Minutes
of
47th PCC meeting

Date: 07.10.2016
Eastern Regional Power Committee
14, Golf Club Road, Tollygunge
Kolkata: 700 033

EASTERN REGIONAL POWER COMMITTEE

MINUTES OF 47TH PROTECTION SUB-COMMITTEE MEETING HELD AT ERPC, KOLKATA ON 19.09.2016 (MONDAY) AT 11:00 HOURS

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

Member Secretary, ERPC welcomed all the participants in the meeting and informed that this is the last PCC meeting before Durga Puja. He requested all the protection engineers to be vigilant and attentive during the puja period for safe & secure operation of grid so that the power demand can be met smoothly. He also requested all to extend their support to WBSEDCL, DPL & CESC during the puja period to meet their demand.

PART – A

ITEM NO. A.1: Confirmation of minutes of 46th Protection sub-Committee Meeting held on 22nd August, 2016 at ERPC, Kolkata.

The minutes of 46th Protection Sub-Committee meeting held on 22.08.16 circulated vide letter dated 01.09.16.

Members may confirm the minutes of 46th PCC meeting.

Deliberation in the meeting

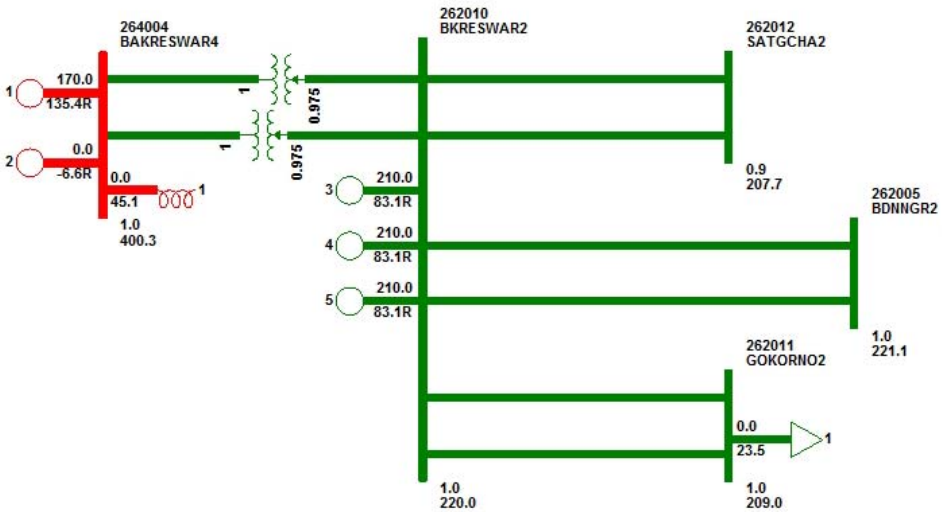
Members confirmed the minutes of 46th PCC meeting.

PART – B

ANALYSIS & DISCUSSION ON GRID INCIDENCES OCCURRED IN AUGUST 2016

ITEM NO. B.1: Disturbance at 220 kV Bakreswar (WBPDCL) S/s on 19-08-16 at 13:39 hrs.

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



2. **Pre fault conditions:** Submitted

Disposition of the feeders at 220kV bus (Two main and one Transfer Scheme):

220 KV MAIN BUS - A	220 KV MAIN BUS - B
1. 220 kV Bakreswar-Gokarna Ckt # I 2. 220 kV Bakreswar- Satgachia Ckt # II 3. 220 kV Bakreswar-Bidhannagar Ckt # II 4. 400/220 kV IBT - II 5. GT #III 6. GT #V 7. ST #IV	1. 220 kV Bakreswar-Gokarna Ckt # II 2. 220 kV Bakreswar- Satgachia Ckt # I 3. 220 kV Bakreswar-Bidhannagar Ckt # I 4. 400/220 kV IBT - I 5. GT #IV 6. ST #V 7. ST#III
Bus coupler on	

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

At 13:39 hrs, 220 kV Bakreswar – Gokhorno – I tripped from Gokharno end on zone 2 due to Y-B-N fault close to Bakreswar. Due to non-opening of B phase breaker at Bakreswar end, LBB protection operated & tripped all the feeders and units along with B/C connected to 220 kV main bus – A.

Time	Name	Local end	Remote end
13:39 Hrs	220 kV Bakreswar-Gokarna Ckt # I	Bus Bar Protection, 30/50Z,2/50Z, 186	YBN,Z-II,76.11 km
	220 kV Bakreswar-Satgachia Ckt # II	Bus Bar Protection 96	Did not trip
	220 kV Bakreswar-Bidhannagar Ckt # II	Bus Bar Protection 96	Did not trip
	400/220 kV IBT - II	Bus Bar Protection 96	Did not trip
	GT #III	Bus bar Protection 96 & Reheat protection	
	GT #V	Bus Bar Protection 96	
	ST #IV	Bus bar Protection 96	

4. **Disturbance record:** Submitted

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

Analysis of PMU plots:

- At Durgapur PMU data, 4 kV voltage dip in Y phase & 2 kV voltage dip in B phase are observed at 13:39:46.200 hrs.
- Fault clearing time is 240 ms approximately.

Status of Reporting: Detail report with DR & EL was received from WBSETCL on 20-08-16.

WBPDCL may explain the following:

- The reason for non-opening of B phase breaker of 220 kV Bakreswar – Gokhorno – I at Bakreswar end and update the latest status.

Deliberation in the meeting

WBSETCL informed that there was a fault in 220 kV Bakreswar – Gokhorno –I which was not cleared from Bakreswar end due to problem in B-phase breaker. This lead to the LBB operation and tripped all the elements of Bus-A along with Bus-coupler at Bakreswar.

PCC advised WBPDCL to check the CB at Bakreswar end of 220 kV Bakreswar – Gokhorno –I line.

ITEM NO. B.2: Disturbance at 220 kV Sasaram S/s on 28-08-16 at 10:38 hrs & 11:10 hrs.

1. **Single line diagram:** Submitted. SLD enclosed at **Annexure-B2**.

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.

BSPTCL and Powergrid may explain the following:

- Place the sequence of events.
- The reason for delayed/not clearing the fault in 132 kV Kudra – Nadokhar S/C from Nadokhar end on both the occasions.
- Bihar SLDC may submit the amount of energy un-served due to this incident.

Deliberation in the meeting

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.*

ITEM NO. B.3: Disturbance at 220 kV Khagul (BSPTCL) S/s on 30-08-16 at 19:18 hrs

1. **Single line diagram:** Submitted, SLD enclosed at **Annexure-B3.**

2. **Pre fault conditions:** Submitted

Name of bay:	**Load:**
LOAD ON incomer 220KV SIPARA and Sampatchak	132MW+132MW=264MW
LOAD ON 4X100MVA TRANSFORMERS	4X66MW=264

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

Y phase jumper of High level Isolator of 132 KV Main Bus snapped , leading to tripping of 220 KV Incomer Lines Sipara and Sampatchak and all four 100 MVA Power Transformers.

4. **Relay indications:** Submitted

S.No.	Name of Bay / Line	Local end relay type / make & Indications	Remote end Indication
1.	220 KV Sipara	Earth Fault	
2.	220 KV Sampatchak	Earth fault	
3.	100 MVA Tr. 1	HV- Non Directional Overcurrent, Earth fault LV- Non Directional Overcurrent, Earth fault	
4.	100 MVA Tr 2	HV- Non Directional Overcurrent, Earth fault LV- Non Directional Overcurrent, Earth fault	
5.	100 MVA Tr. 3	LV- Dir. Over current	
6	100 MVA tr. 4	HV- Earth fault LV- Earth fault	

5. **Disturbance record:** Not Submitted

6. **Remedial action taken :** Submitted.

   The damaged Jumper was replaced and adjacent Jumpers were also tightened.

BSPTCL may explain the following:

- BSPTCL may place the relay indications, DR and explain the tripping incidence.

Deliberation in the meeting

BSPTCL informed that--

- *There was Y-phase jumper snapping of high level isolator of 132 kV main bus at 220/132 kV Khagaul S/s.*
- *This resulted in tripping of 220 KV Incomer lines from Sipara and Sampatchak and all four 100 MVA Power Transformers.*

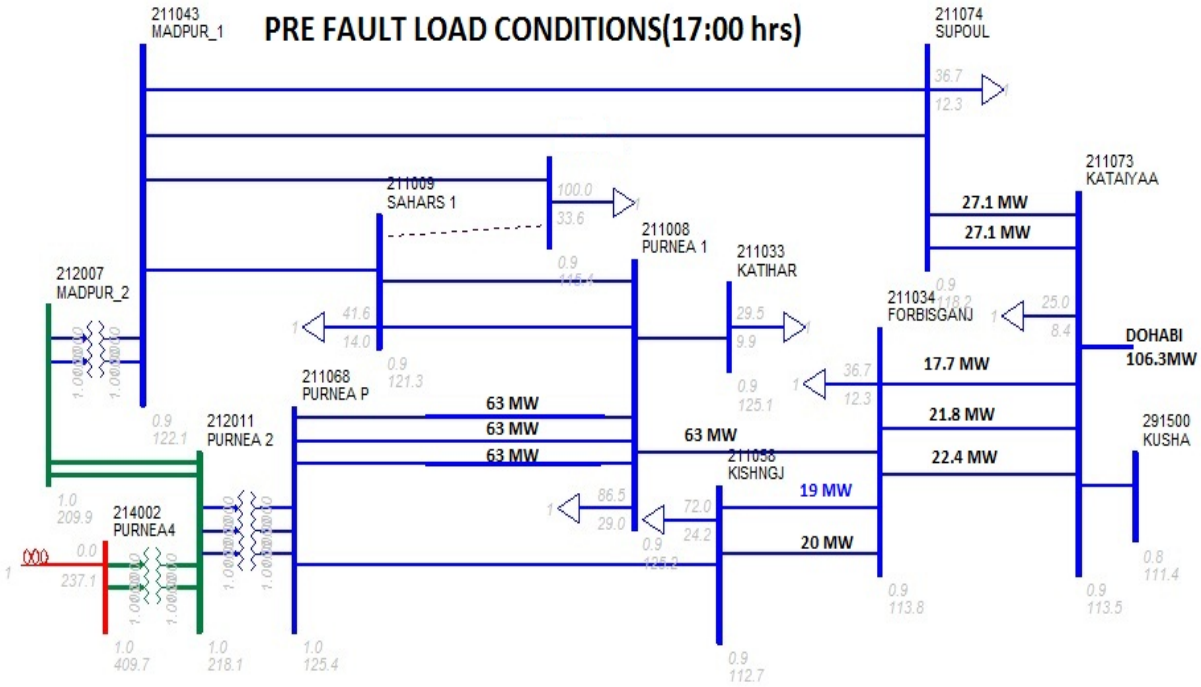
- *On query it was informed that the existing settings for all 220 kV feeders are not having reverse zone protection (with distance relay as SEL 311) and the Earth Fault settings are non-directional with definite time.*

After detailed discussion, PCC 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.*

ITEM NO. B.4: Multiple elements tripping at 132kV Purnea (PG) and 132kV Purnea (BSPTCL) system on 19-08-16 at 17:11 hrs.

1. **Single line diagram:** Submitted



2. **Pre fault conditions:** Submitted

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

At 17:12 hrs, 132 kV Purnea (PG) – Purnea (BSPTCL) – II tripped due to B phase LA bursting at 132 kV Purnea (PG) and the following other elements also tripped:

- 132 kV Purnea (PG) – Purnea (BSPTCL) – III
- All 220/132 kV ATRs at Purnea (PG)

After tripping of all the ATRs at Purnea (PG), load at Purnea & its surrounding area got shifted to 132 kV Supaul - Kataiya D/C which tripped on O/C (Antecedent power flow was 27 MW) from Supaul end causing power failure at Purnea, Forbisgunj, Katihar, Khagaria, Naugachia & Nepal(Duhabi).

4. **Relay indications:** Submitted

Time (Hrs)	Details of tripping	Relay at local end	Relay at remote end
17:12	132 kV Purnea (PG) – Purnea (BSPTCL) – II	67N(O/C)	O/C & E/F Ia-0.75A, Ib-0.75A, Ic-1.44KA,In-.43KA

Hrs	132 kV Purnea (PG) – Purnea (BSPTCL) – III	Yet to be received	O/C & E/F, Fault duration-420ms
	220/132 kV ATR – I, II, III at Purnea (PG)	Tripped	
	132 kV Supaul - Kataiya D/C	O/C	Did not trip

5. **Disturbance record:** Not Submitted

6. **Remedial action taken :** Not given

Status of Reporting:

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

Analysis of PMU plots:

- 20 kV voltage dip observed in B phase at Binaguri PMU. Fault clearing time 500 ms.

BSPTCL and Powergrid may explain the following:

- The reason for tripping 132 kV Purnea (Bihar) – Purnea (PG) –III & 220 /132 kV ATR – I, II, III at Purnea (PG).
- Bihar SLDC may submit the amount of energy un-served due to this incident.

Deliberation in the meeting

Powergrid informed that the B-phase LA of 132 kV Purnea(PG)-Purnea(B)-II blasted at Purnea (PG) end. The ABB relay picked up the fault however, due to sluggish operation of the relay the 132 kV Purnea(PG)-Purnea(B)-II line got tripped after 300 ms which resulted in tripping of all the ICTs in at Purnea (PG).

PCC took serious note of non-submission of report by Powergrid and advised Powergrid to submit the report as decided in 33rd TCC. PCC advised Powergrid to test the relay at Purnea(PG) end.

BSPTCL explained the following:

- *At 17:11 hrs B- phase LA of 132 KV Purnea(PG)-Purnea(B)-II bursted at Purnea (PG) end.*
- *132 KV Purnea(PG)- Purnea(B)-II tripped from Purnea (PG) end with 67N and 86 relay and in Purnea(B) end O/C & E/F relay appeared .*
- *132 KV Purnea(PG)-Purnea ckt 3 tripped from Purnea (B) end with relay O/C and E/F.*
- *As all the three ICTS got tripped at Purnea (PG), this led to total power failure at Purnea(B).*
- *Consequently total power failure occured at Forbesganj GSS.*
- *This led to de-energisation of 132 KV Forbesganj-Kataiya CKT-1,2,3.*
- *Consequently 132 KV Supaul-Kataiya CKT-1,2 tripped at O/C.*
- *132 KV Supaul-Kataiya CKT-1 tripped from Supaul end on 86B,O/C,Y&B phase.*
- *132 KV Supaul-Kataiya CKT-2 tripped from Ktaiya end on 67 O/C relay.*
- *Due to overdrawl of power from Dohabi(Nepal),132 KV Supaul-Kataiya CKT-2 tripped from SupaulGSS end on 86B,O/C,67Y phase relay at 20:01hrs.*

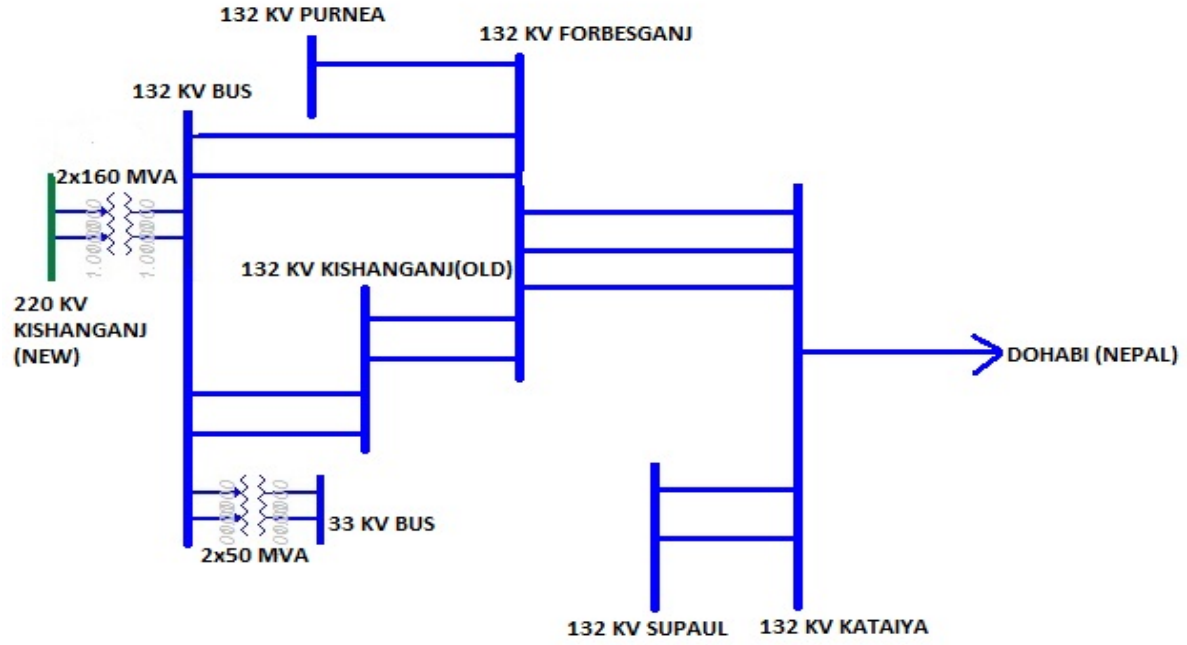
Relay indications:

S.NO.	Name of Bay/Line	Local end relay type/make & Indications	Remote end relay type/make & Indications
01	132 KV Purnea(PG)-Purnea ckt 2	67N and 86	O/C & E/F
02	132 KV Purnea(PG)-Purnea ckt 3	No information by PG	O/C and E/F
03	132 KV Purnea(PG)-Purnea ckt 1	No information by PG	No tripping

04	Supaul-Kataiya CKT-1	86B,O/C,Y&B	No tripping
05	Supaul-Kataiya CKT-2	No tripping	67 O/C
06	Supaul-Kataiya CKT-2	86B,O/C,67Y	No tripping

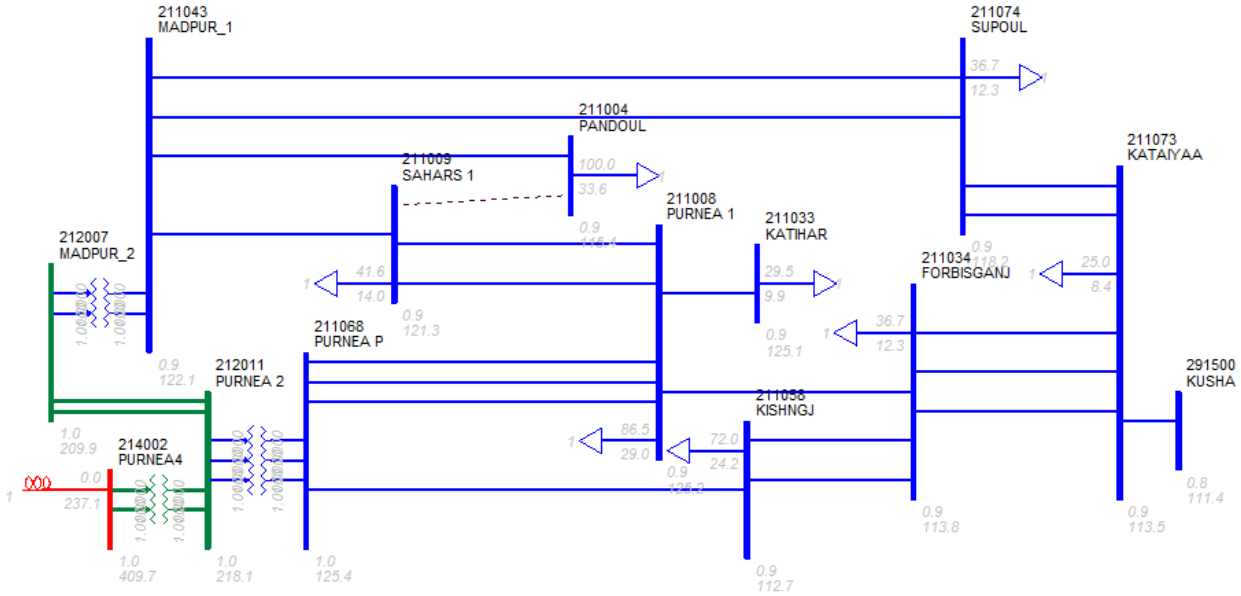
Remedial Measures:

With commissioning of 220/132/33 KV KISHANGANJ (NEW) GSS, the burden at 132 KV Purnea (BSPTCL) will be reduced and power to Dohabi(Nepal) can be fed smoothly. The connectivity diagram is given below:



ITEM NO. B.5: Tripping of 3 X 100 MVA, 220/132 kV ICT at Madhepura on 31-08-16 at 19:53 hrs.

At 19:53 Hrs, all the 3 X 100 MVA, 220/132 kV ICT at Madhepura tripped. The load at Nepal, Kataiya, Supaul & Madhepura were being catered through 132kV Purnea (B)- Forbisgunj S/C & 132kV Purnea(PG)- Kishangunj- Forbisgunj S/C lines. As total load supplied was of the order of 350 MW, these 132 kV lines tripped on O/C.



Relay indications:

Time (Hrs)	Details of tripping	Relay at local end	Relay at remote end
19:53 Hrs	220/132 kV ICT – I, II, IV at Madhepura	LBB relay	
	132 kV Purnea (PG) – Purnea (BSPTCL) - III	O/C	Did not trip
	132 kV Purnea (B) – Forbisgunj S/C	O/C & E/F	Did not trip
	132 kV Purnea (PG) – Kishangunj-Forbisgunj S/C	O/C	Did not trip

Status of Reporting:

- BSPTCL has submitted the tripping report on 03-09-16.

Analysis of PMU plots:

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

BSPTCL may explain the following:

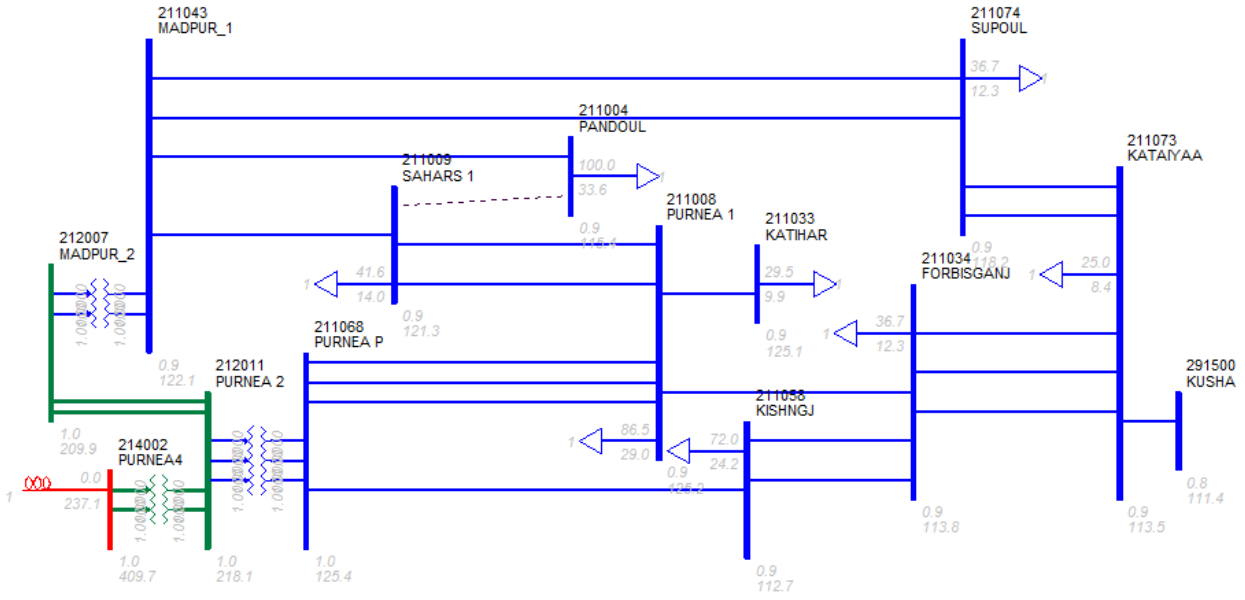
- The reason for tripping of 220/132 kV ICT – I, II, III at Madhepura.
- Bihar SLDC may submit the amount of energy un-served due to this incident.

Deliberation in the meeting

BSPTCL explained the following:

- *220/132 kV ICT – I, II, III at Madhepura tripped due to mal-operation of LBB.*
- *Subsequently, the 132kV Purnea (B)- Forbisgunj S/C & 132kV Purnea(PG)- Kishangunj-Forbisgunj S/C lines tripped on over load.*
- *M/S Siemens has been consulted for rectification of problem of Maloperation of LBB relay.*

ITEM NO. B.6: Tripping of 220 KV Purnea-Madhepura line I & II on 31-08-16 at 22:12 hrs.



At 22:12 Hrs, 220 KV Purnea-Madhepura-II & I tripped on R-N fault & overload respectively. After tripping of 220 kV Purnea - Madhepura D/C, load at Nepal, Kataiya, Supaul & Madhepura was supplied through 132kV Purnea(B)- Forbisgunj S/C & 132kV Purnea(PG)- Kishangunj- Forbisgunj S/C which tripped on overload.

220 KV Purnea-Madhepura – I was restored at 22:32 hrs. It was hand-tripped at 23:48 hrs. due to voltage unbalance.

Relay indications:

Time (Hrs)	Details of tripping	Relay at local end	Relay at remote end
22:12 Hrs	220 KV Purnea(PG) - Madhepura-II	RN, Z-I, 47.6 km from Purnea, F/C = 2.7 KA, A/R Successful	Yet to be received
	220 KV Purnea(PG) - Madhepura-I	Overload	Yet to be received
	132 kV Purnea (PG) – Purnea (BSPTCL) T/C	Overload	Did not trip
	132 kV Purnea (PG) – Kishangunj S/C	Overload	Did not trip

Status of Reporting:

- BSPTCL has submitted the tripping report on 03-09-16.

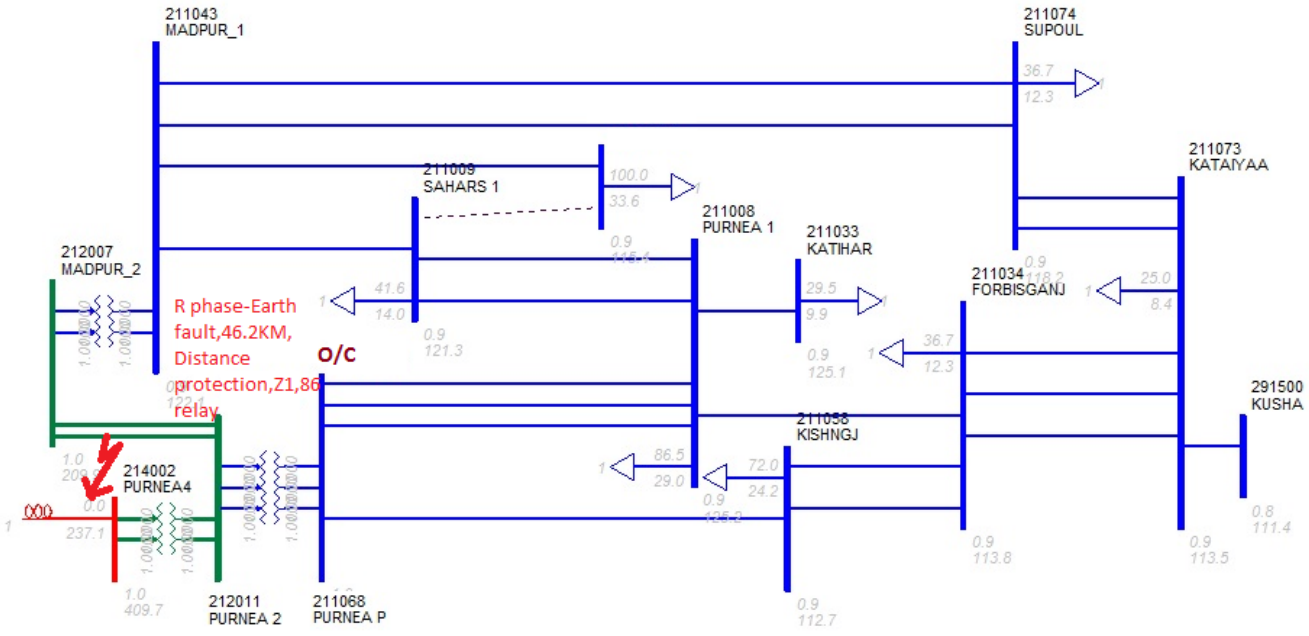
Analysis of PMU plots:

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

BSPTCL and Powergrid may explain the following:

- The reason for tripping 132 kV Purnea (Bihar) – Purnea (PG) –T/C, 132 kV Purnea (PG) – Kishangunj S/C & 220 KV Purnea (PG) - Madhepura-I.
- Bihar SLDC may submit the amount of energy un-served due to this incident.

<u>Deliberation in the meeting:</u>



BSPTCL explained the following with the above diagram:

- *At 22:12 Hrs. 220 KV Madhepura-Purnea(PG) CKT-II was tripped due to jumper snapping.*
- *Subsequently, 220 KV Madhepura-Purnea(PG) CKT-I also tripped on overload.*
- *This resulted in tripping of 132kV Purnea(B)- Forbisgunj S/C & 132kV Purnea(PG)-Kishangunj- Forbisgunj S/C were tripped lines on overload*

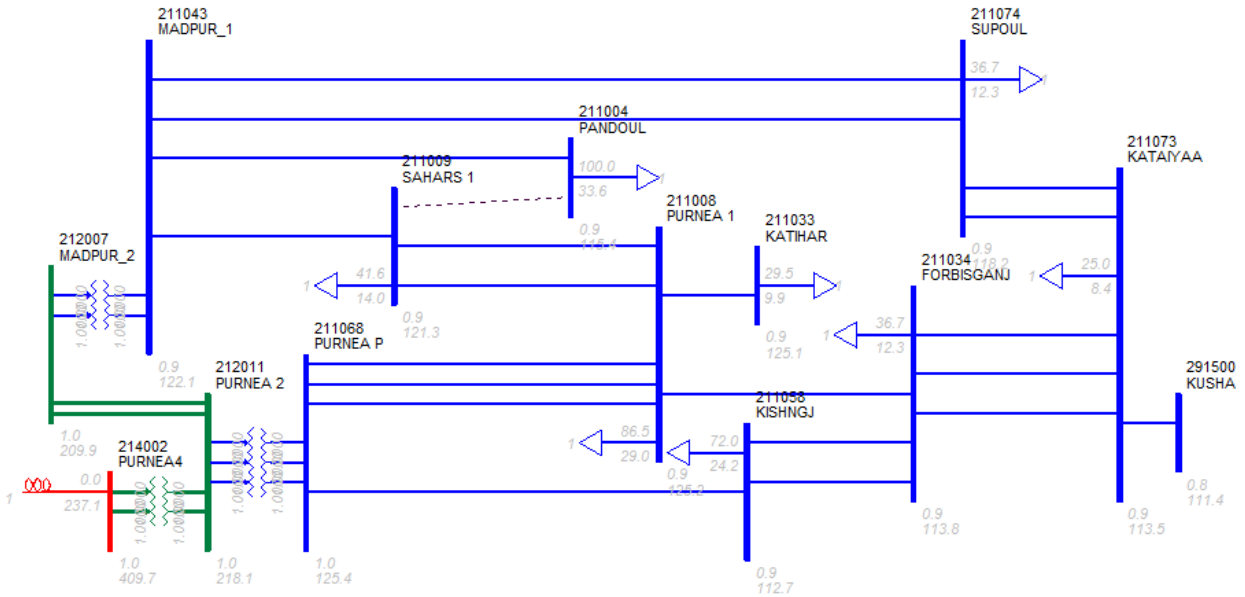
- *At 22:45 Hrs. 220 KV Madhepura-Purnea(PG) CKT-II was under breakdown and 220 KV Madhepura-Purnea(PG) CKT-I was charged again, but humming sound was heard from all power transformes with the following voltage profiles: Vry=232KV,Vyb=116KV,Vbr=141 KV.*
- *The voltage profile clearly indicated the broken conductor in B-phase.*
- *Consequently 220 KV Madhepura-Purnea(PG) CKT-I was hand tripped.*
- *After thorough patrolling of above two circuits, it was found that B-phase jumper of 220 KV Madhepura-Purnea(PG) CKT-I snapped at location no.51.*
- *After restoration work 220 KV Madhepura-Purnea(PG) D/C line was charged at 13:07 hrs on 01.09.16*

Remedial Measures taken by BSPTCL:

- *220 KV Madhepura-Purnea(PG) D/C was thoroughly patrolled and tree prunning was done wherever required. The transmission line is clear of unwanted vegetation.*
- *As a remedial measure jumper tightening is also in progress .Out of 80 tension towers of 220 KV Madhepura-Purnea(PG) D/C, Jumper-tightening at 10 towers is already completed.*

ITEM NO. B.7: 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.

Deliberation in the meeting

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.*

ITEM NO. B.8: 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.

WBSETCL and WBPDCL may explain.

Deliberation in the meeting

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

PART- C:: OTHER ITEMS

ITEM NO. C.1: Frequent tripping of 220kV Ib TPS-Budhipadar line in the month of August, 2016

220kV Ib TPS-Budhipadar line is tripping repeatedly. Tripping details of Aug 2016 are enclosed at **Annexure-C1**.

It was also observed that whenever 220kV Ib TPS-Budhipadar line-III is tripping the ckt 4 also getting tripped consequently.

On 30th Aug 2016 at 16:09-16:18 hrs three ckts out of four got tripped and this resulted in an unit tripping and generation reduction of other units.

Ib-TPS and OPTCL may explain.

Deliberation in the meeting

OPTCL informed that there was huge debris dumped between two towers of the 220kV Ib TPS-Budhipadar line which was causing earth fault. Now the debris had been cleared.

Regarding the tripping of 220kV Ib TPS-Budhipadar line-IV along with the line-III, it was advised to check the Switch on to fault (SOTF) settings.

In 46th PCC, OPTCL was advised give a presentation on islanding scheme implementing at Ib-TPS in next PCC meeting.

Ib-TPS and OPTCL may present the details.

Deliberation in the meeting

OPTCL explained the Ib-TPS islanding scheme with a presentation which is enclosed at ***Annexure-C.1A.***

ITEM NO. C.2: Tripping incidences in the month of August, 2016

Other tripping incidences occurred in the month of August, 2016 which needs explanation from constituents of either of the end is given at Annexure- C2.

Members may discuss.

Deliberation in the meeting

Members explained the tripping incidences. Updated list is enclosed at **Annexure- C2.**

ITEM NO. C.3: 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.

JUSNL may update.

Deliberation in the meeting

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

ITEM NO. C.4: 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.

Deliberation in the meeting

Members noted for compliance.

ITEM NO. C.5: 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.

Deliberation in the meeting

PCC advised all the constituents to comply the pending observations.

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

Schedule for 27th to 30th September, 2016:

Third Party Protection:

- 400kV Biharshariff
- 765kV Gaya
- 400kV Lakhisarai
- 400kV Banka

ERPC Protection Committee visit

- 220KV Begusarai
- 220 kV Biharshariff

UFR testing:

- 132kV Rajgir
- 132kV Nalanda
- 132/33kV Bari Pahari(Biharshariff)

Members may discuss and finalize.

Deliberation in the meeting

PCC decided to carry out the Third Party Protection audit of 765 kV Gaya, 400 kV Bihar Sharif of PGCIL, 400 kV Nabinagar and 220 kV Bihar Sharif of BSPTCL in Sept/Oct, 2016.

Further, it was also decided that the audit team will be comprised of one member each from DVC, West Bengal, Powergrid, ERLDC and ERPC.

It was also decided that the third party audit team will carry out the UFR inspection of 132/33 KV Bari Pahari (Bihar Sharif), Nalanda and Rajgir sub-stations of BSPTCL along with third party audit in Sept/Oct, 2016.

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. 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.

Members may note.

Deliberation in the meeting

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.

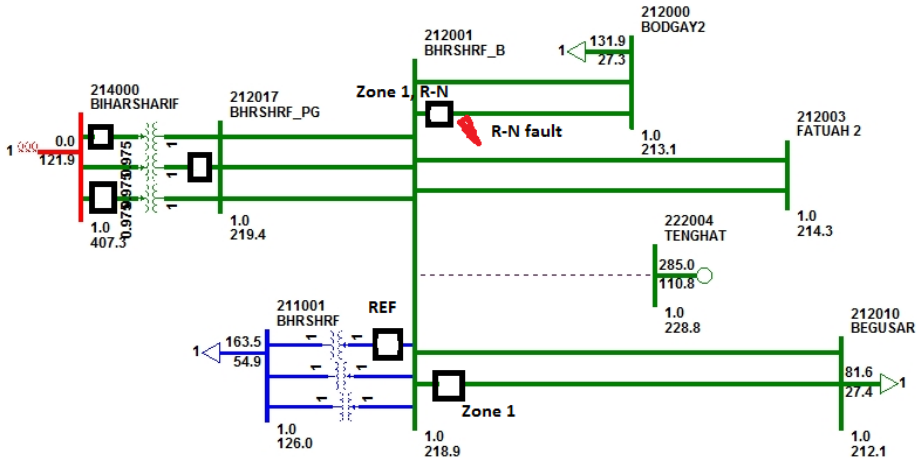
PART- D

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 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-II 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.

Deliberation in the meeting

BSPTCL informed that the information will be submitted soon..

Item No D.2 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.

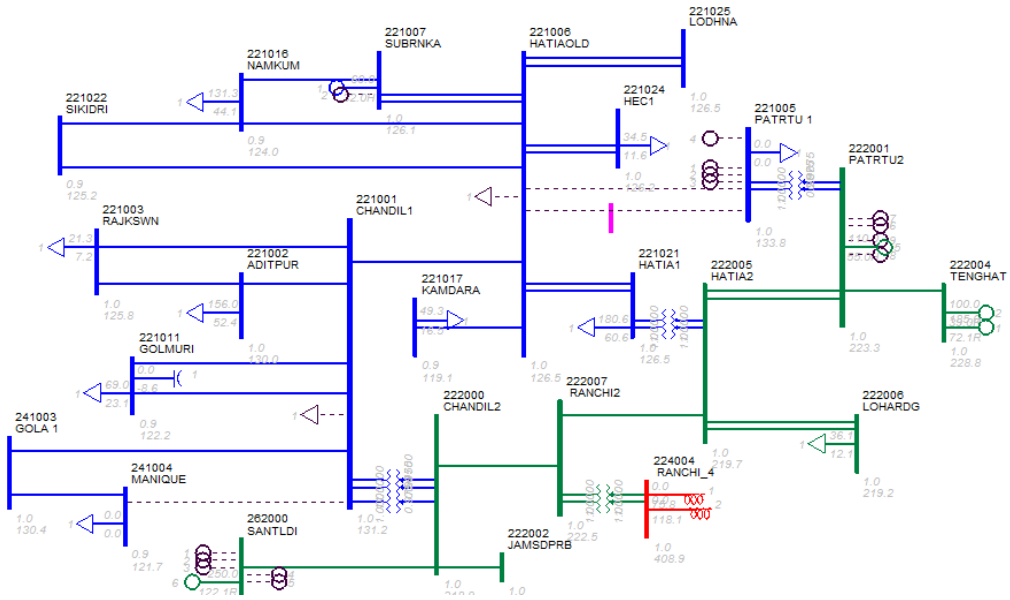
Powergrid may update.

Deliberation in the meeting

*Powergrid submitted a report which is enclosed at **Annexure- D.2**.*

Item No D.3 Total Power failure at 220/132kV Hatia S/s of JUSNL system on 20-04-16 at 15:05 hrs

At 14:57 hrs, SLG (i.e. B-N) fault had occurred in 220kV Ranchi- Chandil S/c line near to Chandil S/s. And due to delayed clearance of the fault from Ranchi S/s, the other 220kV lines emanating from Hatia S/s such as 220kV Ranchi- Hatia D/c lines tripped from Hatia end. Thereafter running unit of Patratu (U#10) tripped due to heavy electrical jerk.



Relay indications are as follows:

Time (Hrs)	Details of tripping	Relay at local end	Relay at remote end
14:57 hrs	220kV Ranchi-Chandil S/c	At Ranchi Tripped	At Chandil B-P, Zone-I, Fault location-38.22 KM, Earth Fault
	220kV Hatia-Ranchi-I	At Ranchi Did not Tripped	AT Hatia Earth Fault
	220kV Hatia-Ranchi-II	At Ranchi Did not Tripped	AT Hatia Earth Fault
	Patratu U# 10	Due to electrical Jerk	
15:05-15:10 hrs	220kV PTPS- Hatia –I	At Hatia O/V	At PTPS Did Not Trip
	220kV PTPS- Hatia –II	At Hatia O/V	At PTPS Did Not Trip
	132kV PTPS- Hatia-I	At PTPS O/C	At Hatia Did not Tripped
	132kV PTPS-Kanke-Hatia-	At PTPS O/C	At Kanke Did not Tripped
	220kV PTPS- TTPS S/c	At PTPS O/V	At TTPS Did not Tripped
	TTPS U # 2	Tripped on O/V	

Analysis of PMU plots:

- From the Ranchi PMU plot 9kV Voltage dip has been observed in B-Ph at 14:57 hrs.
- Fault clearance time was approx.440 ms.

JUSNL and Powergrid may explain the following:

- Delayed tripping of Ranchi- Chandil S/c line from Ranchi end may be investigated and explain by PGCIL.
- Tripping of 220kV Patratu- Hatia D/c line and 220kV PTPS- TTPS S/c from Hatia end on over voltage
- Tripping of 132kV PTPS- Kanke-Hatia line from PTPS end on over current
- Status of 220/132kV ATRS at Hatia (tripped or not).

PCC advised JUSNL submit detailed report to ERPC and ERLDC at the earliest.

JUSNL may update.

Deliberation in the meeting

JUSNL vide mail dated 18.09.16 has submitted the detailed report with DR & EL wherein the followings were explained:

- *220KV Chandil to PGCIL Circuit tripped on E/F at 14.57 hrs at both end (Zone-I, 38.22Km). At Chandil GSS fault was cleared but due to delayed tripping in PGCIL 220KV bay the fault proceeded to Hatia 220KV & PTPS. Subsequently unit 10 of PTPS was tripped.*
- *At 15.10hrs, over excitement in Tenughat led to tripping of TTPS-PTPS line on Over Voltage leads to Total Power Failure(TPF) in Hatia-II 220KV GSS.*

- *150MVA Transformer No.2 of Hatia II GSS was also tripped with relay 86A1, 86A2.*

Relay Indications:

Sl. No.	Name of Bay/Line	Tripping time (Hrs.) (Local End)	Restoration time (Hrs.)	Local End Relay indication	Remote End Relay indication
1	220KV Chandil-PGCIL	14:57	15:18	E/F B-phase, zone 1,fault location, 38.22KM, Master tripped relay 86, Fault Amp-Ia-110.1A,Ib-106.3A,Ic-95.15A,Tripped phase ABC,E/F start>1, Auxiliary relar lock out, Fault duration 213.5ms, Block A/R, Relay tripped time- 100.1 ms, VAN- 129.4KV, VBN - 129.5 KV, VCN- 131.4 KV, Fault resistance 33.60 Ohm	E/F, B Phase, Fault current 0.5 KA
2	220KV Hatia-II – PGCIL Ckt-I	P442 main-I 14:57 P442 main-II 14:57	15:21	Active group - 1, E/F, VT fail alarm, AR locked out short, Fault Duration 200.0 ms, Relay trip time 625.35 ms	Did not trip
3	220KV Hatia-II - PGCIL Ckt-II	P442 main-I 14:49 P442 main-II 14:46	15:22	Active group - 1, E/F, VT fail alarm, AR locked out short, Fault Duration 185.0 ms, Relay trip time 95.00 ms	Did not trip
4	220KV Hatia-II - PTPS Ckt-I	P442 main-I 15:09 P442 main-II 15:08	16:01	Active group - 1, Started phase A, V>1 trip, VT fail alarm, Trip phase ABC, Fault duration 440.1 ms, Relay trip time 941.4 ms	Did not trip
5	220KV Hatia-II - PTPS Ckt-II	P442 main-I 15:08 P442 main-II 15:08	16:02	Activre group - 1, Srarted phase C, V>1 trip,VT fail alarm, AR locked out short, relay tripping time 1.277 ms	Did not trip
6	220KV PTPS - TTPS T/L both Ckt. Tripped at PTPS end.	15:10	15:25	O/V relay	Did not trip
7	132KV PTPS - Hatia I 8C & 9C T/L tripped at PTPS end	15:10	15:48	O/C relay	Did not trip
8	PTPS Unit no- 10	14:57	21:22	Due to electric jerk	
9	TTPS Unit no-02	15:10		O/V relay	

Item No D.4 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.

Deliberation in the meeting

PCC advised Powergrid & NTPC to submit a report on the progress..

Item No D.5 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*

Deliberation in the meeting

OPTCL informed that the 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 noted for compliance.

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

Deliberation in the meeting

OPTCL is yet to submit the report.

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.

Deliberation in the meeting

WBSETCL informed that the bus differential scheme at 400kV Bidhannagar S/s will be tested during opportunity shutdown.

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.

Deliberation in the meeting

BSPTCL informed that the work is in progress.

Meeting ended with vote of thanks to the chair and best wishes for Durga Puja.

****

Annexure- A

Participants in the 47th PCC meeting

Venue: ERPC Conference Hall, Kolkata Time: 11:00 hrs Date: 19.09.2016 (Monday)

Sl No	Name	Designation/ Organization	Contact Number	Email	Signature
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16	S. Bal	PGCIL	9903180042	sukdevbal@powergridindia.com	[signature]
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18	D. K. Bauri	EE, ERPC	9883617236	eeop.erpc@gov.in	[signature]
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20	G.K. Choubey	CE, BSPTCL	7763817705	gkc1959@rediff.com	[signature]

Participants in the 47th PCC meeting

Venue: ERPC Conference Hall, Kolkata Time: 11:00 hrs Date: 19.09.2016 (Monday)

Sl No	Name	Designation/ Organization	Contact Number	Email	Signature
21	Dharambeer Singh	AEE/SLDC JUSNL	9771850485	sldcranchi@gmail.com	
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34	PK Mahapatra	DGM	9338715401	pradeep.mahapatra@opgc.co.in	
35	SUDIPTA GHOSH	Mgr-(PS), WBPDCL	9474363864	g-sudiptas@rediffmail.com	
36	A. Sen Pradhan	SE(E) DVC	9932719986	aditi_senpradhan@dvcindia.org	
37	P. HALDER	DGM(OS) WBPDCL	8336903685	phaldar@wbpdcl.co.in	
38	P.P. Jena	AEE ERPC	9776198991	pranayapiyusha@gmail.com	
39	Jitendra Choubey	EEE BSPTCL	9102562671	Vedvdev@gmail.com	
40	V. Kalyanaraman	SE	8902499969	akucera	

Participants in the 47th PCC meeting

Venue: ERPC Conference Hall, Kolkata   Time: 11:00 hrs   Date: 19.09.2016 (Monday)

Sl No	Name	Designation/ Organization	Contact Number	Email	Signature
41	S.K. Naik	Ch. Mgr PS, ABSR	9437962169	amodisha@gmail.com	[signature]
42					
43					
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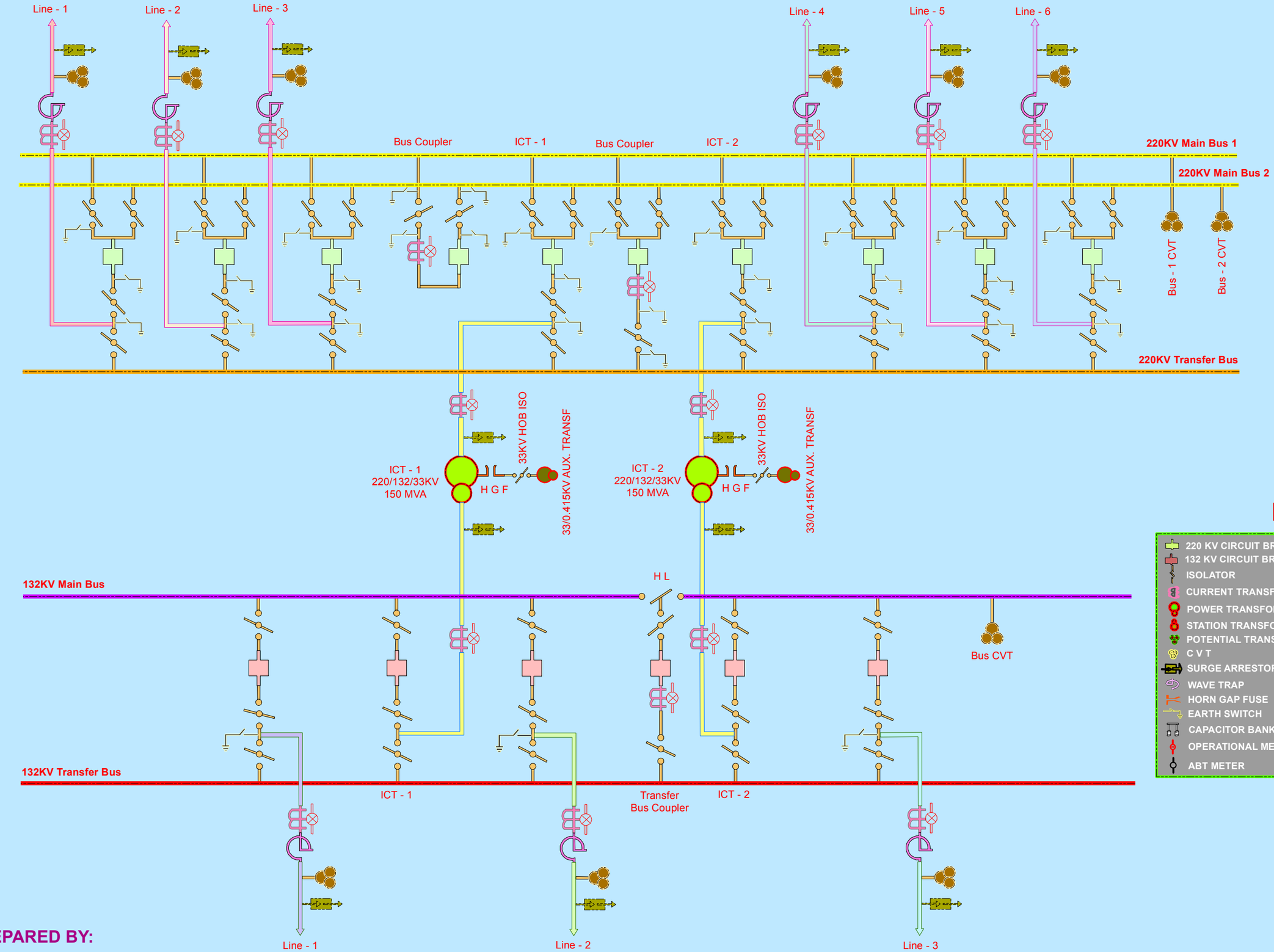
SINGLE LINE DIAGRAM OF 220/132 KV GSS PUSAULI

Annexure-B2



LEGEND

- 220 KV CIRCUIT BREAKER
- 132 KV CIRCUIT BREAKER
- ISOLATOR
- CURRENT TRANSFORMER
- POWER TRANSFORMER
- STATION TRANSFORMER
- POTENTIAL TRANSFORMER
- C V T
- SURGE ARRESTOR
- WAVE TRAP
- HORN GAP FUSE
- EARTH SWITCH
- CAPACITOR BANK
- OPERATIONAL METER
- ABT METER

- 220KV TRANSFER BUS
- 220KV MAIN BUS
- 132KV TRANSFER BUS
- 132KV MAIN BUS
- INCOMER
- 220KV LINE - 1
- 220KV LINE - 2
- 220KV LINE - 3
- 220KV LINE - 4
- 220KV LINE - 5
- 220KV LINE - 6
- 132KV LINE - 1
- 132KV LINE - 2
- 132KV LINE - 3

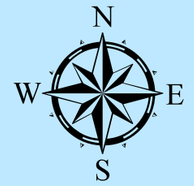
PREPARED BY:

NATIONAL INFORMATICS CENTRE
THE IT SUPPORT PROFESSIONALS

Authorized Signatory

SINGLE LINE DIAGRAM OF 220/132/33 KV GSS KHAGAUL

Annexure-B3



33KV Transfer Bus

33KV Main Bus

Capacitor Bank - 3
Capacitor Bank - 2
Capacitor Bank - 1
33KV Neora
33KV Khagaul - 1
33KV Khagaul - 2
Abandoned Bay
AIIMS - 1
33KV Bus Coupler
33KV Danapur - 1
33KV Danapur - 2
33KV Khagaul - 3
33KV Khagaul - 4
AIIMS - 2

33/0.415 KV SST No. - 1
To ACDB for 132/33 KV Control Room
132/33 KV 50 MVA Tr. No. - 1
132/33 KV 50 MVA Tr. No. - 2
132/33 KV 50 MVA Tr. No. - 3
33/0.415 KV SST No. - 1
To ACDB for 132/33 KV Control Room

132KV Main Bus

132KV Bihta - 1
132KV Bihta - 2
132KV Bus Coupler
132KV Digha - 1
132KV Digha - 2
132KV Railway

132KV Transfer Bus

220/132 KV 100 MVA Tr. No. 2
220/132 KV 100 MVA Tr. No. 1
220/132 KV 100 MVA Tr. No. 3

220KV Transfer Bus

220KV Main Bus

220KV Arrah - 1
220KV Arrah - 2
220KV Bus Coupler
220KV Sampatchak No. - 2
220KV Sipara

LEGEND

220 KV CIRCUIT BREAKER	C V T	132KV TRANSFER BUS	ARRAH - 1
132 KV CIRCUIT BREAKER	SURGE ARRESTOR	132KV MAIN BUS	ARRAH - 2
33 KV CIRCUIT BREAKER	WAVE TRAP	33KV MAIN BUS	BIHTA - 1
ISOLATOR	HORN GAP FUSE	33KV TRANSFER BUS	BIHTA - 2
CURRENT TRANSFORMER	EARTH SWITCH	220KV MAIN BUS	DANAPUR - 1
POWER TRANSFORMER	CAPACITOR BANK	220KV TRANSFER BUS	DANAPUR - 2
STATION TRANSFORMER	OPERATIONAL METER	INCOMER	DIGHA - 1
POTENTIAL TRANSFORMER	ABT METER	ABANDONED BAY	DIGHA - 2
KHAGAUL - 3	KHAGAUL - 4	NEORA	SAMPATCHAK NO. 2
ACDB FOR CONTROL ROOM	AIIMS - 1	SIPARA	
	AIIMS - 2	KHAGAUL - 1	
		KHAGAUL - 2	
		RAILWAY	

PREPARED BY:

NATIONAL INFORMATICS CENTRE
THE IT SUPPORT PROFESSIONALS

Authorized Signatory

Annexure-C1

ODISHA POWER GENERATION CORPORATION LTD.
(A Government Company of the State of Odisha)
CIN: U401040R1984SG001429

Ib Thermal Power Station
Banharpali, Dist.: Jharsuguda, Odisha - 768 234, India
Plant Manager : (+916645) 289266, Fax: (+916645) 222-230
Factory Manager : (+916645) 222224, Fax: (+916645) 222-230

OPGC
Power For Progress

To

A.K.Bandhyopadhyaya
Member Secretary
Eastern Region Power Committee
14Gulf Club Road, Tollygunj,
Kolkata-700033

Ltr.No ITPS(E):-446

Date:- 08.09.2016

Sub: Agenda items to include in 47th PCC meeting on 19th September-2016

Ref: Your letter No.ERPC/PROTECTION/2016/ -, dtd.02.09.2016

Sir,

With reference to above, we herewith request to include the followings points in the agenda item in 47th PCC meeting to be held on 19th September-2016:

01. Frequent tripping of 220KV IB-Budhipadar circuit occurred in the month of Aug-16:

The details are as follows:

Date	Time(Hrs)	Line	Relay Indications	
			IBTPS End	Budhipadar End
02/08/2016	05:43	1	Dist Z1	Dist Z1 (Y&B PH)
02/08/2016	05:43	2	Dist Z1	Dist Z1 (Y&B PH)
02/08/2016	07:28	4	Dist Z1(R-Ph)	Dist Z1(R-Ph)
24/08/2016	12:36	3	Dist Z2, B/C O/C &E/F	Dist Z1 (B-Ph)
24/08/2016	12:36	4	Not tripped	Tripped (NA), Ann SOTF
26/08/2016	19:28	3	Dist Z2, B/U O/C & E/F	Dist Z1 (B-Ph)
26/08/2016	19:28	4	Not tripped	Tripped (NA), Ann SOTF
30/08/2016	10:09	3	Dist Z2, B/U O/C & E/F	Dist Z1 (B-Ph)
30/08/2016	10:09	4	Not tripped	Tripped(NA), Ann. SOTF
30/08/2016	16:09	3	Dist Z2, B/U O/C & E/F	Dist Z1 (B-Ph)
30/08/2016	16:09	4	Not tripped	Tripped(NA), Ann. SOTF
30/08/2016	16:18	2	Dist Z1 (B-Ph), DIR E/F	Dist Z1 B-Ph E/F
31/08/2016	14:32	3	Dist Z2 , B/U O/C & E/F	Dist Z1

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Banharpali, Dist.: Jharsuguda, Odisha - 768 234, India
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OPGC
Power For Progress

It is observed from the above sequences that whenever IB-Budhipadar Circuit -3 tripped, circuit-4 also tripped consequently without any sufficient relay indication.

On 30th Aug at 16:09-16:18hrs 3 number of circuits out of 4 circuits got tripped while our both units were in service, hence it could have resulted in an Unit tripping. Thus generation of both units were reduced to a safe margin to avoid Unit tripping on line overload.

This type of undesirable tripping is causing a system disturbance at our end followed by generation loss. Therefore we request for proper investigation in this regard to avoid such occurrences in future.

This is for your kind information and necessary action please.

Thanking you,

Yours faithfully

08.09.16

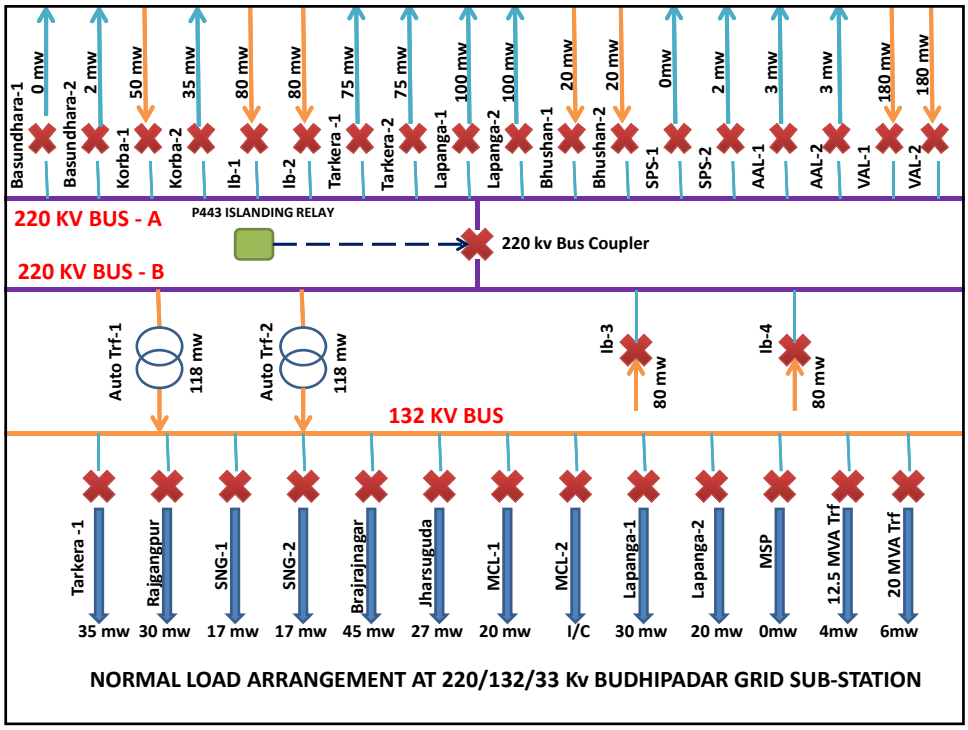
Plant Manager

cc to:
(i) Chief Load Dispatcher, SLDC, OPTCL, P.o Mancheswar Rly. Colony Bhubaneswar.
(ii) Chief General Manager (O&M), OPTCL, Janpath, Bhubaneswar.

Corporate Office : Zone-A, 7th Floor, Fortune Tower
Chandrasekharpur, Bhubaneswar - 751023, Odisha
Ph: 0674-2303765-66, Fax : 0674-2303755
website : www. opgc.co.in

PPT ON ISLANDING SCHEME TO BE ADOPTED AT 220/132/33 Kv BUDHIPADAR GRID S/S

SUDIPTA SENGUPTA
D.G.M (E&MR),
OPTCL.



NORMAL LOAD ARRANGEMENT AT 220/132/33 Kv BUDHIPADAR GRID SUB-STATION

CONDITION REQUIRED BY IB THERMAL TO SAFE GUARD THEIR GENERATOR FROM SYSTEM DISTURBANCE

1. Separate house load in tune of 140-150 MW radially on IB Thermal from Budhipadar.

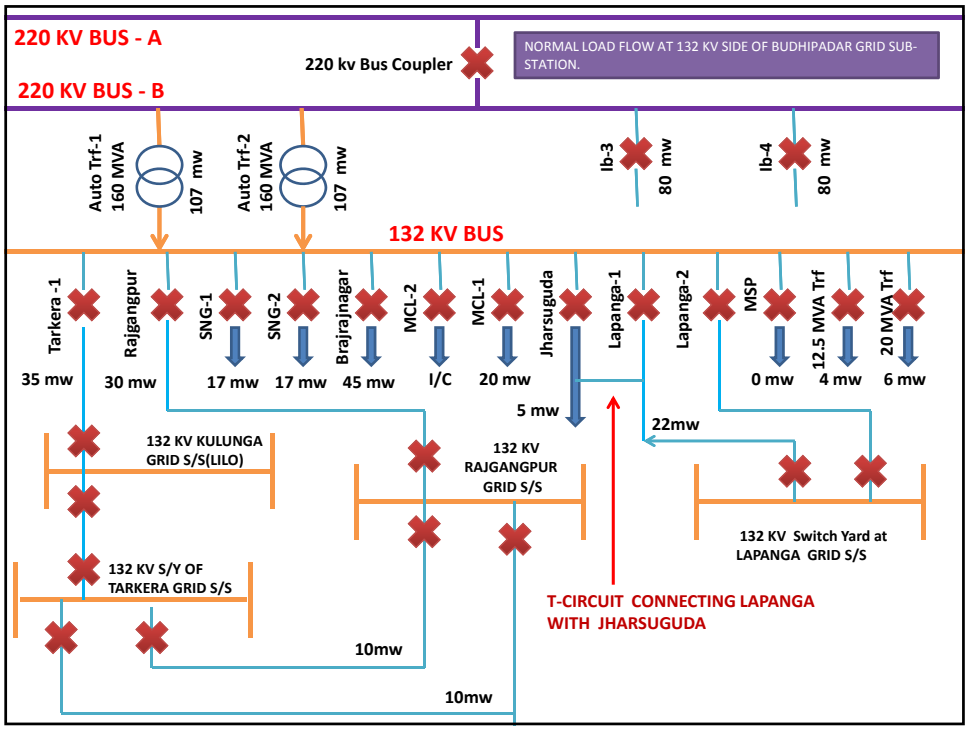
2. A ramping signal from islanding relay from Budhipadar to the IB Generator.

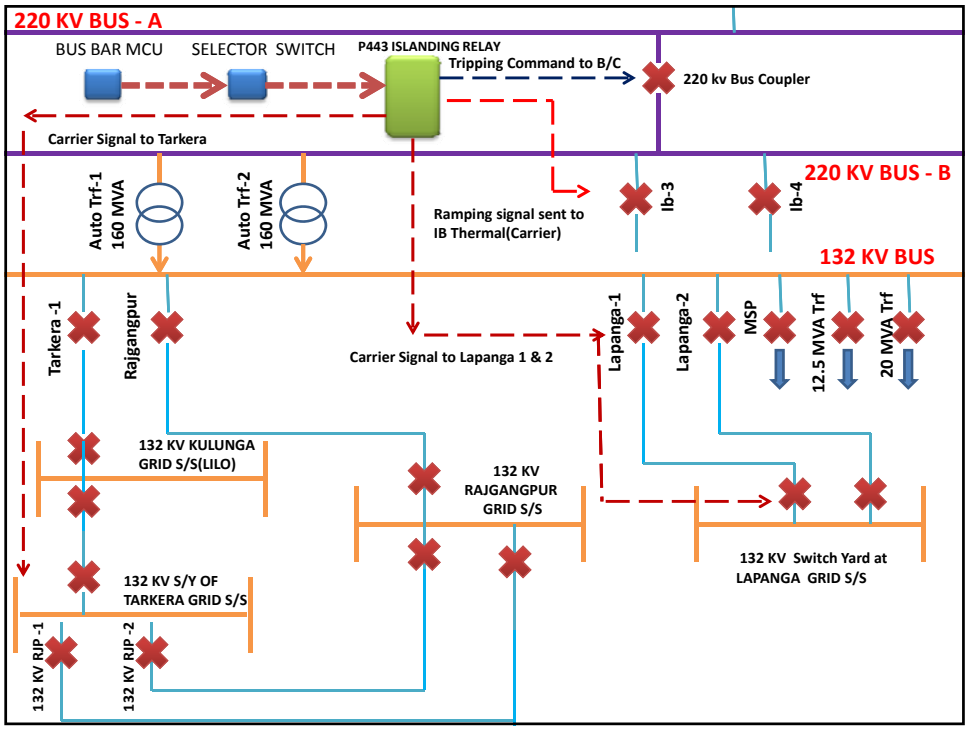
CONDITIONS FOR ISLANDING RELAY

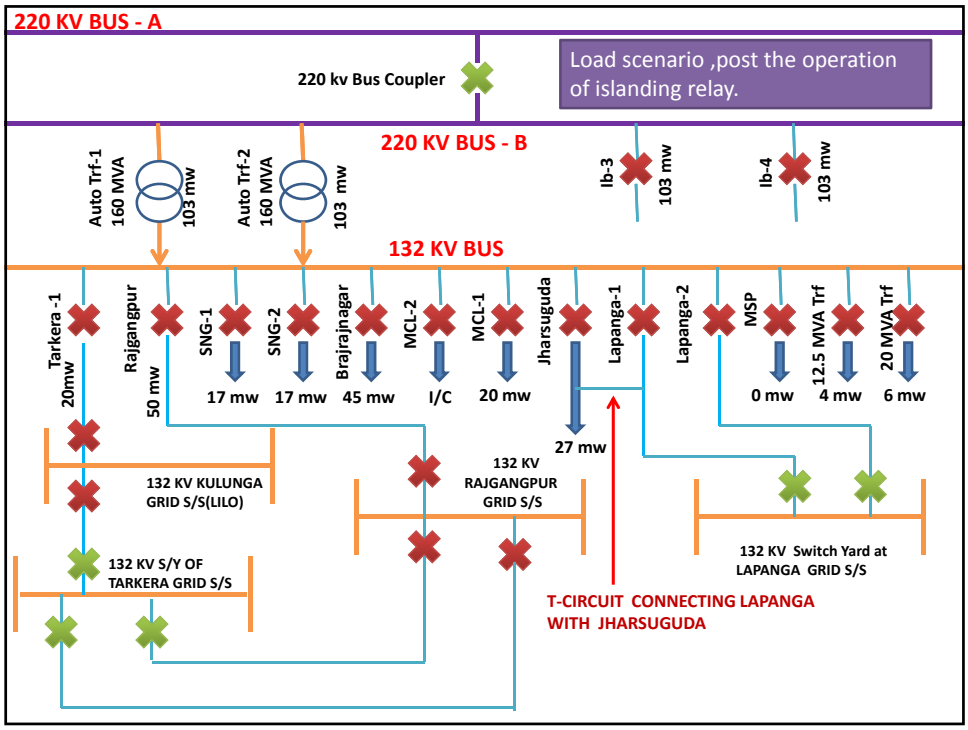
1. DF/DT =0.7Hz/Sec Time=500 ms
2. >HZ (Over Frequency)= 51.25Hz/3Sec & 52.0Hz/1Sec
3. <HZ (Under Frequency)=48.5Hz/3Sec & 48.2Hz/1Sec
4. Over Voltage(Phase)= 140KV/5 Sec & 146KV/1Sec
5. Under Voltage(Phase)=114KV/5Sec & 108KV/1Sec

Note- Islanding relay(P443) will actuate even in case of Bus-Bar Protection Operation.

Note- 132 /33 Kv Kuchinda Grid S/s will get power from either Rajgangpur or sambalpur


220 KV BUS - A
220 kv Bus Coupler
NORMAL LOAD FLOW AT 132 KV SIDE OF BUDHIPADAR GRID SUB-STATION.
220 KV BUS - B
Auto Trf-1 160 MVA
107 mw
Auto Trf-2 160 MVA
107 mw
Ib-3
80 mw
Ib-4
80 mw
132 KV BUS
Tarkera -1
Rajgangpur
SNG-1
SNG-2
Brajrajnagar
MCL-2
MCL-1
Jharsuguda
Lapanga-1
Lapanga-2
MSP
12.5 MVA Trf
20 MVA Trf
35 mw
30 mw
17 mw
17 mw
45 mw
I/C
20 mw
0 mw
4 mw
6 mw
5 mw
22mw
132 KV KULUNGA GRID S/S(LILO)
132 KV RAJGANGPUR GRID S/S
132 KV Switch Yard at LAPANGA GRID S/S
132 KV S/Y OF TARKERA GRID S/S
T-CIRCUIT CONNECTING LAPANGA WITH JHARSUGUDA
10mw
10mw


220 KV BUS - A
BUS BAR MCU
SELECTOR SWITCH
P443 ISLANDING RELAY
Tripping Command to B/C
220 kv Bus Coupler
Carrier Signal to Tarkera
220 KV BUS - B
Auto Trf-1 160 MVA
Auto Trf-2 160 MVA
Ramping signal sent to IB Thermal(Carrier)
Ib-3
Ib-4
132 KV BUS
Tarkera -1
Rajgangpur
Carrier Signal to Lapanga 1 & 2
Lapanga-1
Lapanga-2
MSP
12.5 MVA Trf
20 MVA Trf
132 KV KULUNGA GRID S/S(LILO)
132 KV RAJGANGPUR GRID S/S
132 KV Switch Yard at LAPANGA GRID S/S
132 KV S/Y OF TARKERA GRID S/S
132 KV RJP -1
132 KV RJP -2



THANK YOU

SUDIPTA SENGUPTA
D.G.M (E&MR),
OPTCL.

Annexure- C.2

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

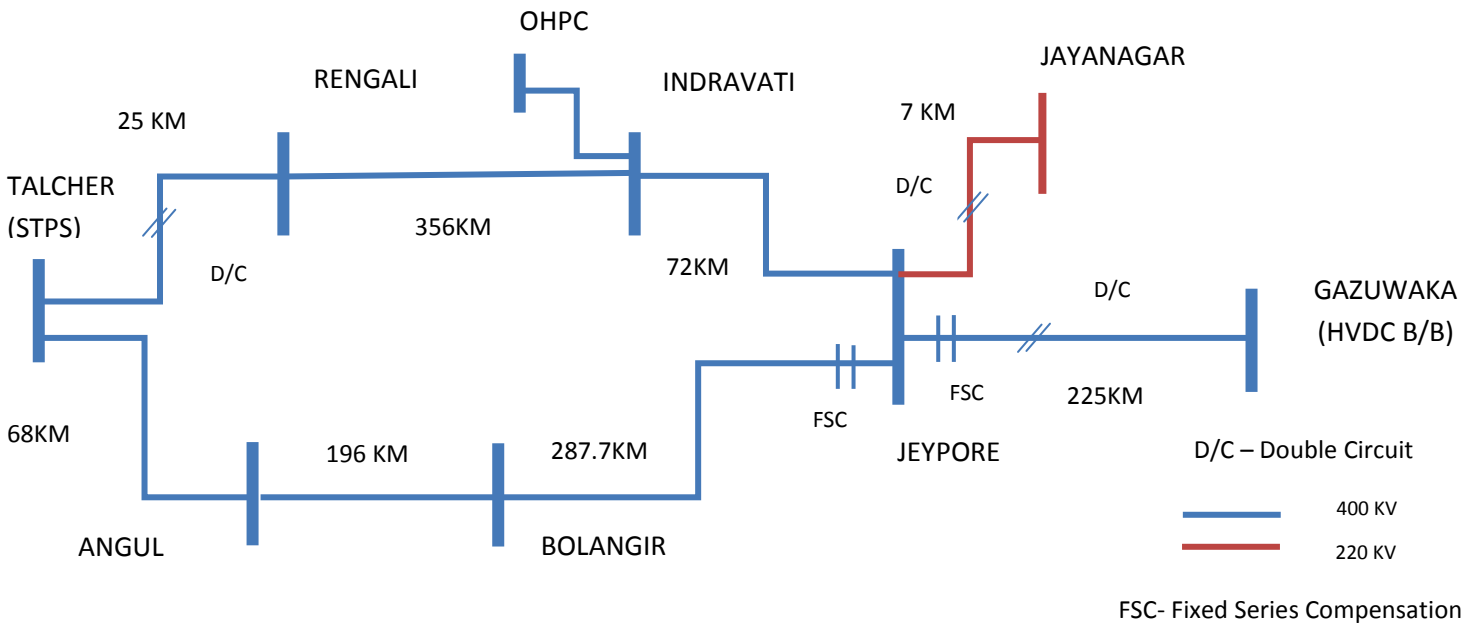
S.NO	LINE NAME	TRIP DATE	TRIP TIME	RESTORATION DATE	RESTORATION TIME	Reason	Fault Clearance time in msec	Relay Indication LOCAL END	Relay Indication REMOTE END	Auto Recloser status	DR/EL received within 24 Hrs	DR/EL received after 24 Hrs	Remarks
Fault clearing time is violating protection standard (As per PMU data)													
1	132 KV MUZAFFARPUR-DALKEBAR	01.08.16	19:14	01.08.16	19:52	R-N FAULT	520 ms approx	Z-III, R-Y, 299.6kM from MZF, Iy=514.04A, Ib=221.00A	Yet to be received	No autoreclose operation observed in PMU data	No	Yes	Z-III timing may be coordinated
2	220 KV FARAKKA-LALMATIA	03.08.16	17:45	03.08.16	18:34	TRIPPED FROM FARAKKA END ONLY	1000 ms approx	B-N, Z-III	Did not trip	--	No	No	Voltage dip observed in all three phases (PLCC not avbl)
3	400 KV JAMSHEDPUR-BARIPADA	06.08.16	13:14	06.08.16	14:47	R-Y FAULT	560 ms approx	R-Y , Z-II, 122.9 Km from Jamshedpur end IR -- 4.49 KA , IY -- 4.41 KA	R-Y , Z-I, 18.9 Km from Baripada end IR -- 8.9 KA , IY -- 9.1 KA	--	Yes	--	Z-II timing may be checked at Jamshedpur end
4	220 KV RANCHI - CHANDIL	07.08.16	01:17	07.08.16	18:34	B-N FAULT .	400 ms approx	Z-II, B-N	B-N, Z-I	No autoreclose operation observed in PMU data	No	Yes	Healthiness of PLCC channel may be checked
5	220 KV ROURKELA - TARKERA-II	11.08.16	08:31	11.08.16	17:40	B-N FAULT	600 ms approx	B-N, Z-I,	Yet to be received	No autoreclose operation observed in PMU data	Yes	--	
6	400 KV TALA-BINAGURI-II	14.08.16	13:05	17.08.16	21:34	Y-N FAULT	450 ms approx	Yet to be received	Y-N , Z-II, F/D- 139.4 Km from Binaguri, F/C- 1.04 KA (carrier received)	No autoreclose operation observed in PMU data	No	Yes	
7	220 KV CHANDIL-SANTALDIH	25.08.16	13:58	25.08.16	14:14	R-N FAULT	280 ms approx	R-N, Z-II, R- Ph, 136.30 Km from Chandil, F/C:1.329 KA	R-N, Z-I, 31.56 Km from STPS, Fault Duration : 63.27 ms, F/C: 2.490 KA	No autoreclose operation observed in PMU data	No	No	DR, EL & A/R are not available at STPS
Multiple tripping at same time													
1	220 KV JORETHANG-NEW MELLI	01.08.16	11:43	01.08.16	12:34	B-N FAULT	<100	B-N, 3.3 km from Jorethang	Did not trip	No autoreclose operation observed in PMU data	Yes	--	EL received from Jorethang
2	220 KV JORETHANG-RANGPO			01.08.16	12:27	B-N FAULT	<100	B-N, 19 km from Jorethang	Did not trip	No autoreclose operation observed in PMU data	Yes	--	EL received from Jorethang
3	220 KV NEW MELLI-RANGPO			01.08.16	12:41	B-N FAULT	<100	Yet to be received	O/C	No autoreclose operation observed in PMU data	No	No	
4	220 KV MUZAFFARPUR - HAZIPUR - II	10.08.16	12:51	10.08.16	13:17	B-N FAULT	<100	B-N, Z-II, 71 km from MZF	B-N, Z-I, 13.8 km from Hazipur	No autoreclose operation observed in PMU data	--	Yes	As per BSPTCL, there was no fault in second circuit
5	220 KV MUZAFFARPUR - HAZIPUR -I			10.08.16	13:40	B-N FAULT	<100	B-N, Z-II, 65 km from MZF	Z-I	No autoreclose operation observed in PMU data	--	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
6	220 KV CHUKHA -BIRPARA - I	25.08.16	17:03	25.08.16	18:12	LBB OPERATED AT CHUKHA	--	LBB operated at Chukha	DT Received	--	No	No	Spurious tripping at Chukha
7	220 KV CHUKHA -BIRPARA - II			25.08.16	18:32	LBB OPERATED AT CHUKHA	--	LBB operated at Chukha	DT Received	--	No	No	Spurious tripping at Chukha
Fault Not observed in PMU data													
1	765 KV GAYA - BALIA	10.08.16	01:00	10.08.16	03:04	DT RECEIVED at Gaya	--	DT Received	Yet to be received	--	No	Yes	
2	400 KV FARAKKA - SAGARDIGHI	16.08.16	13:10	16.08.16	13:33	OVER VOLTAGE	--	OVER VOLTAGE	OVER VOLTAGE	--	--	Yes	
3	400 KV PURNIA - BINAGURI -I	23.08.16	23:03	23.08.16	23:25	DT RECEIVED AT BINAGURI	--	Yet to be received	DT Received	--	No	No	PLCC Malfunction
4	220 KV BIRPARA - SALAKATI-I	31.08.16	18:02	31.08.16	19:14	DIRECTIONAL EARTH FAULT	--	TEF at Birpara end	Yet to be received	--	No	Yes	
No autorecloser operation observed in PMU data													
1	400 KV KOLAGHAT-KHARAGPUR	03.08.16	06:20	03.08.16	06:34	Y-N FAULT	<100	Y-N, Z-I, F/C= 7.55 KA, 31.28KM from KTPS, A/R Started	B-N, Z-I, A/R started, DT Recived	No autoreclose operation observed in PMU data	Yes	--	
2	400 KV PURNEA-MUZAFARPUR-I	03.08.16	18:11	03.08.16	19:16	R-N FAULT	<100	Yet to be received	Yet to be received	No autoreclose operation observed in PMU data	No	No	
3	400 KV GAYA - CHANDWA -II	04.08.16	18:03	04.08.16	18:34	B-N FAULT .	<100	Yet to be received	Yet to be received	No autoreclose operation observed in PMU data	No	No	
4	400 KV TALA-BINAGURI-I	14.08.16	13:05	14.08.16	13:31	Y-N FAULT	<100	Yet to be received	Y-N, Iy = 1.8 KA, Distance=188.9 KM, Z2 (Carrier aided trip), A/R successful for main breaker only	A/R successful at Binaguri end only	No	Yes	
5	400 KV TALCHER - ROURKELA -I	15.08.16	13:50	15.08.16	14:38	B-N FAULT	<100	B-N	Did not trip	No autoreclose operation observed in PMU data	Yes	--	Fault was in ckt - I which was auto reclosed from both the end
6	400 KV RANCHI - RAGHUNATHPUR	15.08.16	15:28	15.08.16	15:50	Y-N FAULT	<100	Y-N, Z-I, 55 KM from Ranchi F/C: .4.1 KA A/R successful.	Yet to be received	A/R successful at Ranchi end only	No	No	Problem in main - II channel at Raghunathpur
7	400 KV TALA - BINAGURI-IV	16.08.16	12:18	16.08.16	12:34	Y-N FAULT	<100	Yet to be received	Y-N, Zone II, 153.3 KM from Binaguri, F/C: 2.3 KA, Carrier Received, A/R started but 3 phase breakers tripped after DT receipt	No autoreclose operation observed in PMU data	Yes	--	

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%.

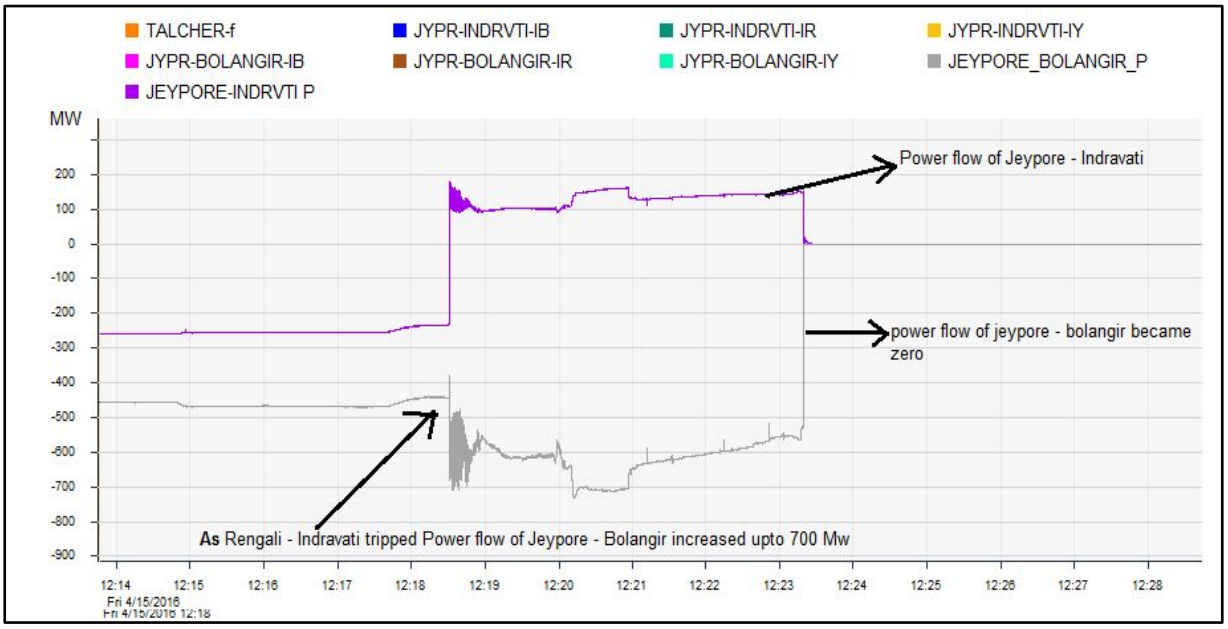
Sequence of Tripping occurred in present case:

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

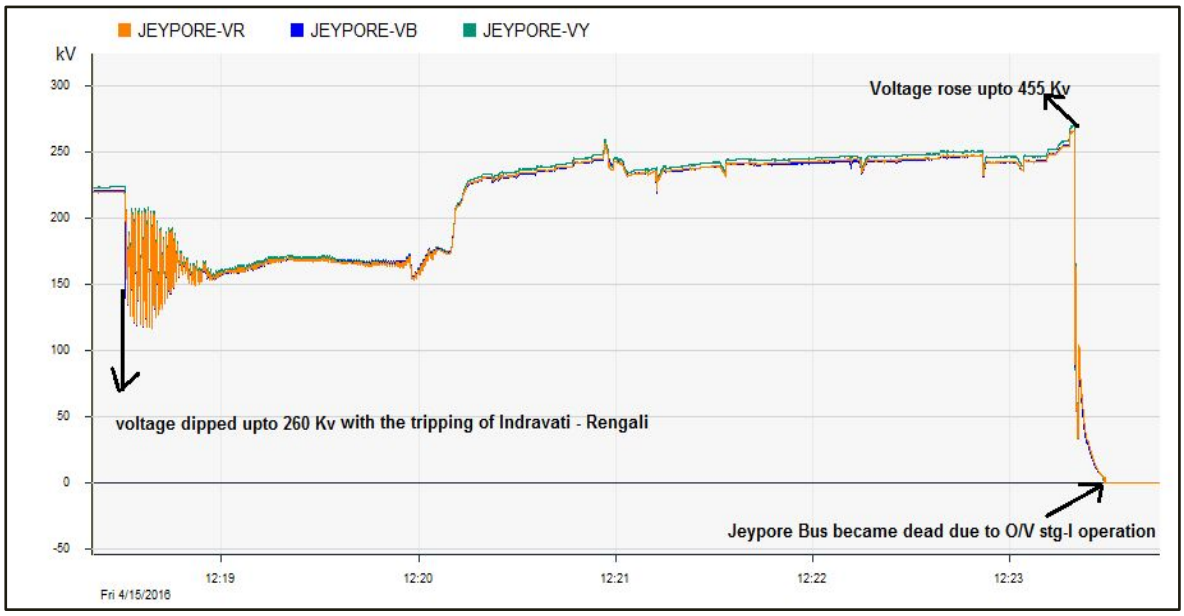
Analysis:

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.