 KV KODERMA-BOKARO-I | 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 unsuccessful | A/R successful at Bokaro end | No autoreclose operation observed in PMU data | No | No | Checked and found the scheme is working correctly |
| 10 | 400 KV KOLAGHAT-JEERAT | 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 | Yes | No | A/R successful at Jeerat end |