



**106 वीं पीसीसी बैठक
का
कार्यवृत्त
Minutes
of
106th PCC Meeting**

दिनांक: 13.10.2021

Date: 13.10.2021

पूर्वी क्षेत्रीय विद्युत समिति

Eastern Regional Power Committee

14, गोल्फ क्लब रोड, टॉलीगंज, कोलकाता: 700 033

14, Golf Club Road, Tollygunge, Kolkata: 700 033

EASTERN REGIONAL POWER COMMITTEE

MINUTES OF 106TH PROTECTION COORDINATION SUB-COMMITTEE MEETING HELD ON 16.09.2021 AT 10:30 HOURS

Member Secretary, ERPC chaired the meeting. The meeting was convened through Microsoft Teams online platform.

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

PART – A

ITEM NO. A.1: Confirmation of minutes of 105th Protection Coordination sub-Committee Meeting held on 23rd Aug 2021 through MS Teams.

The minutes of 105th Protection Coordination sub-Committee meeting held on 23.08.2021 was circulated vide letter dated 07.09.2021.

Members may confirm.

Deliberation in the meeting

Members confirmed the minutes of 106th PCC Meeting.

PART – B

ITEM NO. B.1: Total Power Failure at 220 kV TTPS S/s on 11.08.2021 at 13:34 Hrs

220 kV Bus II & 220 kV TTPS-Meeramundali-II was under shutdown prior to the disturbance.

At 13:34 Hrs, 220 kV Bus-I at TTPS tripped resulting in total power failure at 220 kV TTPS S/S. Around 150 MW load loss occurred at Chainpal, Duburi and Angul.

Load Loss: 150 MW

Outage Duration: 00:15 Hrs

NTPC and OPTCL may explain.

Deliberation in the meeting

NTPC explained the event as follows:

- Before the disturbance, 220 kV Bus -II was under shutdown along with 220 kV TTPS-Meeramundali II to attend hotspot in this feeder.*
- At 13:34 hrs, while removing bird nest at 220 kV Bus I, metallic scrap fell on B phase of 220 kV Bus I resulting in B phase bus fault.*
- Subsequently busbar protection operated for 220 kV Bus- I and tripped all the elements connected to this bus. This resulted in total power failure at 220/132 kV TTPS S/s.*

On query from ERLDC regarding sending of DT signal to remote end of the lines during operation of busbar protection, NTPC representative informed that the PLCC is not operational for the lines connected to 220 kV TTPS s/s.

OPTCL informed that there was no tripping at Joda as well as Meramundali end during the disturbance.

Regarding PLCC issue, OPTCL representative submitted that PLCC is operational at OPTCL end of the line however the same is not functional at TTPS end.

PCC advised OPTCL to submit present status of PLCC communication for all the lines connected to 220 kV TTPS S/s and take actions to operationalize PLCC communication so that carrier-aided tripping scheme and autorecloser scheme can be implemented in those lines.

In a separate query, NTPC intimated that as TTPS units have stopped generating power and are going to be dismantled, a proposal is under consideration for handing over of 220 kV TTPS switchyard to OPTCL and the substation would be handed over to OPTCL in near future.

ITEM NO. B.2: Total Power Failure at 220 kV Sonenagar S/s on 06.08.2021 at 15:18 Hrs

At 15:18 hrs, 220 KV Bus-I at Sonenagargot tripped on operation of bus bar protection. As a result, 220 KV Chandauti-Sonenagar D/C tripped leading to total power failure at 220/132 KV Sonenagar (BSPTCL) and radially connected 132 KV Substations.

Relay Indications:

Time	Name	End 1	End 2	PMU Observation
15:18	220KV Bus-1 at Sonenagar	Bus Bar Protection operated at Sonenagar	-	1 kV dip observed in Y_ph and B_ph voltage at Chandauti
	220 KV Chandauti-Sonenagar-1			
	220 KV Chandauti-Sonenagar-2			

Load Loss: 150 MW

Outage Duration: 00:19 Hrs

BSPTCL may explain.

Deliberation in the meeting

BSPTCL representative informed that on the day disturbance, CT testing was carried out for upcoming 220/132 kV160 MVA ICT under commission work. During the testing, spurious busbar protection signal got triggered and lead to operation of busbar differential relay. As a result, 220 kV Chandauti-Sonenagar D/C tripped leading to total power failure at 220/132 kV Sonenagar (BSPTCL) and radially connected 132 kV Substations.

PCC observed that similar type of inadvertent tripping of busbar/LBB protection relay during commissioning work have been observed in last month and expressed serious concern on this issue.

PCC advised BSPTCL to take utmost measure to avoid such type of tripping during commissioning work.

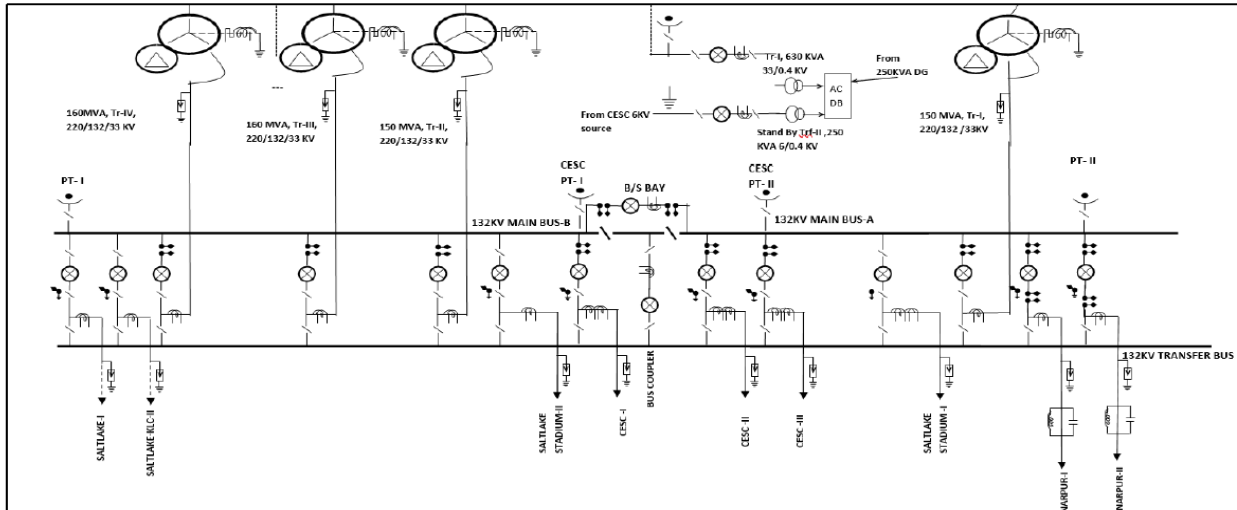
Regarding implementation of week in-feed protection at Sonenagar end for 220 kV Chandauti-Sonenagar line, they intimated that duplex channel in PLCC is necessary for implementing the scheme. PCC advised BSPTCL to implement the scheme in coordination with their telecom & CRITL wing.

ITEM NO. B.3: Major grid events other than GD/GI

ITEM NO. B.3.1: CESC Islanding event on 01/08/2021 at 18:18 and 19:50 Hrs.

CESC system got islanded twice on 01st August due to Bus fault at 132 kV KASBA (WB) system and delayed fault clearance. Detailed Disturbance report is attached at **Annexure B.3.1**.

Bus Configuration at 132 kV KASBA(WBSETCL) S/S



Following things needs to be discussed

- Delayed clearance from WB end.
- Large variation of Frequency within Islanded until it synchronized with Grid.

CESC and WBSETCL may explain.

Deliberation in the meeting

Event-1 at 18:18 hrs :

WBSETCL representative explained the disturbance as follows:

- Due to falling of kite string between main bus side Isolator and breaker of 132 kV Kasba-Saltlake Stadium-I, bus fault occurred at Bus A of 132 kV Kasba S/s.
- The bus bar protection of Bus A operated and issued tripping command to all connected feeders of Bus A. Subsequently all the elements of Bus-I tripped except bus section circuit breaker which was coupling both the buses. As Bus section Breaker did not open, fault was fed via Bus B, through three nos. of 220/132kV Transformers.
- At the same time, R phase CT of LV side of 220/132 kV ICT 2, which was connected to Bus-B burst out and created a fault in 132 kV bus-B. Subsequently Bus Bar Protection Relay operated and all 96 relay associated to main bus section-B as well as differential relay of ICT 2 operated and cleared the fault.
- Due to delayed clearance of fault at Kasba end, islanding condition of CESC (i.e. dir O/C 800 Amps ,delay 150 Msec and U/V <70% ,delay-150ms) got satisfied and CESC system got islanded by tripping all three circuits of CESC-Kasba(WBSETCL) line.

WBSETCL further informed that during checking it was found that wire connected to output contact of 96 relay of 132 kV Bus Section Bay to trip coil of CB was broken due to which bus section breaker did not trip. The same was rectified immediately.

Further they informed that LBB of bus section breaker was also not available. Regarding the same, they submitted that LBB would be implemented by October-21.

Event 2 at 19:50 hrs:

- After restoration of 132kV Bus at Kasba Substation, 132 kV Salt lake Stadium-Kasba -1 line was charged from Saltlake Stadium end upto 132 kV transfer bus of Kasba substation for engaging the said circuit through transfer bus coupler of Kasba end.
- During this time, another fault occurred due to falling of kite string at transfer bus which lead to tripping of 132 kV Salt lake Stadium-Kasba -1 line. The fault was fed by Kasba S/s through 132 kV Kasba-Saltlake AIS-Saltlake Stadium loop.
- They informed that 132 kV Saltlake Stadium-Kasba D/C was having line differential protection, however as the fault occurred at transfer bus of Kasba S/s, it was cleared from Salt lake end in zone-2 of distance protection in 350 msec.
- During this event, the islanding condition of CESC got satisfied and the system got islanded at 19:50 hrs.

During analysis of event-1, it was opined that HV side of 220/132 kV ICTs should have tripped in over-current protection to clear the bus-fault at 132 kV Kasba S/s. WBSETCL replied that the existing current settings of 600 A, TMS:0.4 was adopted in consultation with CESC to accommodate high load transfer to CESC.

PCC advised CESC & WBSETCL to review the existing overcurrent settings of 220/132 kV ICTs at Kasba S/s in view of present disturbances.

ERLDC pointed out that frequency variation was observed in CESC islanded system upto 1 Hz and was varying continuously till it got synchronized with grid at Howrah point. In Event-2 also the same phenomena was observed with a frequency variation of 0.5 Hz. The report of ERLDC is enclosed at Annexure.

PCC advised CESC to look into the issue of prolonged variation of frequency in CESC system during islanded mode and submit a report to ERPC/ERLDC in this regard.

ITEM NO. B.3.2: Tripping of Bus-1 at 220 kV Ramchandrapur on 20/08/2021 at 20:24 Hrs.

220 kV Bus-I at Ramchandrapur got tripped on operation of bus bar differential protection due to snapping of B-phase jumper of bus coupler bay.

Further following issues need to be explained:

- Delayed clearance of the fault.
- Tripping of 220/132 kV ICT- IV at Chandil on REF for a fault at remote bus.

JUSNL may explain.

Deliberation in the meeting

JUSNL explained the event with help of presentation which is attached at **Annexure B.3.2**

- At 20:24 Hrs, B phase jumper snapped between breaker and CT of bus coupler bay at 220 kV Ramchandrapur(RCP) S/s resulting in a bus fault for main bus-1.
- The following elements tripped to clear the fault:

Element Name	Relay indication at End 1	Relay indication at End 2
220 kV Bus Coupler	B phase fault detected with IB- 19.02 kA but fault cleared before tripping. After 200 ms fault again appeared with IB- 6.5 kA and B/C tripped on E/F in 450 ms approx.	
220 kV RCP – Chaibasa ckt- 01	E/F Instantaneous (High set), IB- 3.53 kA	Did not tripped.
220 kV RCP - Chandil	Did not trip.	BN fault, Z2, 31.9 km, IB -2.91 kA
220 kV RCP - Joda	Did not trip.	BN fault, Z2, 157.01 km, IB – 1.26 kA
220 KV Jamshedpur-Ramchandrapur I & II (400/220 kV ICT – I & II at Jamshedpur)	Both ICT Tripped from LV side at RCP GSS. No tripping from HV side.	
150 MVA, 220/132 kV ICT - III	Back up O/C and E/f in both HV and LV side (Electromechanical relay)	

- At the same time, 100 MVA 220/132 kV ICT –IV at Chandil GSS also tripped on REF protection. The disturbance resulted overloading of 220/132 kV ICT-1 & 2 at Chandil & ICT-2 at RCP and subsequently all these ICTs tripped on overload after five minutes of the disturbance.
- The bus-2 was in service during the disturbance.

Regarding discrepancies observed during the event, JUSNL explained as follows:

- The 220 kV busbar protection at Ramchandrapur S/s is out of service for last one year due to card issue in the panel. The necessary procurement has been completed and the same would be put into service within 2 months.
- The tripping of 220 kV RCP-Chaibasa-I at RCP end on E/F protection instantaneously was due to improper settings in the relay. The same would be resolved soon.
- Regarding tripping of ICT at Chandil on REF protection, they informed that similar occurrence of ICT tripping was observed whenever a fault occurred at nearby elements/substations and fault current flows through the ICT. They added that some wiring issue to the relay was found out. And the same would be rectified soon in presence of relay OEM engineers.

PCC opined that non-availability of busbar protection at 220 kV Ramchndrapur S/s resulted in delayed clearance of the fault and also expressed concern for mal-operation of the relays at RCP end for 220 kV Chaibasa-1 line and at Chandil end for 220/132 kICT-4.

After detailed deliberation, PCC advised JUSNL following:

- To restore the busbar protection at 220 kV Ramchandrapur S/s within a month.
- To check the settings as well as directionality of earth fault relay for 220 kV RCP-Chaibasa line at RCP end. The non-directional feature of the relay shall be disabled.
- Regarding tripping of ICT-4 at Chandil, PCC advised JUSNL to check the stabilizing resistor value for REF relay in addition to the wiring issue. The relay shall be checked and tested before putting it into service.
- To share relay indications of elements(local as well as remote) connected with Bus – II at Ramchandrapur S/s during this disturbance to ERPC/ ERLDC. As the fault was cleared in 450msec, the relays of elements connected to bus-2 must have picked up during the disturbance. The same need to be analyzed and in case of discrepancy, the same shall be rectified.

JUSNL informed that they had reduced zone 4 time setting of the lines at 220 kV RCP end to 300 milliseconds after this incident.

ITEM NO. B.4: Repeated Tripping of Transmission Lines and associated issues

ITEM NO. B.4.1: Repeated Tripping of 400 kV FSTPP-KHSTPP circuit-3.

400 kV Farakka-Kahalgaon -3 had been tripped four times in the month of August-21 due to DT receipt at Kahalgaonend.

Details are attached below.

	Element Name	Tripping Date	Tripping Time	Reason	Remarks	Revival Date	Revival Time
>	400KV-FSTPP-KHSTPP-3	27/08/2021	05:52	TRIPPED FROM KAHALGAON END AGAIN		27/08/2021	16:15
>	400KV-FSTPP-KHSTPP-3	27/08/2021	03:59	KHSTPP: DT RECEIVED; TRIPPED FROM KAHALGAON END ONLY		27/08/2021	04:25
>	400KV-FSTPP-KHSTPP-3	27/08/2021	00:39	KHSTPP: DT RECEIVED; TRIPPED FROM KAHALGAON END ONLY		27/08/2021	01:54
>	400KV-FSTPP-KHSTPP-3	26/08/2021	09:58	FSTPP- No initiating relay operated, Only Main bay opened, KHSTPP-Only DT received		26/08/2021	10:35

NTPC & Powergrid may explain.

Deliberation in the meeting

NTPC informed that spurious DT signal was being sent from Farakka end due to loose wiring in PLCC panel. The issue has been rectified and no new tripping incidence was observed after rectification work.

ITEM NO. B.4.2: Repeated Tripping of 220 kV Jorethnag – New Melli Line along with Unit -1 of Jorethang HEP

220 kV Jorethang -New Melli line has been tripped 3 times along with Unit-1 of Jorethang HEP with same fault location and nature.

Details are mentioned below:

	Element Name	Tripping Date	Tripping Time	Reason	Remarks	Revival Date	Revival Time
>	220KV-JORETHANG-NEW MELLI-2	31/08/2021	10:50	MELLI: B_N, FD- 9.12 KM, FC- 2.08KA, Z-1 JORTHANG - B_N , FD - 6.5 KM , FC - 1.299 KA		31/08/2021	11:37
>	220KV-NEW MELLI-JORETHANG-1	30/08/2021	11:43	New-Melli- B-N, 1.894 kA, 10.07km, Z-II Jorethang- Awaited		30/08/2021	12:01
>	220KV-NEW MELLI-JORETHANG-1	10/08/2021	10:17	New Melli- B-N FD-10.07 km FC- 1.98kA; Jorethang: O/C operated, Fd= 15.4 km		10/08/2021	10:58

Following discrepancy has been observed:

1. Same Fault Location and with High resistive nature:

In all the events it was observed that all the faults were at 10 Km from New Melli end in B phase and were of high resistive

2. Tripping of Unit -1 for Loss of field protection:

It was also observed that whenever there is any fault in any line, Unit -1 is tripping with loss of field protection. However, Unit-2 remains stable. It is advised to check the AVR & Excitation system associated with Unit -1 to avoid such mal-tripping of units on loss of field protection.

Jorethnag HEP & Powergrid may explain.

Deliberation in the meeting

DANS energy representative informed that on patrolling of the 220 kV Jorethang -New Melli line, vegetation issue was found at 6.5 km from Jorethang HEP end. The same was attended and now the clearance issue has been resolved.

Regarding tripping of generating unit due to loss of field protection, they informed that they had communicated the issue to M/s GE for analysis of the event and checking of AVR & Excitation system associated with Unit -1. They added that OEM visit has been scheduled in October-21.

ITEM NO.B.4.3: Repeated Tripping of 220 kV Joda-Ramchandrapur line.

In the month of August and September' 21, 220 kV Joda-Ramchandrapur line has been tripped on multiple occasions. Details of these tripping are provided below.

	Element Name	Tripping Date	Tripping Time	Reason	Remarks	Revival Date	Revival Time
>	220KV-JODA-RAMCHANDRAPU R-1	20/08/2021	20:24	Joda: Z-2, B-N, Ib= 1.26 kA, Fd= 157.01 km		20/08/2021	22:43
>	220KV-JODA-RAMCHANDRAPU R-1	15/08/2021	11:53	Joda: R_N, 58.82 km, 1.67 kA Ramchandrapur: R_N, 1.65 kA		15/08/2021	12:20
	Element Name	Tripping Date	Tripping Time	Reason	Remarks	Revival Date	Revival Time
>	220KV-JODA-RAMCHANDRAPU R-1	03/09/2021	21:52	JODA - DT RECEIVED - FAULT R_N , FD -161.35 KM Z2 , FC - 1.1 KA		04/09/2021	02:48
>	220KV-JODA-RAMCHANDRAPU R-1	03/09/2021	10:24	Joda-Z1 R-N FC- 1.377 kA FD- 42.37KMkm, Z-1, R-N, IR=1.89KA, , Dist.=98.4Km		03/09/2021	11:10
>	220KV-JODA-RAMCHANDRAPU R-1	02/09/2021	10:20	JODA: Z-1, E/F, FD-41 KM, FC- 0.5 KA; RAMCHPUR: Z-1, FD- 97.4 KM, FC-1.9 KA		02/09/2021	11:16
>	220KV-JODA-RAMCHANDRAPU R-1	01/09/2021	11:20	RAMCHANDRAPU R: Y-N, Fc= 0.75 kA, Z-1, Fd= 4.4 km; Joda: Y-N, Fc= 1.55 kA		01/09/2021	12:20

JUSNL and OPTCL may explain.

Deliberation in the meeting

JUSNL informed that line patrolling was carried out after 3rd Sep 2021, however they had not found any clearance/sag issues. They further informed that no tripping incident was observed since the patrolling.

PCC advised JUSNL to carry out patrolling in concerned section of the line in case the tripping is repeated in future.

ITEM NO. B.4.4: Repeated Tripping of 132 kV Banka -Sultanganj D/C

132 kV Banka -Sultanganj D/C had been tripped repeatedly with fault in one circuit and due to overload for other circuit. These lines had tripped 17 times in last 2 months causing load loss at Sultanganj, Tarapur, Jagdishpur, Chitra, Deoghar. This issue was also observed earlier.

It is observed that in the month of August these lines got tripped due to Single phase fault at a distance of 18-20 km from Banka end where all tripping seems to be caused due to vegetation issue. Faults could be transient in nature as every time lines are getting charged within 30 Minutes.

Element Name	Tripping Date	Tripping Time	Reason	Revival Date	Revival Time
132 kV-BANKA (PG)-SULTANGANJ-2	31-08-2021	13:47	On overload	31-08-2021	14:10
132 kV-BANKA (PG)-SULTANGANJ-1	31-08-2021	13:47	Sultanganj -fault - R_N , FD - 3.8 km	31-08-2021	14:10
132 kV-BANKA (PG)-SULTANGANJ-2	28-08-2021	01:00	BANKA - FAULT - R_N , FD - 18.3 KM , FC - 4.7 KA	28-08-2021	01:27

132 kV-BANKA (PG)-SULTANGANJ-1	28-08-2021	01:00	TRIPPED DUE TO OVERLOADING , AFTER 132 KV BANKA - SULTANGUNJ -2 TRIPPED ON R_N FAULT	28-08-2021	01:23
132 kV-BANKA (PG)-SULTANGANJ-2	26-08-2021	22:30	TRIPPED DUE TO OVERLOADING , AFTER 132 KV BANKA - SULTANGUNJ -1 TRIPPED	26-08-2021	23:02
132 kV-BANKA (PG)-SULTANGANJ-1	26-08-2021	22:30	BANKA - R_N FAULT , FD - 18.1 KM , FC - 4.6 KA , SULTANGUNJ - R_N FAULT , FD - 21.7 KM , FC - 1.2 KA ,	26-08-2021	23:01
132 kV-BANKA (PG)-SULTANGANJ-1	26-08-2021	20:34	Sultanganj: Z1, R-N, 1.21kA, 21.6Km Banka: R-N, 4.4kA, 18.09Km	26-08-2021	20:58
132 kV-BANKA (PG)-SULTANGANJ-2	20-08-2021	14:10	Overload on ckt 2 due to tripping of ckt1, Tripped from PG end only	20-08-2021	14:44
132 kV-BANKA (PG)-SULTANGANJ-1	20-08-2021	13:55	Banka:-29.08 km ,2.872kA, Y-N, Z-I. Sultanganj:-Z-I, Y-N, 2.03kA, 9.8km.	20-08-2021	14:44

BSPTCL may explain.

Deliberation in the meeting

BSPTCL informed that patrolling of 132 kV Banka -Sultanganj D/C was carried out between 04/09/21 and 06/09/21 during which vegetation issues and issues with disc insulator string were found at certain locations of the line. Subsequently tree cutting / pruning were done at required locations and damaged disc insulator strings were replaced by new one at various locations.

PCC advised BSPTCL to complete pending work of insulator replacement and vegetation clearance in the line at the earliest.

PCC further advised SLDC, Bihar to plan a local SPS or a load shifting procedure to other sources in case of tripping of one circuit in 132 kV Banka-Sultanganj line to fulfill N-1 reliability criteria.

ITEM NO. B.4.5: Repeated Tripping of 132 kV Sultanganj- Deogarh D/C

132 kV Sultanganj-Deogarh had tripped 8(eight) times in the month of August-21. Details of these tripping are given below –

Sr. No	Element Name	Tripping Date	Tripping Time	Reason	Revival Date	Revival Time
1	132 kV-SULTANGANJ-DEOGHAR-1	29-08-2021	05:00	Sultanganj- z- 1 Y-N FC-Iy-1.841KA FD - 32.05km	29-08-2021	05:35
2	132 kV-SULTANGANJ-DEOGHAR-1	25-08-2021	17:37	DEOGHAR: B_N, FC-0.843 KA, SULTANGANJ:Ir=819.8A, Iy=76.91A, Ib=277.3A, Z-2,FD-107.3 KM	25-08-2021	18:05
3	132 kV-SULTANGANJ-DEOGHAR-1	18-08-2021	00:05	Sultan:1.79kA,R-ph.Deoghar:Didn't trip	18-08-2021	00:30
4	132 kV-SULTANGANJ-DEOGHAR-1	17-08-2021	20:20	Sultanganj:- O/C, E/F, Master trip relay operated Deoghar:- Not Tripped.	17-08-2021	20:55
5	132 kV-SULTANGANJ-DEOGHAR-1	13-08-2021	01:50	SULTANGUNJ: O/C, E/F	13-08-2021	02:15
6	132 kV-SULTANGANJ-DEOGHAR-1	08-08-2021	02:22	Sultanganj: Y-N ,114.7km,0.796 kA,Z-2	08-08-2021	03:10
7	132 kV-SULTANGANJ-DEOGHAR-1	06-08-2021	21:25	Sultanganj: DP, Z-2, B-Ph, 98.57 km, 0.862 kA	06-08-2021	21:45
8	132 kV-SULTANGANJ-DEOGHAR-1	04-08-2021	15:50	O/C E/F,29.90KM,Ir=65.49A,Iy=152A,Ib=1.865KA,Z-1	04-08-2021	16:25

In the past months also, line had been tripped many times for which discussions were held in the earlier PCC meetings.

In 105th PCC Meeting,

BSPTCL confirmed that line length of 132 kV Sultanganj-Deoghar S/C is 92 km, out of which 84 km from Sultanganj end comes under BSPTCL jurisdiction and rest 8 km from Deoghar end comes under JUSNL jurisdiction.

Regarding clearance issues, they informed that line shutdown has been planned on 26th Aug 2021 in order to resolve pending clearance issues.

Regarding protection settings of relays at Deoghar end, JUSNL informed that 132 kV Jamtara-Deoghar was LILOed at Chitra in Aug-2020. As a result line length of shortest and longest line at Deoghar S/S and Jamtara S/S had got changed and the protection settings at respective ends need to be reviewed. They further submitted that the settings at Deoghar and Jamtara end are being reviewed and revised settings would be implemented shortly.

PCC advised JUSNL to share the details regarding change in configuration in 132 kV Deoghar-Jamtara line to BSPTCL & DVC and advised BSPTCL & DVC to review the protection settings at 132 kV Sultanganj&Maithon S/s respectively.

BSPTCL& JUSNL may update.

Deliberation in the meeting

BSPTCL informed that vegetation issues were found in many locations during patrolling of the line. The same had been cleared. However during tower top patrolling, disc insulators were found damaged at various locations in the line. The insulator replacement work has been planned and the work would be carried by the agency soon.

PCC advised BSPTCL to resolve all clearance issues in the line and complete the insulator replacement work at the earliest.

On query from PCC regarding protection settings for 132 kV Sultanganj-Deoghar line Sultanganj end, BSPTCL informed that revised settings had been incorporated in the relay based on the details received from JUSNL.

ITEM NO. B.5: Status of Islanding Schemes in Eastern Region

1. KBUNL Islanding Scheme

In special meeting held on 08.06.2021, following deliberations were made:

7. KBUNL Islanding scheme would be designed considering both units of KBUNL stage-II (2x195 MW) as participating generator and connected radial loads at Gopalganj along with in-house load of KBUNL.
7. The islanding frequency will be at 48.6 Hz and this is subject to revision based on the suggestion received from KBUNL/OEM on underfrequency settings of the generator units.
7. Based on the revised simulation study result, ERLDC would communicate the desired frequency band to KBUNL for their units for stable operation of the islanding scheme. KBUNL would review the proposed range for frequency settings in consultation with their engineering wing & OEM and communicate their observation to ERLDC in this regard. They would also take up for dynamic simulation study with regard to islanding mode of operation of the units.
7. KBUNL would confirm the provision of Islanding mode of operation in the governors of their Stage-II units.
5. Based on the response received from KBUNL to the above queries, a separate meeting would be convened to discuss further course of action.
6. KBUNL would expedite the construction work related to implementation of Islanding scheme in switchyard. They would also take up with concerned OEM for testing and commissioning of islanding relay panel at their end.
7. BSPTCL to submit the present status of the availability of communication channels (i.e. availability and status of OPGW, PLCC, DTPC coupler) in the transmission lines/substations considered under KBUNL islanding scheme.

In 105th PCC Meeting following deliberations were took place –

Regarding bay construction work at KBUNL switchyard, NTPC informed that construction work of three nos. bays had been completed and work related to 4th bay is in progress.

ERPC secretariat informed that time line for implementation of KBUNL islanding scheme had been decided as December-21 and advised NTPC to complete the pending bay construction work by target date i.e. Sep 2021.

PCC also advised NTPC to share the e-mail confirmation regarding proposed range in frequency settings of the KBUNL Stage-II units to ERPC/ERLDC.

KBUNL may update.

Deliberation in the meeting

NTPC informed that ongoing civil work in the switchyard got delayed due to severe rain and the same would be now completed by Oct '21. Further, the testing & commissioning work would be completed by Jan '22.

Regarding frequency settings of the KBUNL Stage-II units, they informed that a meeting has been scheduled to discuss the issue.

The issue was referred to forthcoming TCC meeting for further discussion.

2. CTPS Islanding Scheme

In special meeting held on 08.06.2021, following deliberations were made:

1. ERLDC would share the simulation study report with all concerned in DVC i.e. SLDC DVC, SPE wing of DVC & CTPS-B.

2. The CTPS-B islanding scheme is to be designed with two units of CTPS-B (2x250 MW) generating station as participating generator and connected loads at CTPS, Putki, Biada, Nimiaghata & Patherdih.

3. The islanding frequency for CTPS-B islanding system was decided as 48.4 Hz.

4. CTPS-B would take up with their OEM for confirmation of the following

- Provision of Islanded mode of operation in the governor of CTPS-B units.
- Provision for increasing the turbine over frequency settings to a higher value or enhancement of the time delay in existing settings.
- Detail study of islanding response of CTPS units based on the necessary simulation at islanding frequency of 48.4 Hz.
- Detailed study on dynamics of governor and turbine during formation of island at islanding frequency of 48.4 Hz.

5. DVC would take up with concerned OEM for necessary installation & testing of islanding panel at CTPS-B end.

In special meeting held on 06.08.2021, following deliberations took place –

Regarding increasing the turbine over frequency settings to a higher value or enhancement of the time delay in existing settings, they informed that their C & I wing as well as OEM had expressed their reservation in raising the over-frequency setting or increasing the time delay.

Representative of SPE wing of DVC updated that necessary discussion for implementation of the scheme at CTPS-B is going on with M/s GE for finalization of the scope of work & other modalities.

He submitted that the tender process for implementation of islanding scheme would be initiated within two weeks.

DVC was advised to prepare the detail action plan for implementation of the scheme along with time line for each milestone and submit it to ERPC secretariat within fortnight. They were also advised to take all measures in expediting the implementation work.

In 105th PCC Meeting,

PCC advised DVC to submit present status of the implementation work as well as a detail action plan with time line for each milestone for implementation of CTPS islanding scheme.

Deliberation in the meeting

CTPS representative was not available in the meeting.

PCC advised DVC to submit present status of the implementation work for CTPS Islanding scheme.

The issue was referred to forthcoming TCC meeting for further discussion.

3. IB-TPS Islanding Scheme

In special meeting held on 09.04.2021, OPGC representative informed the followings:

- a) PLCC work has already been completed and the signal is available at their end.
- b) The annual overhauling of IBTPS is scheduled on 17th April 2021 for 25 days.
- c) OEM (BHEL) is developing a new scheme and the same would be implemented during the overhauling period after getting confirmation from OEM.

OPGC was advised to share the requisite details to ERPC secretariat at the earliest.

In special meeting held on 06.08.2021, following deliberations took place –

OPGC representative informed that work order had been placed on OEM M/s BHEL for implementation of the Islanding scheme at IB TPS units. However, they are facing great difficulty in getting the response from OEM.

MS, ERPC advised OPGC to submit all the relevant documents with regard to their communication with OEM to ERPC secretariat so that the issue may be taken up with appropriate authority.

OPGC was also advised to take up the issue with their highest authority as well as with the OEM for expediting the implementation of islanding scheme.

In 105th PCC Meeting,

OPGC representative intimated that after special meeting dated 06/08/21, they tried to communicate OEM (M/s BHEL) several times however no response was received from the OEM till date.

PCC advised OPGC to submit all the relevant documents with regard to their communication with OEM to ERPC secretariat so that the issue may be taken up with appropriate authority.

OPGC may update.

Deliberation in the meeting

OPGC informed that a meeting is going to be held among OEM, SLDC Odisha, OPTCL & OPGC to finalize the scheme and implementation thereof.

The issue was referred to forthcoming TCC meeting for further discussion.

4. Patna Islanding Scheme

In special meeting held on 06.08.2021 following deliberations took place –

1. SLDC Bihar was advised to submit the following:

I. Revised base case considering the following:

- Peak load scenario of 2021-22(March-22)of the Patna Islanding area.
- Off-peak load scenario of 2021-22(March-22) in Patna Islanding area.
- Critical/essential loads of Patna (Load to be considered during islanding operation with one unit of NPGC).

II. The disconnection points may be reviewed by SLDC, Bihar considering their operation philosophy in practice.

III. The present status of the availability of communication channels(i.e. availability & status of OPGW/PLCC, DTPC coupler)in transmission lines/substations considered under the Patna Islanding scheme.

IV. SLDC Bihar was also advised to make a provision of dedicated page in SCADA display in their control room for Patna Islanding Scheme. Through the display, vital parameters like actual generation & load within the electric boundary of the island, voltage, frequency, power flow in peripheral lines can be monitored.

2. NPGC was advised to submit the inhouse load quantum of Nabinagar units to ERPC and ERLDC.

3. BGCL was advised to submit the present status of the work for 440/220/132 kV Jakhanpur S/s and its associated 220kV and 132 kV lines along with the target date of completion to ERPC and ERLDC.

4. It was decided that tentative frequency for triggering of the islanding operation would be considered at 48.4 Hz. This frequency would be reviewed after completion of the islanding simulation study by ERLDC.

On receipt of the revised base case and confirmation of disconnection points and by Bihar, ERLDC would carry out further study & submit their observation within two weeks.

In 105th PCC Meeting,

SLDC Bihar representative informed that the revised base cases would be submitted within two days.

PCC advised SLDC Bihar to coordinate with BGCL for submitting the present status of the work for 440/220/132 kV JakhanpurS/s and its associated 220kV and 132 kV lines along with the target date of completion.

PCC advised NTPC to submit the in-house load quantum of Nabinagar STPP units to ERPC and ERLDC.

SLDC Bihar & NTPC may update.

Deliberation in the meeting

ERLDC informed that they had received requisite information from SLDC Bihar & Nabinagr TPP. They intimated that they would require two-week time to complete the study.

In order to expedite the simulation study, it was suggested for carrying out dynamic study for Patna Islanding scheme by M/s PRDC.

PCC agreed for the same and advised PRDC to complete the simulation study by September'21. The required data would be provided by ERLDC.

MS, ERPC advised BSPTCL to prepare the DPR for implementation of Patna islanding scheme and submit it to PSDF nodal agency within 15 days.

The issue was referred to forthcoming TCC meeting for further discussion.

5. Ranchi Islanding Scheme

In special meeting held on 06.08.2021 following deliberations took place –

- 1) The Ranchi islanding scheme would be designed considering the present network configuration excluding the new/upcoming substations.
- 2) The island would be formed with one unit of TenughatTPS(150-160 MW average generation) & Inland IPP(50-55 MW average generation) as participating generator & essential/critical loads of Ranchi to the tune of 180 MW.
- 3) JUSNL would submit the revised base case considering only critical/essential loads of Ranchi which is to be considered under islanding scheme along with the disconnection points.
- 4) Considering the age of Tenughat units and to enhance the success rate of island, it was decided that triggering frequency for of the islanding operation would be kept at 48.5 Hz. This frequency would be reviewed after completion of the islanding simulation study by ERLDC.
- 5) On receipt of the revised base case & disconnection details, ERLDC would carry out further study & submit their observation within two weeks.

In 105th PCC Meeting,

JUSNL informed that revised base case along with the disconnection points for Ranchi Islanding Scheme had been sent to ERLDC.

ERLDC stated that the details had been received from JUSNL and they would carry out the study & submit their report within two weeks.

SLDC Jharkhand may update.

Deliberation in the meeting

ERLDC informed that they had received requisite details from JUSNL and simulation study is being carried out by them and the same would be completed within a week.

MS, ERPC advised JUSNL to prepare the DPR for implementation of Ranchi islanding scheme and submit it to PSDF nodal agency within 15 days.

The issue was referred to forthcoming TCC meeting for further discussion.

ITEM NO. B.6: Tripping Incidence in month of August 2021

Tripping incidents in the month of August 2021 which needs explanation from constituents of either of the end is attached.

Concerned utilities may explain.

Deliberation in the meeting

*Explanation from constituents related to tripping incidents in the month of August 2021 is attached at **Annexure B.6**.*

ITEM NO. B.7: Frequent Tripping of 400 kV Baripada-Kharagpur line

It has been observed that 400 kV Baripada-Kharagpur line had tripped multiple times in recent months mostly on single phase to earth fault. Details of line tripping from April'2019 to till date is attached at Annexure-B7.

As per relay indications from Baripada end, 57 out of 58 instances of tripping occurred in West Bengal jurisdiction. Number of tripping with distance from Baripada is summarised below where it can be observed that repeated fault is occurring at same location:

Distance From Baripada (km)	No. of trippings
0-10	1
30-40	2
40-50	11
50-60	10
60-75	7
75-85	14
90-100	10
More than 100	3

WBSETCL may explain.

Deliberation in the meeting

It was observed that most of the tripping had occurred within section of 40-60 Km & 75-100 Km of the line.

WBSETCL representative informed that the tripping of the line in their control area is due to vegetation issue & mainly on account of eucalyptus tree. They further informed that they are facing local issues in clearing the tree/vegetation in the concerned section of the line and submitted that they are planning to resolve the issue in coordination with district administration.

PCC advised WBSETCL to take up the issue with local district administration and referred this to forthcoming TCC meeting.

PART- C::OTHER ITEMS

ITEM NO. C.1: Schedule of Training Program on PSCT and PDMS by PRDC

As part of 4th year support period, PRDC has conducted online training program on PDMS & PSCT at Bihar & West Bengal. In continuation to same PRDC is going to conduct online training program for Jharkhand, Odisha and Sikkim as per the following schedule.

SI No.	Date	State
1	27.09.2021-28.09.2021	Jharkhand
3	04.10.2021-05.10.2021	Odisha
5	25.10.2021-26.10.2021	Sikkim

Members may note.

Deliberation in the meeting

Members noted.

ITEM NO. C.2: Backup Overcurrent Relay coordination for Sikkim Complex.

In 97th PCC following deliberations were made,

It was informed that IDMT characteristics were implemented at Jorethang and Tashiding.

In 103rd PCC following deliberations took place –

Powergrid informed that the protection philosophy for backup protection of lines & ICTs being followed by them in Sikkim Complex is as follows:

- Philosophy of T-op for Lines = $(Z3 + 0.1)$ Sec,
- Philosophy of T-op for Transformer = $(Z3+0.1)$ for O/C & $(Z3+0.2)$ for E/F

However, the proposed settings for ICTs based on PRDC study is:

- T-op for HV & LV side=0.8 Sec for O/C and T-op for HV & LV= 1.4 sec for E/F

They suggested to review the proposed settings in line with their existing settings for lines & ICTs in Sikkim Complex.

They further informed that zone 3 settings of 400 kV Kishanguj-Rangpoline is 1.5 second whereas proposed settings for backup overcurrent relay of line is 1.2 second which would result in tripping of DEF before zone 3 of distance protection.

PCC advised PRDC to carry out revised study considering the existing zone-3 settings by Powergrid and share report among concerned utilities for implementation of revised settings at their end.

In 104th PCC, PRDC informed that the revised study considering the zone-3 settings of the transmission lines in Sikkim Complex would be completed within a week.

PCC advised PRDC to share the report among concerned utilities for implementation of revised settings at their end.

Further, the revised study had been carried out by PRDC considering the Powergrid philosophy in practice & existing zone-3 settings of the line.

In 105th PCC Meeting, PCC advised all concerned utilities to implement the proposed settings in the line at their respective ends as given in the report attached at **Annexure C.2**.

Members may update.

Deliberation in the meeting

Powergrid ER-I representative informed that for 400 kV Teesta III – Kishangunj line at Kishanganj end, the neutral current during fault considered in the report was 925 A whereas the actual current during the disturbance on 03.09.2021 was observed more than 1000A. Thus, the proposed settings would have led to tripping of the line before zone-3 timing of the relay.

PCC advised PRDC to analyse the tripping of the aforesaid line on 03.09.2021 and the settings may be proposed considering the actual fault current observed in the line.

Powergrid ER-II representative informed that there is a large variation in load current for the lines considered under Sikkim complex between high hydro period & lean hydro period and submitted that the pick-up settings value for DEF relay proposed in the report seems to be on higher side w.r.t. lean hydro period. Further they informed that as per their philosophy, the pick-up current for DEF relay in 400 kV lines is 200 A(primary).

It was opined that as other utilities in Sikkim complex have already implemented the revised DEF settings, Powergrid may implement the proposed settings for ensuring better coordination of DEF relay.

PCC advised Powergrid to implement the proposed DEF settings as given in the report of PRDC at their end.

PCC further advised PRDC to carry out a study for DEF relay coordination for the lines at Sikkim complex considering fault level corresponding to minimum hydro generation at Sikkim complex.

ITEM NO. C.3: Review of guideline for over voltage setting for anti-theft charging of 765 kV, 400 kV and 220 kV Lines --ERLDC

In 67th PCC meeting, Relay settings were finalized for anti -theft charging of lines where over voltage setting was finalized as mentioned below:

- Over voltage Stage-I - Overvoltage pick up should be minimum of all the lines connected from the charging substation with minimum grading and minimum time delay corresponding to other lines which are in service.
- Further, it was informed to utilities to keep it above 105 % but it should also be lower than any of the other lines over voltage setting.

However, many utilities keep it at 105 % itself which is leading to tripping of line during charging itself. These can be due to operational regime voltage of substation being around 416-420 kV and during charging the over voltage criteria of 105 % is already reached.

Therefore, it is suggested to insert a guideline that,

- Based on charging end substation voltage profile, utilities should keep overvoltage pickup of anti-theft charge line as 1 or 2 % below the minimum over voltage setting of all lines from that substation.

It is suggested that for anti-theft charge line, if utilities desired to keep O/V enabled for remote end (open end) substation then:

- It should be greater than the rated voltage of equipment e.g.: for 400 and 765 kV lines it should not be less than 110% and for 220 kV it should be at least 112%.
- If utility finds that at remote end is observing high voltage, then they may request respective SLDC or ERLDC to open the circuit to avoid any equipment issue.

These will reduce unwanted tripping of anti-theft charged line.

Further, in line with the discussions held during 102nd PCC Meeting, requirement O/V protection for Anti-theft charging of 220 kV lines also need to be discussed.

Members may discuss.

Deliberation in the meeting

ERLDC explained the issue they are observing with regard to overvoltage settings of anti-theft charged lines and proposed certain modification w.r.t. to the guidelines for overvoltage settings of anti-theft charge lines.

Based on the discussion in the meeting, the following guidelines are suggested.

For anti-theft charging of 765 & 400 kV lines at charging station end:

- *Overvoltage pick up should be below the minimum over voltage setting of all lines from that charging substation.*
- *The settings shall be more than 105% and preferably just below (say 1 or 2 % below) the minimum over voltage setting of all lines from that substation.*

Overvoltage settings for remote end (open end) substation for anti-theft charged lines:

- *The utility may in its discretion keep overvoltage settings at remote end of line and a trip command may be sent to charging station in order to avoid voltage stress on the equipment (LA, CVT etc.) during overvoltage condition. In such case, the settings shall be greater than the rated voltage of equipment e.g.: for 400 and 765 kV lines it should not be less than 110% and for 220 kV it should be at least 112%.*
- *In case high voltage is observed at remote end of the line, the affected utility may request respective SLDC or ERLDC to open the circuit for safety of the equipment.*

For anti-theft charging of 220 kV lines, the similar guidelines as given above may be followed.

PCC advised all the utilities to submit their comments on the above guidelines for overvoltage settings for anti-theft charging of transmission lines.

ITEM NO. C.4: Protection coordination of the New Transmission elements to be charged in Eastern Region

ITEM NO. C.4.1: FTC for LILO of 400 kV Patna-Kishanganj D/C at Saharsa

As per information received at ERLDC, 400 kV Patna -Kishanganj is being LILOed at Saharsa along with FTC of following element. Details of the line (as received at ERLDC)

- LILO of 400 kV Patna-Kishanganj D/C at Saharsa along with associated bays.
- 400 kV 125 MVar Bus Reactor 1 & 2 along with associated bays at Saharsa.
- 400/220 kV ICT 1 & 2 along with associated bays at Saharsa.
- 220/132 kV ICT 1 & 2 along with associated bays at Saharsa.

Name	Conductor type	Length
400 kV Patna -Saharsa-I&II	ACSR Quad Moose	238.16 km
400 kV Saharsa-Kishanganj-I&II	ACSR Quad Moose	183.235 km

Protection coordination may be required as per the following table.

Reason	S/S may be affected	Remarks	Utility to respond	Response received
400 kV Patna - Kishanganj D/C lilo at Saharsa	Patna & Kishanganj	Protection coordination to be done for all newly connected elements as per ERPC's guidelines	POWERGRID ER-1	Yet to be received
	Saharsa	Protection coordination to be done for all newly connected elements as per ERPC's guidelines. Time grading to be done for Saharsa as Zone-2&z-3 will overlap with adjacent shortest line.	PMJTL	Yet to be received
	S/S connected to Patna & Kishanganj: Barh ,Balía , Npgc ,Binaguri, New Purnea , Rangpo , Teesta-III,DMTCL	For all adjacent substations connected to Patna & Kishanganj, adjacent longest line length will reduce significantly, so Zone-3 settings will be affected. Previously Patna-Kishanganj(420km) was longest which will now be Patna-Saharsa(238km) for all adjacent s/s connected to Patna ,eg: Barh,Balía,NPGC. For all adjacent S/S to Kishanganj such as:,DMCTL,Binaguri,Purnea,Tees ta-3,Rangpo adjacent longest line length will also reduce. In case of Zone 2 &Zone 3 overlap of adjacent sections Time grading to be ensured. Kindly check and confirm any setting revision if required.	POWERGRID ER-1&2. NPGC/NTPC BARH/DMTCL/ TVPTL	Yet to be received

Following details are to be shared by various utilities:

- POWERGRID ER-1, ER-2, PMJTL, NPGC, NTPC BARH, DMTCL, TVPTL may share whether revision of any existing protection setting at above mentioned S/S is required or not. In case of any revision, the revised setting may be shared with ERPC and ERLDC.
- The protection setting at Patna &Kishanganj, Saharsa may be shared with ERPC and ERLDC.

- Status of carrier protection and PLCC channel in the all above mentioned section may be shared.

Concerned utilities may update.

Deliberation in the meeting

PCC advised concerned utilities to submit revised relay settings to ERPC/ERLDC for necessary update in PDMS database.

ITEM NO. C.4.2: FTC of 765 kV Medinipur-New Jeerat- D/C

As per information received at ERLDC, following elements have been first time charged at 765/400 kV New Jeerat S/S.

1. 765/400 kV, 1500 MVA ICT-I at New Jeerat SS along with associated bays.
2. 765/400 kV, 1500 MVA ICT-II at New Jeerat SS along with associated bays.
3. 765 kV Medinipur-New Jeerat-I Line along with associated bays at both the end(169 km Hex Zebra).
4. 765 kV Medinipur-New Jeerat-II Line along with associated bays at both the end (169 km Hex Zebra).
5. 765 kV Main Bus-I NewJeerat SS.
6. 765 kV Main Bus-II New Jeerat SS.
7. 400 kV Main Bus-I NewJeerat SS.
8. 400 kV, 125 MVar Bus Reactor I at New Jeerat SS along with associated bays.
9. 400 kV, 125 MVar Bus Reactor II at New Jeerat SS along with associated bays.
10. 765 kV, 330 MVar Bus Reactor I at New Jeerat SS along with associated bays.
11. 765 kV, 330 MVar Bus Reactor II at New Jeerat SS along with associated bays.

Reason	S/S may be affected	Remarks	Utility to respond	Response received
FTC of 765 kV Mednipur-New Jeerat (PMJTL SS) Ckt-I&II	Mednipur	Protection coordination to be done for all newly connected elements as per ERPC's guidelines. Busbar protection to be ensured.	PMJTL	Response received/Relay setting to be received
	New Jeerat	Protection coordination to be done for all newly connected elements as per ERPC's guidelines. Busbar protection to be ensured.	PMJTL	Response received/Relay setting to be received
	S/S connected to Mednipur: New Ranchi	Adjacent Shortest line will be now NewJeerat-Mednipur(169 km). Hence Zone-2 of adjacent lines may overlap with this section so ,Z-2 time grading for co-ordination required.Kindly check and confirm any setting revision if any change in adjacent short and long line.	POWER GRID ER-1	Response received/Relay setting to be received

Following details to be shared/confirmed:

- PMJTL/POWERGRID ER-1 may share whether revision of any existing protection setting at above mentioned S/S is required or not. In case of any revision, the revised setting may be shared with ERPC and ERLDC.
- Protection setting of all the elements as mentioned above may be submitted.
- Status of carrier protection and PLCC channel in the all above mentioned section may be shared.

Concerned utilities may update.

Deliberation in the meeting

PCC advised concerned utilities to share protection settings file for their respective ends to ERPC/ ERLDC.

ITEM NO. C.4.3: FTC of 220 kV Ranchi-Ramgarh S/c

As per information received at ERLDC, following element has been charged or the first time at 400/220 kV Ranchi (PG) S/S.

220 kV RANCHI(PG)-RAMGARH,

- Total Length-94.47 KM, AAAC Single Zebra

As per information available, protection coordination may be required as per the following table.

Reason	S/S may be affected	Remarks	Utility to respond	Response received
FTC OF 220 kV RANCHI(PG)-RAMGARH,	RANCHI	Protection coordination to be done for all newly connected elements as per ERPC's guidelines. Busbar protection to be ensured.	PG-ER-1	Received
	RAMGARH	Protection coordination to be done for all newly connected elements as per ERPC's guidelines.	DVC	Received
	S/S connected to RANCHI(PG): Chandil ,Hatia	Adjacent longest line will be now 220 kV RANCHI(PG)-RAMGARH, (94.47km). Hence Zone-3 settings at Chandil and Hatia end may be changed keeping in view it should not encroach next voltage level. Kindly check and confirm any setting revision if any change in adjacent short and long line.	JUSNL	Received/Relay setting to be received

Following Details to be shared:

- POWERGRID ER-1/DVC/JUSNL may share whether revision of any existing protection setting at above mentioned S/S is required or not. In case of any revision, the revised setting may be shared with ERPC and ERLDC.
- Status of carrier protection and PLCC channel in the all above mentioned section may be shared.

Concerned utilities may update.

Deliberation in the meeting

PCC advised concerned utilities to share protection settings file for their respective ends to ERPC/ ERLDC.

ITEM NO. C.4.4:FTC for LILO of 220 kV Purnea-Begusarai-I at Khagaria

As per information received, 220 kV New Purnea (PG)-Begusarai-I is being LILOed at Khagaria. After LILO, lines will be as below (as received at ERLDC):

Name	Conductor type	Length
220 kV New Purnea (PG)-Khagaria-I	ACSR Triple Zebra	102 km
220 kV Begusarai-Khagaria-I	ACSR Triple Zebra	98 km

Reason	S/S may be affected	Remarks	Utility to respond
FTC OF 220 kV New Purnea (PG)-Khagaria I & 220 kV Khagaria-Begusarai I (LILO of 220 kV New Purnea (PG)-Begusarai I at Khagaria)	Khagaria	Protection coordination to be done for all newly connected elements as per ERPC's guidelines. Busbar protection to be ensured. Adjacent longest line for existing lines at Khagaria was previously 220 kV New Purnea (PG)-Begusarai. Now it will change. Hence, Zone-3 settings for existing lines at Khagaria may be reviewed keeping in view it should not encroach next voltage level.	BSPTCL
	New Purnea (PG)	Protection coordination to be done for all newly connected elements as per ERPC's guidelines.	PG ER-I

	Begusarai	Protection coordination to be done for all newly connected elements as per ERPC's guidelines.	BSPTCL
	S/S connected to New Purnea(PG): Purnea(PG), Madhepura	Adjacent longest line will be now 220 kV New Purnea(PG)-Khagaria,(102 km). Hence Zone-3 settings at Purnea(PG) and Madhepura end may be reviewed keeping in view it should not encroach next voltage level. Kindly check and confirm any setting revision if any change in adjacent short and long line.	BSPTCL, PG ER-I
	S/s connected to Begusarai: Samastipur, Barauni (BTPS)	Adjacent longest line for Samastipur, Barauni (BTPS) will be now 220 kV Begusarai-Khagaria (98 km). Hence Zone-3 settings at Samastipur, Barauni (BTPS) end may be reviewed keeping in view it should not encroach next voltage level. Kindly check and confirm any setting revision if any change in adjacent short and long line.	BSPTCL

Following details to be shared:

- Respective Utilities may share whether revision of any existing protection setting at above mentioned S/S is required or not. In case of any revision, the revised setting may be shared with ERPC and ERLDC.
- Status of carrier protection and PLCC channel in the all above mentioned section may be shared.

Concerned utilities may update.

Deliberation in the meeting

BSPTCL was advised to share revised protection settings for their respective ends to ERPC/ ERLDC.

PART- D:: FOLLOW-UP OF PREVIOUS PCCM

ITEM NO. D.1: Total Power Failure at 220 kV Rengali HEP on 27/07/2021 at 08:57 Hrs

At 08:57 hrs, all feeders connected to Rengali PH S/s tripped along with Unit # 1, 2, 4 and 5. As per the information received, there was a fault in the downstream i.e. 33kV system at Rengali PH which got cleared at 220 kV Rengali PH end.

In 105th PCC Meeting following deliberations took place –

OHPC representative clarified that there was no fault in downstream i.e. 33 kV system on the day of disturbance. However, all 220 kV feeders at Rengali PH tripped from Rengali PH end on overvoltage protection. Simultaneously generating units #1, 2, & 4 got tripped on reverse power flow protection which resulted in total power failure at Rengali PH S/s.

- Regarding overvoltage settings protection at Rengali PH end, they informed that the settings are uniform for all the 220 kV lines & the values are as follows.
 - Main-1 relay(old): 136 % with instantaneous tripping
 - Main-2 relay (new relay): 125 % with 5 second delay.
- They added that during the disturbance the overvoltage protection of main-2 relay got operated and tripped all the feeders.

It was informed that no tripping was observed from remote end of the lines.

During analysis, it was observed that the overvoltage condition was being observed at Rangali PH only whereas no such condition was reported at nearby OPTCL substations. Also, it was informed that similar incident of tripping of the lines at Rengali PH in overvoltage protection was reported in the month of October-2020.

PCC opined that the earth resistance of substation is an important factor for localized overvoltage condition and suggested OHPC to do root cause analysis of the event in order to find out the reason for overvoltage.

After detailed deliberations, PCC further advised the followings to OHPC:

- to check the earth resistance of the individual earth pits as well as structures in the substation.
- to verify DAVR settings and operation of limiters in DAVR for the generating units for any discrepancies.
- to set overvoltage settings in all the relays in range of 135 % to 140 % at their end for all feeders with proper time and voltage grading. PCC also advised OHPC to develop a uniform philosophy for overvoltage settings in consultation with SLDC Odisha, OPTCL & ERLDC.
- to find out the reason for tripping of the generating units in reverse power flow protection.

OHPC was advised to submit a detailed report on root cause analysis of the above event.

OHPC may update.

Deliberation in the meeting

OHPC informed that earth resistance was checked in the substation and found in order.

Regarding DVAR settings and operation of limiters in DVAR, they informed that it would be checked during annual maintenance program of generating unit.

They intimated that overvoltage settings in the relays had been revised with proper time and voltage grading as per the suggestion of PCC.

PCC advised OHPC to check CVT secondary earthing circuits for any double earthing/grounding as double earthing leads to high voltage during fault.

ITEM NO. D.2: Repeated Tripping of 220 kV Budhipadar-Korba & 220 kV Budhipadar-Raigarh line and associated Issues

It has been observed that 220 kV Budhipadar-Korba & 220 kV Budhipadar-Raigarh circuits had tripped multiple occasions in last few months. Based on available DR analysis, it was observed that faults are occurring due to ROW vegetation issues. In addition to that, protection and Auto reclosure issues are also observed for these circuits.

The details of line tripping are given below:

In 105th PCC Meeting,

Regarding tripping of the lines, OPTCL replied that after repeated tripping events in month of May and June 2021, they had carried out line patrolling and cleared all vegetation issues at identified fault locations. However repeated tripping was being observed again in August -2021 and they informed that they would carry out thorough patrolling of the line in order to resolve any ROW/clearance issues.

PCC advised OPTCL to resolve RoW /clearance issues in the line by Sept' 21.

Regarding implementation of auto-recloser scheme, they replied that as an interim measure, auto-recloser at Budhipadar end would be implemented without PLCC similar to as done for 220 kV Katapalli -Bolangir (PG) line.

PCC advised OPTCL to resolve auto-reclose issue at Budhipadar end by 15th Sep'21.

OPTCL may update.

Deliberation in the meeting

OPTCL representative informed that auto-recloser scheme (without PLCC) had been implemented for 220 kV Budhipadar – Lapanga circuit-1 and it would be implemented for other feeders at Budhipadar end by Oct-21.

PCC advised OPTCL to implement autorecloser scheme for remaining feeders at 220 kV Budhipadar end at the earliest.

ITEM NO. D.3: N-1 reliability issue of 2 X 315 MVA 400/220 kV Ranchi ICTs

2 X 315 MVA 400/220 kV Ranchi ICTs are the primary source of power to the capital city of Ranchi. The downstream network from 400/220 kV Ranchi substation of PGCIL is presently having four lines (Three 220 kV lines to 220/132 kV Hatia (JUSNL) and one 220 kV line to Chandil substation. With increasing load and inadequate Tenughat generation, the load on these ICTs has reached more than 220 MW each since the last few quarters during peak hours. Thus, the ICTs were not satisfying the N-1 criteria.

In Aug 2021, 220 kV Ranchi-Ramgarh circuit was commissioned by DVC. With This line, the 400/220 kV ICTs loading increased each by 40-60 MW (total drawal by DVC through the line being 80-120 MW). This additional loading had aggravated the N-1 reliability issue of Ranchi ICTs.

In addition, any tripping of Bokaro ICTs would cause severe loading of Ranchi ICTs due to this newly commissioned line (one ICT tripping would lead to tripping of other ICT on overload).

In 105th PCC Meeting following deliberations took place -

ERLDC representative informed that with commissioning of 220 kV Ranchi-Ramgarh D/C line of DVC, the loading of the 400/220 kV ICTs at Ranchi had been further increased and this has aggravated the n-1 reliability concern of ICTs at Ranchi. They stated that immediate measures are required to address this issue.

PCC decided that a special meeting may be convened among DVC, JUSNL, Powergrid, ERLDC & ERPC secretariat to discuss and finalize remedial measures to address the reliability issue of ICTs at Ranchi.

Members may update.

Deliberation in the meeting

It was informed that special meetings were held on 01st Sep 2021 and 06th Sep 2021 among DVC, JUSNL, Powergrid, ERLDC & ERPC secretariat and an SPS was finalized for ensuring n-1 reliability criteria of 400/200 kV ICTS at Ranchi. The minutes of the meeting is enclosed at Annexure D.3.

The SPS in brief is as follows:

Stage1- For 100% load in ICT-1 or ICT 2, SPS issues trip command to 220 kV Ranchi-Ramgarh line after 300 Seconds delay

Stage2- For 130% load in ICT-1 or ICT 2, SPS issues trip command to 220 kV Ranchi-Ramgarh line after 5 Sec delay

Powergrid informed that cable work for implementation of the SPS is in progress and the same would be implemented by 23rd Sep 2021.

ITEM NO. D.4: Disturbance at 220 kV Biharsharif Substation on 01.06.2021 at 17:10 Hrs

On 01.06.2021 at 17:10 hrs, all 220 kV lines, emanating from 220 kV Biharshariff (BSPTCL) tripped. As per the information received, R phase CT at LV side of 400/220 kV ICT- 2 got busted resulting in tripping of all emanating lines. Total load loss was around 180 MW at Ekangasara / Rajgir / Baripahari / Hatida / Harnaut / Barh / Nalanda in Bihar system.

In 105th PCC Meeting,

BSPTCL representative updated the status as follows:

- The time setting of zone-4 protection in distance relay for all lines connected to 220 kV Biharsharif S/s had been reduced to 250 msec.
- Regarding implementation of busbar protection, they had taken up with their higher authority for early commissioning of the busbar protection at Biharshariff.
- Regarding checking of cables/wiring for ICTs, they informed that ICT-1 & ICT-3 are connected through common cable for which simultaneous s/d of both ICTs are required to carry out the activity. The checking would be done after getting the shutdown approval.

Powergrid intimated that they had received proposal from site for disabling the feature of extending inter-trip command from LV side to HV side of the ICT. They informed that they are considering to extend inter trip command through numerical relay instead of 86 relays and final recommendation in this regard would be sent to site for implementation at the earliest.

BSPTCL & Powergrid may update.

Deliberation in the meeting

Powergrid informed that proposal of extending inter-trip command from LV side to HV side of the ICT through numerical relay instead of 86 relays was going to be implemented through separate cables for ICT-1 & ICT-3. They added that the work is in progress and the scheme would be implemented by October-21.

ITEM NO. D.5: Total power failure at 220 kV BTPS(BSPTCL)S/s on 01.06.2021 at 17:03 Hrs

On 01.06.2021 at 17:12 hrs, the following elements got tripped resulting in total power failure at 220 kV BTPS.

- I. 220 kV Hazipur-BTPS circuit- 1
- II. 220 kV Mokama-BTPS-2
- III. 220 kV BTPS-Begusarai D/C
- IV. 220 kV Begusarai-Purnea(PG) circuit-I
- V. 220 kV Begusarai-Khagaria circuit-2
- VI. 220 kV Begusarai- New Samastipur (Ujiyarpur) D/C
- VII. 220 kV Mokama(BGCL)-Biharshariff D/C

In 104th PCC Meeting following deliberations took place –

BTPS further informed that high voltage is generally observed at BTPS end & the average voltage remain in the range of 230-235 kV.

PCC advised BTPS to share the voltage data along with the reactive power absorption data of their generating units to SLDC Bihar as well as to ERLDC for review.

In 105th PCC Meeting following deliberations took place -

It was informed that a proposed overvoltage settings for lines connected at 220 kV BTPS S/s was submitted by BTPS to SLDC, Bihar for their comments.

PCC advised SLDC Bihar to review the proposed settings and submit their observations at the earliest.

SLDC Bihar may update.

Deliberation in the meeting

PCC advised SLDC Bihar to review the proposed settings and submit their observations at the earliest.

ITEM NO. D.6: Disturbance at Bodhgaya S/S on 17/05/2021 at 23:06 Hrs

At 23:06 hrs, 220 kV Gaya-Bodhgaya-1 & 2 tripped from Gaya end only. At the same instance, all 220/132 KV ICTs at Bodhgaya also tripped causing load loss of 150 MW at Chandauti, Sherghati, Imamganj, Bodhgaya&Rafiganj Traction. 220 KV Bodhgaya-Khijasara D/C was hand-tripped from Bodhgaya end.

In 105th PCC Meeting,

BSPTCL informed that they had shared ICT backup protection settings of Bodhgaya S/s with Powergrid.

PCC advised Powergrid to revise zone 3 settings at Gaya end for 220 kV Gaya-Bodhgaya lines in coordination with ICT backup protection settings at Bodhgaya S/s.

Powergrid may update.

Deliberation in the meeting

Powergrid informed that ICT backup settings of Bodhgaya S/s was received to them recently. They added that the zone-3-time settings for 220 kV Gaya-Bodhgaya lines at Gaya end would be coordinated accordingly.

ITEM NO. D.7: Total Power Failure at Dumka S/s on 15/05/2021 at 12:01 Hrs

Due to tower collapse of 220 kV Farakka-Lalmatia S/C in April 2021, local load at 220 kV Dumka and Godda S/S were being radially fed from 400/220 kV Maithon S/S through 220 kV Maithon-Dumka D/C and 220 kV Dumka-Godda D/C. 220 kV Maithon-Dumka-1 was under shutdown for attending the hotspot at connector of R-phase pole circuit breaker of the line.

At 12:02 hrs 220 kV Maithon Dumka – 2 tripped on R phase to earth fault resulting in total power failure at Goda, Dumka S/S and nearby areas.

In 105th PCC Meeting,

JUSNL informed that as per the information received from site, the make of PDH unit at Dumkais different from Maithon end. They further informed that for establishing communication between both end and for successful A/R operation, PDH of PLCC must be of same make on either end.

PCC advised JUSNL to re-verify the make of PDH at Maithon end in coordination with Powergrid. In case the PDH make is same on either end, they shall resolve carrier issue in consultation with OEM.

In case the PDH make on either end is different, then the PDH may be replaced or new PDH may be purchased to restore the PLCC communication.

PCC opined that as the onus of restoration of PLCC in 220 kV Maithon-Dumka line lies with JUSNL, JUSNL shall take appropriate action to restore the PLCC at the earliest.

JUSNL may update.

Deliberation in the meeting

JUSNL informed that for 220 kV Maithon-Dumka-2, there was a link failure issue in DTPC which had been rectified and the PLCC is now in service.

For 220 kV Maithon-Dumka-1, they intimated that there was a card issue in PLCC panel. The OEM (M/s ABB) had been communicated regarding the issue and the same would be resolved by September' 21.

ITEM NO. D.8: Disturbance at Jasidih(JUSNL) S/S on 27/05/2021 at 10:13 Hrs

On 27-05-2021, demand in Jharkhand system was low because of thunderstorm and heavy rainfall caused by Cyclone Yaas. This had resulted in high voltage at various parts of JUSNL network.

At 03:22 hrs, 220 kV Dumka-Jasidih D/C were hand tripped at Dumka end because of overvoltage. Charging of 220 KV Dumka-Jasidih – 1 was attempted at 03:51 Hrs and 07:01 Hrs and finally it was charged at 09:50 Hrs.

At 10:13 hrs, 220 kV Dumka Jasidih – 1 tripped from Dumka end due to operation of overvoltage stage 1. With this 132 kV Dumka – Dumka D/C and 132 kV Dumka – Deoghar D/C also got tripped. This has led to loss of supply at 220/132 kV Jasidih and 132 kV Dumka substation.

In 105th PCC Meeting,

JUSNL informed that a draft philosophy for overvoltage settings had been prepared by them and the same was circulated among their field offices for comments.

They added that after incorporating the observations received from field units, the final report would be shared with ERPC/ERLDC for review.

JUSNL may update.

Deliberation in the meeting

*It was informed that draft overvoltage settings philosophy has been received from JUSNL. The same is enclosed at **Annexure D.8**.*

PCC advised ERLDC/ERPC secretariat to submit their observations on the draft philosophy to JUSNL.

ITEM NO. D.9: Grid event at 132 kV Motihari (DMTCL) S/S on 21-04-2021 at 20:19 hrs

On 21st April 2021 at 19:00 hrs, 132 kV side of 400/132 kV 315MVA ICT-3 (Ownership is with PowergridMithilanchal Transmission Ltd) at Motihari was being charged through 132 kV GIS Bus 1. Just after charging of new ICT, 132kV Main bus-1 at Motihari tripped due to Bus extension module SF6 gas pressure low trip at 19:01 Hrs. Following feeders which were connected with 132kV Main bus – 1 at Motihari tripped:

- 132 kV side of 400/132 kV ICT – 1 at Motihari
- 132 kV Betiya – 1
- 132 kV Motihari – 1
- 132 kV Raxaul – 1

In 105th PCC Meeting,

PMTL representative informed that the investigation report for failure of bus extension module was submitted to PSETD division of CEA. PCC advised PMTL to share the disturbance report to ERPC also.

Regarding restoration of the damaged GIS section, PMTL intimated that they had received two offers from OEM i.e. M/s TBEA.

- First one is for bus extension module, for which offer had already been accepted and in process for approval.
- Other offer is for adjacent damaged bay (132 kV DMTCL-Raxaul-2) for which cost negotiation are going on with OEM.

Regarding timeline to complete the work, PMTL informed that since all materials required for restoration work are to be imported from China, it would take some time for restoration.

PCC advise PMTL to process both offer simultaneously so that restoration work of damaged GIS module may be completed at the earliest.

PMTL & DMTCL may update.

Deliberation in the meeting

PMTL informed that offers received from OEM i.e., M/s TBEA regarding restoration of the damaged GIS section is under examination.

Regarding timeline to complete the work, PMTL informed that since all materials required for restoration work are to be imported from China, it would take 40-50 days for restoration after placing the supply order.

ITEM NO. D.10: Repeated delayed clearance of faults at 220 kV Chandil STPS S/C

In March 2021, 220 kV Chandil STPS S/C tripped repeatedly due to various short circuit faults at 6-12 km from STPS.

In 105th PCC Meeting,

JUSNL informed that OEM had visited the site on 17th July 2021 and had identified some issues with PLCC panel.

They further informed that work order for rectification work of PLCC panel would be placed after receiving the cost estimate from OEM and submitted that PLCC issue at Chandil would be resolved by October'21.

JUSNL may update.

Deliberation in the meeting

JUSNL informed that cost estimate was received from OEM and work order for rectification work of PLCC panel would be placed after getting approval from higher authority. They added that the PLCC issue would be resolved within Nov-21.

PCC advised JUSNL to expedite the approval process and resolve the issue by Oct-21.

Annexure A

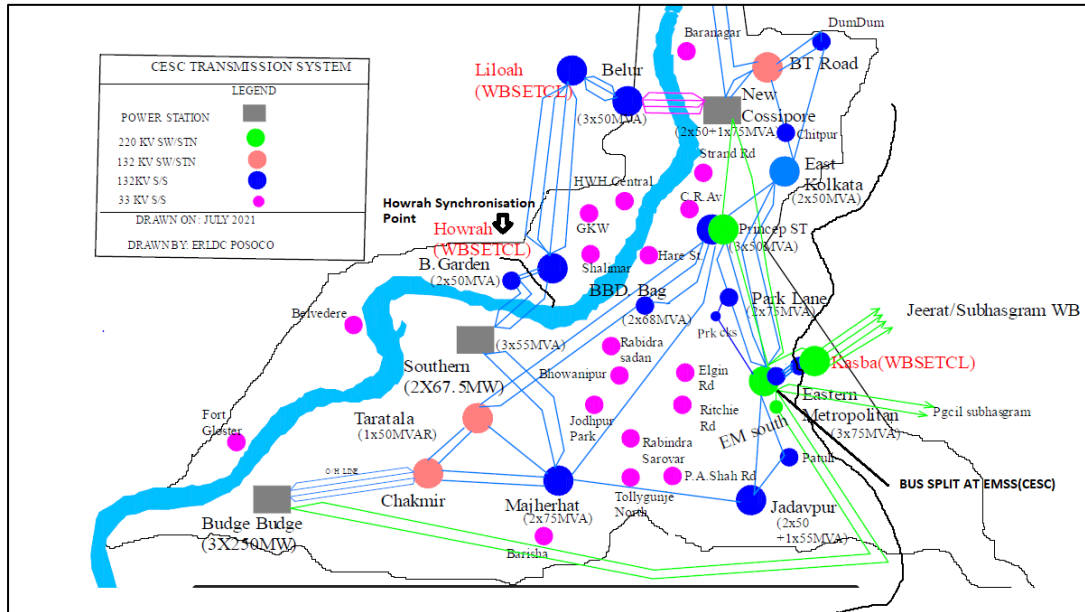
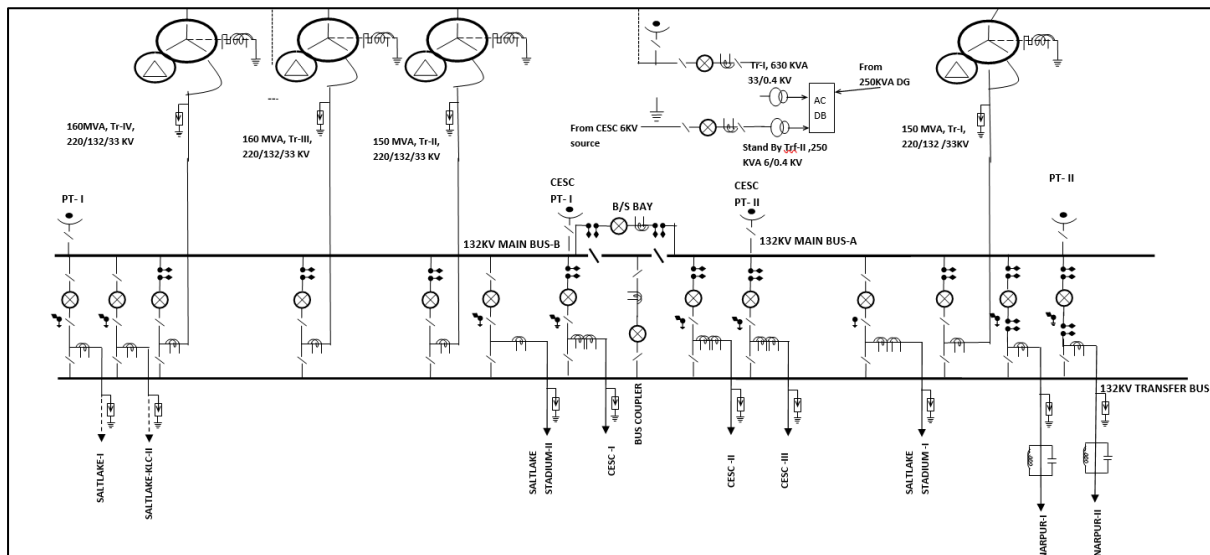
LIST OF PARTICIPANTS IN 106TH PCC MEETING HELD ON 16.09.2021

Full Name	User Action	Timestamp
ERPC Kolkata	Joined	9/16/2021, 10:24:55 AM
gaurav (Guest)	Joined	9/16/2021, 10:25:08 AM
ARUN KUMAR, TD, ADP, JUSNL (Guest)	Joined	9/16/2021, 10:25:08 AM
OPTCL,EMR SUB-DIVISION MERAMUNDALI (Guest)	Joined	9/16/2021, 10:25:08 AM
gautam nayak (Guest)	Joined	9/16/2021, 10:25:08 AM
Amaresh Mallick, ERLDC (Guest)	Joined	9/16/2021, 10:25:26 AM
DEBDAS MUKHERJEE WBPDC (Guest)	Joined	9/16/2021, 10:26:25 AM
SMA SAHOO,DGM,OPTCL,BHUBANESWAR (Guest)	Joined	9/16/2021, 10:26:47 AM
Sukdev (PG) (Guest)	Joined	9/16/2021, 10:27:41 AM
DGM, EMR DIVISION, JAIPUR ROAD, OPTCL (Guest)	Joined	9/16/2021, 10:28:04 AM
Prasanna Kumar Sahoo	Joined	9/16/2021, 10:28:11 AM
Arindam Bsptcl (Guest)	Joined	9/16/2021, 10:28:18 AM
Alok Pratap Singh ,ERLDC (Guest)	Joined	9/16/2021, 10:28:21 AM
Anjan Kumar Sahoo	Joined	9/16/2021, 10:28:54 AM
rajendra prasad (Guest)	Joined	9/16/2021, 10:28:55 AM
Aishwary Shukla AEE CRITL JUSNL (Guest)	Joined	9/16/2021, 10:29:00 AM
Pallavi Kansal	Joined	9/16/2021, 10:29:22 AM
Ch Mohan Rao,PG,Odisha (Guest)	Joined	9/16/2021, 10:30:59 AM
Ankur Kumar (Guest)	Joined	9/16/2021, 10:31:10 AM
Sh. Satish Kant	Joined	9/16/2021, 10:31:13 AM
Rajiv Kumar Singh CESC (Guest)	Joined	9/16/2021, 10:31:17 AM
Prachi Gupta (Guest)	Joined	9/16/2021, 10:31:29 AM
Rakesh Oraon (Guest)	Joined	9/16/2021, 10:32:29 AM
jitesh kumar (Guest)	Joined	9/16/2021, 10:32:30 AM
Manoranjan Panigrahi	Joined	9/16/2021, 10:32:42 AM
deepak thakur, BSPTCL (Guest)	Joined	9/16/2021, 10:33:07 AM
SANJEEV KUMAR (Guest)	Joined	9/16/2021, 10:33:36 AM
Dilip kant Jha Eee Bsptcl (Guest)	Joined	9/16/2021, 10:33:47 AM
Deepak Kumar Singh (Guest)	Joined	9/16/2021, 10:34:30 AM
Nishant Kumar Shankwar	Joined	9/16/2021, 10:34:38 AM
SLDC-ODISHA (Guest)	Joined	9/16/2021, 10:34:52 AM
Sucharit Mondal (Guest)	Joined	9/16/2021, 10:35:04 AM
GAGAN KUMAR EEE (Guest)	Joined	9/16/2021, 10:35:26 AM
shadab hasan (Guest)	Joined	9/16/2021, 10:36:25 AM
DILSHAD ALAM (Guest)	Joined	9/16/2021, 10:36:29 AM
Akash Modi,ERLDC (Guest)	Joined	9/16/2021, 10:39:02 AM
D.K.Jain ED ERLDC (Guest)	Joined	9/16/2021, 10:39:06 AM
SLDC(odisha) (Guest)	Joined	9/16/2021, 10:39:12 AM
eee critl (Guest)	Joined	9/16/2021, 10:39:37 AM
Prabhat Kumar (Guest)	Joined	9/16/2021, 10:39:40 AM
N Mondal (Guest)	Joined	9/16/2021, 10:39:46 AM
Chandan Kumar (Guest)	Joined	9/16/2021, 10:40:06 AM
U K MISHRA (Guest)	Joined	9/16/2021, 10:42:55 AM
Cornelius marandi (Guest)	Joined	9/16/2021, 10:45:41 AM
saroj kumar bohidar (Guest)	Joined	9/16/2021, 10:48:01 AM
Kumar Amrendra Madanpuri (Guest)	Joined	9/16/2021, 10:48:25 AM
CRITL (Guest)	Joined	9/16/2021, 10:50:08 AM
abhinaba basu (Guest)	Joined	9/16/2021, 10:51:57 AM
BIHAR GRID COMPANY	Joined	9/16/2021, 10:51:59 AM

[illegible]

BUS FAULT AT 132 KV KASBA(WBSETCL) & CESC ISLANDING EVENT ON 01 AUGUST 2021**Configuration prior to Event:**

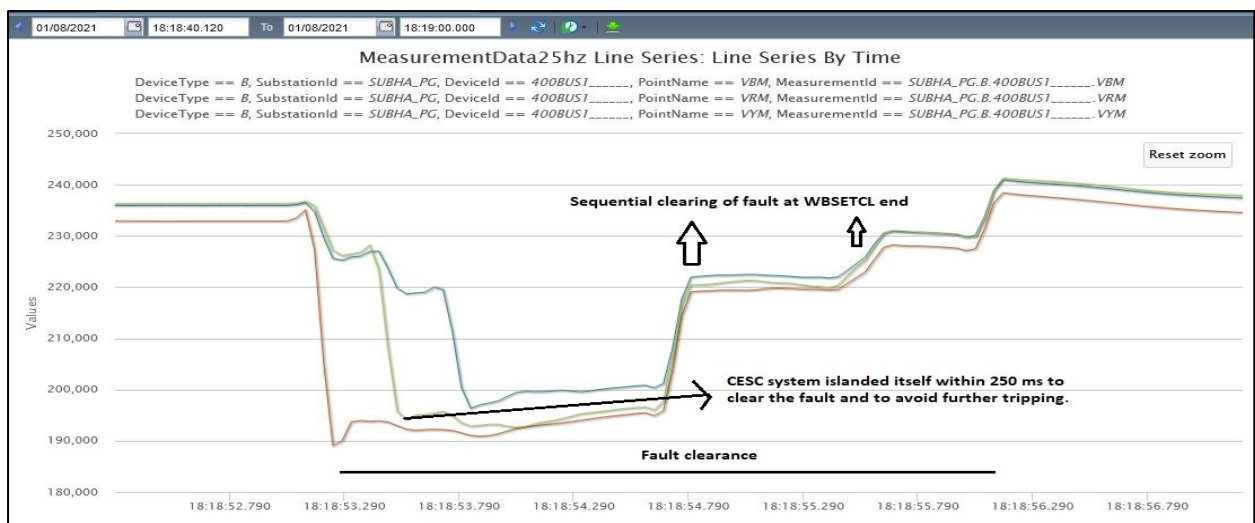
220 kV EMSS (CESC) is having Bus -Split, where at one bus ,Radial load is being fed via 220 kv Subhasgram(PG) D/C ,While another bus is synchronized with grid via 3*132kV EMSS(CESC)-KASBA (WBSETCL) circuits and further CESC system connected with the same bus. Hence at this point CESC is synchronized with the grid via 3*132 kV KASBA (WBSETCL) circuits.

**Bus Configuration at 132 kv KASBA(WBSETCL) S/S**

132kv kasba-Sonarpur-1 & 2 ckt, 132 kasba-cesc-2 & 3 ckt, Kasba-Saltlake stadium-1 & 150MVA TR-1 at 132 KV Bus Section-A & 132kv kasba-Saltlake-1 & 2 ckt, 132 kasba-cesc-1 ckt, Kasba-Saltlake stadium-2 & 150MVA TR-2, TR-3 & TR-4 on bus section B.

Analysis of First Event at 18:18 Hrs on 01/08/2021

- At 132 kV KASBA (WB) about 18:18 hrs one bus fault occurred at Bus A due to falling of kite string between Main Bus side Isolator and Breaker of 132 KV Kasba-Saltlake Stadium Ckt-1.
- Bus bar of Bus A operated and gave tripping command to all the elements associated with the Bus A and all elements tripped except Bus section breaker as shown in SLD which was coupling both the buses.
- During checking it was found that one wire (which is connected to output contact of 96 relay of 132KV Bus Section bay for trip positive to trip coil of CB) was broken due to which it did not tripped.(This has been rectified).
- LBB of Bus section breaker was not available so it also didn't tripped through LBB.(Status of LBB incorporation) **(WBSETCL to update)**.
- From the PMU plot of Bus voltage of Subhasgram (PG) attached below, it is clear that fault isolated after 3 seconds. As fault was getting fed via Transformers, It should have cleared the fault from HV side by Backup O/C operation, why it did not operated. Whether Backup O/c or any other protection picked up or not?(**WBSETCL to update**).
- As Bus section Breaker did not tripped fault was getting fed via Bus B, through 220/132kV Transformers due to this fault feeding, R phase 132 KV CT of 220/132 KV TR#2, which was connected to Bus Section-B, burst out and created a Bus B Fault and Bus Bar Relay (87 B & 87 CH), operated and all 96 relay associated to Main Bus Section-B & Differential relay, 86 of TR#2 operated and cleared the fault.



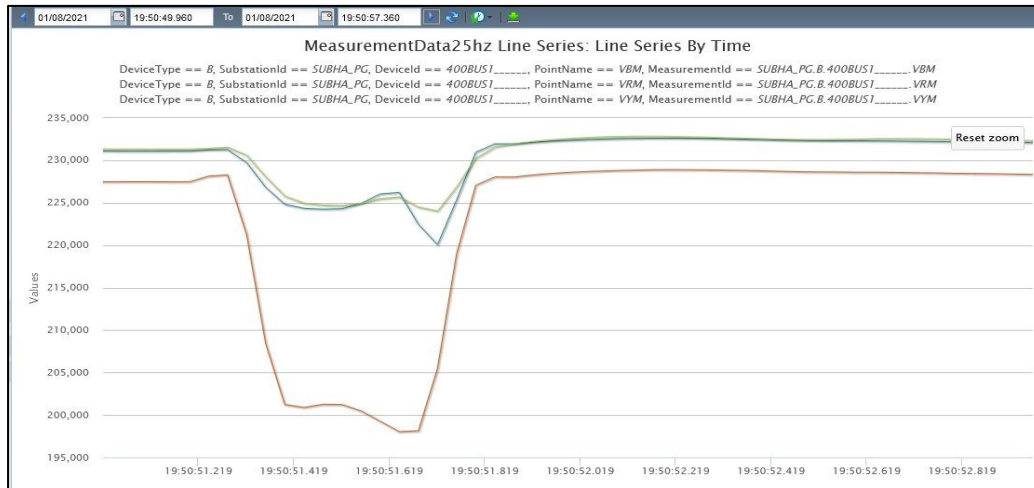
2nd Event Occurred at 19:50 Hrs:

- After restoration of 132kV Bus at Kasba Substation, 132 Kv SaltLake Stadium-Kasba -1 was charged upto 132KV Transfer bus of kasba substation, from SaltLake Stadium end for engaging the mentioned Ckt-1 through Transfer Bus Coupler of Kasba end.
- 132 kV SaltLake Stadium-Kasba 1&2 are fully connected through 132KV cable with Line differential protection.
- 132 Kv Salt Lake Stadium-Kasba Ckt-1 tripped on zone-2(350ms) from Saltlake stadium end due to falling of kite thread at Transfer bus end.
- From Kasba end which protection operated to isolate the fault by Transfer Bus coupler breaker tripping. Why Distance protection at Kasba end did not cleared the fault from Kasba

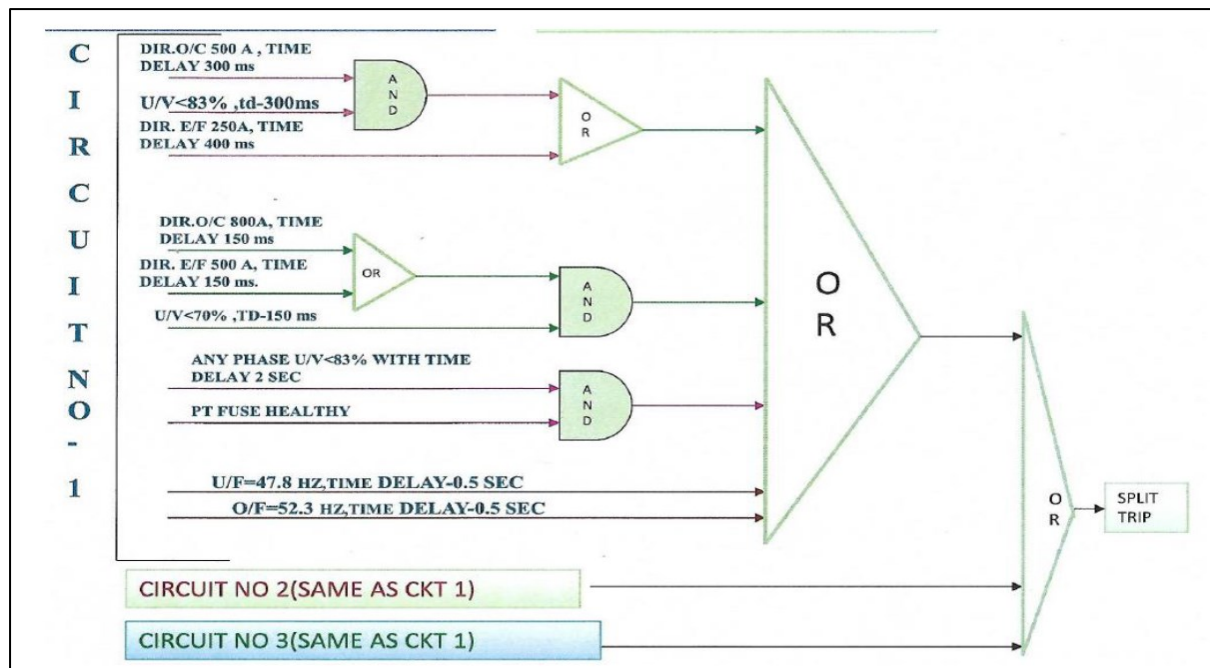
end which would have avoided delayed clearance second time and Cesc Islanding.(WBSETCL to update).

- But prior to that Islanding condition -2 got satisfied as it considers delay of only 150 ms and CESC islanded again.(Logic shown below)
- Rest 132 kV KASBA WBSETCL system was healthy and intact this time.

PMU plot of Subhasgram Bus-Voltage showing Fault clearance 350 ms zone-2 time from WB end.



CESC Islanding during event:



Logic diagram for Islanding of CESC is mentioned in above Figure .

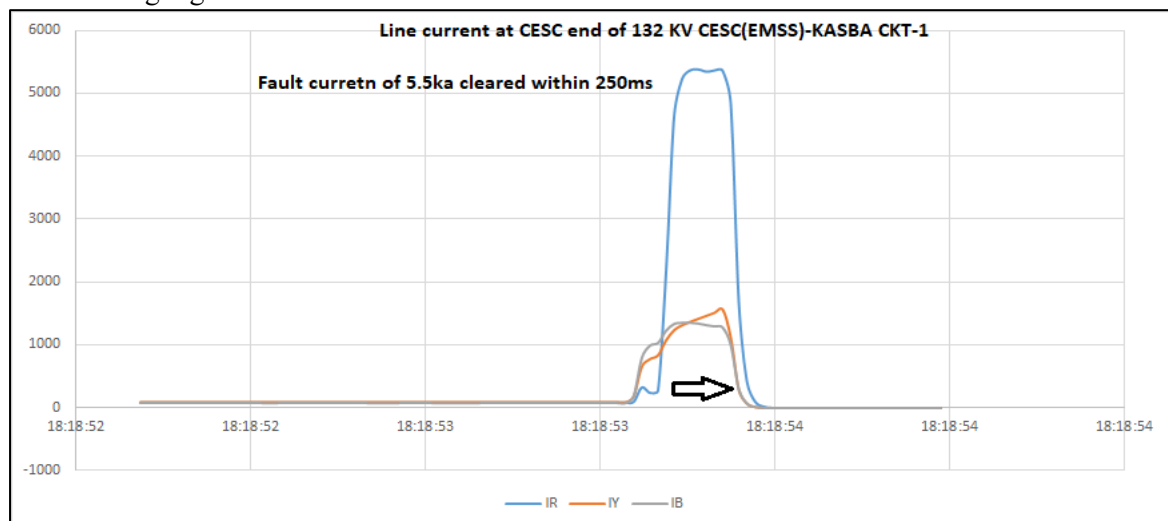
- Due to the BUS fault at 132 kV KASBA WBSETCL end and delayed clearance as per the above logic diagram condition 2 got satisfied: Dir O/C 800 Amps ,Delay 150 Msec and U/V < 70% ,Delay-150ms.Hence CESC islanded itself by tripping all 3 circuits of Kasba WBSETCL.

EVENT 1:

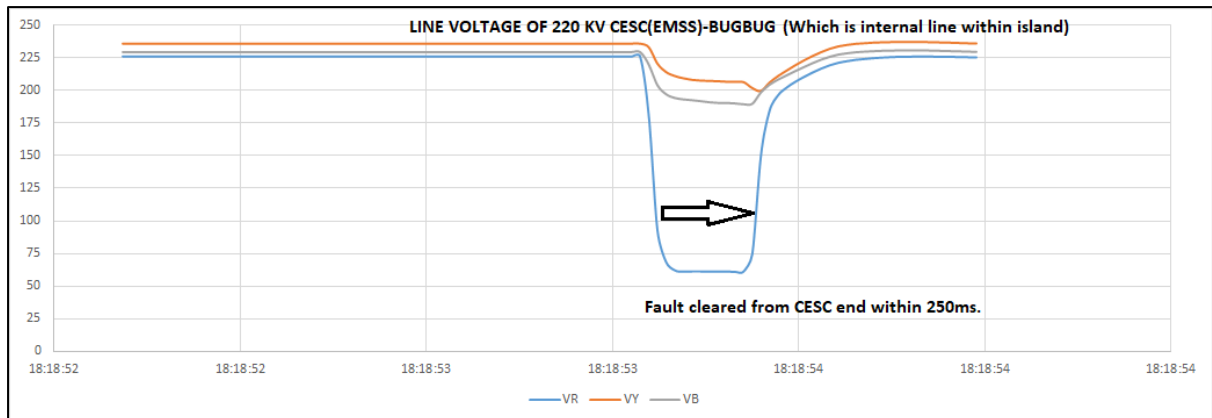
CESC islanded itself as total fault current seen by CESC end was 5.2 Ka and cleared fault by tripping all 3 circuits within 250 ms.

- Line current of 132 kV CESC(EMSS)-KASBA(WBSETCL) shown below:

Line current became zero within 250 ms of fault validating tripping of circuits from CESC end as per the Islanding logic.



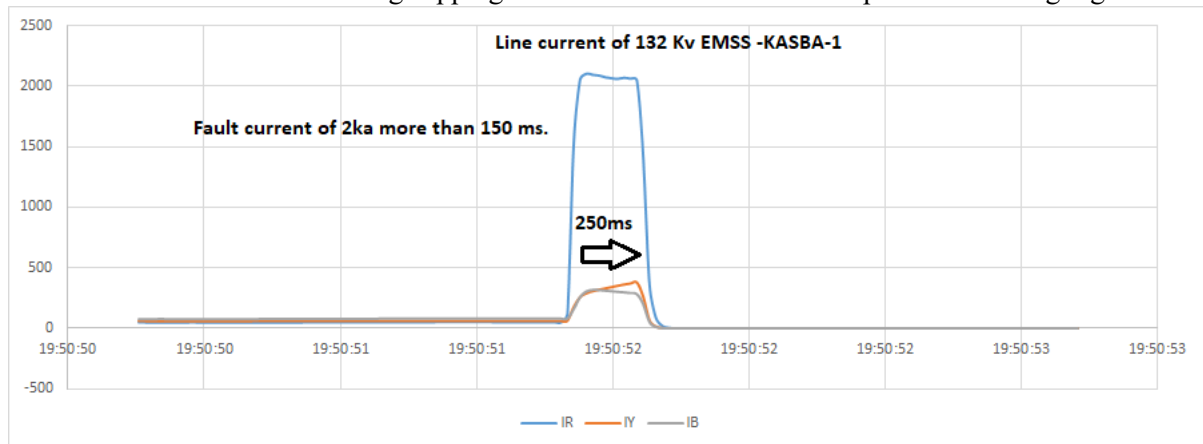
- LINE Voltage of 220 kV EMSS -(BUGBUG) :** This also indicating fault clearance within 250ms from CESC end while Subhasgram Pmu Bus voltage connected with WBSETCL system indicates delayed clearance from WBSETCL end.



At 18:27 Hrs CESC was synchronized with Howrah Point. Then Synchronization point again changed to 18:35 Hrs at KASBA .

EVENT 2:

Line current of 132 Kv CESC(EMSS)-KASBA(WBSETCL) shown below: Line current became zero within 250 ms of fault validating tripping of circuits from CESC end as per the Islanding logic.



At 19:57 Hrs. CESC was synchronized to Howrah point.

For maintaining Frequency in the island following action are taken:

Low frequency in Islanded system: Loads will be shed through the operation of UFR relays (Stage 1,2 , 3 &4); bulk loadshedding may also be carried out from CESC Control Room to boost up frequency .

High Frequency condition: BBGS will back down generation by operation of FGMO/RGMO and HP-LP Bypass system and will control frequency with guidance from Control Room at CESC House.

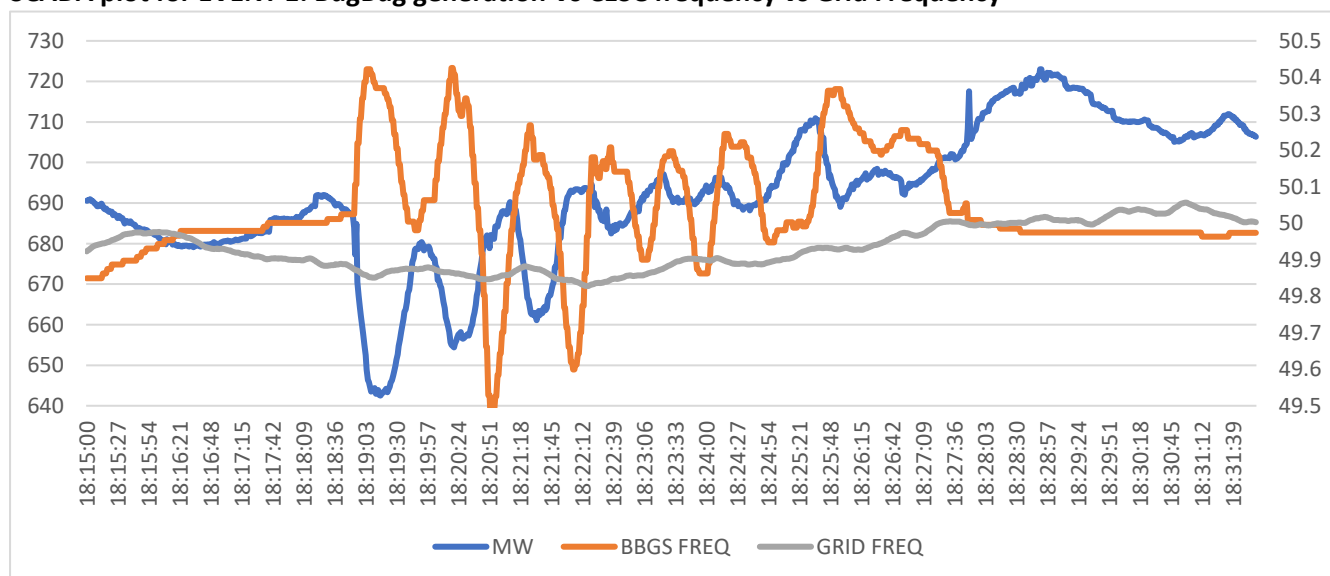
Observations During Islanding of CESC:

CESC to reply following

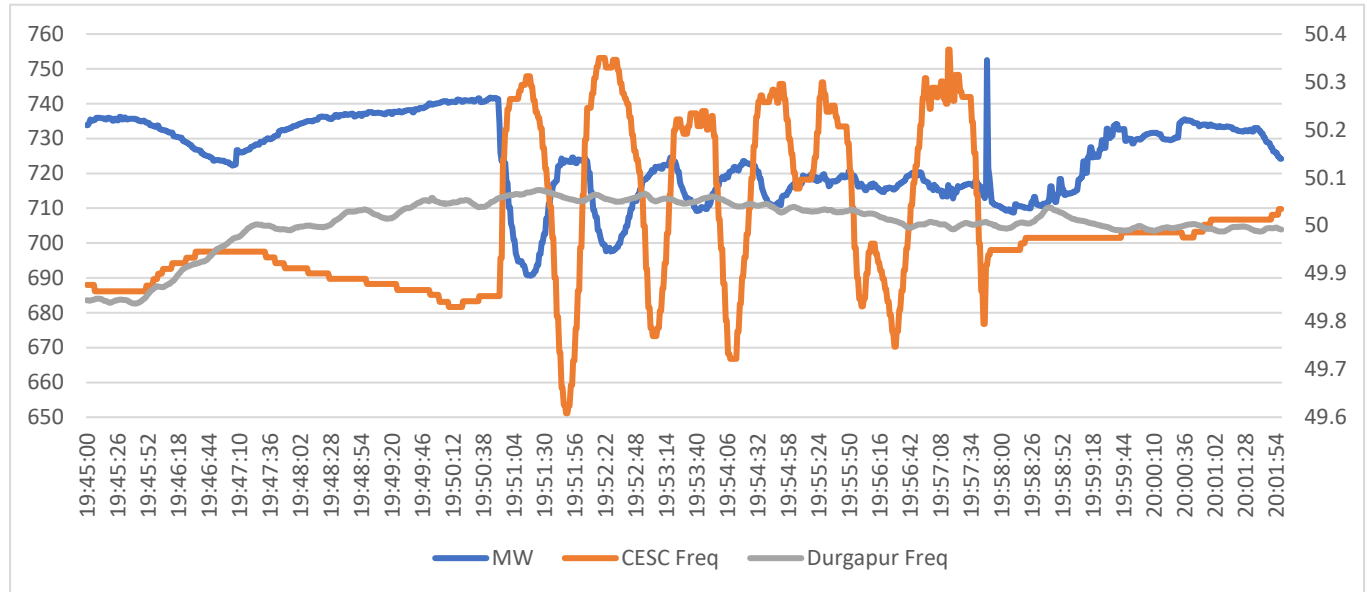
- **Criteria for Islanding condition by CESC** may once be reviewed as ,in condition 2 delay of only 150ms is provided **where the allowable fault clearance as per CEA grid standards for 220 & 132 kV level is 160 ms** ,so even in case of clearance in Zone 1 chances of islanding is possible.
- With the help of proper study if possible, it can be increased further to avoid Islanding for Z-1 fault clearance.
- There is large difference between Pre islanding and post synchronisation of Grid frequency and Bugbug frequency data as submitted, Which is not possible for synchronised grid.**(As observed from Scada)**.This may be looked into and corrected.
- With PMU frequency data Pre-&Post synchronisation frequency of CESC and Grid was found same as attached below .
- Variation of frequency after island formation in Bug-bug frequency is observed upto 1Hz and was varying continuously till it got synchronised with grid at Howrah point, this may also be checked.
- In Event 2 also it can be observed that, although bug-bug generation was more are less constant still frequency variation of 0.5 Hz observed in Bug -bug frequency. Same thing was observed in event 1 also but was prominent in Event-2 .
- Such pro longed variation of frequency during whole islanded mode may be checked as generation variation was minimal.
- Any cyclic load changes or other behaviour may also be analysed for the same.
- **Governor parameter tuning during islanded mode may also be checked along with PSS for stability during islanded mode.**

Reason for such continuous high oscillating variation in frequency may be analysed and possible consequences may also be looked into as it may cause operation of UFR relay in some cases inside the island.

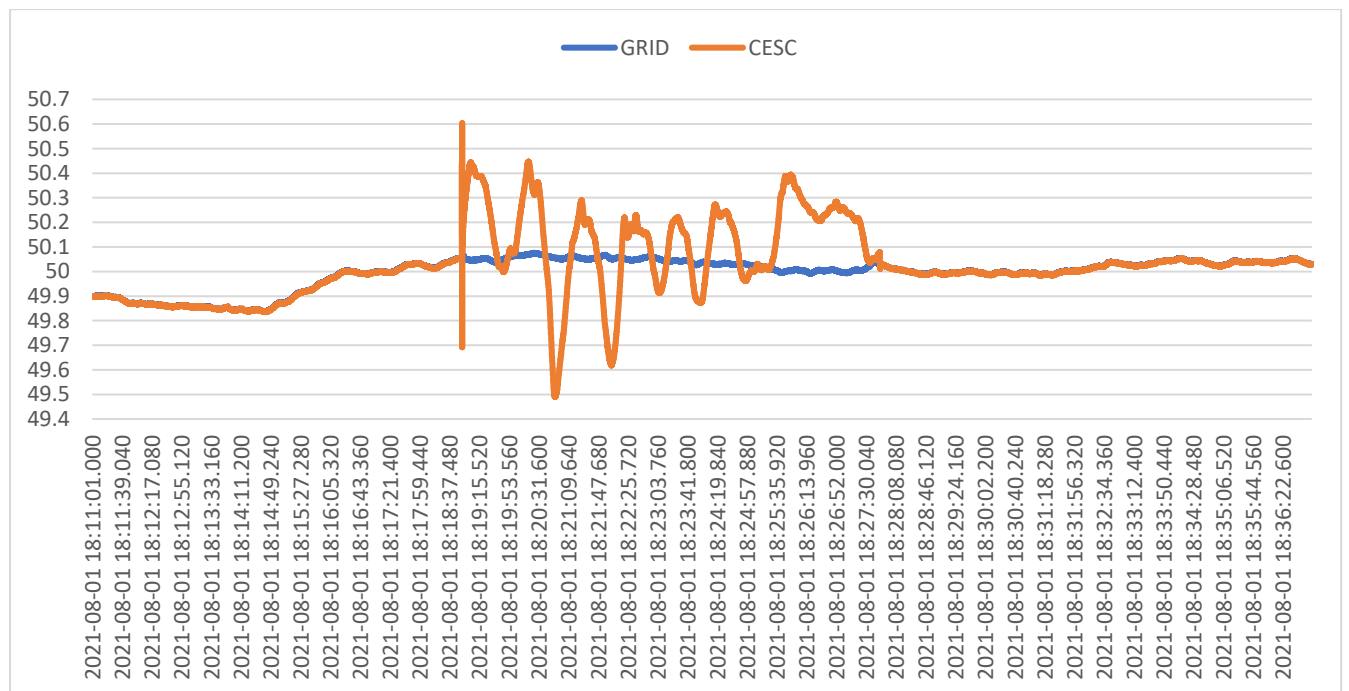
SCADA plot for EVENT 1: BugBug generation Vs CESC frequency vs Grid Frequency



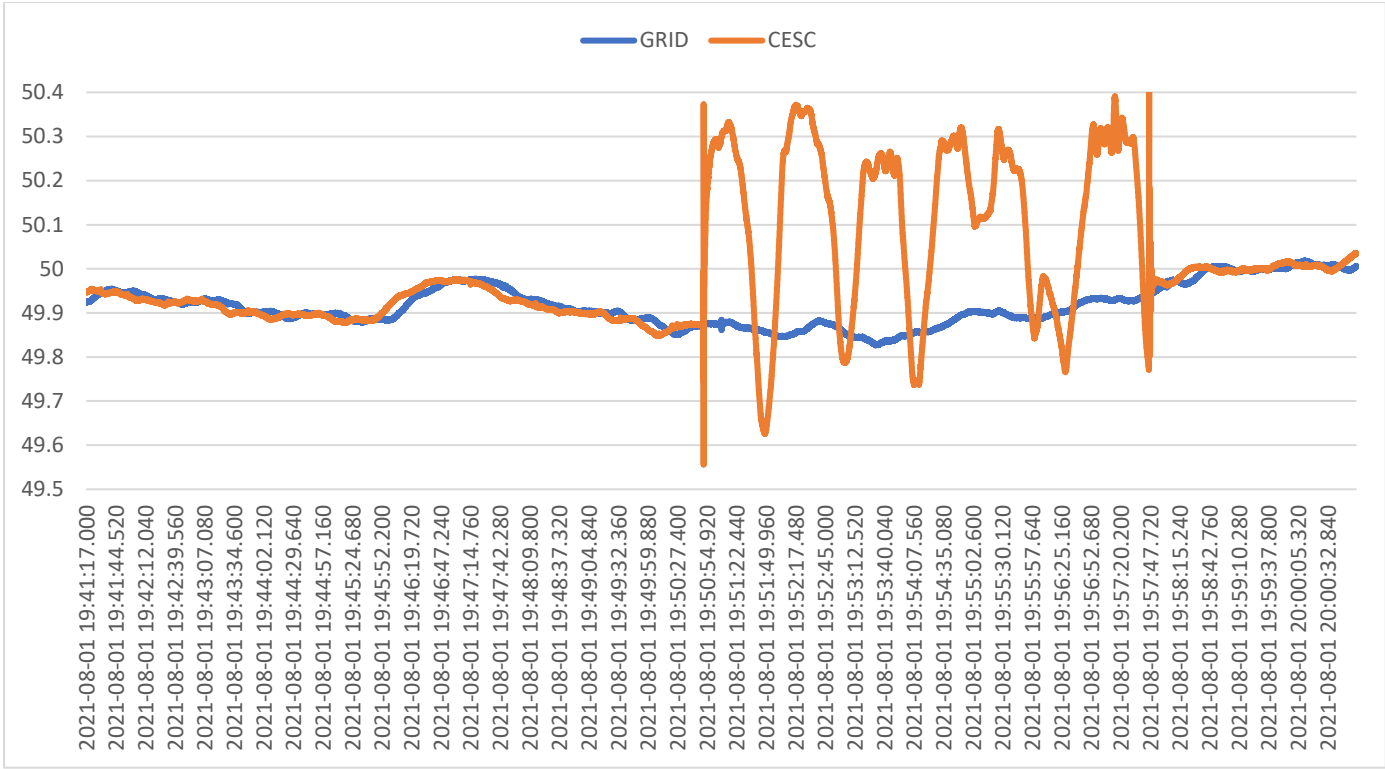
SCADA plot for EVENT 2: BugBug generation Vs CESC frequency vs Grid Frequency



EVENT 1: Frequency comparison by PMU Plot:



EVENT 2: Frequency comparison by PMU Plot:



Grid Disturbance at 220/132 kV Ramchandrapur GSS on 20.08.2021 at 20:24 hrs.



Overview of Incident : -

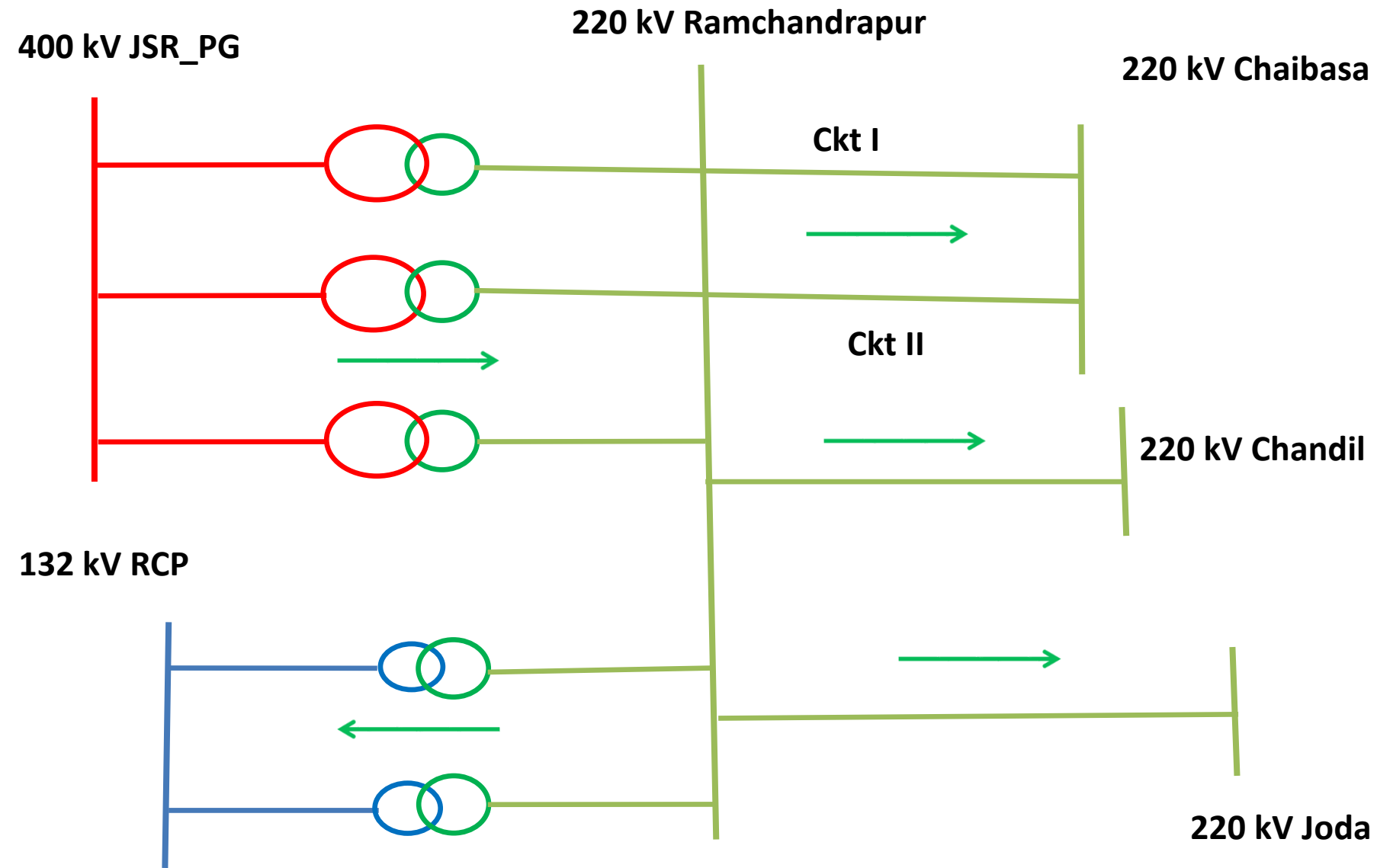
- **B phase jumper snapped between Breaker and CT of 220 kV Bus coupler bay resulting in Bus fault, hence tripping of Bus Coupler and outage of BUS – I. Bus –II remained Charged during the event**
- **Bus Bar Differential Protection was out in service at the time of event due to some rectification work.**
- **Load Loss – 250 MW**
- **Weather - Normal**

Overview of Incident : -

Major elements tripped:

- 220 kV Main Bus I at Ramchandrapur
- 220 KV Jamshedpur-Ramchandrapur I & II (400/220 kV ICT – I & II at Jamshedpur)
- 220 kV Ramchadrapur-Joda
- 220 kV Ramchandrapur-Chandil
- 2*150 MVA, 220/132 kV ICT II, ICT III at Ramchandrapur
- 3*100 MVA; 220/132 kV ICT I, ICT II & ICT IV at Chandil

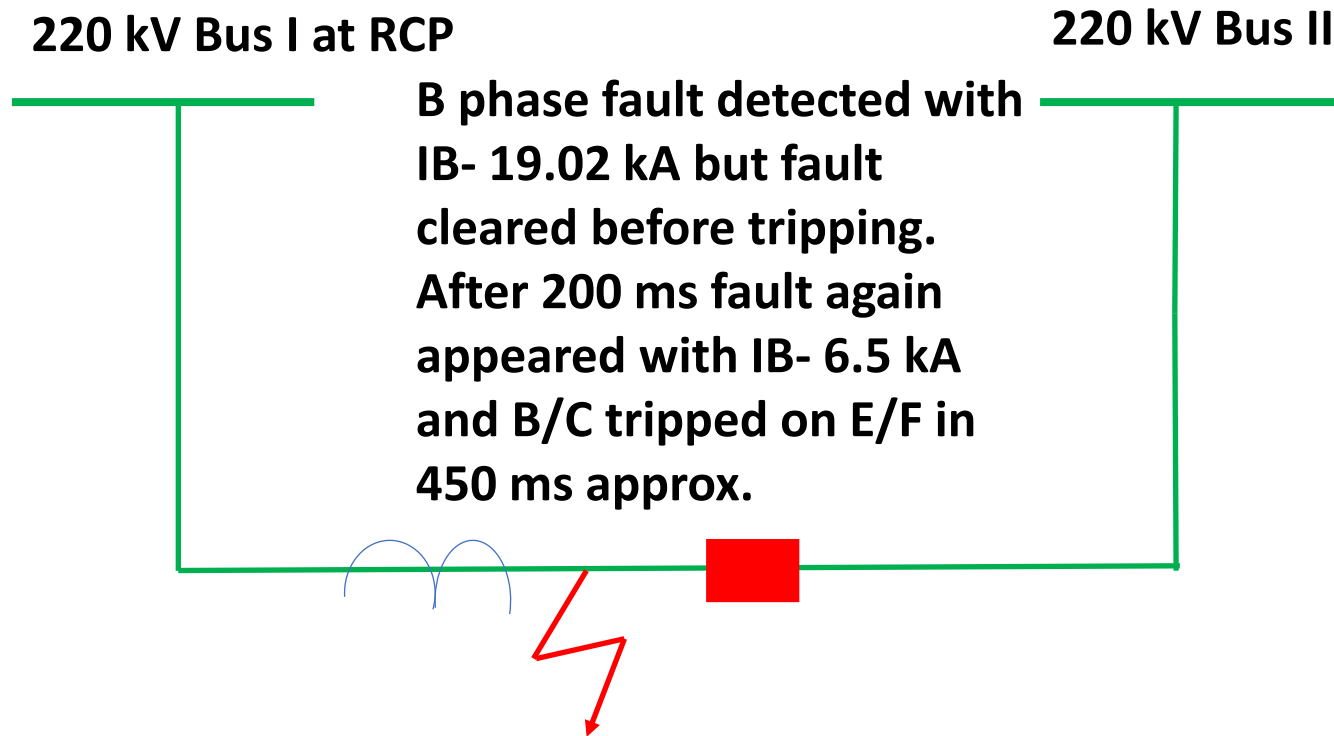
• Pre-fault Condition :-



Feeder Positions :-

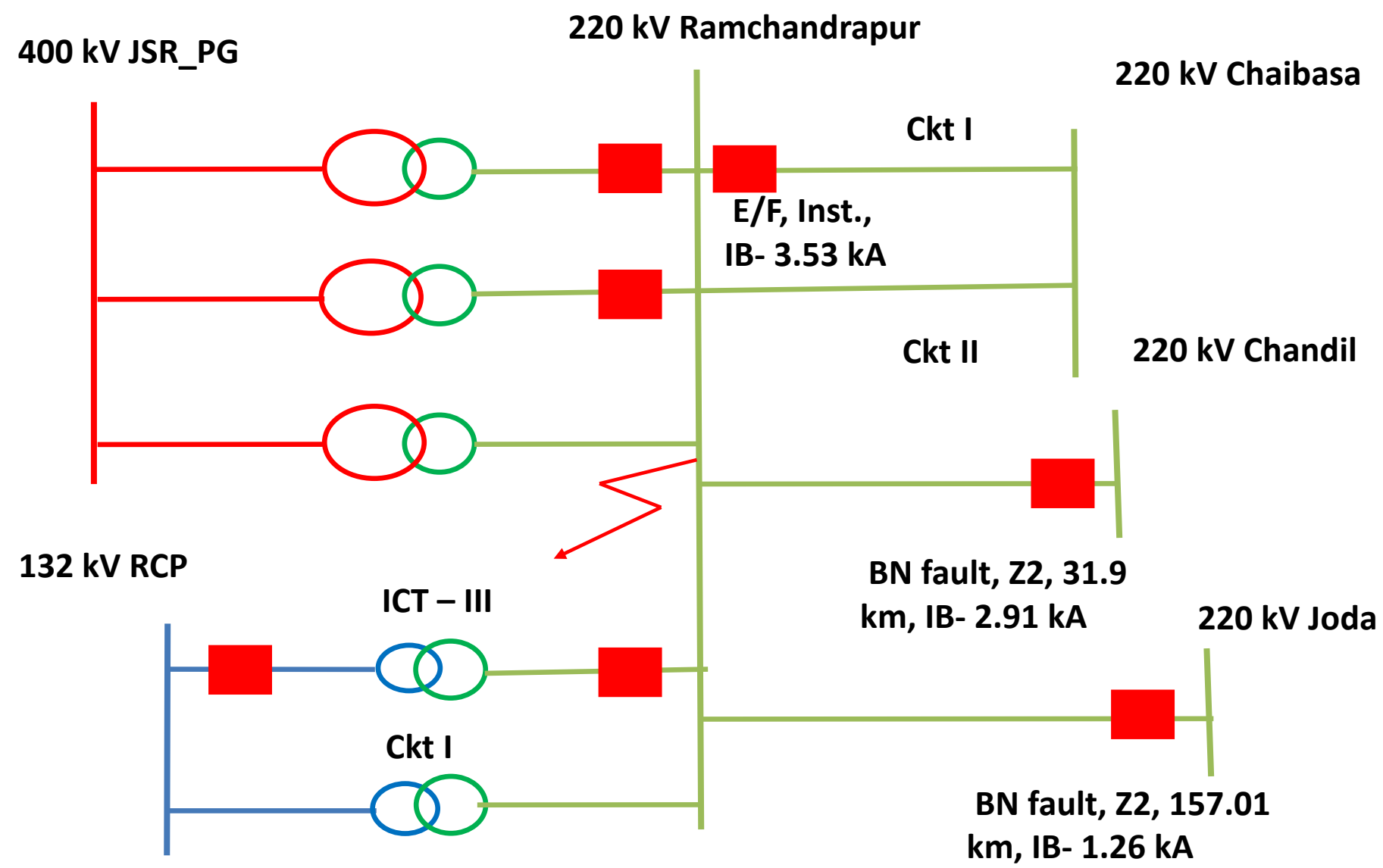
- **Bus I** :- 220 KV Jamshedpur(PG)-Ramchandrapur I & II (400/220 kV ICT – I & II at Jamshedpur(PG)), 220 kV Joda, 220 kV Chandil, 220 kV Chaibasa – I, 150 MVA 220/132 kV ICT- III
- **Bus II** :- 220 KV Jamshedpur-Ramchandrapur III (400/220 kV ICT III at Jamshedpur), 220 kV Chaibasa – II, 150 MVA 220/132 kV ICT- II

Post fault Condition :-



B phase jumper snapped between Breaker and CT of 220 kV Bus coupler bay

• Post fault Condition :-



• Relay Indications :-

Element Name	Relay indication at End 1	Relay indication at End 2	Remarks
220 kV Bus Coupler	B phase fault detected with IB- 19.02 kA but fault cleared before tripping. After 200 ms fault again appeared with IB- 6.5 kA and B/C tripped on E/F in 450 ms approx.		
220 kV RCP – Chaibasa ckt- 01	E/F Instantaneous (High set), IB- 3.53 kA	Did not tripped.	Due to improper setting at RCP end
220 kV RCP - Chandil	Did not tripped.	BN fault, Z2, 31.9 km, IB -2.91 kA	
220 kV RCP - Joda	Did not tripped.	BN fault, Z2, 157.01 km, IB – 1.26 kA	
220 KV Jamshedpur-Ramchandrapur I & II (400/220 kV ICT – I & II at Jamshedpur)	Both ICT Tripped from LV side at RCP GSS		

• Relay Indications :-

Element Name	Relay indication	Remarks
150 MVA, 220/132 kV ICT - III	Back up O/C and E/f in both HV and LV side (Electromechanical relay)	
150 MVA, 220/132 kV ICT - II	O/C	Tripped on 20:29 hrs

Element Name	Relay indication	Remarks
100 MVA, 220/132 kV ICT – IV at Chandil GSS	REF protection	Due to improper wiring of REF ckt.
100 MVA, 220/132 kV ICT – I at Chandil GSS	O/C (1 st stage), Approx. 2.0 s IR- 0.74 kA, IY- 0.76 kA, IB = 0.75 kA	Tripped on 20:29 hrs
100 MVA, 220/132 kV ICT – I at Chandil GSS	O/C (1 st stage), Approx. 2.0 s IR- 0.74 kA, IY- 0.76 kA, IB = 0.75 kA	Tripped on 20:29 hrs

- **Tripping Analysis :-**

- ❖ **220 kV Bus Coupler** - B phase fault detected with IB- 19.02 kA but fault cleared before tripping. After 200 ms fault again appeared with IB- 6.5 kA and B/C tripped on E/F in 450 ms approx.

Bus bar differential protection was out of service during the event.

- ❖ As the bus fault was occurred in main -1 bus side subsequently, all the elements of Bus – 1 tripped and Bus – 2 remained in service.
- ❖ 220 kV RCP – Chandil and 220 kV RCP – Joda tripped from remote end in Z2 while 220 kV RCP – Chaibasa -1 tripped from RCP at E/f (High set) instantaneously due to improper setting.

- **Tripping Analysis :-**

- ❖ **220 KV Jamshedpur-Ramchandrapur I & II (400/220 kV ICT – I & II at Jamshedpur) :-**

Both ICT – I & II tripped from LV side at Ramchandrapur.

- ❖ 150 MVA, 220/132 kV ICT – III also tripped on O/c and E/F
- ❖ During the event 100 MVA, 220/132 kV ICT –IV also tripped on REF (NCT polarity issue) at Chandil GSS.
- ❖ After tripping of Bus – 1 elements at RCP and 100 MVA, 220/132 kV ICT –IV at Chandil GSS all the downstream load of Jamshedpur region were shifted on 150 MVA, 220/132 kV ICT – II at RCP and 100 MVA, 220/132 kV ICT – I & II at Chandil.
- ❖ Subsequently , these transformers tripped on over load after 5 minutes gap of the RCP grid disturbance.

- **Remedial Measures to be taken :-**

- ❖ 220 kV RCP – Chaibasa – I relay settings to be reviewed.
- ❖ 100 MVA, 220/132 kV ICT –IV REF wiring diagram to be checked.

THANK YOU

List of Important transmission lines in ER which tripped in Aug 2021

Annexure B.6

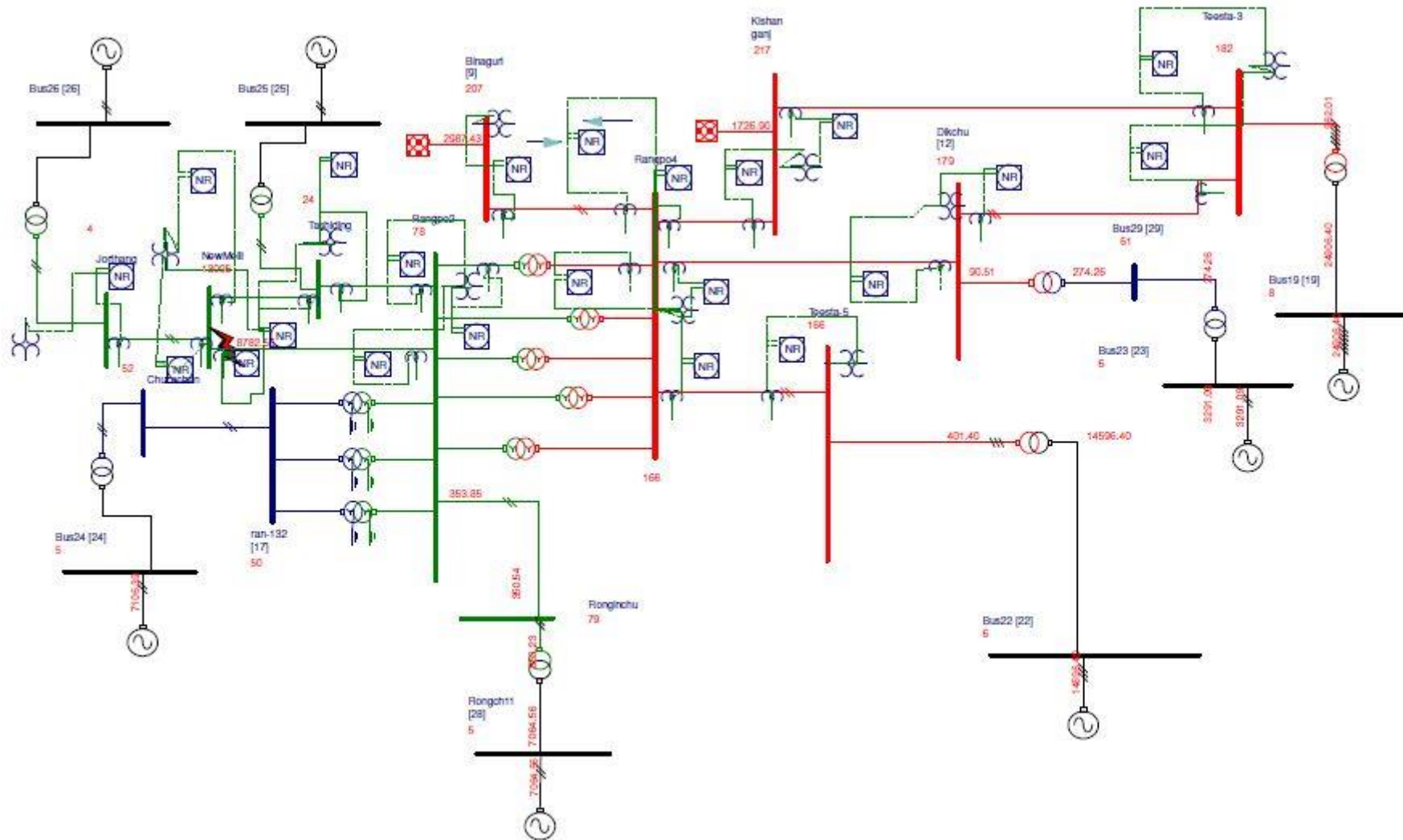
S.NO	LINE NAME	TRIP DATE	TRIP TIME	Relay Indication LOCAL END	Relay Indication REMOTE END	Reason	Fault Clearance time in msec	Remarks	LOCAL END UTILITY	REMOTE END UTILITY	Utility to update	Utility Response
1	220KV-TSTPP-MEERAMUNDALI-2	02-08-2021	12:18	TSTPP: R-Earth, 4.7 kA, 35.9 KM		R-Earth	350	Tripped in Z II time from Meeramundali, Carrier signal not received	NTPC TSTPP	OPTCL	NTPC TSTPP	Carrier scheme not available
2	220KV-DARBHANGA (DMTCL)-MOTIPUR-2	04-08-2021	05:56	-	Motipur: B-Earth, 2.934 kA, 33 km	B-Earth	<100	Single phase tripping during AR failure	DMTCL	BSPTCL	Both utilities	Intimated. BSPTCL will check
3	220KV-SITAMARHI-MOTIPUR-1	04-08-2021	11:52	Sitamarhi: B-Earth, 29 KM, 3.55 kA	CB got stuck, LBB operated	B-Earth	500	Z II started and carrier received but breaker didn't opened hence LBB operated at Motipur	PMTL	BSPTCL		Tripping coil changed at Motipur
4	220KV-RANCHI-CHANDIL-1	05-08-2021	09:11	64.39 km, 2.55 kA	Earth, 18.5 KM, 3.4 kA	B-Earth	400	Carrier signal not sent from Chandil	PG ER-I	JUSNL	Chandil	PLCC issue (maintained by Powergrid)
5	400KV-MALDA-NEW PURNEA-1	06-08-2021	05:52	49.39 km, 7.28 kA	Earth, 80.6 km, 3.9 kA	B-Earth	<100	after failure of main CB A/r	PG ER-II	PG ER-I		Powergrid will check the relay
6	220KV-TENUGHAT-BIHARSHARIF-1	06-08-2021	11:51	Tenughat: R-Earth, 129.6 km, 1.23 kA	Biharsharif: R-Earth, Z I, 2.54 kA, 54.88 KM	R-Earth	<100	Three phase tripping for single phase fault	JUSNL	BSPTCL	Both utilities	PLCC commissioning not completed yet
7	220KV-TSTPP-MEERAMUNDALI-1	07-08-2021	09:36	Y_B-Earth		Y_B-Earth	500	Fault was in 220 KV Meeramundali-BSL. Both lines tripped in Z II from TSTPP sensing same fault as fault was not cleared from Meeramundali	NTPC TSTPP	OPTCL	Line voltage appearing at both ends	Co-ordination issue due to short line. PCC advised for implementation of differential protection. PCC also asked for a report on successful BSL islanding
8	220KV-TSTPP-MEERAMUNDALI-2	07-08-2021	09:36	Tripped from TSTPP end only		Y-B-Earth	500		NTPC TSTPP	OPTCL		

9	220KV-CHANDIL-RANCHI-1	10-08-2021	20:02	Chandil: R_B, 82.6 km, Ir: 2.43 kA, Ib: 2.55 kA	Ranchi: R_B, 18.02 km, Ir: 8.5 kA, Ib: 8.57 kA	R_B-Earth	500	Carrier signal not sent from Ranchi	PG ER-I	JUSNL		PLCC issue (maintained by Powergrid)
10	220KV-MAITHON-DUMKA-1	10-08-2021	22:21	Z I, 40 KM, 3.927 kA	Earth, 28.08 KM, 1.89 kA	R-Earth	<100	Three phase tripping due to unhealthy PLCC	PG ER-II	JUSNL		PLCC scheme not available
11	400KV-NEW PURNEA-MUZAFFARPUR-1	11-08-2021	22:49	New Purnea: Y-Earth, 135.2 km, 3.3 kA	Muzaffarpur: Y-Earth, 139.6 km, 3.3 kA	Y-Earth	<100	Three phase tripping for single phase fault. A/r was not in shutdown	PG ER-I	PG ER-I		PLCC issue (maintained by Powergrid)
12	220KV-BUDHIPADAR-KORBA-1	14-08-2021	13:12	Budhipadar: B-Earth, 108.1 km, 1.44 kA	Korba: B-Earth, Z II, 60 KN, 2.039 kA	B-Earth	200	Three phase tripping for single phase fault	OPTCL	WR		A/r scheme to be implemented by October'21
13	220-KV-NEW PURNEA-MADHEPURA-1	14-08-2021	14:38	New Purnea: B-Earth, Z I, 12.8 km, 3.75 kA	Madhepura: B-Earth, Z I, 71.8 km, 1.78 kA	B-Earth	<100	A/r not operated at New Purnea	PG ER-I	BSPTCL		
14	220KV-MAITHON-DUMKA-2	15-08-2021	10:12	Maithon - B-Earth , FD - 54.909 KM , FC - 2.471 KA	DUMKA - B-Earth , FD - 4 KM , FC - 1.27 KA	B-Earth	350	Three phase tripping for single phase fault	PG ER-II	JUSNL		PLCC scheme not available
15	220KV-JODA-RAMCHANDRAPUR-1	15-08-2021	11:53	Joda: R-Earth, 58.82 km, 1.67 kA	Ramchandrapur : R-Earth, 1.65 kA	R-Earth	100	A/r not in service. Other two phase tripped in 500 msec from Ramchandrapur end	OPTCL	JUSNL		PLCC scheme not available
16	220KV TENUGHAT-BIHARSHARIF	15-08-2021	13:12	TENUGHAT: R-Earth, Z-1, FD-100.2 KM, FC 1.07 KA	BIHARSARIF: R-Earth, 84.3 KM, 1.628 kA	R-Earth	200	Three phase tripping. A/r not in service	JUSNL	BSPTCL		PLCC commissioning not completed yet
17	220KV KATAPALLI-BOLANGIR-1	16-08-2021	02:02		Bolangir: B-Earth, 72.3 km, 1.76 kA	B-Earth	<100	Three phase tripping from both ends for single phase fault, three phase A/r from Katapalli; No AR at	OPTCL	PG ER-III		Issue in relay at Bolangir, A/r kept in service without PLCC at Katapalli
18	220KV-BUDHIPADAR-KORBA-1	16-08-2021	13:02	Budhipadar-R-N, Z I, FD-52.6km FC-2.93kA		R-Earth	<100	Three phase tripping for single phase fault at Budhipadar	OPTCL	WR		A/r scheme to be implemented by October'21
19	220KV-NEW PURNEA-MADHEPURA-1	22-08-2021	11:59	New Purnea: B-Earth, 1.795 KM, 20.504 kA		B-Earth	<100	Three phase tripping for single phase fault from New Purnea	PG ER-I	BSPTCL		

20	220KV-BUDHIPADAR-KORBA-2	23-08-2021	02:54	Budhipadar: B-Earth, 191.3 km, 1.79 kA		B-Earth	<100	Three phase tripping for single phase fault	OPTCL	WR		A/r scheme to be implemented by October'21
21	400KV-KHSTPP-BARH-2	23-08-2021	03:07	Tripped on O/V at KHSTPP		O/V	NA	Successful A/r observed in 400 KV KHSTPP-Banka II at the same time	NTPC KHSTPP	NTPC Barh		
22	400KV-BARIPADA-KHARAGPUR-1	24-08-2021	11:17	Baripada: Y-Earth, Z II, 77.2 km, 3.07 kA	Kharagpur: Y-Earth, 16.27 km, 8.47 kA	Y-Earth	<100	A/r failed at Baripada but other two phase CB didn't open, later two phase opened on PD	PG ER-III	WBSETCL		Status from breaker of faulted phase was not available at Baripada that's why other two phase didn't open during AR failure
23	400KV-MERAMUNDALI-LAPANGA-2	24-08-2021	13:18	Meramundali: B-Earth, 136.1 km, 2.85 kA, A/r failed	Lapanga: B-Earth, 70.8 km, 3.06 kA	B-Earth	<100	A/r failed at Meramundali. Tie CB at Lapanga took AR attempt after failed attempt of main CB	OPTCL	OPTCL		
24	220KV-DARBHANGA(DMTCL)-LAUKAHI-2	24-08-2021	15:57	Darbhangar: B-Earth, 53.11 km, 1.281 kA	Laukahi: B-Earth, 42.18 km, 0.909 kA	B-Earth	160	initially DEF started then fault sensed in z-1 by Distance Protection but A/r lockout triggered for single phase fault and all three phase opened at Laukahi	DMTCL	BSPTCL		PLCC issue at DMTCL end
25	220KV-BEGUSARAI-NEW PURNEA-1	24-08-2021	17:26	Begusarai: B-Earth, 218 km, 0.4 kA	New Purnea: B-Earth, 15.6 km, 7.06 kA	B-Earth	<100	Faulty phase tripped immediately and Rest 2 unfaulted phase also tripped after 400 ms ,at Purnea end reason may be checked ,seems PD time delay 400ms only.	BSPTCL	PG ER-I		
26	400KV JHARSUGUDA-RAIGARH-1	25-08-2021	12:19	Jharsuguda: Y-Earth, Z I, 80 km, 3.8 kA		Y-Earth	<100	A/r failed, discrepancy in A/r dead time of two ends	PG ER-III	WR		Intimated. PG will check
27	220KV NEW PURNEA-MADHEPURA-1	27-08-2021	05:37	New Purnea: B-Earth, 3.81 kA, 54.9 km	Madhepura: B-Earth, 3.23 kA, 32.5 km	Y-Earth	<100	A/r failed from New Purnea while A/r was successful from Madhepura. Jumper snapping reported	PG ER-I	BSPTCL		

28	220KV JORETHANG-NEW MELLI-1	30-08-2021	11:43	New Melli: B- Earth, 10.07 km, 1.894 kA		B- Earth	<100	Fault in zone-2 from Jorethang ,Carrier received but No A/r and 3 phase tripping occurred , eveolving fault.Same time unit 1 also tripped on Loss of field ,AVR may be checked	DANS	PG ER-II		Vegetation issue which was cleared. For unit I, response awaited from OEM
29	220KV JORETHANG-NEW MELLI-2	31-08-2021	10:50	Jorethang: B- Earth, 6.5 km, 1.29 kA	New Melli: B- Earth, 9.12 km, 2.08 kA	B- Earth	500	Fault in zone-2 from Jorethang ,Carrier received but No A/r and 3 phase tripping occurred , eveolving fault.Same time unit 1 also tripped on Loss of field ,AVR may be checked	DANS	PG ER-II		

Network:



This is the maximum conditions by taking all generators are on at individual generating stations.

Line	Relay Connected at	CT Ratio in A	Fault Location	Fault Current seen by the Relay	Existing				Proposed			
					Ie> in A (Primary)	Characteristics	TMS/ Time Delay	Top (sec)	Ie> in A (Primary)	Characteristics	TMS	Top in sec
Binaguri-Rangpo	Rangpo end	2000/1	Binaguri	2257	200	IEC NI	0.568	1.6	400	IEC NI	0.402	1.6
Binaguri-Rangpo	Binaguri end	2000/1	Rangpo	3021	200	IEC NI	0.638	1.6	400	IEC NI	0.472	1.6
Kishangunj-Rangpo	Rangpo end	3000/1	Kishangunj	1804	200	IEC NI	0.514	1.6	600	IEC NI	0.254	1.6
Kishangunj-Rangpo	Kishangunj end	3000/1	Rangpo	1690	400	IEC NI	0.28	1.3	600	IEC NI	0.239	1.6
Rangpo- Dikchu	Rangpo end	3000/1	Dikchu	6830	200	IEC NI	0.61	1.1	600	IEC NI	0.392	1.1
Rangpo- Dikchu	Dikchu end	3000/1	Rangpo	6620	600	DT	1.5	1.5	600	IEC NI	0.422	1.2
Rangpo- TeesthaV	Rangpo end	2000/1	Teestha V	7814	200	IEC NI	0.6	1.1	400	IEC NI	0.481	1.1
Rangpo- TeesthaV	TeesthaV end	2000/1	Rangpo	3853	-	-	-		400	IEC NI	0.397	1.2
Kishangunj-Teestha III	Kishangunj end	3000/1	Teestha III	925	400	IEC NI	0.28	2.3	600	IEC NI	0.068	1.1
Kishangunj-Teestha III	Teestha III end	2000/1	Kishangunj	1555	-	-	-	-	400	IEC NI	0.236	1.2
Dikchu-Teestha III	Dickchu end	3000/1	Teestha III	3453	400	DT	1.5	1.5	600	IEC NI	0.305	1.2
Dikchu-Teestha III	Teestha III end	3000/1	Dikchu	5867	-	-	-		600	IEC NI	0.4	1.2
Rangpo 220Kv Bus												
Rangpo-Tasheding	Rangpo end	1600/1	Tasheding	1966	320	IEC NI	0.38	1.4	320	IEC NI	0.24	0.9
Rangpo-Tasheding	Tasheding end	800/1	Rangpo	1446	160	DT	1.2		160	IEC NI	0.39	1.2
Rangpo- Newmelli	Rangpo end	1600/1	Newmelli	3173	320	IEC NI	0.399	1.1	320	IEC NI	0.30	0.9
Rangpo- Newmelli	Newmelli end	1600/1	Rangpo	3075	320	IEC NI	0.33	0.9	320	IEC NI	0.30	0.9
Tasheding-Newmelli	Tasheding end	800/1	Newmelli	1956	160	IEC NI	0.24	0.65	160	IEC NI	0.37	1
Tasheding-Newmelli	Newmelli end	1600/1	Tasheding	2164	320	IEC NI	0.314	1.1	320	IEC NI	0.25	0.9
Newmelli-Jorethang	Newmelli end	400/1	Jorethang	6986	-	-	0.473	-	80	IEC NI	0.60	0.9
Newmelli-Jorethang	Jorethang end	400/1	Newmelli	3715	100	DT	0.6	0.6	80	IEC NI	0.57	1

Rangpo - Ronginchu	Rangpo end	1600/1	Ronginchu	6078	208	IEC NI	0.52	1	208	IEC NI	0.45	0.9
Rangpo - Ronginchu	Ronginchu end	400/1	Rangpo	6091	60	DT	0.5	0.5	80	IEC NI	0.65	1
Line	Relay Connected at	CT Ratio in A	Fault Location	Fault Current seen by the Relay	Existing				Proposed			
					I> in A (Primary)	Characteristics	TMS/ Time Delay	Top (sec)	I> in A (Primary)	Characteristics	TMS	Top (sec)
Newmelli-Jorethang	Jorethang end	400/1	Newmelli	1009	300	IDMT	0.09	0.42	400	IEC NI	0.11	0.8

Relay Connected	CT Ratio in A	Fault Current seen by the Relay	Existing						Proposed					
			I> in A (Primary)	Characteristics	TMS	Top (sec)	I>	Time delay	I> in A (Primary)	Characteristics	TMS	Top (sec)	I>>(Primary)	Time delay
315 MVA Transformer 400 kV Side	2000/1	3526.33	682	IEC NI	0.21	0.9			682	IEC NI	0.21	0.9	4086	0.05
315 MVA Transformer 220 kV Side	1600/1	770	1240	IEC NI	0.11	1.6			1240	IEC NI	0.11	1.6		

Relay Connected	CT Ratio in A	Fault Current seen by the Relay	Existing						Proposed					
			IN> in A (Primary)	Characteristics	TMS	Top (sec)	IN>>	Time delay	IN> in A (Primary)	Characteristics	TMS	Top (sec)	IN>>	Time delay
315 MVA Transformer 400 kV Side	2000/1	423	91	IEC NI	0.51	2.28			91	IEC NI	0.22	1		
315 MVA Transformer 220 kV	1600/1	719.8	165	IEC NI	0.51	2.38			165	IEC NI	0.36	1.7		

The grid fault levels of connected stations were considered is as tabulated in table below

SL NO.	STATION NAME	3-phase FAULT MVA	3-phase FAULT CURRENT (Amps)	1-phase FAULT MVA	1-phase FAULT CURRENT (Amps)
1	BINAGURI 400kV	24461	35307.1	19496.993	28141
2	KISHANGANJ 400kV	23602	34067	16428.708	23713
3	TEESTA-3 400kV	14836	21414	15239.5	21996.4
4	DIKCHU 400kV	13253.6	19129.9	11835.275	17083
5	TEESTA-5 400kV	14899	21504	13829.3	19960.9
6	RANGPO 400kV	17283	23237	16572.1	23919.8
7	RANGPO 220kV	13699	32419	12635	33160
8	TASHIDING 220kV	6331	11099	2690.914	7062
9	NEW MELLI 220kV	5344	13444	4893.6	12842.9
10	JORTHANG 220kV	6947	9958	2891.617	7589
11	RONGINCHU 220kV	9032.627	23.704	4694.68	12320

Note: For all the lines and transformer relay settings are Directional FWD.

Minutes of Meeting of Reliability issue of 400/220 kV Ranchi ICTs and implementation of SPS required for this issue

Background Summary :

2 X 315 MVA, 400/220 kV Ranchi ICTs are the primary source of power to the capital city of Ranchi. The downstream area of 400/220 kV Ranchi substation of PGCIL was connected with 220/132 kV Hatia (JUSNL) through three lines and with 220/132 kV Chandil substation through one line before commissioning of 220 kV Ranchi – Ramgarh line. With increasing load and less generation of Tenughat PP, the load on these ICTs has reached more than 220 MW each since the last few quarters during peak hours. Thus, the ICTs were not satisfying the N-1 criteria. Based on this, in the 3rd ERPCTP meeting held on 9th feb 2021, one additional 500 MVA 400/220 kV ICT was approved.

During 3rd ERPCTP meeting, through operational feedback and discussion held in the meeting, ERLDC highlighted the importance of additional ICT at Ranchi along with early commissioning of 400/220 kV Patraru substation with its associated planned elements to reduce this N-1 reliability issue to avoid any power interruption to Ranchi city. In addition, ERLDC also highlighted that considering the load growth in the Jharkhand capital city and incoming additional 220 kV connectivity from Mejia-A and Ramgarh of DVC to Ranchi, this 400/220 kV additional ICT would be very much required at Ranchi substation.

In the DVC system, 400/220 kV Bokaro TPS having 2 X 315 MVA ICTs (supplying 220/132 kV Ramgarh, Bokaro and Chandrapura areas of DVC) did not satisfy N-1 criteria as highlighted in the past. DVC had not shared any augmentation plan on resolving N-1 of Bokaro ICT.

In Aug 2021, 220 kV Ranchi-Ramgarh circuit was commissioned by DVC. With this line, the 400/220 kV ICTs at Ranchi loading increased each by 40-60 MW (total drawal by DVC through the line being 80-120 MW). This additional loading had aggravated the N-1 reliability issue of Ranchi ICTs. In addition, any tripping of Bokaro ICTs would cause severe loading of Ranchi ICTs due to this newly commissioned line (one ICT tripping would lead to tripping of other ICT on overload). These aspects were deliberated in the 182nd OCC and 105th PCC meetings. It was decided in OCC and PCC that a meeting by ERLDC would be convened to decide on the operational issue and SPS design and implementation along with DVC, JUSNL, PGCIL ERTS 1 and ERPC.

Based on this, ERLDC convened two meetings (**1st meeting on 01/09/2021 and 2nd meeting on 06/09/2021**). The discussion held and final action plans as decided by members are summarized as follows.

Discussion Summary of 1st Meeting held on 1st Sept 2021

ERLDC started the discussion by highlighting the background of 400/220 kV Ranchi ICTs N-1 compliance issue. It was highlighted that these ICTs are the primary source of power to Ranchi capital city and loading of ICTs at Ranchi will further increase after connection of 132 kV Ranchi – Ramgarh line to Ranchi and Ranchi ICTs will not fulfil N-1 criterion. It was informed to members that this issue will keep on prevailing till commissioning of 400/220 kV Patraru substation and associated element by JUSNL (Work being executed by PGCIL).

Jharkhand SLDC shared the information that 400/220 kV Patraru substation is vital for their system and they are taking steps for faster completion and charging. They intimated that 400 kV Ranchi-

Patratu D/C are kept in antitheft charge condition from Ranchi. SLDC further informed that 400/220 kV Patratu substation along with all elements will be commissioned by March 2022 (Early commissioning by Dec 2021 is also being expected). This will result in shifting of around 100 MW load from 400/220 kV Ranchi ICTs. This substation and its ICTs will act as a parallel path for 400/220 kV Ranchi ICTs thus relieving the constraint.

CGM, ERLDC informed participants that based on the available update, it is observed that the issue being observed presently is a short-term issue (3-6months) and will be resolved with commissioning of 400/220 kV Patratu system of JUSNL with present load pattern.

With the above backdrop, ERLDC suggested two proposals to ensure the N-1 reliability of Ranchi ICTs without involving direct load shedding :

1. To keep 220 kV Ramgarh-Ranchi circuit open from Ranchi end till commissioning of 400/220 kV Patratu substation and associated elements
2. To have one SPS on 400/220 kV Ranchi ICTs which will trip 220 kV Ramgarh-Ranchi circuit in case Ranchi ICTs loading violate its overload capacity during N-1 contingency.

During the meeting, ERLDC explained that each ICT of Ranchi has around 50 % sensitivity on other ICT during N-1 contingency. So, if each ICT is loaded above 210 MVA (with pf 0.9, ~190 MW) then other ICT will reach its rated capacity. These ICTs of Ranchi should be capable of holding up to 130% of the rated capacity for 30 minutes as per their design and cooling system in place. This comes out as 410 MVA (0.9 pf; ~370 MW). Thus 246 MW loading on each ICT during N-1 contingency would cause loading of other ICT to 130 % of rated MVA. Therefore beyond 246 MW, immediate action is desired to reduce the load on ICTs to ensure that it is not above the emergency loading capacity for a large duration of time and ERLDC/SLDCs operator should be able to take action to reduce the same.

Based on this, 2-stage SPS will be proposed where one rating will be below rated capacity to take care of N-1 capacity with delays in minutes and other setting which will operate quickly in seconds as per above rated setting but below backup overcurrent protection pickup setting. For both cases, presently 220 kV Ranchi-Ramgarh line tripping was suggested.

DVC SLDC and STU team comment : DVC SLDC and STU team discussed these details during the meeting. DVC intimated that Ramgarh is having many mining loads so any bus segregation/split using bus coupler at 220 kV system would reduce reliability. In addition, DVC also agreed that load shedding has to be avoided and SPS-based tripping would be a good solution as proposed. It was informed that DVC will take action in case their system is having any event (CTPS generation loss/Bokatro ICT/Bokaro generation loss etc.) causing overloading of Ranchi ICTs and higher loading on 220 kV Ranchi Ramgarh circuit.

Jharkhand SLDC Comment : Jharkhand SLDC informed members that Ranchi ICTs can become overloaded if there is low generation in Tenughat or tripping of 220 kV Tenughat(TTPS)-Patratu circuit. They will also take appropriate action if overloading is due to any event in their system.

PGCIL ERTS 1 Comment : PGCIL ERTS 1 informed that Ranchi ICTs are old so setting below rated capacity may be considered for the operation. In regards to this, ERLDC and DVC SLDC/STU/CRITIL opined that ICTs should be utilized with emergency loading capability during contingency conditions keeping a safe margin. Any SPS is required to be provided considering thermal overload with keeping appropriate time margin. It was required that PGCIL may share their overcurrent

settings for ICTs along with thermal overload protection and any other protection which are bound to operate for ICT overloading. It was desired that ICTs should not be underutilized during the emergency and should provide assistance to the system operator to take some immediate action.

PGCIL ERTS 1 further informed that they will share the required protection and overloading details. In addition, they further informed that it will take 15 days for the implementation of the SPS scheme after approval.

Based on the discussion, the following action points have been decided in the 1st meeting:

1. Due to the aggravated situation of Ranchi ICTs feeding capital city load, till SPS in implementation, the 220 kV Ranchi-Ramgarh circuit would be kept open from Ramgarh end and would be taken in service in case of any exigency taking into account real-time scenario based on mutual discussion between ERLDC and DVC SLDC. PGCIL ERTS 1 intimated that it would take around 15 days for implementation of the SPS for Ranchi ICTs after the finalization of the design/scheme.
2. 400/220 kV Ranchi ICTs SPS would be designed so that in case of any vulnerability of ICTs, a tripping command to 220 kV Ranchi-Ramgarh circuit locally from 400/220 kV Ranchi substation would be given to reduce the loading.
3. The real-time operator of SLDC Jharkhand, SLDC DVC and ERLDC with the best effort would try to keep these ICTs loading within reliability limits as per CEA standards and IEGC regulations.
4. PGCIL would share within 2 days, the overload capacity, all over current and over load related settings along with any mechanical protection settings related to ICT loading for designing the SPS scheme.
5. JUSNL would keep on updating about 400/220 kV Patratu substation and associated commissioning (Projected target date being March 2021)

Action taken after 1st meeting :

- Based on this discussion, the 220 kV Ranchi-Ramgarh circuit was made open from Ramgarh on 1st Sept 2021.
- PGCIL ERTS 1 shared the following details related to 400/220 kV Ranchi ICTs and associated overload capacity and protection system.

Setting shared by PGCIL ERTS 1 for 400/220 kV Ranchi ICTs on 3rd Sept 2021

WTI/OTI alarm and trip settings for ICT are as follows:

- WTI Alarm/Trip: 100/110 deg. C
- OTI Alarm/Trip: 90/100 deg. C

Pickup value for overcurrent is kept at 150% of rated current with IDMT characteristic for both ICTs as observed from relay setting shared.

PGCIL ERTS 1 in their communication proposed the following settings for the operation of SPS:

1. Tripping of 220 kV Ranchi-Ramgarh line after a time delay of 5 minutes if the load on ICT increases from 90% i.e. 410A current on HV side.
2. Tripping of 220 kV Ranchi-Ramgarh line after a time delay of 3 seconds if the load on ICT increases from 110% i.e. 500A current on HV side.

There is no additional thermal overload protection for the ICTs. In addition, there is only an overcurrent high set protection at 4 kA with 50 ms which is provided for short circuit related protection.

Discussion Summary of 2nd Meeting held on 6th Sept 2021

Based on available details and previous meeting discussion, ERLDC proposed the following action plans and SPS for N-1 reliability of 400/220 kV Ranchi ICTs.

Table 1: Action plans before SPS operation under N-1 issue of Ranchi ICTs

Condition	Grid Condition	Action by Utility and SLDC/ERLDC
400/220 kV Ranchi any ICTs loading > 220 MW	Alarm State	<p>PGCIL ERST 1 : Alarm ERLDC operator on such overloading.</p> <p>ERLDC: Check any issue in DVC/Jharkhand and action to be taken by the respective utility to reduce ICTs loading.</p> <p>DVC SLDC: Check their areas for any contingency/ event and loading of 220 kV Ranchi – Ramgarh line. Taking appropriate actions in consultation with ERLDC.</p> <p>Jharkhand SLDC: Check their areas for any contingency/ event and loading of Ranchi ICTs. Taking appropriate actions in consultation with ERLDC.</p>
400/220 kV Ranchi any ICTs loading > 250 MW	Alert State	<p>PGCIL ERST 1: Alert ERLDC operator on such overloading.</p> <p>ERLDC: Check any issue in DVC/Jharkhand and instruct action from utility to reduce Ranchi ICTs loading within the safe limit.</p> <p>DVC SLDC: Check their areas for any contingency/ event and loading of 220 kV Ranchi – Ramgarh line. Taking appropriate action without any delay and informing ERLDC.</p> <p>Jharkhand SLDC: Check their areas for any contingency/ event and loading of Ranchi ICTs. Taking appropriate action without any delay and informing ERLDC.</p>

Table 2: SPS for N-1 issue of Ranchi ICTs

Condition	SPS Operation	SLDC Action in addition to SPS
400/220 kV Ranchi any ICTs loading > 280 MW (100 % loading of ICTs)	<p>Condition: If any of the 315 MVA 400/220 kV Ranchi ICTs are loaded to rated current for 5-minutes continuous duration.</p>	<p>DVC SLDC: If the overloading is due to contingency in their area then DVC to do immediate load shifting/load shedding on an urgent basis.</p>

	Action : Trip 220 kV Ranchi - Ramgarh circuit	Jharkhand SLDC: If the overloading is due to contingency in their area then Jharkhand to do immediate load shifting/load shedding on an urgent basis.
400/220 kV Ranchi any ICTs loading > 368 MW (130 % loading of ICTs)	Condition: If any of the 315 MVA 400/220 kV Ranchi ICTs are loaded to 130 % of rated current for 5 seconds continuous duration . Action : Trip 220 kV Ranchi - Ramgarh circuit	DVC SLDC: If the overloading is due to contingency in their area then DVC to do immediate load shifting/load shedding on an urgent basis. Jharkhand SLDC: If the overloading is due to contingency in their area then Jharkhand to do immediate load shifting/load shedding on an urgent basis.

***SPS will be disabled during any of 400/220 kV ICTs shutdown at Ranchi and taking appropriate manual action to avoid second ICT overloading.**

ERLDC explained to the members in the meeting that ICTs should be utilized considering overload capacity limits and any SPS should be implemented considering their thermal rating. It was agreed by PGCIL ERTS 1 that ICT during an emergency, ICT can sustain around 130% overload for 30 minutes. Thereafter above scheme was discussed. **ERLDC highlighted that 400/220 kV Ranchi ICTs and 220 kV Line loading should also be monitored by DVC SLDC as well Jharkhand SLDC.** These alarm/alert settings should be enabled for the control room operator at both SLDCs, ERLDC and RTAMC Patna.

DVC Comment: DVC informed that the above SPS is acceptable. They further informed that DVC will be taking prompt action to reduce loading in case the ICTs loading has increased due to any contingency within the DVC system. ERLDC informed that they should closely monitor the 220 kV Ranchi - Ramgarh circuit whose loading in general during normal scenarios should be between 80-120 MW. However, if it exceeds 150 MW then an Alert should be immediately shown to the operator to take fast action. During the meeting, it was decided that DVC may keep an alarm at 130 MW and alert at 150 MW for this circuit for their operator and have an action plan ready for quicker action. SLDC informed that they will share their contingency plan to reduce ICTs as well as 220 kV Ranchi - Ramgarh circuit loading during such untoward event if any.

DVC stated that this SPS of line tripping should be reviewed after 400/220 kV Patrattu commissioning or any delay in 400/220 kV Patrattu substation commissioning. **It was agreed by the members that the SPS will be reviewed after Dec 2021. If commissioning of 400/220 kV Patrattu substation delayed, the automatic local area load shedding scheme may be implemented in Ranchi after due discussion.**

Jharkhand SLDC comment: Jharkhand SLDC also informed that the SPS is acceptable. They informed that 400/220 kV Patrattu and associated elements are in full swing for commissioning and will be ready by Dec 2021. SLDC agreed that they will closely monitor and will share their action

plan for emergency and alert state. Ranchi ICTs can overload only in the scenario of low generation at Tenughat or 220 kV TTPS - PTPS line tripping. These ICTs will not get overloaded due to any N-1 tripping at Ramchandrapur as it has connectivity with 400/220 kV Jamshedpur and 220 kV STPS.

ERLDC informed that there can be a situation when N-1 of one ICT causing other ICT overloading leading to SPS operation (tripping of 220 kV Ranchi - Ramgarh line), and the ICT can still be overloaded above 280 MW. Under this scenario, Jharkhand SLDC should immediately resort to load shedding without any delay to safeguard this remaining ICT. If timely prompt action is not taken then this could result in a blackout of Ranchi capital city area.

ERPC comment: ERPC provided the input that this SPS is necessary given the prevailing scenario. This has been discussed in 182nd OCC and 105th PCC and if agreed to participants then PGCIL should implement the SPS scheme as discussed. He informed that DVC should proactively take action during any event in their system. The commissioning of 400/220 kV Patraru is very important and should be completed as per the provided timeline.

PGCIL ERTS 1 comment: PGCIL agreed to the implementation of the SPS and informed that transformers are capable of being over loaded in accordance with IS 2026 (PART 7) IEC-60076-7. It was informed that such condition however to be avoided and therefore DVC and Jharkhand SLDC in coordination with ERLDC should take prompt action during Alert state itself to avoid such loading situation. It was informed that by 20th Sept 2021, the above SPS will be implemented. PGCIL ERTS 1 informed that planned 500 MVA 3rd ICT at Ranchi would take around 2 years for commissioning and presently under DPR stage.

Based on the above, the following decisions have been taken during the 2nd meeting:

1. PGCIL ERTS 1 to implement the discussed SPS with necessary physical wiring by the 20th Sept 2021.
2. DVC and Jharkhand SLDC to implement Alarm and Alert in their SCADA system for 400/220 kV Ranchi ICTs to alert real-time operators.
3. DVC and Jharkhand SLDC to share their action plan for Alarm and Alert state and keep their system operator aware of prompt action to be taken for such state. **(DVC shared action plan attached as MoM)**
4. After SPS implementation, DVC to take the 220 kV Ranchi - Ramgarh circuit in service and manage the loading within 150 MW during the normal operating scenario- Action-plan in annexure. The alarm may be set above 130 MW Loading.
5. The SPS will be reviewed after 31st Dec 2021 based on the status of 400/220 kV Patraru substation

Meeting Attendee list

1. **Representative from ERLDC**
2. **Representative from ERPC**
3. **Representative from PGCIL ERTS 1 RHQ**
4. **Representative from SLDC Jharkhand**
5. **Representative from SLDC DVC**
6. **Representative from DVC STU and Planning**
7. **Representative from DVC CRITL**

Annexure : DVC Action Plan

Prior to the commissioning of 220 kV S/C Ramgarh-Ranchi line, 2 X 315 MVA, 400/220 kV Ranchi ICTs were supplying power to 220/132 kV Hatia S/S and 220/132 kV Chandil substation of JUSNL through three numbers of 220 kV lines and one number of 220 kV line respectively. 220 kV S/C Ramgarh-Ranchi Tie-line of DVC was charged first-time and put on load on 21st of August '21. Meanwhile, power assistance from Ranchi helped in reducing the loading of the ICTs of BTPS A.

However, ERLDC raised their concern regarding N-1 reliability issues subsequent to the commissioning of the Ramgarh-Ranchi Tie as Ranchi ICTs are the primary source of power to Ranchi capital city. In addition they also highlighted that any contingency in DVC system may lead to severe O/L of Ranchi PG ICTs. These issues were discussed in the 182nd OCC & 105th PCC meeting and as per the deliberations there, ERLDC convened two meetings (1st meeting on 01/09/2021 and 2nd meeting on 06/09/2021).

On the above backdrop it was decided to implement SPS operation for tripping of the Ranchi-Ramgarh line from Ranchi end as per the proposed overload settings of the ICTs by ERLDC. In addition to that, in order to reduce the ICT loading of Ranchi well below the SPS setting both the SLDCs of DVC and Jharkhand were advised to chalk out some action plan to be taken up manually.

Accordingly, the following is being proposed by DVC considering all the remote contingencies that may occur in the DVC grid:

Case	Loading as monitored in SCADA	Owing to Condition in DVC system	Remedial Actions	Remarks
I	Loading of 220 kV Ramgarh-Ranchi Ckt > 150 MW AND Loading of Ranchi PG ICTs < 220 MW each.	No contingency in DVC System.	No action from DVC end.	Includes the condition when Power assistance is being availed by Jindal from DVC Jamshedpur point of supply.
II	Loading of 220 kV Ramgarh-Ranchi Ckt > 150 MW.	a) Tripping of one of the BTPS-A ICTs	1. Instantaneous Shedding of JSEB feeders at Ramgarh and BTPS-B. 2. Bus splitting at BTPS B at the earliest in order to restore the shedded feeders.	The assistance of 220 kV Ramgarh-Ranchi will keep the loading of the other ICT within safe limit. Under Bus-Split condition Single ICT of BTPS A & BTPS-Ramgarh D/C will be on one bus.
		b) BTPS-A Unit Tripping	Opening of 220 kV Ranchi-Ramgarh Tie.	Loads of Ramgarh and Bokaro region will be catered by CTPS-B and KTPS units without overloading the ICTs of BTPS A
		c) Bus-fault at 400 kV BTPS-A with outage of BTPS-A	Opening of 220 kV Ranchi-Ramgarh Tie	Loads of Ramgarh and Bokaro region will be catered by CTPS-B and

		unit, one ICT & One BTPS-KTPS Ckt.		KTPS units without overloading the ICT of BTPS A.
		d) Bus fault at 220 KV Bokaro with outage of one number of Bokaro-Ramgarh line	Instantaneous Shedding of JSEB feeders at Ramgarh and BTPS-B.	
		e) CTPS-B Both Units out of bar(i.e. planned outage of one unit and forced tripping of the On-bar unit)	Opening of 220 kV BTPS-CTPS D/C.	Monitoring of load of 220 kV Dhanbad-Maithon PG Ckts.
		f) Tripping of both 220 kV Dhanbad-Maithon PG Ckts	Opening of 220 kV BTPS-CTPS D/C.	Monitoring of load of 220 kV Kalyaneswari - Maithon PG Ckts.

Annexure : SLD : 400/220 kV Ranchi Substation

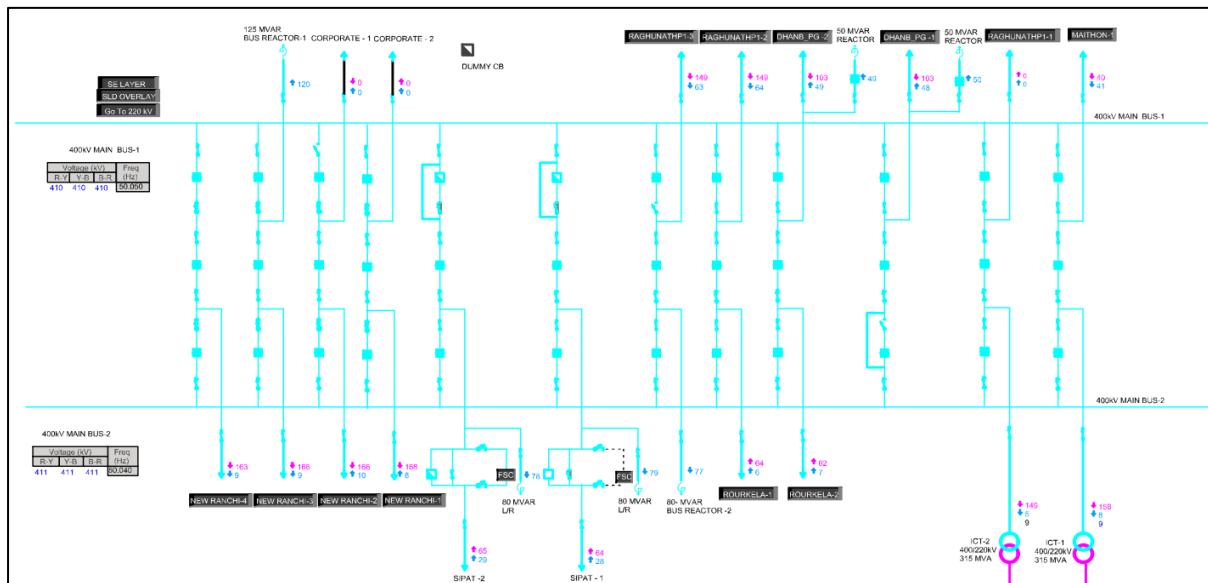


Fig : 400 kV Bus

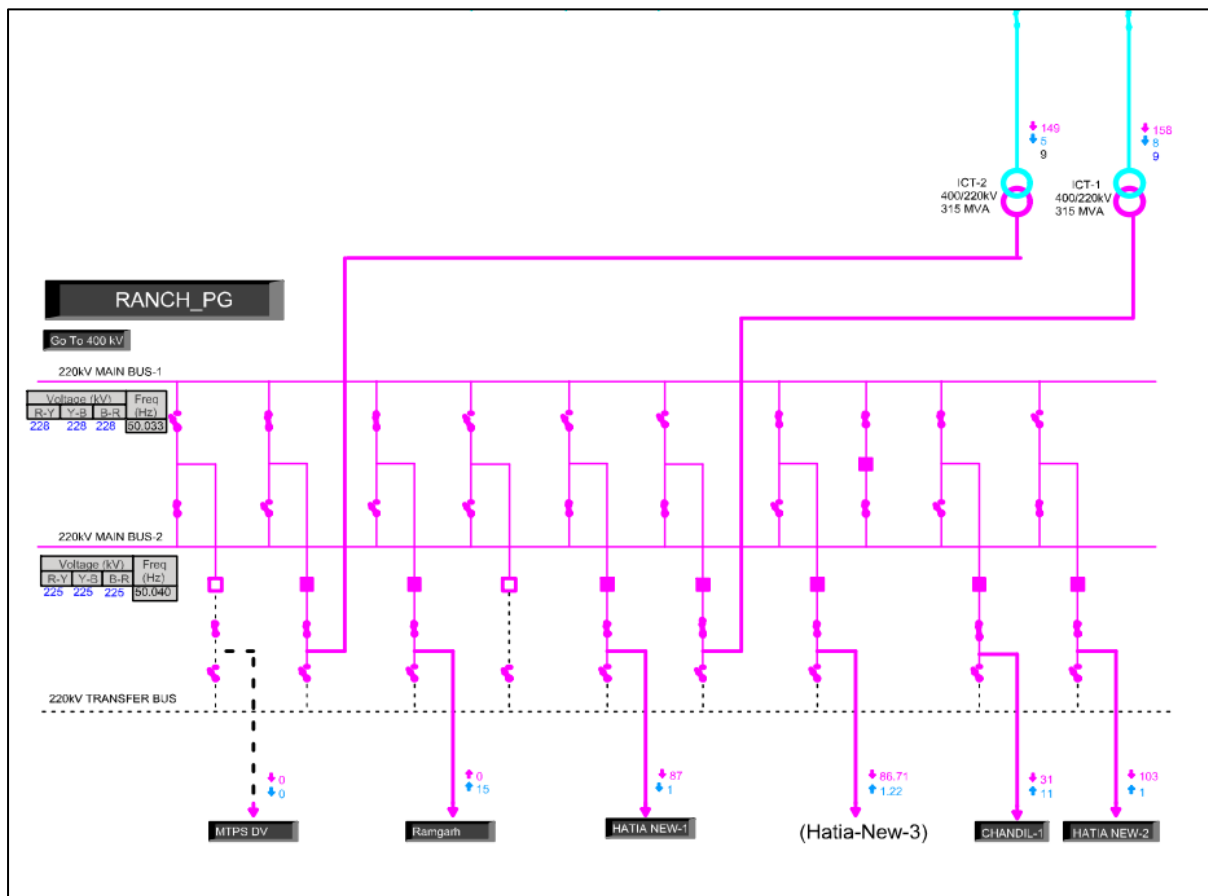


Fig : 220 kV Bus

Over Voltage Philosophy: -

In 103th PCC meeting PCC has advised to develop a Philosophy for Over Voltage setting at 220 kV level for JUSNL system. Accordingly, a philosophy for Over Voltage setting (Phase – Earth) at 220 kV level is proposed as follows –

Over Voltage functions	T/L ckt - 01	T/L ckt - 02
Function	Definite Time (DT)	Definite Time (DT)
1 st Stage Pick Up (Uph- e >)	110 % (70.0 V)	120 % (76.0 V)
1 st Stage Time delay (T Uph- e >)	7.0 s	5.0 s
2 nd Stage Pick Up (Uph- e >>)	140 % (89.0 V)	150 % (95.0 V)
2 nd Stage Time delay (T Uph- e >>)	0.1 s	0.1 s
Reset Ratio	0.99	0.99

Note :- i) Only Phase – Neutral (Ph- E) Over Voltage setting will be enabled.

ii) Pick Up voltage is considered in secondary values.