Agenda
for
48th PCC meeting

Date: 20.10.2016
Eastern Regional Power Committee
14, Golf Club Road, Tollygunge
Kolkata: 700 033

EASTERN REGIONAL POWER COMMITTEE

AGENDA FOR 48TH PROTECTION SUB-COMMITTEE MEETING TO BE HELD AT ERPC, KOLKATA ON 20.10.2016 (THURSDAY) AT 11:00 HOURS

PART – A

ITEM NO. A.1: Confirmation of minutes of 47th Protection sub-Committee Meeting held on 19th September, 2016 at ERPC, Kolkata.

The minutes of 47th Protection Sub-Committee meeting held on 19.09.16 circulated vide letter dated 07.10.16.

Members may confirm the minutes of 47th PCC meeting.

PART – B

ANALYSIS & DISCUSSION ON GRID INCIDENCES OCCURRED IN SEPTEMBER 2016

ITEM NO. B.1: Multiple trippings at IBEUL on 27-09-16

The following lines were tripped on 27-09-2016:

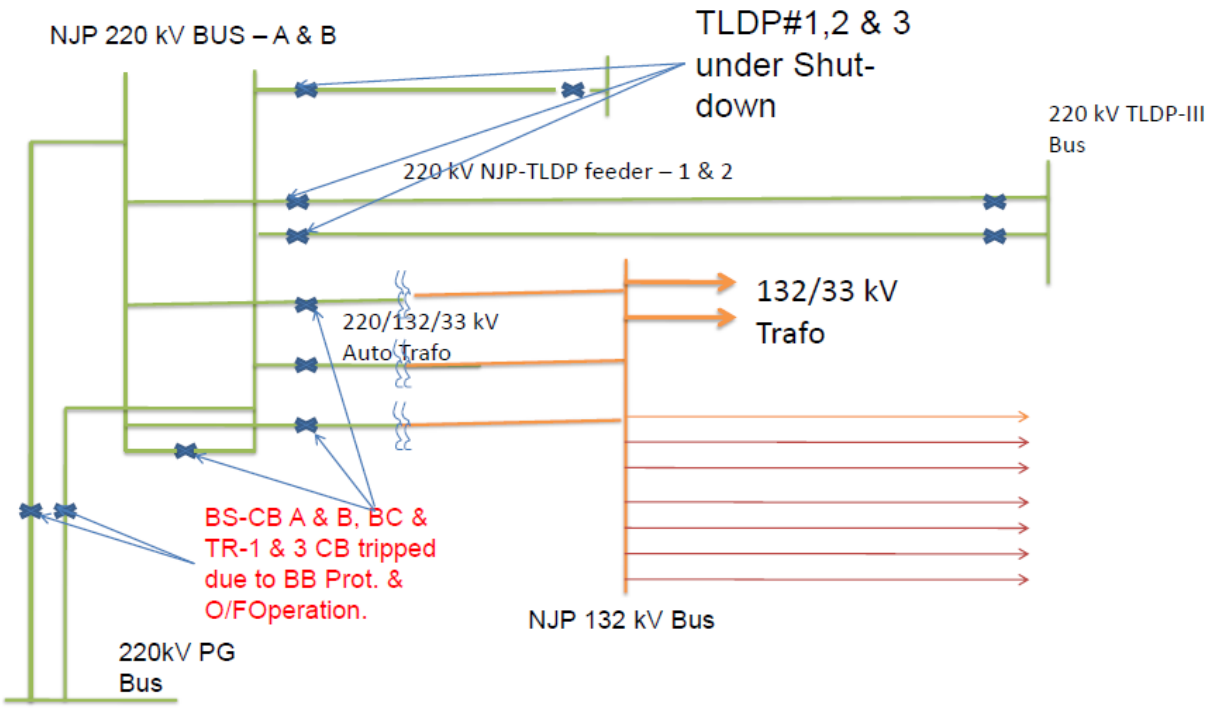
- 400 kV IBEUL Raigarh
- 400 kV IBEUL Raigarh S/C
- 400 kV IBEUL Jharsuguda S/C

Sequence of events are enclosed at **Annexure-B1.**

Powergrid and IBEUL may explain.

ITEM NO. B.2: Disturbance at 220/132 kV NJP System on 01.09.2016 at 09:40 hrs.

1. **Single line diagram:** Submitted



2. **Pre fault conditions:** Submitted

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

As 220 KV NJP – TLDP – III & IV was under shutdown, Discharge rod was connected to Transfer bus through R phase isolator dropper of 220 kV NJP – TLDP IV bay. At 09:41 hrs, partially closing R phase isolator arm of 220/132 kV ATR I caused electrical flushing and made non-fatal injury to the nearby workers. This incident resulted bus fault and tripped of all elements connected to Bus I along with B/C. Both 220 kV Bus I & II extension breaker at POWERGRID tripped for this incident. 220/132 kV ATR II was manually switched off after this incident.

Time	Name	Local end	Remote end
09:40 hrs	160 MVA 220/132/33kV Transformer-I &III	Over-Flux , 86L (HV) & 86(L) IV [OF Settings-Alarm-109%, Trip-112%] BB protection : RADSS, BZ-A trip	NA
	220 kV PGCIL(Binaguri)-NJP Bus Section CB A & B	96BSA & 96 BSB trip	NA
	220 kV Bus-Coupler	96 B1 trip	NA

4. **Remedial action taken :** Submitted

Spurious partial closing of one pole (R-ph) of 220 kV Isolator arm due to malfunction of TB Isolator associated with 160 MVA 220/132/33 kV Tr-1 caused electrical flash as reported. Reason for such malfunction of Isolator arm is to be investigated & ascertained by committee.

Analysis of PMU plots:

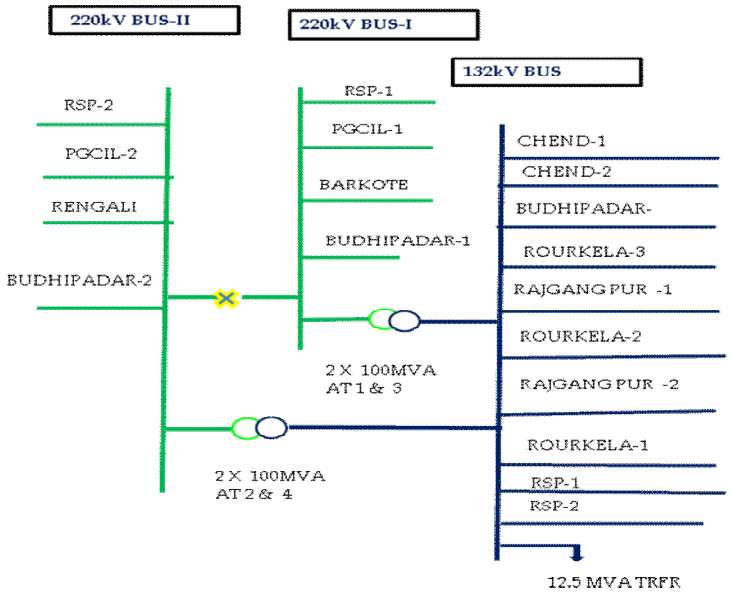
- 12 kV voltage dip observed in R phase at Binaguri PMU.
- Fault clearing time 40 ms.

Status of Reporting: Tripping report with EL received from WBSETCL on 26-09-16

WBSETCL and Powergrid may explain.

ITEM NO. B.3: Disturbance at 220kV Tarkera S/s on 22-09-16 at 15:38 hrs.

1. **Single line diagram:** Submitted



2. **Pre fault conditions:** Submitted

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

At 15:38 hrs, heavy flash was observed at 132kV PT due to partial snapping of R phase jumper connection to Potential Transformer. All 220/132kV Auto Transformers were tripped from 220kV side on operation of directional Over current Earth fault protection.

The Bus bar protection (SIEMENS 7SS52) also operated for Bus-II only. all the feeders connected to Bus – II along with B/C tripped due to operation of bus bar protection. The relay indications are as follows:

Time	Name	Local end	Remote end
15:37 hrs	220 kV Tarkera – Rourkela II	At Tarkera Bus bar protection	Did not trip at remote end
	220/132 kV ATR - II at Tarkera	At 220 kV side Bus Bar protection	At 132 kV side Master trip
	220/132 kV ATR – III & IV at Tarkera	At 220 kV side Bus Bar protection	Did not trip at 132 kV side
	220 kV Tarkera – Budhipadar –II	At Tarkera Bus bar protection	Did not trip at remote end
	220 kV Tarkera - Rengali II	At Tarkera Bus bar protection, back up B-N, E/F	R-Y, 1.36 km from Rengali
	220/132 kV ATR - I at Tarkera	At 220 kV side Bus Bar protection	At 132 kV side B phase E/F
	220 kV Tarkera - RSP – II	At Tarkera Bus bar protection	Did not trip at remote end
15:37 hrs	132kV Tarkera- Budhipadar	Non directional Over Current Earth Fault Relay (CDG-31)	
	132kV Tarkera- Rajgangpur-2	Non directional Over Current Earth Fault Relay (CDG-31)	
	132kV Tarkera- Rajgangpur-1		Directional O/C & E/F Protection (7SJ62)

4. **Disturbance record:** Submitted

5. **Remedial action taken :** Submitted

- Malopearion of the Bus bar protection (SIEMENS 7SS52) has been discussed with SIEMENS. Relay DR data has been sent to SIEMENS for necessary analysis at their end and taking remedial measures.

- Now the Bus bar protection is kept out of service.

Analysis of PMU plots: At 15:37:45 hrs 18 kV voltage dip has been observed in R, Y & B – phase voltage at Rourkela PMU data. Fault clearance time was 880 ms.

Status of Reporting: Tripping reports from OPTCL has been received on 24-09-16.

OPTCL may explain.

ITEM NO. B.4: Disturbance at 400kV Khahalgaon S/s on 28-09-16 at 06:50 hrs.

1. **Single line diagram:** Submitted (enclosed at **Annexure-B4**)

2. **Pre fault conditions:** Submitted

   400 KV Bus reactor#2 is out of service since Dec'2014.

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

At 06:50 hrs, all breakers connected to Bus – I at Kahalgaon tripped on bus differential protection due to failure of B phase CT of 400 kV Farakka – Kahalgaon – II main bay. At same time, 400 kV Kahalgaon – Farakka – III & IV tripped from Kahalgaon end on Z-IV. 400 kV Kahalgaon – Maithon – I & II tripped on overvoltage at Kahalgaon in O/V stage II. 400 kV Kahalgaon – Barh – I tripped on TEED protection. Relay indications are as follows:

Name & timing	Relay at Kahalgaon end	Relay at remote end
400 kV Kahalgaon – Farakka – IV (06:50:09.030 hrs)	Main & Tie breaker tripped on Z-IV. (Time delay setting was 350 ms but line tripped after 120 ms)	Z-II started but did not trip
400 kV Kahalgaon – Farakka – III (06:50:09.030 hrs)	Main & Tie breaker tripped on Z-IV. (Time delay setting was 350 ms but line tripped after 120 ms)	Z-II started but did not trip
400 kV Kahalgaon – Maithon – I (06:50:09.108 hrs)	Main & Tie breaker tripped on O/V stage – II (DR is yet to be received)	Information yet to be received
400 kV Kahalgaon – Farakka – II (06:50:09.108 hrs)	Main breaker tripped in differential protection of Bus I. Tie breaker tripped on O/V stage II protection of 400 kV Kahalgaon – Maithon – I (Same dia)	B-N, Z-II started at 06:50:08.918 hrs. Z-I picked up at 06:50:09.066 hrs and only B phase pole open. Later at 6:50:09.449 hrs Z-I picked up for Y-N fault and all three breakers tripped (5 kV voltage dip observed at BSF PMU at same time).
400 kV Kahalgaon – Maithon – II (06:50:09.245 hrs)	Main breaker tripped in bus differential protection of bus - I & Tie breaker tripped on O/V stage – II (DR is yet to be received)	Information yet to be received
400 kV Kahalgaon – Barh – I (06:50:09.300 hrs)	TEED Protection (Mal-operation)	Z-II started, line tripped on direct trip receipt.

4. **Disturbance record:** Submitted

5. **Remedial action taken :** Submitted

- Faulty equipments (i.e. 02 nos CTs & 02 nos set of insulator stacks of isolator) were identified & replaced with new one.
- 400 KV Kh- FKK#3 & 4 line is the property of PGCIL & maintenance involving OEM/expert service is in PGCIL scope. Matter is taken up with OEM i.e. M/s ALSTOM through PGCIL for root cause analysis of MICOM P444 operation at less time delay than set time delay for Zone#4 operation.

- Old 400 KV CTs (>25 yrs) is already under replacement plan in phased manner at NTPC Kahalgaon. 42 nos. of 400 KV CTs are already replaced.

Analysis of PMU plots:

- At Biharshariff PMU data, 70 kV voltage dip has been observed in B phase.
- Fault Clearance time was 120 ms. approximately.

Status of Reporting:

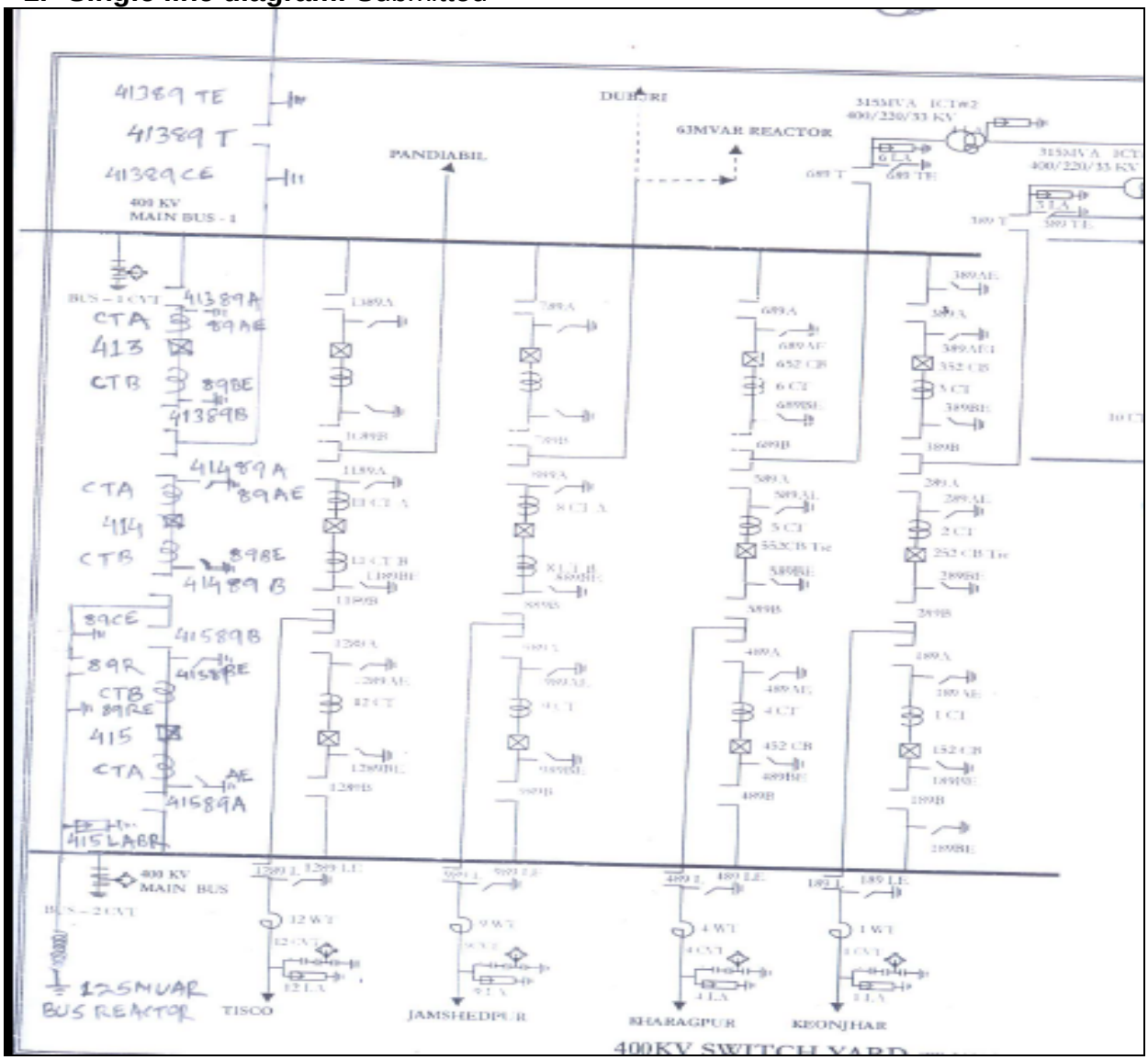
- NTPC Kahalgaon has submitted the tripping report along with DR on 02-10-16
- NTPC Farakka has submitted the tripping report along with DR along with DR on 01-10-16
- NTPC Barh has submitted the tripping report along with DR along with DR on 01-10-16

NTPC may explain the following:

- Reason for Z-IV operation of 400 kV Kahalgaon – Farakka – III & IV
- O/V protection operation of 400 kV Kahalgaon – Maithon – I & II
- TEED protection operation of 400 kV Kahalgaon – Barh – I at Kahalgaon end.

ITEM NO. B.5: Disturbance at 400 kV Baripada S/s on 28.09.16 at 10:08 hrs.

1. **Single line diagram:** Submitted



2. **Pre fault conditions:** Submitted

Bus-I	**Bus-II**
315 MVA ICT-I	Keonjhar
315 MVA ICT-II	TISCO
Pandiabili	Jamshedpur
Duburi	kharagpur

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

400 kV bus I was under shutdown due to jumpering work. So all main CBs connected to bus I were in open condition. At 10:08 hrs, bus differential protection of 400kV Bus-II at Baripada S/s operated due to mal-operation of GIS bus duct gas density monitor and tripped all main breakers connected to bus II. All the feeders and ICTs were connected only to the element in same bay through tie bay. At the same time tie bay between 400kV Baripada- Duburi S/c & 400kV Baripada- Jamshedpur S/c tripped due to DT receipt. So these two circuits tripped from Baripada end only.

Relay indications are given below:

Time (Hrs)	**Details of tripping**	**Relay at local end**	**Relay at remote end**
03:50 hrs	400kV Bus-I at Baripada	Planned shutdown	
10:08 hrs	400kV Bus-II at Baripada	Became dead after tripping all the Main CBs of lines connected to Main Bus-II due to operation of bus differential protection	
	400kV Baripada- N.Duburi S/c & 400kV Jamshedpur- Baripada S/c	**At Baripada** Tie CB tripped (both Ckt on same Dia) on operation of DT receipt	

4. **Disturbance record:** Submitted

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

Analysis of PMU plots:

- From the Talcher & Jeypore PMU plot no signature of fault has been observed.

Status of Reporting: Tripping report along with DR has been received from PGCIL on 02-10-16.

Powergrid may explain the following:

- Reason for tripping of Tie CB of 400kV Jamshedpur & N.Duburi at Baripada on operation of DT receipt.

ITEM NO. B.6: Tripping of Tenughat U # 2, Patratu U # 10 and 400/220kV, 315 MVA ICT-I , II & III at Biharshariff S/s on 02.09.16, 19:32 hrs.

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

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

3. **Detailed analysis of tripping incident:** Not Submitted

- As per information received from BSPTCL & JUSNL through telephonic conversation at 19:19 hrs, Tenughat U #2 tripped due to low drum level.

- From the SCADA data dumped at ERLDC, it seems that after tripping of Tenughat U # 2, loading on 400/220kV, 315 MVA ICT-I , II & III at Biharshariff went upto 260MW/ICT.
- Further, at 19:31 hrs, running unit of Patratu U # 10 also tripped (reason awaited).
- Thus after tripping of running units of Tenughat & Patratu, the loading on said ICTs went beyond 270 MW/ICT and it tripped instantaneously on actuation of backup overcurrent protection from 400kV side.

After tripping of all 315 MVA ICTs at Biharshariff, load at Biharshariff, Fatuah, Darbhanga and its surrounded area were being fed from 220kV Ranchi- Hatia D/c and due to this reason the said line were getting heavily overloaded. Thus to avoid the further overloading tripping of the said lines, 220kV Tenughat- Biharshariff S/c was manually opened.

Due to tripping of all 315 MVA ICTs at Biharshariff and manually opened of 220kV Tenughat-Biharshariff S/c line, load loss of approximately 690 MW occurred at Biharshariff, Fatuah, Darbhanga & its surrounded area.

Time (Hrs)	Details of tripping	Relay at local end	Relay at remote end
19:19 hrs	Tenughat U # 2	Tripped due to low drum level	
19:32 hrs	Patratu U # 10	Tripped (Reason awaited)	
	315 MVA 400/220 kV ICT I	Tripped on operation of back up overcurrent protection from 400kV side.	
	315 MVA 400/220 kV ICT II		
	315 MVA 400/220 kV ICT III		

4. **Disturbance record:** Not Submitted

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

Analysis of PMU plots:

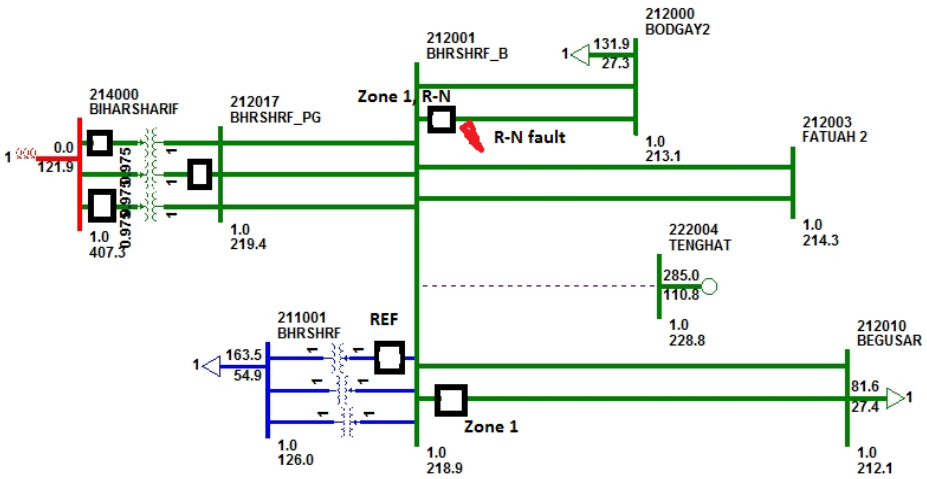
- From the Biharshariff PMU plot no signature of fault was observed.

Status of Reporting: Report from PGCIL, JUSNL & BSPTCL is yet to be received.

BSPTCL and JUSNL and Powergrid may explain.

ITEM NO. B.7: Disturbance at 400kV Biharshariff (PG) and 220 kV Biharshariff S/s (BSPTCL) on 07-09-16 at 03:59 hrs.

1. **Single line diagram:** Submitted



2. **Pre fault conditions:** Submitted

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

At 03:57 hrs, 220 KV Biharshariff – Begusarai – II tripped along with 132 kV Biharshariff – Samastipur, 400/220 kV ICT – II, III and 220/132 kV ATR - I at Biharshariff. On investigation, it was found that R phase jumper of 220 KV Biharshariff – Begusarai – II was snapped at tower location 154 (7km from Biharshariff).

Time (Hrs)	Details of tripping	Relay at local end	Relay at remote end
03:57 hrs	220 kV Biharshariff- Begusarai-II	R phase jumper snapped, 7km from Biharshariff	
	400/220 kV ICT – II at Biharshariff	Tripped from 220 kV (BSPTCL) side, 86 (Master trip relay), Did not trip at 400 kV side	
	400/220 kV ICT – III at Biharshariff	220 KV side: 86 (Master trip relay) 400 kV side: Backup OC trip, 86A/B	
	220/132 kV ATR - I at Biharshariff	REF, 86T (Master trip relay)	
	132 kV Biharshariff – Samastipur	Reason yet to be received	

4. **Disturbance record:** Submitted

5. **Remedial action taken :** Submitted

After resetting of relay 220 KV Biharsharif-Begusarai ckt-I charged at 04:35 hrs & ckt –II charged at 18:30 hrs from Biharsharif end after replacement of the damaged jumper with new one.

Analysis of PMU plots:

- At Biharshariff PMU data, 80 kV voltage dip has been observed in R-phase.
- Fault Clearance time was less than 100 ms.

Status of Reporting:

- Detail report along with DR & EL was received from BSPTCL on 17-09-16.
- Detail report with DR & EL received from PG on 26-09-16.

BSPTCL and Powergrid may explain the following:

- The reason for tripping of 400/220 kV ICT – II & III, 220/132 kV ATR - I at Biharshariff
- Tripping of 132 kV Biharshariff – Samastipur.
- In DR file for the tripping of 220 kV Biharshariff Begusarai – II, R phase E/F and R phase series fault was detected within 300 ms. BSPTCL may explain.

ITEM NO. B.8: Tripping of 220 KV Biharshariff - Begusarai D/C line on 18-09-16 at 09:28 hrs.

1. **Single line diagram:** Submitted

2. **Pre fault conditions:** Submitted

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

At 09:28 hrs, 220 KV Biharshariff - Begusarai D/C tripped on Y-B fault causing power failure at Begusarai and Darbhanga.

Time (Hrs)	Details of tripping	Relay at local end	Relay at remote end
09:28 hrs	220 kV Biharshariff- Begusarai -I	Y-B, Z-I, 35.9 km from Biharshariff, IR=0.49 KA, IB= 5.28 KA, IY=4.88 KA	SOTF, Directional O/C
	220 kV Biharshariff- Begusarai -II	Did not trip	Y-B

4. **Disturbance record:** Submitted

5. **Remedial action taken :** Submitted

- After resetting of relay 220 KV Biharsharif-Begusarai ckt-I charged at 09:40 hrs & ckt –II charged at 10:10 hrs from Begusarai end and 10:05 hrs from Biharsharif end stood ok.
- The Distance protection of the 220 KV ckt I &2 checked at GSS Biharsharif on dt 14/10/16and found ok.

Analysis of PMU plots:

- At Biharshariff PMU data, 15 kV voltage dip has been observed in Y & B phase.
- Fault Clearance time was less than 100 ms.

Status of Reporting: BSPTCL has submitted the tripping report along with DR on 26.09.16.

BSPTCL may explain the following:

- Reason for tripping of both 220 KV Biharshariff - Begusarai D/C may be explained by BSPTCL.
- Bihar SLDC may furnish amount of energy un-served and duration of disturbance.

ITEM NO. B.9: Tripping of 220 KV Biharshariff - Fatuha D/c line on 20-09-16 at 15:44 hrs.

1. **Single line diagram:** Submitted

2. **Pre fault conditions:** Submitted

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

At 15:44 hrs, R-N fault was initiated due to bursting of R-Ph CT of 220kV Patna- Fatuah S/c (idle charged from Fatuah end) at Fatuah end. The following lines tripped:

- 220kV Biharshariff- Fatuah Ckt-I tripped from Biharshariff end on zone 2
- 220kV Biharshariff- Fatuah Ckt-II tripped from Fatuah end on Z-I relay.

Time (Hrs)	Details of tripping	Relay at local end	Relay at remote end
15:44 hrs	220kV Biharshariff- Fatuah –I	**At Biharshariff** R-Ph, Zone-2, fault location 49.86 km ,fault current	**At Fatuah** Did Not Trip

		IR=3.083 kA , IY=848.3A,IB=992.7A . Relay Trip Time =79.9ms,fault duration =325 ms	
	220kV Biharshariff- Fatuah –II	**At Biharshariff** Did Not Trip	**At Fatuah** R-N , ZONE-1, fault location 0.5389 km, fault current IR=2.907kA,IY=584.80A, IB=960.60A, Relay Trip Time =80.01ms,fault duration =50 ms

4. **Disturbance record:** Submitted

5. **Remedial action taken :** Submitted

   - The Damaged R-phase CT of 220 KV Fatuha -PG (patna) was replaced ,
   - The reverse polarity of the 220 kv CT in 220 kv Biharsharif ckt II at GSS Fatuha was corrected and the Bay was taken into service at 14:30 Hrs on dated 21/09/2016.

Analysis of PMU plots:

- From the Biharshariff PMU plot 25kV voltage dip was observed in R-Ph at 15:44:46 hrs.
- Fault clearance time was 350 ms.

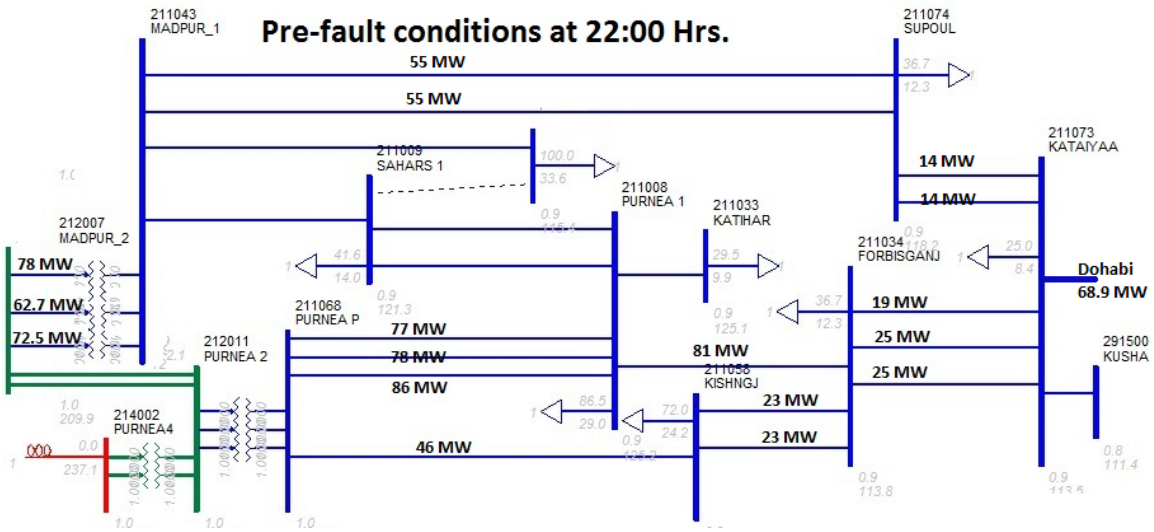
Status of Reporting: BSPTCL has submitted the tripping report along with DR on 26.09.16.

BSPTCL may explain the following:

- 220kV Biharshariff- Fatuah ckt-II at Biharshariff end should clear the fault on Zone-II.
- As per relay setting submitted by BSPTCL, Zone-IV time setting at both Biharshariff & Fatuah S/s is 1200 ms. However, as per CEA standard protection philosophy it should be 500 ms. Thus BSPTCL may check and apply the setting as per CEA standards.

ITEM NO. B.10: Disturbance at 132 kV Purnea S/s on 12-09-16 at 22:40 hrs.

1. **Single line diagram:** Submitted



2. **Pre fault conditions:** Submitted

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

At 22:40 Hrs, 132 kV Purnea (PG) – Purnea (BSPTCL) – III tripped due to snapping of Y phase jumper near gantry at BSPTCL s/s. At same time, 132 kV Purnea (PG) – Kishangunj – Forbisgunj and 132 kV Purnea (PG) – Purnea (BSPTCL) – I & II tripped from Purnea (PG) end on O/C (as per BSPTCL report). After tripping of 132 kV Purnea (PG) – Purnea (BSPTCL) T/C & 132 kV Purnea (PG) – Kishangunj – Forbisgunj, load at adjacent area and Nepal was catered through 220 KV Purnea-Madhepura – I & II which tripped from Purnea end on O/C. Antecedent flow was 150 MW per circuit.

Time (Hrs)	Details of tripping	Relay at local end	Relay at remote end
22:40 Hrs	132 kV Purnea (PG) – Purnea (BSPTCL) – III	Yet to be received	E/F
	132 kV Purnea (PG) Purnea (BSPTCL) I & II	O/C at PG end	Did not trip
	132 kV Purnea (PG) – Kishangunj – Forbisgunj	O/C at PG end	Did not trip
	220 KV Purnea-Madhepura – I & II	O/C at Purnea end	Did not trip

4. **Disturbance record:** Not Submitted

5. **Remedial action taken :** Submitted

- Snapped Y-Phase jumper near gantry of 132 KV Purnea(PG)- Purnea bay was replaced and jumper connection of other phases was also tightened. System was normalised at 02:32 Hrs on 13.09.2016.

Analysis of PMU plots:

- 17.5 kV voltage dip observed in Y phase at Binaguri PMU. Fault clearing time is 350 ms approximately.

Status of Reporting:

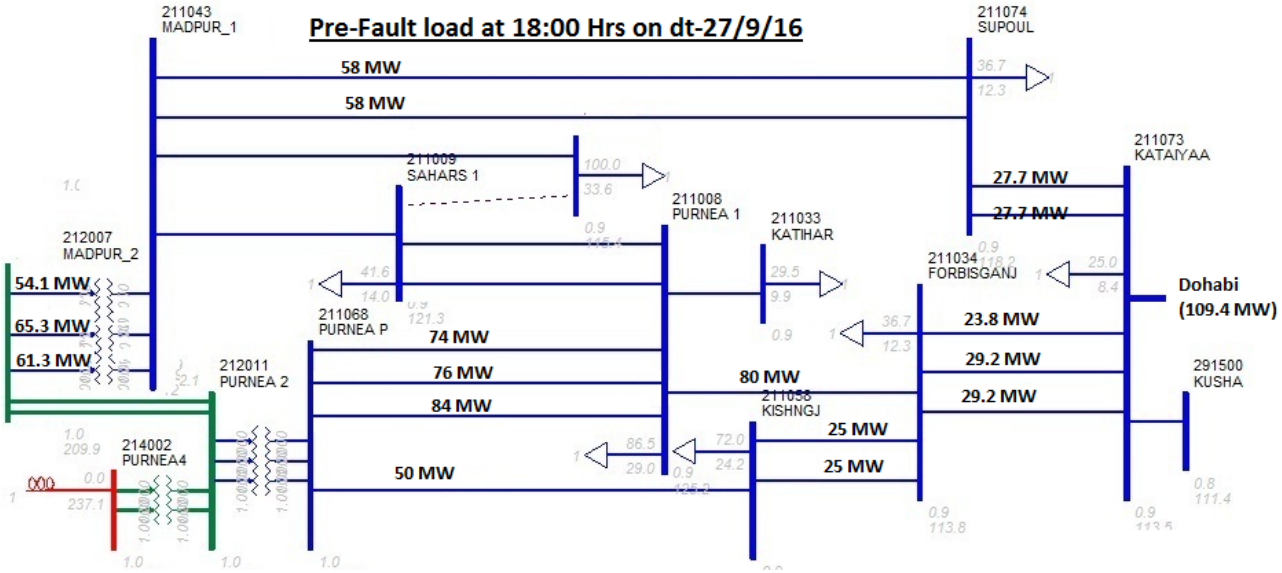
- BSPTCL has submitted the tripping report on 17-09-16.
- Tripping report is to be received from PG.

BSPTCL and Powergrid may explain the following:

- POWERGRID may explain reason for tripping 132 kV Purnea (PG) - Purnea (BSPTCL) - I & II, 132 kV Purnea (PG) – Kishangunj – Forbisgunj from Purnea (PG) end.
- As per Binaguri PMU data, fault clearance time was approx. 350 ms (Z-II timing). BSPTCL & POWERGRID may investigate delayed clearance of fault as any fault at 132 level should be cleared within 160 ms. as per Clause 3(e) of CEA Grid Standards 2010.
- Bihar SLDC may submit the amount of energy un-served due to this incident.

ITEM NO. B.11: Disturbance at 132kV Purnea and 220kV Madhepura S/s on 27-09-16 at 19:00 hrs.

1. **Single line diagram:** Submitted



2. **Pre fault conditions:** Submitted

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

- At 18:53 Hrs,132 KV Purnea-Forbesganj line tripped from Purnea(B) end on distance protection and from Forbesganj end on O/C relay.
- At the same time 132 KV Purnea(PG)-Kishanganj-Forbesganj T/L tripped from Purnea(PG) end on zone 2, distance protection relay.
- At 19:00 Hrs. 3X100 MVA 220/132 KV Transformers tripped on overload at GSS Madhepura

Sl.No.	Name of Bay / Line	Local End Relay Indications	Remote End Relay Indications
1.	132 KV Purnea(B)-Fobesganj T/L	Zone-1, 18.44 KM	R-phase, O/C, 67/67N, 86
2.	132 KV Purnea(PG)-Kishanganj-Forbisgank Ckt T/Ls	R-Ph, zone 2, distance=203.4 Km.	No tripping
3.	3X100 MVA, 200/132 KV ATRs at GSS Madhepura	O/C relay in all three 200/132 KV ATRs at GSS Madhepura	
4.	132 KV Forbesganj-Kataiya T/Ls	No Tripping	No Tripping
5.	132 KV Madhepura-Supaul T/L-1	O/C	No tripping
6.	132 KV Madhepura-Supaul T/L-2	O/C	No Tripping

4. **Disturbance record:** Not Submitted

5. **Remedial action taken :** Submitted

- The problem of snapped jumper and conductor and broken insulator disc was attended and rectified.
- Overcurrent relay settings at GSS Kataiya ,GSS Supaul and GSS Madhepura were checked and corrected.

Status of Reporting: BSPTCL has submitted the tripping report

BSPTCL and Powergrid may explain.

ITEM NO. B.12: Continuous tripping in 400kV Binaguri-Bongaigaon and 220kV CHPC-Birpara sections.

Repeated tripping of 400kV Binaguri-Bongaigaon sections and 220kV CHPC-Birpara-I & II have been observed in the recent past. The details of trippings are indicated at the **Annexure-B12**. Powergrid/ENCIL/Bhutan may confirm the details of preventive maintenance and other necessary actions being taken to prevent such trippings.

Powergrid/ENCIL/Bhutan may explain.

PART- C:: OTHER ITEMS

ITEM NO. C.1: Tripping incidences in the month of September, 2016

Other tripping incidences occurred in the month of September 2016 which needs explanation from constituents of either of the end is given at **Annexure- C1.**

Members may discuss.

ITEM NO. C.2: Protection Committee visit to BSPTCL and JUSNL Sub-stations

In view of repeated uncoordinated trippings in BSPTCL and JUSNL systems, 31st TCC/ERPC formed a committee of following protection engineers to review the situation:

- Shri Sabyasachi Roy, ACE, WBSETCL,
- Shri L Nayak, GM, OPTCL
- Shri Jayanta Datta, SE, DVC
- Shri Surajit Bannerjee Asst GM, ERLDC,
- Shri Jiten Das, Asst GM, PGCIL
- Shri S. B. Prasad, ESE, BSPTCL
- Shri Vidyasagar Singh, ESE, JUSNL

PCC decided that the protection committee members will carry out the site visit of JUSNL substations during 11th to 14th May, 2016 to review the protection system in respect of Chandil, Ramchandrapur, Adityapur and adjoining substations.

In 43rd PCC, it was informed that the Protection team has visited 132/33 kV Ramchandrapur, Adityapur & 220/132 kV Chandil S/s of JUSNL from 11th to 12th May, 2016.

A special meeting was held on 08.06.16 to discuss the observations of the site visit of Chandil, Ramchandrapur, Adityapur & adjoining substations by ERPC team. In the meeting it was emphasized that the distance protection along with the back-up protection of JUSNL system (comprising of 220kV Ramchandrapur, Chandil & Hatia-II and 132 kV Adityapur & Hatia-I) needs to be reviewed for proper protection co-ordination. It was decided that the Protection team will carry out the setting calculations for all the 220 kV & 132 kV lines along with the 220/132 kV ICTs based on the data provided by JUSNL which shall be implemented by JUSNL.

In 33rd TCC, it was advised JUSNL to comply the recommendations given by the ERPC protection team.

Thereafter, a special meeting was held in ERPC on 08.07.16 to review the protection settings of all the 220 kV & 132 kV lines along with the 220/132 kV ICTs of 220/132kV Ramchandrapur, Chandil & Hatia-II and 132 kV Adityapur & Hatia-I substations of JUSNL. Representatives of DVC, WBSETCL and ERLDC as members of ERPC Protection team attended the meeting.

After detail study of the data as submitted by JUSNL, it was observed that there was some missing data/mismatch in the information. Therefore, it was felt that the complete details of all Lines (i.e. Line length, Single or double circuit) originating from the following Sub-stations Bus along with Transformer data (MVA, % Z, Voltage Ratio) are required for finalizing the protection settings for all the 220 kV & 132 kV lines:

1. 220KV Ramchandrapur
2. 132KV Ramchandrapur
3. 132KV Tamar
4. 132KV Golmuri
5. 132KV Rajkharswan
6. 220KV Chandil
7. 132KV Chandil
8. 132KV Adityapur
9. 220KV PTPS
10. 132KV PTPS
11. 132KV Lohardaga
12. 132KV Namkum
13. 132KV HEC
14. 132KV Kanke
15. 132KV Kamdara
16. 132KV Hatia I
17. 132KV Hatia 2
18. 220KV Hatia 2
19. 132KV Sikidri

JUSNL has submitted the desired information and the same has been circulated to protection team.

Protection settings of all the 220 kV & 132 kV lines along with the 220/132 kV ICTs of 220/132kV Ramchandrapur, Chandil & Hatia-II and 132 kV Adityapur & Hatia-I substations of JUSNL were finalized in a special meeting on 28.07.2016. JUSNL was advised to implement the settings.

In 46th PCC, JUSNL informed that they have incorporated the recommended settings at 220 kV Chandil, Hatia-I and 132 kV Hatia-II sub-stations. 220 kV Ramchandrapur & 132 kV Adityapur Sub-stations will be implemented by 1st week of September, 2016.

PCC advised JUSNL to submit a report on improvements observed in protection system performance after implementation of the recommended settings.

JUSNL agreed.

Information received from JUSNL is enclosed at **Annexure-C2**

JUSNL may update.

ITEM NO. C.3: PROTECTION PHILOSOPHY OF EASTERN REGION

The Protection Philosophy finalized in special PCC meeting held on 20th July, 2015 is as given below:

Sl. No.	Zone	Direction	Protected Line Reach Settings	Time Settings (in Seconds)	Remarks
1	Zone-1	Forward	80%	Instantaneous (0)	As per CEA
2a	Zone-2	Forward	For single ckt- 120 % of the protected line	0.5 to 0.6 - if Z2 reach overreaches the 50% of the shortest line ; 0.35- otherwise	As per CEA
			For double ckt- 150 % of the protected line		As per CEA
2b	Zone-2 (for 220 kV and below voltage Transmission lines of utilities)	Forward	120 % of the protected line, or 100% of the protected line + 50% of the adjacent shortest line	0.35	As per CEA with minor changes

3	Zone-3	Forward	120 % of the (Protected line + Next longest line)	0.8 - 1.0	As per CEA
4	Zone-4	Reverse	10%- for long lines (for line length of 100 km and above) 20%- for shot lines (for line length of less than 100 km)	0.5	As per CEA

Note:

1) **Zone-2:- Z2 Reach should not encroach the next lower voltage level.**
2) **Zone-3:- If Z3 reach encroaches in next voltage level (after considering "in-feed"), then Z3 time must be coordinated with the fault clearing time of remote end transformer.**
3) **Zone-4:- If utility uses carrier blocking scheme, then the Z4 reach may be increased as per the requirement. It should cover the LBB of local bus bar and should be coordinated with Z2 time of the all other lines.**
4) **The above settings are recommended primarily (exclusively) for uncompensated lines.**

All the constituents agreed on the principles read with notes as above.

Till date DVC, WBSETCL, JUSNL, OPTCL, Powergrid (ER-I, ER-II & Odisha-Projects), NTPC, BSPTCL, NHPC, Vedanta and GMR had submitted the zone settings.

PCC advised all the other constituents to implement the revised zone philosophy and submit the settings to ERPC at the earliest.

JITPL, MPL and Adhunik may submit the revised zone settings data at the earliest.

ITEM NO. C.4: 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	37	68.52
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

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

Members may update.

2. Schedule for 2nd Third Party Protection Audit:

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

1) Jeerat (PG) Completed on 15th July 2015
2) Subashgram (PG) Completed on 16th July 2015
3) Kolaghat TPS (WBPDCL)- Completed on 7th August 2015
4) Kharagpur (WBSETCL) 400/220kV - Completed on 7th August 2015

5) Bidhannagar (WBSETCL) 400 &220kV Completed on 8th September, 2015
6) Durgapur (PG) 400kV S/s Completed on 10th September, 2015
7) DSTPS(DVC) 400/220kV Completed on 9th September, 2015
8) Mejia (DVC) TPS 400/220kV Completed on 11th September, 2015
9) 400/220/132kV Mendhasal (OPTCL) Completed on 2nd November, 2015
10) 400/220kV Talcher STPS (NTPC) Completed on 3rd November, 2015
11) 765/400kV Angul (PG) Completed on 4th November, 2015
12) 400kV JITPL Completed on 5th November, 2015
13) 400kV GMR Completed on 5th November, 2015
14) 400kV Malda (PG) Completed on 23rd February, 2016
15) 400kV Farakka (NTPC) Completed on 24th February, 2016
16) 400kV Behrampur(PG) Completed on 25th February, 2016
17) 400kV Sagardighi (WBPDCL) Completed on 25th February, 2016
18) 400kV Bakreswar (WBPDCL) Completed on 26th February, 2016

Nomination for the audit has been received from DVC, WBSETCL and ERLDC.

Schedule for the audit is given below:

Date of Audit	Substations
01-11-2016	765 kV GAYA
02-11-2016 to 04-11-2016	400kV BIHARSHARIFF(PG) & 220KV BIHARSHARIFF(B) **UFR Testing** 132/33 KV Bari Pahari (Bihar Sharif), 132/33 KV Nalanda and 132/33 KV Rajgir

Powergrid requested to nominate the member and coordinate.

ITEM NO. C.5: 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. Subsequently, the LOA was given to PRDC and the first implementation meeting was held on 12.04.2016.

Operational load flow requisite data format is available in ERPC website. All the constituents are requested to submit the filled formats at the earliest and co-operate for smooth implementation of the project in time bound manner.

In last PCC, all the constituents were advised to submit the filled formats at the earliest.

A hands on training program was held from 05/09/2016 to 09/09/2016 at ERPC Kolkata.

PRDC updated the latest status of the implementation of the project and informed the following:

- Data collection for Odisha including IPPs has been completed.
- Data collection for JUSNL and DVC (located at Jharkhand) is going on and around 40 sub-stations have been completed.
- Data collection for DVC (located in West Bengal) has also been started.
- Data collection for West Bengal, WBPDCL, DPL and CESC will be started after Puja.

PCC requested all the respective members to extend their supports for data collection of their sub-stations.

Members may note.

PART- D

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 D.1 Disturbance at 220 kV Sasaram S/s on 28-08-16 at 10:38 hrs & 11:10 hrs.

1. **Single line diagram:** Submitted.

2. **Pre fault conditions:** Submitted

Pre Fault data on 28.8.16 at 10:00 hrs in Pusauli GSS:

Voltage of 132 KV Kudra –Pusauli (PG)	134.4 KV
Load on 220 Pusauli (PG)- Pusauli	125.2 MW
Load on 132 KV Kudra –Pusauli (PG)	55.1 MW

Pre Fault data on 28.8.16 at 11:00 hrs in Pusauli GSS:

Load on 220 KV ARA (PG)-pusauli	9.7 MW
Load on 132 KV Kudra –Pusauli (PG)	6.1 MW

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

At 10:38 hrs, 220 kV Sasaram- Nandokhar S/C along with 220/132 kV ATRs at Nandokhar tripped due to Y-N fault in 132 kV Kudra – Nadokhar S/C.

In order to restore supply to Khurda, 132 kV Kudra – Nadokhar S/C was charged at 11:10 hrs. At the same time, 220 kV Arrah –Nadokhar tripped from Arrah end with relay indication Y-N fault with distance of 113 km from Arrah(PG) end and fault current of 0.9 kA. On investigation, it was found there was a clearance problem between 132 kV Kudra – Nadokhar S/C and 33 kV feeders of 132/33 kV Khurda S/S.

4. **Relay indications:** Submitted

Time (Hrs)	**Details of tripping**	**Relay at local end**	**Relay at remote end**
10:38 hrs	132 kV Nandokhar - Kudra S/C	Y-N, F/C 2.76 KA	Yet to be received
	220 kV Sasaram- Nandokhar S/C	Y-N, Z-III, 92.76 km from Sasram, F/C 1.76 kA	Did not trip
	150 MVA, 220/132 kV ATR-II at Nadokhar	HV- Over-current , Earth fault LV- Over-current earth fault	
11:10 hrs	220 kV Arrah- Nandokhar S/C	Tripped	Earth Fault

5. **Disturbance record:** Sequence of events submitted

6. **Remedial action taken:** Submitted

During patrolling it was found that clearance between Y phase conductor of 132 Kv Nadokhar -

Kudra Transmission line and 33 KV Kudra –Chenari line was not sufficient.

Clearance between Y phase conductor of 132 Kv Nadokhar -Kudra Transmission line and 33 KV Kudra –Chenari line was increased. After rectification, the line was Charged.

Analysis of PMU plots:

At 10:38 hrs

- 30 kV voltage dip in Y phase is observed at 10:38:16.700 hrs. 7 kV voltage dip in R phase is observed at 10:38:18.700 hrs.
- Fault clearing time is 1500 ms.

At 11:10 hrs

- 25 kV voltage dip in Y phase is observed at 11:10:33.700 hrs. 25 kV voltage dip in R phase is observed at 11:10:34.400 hrs.
- Fault clearing time is 900 ms.

Status of Reporting: BSPTCL has submitted the tripping report on 30-08-16.

In 47th PCC, BSPTCL informed that –

- *The 132 kV Sasaram- Nadokhar was made T-connection at Kudra Substation.*
- *There was a clearance problem between 132 kV Kudra – Nadokhar S/C and 33 kV Kudra – Chenari line of 132/33 kV Khurda S/S..*
- *The distance protection at Nadokhar end did not pick up the fault.*
- *Finally the 132 kV Kudra-Nadokhar line tripped in E/F at Nadokhar end as the earth fault setting is non-directional with definite time of 500 ms.*
- *150 MVA, 220/132 kV ATR-II at Nadokhar also tripped on E/F.*

After detailed discussion PCC advised the following—

- *Any transmission line of 132 kV and above voltage level should not be made T-connection without any prior intimation to ERLDC/ERPC. BSPTCL should remove the T-connection of 132 kV Sasaram- Nadokhar at Kudra Substation at the earliest.*
- *The distance protection settings of 132 kV Sasaram- Nadokhar line need to be reviewed at both the end for the T-Connection of the line at Kudra S/s.*
- *BSPTCL was advised to review the E/F settings of lines and recommended to adopt directional feature with IDMT characteristics.*
- *BSPTCL was also advised to check the CB opening timings at Nadokhar end.*

BSPTCL may update.

Item No D.2 Disturbance at 220 kV Khagul (BSPTCL) S/s on 30-08-16 at 19:18 hrs

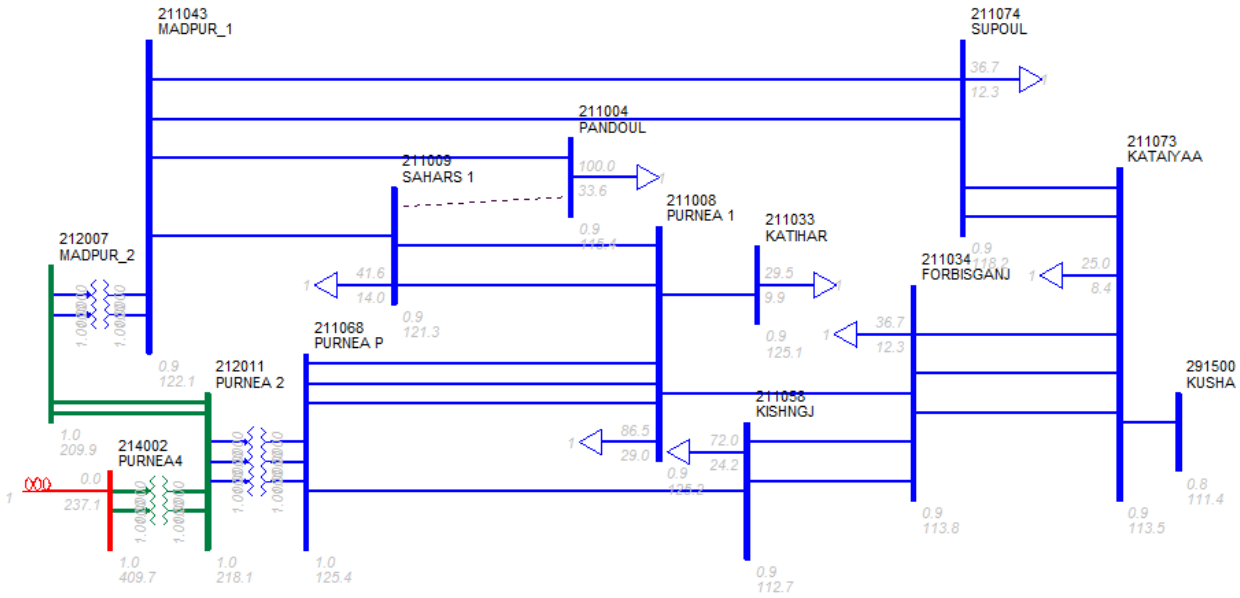
In 47th PCC, BSPTCL was advised the following—

- *The reverse zone protection may be implemented for all the 220 kV and 132 kV lines as per the Protection Philosophy of ER (In SEL311 the Z3 (reverse) may be used for Z4-Reverse zone protection & Z4 (forward) may be used for Z3 zone protection).*
- *To review the E/F settings of all 220 kV and 132 kV lines with recommendations to adopt directional feature with IDMT characteristics.*

BSPTCL may update.

Item No D.3 Multiple elements tripping at 132kV Purnea (PG) and 132kV Purnea (BSPTCL) system on 14-08-16 at 12:32 hrs.

At 12:32 hrs, 132 kV Purnea (PG) - Kishangunj – Forbisgunj line tripped from Purnea end on zone 2 and 132 kV Purnea (BSPTCL) - Forbisgunj line tripped from Purnea(B) end on zone 2. Both lines did not trip from remote end.



Relay indications:

Time (Hrs)	Details of tripping	Relay at local end	Relay at remote end
12:32	132 kV Purnea (PG) - Kishangunj - Forbisgunj	Z-II, 146.8 km, IA=1.045KA, IB=779.5A, IC=270.7A	Did not trip from Forbisgunj
	132 kV Purnea (BSPTCL) - Forbisgunj	Z-II, 88.49 KM, IA-339.7A, IB-601.7A, IC-279. 6A, O/C - B phase , E/F	Did not trip from Forbisgunj

Status of Reporting:

- BSPTCL has submitted the tripping report on 30-08-16.

Analysis of PMU plots:

- 4 kV voltage dip observed in R & Y phase at Binaguri PMU. Fault clearing time 2000 ms.

BSPTCL and Powergrid may explain the following:

- The reason for tripping of 132 kV Purnea (PG) - Kishangunj – Forbisgunj & 132 kV Purnea (BSPTCL) – Forbisgunj
- The reason for not-tripping of both the circuits from Forbisgunj end.
- The reason for delayed fault clearing, as per Binaguri PMU data, fault clearance time was approx. 2000 ms.

In 47th PCC, BSPTCL informed that 132 kV Purnea (PG) - Kishangunj – Forbisgunj & 132 kV Purnea (BSPTCL) – Forbisgunj lines were tripped on transient fault.

BSPTCL failed to explain the exact cause of disturbance in the meeting.

The following points are still not cleared from the report and needs explanation from BSPTCL:

- *The reason for non-tripping of both the circuits from Forbisgunj end.*
- *The reason for delayed fault clearing, as per Binaguri PMU data, fault clearance time was approx. 2000 ms.*

BSPTCL may update.

Item No D.4 Tripping of 132kV BTPS-Bighati line-1 and subsequent tripping of BTPS Unit #1, 2, 4 & 5 at 11:05 hrs on 01.09.2016

WBPDCL vide letter dated 02.09.2016 informed that at 11:05 hrs on 01.09.2016, 132kV BTPS-Bighati line-1 tripped due to snapping of B-ph conductor at 5.04 km (tower location 73 & 74) from Bighati end.

Bighati end tripped on zone 1 protection but BTPS end tripped on zone 5 after 1005 ms.

Due to delayed fault clearance from BTPS end, all the running units (Unit #1, 2, 4 & 5) of BTPS tripped.

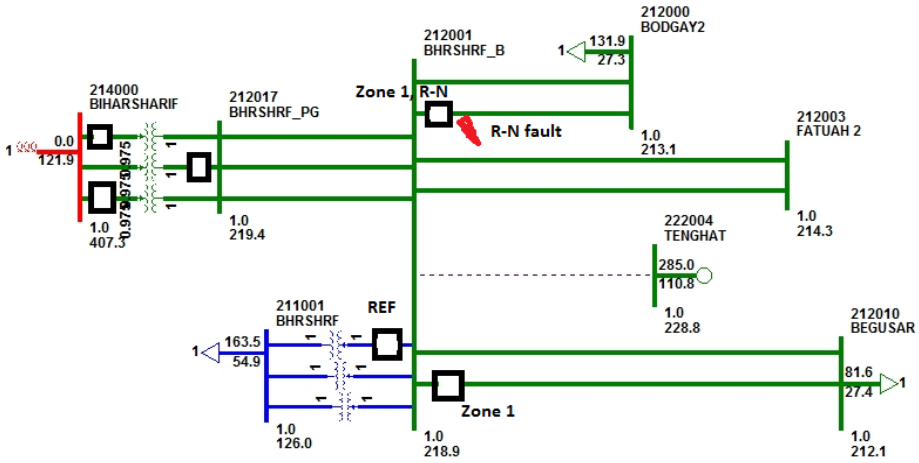
WBPDCL requested for reviewing of the protection setting for proper relay coordination.

In 47th PCC, PCC advised WBSETCL and WBPDCL to review the relay settings bilaterally with intimation to ERPC/ERLDC.

WBSETCL and WBPDCL may update.

Item No D.5 Total Power failure at 220/132kV Biharsharif S/s of BSPTCL system on 26-06-16 at 07:28 hrs.

1. **Single line diagram:**



2. **Pre fault conditions:** Submitted

Name of feeder	Power flow in MW	Name of feeder	Power flow in MW
220KV ICT1	170	132KV Baripahari ckt 1	30
220KV ICT2	170	132KV Baripahari ckt 2	30
220KV ICT3	170	132KV Hathidah ckt 1	00
220KV FATHUA CKT 1	110	132KV Hathidah ckt 2	00

220KV FATHUA CKT 2	110	132KV L28(Nalanda)	20
220KV Begusarai ckt 1	70	132KV L29(Rajgir)	20
220KV Begusarai ckt 2	70	132KV Nawada	35
220KV Bodhgaya ckt 1	00	132KV Ekangarsarai	20
220KV Bodhgaya ckt 2	00	132KV Sheikhpura	00
150MVA Tr no 1	48		
150MVA Tr no 2	48		
150MVA Tr no 3	48		

3. Tripping incident details:

At 07:28 hrs, R phase jumper of wave trap of 220 kV Biharshariff- Bodhgaya-II snapped at Biharshariff end and 220 kV Biharshariff- Bodhgaya-II tripped on zone 1 from Biharshariff end. Simultaneously the following elements tripped:

- 400/220 kV 315 MVA ICT - II at Biharshariff (PG) on back up O/C, R-N from 400 kV side.
- 400/220 kV 315 MVA ICT – III tripped from 220 kV side
- After tripping of ICT II & III, 400/220 kV ICT I at Biharshariff tripped on overload from 400 kV side.
- 220kV Biharsharif-Begusarai ckt-ll tripped from Biharshariff end on zone 1
- 150 MVA, 220/132kV ATR-I at 220 kV Biharshariff (Bihar) S/s on REF protection

At the time of incident, 220 kV Tenughat Biharshariff was not in service due to tower collapse. So, 220/132 kV Biharshariff (BSPTCL) S/S became after tripping of ICTs and power failure occurred at Biharshariff, Begusarai and Fatua.

4. Relay indications:

Time (Hrs)	Details of tripping	Relay at local end	Relay at remote end
07:28 hrs	220 kV Biharshariff- Bodhgaya-II	Micom P442/(R-N fault) Distance relay, Zone 01	NA
	220 kV Biharshariff- Begusarai-II	Siemens 7SA52,Zone-1	NA
	315 MVA 400/220 kV ICT II	Back up O/C protection in R-Phase from 400 kV side	
	315 MVA 400/220 kV ICT III	Tripped from 220 kV side	
	315 MVA 400/220 kV ICT I	Tripped on Overload at 400 kV side	

Analysis of PMU plots:

- From the Biharshariff PMU plot 80 kV voltage dip has been observed in R-Ph at 07:28 hrs
- Fault Clearance time was less than 100 ms.

Powergrid and BSPTCL may explain the following:

- BSPTCL may furnish the tripping details of 220 kV Biharshariff- Bodhgaya-II at Bodhgaya end.
- BSPTCL may explain the tripping of 220 kV Biharshariff- Begusarai-II
- BSPTCL explain the tripping of 150 MVA, 220/132kV ATR at 220 kV Biharshariff (Bihar) S/s.
- Powergrid may explain the tripping of 400/220 kV ICT I & II on backup O/C protection as the fault was cleared within 100 msec, (as per PMU data).
- Bihar SLDC may furnish amount of energy un-served and duration of disturbance.

In 45th PCC, BSPTCL explained the disturbance as follows:

- *There was a fault in 220 kV Biharshariff- Bodhgaya-II near to 220kV Biharshariff S/s and the line tripped from Biharshariff end on Zone 1 but did not trip from Bodhgaya end.*
- *220 kV Biharshariff- Bodhgaya line-I tripped from Bodhgaya end on high set O/C protection.*

BSPTCL failed to explain the following:

- *Tripping of 315 MVA ICT-II from 220kV side*
- *Tripping of 150 MVA, 220/132kV ATR-I from 220kV side*
- *Tripping of 220 kV Biharshariff- Begusarai-II from Biharshariff end on zone 1.*

PCC could not able to conclude the tripping incidence and advised BSPTCL to submit a detailed report within a week.

Thereafter BSPTCL submitted a presentation and DR of Begusarai end.

In 46th PCC, BSPTCL failed to explain the cause of unwanted tripping of 150 MVA, 220/132kV ATR-I from 220kV side on REF protection and 220 kV Biharshariff- Begusarai-II from Biharshariff end on zone 1.

PCC advised BSPTCL to submit the schematic diagram and other connectivity details of REF protection of 150 MVA, 220/132kV ATR-I.

PCC also advised to submit the softcopy of DR files of 220 kV Biharshariff- Begusarai line tripping.

BSPTCL may explain.

Item No D.6 Total power interruption in S. Orissa system on 15-04-16 at 12:17 hrs – 12:23 hrs.

At 12:17 hrs, 400KV Indravati - Rengali S/c line tripped on transient SLG (i.e. C-N) fault. Auto reclose operation was successful at Indravati end but unsuccessful at Rengali end. After few millisecond, direct trip has been received from Rengali end due to over voltage at Rengali and the line tripped from Indravati end also.

Thereafter, the following elements were tripped:

- 400KV Jeypore-Bolangir line (tripped on high voltage from Jeypore)
- 400KV Indravati-Jeypore line (tripped on high voltage from Jeypore)
- 220/132kV ATR-I,& II at Jayanagar (tripped on over flux)
- 220/132kV ATR-I,& II at Bhanjanagar (tripped on over flux)
- Running units #2& 3 of U.Kolab (tripped on over flux)
- Running unit #5 of Balimela

The bus voltage at Jeypore became zero and 400KV Jeypore-Gajuwaka D/C line was hand tripped from Gajuwaka end.

Thus after tripping of above 400kV lines along with 220/132kV ATRs at Jayanagar & Bhanjanagar, there were no other path left to feed the load at South Orissa system mainly at Theruvali, Bhanjanagar, Narendrapur area. Therefore, flow became zero on all the 220kV lines and bus became dead at Jeypore, Indravati, Jayanagar, Theruvali, and Bhanjanagar & Narendrapur S/s.

Due to tripping of above mentioned lines and units approx. 550 MW load loss and 60 MW generation loss (running units of Balimela & U.Kolab) occurred in south Orissa system mainly at Bhanjanagar, Theruvali, Narendrapur and its surrounded area.

In 43rd PCC, Powergrid explained that--

- At 12:17 hrs, 400KV Indravati - Rengali S/c line tripped on transient SLG (i.e. C-N) fault.
- Auto reclose operation was successful at Indravati end but unsuccessful at Rengali end due to over voltage at Rengali.
- Hence, after few millisecond, the line tripped from Indravati end also on receipt of direct trip from Rengali end.
- After the incident there was oscillations in the system and huge over voltage was observed and the following elements were tripped:

1) 400KV Jeypore-Bolangir line (tripped on high voltage from Jeypore)
2) 400KV Indravati-Jeypore line (tripped on high voltage from Jeypore)
3) 220/132kV ATR-I,& II at Jayanagar (tripped on over flux)
4) 220/132kV ATR-I,& II at Bhanjanagar (tripped on over flux)
5) Running units #2& 3 of U.Kolab (tripped on over flux)
6) Running unit #5 of Balimela

PCC felt that similar incident was happened on 10-03-16 at 12:24 hrs to 12:31 hrs and severe oscillations, high voltage were observed in south odisha system during the disturbance.

The details from HVDC Gajuwaka end are also not available for detailed analysis of the disturbance.

PCC advised Powergrid to carry out the following and submit a detailed report:

- Check the reason for high voltage at 400kV Rengali end during auto reclose operation in 400kV Indravati-Rengali line
- Collect the details of all the events from HVDC Gajuwaka end during the disturbance
- Detailed analysis for the reason of high voltage at Jeypore and adjoining areas.& also for the oscillations observed in the system.

Powergrid agreed.

PCC also felt that the PDO conditions of HVDC, Gajuwaka needs to be reviewed after detail study of the S. Odisha system.

In 46th PCC, Powergrid informed that study is in progress.

Powergrid submitted a report which is enclosed at ***Annexure- D6****.*

Members may note.

Item No D.7 Frequent Blackouts at Kanti TPS

On 7th April, 2016, total station power failure (Blackout) incident has occurred at Kanti TPS. There was some fault at 220KV Gopalganj side from Kanti TPS Switchyard and 220kV Muzaffarpur-Kanti D/C line tripped on Zone 3 before fault was cleared from Kanti TPS end. This had resulted in total power failure at Kanti TPS leading to Emergency situation with hot turbine coasting down without normal lub oil supply.

A special meeting was convened at ERPC, Kolkata on 18-04-2016 and the following decisions were taken:

a) As a temporary measure, zone 1 and zone 2 time setting of all 220kV and 132kV lines at Kanti TPS end should be changed to instantaneous and zone 3 time setting as 200ms in order to clear the downstream faults from Kanti TPS end.
b) Powergrid was advised to change the zone 3 time settings at Muzaffarpur (PG) end as per protection philosophy of ERPC.

c) NTPC and Powergrid were advised to activate the PLCC scheme for 220kV Muzaffarpur-Kanti D/C by 26th April, 2016 and give feedback in 42nd PCC Meeting.
d) On activation of PLCC system, Powergrid is to change the zone 2 time setting at Muzaffarpur (PG) end as per protection philosophy of ERPC.
e) BSPTCL was advised to check the clearance between cross arm and jumper and rectify if required.
f) BSPTCL was advised to review the protection system and relay coordination of 220kV Gopalgunj, Darbhanga and Begusarai and all 132kV feeders in around Kanti. Therefore, BSPTCL was advised to submit their relay details to Powergrid by 22nd April, 2016 for review. Powergrid was requested to study the details and give feedback in 42nd PCC Meeting scheduled to be held on 27th April, 2016.
g) It was decided that the above temporary measure will be followed, till BSPTCL protection system is full proof.
h) Further course of action will be decided in PCC Meeting for relay coordination in BSPTCL system in and around Kanti TPS.

In 42nd PCC, Kanti TPS, NTPC informed that zone settings at their end have been revised as per the recommendation. Regarding activation of PLCC scheme for 220kV Muzaffarpur-Kanti D/C line NTPC informed that cabling has been done but some parts in PLCC panels were defective and needs to be replaced.

Powergrid informed that they have not yet revised the zone 3 time setting at Muzaffarpur (PG) end.

PCC advised Powergrid to revise the zone 3 time setting at Muzaffarpur (PG) end as per protection philosophy of ERPC at the earliest. PCC also advised Powergrid to implement the PLCC scheme for 220kV Muzaffarpur-Kanti D/C line at the earliest.

Members may update.

Item No D.8 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*: The replacement work of relays at Tarkera 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.

3. Disturbance at 220/132kV Budhipadar S/s of OPTCL System on 14-07-16 at 16:33 hrs

In 46th PCC, OPTCL was advised to collect the tripping details of 132 kV Budhipadar – Lapanga –I , 132 kV Tarkera – Kalunga-Budhipadar and 132 kV Budhipadar – Rajgangpur lines at 16:51 hrs and submit a report to ERPC and ERLDC.

Time	Name	Local end	Remote end
16:51 Hrs.	132 kV Budhipadar – Lapanga - I	Did not trip	O/C, E/F at Lapanga
	132 kV Tarkera – Kalunga _ Budhipadar	Did not trip	E/F, D/P at Tarkera
	132 kV Budhipadar - Rajgangpur	Did not trip	Tripped from Rajgangpur

4. In 42nd PCC, on multiple elements tripping at 400kV Bidhannagar S/s of WBSETCL system on 30-03-16 at 16:25 hrs, PCC felt that since the fault was in common zone of the bus differential protection, the differential protection for both Bus-A & B should have operated to clear the fault immediately.

PCC advised WBSETCL to check the bus differential scheme at 400kV Bidhannagar S/s.

WBSETCL may update.

5. In 46th PCC BSPTCL was advised

- *PCC advised BSPTCL to check all the distance relays at Forbisganj end and take the appropriate action to restore the protection system.*
- *PCC felt that BSPTCL is not getting any additional benefit for keeping two circuits connected in the Kishanganj – Forbisganj section as the Purnea-Kishanganj section is single circuit, Therefore, PCC advised BSPTCL to keep only one circuit in service for the Kishanganj – Forbisganj section. This will ease the relay zone setting problem for 132 KV Purnea (PG)-Kishanganj-Forbisganj line.*
- *Since there is no protection available at 132kV Kishanganj S/s, PCC advised BSPTCL and Powergrid to co-ordinate the zone settings of the line considering 132 KV Purnea (PG)-Kishanganj-Forbisganj line as a single section.*

BSPTCL may update.

6. Disturbance at 220 kV Bakreswar (WBPDCL) S/s on 19-08-16 at 13:39 hrs.

In 47th PCC, WBPDCL was advised to check the CB at Bakreswar end of 220 kV Bakreswar – Gokhorno –I line.

WBPDCL may update.

****

Annexure-B1

Brief report of multiple tripping incident at IBEUL on 27-09-16

Sequence of events

- At 16:45:27.673 hrs, 765 kV Jharsuguda Dharamjaigarh successfully auto-reclosed on B phase transient fault. Breaker was closed at 16:45:28.750 hrs.
- At 16:45:28.920 hrs, voltage dip observed in B phase for 600 ms in Rourkela PMU
- At 15:45:29.011 hrs, time delayed E/F & O/V relay picked up for 400 kV IBEUL Raigarh at IBEUL end till 15:45:31.579 hrs (Almost same timing as PMU) but no line tripped.
  - At this time, R & Y phase current increased to 600 A & B phase current decreased to 12 A(Antecedent current were 177, 159, 120 A)
  - R & B Phase voltage increased to 260 kV and B phase voltage decreased to 196 kV
  - After 600 ms voltage and current (except B phase current) came to antecedent value.

Sequence of events (contd)

- At 15:45:31.561 hrs, R phase breaker of 400 kV IBEUL Raigarh S/C opened due to R-N, Z-I fault. As the fault was in permanent nature, all three phase breakers opened at 15:45:32.738 (R phase breaker opening time) at IBEUL end.
- At 15:45:31.538 hrs & 15:45:32.738 hrs O/V & E/F relay picked up (at both instants) for 400 kV IBEUL Jharsuguda S/C. But line did not trip at IBEUL end.
  - Phase voltage was more than 250 kV for few cycles
- At 15:45:31.566 hrs, R phase breaker of 400 kV IBEUL Jharsuguda S/C opened at Jharsuguda end due to R-N, Z-I fault. As the fault was in permanent nature, all three phase breakers opened at 15:45:32.727 (R phase breaker opening time) at Jharsuguda end.
  - Line was did not trip from IBEUL end. But due to unavailability of source IBEUL bus became dead.

Sequence of events (contd)

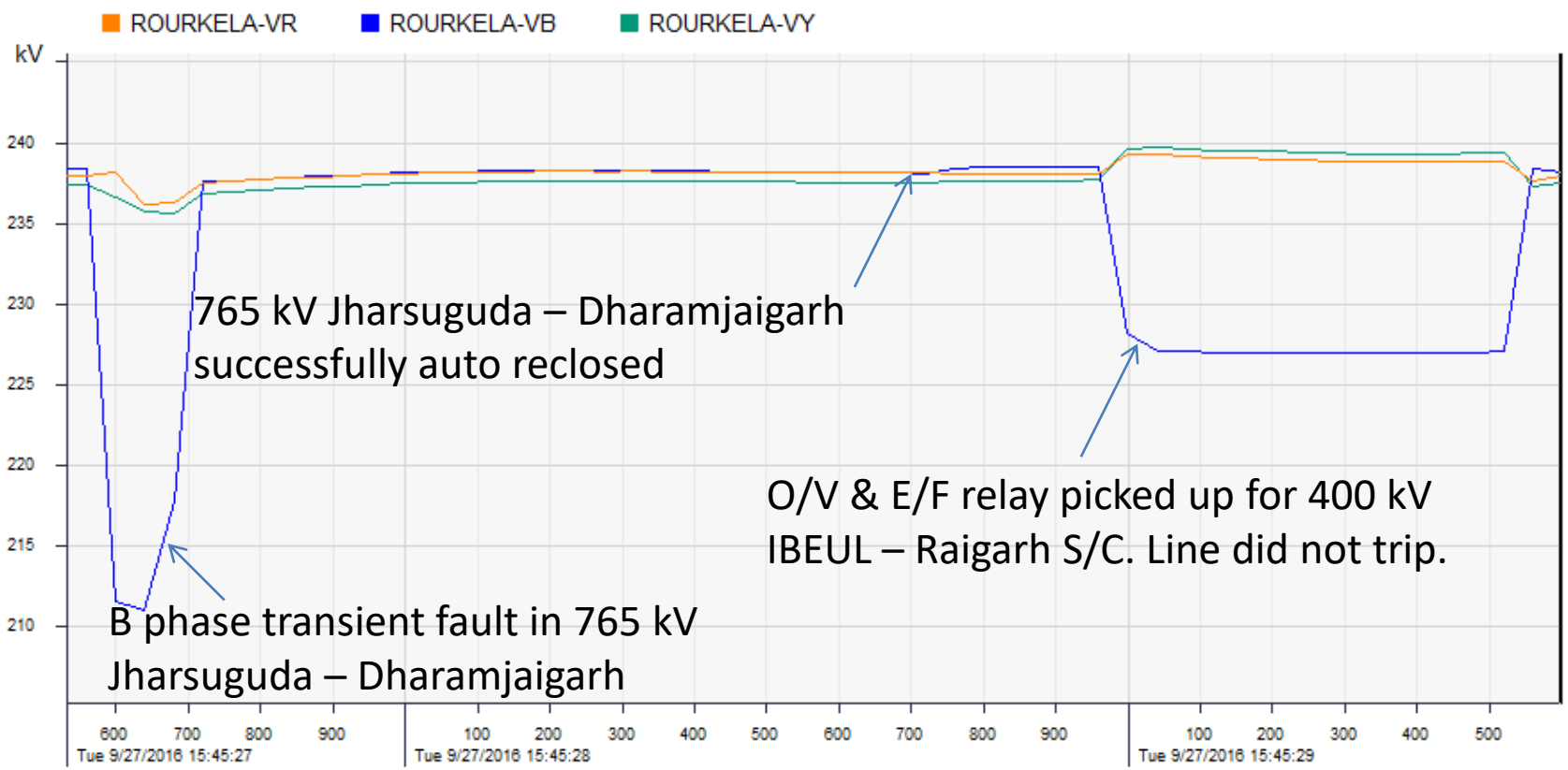
- After initial line patrolling, nothing was found
- 400 kV IBEUL Jharsuguda S/C was at 16:36 hrs.
- Charging attempt was taken for 400 kV IBEUL Raigarh S/C at 18:41 hrs. But line tripped on SOTF
- At 18:41:17.644 hrs. 400 kV IBEUL Jharsuguda tripped from IBEUL end due to operation of O/V stage II relay. R phase voltage was 339 kV.
  - A/R started at Jharsuguda end for R-N, Z-I fault at 18:41:17.458 hrs but all three phase breakers tripped at 18:41:17.732 hrs after DT receipt from IBEUL(remote) end
- After detailed patrolling it was found, R phase jumper broke over the cross arm.
- Line was restored at 17:04 hrs on 28-09-16

Points which are not clear

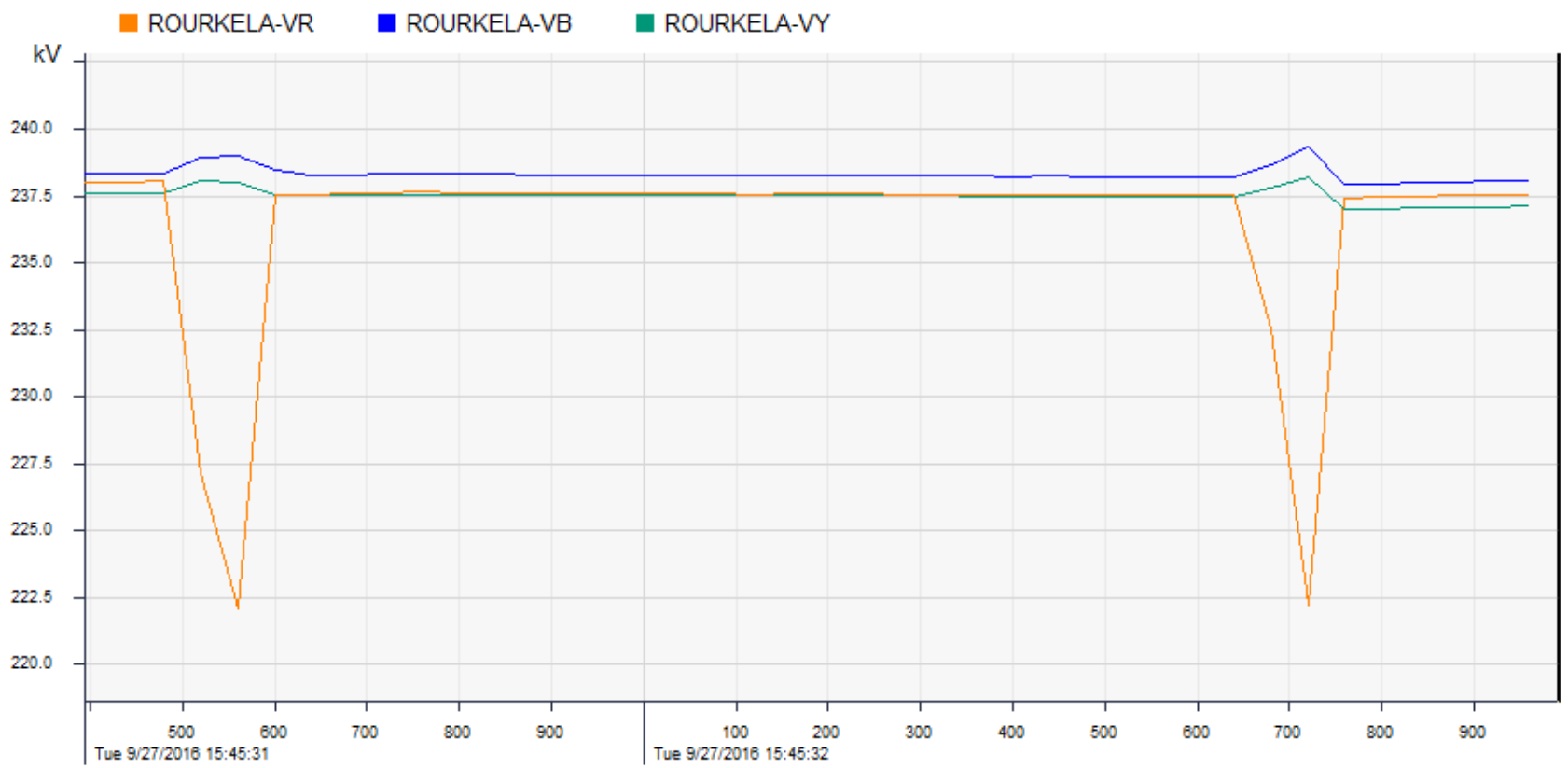
- Reason for 600 ms wide B phase voltage dip at Rourkela PMU at 16:45:28.920 hrs.
  - Time delayed E/F & O/V relay picked up for 400 kV IBEUL Raigarh at same time
- Reason for tripping of 400 kV IBEUL Jharsuguda S/C from Jharsuguda end on Z-I.
  - Unsuccessful A/R operation in PMU data
  - O/V & E/F relay picked up at IBEUL end
  - Over-reaching of Z-I relay is suspected
- Reason for overvoltage at IBEUL end during switching on of 400 kV IBEUL Raigarh at 18:41 hrs
  - A/R started at Jharsuguda end of 400 kV IBEUL Jharsuguda S/C for R-N, Z-I fault but all three phase breakers tripped after DT receipt from IBEUL(remote) end

PMU plots

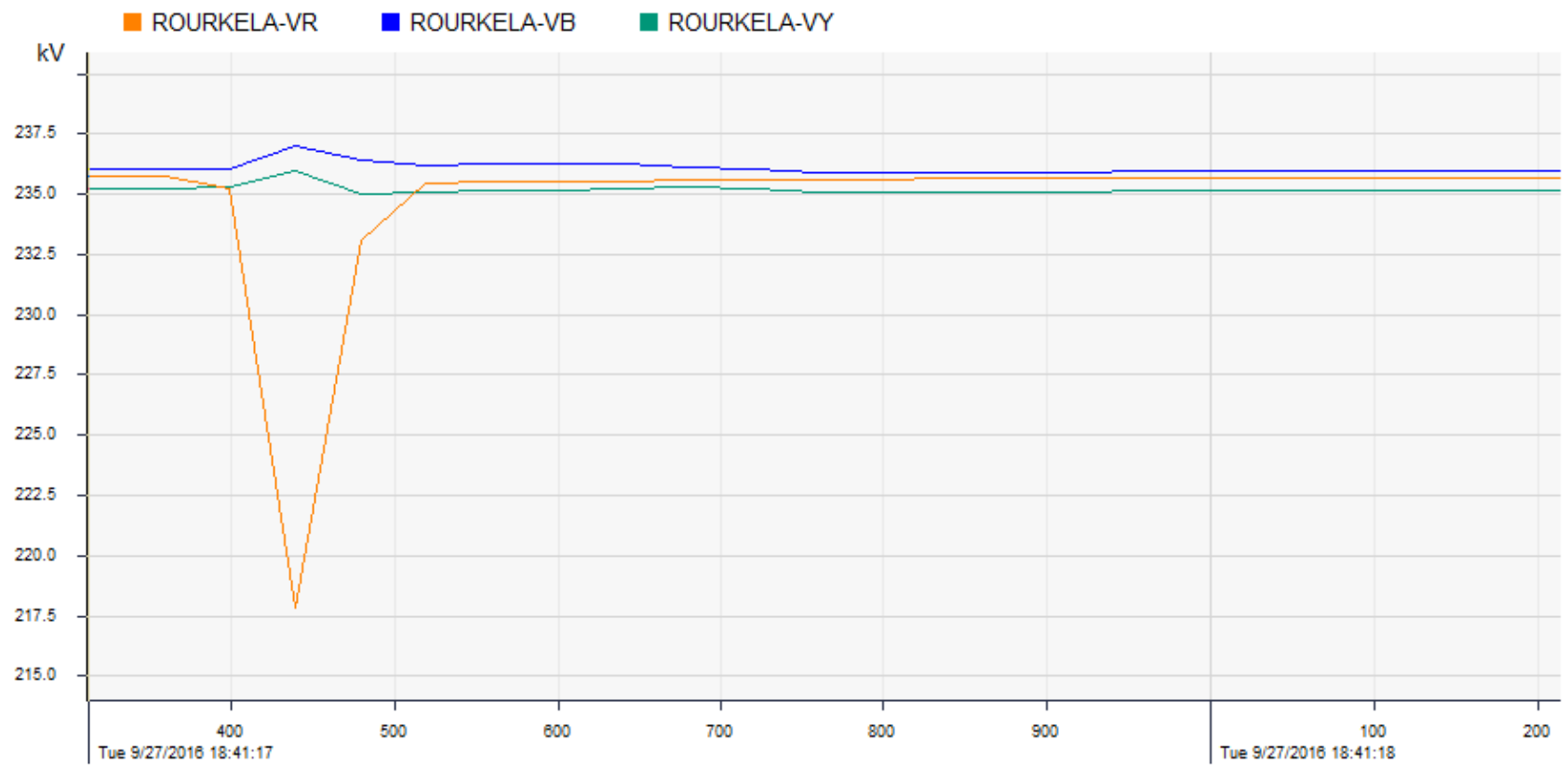
Successful auto reclose of 765 kV Jharsuguda – Dharamjaigarh



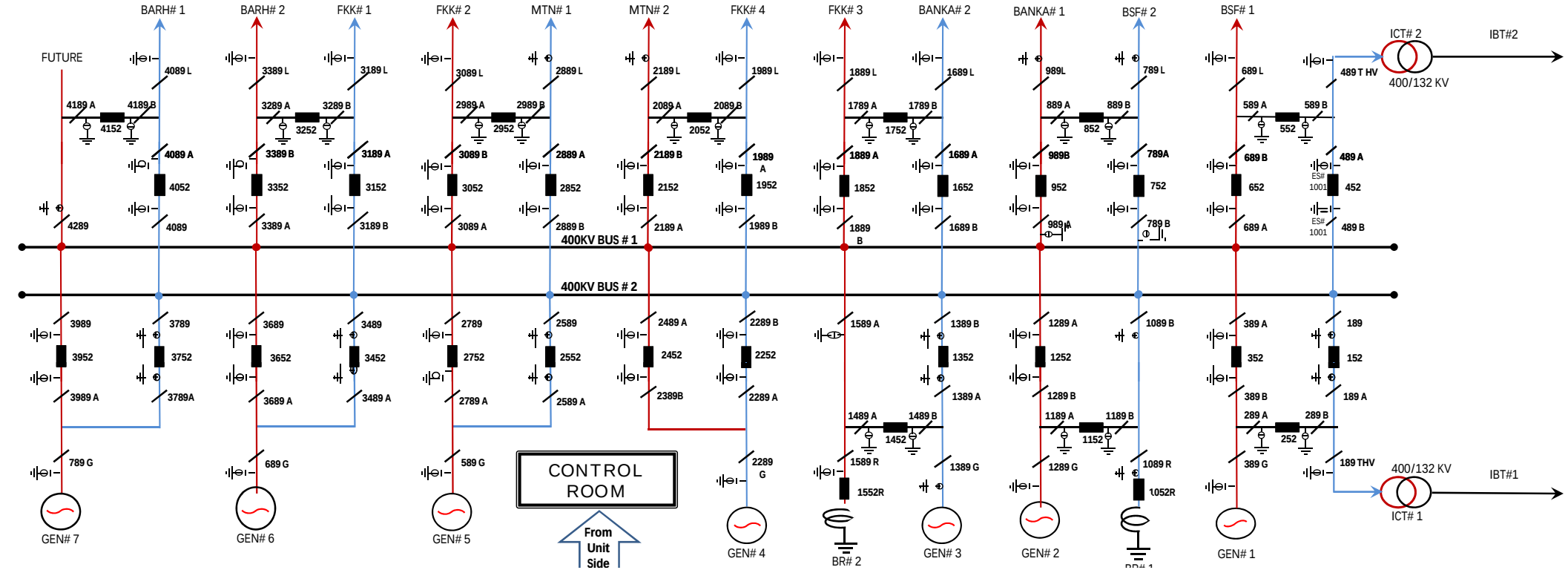
Tripping of 400 kV Jharsuguda – IBEUL – Raigarh at 15:45 hrs



Tripping of 400 kV Jharsuguda – IBEUL – Raigarh at 18:41 hrs



400 KV SWTCH-YARD, KAHALGAON STPS



Annexure-B12

Sl No	NAME OF THE ELEMENT	TRIPPING DATE	TRIPPING TIME	REASON
1	400 kV BINAGURI-BONGAIGAON-I	02/08/2016	13:56	Y-N FAULT
2	400 kV BINAGURI-BONGAIGAON-I	11/08/2016	12:45	B-N FAULT,204.4 KM FROM BINAGURI END,F.C 1.59KA
3	400 kV BINAGURI-BONGAIGAON-III	13/08/2016	13:14	Y-N FAULT
4	400 kV BINAGURI-BONGAIGAON-IV	15/08/2016	22:26	R&B PH,(222.2 KM FROM BINAGURI END,Z-2,F.C.-R-PH-1.94kA,B-PH-2.025kA)(4.99kM FROM BONGAIGAON END, Z-1,F.C.-R PH-9.733KA,B PH-9.679KA)
5	400 kV BINAGURI-BONGAIGAON-IV	18/08/2016	20:41	Y-N FAULT
6	400 kV BINAGURI-BONGAIGAON-I	24/09/2016	23:30	R-B FAULT
7	400 kV BINAGURI-BONGAIGAON-II	24/09/2016	23:30	R-B FAULT
8	400 kV BINAGURI-BONGAIGAON-III	28/09/2016	17:27	Y-B-N FAULT @ BINAGURI,162KM,F.C.-Y PH -3.4 KA
9	400 kV BINAGURI-BONGAIGAON-II	03/10/2016	11:46	B-N FAULT
10	400 kV BINAGURI-BONGAIGAON-III	04/10/2016	11:25	R-Y-N FAULT, 119KM FROM BINAGURI
11	220kV CHUKHA-BIRPARA-I	25/08/2016	17:03	TRIPPED AT CHUKHA END ONLY(LBB OPERATED)
12	220kV CHUKHA-BIRPARA-II	25/08/2016	17:03	TRIPPED AT CHUKHA END ONLY(LBB OPERATED)
13	220kV CHUKHA-BIRPARA-II	04/09/2016	07:31	Y-B FAULT
14	220kV CHUKHA-BIRPARA-I	15/09/2016	12:47	R-Y FAULT
15	220kV CHUKHA-BIRPARA-II	15/09/2016	12:47	R-Y FAULT
16	220kV CHUKHA-BIRPARA-II	15/09/2016	14:54	Y-B FAULT
17	220kV CHUKHA-BIRPARA-II	16/09/2016	12:23	R-N FAULT
18	220kV CHUKHA-BIRPARA-II	19/09/2016	17:10	B-N FAULT
19	220kV CHUKHA-BIRPARA-I	19/09/2016	22:10	R-Y-B FAULT
20	220kV CHUKHA-BIRPARA-II	19/09/2016	22:10	R-Y-B FAULT
21	220kV CHUKHA-BIRPARA-I	21/09/2016	02:08	R-N FAULT
22	220kV CHUKHA-BIRPARA-I	25/09/2016	08:34	ALL LINES TRIPPED FROM CHUKHA END ONLY
23	220kV CHUKHA-BIRPARA-II	25/09/2016	08:34	ALL LINES TRIPPED FROM CHUKHA END ONLY
24	220kV CHUKHA-BIRPARA-I	03/10/2016	14:13	B-N FAULT, 1.55KA, 50.34KM FROM BIRPARA
25	220kV CHUKHA-BIRPARA-II	03/10/2016	14:13	B-N FAULT, 1.57KA, 59.39KM FROM BIRPARA

Annexure-C1

List of important transmission lines (220 kV & above) in ER which tripped in September'16

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 FROM LOCAL END	DR/EL RECEIVED FROM REMOTE END	Remarks
Fault clearing time is violating protection standard (As per PMU data)													
1	220 KV MAITHON-DUMKA-II	02.09.16	15:51	04.09.16	19:06	R-B FAULT	500 ms approx	R-B, Z-II, DEF(started)	Information yet to be received	--	Yes	No	
2	220 KV BIHARSARIF-TENUGHAT	07.09.16	12:03	07.09.16	12:31	B-N FAULT	320 ms approx	B-N, Z-II	B-N, Z-I, 31.73 km from Tenughat	No autoreclose operation observed in PMU data	No	Yes	
3	220KV BOLANGIR-SADHEPALLY	12.09.16	05:07	12.09.16	06:27	BACK UP O/C & EARTH FAULT	400 ms approx	Did not trip	Back up o/c and E/F protection	No autoreclose operation observed in PMU data	--	No	
4	220 KV ROURKELA - TARKERA -II	19.09.16	12:03	19.09.16	17:14	B-N FAULT	600 ms approx	B-N, Z-I, IC -9.810 KA, 5.671 KM from RKL, A/R successful at RKL end	B-N, Z-II, F/C: 5.26 KA, 15.1 KM from Tarkhera	No autoreclose operation observed in PMU data	Yes	No	
5	400/220 kV 315 MVA ICT-II @ ROURKELA			19.09.16	13:02	B-Ph O/C & BACKUP E/F	600 ms approx	--	B-Phase O/C & E/F relay at 220 kV side	--	Yes	Yes	ICT tripped again at 13:12 hrs on back up over current protection
6	220KV BARIPADA - BALASORE -I	22.09.16	18:04	22.09.16	19:15	B-N FAULT	400 ms approx	B-N, Z-II, If=1.782KA, Dist-74.54km from Baripada	Information yet to be received	No autoreclose operation observed in PMU data	No	No	220KV Balasore-N.Duburi tripped at same time from N. Duburi end only with relay indication B-N, Z-II, If-1.55KA, Distance-128.5KM
7	220KV BARIPADA - BALASORE -II			22.09.16	19:15	B-N FAULT	400 ms approx	B-N, Z-II, If=1.793KA, Dist:-98.2KM from Baripada	Information yet to be received	No autoreclose operation observed in PMU data	No	No	
Multiple tripping at same time													
1	220 KV BIRPARA - SALAKATI-I	01.09.16	23:22	02.09.16	00:15	R - N FAULT	<100	R-N, Z-I, A/R successful at Birpara	Information yet to be received	At Birpara end A/R successful	Yes	No	
2	220 KV BIRPARA - SALAKATI-II			02.09.16	01:03	R - Y FAULT	<100	Information yet to be received	Information yet to be received	--	No	No	
3	220 KV TARKERA - RENGALI - II	09.09.16	01:08	09.09.16	01:48	B-N FAULT	PMU data not avbl	B-N, Z-I, 2.5 kA, 54 km from Tarkhera	--	PMU data not avbl	No	No	All the other feeders along with ATRs at Tarkhera tripped on bus bar protection due to B phase insulator punchured at location no 539 of 220 kV Rengali - Tarkhera - II
4	220 KV CHPC -BIRPARA-I	15.09.16	12:47	15.09.16	13:10	R-Y FAULT	<100	Information yet to be received	R-Y, 46.76 km from Birpara	--	No	Yes	
5	220 KV CHPC -BIRPARA-II			16.09.16	01:38	R-Y FAULT	<100	Information yet to be received	R-Y, Z-I	--	No	Yes	Charging attempt was taken at 12:54 hrs. & 14:00 hrs. But line did not hold
6	220 KV BEGUSARAI-BIHARSHARIFF D/C	18.09.16	08:38	18.09.16	10:10	Y-B-N FAULT	<100	Information yet to be received	Information yet to be received	No autoreclose operation observed in PMU data	No	No	
7	220 KV BUDHIPADAR-KORBA-II	20.09.16	20:05	20.09.16	21:15	R-B FAULT	<100	R-B Fault, Z-I, 7.7 KM from Budhipathar, Ir=7.26 KA , Ib= 15.73 KA	Information yet to be received	--	No	No	
8	220 KV BUDHIPADAR-RAIGARH			22.09.16	19:12	R-B FAULT	<100	R-B Fault,Z-I, 10.2 KM from Budhipathar, Ir=6.47 KA , Ib= 9.04 KA	Information yet to be received	--	No	No	

S.NO	LINE NAME	TRIP DATE	TRIP TIME	RESTORATION DATE	RESTORATION TIME	Reason	Fault Clearance time in msec	Relay Indication LOCAL END	Relay Indication REMOTE END	Auto Recloser status	DR/EL RECEIVED FROM LOCAL END	DR/EL RECEIVED FROM REMOTE END	Remarks
9	220 KV RAMCHANDRAPUR - CHANDIL	22.09.16	14:36	22.09.16	17:10	B-N FAULT	<100	B-N, Z-I, F/C 13.28 kA, 3.78 km from RCP end	RYB, Master trip, E/F	No autoreclose operation observed in PMU data	Yes	No	
10	315 MVA ICT -I & II AT JAMSHEDPUR			22.09.16	15:19 / 15:15	MASTER TRIP RELAY OPERATED	<100	Information yet to be received	Master trip relay at RCP (220 kV end)	--	No	No	
11	400 KV BIHARSHARIFF-BALIA -I	24.09.16	11:50	24.09.16	12:45	R-N FAULT	<100	Information yet to be received	Information yet to be received	No autoreclose operation observed in PMU data	No	No	400 KV BIHARSHARIFF-BALIA -II tripped from Balia end at same time
12	400 KV BINAGURI - BONGAIGAON-I	24.09.16	23:30	25.09.16	00:03	R-B FAULT	<100	R-B-N, ZI, 190.52 km from Binaguri	R-B-N, Z-I, 50.32 Kms. From Bongaigaon	--	No	Yes	
13	400 KV BINAGURI - BONGAIGAON-II			24.09.16	23:57	R-B FAULT	<100	R-B-N, ZI, 190.52 km from Binaguri	R-B-N, Z-I, 56.11 Kms. From Bongaigaon	--	No	Yes	As per DR data, R phase tie breaker was open at Bongaigaon end prior to the tripping
14	400 KV ARAMBAG-BIDHANNAGAR	25.09.16	09:30	25.09.16	13:44	Y-N FAULT	<100	Information yet to be received	Information yet to be received	--	No	No	400 KV PPSP-BIDHANNAGR D/C tripped at same time
15	220 KV CHUKHA-BIRPARA -I	25.09.16	08:34	25.09.16	09:47	LBB OPERATED AT CHUKHA	--	LBB	Did not trip	--	No	--	Reason of LBB operation is yet to be received
16	220 KV CHUKHA-BIRPARA -II			25.09.16	09:18	LBB OPERATED AT CHUKHA	--	LBB	Did not trip	--	No	--	
Fault Not observed in PMU data													
1	400 KV RANCHI-CHANDWA-I	03.09.16	16:49	03.09.16	17:41	DEF AT RANCHI	--	DEF at Ranchi	DT reiceived	--	No	No	
2	400 KV LAKHISARAI-BIHARSARIF-I	06.09.16	03:39	06.09.16	05:33	TRIPPED FROM BIHARSARIF END	--	Did not trip	Information yet to be received	--	--	No	
3	400 KV KOLAGHAT - CHAIBASA	06.09.16	14:41	06.09.16	18:21	O/V VOLTAGE RELAY MALFUNCTION AT CHAIBASA	--	Information yet to be received	O/V	--	No	No	O/V relay malfunction
4	220 KV PUSAULI - SAHUPURI	08.09.16	01:49	08.09.16	02:38	SPOURIOUS TRIPPING	--	Information yet to be received	Information yet to be received	--	No	No	
5	400 KV JHARSUGUDA - ROURKELA -II	09.09.16	13:03	09.09.16	13:20	DT RECEIVED AT JHARSUGUDA	--	DT reiceived	Information yet to be received	--	No	No	
6	220 KV FARAKKA - LALMATIA	14.09.16	17:02	14.09.16	17:47	DC SUPPLY FAILURE AT LALMATIA	--	--	DC supply failure	--	No	No	
7	220 KV BUDHIPADAR -KORBA-I	18.09.16	23:01	18.09.16	23:32	SPOURIOUS TRIPPING	--	Information yet to be received	Information yet to be received	--	No	No	
8	400 KV GMR - MERAMUNDALI	19.09.16	12:51	19.09.16	17:23	DT RECEIVED AT MERAMUNDALI.	--	Information yet to be received	DT reiceived	--	No	No	
9	400/220 kV 315 MVA ICT-II @ ROURKELA	19.09.16	13:12	19.09.16	18:20	MALOPERATION OF BACK UP OVER CURRENT AT 400 KV SIDE	--	--	--	--	Yes	Yes	Mal-operation of B-Phase O/C & E/F relay at 400 kV side
10	220 KV BIRPARA-SALAKATI-I	19.09.16	17:23	19.09.16	19:46	EARTH FAULT	--	Time delayed earth fault at Birpara	Information yet to be received	--	Yes	No	
11	765KV JHARSUGUDA - DHARAMJAYGARH-I	22.09.16	11:21	22.09.16	12:01	DT RECEIVED AT JHARSUGUDA	--	DT reiceived	Information yet to be received	--	No	No	
12	400 KV FARAKKA- KAHALGAON-IV	25.09.16	00:50	25.09.16	01:22	D/T RECEIVED AT FARAKKA	--	DT reiceived	Information yet to be received	--	No	No	
13	400 KV BARIPADA-TISCO	28.09.16	01:33	28.09.16	02:02	DT RECEIVED AT TISCO	--	DT reiceived	Information yet to be received	--	No	No	
14	765 KV NEW RANCHI - DHARAMJAYGARH -I	28.09.16	11:50	28.09.16	13:28	DT RECEIVED AT NEW RANCHI.	--	DT reiceived	Information yet to be received	--	No	No	

S.NO	LINE NAME	TRIP DATE	TRIP TIME	RESTORATION DATE	RESTORATION TIME	Reason	Fault Clearance time in msec	Relay Indication LOCAL END	Relay Indication REMOTE END	Auto Recloser status	DR/EL RECEIVED FROM LOCAL END	DR/EL RECEIVED FROM REMOTE END	Remarks
15	400 KV SASARAM - VARANASI	28.09.16	02:46	28/09/2016	16:17	PLCC MAL FUNCTION AT SASARAM	--	--	--	--	No	No	
16	400KV ARAMBAG-KOLAGHAT	30.09.16	06:40	30/09/2016	07:28	DT RECEIVED AT ARAMBAG	--	DT reiceived	Information yet to be received	--	No	No	
No autorecloser operation observed in PMU data													
1	400 KV MPL-RANCHI-II	02.09.16	16:35	02.09.16	16:56	R-N FAULT	<100	Information yet to be received	Information yet to be received	No autoreclose operation observed in PMU data	No	No	
2	400 KV MPL-RANCHI-II	03.09.16	14:56	03.09.16	15:45	R-N FAULT	<100	R-N, Z-I, F/C : 13.9 kA, 7.8 KM from MPL	R-N, Z-II, F/C :1.7 kA	No autoreclose operation observed in PMU data	No	No	
3	400KV MERAMANDALI-STERLITE-II	10.09.16	16:21	10.09.16	17:22	Y-N FAULT	<100	Information yet to be received	Information yet to be received	No autoreclose operation observed in PMU data	No	No	
4	400 KV SEL - MERAMUNDALI-II	13.09.16	14:31	13.09.16	15:45	B-N FAULT	<100	Information yet to be received	Information yet to be received	No autoreclose operation observed in PMU data	No	No	
5	400 KV BIHARSHARIF - BALIA-II	19.09.16	15:51	20.09.16	19:28	Y-PHASE CT BURST AT BALIA END	<100	R-Y-N,Z-II, 245 KM from BSF, Ir-2.361 kA, Iy-3.234 kA	Y-N	No autoreclose operation observed in PMU data	No	No	
6	400KV SEL - MERAMUNDALI-I	22.09.16	15:25	22.09.16	18:03	B-N FAULT	<100	Information yet to be received	Information yet to be received	No autoreclose operation observed in PMU data	No	No	
7	400 KV KOLAGHAT - CHAIBASA	28.09.16	12:04	28.09.16	12:30	B-N FAULT	<100	B-N, Z-I, F/C 14.17 kA, 3.462KM from KTPS	B-N, Z-II, F/C 1.7 kA, 246km from Chaibasa	No autoreclose operation observed in PMU data	Yes	No	
Others													
1	220KV BIRPARA-SALAKATI-II	16.09.16	18:09	17.09.16	10:35	R-N FAULT	<100	R-N, Z-I	R-N, Z-I, A/R successful at Salakati end, but line tripped due to fault in reclaim time	No autoreclose operation observed in PMU data	Yes	Yes	

Annexure-C2

JHARKHAND URJA SANCHARAN NIGAM LIMITED

(CIN No. – U40108JH2013SGC001704)

Office of the Electrical Executive Engineer, Transmission Division, Ranchi

Kusai Colony, P.O. + P.S. :- Doranda, Ranchi, Jharkhand :- 834002, Mobile:- 9431707302, Email:- eeetdr@gmail.com

Letter No:....1129...../ Dated ..23/09/2016./

From,

Er. Raju Mahtha
Electrical Executive Engineer.

To,

The Electrical Superintending Engineer,
Transmission Circle, Ranchi

Sub:- ***Refer to Un-coordinated trappings in JUSNL system.***

Sir,

Please find below the action taken by our side on recommendation given by ERPC, Kolkata, Details are givenm below:-

1. Through Relay Coordination of GSS Hatia-I, Hatia-II, Namkum, Kanke and Lohardaga has been done in the month of Feb-Mar 2016 by M/S Alstom T&D India Lmited.
2. Checking of secondary circuit at 220/132 KV GSS Hatia-II, 132/33 KV GSS Hatia-I & Kanke has been done in the month of July 2016 by M/S LB Engineering Limited, Kolkata and T&C Wing, Ranchi.
3. New setting provided by ERPC has been implemented at 220/132 KV Grid Sub-Station Hatia-II and 132/33 KV Grid Sub-Station Hatia-I by CRITL, Ranchi. Rest will be implemented by CRITL, Ranchi shortly.
4. Appointment of consultant agency for preparation of DPR is under process at HQ, level.

Yours Faithfully

23/9/16

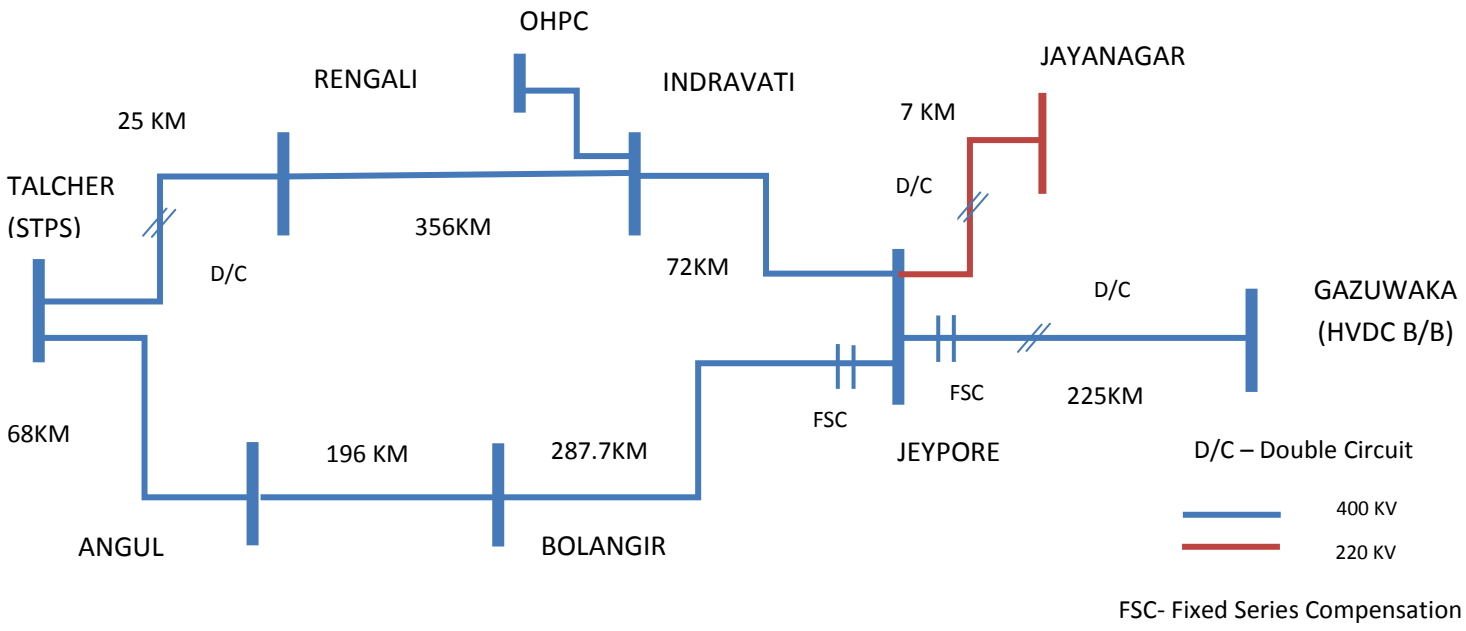
(*Er. Raju Mahtha*)
Electrical Executive Engineer
Transmission Division, Ranchi

Mani Bhushan Jha/Transmission Division, Ranchi

REPORT ON TRIPPINGS OCCURED ON 15.04.16 AT 12:17HRS AND SUBSEQUENT BUS VOLTAGE ZERO CONDITION AT JEYPORE

Background: On 15.04.16, Bus voltage at 400/220KV Jeypore substation has become zero after tripping of 400KV Rengali-Indravati Line at both ends. It has happened thrice in a year span i.e 1st on 21.05.15, 2nd on 10.03.16 and the present case. Further, it happens only when 400KV Indravati- Rengali line trips at Indravati s/s and power flow feed from Indravati-Jeypore line at Jeyporebecomes zero.In such case, only line left for feeding power to jeyporeis 400KV Jeypore-Bolangir line as no infeed from Jayanagar at Jeypore and OHPC at Indravati in summer. Further, after tripping of 400KV Rengali-Indravati Line, 400KV Jeypore-Bolangir line trips on over voltage after some time leading to bus dead condition at Jeypore s/s.

Connectivity diagram of Lines:



FSC- Fixed Series Compensation

Details of FSC:

1. 400KV Jeypore-Gazuwaka D/C line with 50% compensation/
2. 400KV Jeypore-Bolangir S/C line with 63%(approx) compensation. Earlier this line was connected at Meramundalifrom Jeyporewith a line length of 456KM and 40% compensation and now, it has aLILO at Bolangir (287.7KM) with no modification in FSC at Jeypore. As a result, now the compensation of this line is around 63%.

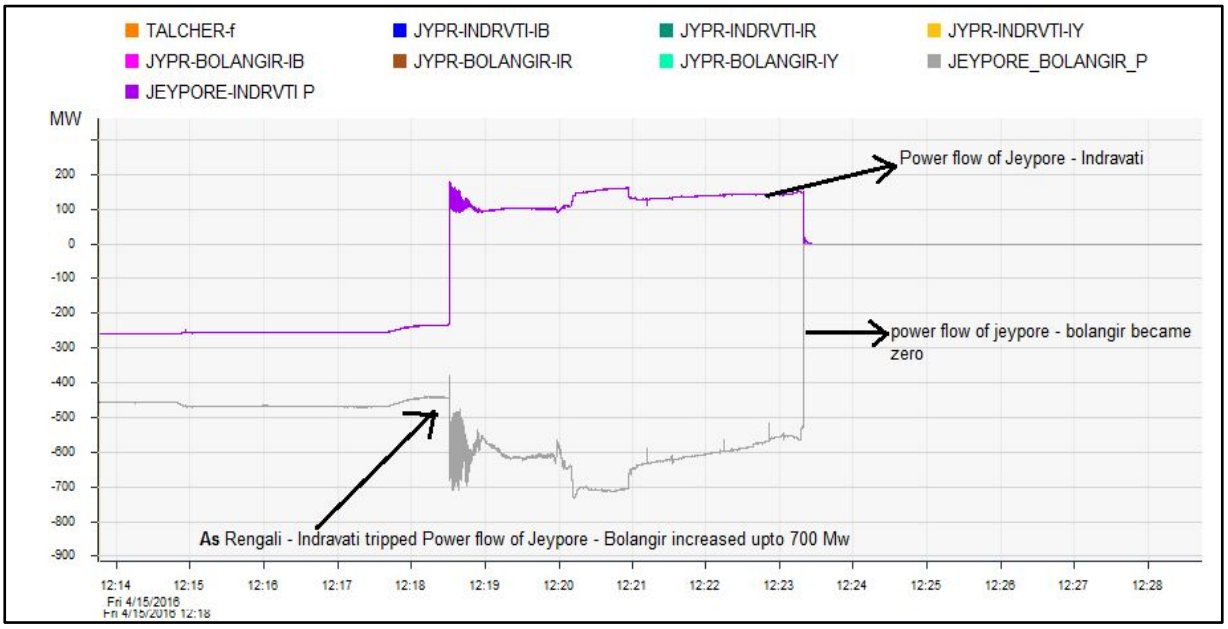
Sequence of Tripping occurred in present case:

SL NO	TIME OF TRIPPING	TRIPPED LINE	CAUSE OF TRIPPING	STAUS OF AUTO RECLOSE
01	12:17:31hrs	400KV Rengali–Indravatiline	***Transient Fault: 1.84kA, B-N , 222.32Km from Rengali.*** Subsequent over voltage immediately after tripping of one pole and prior to A/R caused three phase tripping at Rengali and sent DT to Indravati.	A/R Blocked due to Over Voltage.
02	12:23:19hrs	400KV Jeypore-Bolangir Line	Over Voltage stage-1	NA
04	12:29:32 hrs	400KV Jeypore-Gazuwaka Line - II	Tripped due to DT receipt as these lines were hand tripped at Gazuwaka-1&2 as informed by them.	NA
05	12:29:48 hrs	400KV Jeypore-Gazuwaka Line - I		NA
07	12:48:21 hrs	220KV Jeypore-Jayanagar-1&2	Hand Tripped	NA
07	12:43:21 Hrs	400KV Jeypore-Indravati line	Hand Tripped	NA

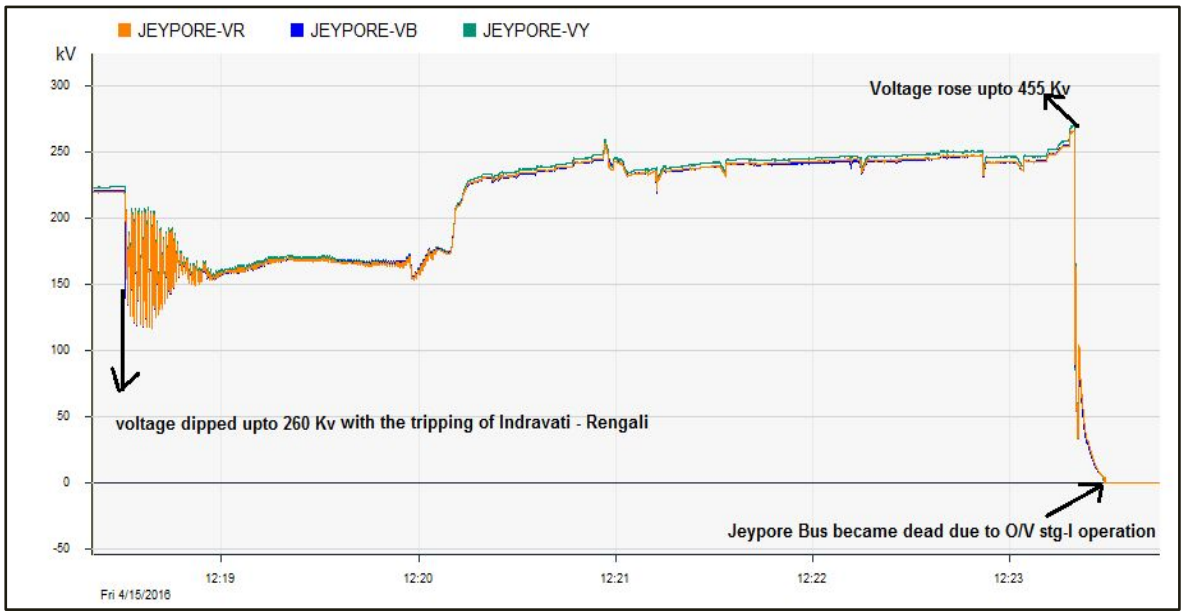
Analysis:

Based on the trip reports received from sites and collected PMU plots from ERLDC, the following analysis was done.

1. Initially, B-ph (RYB nomenclature) of 400KV Rengali- Indravati line tripped due to transient fault at a distance of 222.32 km from Rengali S/S and after few milliseconds, over voltage stage-2 (Inst.) operated in R-PH and tripped the line on over voltage sending a DT signal to Indravati S/S and blocking A/R operation. Tripping reports of Rengali&Indravati are enclosed for your reference.
2. The status of power flow as per PMU at Jeypore is shown below.



3. From the plot, there was a power import of around 450MW from Bolangir and around 270MW from Indravati and the total power was fed to SR-1 through 400KV Jeypore-Gazuwaka D/C line except some less power export (around 25MW seen from FHTR of Jeypore) to 220KV OPTCL lines before tripping of 400KV Rengali- Indravati line.
4. After tripping of 400KV Rengali- Indravati line, the flow in 400KV Jeypore-Bolangir line has increased to 700MW with some oscillation as shown in PMU plots below. At the same time, power flow in 400KV Jeypore-Indravati line has reversed and feeding OPTCL N/W loads at OHPC through Indravati S/S and the same is evident from above plot.
5. Bus Voltage profile at Jeypore S/S after tripping of Rengali - Indravati line as follows as per PMU plots. Voltage oscillations were observed in the plot. There was sudden dip in voltage due to sudden increase in loading of Jeypore-Bolangir line and later on, the rise in voltage observed.



6. After 5mins of Renagli-Indravati line tripping, 400KV Jeypore-Bolangir line tripped on over voltage satge-1. Hence, the total power infeed to jeypore has become zero as there is no power flow from 220KV OPTCL lines at Jeypore and OHPC at Indravati. The same can be seen in PMU plot of Jeypore power as shown above. The trip report of Bolangir line is enclosed.
7. Later, other lines at Jeypore&Indravatiwere hand tripped due to bus dead and no voltage.

Suspected reasons for Sudden Voltage rise:

It is suspected that the following factors may contribute for voltage rise in Jeypore-Bolangir line after tripping of 400KV Rengali-Indravati line and causing tripping of Jeypore-Bolangir line on voltage and making Bus voltage zero at Jeypore s/s.

a) Overcompensation of FSC in Jeypore-Bolangir line after LILO of Jeypore-Meramundali line at Bolangir. Earlier, compensation was 40% for 456 KM line length (Jeypore- Meramundali) and now it has become around 63% for 287.7 Km (Jeypore-Bolangir line).

b) Filter bank insertion at Gazuwaka to boost the voltage whenever voltage dips below 360KV. In the instant case, 80 KV Voltage dip was observed in Jeypore bus voltage after Bolangir

line is over loaded after Regali-Indravati line tripping. So, the filter bank cut off voltage values needs to be checked as it may contribute overvoltage if not bypassed once voltage normalized.**As per information gathered fromGazuwaka, there was no such abnormality observed during that period.**

c) Condition of R-Ph CVT of Bolangir Line at Jeypore as in all the cases over voltage observed in R-Ph only. But in the instant tripping, over voltage found to be observed in other phases also. **However, It has been checked at site and no abnormality has been found.**

d) Further, the frequent trippings on south bus at Gazuwaka HVDC B/B station due to pollution tracking maybethe reason for the possibility of pole blocking and consequent over voltage on Eastern bus.

FAULT FINDINGS&REMEDIAL ACTIONSTAKEN :

(1) The polarity of neutral CT used in NGR bypassing scheme of 50MVAR Line Reactor of 400KV Rengali-Indravati Line at Rengali was found to be reversed, which might have been triggering Reactor REF relay, thereby Reactor protection has been operated in case of thorough fault condition too and sending direct trip to remote end. This polarity reversal in NCT has been rectified.

(2) Proper assignment of Digital as well as Analogue signals in DR and EL done at Rengali, which was found to be mis-matching with actual signal due to NTAMC wirings and retrofitting works done for implementation of NTAMC. Due to this mismatching of signals, it was very difficult to identify the signals for which actual tripping occurred.

(3) The contact in auxiliary relay of Auto Reclosure Lock Out relay at Indravati was found to be burnt and chattering in case of A/R block action. Due to this in spite of receiving A/R lock out signal from remote end, A/R blocking did not occur and the line remained hanging from Indravati end. This auxiliary relay has been replaced with spare one.

The report is being submitted based on prevailing data available with us. Further study of the case is under process to avoid such incidents in future.

(S.K.Naik)
Ch.Mgr(AM)
POWERGRID
Bhubaneswar.

Enclosures:1.Tripping Reports of all substations as mentioned above
2. PMU Plots collected from ERLDC.