भारत सरकार
Government of India
विद्युत मंत्रालय
Ministry of Power
पूर्वी क्षेत्रीय विद्युत समिति
Eastern Regional Power Committee
14, गोल्फ क्लब रोड, टालीगंज, कोलकाता-700033
Tel. No.: 033-24239651,24239658 FAX No. 033-24239652, 24239653 Web: **www.erpc.gov.in**

सं./**NO.** पू.क्षे.वि.स./**PROTECTION/2022/**1025 दिनांक /**DATE:09.11.2022**

सेवा में / To,

संलग्न सूची के अनुसार / As per list enclosed.

विषय : दिनांक - 18.10.2022 को आयोजित 119वीं पीसीसी बैठक का कार्यवृत्त ।

Sub: Minutes of the 119th PCC meeting held on 18.10.2022.

Sir,

18.10.2022 को आयोजित **119**वीं पीसीसी बैठक का कार्यवृत्त पू.क्षे.वि.स. की वेबसाइट (**http://www.erpc.gov.in/**) पर उपलब्ध है । कृपया देखें ।

Please find the minutes of the **119th PCC** meeting of ERPC held on **18.10.2022** available at ERPC website (**http://www.erpc.gov.in/**).

यदि कोई अवलोकन हो, तो कृपया इस कार्यालय को यथाशीध्र भेजा जाए ।

Observations, if any, may please be forwarded to this office at the earliest.

भवदीय / Yours faithfully,

for अलोक 09.XI.22

(पी.पी.जेना / P.P.Jena)
Executive Engineer (PS)
कार्यपालक अभियंता(पी.एस)

LIST OF ADDRESSES:

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Chief Engineer(System Operation), SLDC , BSPTCL, Patna-800021	
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General Manager(O&M), TSTPS, NTPC Ltd., P.O.Kaniha, Dist. Angul, Orissa-759117	General Manager (AM), POWERGRID, Odisha Projects, Sahid Nagar, Bhubaneswar – 751 007
General Manager (OS), ERHQ-I, NTPC Ltd., LoknayakJaiprakashBhawan, (2nd Floor), DakBunglowChawk, Patna-800001	Manager (Electrical), Adhunik Power & Natural Resources Ltd. "Lansdowne Towers, Kolkata-700020 (Fax No. 033-2289 0285)
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Executive Director, ERLDC, POSOCO, Tollygunge, Kolkata-700033	The Head Maithon Power Limited, Maithon Office, MA 5 Gogna, Dist. Dhanbad, Jhankand State, PIN-828207
General Manager (AM), ER-II Power Grid Corporation of India Ltd., J-I-15, Block-EP, Sector-V,Salt Lake,Kolkata-91	Head –Regulatory and contracts, IndiGrid Limited , 247 Embassy, Office No 107, 'B' Wing, Hindustan Co. Bus Stop, Gandhi Nagar, L.B.S. Road, Vikhroli West, Mumbai – 400 079. Ph : +91 845509 96408
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Managing Director, Bhutan Power Corporation Post Box no. 580, Thimpu, Bhutan.	Managing Director, Druk Green Power Corprn. P.O. Box-1351, Thimpu, Bhutan.

Associate Director (Commercial and Regulatory) Darbhanga-Motihari Transmission Company Limited (DMTCL),503, Windsor, Off CST Road, Kalina, Santacruz(E), Mumbai-400098	The Plant Head, JITPL, Angul, Odisha (FAX:011-26139256-65)
Shri D. P. Bhagava, Chief Consultant (O&M), TeestaUrja Limited, New Delhi (FAX:011-46529744)	Director (GM Division), Central Electricity Authority Sewa Bhawan, R. K. Puram, New Delhi-110066
Director (NPC), CEA, NRPC Building, Katwaria Sarai, New Delhi- 110016	President, Dans Energy Pvt. Ltd, 5th Floor, DLF Building No. 8, Tower-C, Gurgaon - 722OO2
Director, Shiga Energy Pw. Ltd., 5th Floor, DLF Building No. 8, Tower-C, Gurgaon - 722OO2	DGM (E&I), HALDIA ENERGY LIMITED, BARIK BHAWAN, KOKATA-700072, FAX: 033-22360955
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Minutes
of
119th PCC Meeting

Date:09/11/2022
Eastern Regional Power Committee
14, Golf Club Road, Tollygunge
Kolkata: 700 033

EASTERN REGIONAL POWER COMMITTEE

MINUTES OF 119th PROTECTION COORDINATION SUB-COMMITTEE MEETING HELD ON 18.10.2022 AT 11:00 HOURS AT ERPC, KOLKATA

Member Secretary, ERPC chaired the meeting. The list of participants is enclosed at ***Annexure A.***

ERLDC presented a statistical analysis on grid disturbance/protection issues for ER grid for the last quarter i.e., July-Sep'22. The presentation is enclosed at ***Annexure B****. Some of the key issues highlighted are given below:*

- *Unwanted tripping of the elements has increased in the month of Sep'22 compared to July & August'22.*
- *In single line tripping, discrepancy in auto recloser operation was observed mainly for the transmission lines of the state utilities i.e. OPTCL, DVC, JUSNL.*
- *More than 60 % bus tripping was observed due to mal operation of the LBB/Busbar relay.*
- *Around 50 % tripping of ICT/Reactors were due to maloperation of the relay. Among the maloperation of the relay, 50 % was due to operation of OTI/WTI, PRV & Buchholz relay.*

Member Secretary ERPC advised all the utilities to take note of the observations made by ERLDC from the statistical data and advised to take necessary measures to resolve all the protection related issues in their system so as to reduce unwanted tripping of the power system elements.

PART – A

ITEM NO. A.1: Confirmation of Minutes of 118th Protection Coordination sub-Committee Meeting held on 20th September 2022 through MS Teams online platform.

The minutes of 118th Protection Coordination sub-Committee meeting held on 20.09.2022 was circulated vide letter dated 04.10.2022.

Members may confirm.

Deliberation in the meeting

Members confirmed the minutes of 118th PCC Meeting.

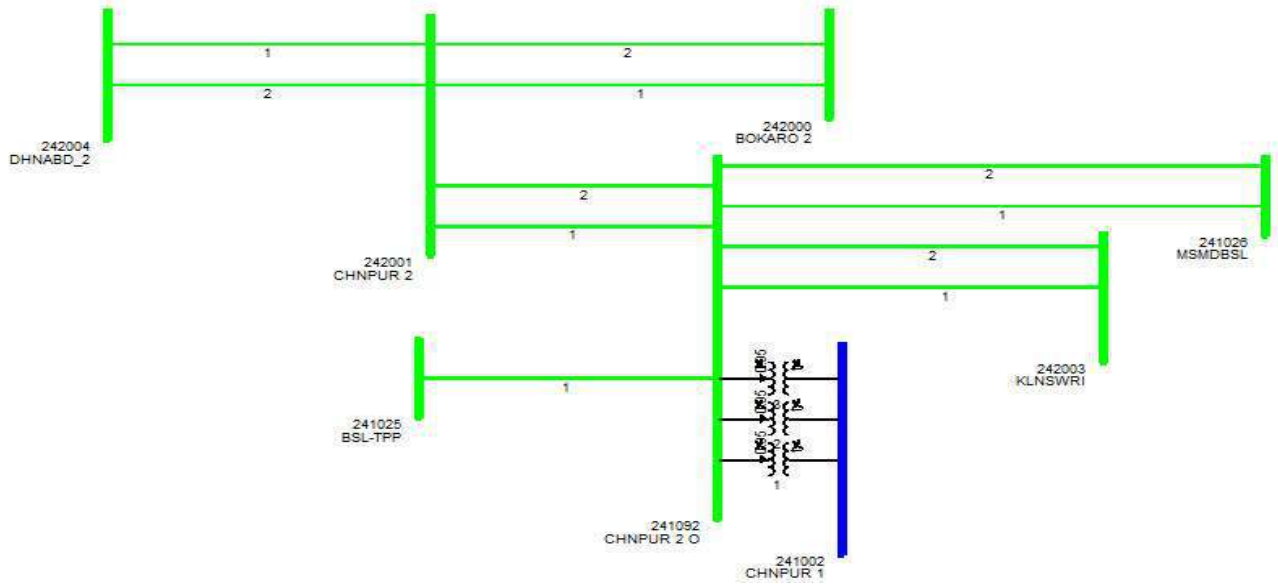
PART – B

ITEM NO. B.1: Total Power failure at 220 kV CTPS A and CTPS B (DVC) S/s on 24.09.2022 at 10:55 Hrs

At 10:50 Hrs, 220 kV CTPS B-BTPS (Bokaro B)-2 was hand tripped in order to control loading of 2* 315 MVA 400/220 kV ICTs at Bokaro.

At 10:55 Hrs, 220 kV CTPS B-BTPS (Bokaro)-1 was also hand tripped to further reduce loading of those ICTs. However, Y phase CB of this line got stuck at CTPS B end subsequently LBB operated and gave tripping command to all elements in both buses.

At 11:03 Hrs, 220 kV CTPS A- Kalyaneshwari also got tripped which led to total power failure at 220 kV CTPS A S/s also.



Detailed report from ERLDC is attached at **Annexure B.1.**

Load Loss: 400 MW, Gen. Loss: 393 MW
Outage Duration: 00:10 Hrs

DVC may explain.

Deliberation in the meeting

DVC representative explained the event as follows:

- *On 24/09/2022 at 10:50 Hrs, loading of 2*315 MW ICT at Bokaro had reached up to 280 MW each. To reduce loading of ICTs, 220 kV CTPS B-BTPS (Bokaro B)-2 was hand tripped. However, the ICT loading was not reduced as load was shifted to 220 kV CTPS B-BTPS (Bokaro B)-1. So, hand tripping of 220 kV CTPS B-BTPS (Bokaro B)-1 was also attempted at 10:55 Hrs during which Y phase pole of CB got stuck and did not open.*
- *Due to stuck breaker condition, broken conductor protection operated and resulted in lockout condition of relay which initiated LBB operation.*
- *LBB relay issued trip command for all elements connected to main Bus-1. But it also gave tripping command to all the elements from Main bus -2. It was later found that, ST#8 was at MB#2 but both CT switching relays of main bus-1 & main bus-2 of this bay was operated condition hence it caused tripping of all bays of main bus-2 through 96 relays.*
- *On a query from ERLDC regarding operation of pole discrepancy relay, DVC representative could not confirm it.*
- *After tripping of both buses at CTPS-B, both running units at CTPS B got tripped on overspeed due to loss of evacuation path.*
- *At 11:02 Hrs, load of CTPS A was met by 220 kV CTPS A- Kalyaneswari D/C and line loading of these lines got increased to 170 MW each. Subsequently Y-B phase fault occurred in 220 kV CTPS- Kalyaneswari -2 and all 3 phases got tripped.*

- *After tripping of 220 kV CTPS -Kalyaneswari -2, loading for circuit-1 increased to 300 MW but after 30 seconds it reduced to 190 -200 MW. Thereafter this line also developed a R-Y phase fault which was cleared by tripping of relay from both end in 100 ms and resulted in total power failure at CTPS A.*

From PMU plot it was observed that 3-phase auto recloser operation occurred in 220 kV Kalyansweri circuit-2 before tripping of the line. DVC was advised to check the relay operation for this tripping.

ERLDC representative enquired about settings of broken conductor protection at CTPS B end for which DVC representative replied that protection settings at their end is 20% with instantaneous tripping.

Members of PCC opined that broken conductor protection is usually set in alarm mode instead of tripping. PCC observed that the settings adopted by DVC for broken conductor protection is quite conservative and not the usual practice as followed by other utilities. PCC advised DVC to submit the criteria/philosophy behind such setting and further advised to review the setting and the broken conductor protection may be set in alarm mode instead of issuing tripping command.

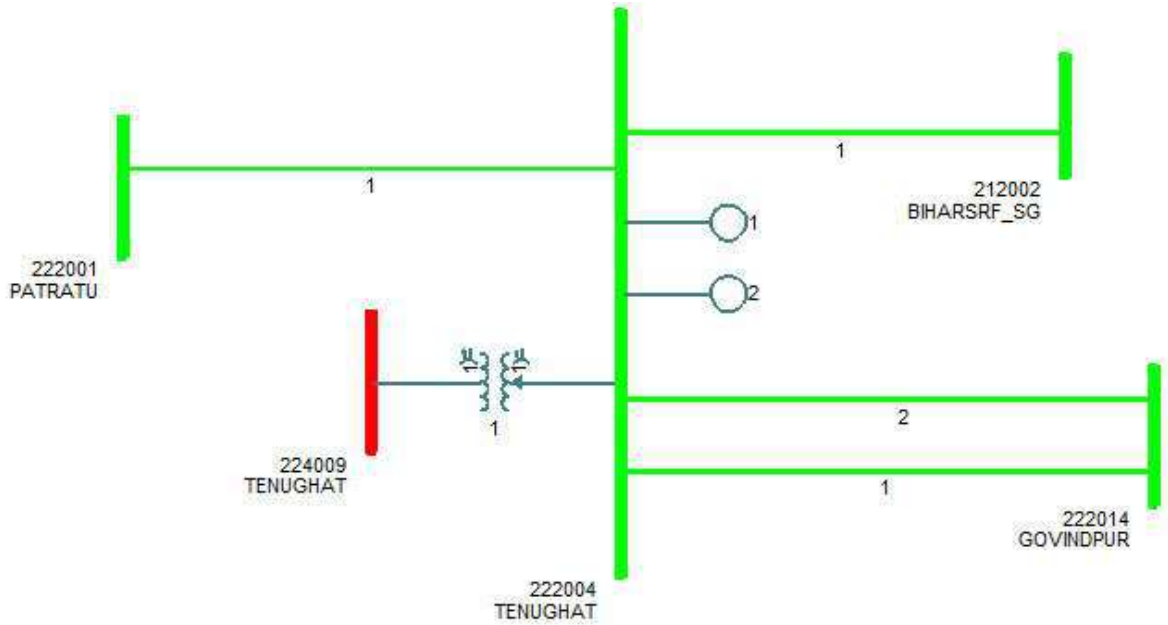
It was observed that complete DR/EL files related to the disturbance had not been submitted by DVC.PCC advised DVC to submit all the relevant DR/EL related to the disturbance at the earliest.

PCC also advised DVC to implement numerical bus bar protection at CTPS A and CTPS B at earliest.

ITEM NO. B.2: Disturbance at 220 kV Tenughat (TVNL) S/S on 09.09.2022 at 12:55 Hrs

At 12:55 Hrs, R_B_N fault struck at 220 kV Tenughat-Govindpur D/c line. 220 kV Govindpur-Dumka-1 and 210 MW Unit 2 at Tenughat also got tripped at the same time.

Detailed report from ERLDC is attached at **Annexure B.2.**



Relay Indications:

Time	Name	End 1	End 2	PMU Observations
12:55	220 kV Tenughat-Govindpur-1	Tenughat: R_B_N, 15.43 km, Ir: 3.087 kA, Ib: 3.115 kA	Govindpur: R_B_N, Ir: 1.31 kA, Ib: 1.22 kA	65 kV dip in R_ph and 73 kV dip in B_ph voltage at Tenughat. Fault clearance time: 100 msec
	220 kV Tenughat-Govindpur-2	Tenughat: R_B_N, 16.36 km, Ir: 2.642 kA, Ib: 3.041 kA	Govindpur: R_B_N, Ir: 1.32 kA, Ib: 1.12 kA	
	220 kV Dumka-Govindpur-1	-	-	
	210 MW U#2 at Tenughat	O/C E/F		

Gen. Loss: 150 MW
Outage Duration: 06:02 Hrs
TVNL & JUSNL may explain.

Deliberation in the meeting

Tripping of 220 kV TVNL-Govindpur D/C line:

Phase to phase (R-B-N) fault occurred in both the circuits of 220 kV Tenughat-Govindpur line which was sensed in zone 1 protection by relay at Tenughat end and tripping occurred as desired. Relay at Govindpur end sensed the fault in zone 2. After receipt of carrier from Tenughat end, tripping from Govindpur end occurred within 100 ms.

Regarding fault location, JUSNL representative stated that patrolling was carried out under the line however no physical fault was found. He added that clearance issues might had resulted in the incident.

PCC advised JUSNL to rectify all clearance related issues present in 220 kV Tenughat-Govindpur D/C line so that similar type of incidents can be avoided in future.

Tripping of 220 kV Govindpur-Dumka-1:

During the above disturbance, relay at Dumka end for 220 kV Dumka-Govindpur-1 sensed the fault in zone-3, however tripping occurred within 100 ms as T1(timer of zone-1) had picked up. This is observed from disturbance recorder of the relay.

On enquiry from PCC, whether triggering for T1 timer for zone 3 tripping had observed in past, JUSNL representative replied that this was observed for first time. He further added that PSL logic was also checked however no abnormality was found.

Powergrid representative opined that this might be due to firmware version in the relay and the OEM may be consulted to check & update the firmware in the relay.

PCC advised JUSNL to share PSL logic of relay to ERPC/ERLDC. It further advised JUSNL to communicate this matter to relay manufacturer for testing and updating firmware in the relay.

Tripping of Unit #2 of Tenughat:

Regarding tripping of Tenughat unit 2 during the incident, TVNL representative informed that one of the overload/overcurrent setting at generator side relay was set at 20 kA with no time delay. The relay is of electromechanical type & the setting was given by OEM of the generator unit during the commissioning of the unit.

He added that during the disturbance, fault current was more than 20 kA as per the event logger & this resulted in the operation of the above relay and unit# 2 got tripped within 100 ms.

PCC enquired TVNL that similar type of unit tripping incidents had occurred in past months also in 2022 for which TVNL representative submitted that earlier tripping had occurred due to high set settings of GT which had been disabled after recommendation of PCC forum.

PCC enquired TVNL about non tripping of unit 1 for which TVNL representative replied that o/c numerical relay settings for unit 1 is 9.5 k A with time delay of 10 seconds, therefore unit 1 had not tripped during the event because of time delay.

PCC advised TVNL to review overcurrent settings of unit #2 considering the present transmission network & fault level data at Tenughat. The coordination study may be done considering when one unit in operation & there is a line fault in one of the outgoing feeders (worst case scenario). The revised setting may be implemented at Unit end & the same may be intimated to PCC.

ITEM NO. B.3: Repeated Disturbances at 220 kV Ratu(JUSNL) S/s

A. Total Power failure at 220 kV Ratu(JUSNL) S/s on 12.09.2022 at 18:54 Hrs

At 18:54 Hrs, 400/220 kV ICT-2 at Patratu got tripped due to operation of WTI and OSR relay. Consequently, power supply to radially fed 220 kV Ratu (Burmu) S/s got interrupted.

Load Loss: 90 MW
Outage Duration: 06:33 Hrs

B. Total Power failure at 220 kV Ratu(JUSNL) S/s on 13.09.2022 at 10:03 Hrs

At 10:03 Hrs, 400/220 kV ICT-2 at Patratu got tripped due to operation of WTI and OSR relay. Consequently, power supply to radially fed 220 kV Ratu (Burmu) S/s interrupted.

Load Loss: 65 MW
Outage Duration: 10:33 Hrs

JUSNL may explain.

Deliberation in the meeting

JUSNL representative informed that on day of incident, heavy rain was reported because of which water ingress took place at terminal contacts of OSR relay of 400/220 kV ICT-2 at Patratu. He further added that DC earth fault in bay was also reported during the event consequently 400/220 kV ICT-2 at Patratu got tripped due to operation of WTI and OSR relay. The similar tripping observed for both the events on 12.09.2022 & 13.09.2022.

On enquiry, it was informed that both the ICTs are presently not in service. For ICT-1, fault was found in tertiary winding and the transformer has been sent to the factory for repair. For ICT-2, after detail checking oil filtration has been completed. The testing has been conducted and the test report has been sent to the transformer manufacturer for their feedback. After getting clearance from OEM, ICT-2 will be charged.

As remedial measure for future events, PowerGrid representative suggested to use canopy at terminal contacts of relays like OSR relay so that moisture ingress can be avoided.

CESC representative added that most of relays gets mal-operated if DC earth fault is developed in bay/switchyard therefore suitable steps must be taken for early detection & rectification of DC earth fault in the substation to avoid this type of maloperation of the relays.

PCC opined that all utilities may share the best practices adopted in their system to avoid such type of maloperation of Transformers/Reactors so that a common best practice may be compiled and shared for benefit of all.

ITEM NO. B.4: Disturbances at 400kV Chandwa S/s

A. On 20.09.2022 at 16:50 Hrs

At 16:50 Hrs, 400 kV Bus-2 at Chandwa got tripped during testing work on 400 kV Bus-1 which was under shutdown for interconnection of existing bus with new bus. Subsequently total power failure occurred at 400 kV Chandwa S/s. DMT Scheme is present at Chandwa S/s.

Detailed report from ERLDC is attached at **Annexure B.4.1.**

Relay Indications:

Time	Name	End 1	End 2	PMU Observations
16:50	400 kV Bus-2 at Chandwa	Bus bar protection operated at Chandwa	**-**	No fault observed in PMU
	400 kV Gaya-Chandwa D/c		**-**	
	400 kV New Ranchi-Chandwa D/c		**-**	
	125 MVAr Bus Reactor-1&2 at Chandwa		**-**	

No Load Loss and Gen. Loss
Outage Duration: 02:50 Hrs

Powergrid may explain.

Deliberation in the meeting

*The report submitted by Powergrid is attached at **Annexure B.4.1.A.***

Powergrid representative explained that prior to incident, 400kV Bus-1 was under shutdown for GIS bay extension works. During the process for interconnecting the GIS modules, Gas pressure in 403 Bus modules was reduced up to 0.3 MPa. Due to this reduction in pressure the Zone-A trip from M1 & M2 Busbar relay was already in operated condition since 17:09 hrs. of 16.09.2022, however as the status of all the Bus-1 isolators was open, the tripping was not extended to any feeder. On day of incident, due to disturbance in positive supply for the binary input status of isolators, its open status which was high (1) changed to low (0) in Busbar Relay. The closed status for isolators was already low (0) and hence it sensed as an intermediate status subsequently after

getting the intermediate status, in the busbar relay, bus bar protection had operated as per Scheme 1 RADSS of bus bar protection.

Regarding remedial actions, He further informed that tripping scheme of bus bar had been changed to Scheme 2 INX from Scheme 1 RADSS so that similar type of events can be avoided in future.

B. On 28.09.2022 at 15:04 Hrs

At 15:04 Hrs, 400 kV Bus-1 at Chandwa got tripped during testing work on 400 kV Bus-2 at Chandwa which was under shutdown for interconnection of existing bus with new bus. Subsequently total power failure occurred at 400 kV Chandwa S/s.

Detailed report from ERLDC is attached at **Annexure B.4.2.**

Relay Indications:

Time	Name	End 1	End 2	PMU Observations
16:50	400 kV Bus-1 at Chandwa	Bus bar protection operated at Chandwa	**-**	No fault observed in PMU
	400 kV Gaya-Chandwa D/c		**-**	
	400 kV New Ranchi-Chandwa D/c		**-**	
	125 MVAr Bus Reactor-1&2 at Chandwa		**-**	

No Load Loss and Gen. Loss
Outage Duration: 02:25 Hrs

Powergrid may explain.

Deliberation in the meeting

*The disturbance report received from Powergrid is attached at **Annexure B.4.2.A.***

He explained that prior to incident, main bus 1 was already in charged condition and all bus interconnection work of main bus 2 was also completed. On 28.09.2022 at 15:04 Hrs, gas zone trip command for main bus 1 was initiated and bus 1 got tripped.

He added that as per investigation carried out after the incident, they found that as per approved scheme for bay extension, during gas zone tripping for 89A,89B, CTB & CB Gas zone sections initiation was extended to both Zone-I & Zone-II of Busbar protection and resulted in bus tripping.

He submitted that the scheme has been modified and implemented at the site.

ITEM NO. B.5: Disturbance at 400 kV Malda(WBSETCL) S/S on 04.09.2022 at 05:57 Hrs

400 kV bus 1 & 2 at Malda is having double main transfer switching scheme. At 05:57 hrs, both the bus-1 & 2 got tripped due to bus bar protection operation resulting in outage of all 400 kV feeders connected to Malda S/S.

Relay Indications:

Time	Name	End 1	End 2	PMU Observations
05:57	400 kV Bus-1 & 2 at Malda	Bus bar protection operated at Malda		30 kV dip in B_ph voltage at New Purnea. Fault Clearance Time: 100 msec
	400 kV Farakka-Malda-1			
	400 kV Farakka-Malda-2			
	400 kV Malda-New Purnea D/c			
	400/220 kV 315 MVA ICT-3 & 5 at Malda			

Generation & Load loss:Nil
Outage Duration: 04:10 Hrs

A team of ERPC & ERLDC visited Malda S/s on 13.09.2022 to analyze the disturbance.

In 118th PCC meeting, Powergrid submitted their plan for short term as well as long term measures to address the issue of maloperation of LBB relay of TBC bay.

Powergrid may update.

Deliberation in the meeting

*Detailed analysis of the disturbance is enclosed at **Annexure B.5.***

The busbar mal-operated during the external fault due to following reasons:

- *DC earth fault in the substation caused wrong status of bus coupler circuit breaker to the busbar relay. The CB status become open while the actual status is close. This led to mal operation oof busbar relay during the fault in 400 kV Malda-Farakka line.*
- *Check zone of busbar relay (REB 670) was in disabled condition.*

The following remedial measures were taken by Powergrid:

- *The status of the Bus coupler was made "forced close" using soft logic. That means now the B/C CB status will not be decided based on Auxiliary contact. The possible cons of this arrangement are that when BC will be under shut down and a fault happen between CT and CB then both the Bus will be tripped, whereas ideally only Bus-2 should trip. As switching of B/C is planed activity and such fault are very rare that's why it will not pose any serious lack. Also, during B/C shutdown the setting can be changed.*
- *Check zone of bus bar protection has been enabled.*

Further they updated that complete replacement of the protection system at Malda has been approved under ADD CAP by the commission in the present tariff block. Accordingly, the tendering is in progress and the work would be taken up in due course of time.

ITEM NO. B.6: Major grid events other than GD/GI

A. Bus tripping occurred in Eastern Region during September 2022

During September 2022, following incidents of bus bar tripping had been observed in Eastern Region.

Element Name	Tripping Date	Reason	Utility
220 kV Main Bus-1 at Birpara	24.09.22 at 02:17 Hrs	Suspected maloperation of Electromagnetic LBB relay at Birpara	PG ER-2
220 kV Main Bus-2 at Rangpo	10.09.22 at 17:17 Hrs	Bus bar protection operated at Rangpo	PG ER-2
220 kV Bus-1 at Motipur	19.09.22 at 10:51 Hrs	Bus Bar protection Operated	BSPTCL
220 kV Bus-1 at Budhipadar	27-09-22 at 13:49 Hrs	Bus Bar operated	OPTCL
220 kV Bus-1 at Ramchandrapur	28.09.22 at 15:49 Hrs	Bus Bar operated	JUSNL

Concerned utilities may explain.

Deliberation in the meeting

- **Tripping of 220 kV Bus-1 at Ramchandrapur on 28/09/2022 at 15:49 Hrs**

JUSNL representative informed that on 28/09/2022 at 15:49 Hrs, there was C-phase fault developed in 220 kV Joda- Ramchandrapur line and at the same time bus bar protection mal-operated for 220 kV Bus-1 at Ramchandrapur and resulted in tripping of 220 kV Bus-1 at Ramchandrapur. He added that similar maloperation of busbar relay was observed during C-phase fault in any outgoing lines from Ramchandrapur end.

PCC suggested that CT connection may be checked for C-phase for all the feeders connected to busbar relay and the reporting of C-phase current of each 220 kV feeder to busbar relay may be checked.

- **Tripping of 220 kV Bus-1 at Birpara on 24/09/2022 at 02:17 Hrs**

Powergrid representative informed that LBB relay of 220 kV Birpara-Alipurduar line mal-functioned and issued trip command. Asa result busbar operated for 220 kV Bus-1 at Birpara end. He further informed that the replacement of old relays at Birpara has already been planned under ADD CAP and would be completed within a year.

- **Tripping of 220 kV Bus-2 at Rangpo on 10/09/2022 at 17:17 Hrs**

Powergrid informed that many of the bus trippings at 220 kV Rangpo S/s was associated with both the bays of 220 kV Rongnichu line. During this tripping, the capacitor of DC battery charger got burnt which resulted in fluctuation of DC status to the relay. This resulted in triggering of Gas density relay which in turn caused operation of busbar protection. He added that the scheme has been modified as the alarm & trip signal have been segregated with different DC input. With the modified scheme there won't be any triggering of GD relay during the DC failure.

- **Tripping of 220 kV Bus-1 at Budhipadar on 27/09/2022 at 13:50 Hrs**

OPTCL representative informed that at 13:49 hrs both circuits of 220 kV Budhipadar-Vedanta D/C line got tripped in zone-1 protection from Budhipadar end due to R phase to ground fault. Thereafter at 13:50 hrs, busbar protection operated for 220 kV Bus-1 and tripped all the connected elements

to bus-1. He added that during busbar protection sparking was observed in B-phase of bus-1 isolator for Vedanta-1 feeder which resulted in busbar operation.

- **Tripping of 220 kV Bus-1 at Motipur on 19/09/2022 at 10:51 Hrs**

BSPTCL representative was not present in the meeting.

ITEM NO. B.7: Repeated Tripping of Transmission Lines and associated issues

Following lines had tripped repeatedly in the month of September'22.

S.No.	Name of the Element	No. of times Tripped	Remarks	Utility
1	132KV-KHSTPP-SABOUR-1	6	All single phase fault at distance of 11 km from KHSTPP	BSPTCL
2	132KV-RIHAND-GARWAH-1	6	Most of the times tripping from Rihand end only	JUSNL
3	220KV-KHAGARIA-NEW PURNEA-2	4	All B-Earth fault.	BSPTCL
4	132KV-SITAMARHI-Runnisaidpur-D/C	4	Both circuits tripping simultaneously for single phase faults	BSPTCL

Concerned utilities may explain.

Deliberation in the meeting

Regarding tripping of 132kV Kahalgaon- Sabour-1, BSPTCL representative informed that repeated tripping had occurred in month of Sep 2022 mainly due to vegetation issues under the line and further stated that remedial work i.e., tree cutting in the concerned locations is under progress.

Regarding tripping of 132kV Rihand-Garwah-1, JUSNL representative informed that most of tripping had occurred due to vegetation issues and insulator damage. Regarding remedial actions, he informed that vegetation issues had been cleared on 16th Sep 2022 and replacement work of insulators is in progress and will be completed by Nov 2022.

Regarding tripping of 220kV Khagaria New Purnea -2, BSPTCL reply is attached at ***Annexure B.7.***

Regarding tripping of 132kV Sitamarhi- Runnisaidpur D/C, BSPTCL representative informed that repeated tripping had occurred due to improper relay settings which had been rectified and no further tripping had been observed.

ITEM NO. B.8: Multiple Line tripping from 220 kV Khagaria Substation:

Please find details of line tripping from Khagaria S/S in the month of September 2022.

Sr NO	Element Name	Tripping Date	Tripping Time	Reason	Revival Date	Revival Time
1	220KV-KHAGARIA-NEW PURNEA-2	28-09-2022	10:25	Purnea: B-E, F/C 5.658 kA, 23.379 km. Khagaria: B ph,	28-09-2022	19:58

				Zone-1 Fault Location: 71.13km Ifault: 1.342kA		
2	220KV-SAHARSA(PMTL)-KHAGARIA(NEW)-1	25-09-2022	09:09	Khagaria: R-N, 213.7km, 0.58kA	25-09-2022	10:02
3	220KV-SAHARSA(PMTL)-KHAGARIA(NEW)-1	25-09-2022	04:14	86.1 & 86.2 Operated , Fault Location: 86.7km	25-09-2022	05:13
4	220KV-SAHARSA(PMTL)-KHAGARIA(NEW)-1	25-09-2022	00:47	Master trip relay 86 operated (Only tripped from KHAGARIA (NEW) end)	25-09-2022	01:35
5	220KV-KHAGARIA-NEW PURNEA-2	18-09-2022	10:52	Khagaria: B-N, 3.2kA, 28km; New Purnea: B-N, 1.9kA, 72km	18-09-2022	17:39
6	220KV-KHAGARIA-NEW PURNEA-2	16-09-2022	11:27	Awaited	16-09-2022	20:35
7	220KV-KHAGARIA-NEW PURNEA-1	16-09-2022	11:27	New Purnea: Not Tripped Khagaria: Master Trip Relay Operated.	16-09-2022	12:23
8	220KV-KHAGARIA-NEW PURNEA-2	16-09-2022	11:27	220 kV N-Purnea-Kharagaria 2 tripped at 11:27 hrs on B-N fault. Fault dustance 82.2 km from N.Purnea, fault current 2.638 kA. Khagaria: B-Ph,Z-I, 53.3	16-09-2022	12:25

				kM,3.761 kA		
9	220KV-KHAGARIA-NEW PURNEA-1	12-09-2022	13:18	New purnea-Z1 Y-N FC-3.86kA FD-57.3km Khagaria end: Y-B, Zone-1, Il2: 3.80kA, Il3: 3.81kA Distance: 38.9km	12-09-2022	20:58

BSPTCL may explain.

Deliberation in the meeting

Comments from BSPTCL regarding above mentioned tripping is attached at ***Annexure B.8.***

ITEM NO. B.9: Tripping Incidence in month of September-2022

Single line tripping incidents in the month of September-2022 which needs explanation from constituents of either end is attached.

Concerned utilities may explain.

Deliberation in the meeting

Members explained the tripping incidences. The updated status is enclosed at ***Annexure B.9.***

PART- C :: OTHER ITEMS

ITEM NO. C.1: Agenda related to Protection Database

A. Review of utilization of PSCT/PDMS by the utilities of ERPC

Under the PSDF funded project "Creation and maintaining a Web based Protection Database and Desktop based Protection setting calculation tool for Eastern Regional Grid" a centrally available web-based protection database was in operation since 2017. As per the DPR of the project, the project would have five-year support service period after Go-Live of the project. Presently the 5th year support service is going on which will be completed on 31.10.2022. Also, 32 nos. of PSCT licenses were distributed among the ER utilities to carry out protection studies, relay co-ordinations, tripping analysis etc. under the above project.

To decide further course of action regarding protection database, it is necessary to review/discuss the utilization of the protection database as well as PSCT licenses by the utilities of Eastern Region. Utilities may share their experience and give feedback/suggestion on ER Protection database system.

Members may deliberate.

Deliberation in the meeting

ERPC Secretariat representative informed that under the PSDF funded project "Creation and maintaining a Web based Protection Database and Desktop based Protection setting calculation tool for Eastern Regional Grid", a centrally available web-based protection database was made in operation since 2017. PSCT licenses were distributed among utilities to carry out protection studies, relay co-ordinations, tripping analysis etc. under the above project. Training on PSCT and PDMS was also provided to engineers of all utilities at regular interval so that tools can be efficiently used by them.

Member secretary ERPC stressed upon fact that in spite of training on PSCT and PDMS provided at regular interval, the protection settings/relay data are not being added/updated by most of the utilities in the protection database. He informed that under proposed IEGC regulation 2022, protection database has been mandated to be maintained at RPC level. He requested all the utilities of Eastern Region to take necessary steps in this regard so that whenever there is an addition/change in relay setting/protection settings in their respective system, the same shall be updated in protection database of ERPC(PDMS). This will ensure an up-to-date protection database. He further suggested that a modus operandi may be prepared in consultation with ERLDC & other concerned utilities for timely update of the settings data into the database.

With regard to PSCT license, he requested all the utilities to share their utilization as well as feedback on the software.

PCC advised all utilities to share their experience and provide feedback/suggestion on ER Protection database system as well as PSCT tool to ERPC secretariat within 15 days.

B. Submission of protection settings in PDMS

Relay settings of various newly added transmission elements are not available in the protection database. Also, existing settings of some the relays have been revised due to change in network configuration however the settings have not been updated in PDMS.

In 116th PCC meeting, concerned utilities are advised to upload the relay settings in PDMS or send the relay settings to erpc-protection@gov.in . The settings data was received from Powergrid ER-1 & PMTL.

Subsequently vide email dated 05.09.22, all concerned utilities were requested to send the protection settings data for the newly commissioned elements. Requisite information was received from Bihar, OPTCL, WBSETCL.

PRDC may update. Members may respond.

Deliberation in the meeting

PCC advised all utilities to upload pending protection settings in protection database at earliest.

Member Secretary ERPC suggested that nodal person from each utility may be nominated who will be responsible for protection related matter including the updation of relay setting in protection database. Further for state transmission system, SLDCs shall monitor the timely submission 7 update of protection settings in database.

ITEM NO. C.2: Status of Implementation of bus bar protection at 220 kV Substations.

The issue was raised in 45th& 46th TCC Meeting wherein concerned utilities replied that the implementation of busbar protection would be done at the earliest.

The status of availability of busbar protection at 220 kV substations of ER utilities as on August-22 is attached at **Annexure C.2.**

In 46th TCC Meeting,
BSPTCL representative updated that out of twelve substations where busbar protection is not available, proposal for ten no of substations has been sent for funding through PSDF.
Busbar protection of Fatuha S/s will be commissioned in August'22. For Biharsharif S/s, there is space constraint and the busbar protection can be implemented after construction of new control room building.
OPTCL representative informed that some of the substations where busbar is not-operational are under SAS project and the commissioning of busbar is covered under the SAS project. For these substations, the tentative timeline for implementation would be one year.

TCC opined that the requirement of having busbar protection in 220 kV substations is mandatory as per CEA grid connectivity standard and advised concerned transmission utilities to take necessary action for operationalizing busbar protection in all the 220 kV substations in their respective jurisdiction.

Concerned utilities may update the present status.

Deliberation in the meeting

OPTCL representative informed that bus bar protection of nine(9) substations where it was not operational earlier had been rectified and is in healthy state at present.

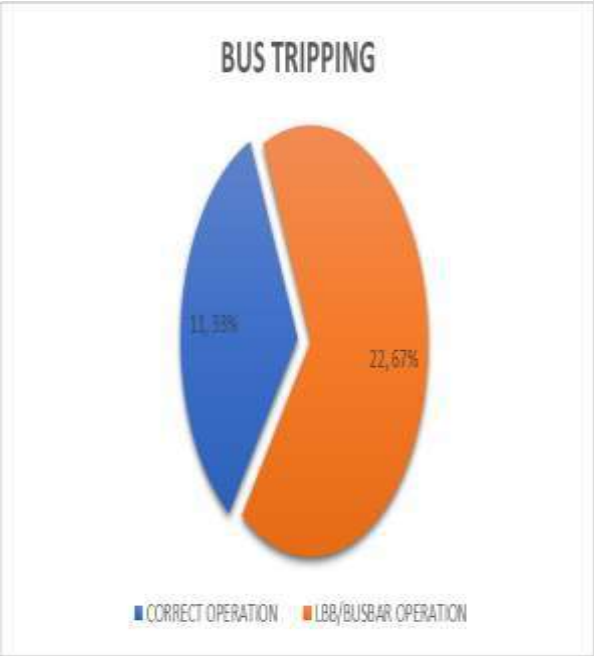
PCC advised OPTCL to share status of bus bar protection of all 220 kV substations to ERPC/ERLDC. The updated status received from OPTCL is attached at ***Annexure C.2.1.***

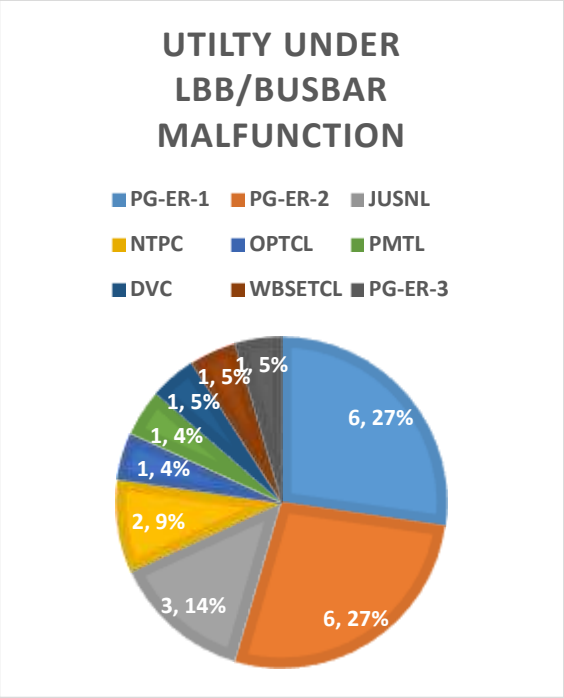
WBSETCL representative informed that bus bar protection at Gokarna and Satgachia S/S is not in service due to pending stability test and it will be put into service by Nov 2022.

JUSNL representative informed that bus bar protection at Chaibasa S/s is not in service at present.

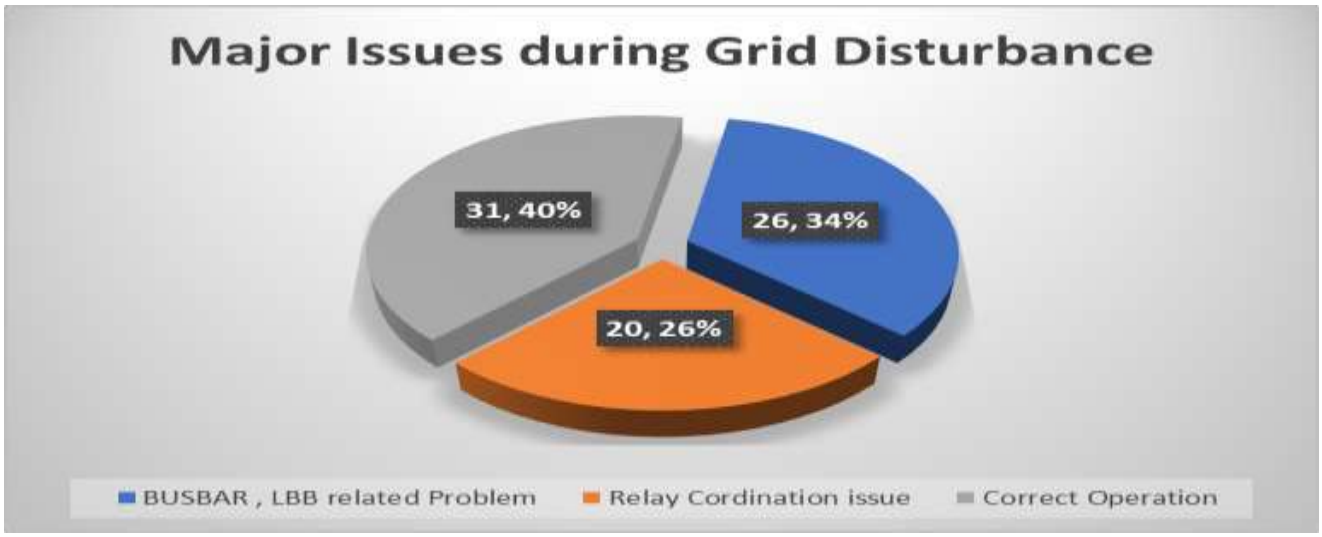
ITEM NO. C.3: Bus tripping occurring in Eastern Region due to LBB or Busbar Mal operation

For the year 2022 it had been observed that the Bus tripping's are mostly occurring due to mal operation of LBB & Busbar protection.





In case of Grid disturbances for the year 2021-22, 60% of the events had occurred due to mal-operation /improper operation of LBB &Busbar, Relay co-ordination issue.



ERLDC may elaborate. Members may discuss.

Deliberation in the meeting

ERLDC representative informed that for the year 2022, it had been observed that bus bar protection had mal-operated for 22 number of bus tripping incidents out of total 33 incidents which clearly shows that false tripping had occurred most of time which affect reliability of protection system of eastern region. He stated that bus bar protection system should not mal- operate in healthy condition as it result in huge load loss. He added that most of the spurious bus tripping incidents had been observed in Powergrid ER-1 and Powergrid ER-2 system.

PCC advised all concerned utilities to take proper actions like review of bus bar protection settings, periodical testing of LBB relay, testing of bus bar relay, adoption of proper measures during testing/commission work in substationetc. in order to avoid spurious bus tripping incidents.

ITEM NO. C.4: Follow-up of Decisions of the Previous Protection Sub-Committee Meeting(s)

The decisions of previous PCC meetings are attached.

Members may update the latest status.

Deliberation in the meeting

*Updated status for decisions of previous PCC meetings is given at **Annexure C.4**.*

ITEM NO. C.5: DEF protection setting review in Sikkim complex in view of LILO of 400 kV Teesta 3-Kishanganj at Rangpo

After LILO of 400 kV Teesta 3-Kishanganj at Rangpo, review of DEF settings for all lines emanating from Teesta-3, Dikchu, Rangpo was necessitated. In 111th PCC meeting, it was decided that PRDC would carry out the study for DEF relay setting coordination for Sikkim Complex with revised configuration of transmission network.

Subsequently the study was carried out and shared with ERLDC for verification of network configuration and fault level data.

In 117th PCC meeting ERLDC observed that the network configuration and fault level informations are in order.

The DEF settings based on the revised study is enclosed at **Annexure C.5.**

In 118th PCC Meeting, PCC advised concerned utilities of Sikkim Complex to implement the revised settings of DEF relay as enumerated in the report at their respective end and confirmation of the same shall be intimated to ERPC/ERLDC.

Concerned utilities may update.

Deliberation in the meeting

It was informed that Tashiding had revised the DEF settings at their end. PCC advised concerned utilities to implement the revised DEF settings at their end at the earliest.

ITEM NO. C.6: Compliance of 3rd Party Protection Audit Team Observations

3rd party protection audit of various substations in Odisha was carried out from 25.04.2022 to 28.04.2022 by audit team. The observation of audit team is attached at **Annexure C.6.1.**

In 117th PCC meeting, NTPC Darlipalli representative informed that the recommendation regarding overvoltage settings have already been complied with and for power swing blocking setting, the matter has been sent to their corporate wing for their comments.

In 118th PCC Meeting, OPTCL vide email dated submitted their compliance.

3rd party protection audit observations for the substations in Jharkhand has been circulated vide letter dated 19.09.2022. The report is enclosed at **Annexure C.6.2**. PCC advised JUSNL, Powergrid & DVC to go through the observations and take necessary action for compliance.

Concerned utilities may update.

Deliberation in the meeting

JUSNL representative informed that approval had been taken from higher authority for compliance of 3rd party protection audit observations for the substations in Jharkhand.

PCC advised Powergrid & DVC to go through the observations and take necessary action for compliance and share updated status of compliance of 3rd party protection audit observations to ERPC.

ITEM NO. C.7: Collection of Protection Setting data by PRDC

In 116th PCC meeting, substation visit of following new substations have been planned by PRDC team to collect the necessary protection settings data.

SL NO	NEW SUBSTATION	VOLTAGE LEVEL	UTILITY	State
1	SAHARSA	400/220 kV	PMTL	Bihar
2	CHATRA	220 kV	JUSNL	Jharkhand
3	KARAMNASA(NEW)	220 kV	BSPTCL	Bihar
4	JAKKANPORE	400/220 kV	BGCL	Bihar
5	NAUBATPUR	400/220 kV	BGCL	Bihar
6	MOKAMAH	220 kV	BGCL	Bihar
7	SAHUPURI	220 kV	BSPTCL	Bihar
8	NPGCL	400 kV	NTPC	Bihar
9	GOBINDPUR	220 kV	JUSNL	Jharkhand
10	JAINAMORE	220 kV	JUSNL	Jharkhand
11	DHANBAD	220 kV	NKTL	Jharkhand
12	Rongichu	220 kV	MBPCL	Sikkim
13	Jorethang	220 kV	Dans Energy	Sikkim
14	MERAMUNDALI B	400 kV	OPTCL	Odisha

In 117th PCC meeting, PRDC representative updated that substation visit for data collection had been completed for the substations in Bihar & Jharkhand. For rest of the substations, the visit would be planned at the earliest.

In 118th PCC Meeting, PRDC representative informed that the Substation visit in Sikkim would be completed by Oct-22.

PCC advised PRDC to update the already collected protection setting data into the database at the earliest.

PRDC may update.

Deliberation in the meeting

PRDC representative informed that the Substation visit in Sikkim would be completed by Oct-22.

ITEM NO. C.8: New Element Integration

A. FTC of 400 kV North Karnpura-Chandwa D/c

As per information received at ERLDC, 400 kV North Karnpura-Chandwa D/c is going to be first time charged.

Line parameters are as below:

Name	Conductor Type	Length
400 kV North Karnpura-Chandwa D/c	Quad Moose	38.067 km

Protection Co-ordination maybe reviewed as per following table:

Reason	Settings to be reviewed	At S/s	Utility	Remarks
FTC of 400 kV North Karnpura-Chandwa D/c	400 kV North Karnpura-Chandwa D/c	North Karnpura, Chandwa	NTPC, PG ER-1	Protection coordination to be done for newly connected elements as per ERPC guidelines.
	400 kV Gaya-Chandwa D/c	Gaya	PG ER-1	Adjacent shortest line will now be 400 kV North Karnpura-Chandwa D/c (38.067 km). Hence Zone-2 time delay may be reviewed.
	400 kV New Ranchi-Chandwa D/c	New Ranchi	PG ER-1	

- Carrier Scheme healthiness confirmation is required to facilitate FTC of the lines.
- Utilities may confirm if any changes in protection setting required or not. If any changes done, may share the revised protection settings with ERLDC and ERPC at the earliest.

Concerned utilities may update.

Deliberation in the meeting

Members noted.

B. FTC of 400 kV New Jeerat-Subhashgram D/c

As per information received at ERLDC, 400 kV New Jeerat-Subhashgram D/c is going to be first time charged.

Line parameters are as below:

Name	Conductor Type	Length
400 kV New Jeerat-Subhashgram D/c	Quad Moose	107 km

Protection Co-ordination maybe reviewed as per following:

Reason	Settings to be reviewed	At S/s	Utility	Remarks
	400 kV New Jeerat-Subhashgram D/c	New Jeerat, Subhashgram	PMJTL, PG ER-2	Protection coordination to be done for newly connected elements as per ERPC guidelines.

FTC of 400 kV New Jeerat-Subhashgram D/c	400 kV Jeerat-New Jeerat D/c	Jeerat	WBSETCL	Adjacent longest line will now be 400 kV New Jeerat-Subhashgram D/c (107 km). Hence Zone-3 settings may be reviewed keeping in view it should not encroach next voltage level.
	400 kV Jeerat-Subhashgram			
	400 kV Rajarhat-Subhashgram	Rajarhat	PG ER-2	
	400 kV Haldia (HEL)-Subhashgram	Haldia	HEL (CESC)	

- Carrier Scheme healthiness confirmation is required to facilitate FTC of the lines.
- Utilities may confirm if any changes in protection setting required or not. If any changes done, may share the revised protection settings with ERLDC and ERPC at the earliest.

Concerned utilities may update.

Deliberation in the meeting

Members noted.

C. LILO of 220 kV Daltonganj-Chatra-2 at Latehar

As per information received at ERLDC, 220 kV Daltonganj-Chatra-2 is going to be LILOed at Latehar S/s.

Line parameters are as below:

Name	**Conductor Type**	**Length**
220 kV Daltonganj-Latehar-2	ACSR Zebra	41.4 km
220 kV Latehar-Chatra	ACSR Zebra	107 km

Protection Co-ordination maybe reviewed as per following table :

Reason	Settings to be reviewed	At S/s	Utility	Remarks
	220 kV Daltonganj-Latehar-2	Daltonganj, Latehar	PG ER-1, JUSNL	Protection coordination to be done for newly connected elements as per ERPC guidelines.
		Daltonganj	PG ER-1	Adjacent longest line will now be 220 kV Chatra-Latehar (107 km). Hence Zone-3 settings may be reviewed keeping in view it should not encroach next voltage level.

LILO of 220 kV Daltonganj-Chatra-2 at Latehar	220 kV Daltonganj-Chatra-1	Chatra	JUSNL	Adjacent longest line will now be 220 kV Daltonganj-Garhwa(New) D/c (55 km). Hence Zone-3 settings may be reviewed keeping in view it should not encroach next voltage level.

- Carrier Scheme healthiness confirmation is required to facilitate FTC of the lines.
- Utilities may review the protection settings accordingly and share the revised settings with ERLDC and ERPC at the earliest.

Concerned utilities may update.

Deliberation in the meeting

Members noted.

****

Annexure A

Participants in 119th PCC Meeting

Venue: ERPC Conference Hall, Kolkata Time: 11:00 hrs Date: 18.10.2022 (Tuesday)

Sl No	Name	Designation/ Organization	Contact Number	Email	Signature
1	**N.S.Mondal**	**Member Secretary ERPC**	**9958389967**	**mserpc-power@nic.in**	
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10	Ch.Mohan Rao	DGM, Powergrid			
11	Nishant Kumar	AGM, DMTCL			
12	Sunil Kumar	ESE, SLDC Bihar			
13	Gagan Kumar	EEE, SLDC Bihar			
14	Sarfaraj Akhtar	EEE, CRITL, BSPTCL			
15	Suraj Kumar Gupta	AEE, CRITL, BSPTCL			
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19	Diptikant Panda	GMR, Odisha			
20	Abakash Adhikary	EE, CRITL, DVC			

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

Participants in 119th PCC Meeting

Venue: ERPC Conference Hall, Kolkata Time: 11:00 hrs Date: 18.10.2022 (Tuesday)

Sl No	Name	Designation/ Organization	Contact Number	Email	Signature
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34	Avinash Shukla	Sr Mgr/ BRBCL	9453201984	AVINASH.SHUKLA@NTPC.CO.IN	
35	Abakash Adhikary	EE, CRITL, DVC	7764813085	abakash.adhikary@dvc.gov.in	
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37	Asif Maltani	Sr. Manager, CDIKCHU	9933370011	arif.md@greenkoenergyprojects.com	
38	V-Kranthi Kumar	DGM CDIKCHU	8374666597	Kranthi.kumar@greenkogroup.com	
39	D. Deepakkumar	Team Member	8939761021	deepak.duvaisamy@andritz.com	
40	~~B K Prasad Rao~~	~~SA Mgr~~			

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Participants in 119th PCC Meeting

Venue: ERPC Conference Hall, Kolkata Time: 11:00 hrs Date: 18.10.2022 (Tuesday)

Sl No	Name	Designation/ Organization	Contact Number	Email	Signature
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44	Sayan Sarkar	ENGINEER	9433013559	sayan.s@pndcinfotech.com	Sayan Sarkar
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49	Sanatan Sarvesh	AD, ERPC			S. Sarvesh
50					
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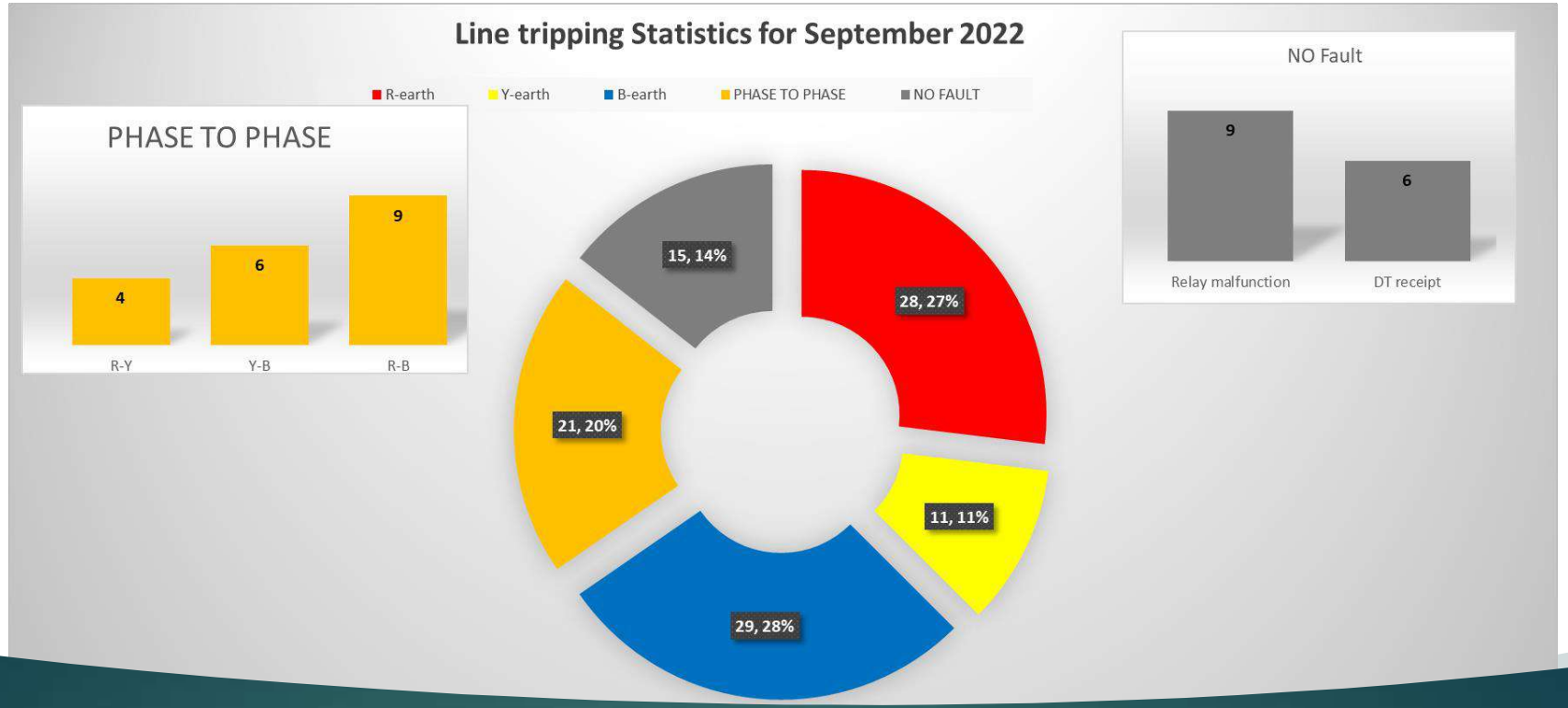
"Coming together is a beginning, staying together is progress, and working together is success." –Henry Ford

Annexure B

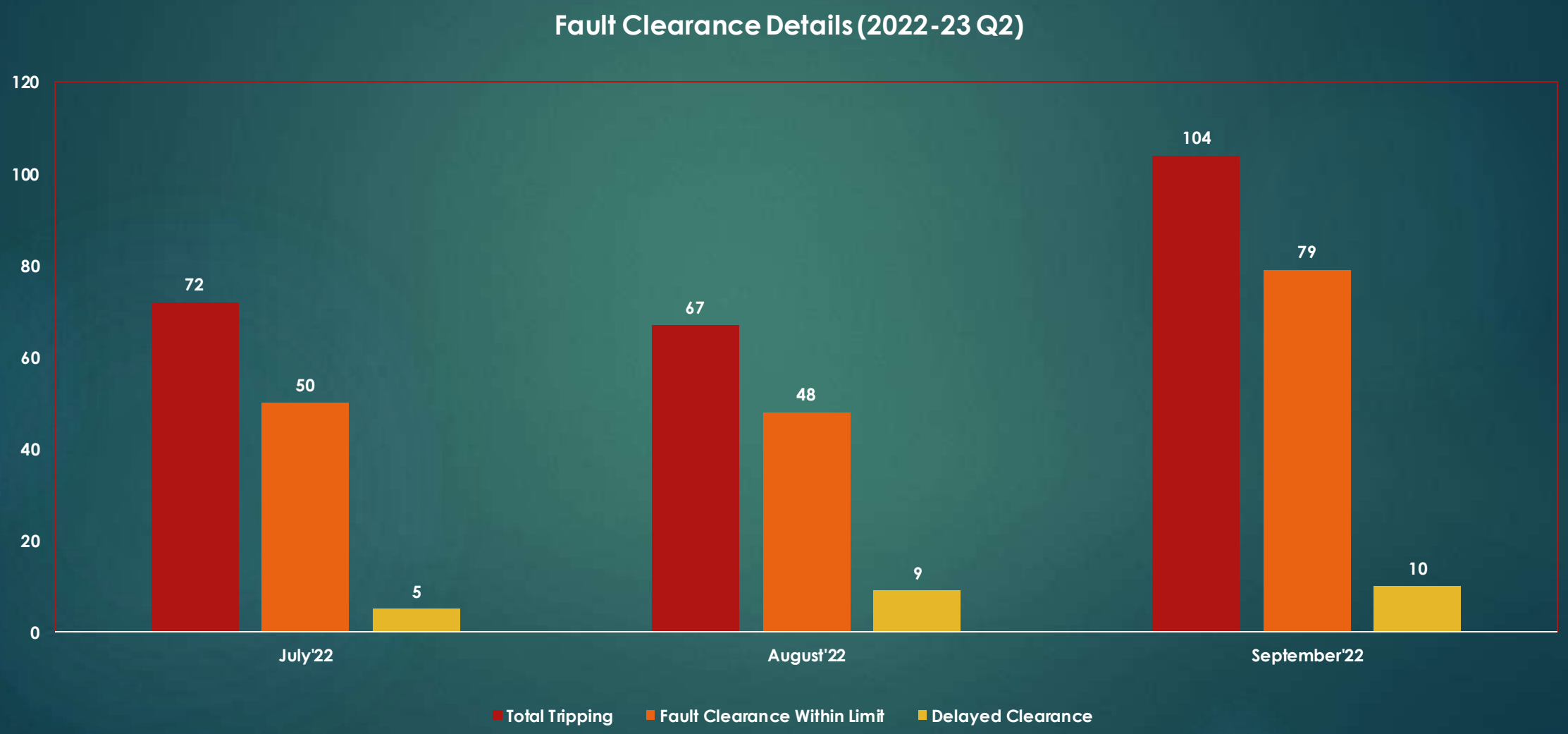
ER Protection Statistics for the month of September'22

Single Line Tripping (Monthwise comparison)

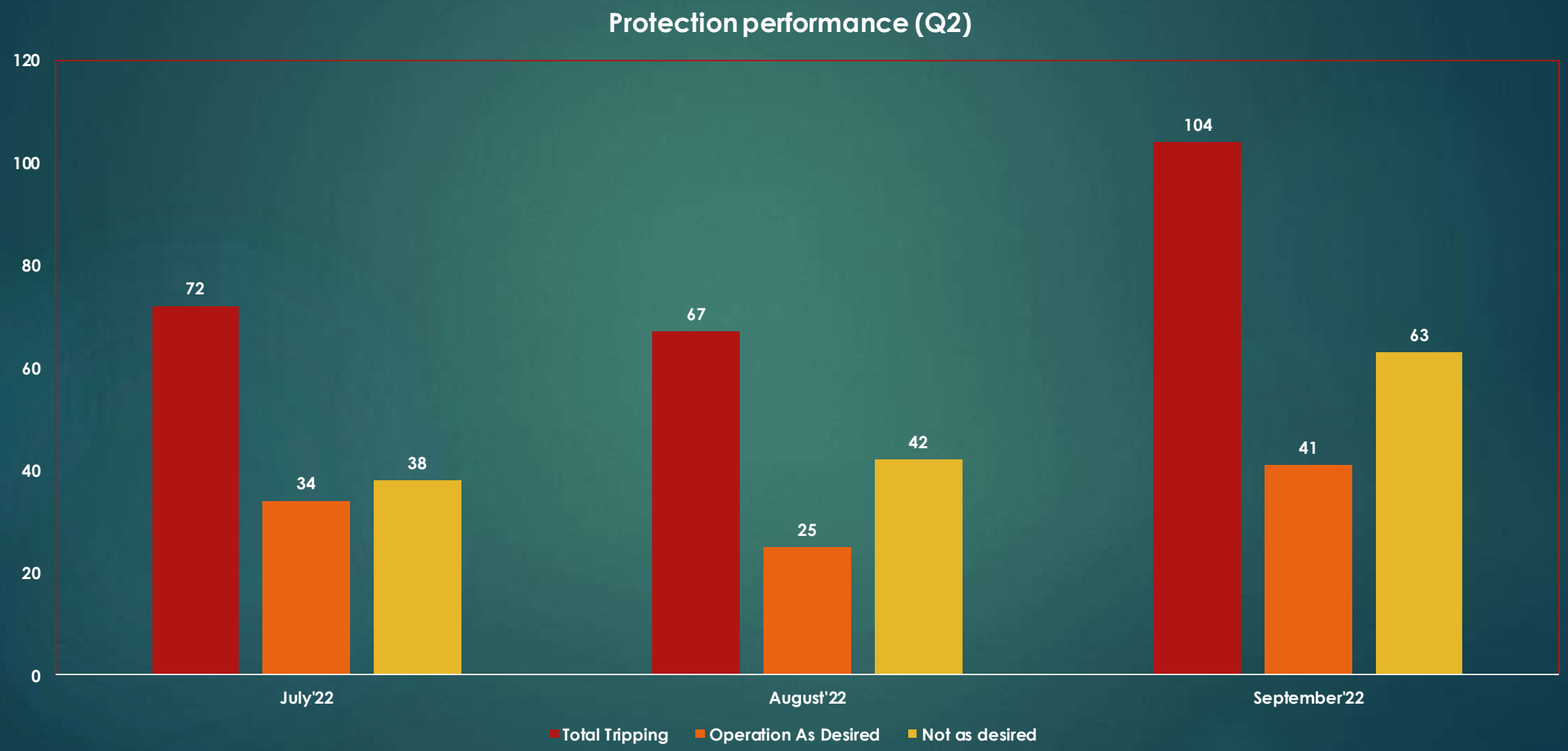


Single Line Tripping Statistics for the Month of September'22

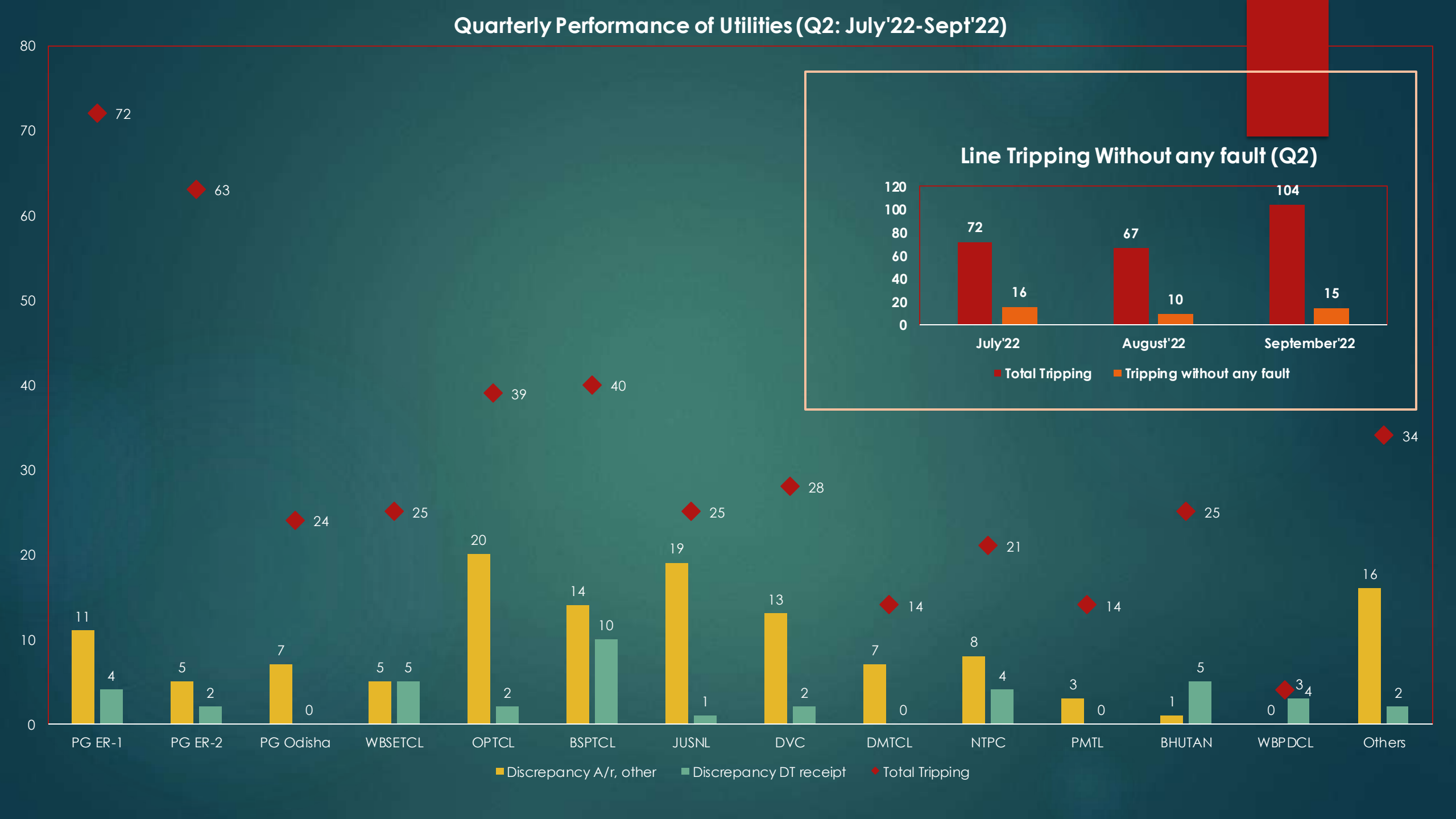
Fault Clearance Stats (Q2)



Quarterly Protection Performance (Q2)



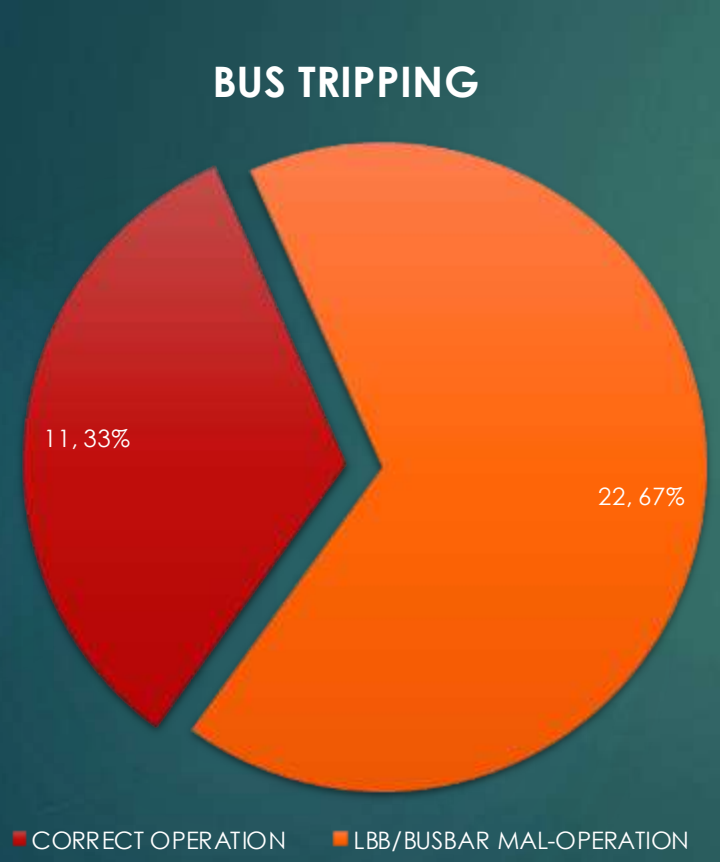
Quarterly Performance of Utilities (Q2: July'22-Sept'22)

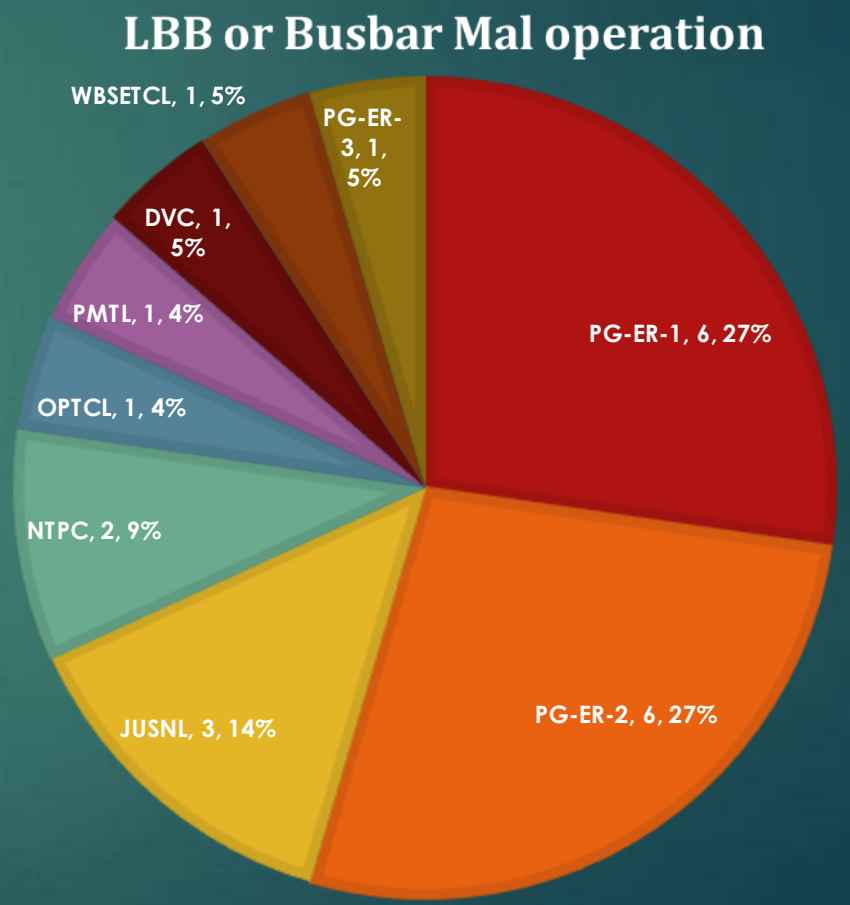


Line Tripping Without any fault (Q2)

Key issues

Bus tripping occurring in Eastern Region due to LBB or Busbar Mal operation

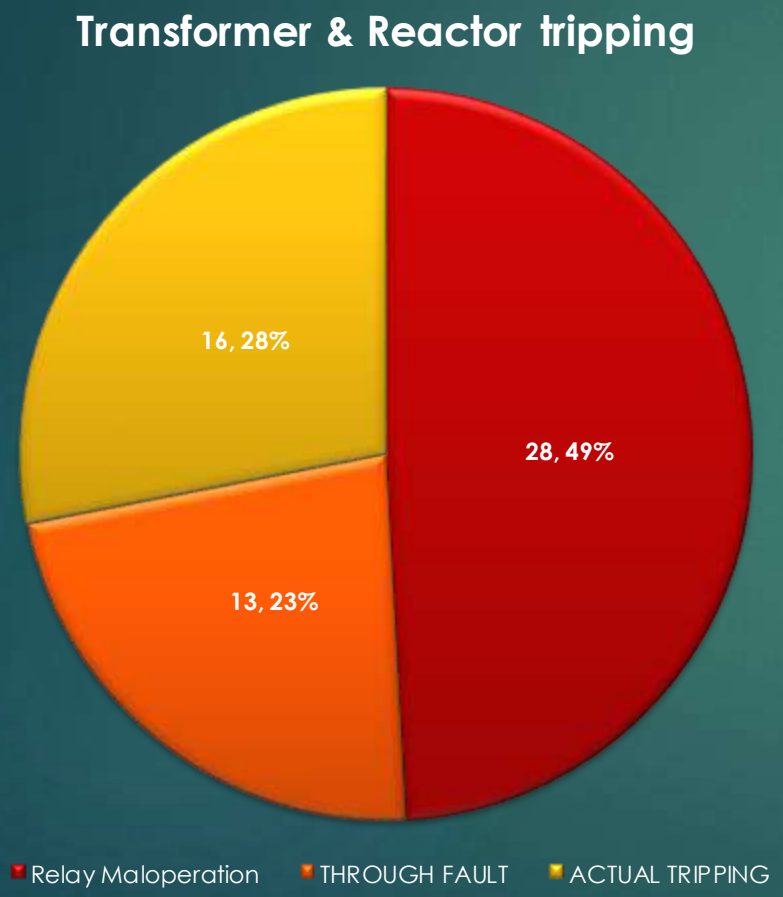


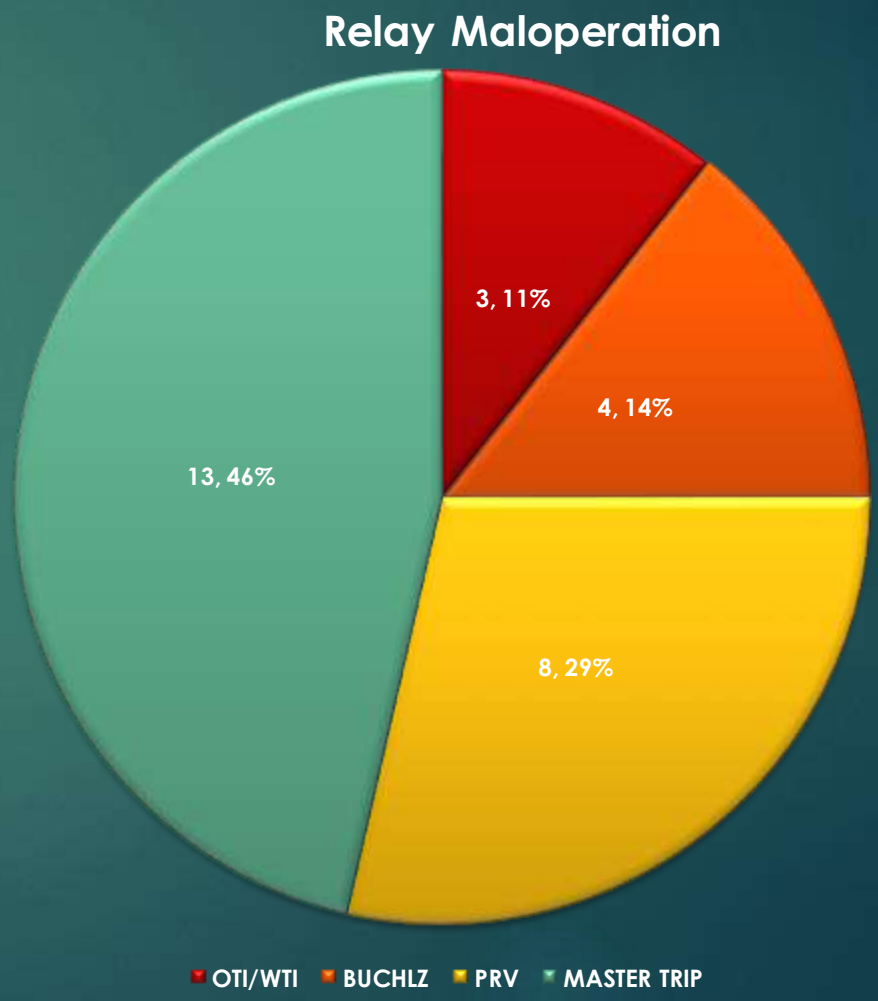


Sr No	Element Name	Tripping Date	Tripping Time	Reason	UTILITY
1	400KV MAIN BUS - 1 AT ANDAL(DSTPS)	22-03-2022	13:05	LBB operated	DVC
2	400KV MAIN BUS - 1 AT DSTPS(ANDAL)	22-03-2022	13:05	Bus Fault	DVC
3	400KV MAIN BUS - 2 AT HALDIA	27-01-2022	11:52	For defect rectification job of Bus post insulator of Line-2 89-B R-Phase, bus was hand tripped on emergency	HEL
4	132KV MAIN BUS - 1 AT DALTONGANJ	22-06-2022	15:25	Bus bar protection operation at Daltongunj	JUSNL
5	220KV MAIN BUS - 2 AT DALTONGANJ	22-06-2022	15:25	Bus bar protection operated at Daltongunj	JUSNL
6	220KV MAIN BUS - 1 AT DALTONGANJ	22-06-2022	15:25	Bus bar protection operated at Daltongunj	JUSNL
7	400KV MAIN BUS - 2 AT KAHALGAON	17-05-2022	10:47	Due to LBB operation of tie CB of unit-2 and B/R-1	NTPC
8	TALCHER - 400KV - Bus 2	22-05-2022	03:49	LBB operated	NTPC
9	220KV MAIN BUS - 1 AT JEYPORE	27-02-2022	11:17	LBB of 220 kV Jeypore-Jaynagar-3 at Jeypore operated and 220 kV Bus 1 tripped.	OPTCL
10	400KV MAIN BUS - 1 AT NEW DUBURI	28-03-2022	14:17	Tripped due to LBB operation of main CB of Meeramundali-II	OPTCL
11	400KV MAIN BUS - 1 AT MERAMUNDALI	20-06-2022	16:31	Awaited	OPTCL
12	220KV MAIN BUS - 2 AT MUZAFFARPUR	28-03-2022	07:12	220 KV BUS-2 AT MUZAFFARPUR TRIPPED DUE TO GAS COMPARTMENT ZONE TRIP FROM KBUNL(FUTURE) GIS BAY OF BSPTCL	PG-ER-1
13	220KV MAIN BUS - 2 AT MUZAFFARPUR	31-03-2022	16:39	LBB PROTECTION OF 220KV MUZFFARPUR-HAJIPUR-1 MALOPERATED AT MUZFFARPUR	PG-ER-1
14	400KV NORTH BUS -2 AT PUSAULI	23-05-2022	17:42	DUE TO DAMAGED BPI IN MAIN BAY OF 400 KV SASARAM-ALLAHABAD LINE AT SASARAM END DURING HEAVY THUNDER STORM, LIGHTNING AND CYCLONIC WEATHER	PG-ER-1
15	220KV MAIN BUS - 1 AT MUZAFFARPUR	11-06-2022	13:28	Bus fault occurred at 220 kV main bus-1 at Muzaffarpur	PG-ER-1
16	400KV MAIN BUS - 1 AT Pusauli	23-07-2022	10:56	Hand tripped in view of equipment safety as B-ph Bus side of 40989A isolator (Daltongunj main bay) broken during operation for AMP of 409bay and was hanging very near to Y-phase BUS at Pusauli	PG-ER-1
17	400KV MAIN BUS - 1 AT RANCHI	28-07-2022	17:26	LBB Operated, Details Awaited.	PG-ER-1
18	400KV MAIN BUS - 2 AT CHANDWA	19-09-2022	16:50	During Bus-1 S/D work/testing Bus-2 tripped	PG-ER-1
19	400KV MAIN BUS - 1 AT CHANDWA	28-09-2022	15:04	Tripped during checking of 400kV Bus- 2 (already under shutdown)	PG-ER-1
20	400KV MAIN BUS - 1 AT PATNA	10-10-2022	15:07	DUE TO LBB OPERATION OF 400KV MAIN BAY OF PATNA SAHARSA CKT 2 AT PATNA.	PG-ER-1
21	400KV MAIN BUS - 2 AT MALDA	29-04-2022	20:01	snapping R-ph Bus connector of 400kV Malda-N. Purnea #2	PG-ER-2
22	400KV MAIN BUS - 2 AT Durgapur	31-05-2022	11:30	Suspected LBB operated of Bus sectionalizer	PG-ER-2
23	400KV MAIN BUS - 4 AT MAITHON	24-06-2022	11:18	Due to LBB operation in 400 KV Main Bay (Bay no 412) of Jamshedpur line	PG-ER-2
24	220KV MAIN BUS - 2 AT RANGPO	11-07-2022	10:03	due to voltage collapse in one cell of 220V DC Battery bank-2, Gas zone tripping command initiated from 220KV Rangpo-Rongnichu line-2 (Bay-213 at Rangpo end) & it tripped 220kV Bus-2 of Rangpo SS.	PG-ER-2
25	400KV MAIN BUS - 2 AT MALDA	04-09-2022	05:57	Bus bar maloperation at Malda	PG-ER-2
26	400KV MAIN BUS - 1 AT MALDA	04-09-2022	05:57	Bus bar maloperation at Malda	PG-ER-2
27	220KV MAIN BUS - 2 AT RANGPO	10-09-2022	17:17	Bus bar protection operated at Rangpo	PG-ER-2
28	220KV MAIN BUS - 1 AT Birpara	24-09-2022	02:17	Suspected maloperation of Electromagnetic LBB relay at Birpara	PG-ER-2
29	400KV MAIN BUS - 2 AT KEONJHAR	12-07-2022	09:25	During planned shutdown of Baripada line, instead of opening Bus side isolator of main CB after opening CBs, site has inadvertently opened bus side isolator of other main CB (Bus reactor CB which is in service).This has resulted in bus fault and tripped Bus-2.	PG-ER-3
30	400KV MAIN BUS - 1 AT SAHARSA	13-05-2022	17:12	Bus bar protection operated at the time of lighting.	PMTL
31	220KV MAIN BUS - 2 AT SUBHASHGRAM	10-01-2022	02:55	Y Phase CT burst of 220 kV Subhasgram - Kasba - 2	WBSETCL
32	400KV MAIN BUS - 2 AT SUBHASGRAM(PG)	20-01-2022	05:41	Busbar protection operated due to earth wire snapping from Gantry between Main and Tie bay of ICT-2	WBSETCL
33	400KV MAIN BUS - 2 AT NEW PPSP	18-07-2022	23:35	Out due to problem in differential protection	WBSETCL

Spurious tripping of ICTs/reactors

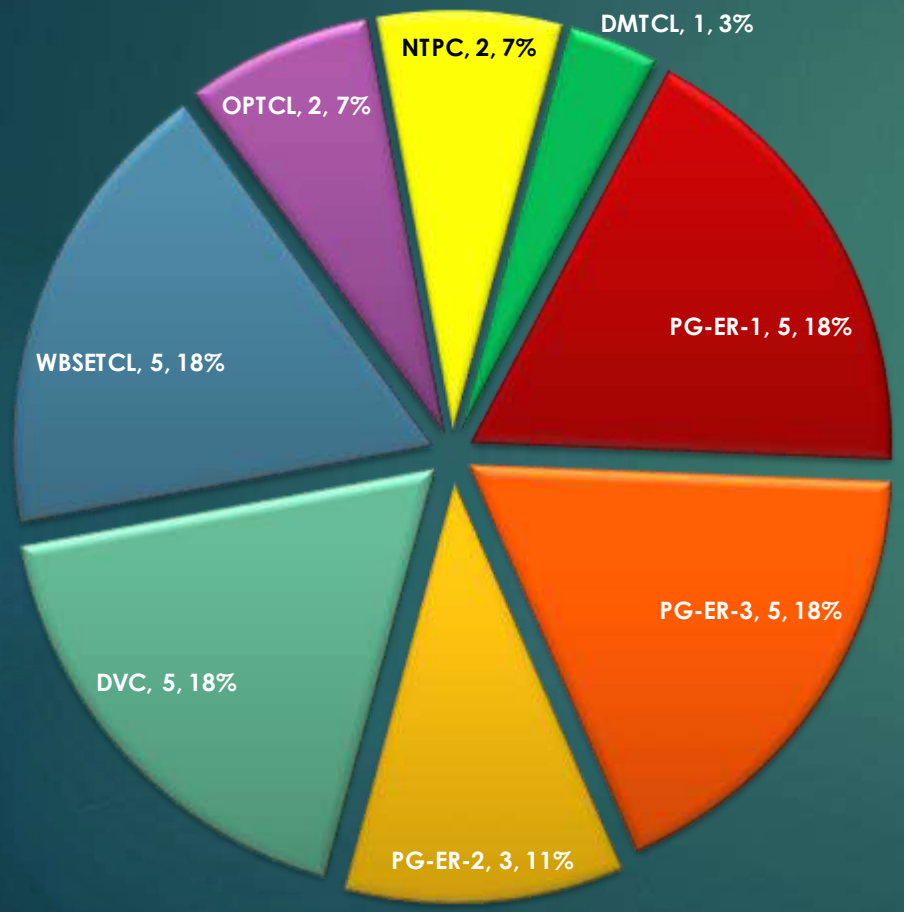
Majority of ICT & Reactor tripping are undesired which are tripping due to occurring due to Mechanical Relay Maloperation such as PRV/Buchholz ,WTI /OTI .



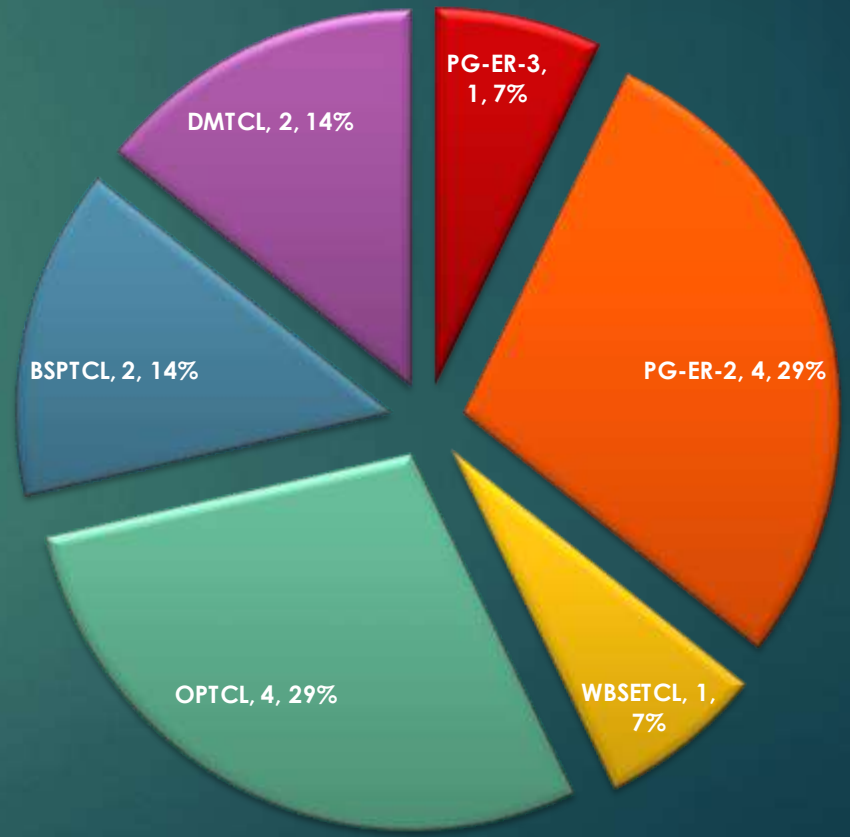


Utility wise ICT Mal-tripping

ICT/Reactor tripping on Relay Mal-operation



ICT/Reactor tripping on Through Fault



ICT TRIPPING 2021 (Jan-Dec)

Sr.	Element Name	Tripping Date	Tripping Time	Reason	UTILITY
1	400KV/220KV 315 MVA ICT 3 AT BIHARSARIFF	01-01-2021	17:31:00	TRIPPED DUE TO DIRECTIONAL O/C.TRIPPED FROM BSEB END ONLY	BSPTCL
2	400KV/220KV 315 MVA ICT 2 AT BIHARSARIFF	01-01-2021	17:31:00	TRIPPED DUE TO DIRECTIONAL O/C	BSPTCL
3	400KV/132KV 315 MVA ICT 3 AT MOTIHARI (DMTCL)	19/04/2021	15:29:00	DIFFERENTIAL RELAY OPERATED , ICT WAS CHARGEN ON NO LOAD FROM 400 KV SIDE	DMTCL
4	400KV/132KV 315 MVA ICT 3 AT MOTIHARI (DMTCL)	18/04/2021	17:54:00	PRD operated	DMTCL
5	400KV/220KV 500 MVA ICT 2 AT DARBHANGA(DMTCL)	25/09/2021	13:28:00	Diretional EF operated at DMTCL	DMTCL
6	400KV/220KV 500 MVA ICT 1 AT DARBHANGA(DMTCL)	25/09/2021	13:28:00	Diretional EF operated at DMTCL	DMTCL
7	400KV/220KV 315 MVA ICT 2 AT DSTPS(ANDAL)	15/02/2021	18:21:00	Inter tripping logic operated .	DVC
8	400KV/220KV 315 MVA ICT 1 AT DSTPS(ANDAL)	18/06/2021	05:19:00	PRV-2 operated	DVC
9	400KV/220KV 315 MVA ICT 1 AT BOKARO-A TPS	06-03-2021	22:47:00	86A RELAY OPERATED;	DVC
10	400KV/220KV 315 MVA ICT 2 AT BOKARO-A TPS	08-06-2021	09:52:00	86 B Trip Relay	DVC
11	400KV/220KV 315 MVA ICT 2 AT BOKARO-A TPS	10-01-2021	12:08:00	REMOTE PROT. OPTD. AND 86A, 86B.	DVC
12	400KV/220KV 315 MVA ICT 1 AT TSTPP	05-08-2021	06:40:00	Buchholz relay/PRD operated	NTPC
13	400KV/132KV 200 MVA ICT 2 AT KAHALGAON	18/10/2021	20:30:00	TRIPPED DURING SYNCHRONIZATION OF 132KV-KHSTPP-KH (BSEB) LINE	NTPC
14	400KV/220KV 315 MVA ICT 2 AT MERAMANDALI	02-05-2021	15:07:00	(HV SIDE)- Dir o/c, M/T , (LV SIDE)- M/T ONLY.	OPTCL
15	400KV/220KV 315 MVA ICT 1 AT MERAMANDALI	02-05-2021	15:07:00	(HV SIDE)- Dir o/c, M/T , (LV SIDE)- M/T ONLY.	OPTCL
16	400KV/220KV 315 MVA ICT 2 AT NEW DUBURI	17/04/2021	17:33:00	Tripped on differential protection	OPTCL
17	400KV/220KV 315 MVA ICT 1 AT MERAMANDALI	06-07-2021	03:19:00	400 KV Side:-E/F & O/C Pick up,M/T 220 KV Side:- M/T	OPTCL
18	400KV/220KV 315 MVA ICT 2 AT NEW DUBURI	16/09/2021	17:57:00	DC earth fault in Relay panel	OPTCL
19	80MVAR SWITCHABLE L/R OF 400KV-MERAMUNDALI-ANGUL-1 AT MERAMUNDALI	06-07-2021	03:19:00	Reactor B/U Impedance relay :-R-E,IR=1.6 KA	OPTCL
20	50MVAR SWITCHABLE L/R OF 400KV-MERAMUNDALI-LAPANGA-2 AT MERAMUNDALI	11-06-2021	06:50:00	NGR- Bucholz Operated	OPTCL
21	400KV/220KV 315 MVA ICT 2 AT INDRAVATI.	06-02-2021	16:00:00	Tripped due to OVERFLUX.Voltage at 220 KV lower end was observed is Vab -242 KV, Vbc-245KV , Vca- 240KV.	OPTCL
22	400KV/220KV 315 MVA ICT 3 AT JAMSHEDPUR(DVC)	03-11-2020	23:45:00	gas pressure low in cb 220 kV side	PG-ER-1
23	400KV/220KV 315 MVA ICT 3 AT JAMSHEDPUR	03-12-2021	18:53:00	BACK UP O/C	PG-ER-1
24	765KV/400KV 1500 MVA ICT 1 AT NEW RANCHI	27/05/2021	11:23:00	Suspected DC Earth fault	PG-ER-1
25	765KV/400KV 1500 MVA ICT 2 AT NEW RANCHI	27/05/2021	07:00:00	86 Relay(master trip)	PG-ER-1
26	765KV/400KV 1500 MVA ICT 1 AT NEW RANCHI	27/05/2021	04:46:00	86 Relay(master trip)	PG-ER-1
27	765KV/400KV 1500 MVA ICT 2 AT NEW RANCHI	27/05/2021	00:41:00	Master trip (86) relay revived. NO FAULT SIGNATURE CAPTURED IN PMU. At the time of tripping heavy rain and storm was observed at site.	PG-ER-1
28	400KV/220KV 500 MVA ICT 2 AT SITAMARHI	16/06/2021	11:52:00	Mal-operation of OSR relay due to moisture ingress.	PG-ER-1
29	400KV/220KV 315 MVA ICT 1 AT JAMSHEDPUR	09-01-2021	11:20:00	jamshedpur-Line differential operated	PG-ER-1
30	400KV/220KV 315 MVA ICT 1 AT JAMSHEDPUR	20/11/2021	18:32:00	Overhead line differential protection operated , CT secondary cable of OH differential protection core is damaged near CT MB at JUSNL end.	PG-ER-1
31	400KV/220KV 315 MVA ICT 1 AT CHAIBASA(PG)	31/10/2021	10:02:00	Failure of 400kv side Y Phase bushing.	PG-ER-1

	Through FAULT
	Relay Mal-operation
	Correct

32	400KV/220KV 315 MVA ICT 5 AT RANGPO	04-08-2021	15:53:00	back up impedance fault	PG-ER-2
33	400KV/220KV 315 MVA ICT 4 AT RANGPO	04-08-2021	15:53:00	back up impedance fault	PG-ER-2
34	400KV/220KV 315 MVA ICT 3 AT RANGPO	04-08-2021	15:53:00	back up impedance fault	PG-ER-2
35	400KV/220KV 315 MVA ICT 1 AT RANGPO	04-08-2021	15:53:00	back up impedance fault	PG-ER-2
36	400KV/220KV 315 MVA ICT 3 AT SUBHASGRAM(PG)	27/05/2021	03:45:00	Master trip operated.	PG-ER-2
37	80MVAR SWITCHABLE L/R OF 400KV-BINAGURI-ALIPURDUAR (PG)-1 AT BINAGURI	05-03-2021	16:51:00	Maloperation due to bird menace near PRD	PG-ER-2
38	240MVAR SWITCHABLE L/R OF 765KV-NEW RANCHI-MEDINIPUR-1 AT MEDINIPUR	07-06-2021	09:28:00	R phase PRV Operated	PG-ER-2
39	400KV/220KV 315 MVA ICT 1 AT BARIPADA(PG)	04-02-2021	19:04:00	OTI maloperation	PG-ER-3
40	400KV/220KV 315 MVA ICT 3 AT ROURKELA	19/07/2021	03:27:00	REF protection of ICT#3 operated	PG-ER-3
41	400KV/220KV 315 MVA ICT 1 AT ROURKELA	19/07/2021	03:27:00	REF protection of ICT#3 operated	PG-ER-3
42	765KV/400KV 1500 MVA ICT 1 AT ANGUL	21/10/2021	17:49:00	WTI protection maloperation	PG-ER-3
43	765KV/400KV 1500 MVA ICT 1 AT ANGUL	16/10/2021	16:49:00	WINDING TEMPERATURE INDICATOR TRIP	PG-ER-3
44	50MVAR NON-SWITCHABLE L/R OF 400KV-ROURKELA-CHAIBASA-2 AT ROURKELA	26/12/2020	12:58:00	Buchholtz relay operated	PG-ER-3
45	50MVAR NON-SWITCHABLE L/R OF 400KV-ROURKELA-CHAIBASA-2 AT ROURKELA	14/06/2021	14:49:00	LINE IS TAKEN IN SERVICE WITHOUT LINE REACTOR BECAUSE OF PRV RELAY OPERATION	PG-ER-3
46	400KV/220KV 315 MVA ICT 1 AT BIDHANNAGAR	23/04/2021	20:09:00	27N (Under Voltage),86 Relay operated	WBSETCL
47	400KV/220KV 315 MVA ICT 1 AT NEW CHANDITALA	22/04/2021	10:47:00	OIL SERGE RELAY	WBSETCL
48	400KV/220KV 315 MVA ICT 4 AT ARAMBAGH	05-07-2021	13:02:00	B phase differntial relay operated	WBSETCL
49	400KV/220KV 315 MVA ICT 1 AT NEW CHANDITALA	05-05-2021	14:19:00	Master Trip Relay operated	WBSETCL
50	400KV/220KV 315 MVA ICT 4 AT JEERAT	04-09-2021	20:22:00	TRIPPED ON DIFFERENTIAL AND PRD PROTECTION OPERATED	WBSETCL
51	400KV/220KV 315 MVA ICT 1 AT JEERAT	06-07-2021	16:51:00	Diff relay 87 operated	WBSETCL
52	400KV/220KV 315 MVA ICT 3 AT ARAMBAGH	18/07/2021	04:55:00	Differential protection operated	WBSETCL
53	400KV/220KV 315 MVA ICT 1 AT BIDHANNAGAR	29/09/2021	23:32:00	Tripped on PRD	WBSETCL
54	400KV/220KV 315 MVA ICT 2 AT JEERAT	22/10/2021	12:36:00	Differential protection operated. Y Ph L.A. blast at 400 kV side	WBSETCL
55	400KV/220KV 315 MVA ICT 3 AT JEERAT	10-03-2021	21:25:00	FACIA (AT HV SIDE) :- CIR. CURRENT PROT. OPTD. GR. A TRIP RELAY :- 86TA (5 NOS FLAGS) CIRCULATING CURRENT RELAY : 87A(1 NO FLAG)	WBSETCL
56	400KV/220KV 315 MVA ICT 1 AT ARAMBAGH	12-05-2021	05:50:00	Buchholz Relay operated	WBSETCL
57	240MVAR SWITCHABLE L/R OF 765KV-NEW RANCHI-MEDINIPUR-2 AT MEDINIPUR	30/07/2021	02:37:00	DC ERATH FAULT,HEAVY RAIN REPORTED	WBSETCL

	Through FAULT
	Relay Mal-operation
	Correct

THANK YOU

पावर सिस्टम ऑपरेशन करपोरेशन लिमिटेड
(भारत सरकार का उद्यम)
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Eastern Regional Load Despatch Centre: 14, Golf Club Road, Tollygunge, Kolkata-700 033.
CIN: U40105DL2009GOI188682
फ़ोन: 033- 24235755, 24174049 फैक्स : 033-24235809/5029 Website:www.erldc.org, Email ID- erldc@posoco.in

घटना संख्या: **10-10-2022/4** दिनांक: **10-10-2022**

Report on the grid event in Eastern Region (पूर्वी क्षेत्र में ग्रिड घटना पर रिपोर्ट)

Summary of the event (घटना का सारांश):

AT 10:50 Hrs, 220 kV CTPS B-BTPS (Bokaro B)-2 was hand tripped to control loading of 2* 315 MVA 400/220 kV ICTs at Bokaro. At 10:55 Hrs, 220 kV CTPS B-BTPS (Bokaro)-1 was also hand tripped to further reduce loading of those ICTs. However, Y_ph CB of this line got stuck at CTPS B end, LBB operated and this gave tripping command to all elements in both buses. At 11:03 Hrs, 220 kV CTPS A-Kalyaneshwari also got tripped which led to total power failure at 220 kV CTPS A S/s also. Both running units at CTPS B tripped leading to 360 MW generation loss. Around 400 MW load loss also reported.

Date / Time of disturbance: 24-09-2022 at 10:55 hrs.

- **Event type:** GD - 1
- **Systems/ Subsystems affected:** 220/132 kV CTPS A, 220 kV CTPS B
- **Load and Generation loss**.
  - 360 MW generation loss occurred at CTPS B
  - 400 MW load loss occurred at CTPS, Putki and nearby area.

Important Transmission Line/element if out (महत्वपूर्ण संचरण लाइने जो बंद है):

- 132 kV Putki-Patherdih D/c

Major elements tripped (प्रमुख ट्रिपिंग):

- 220 kV CTPS A-CTPS B D/c
- 220 kV CTPS A-Kalyaneshwari D/c
- 220 kV CTPS B-Dhanbad D/c
- Main Bus 1 & at 2220 kV CTPS B
- CTPS B U#7, U#8

Network across the affected area (प्रभावित क्षेत्र का नक्शा)

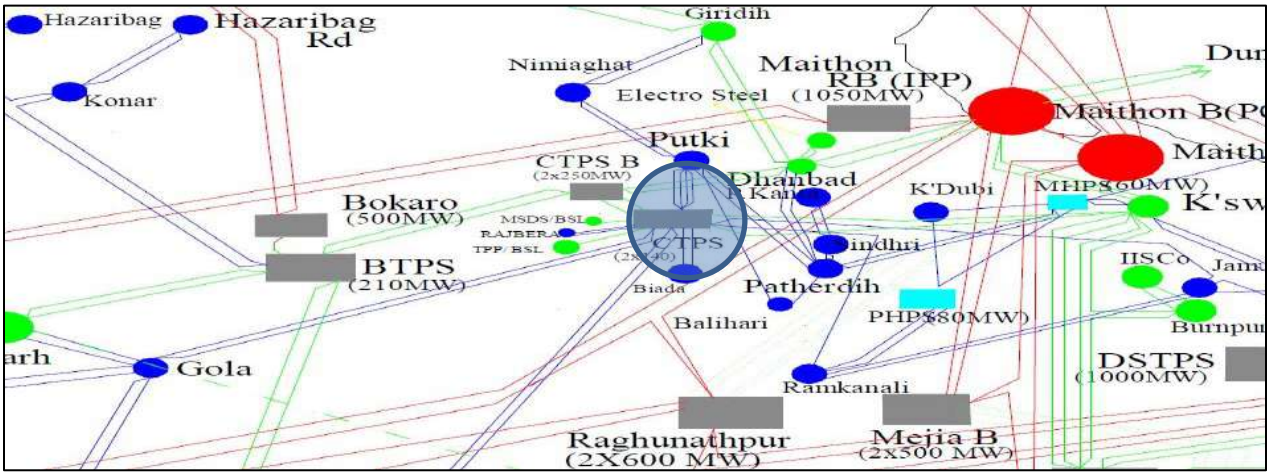


Figure 1: Network across affected area

Figure 2: SCADA snapshot of the system

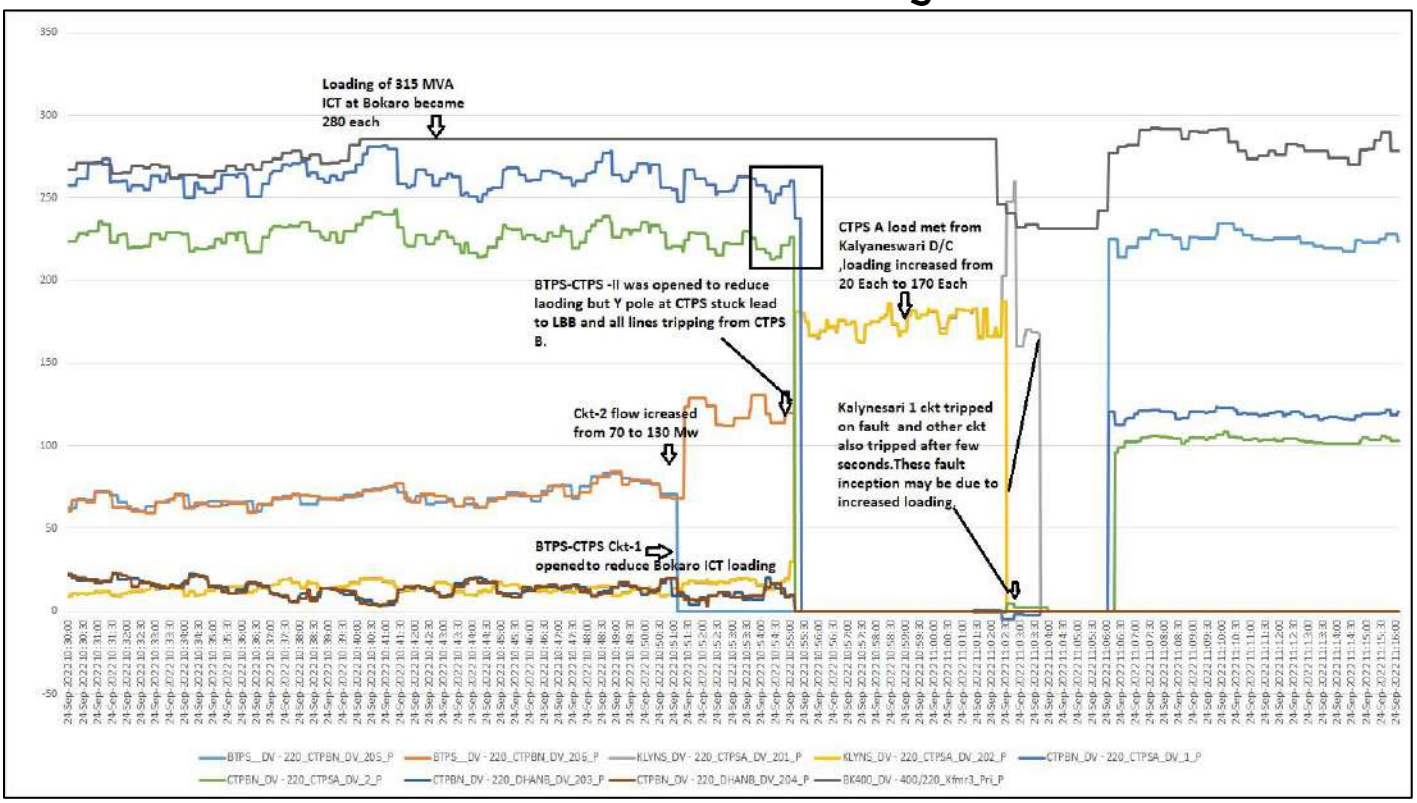
Relay indication and PMU observation (रिले संकेत और पीएमयू पर्यवेक्षण):

Sl. No.	Name of the Element	Tripping Time	Restoration Time	Relay Indication/tripping details (if avbl.)
1.	220 KV CTPS B-BOKARO CKT II	11:06 Hrs.	14:06.hrs.	Relay 21Q (Broken conductor detection relay) & 86.
2	220 KV CTPS B-DHANBAD CKT D/C 220 KV CTPS A-CTPS B Tie D/C	11:06 Hrs	11 :40 Hrs	LBB relay & 96.

Restoration (पूर्वावस्था की प्रप्ति):

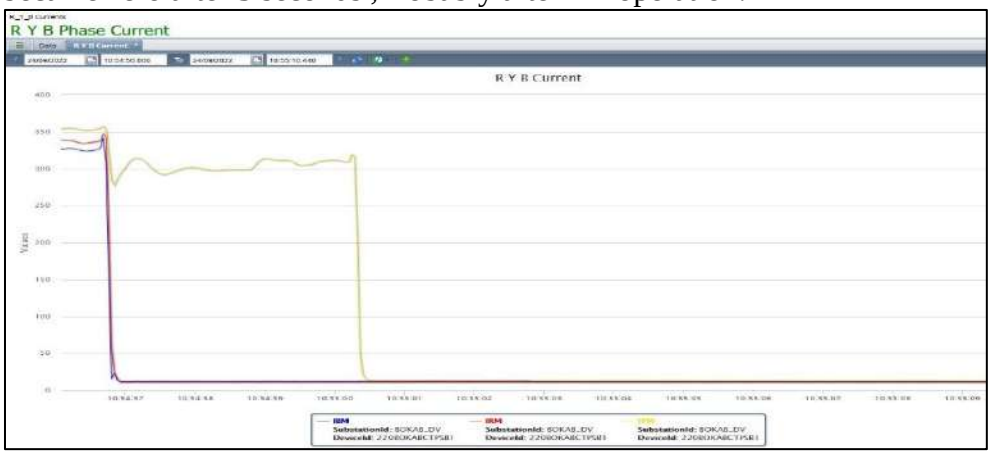
- Load normalized at 11:05 Hrs through 220 kV CTPS- BTPS-1 and 220 kV JSPL-Jamshedpur(D) opened to restrict loading of ICTs at Bokaro-A. 132 kV Maithon - Jamtara also opened to restrict loading of the ICTs.

Analysis of the event (घटना का विश्लेषण) & Protection issue (सुरक्षा समस्या)



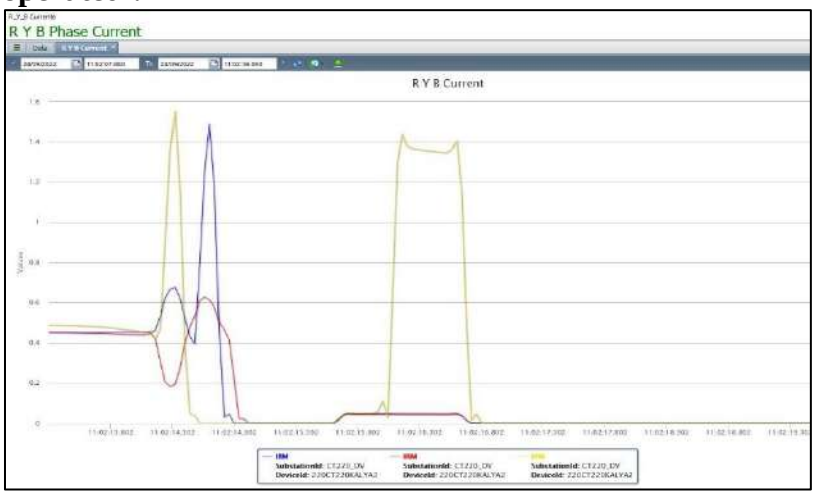
Power flow SCADA plot for the event.

- Loading of 2*315 MVA ICT at Bokaro touched up to 280 MW each and to reduce the loading of ICT ,BTPS-CTPS (B)-I was opened at 10:50 Hrs ,but ICT loading did not reduced as load was shifted to ckt -2 as observed from above scada plot .
- At 10:55 Hrs ckt-2 was also opened but Y pole CB at CTPS (B) got stuck and did not opened which can also be seen from below PMU plot of line current plot. Y phase current became zero after 3 seconds ,Probably after PD operation.



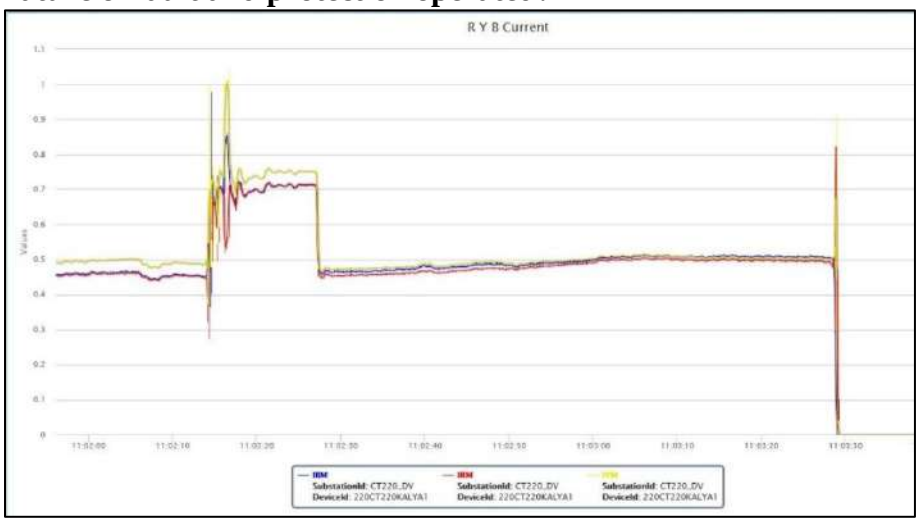
- Under such condition of stuck one pole of breaker PD should have operated and tripped the remaining phase but apart from this all other lines with main bus-1 and 2 at CTPS B tripped.

- Reason for the same was due to stuck breaker condition, Broken conductor protection operated and resulted into lockout relay operation which further initiated Operation of LBB as Y pole was stuck and LBB gave tripping command to each element from Main Bus -1.
- But it also gave tripping command to all the elements from Main bus -2 as there is DMT scheme it was later known that, ST#8 was at MB#2 but both CT switching relays of MB-1 & MB-2 of this bay was operated condition hence It caused tripping of all bays of MB-2 through 96 relays. Supervision and different schemes may be explored to avoid both CT switching overlap with both buses. **DVC to explore till implementation of low impedance busbar.**
- Operation of Broken conductor protection needs to be checked in detail as it led to lockout relay operation and initiation of LBB which led to bus tripping.
- Broken conductor operates on the ration of I2/I1> 20% as one pole was only stuck so I2=I1.
- Since sensitive settings have been employed, it can be expected that the element will operate for any unbalance condition occurring on the system for example, during a single pole auto reclose cycle. Hence, a long time-delay is necessary to ensure co-ordination with other protective devices. **Normally4- 5 second time-delay is provided for Broken Conductor Protection.**
- As Y pole tripped after 3 seconds, Broken conductor protection should have not operated, Generally Broken conductor is used for only alarm purpose. So it can be used for only alarm instead of tripping. **DVC to explain and check.**
- As from CTPS B substations all lines tripped hence both running units also tripped on overspeed due to loss of evacuation path**.**
- At 11:02 Hrs, after tripping of all circuits from CTPS B , load of CTPS A was met by Kalyaneswari D/C and line loading of Kalyanesari increased to 170 Mw each .
- Y-B phase fault occurred in Kalyaneswari ckt-2 and all 3 phases tripped and after 1 second 3 phase auto reclose occurred and all 3 phases got closed then again after 300 ms Y phase fault appeared persisted for approx. 600 ms and got cleared after that with all 3 phase opening .Suspected fault occurrence in this line 2 appears to be due to sag ,clearance issue with increased loading .**DVC may explain the nature of fault and protection operated ?**



- With tripping of Kalyaneswari Ckt-2 the other remaining circuit loading went upto 300 Mw as can be seen from SCADA as well as pmu but later after 30 seconds it reduced to

190 -200 Mw and after a minute this line also developed a R-Y phase fault possibly due to sag and clearance caused by Overloading. **DVC to check this aspect and explain the nature of fault and protection operated?**



- With tripping of CTPS A-Kalyaneswari D/C complete ,CTPS A substation also became dead.
- Fault inception due to high loading may be checked as it occurred in both the lines of kalyaneswari , proper maintenance ,Row , clearance may be ensured to avoid such faults .

Operational Issue:

- High loading of Bokaro ICT, and N-1 non compliance of ICT .
- N-1 violation of CTPS A-CTPS B which may lead to cascaded tripping from CTPS A as the only source after that is Kalyaneswari .

Non-compliance observed (विनियमन का गैर-अनुपालन):

Issues	Regulation Non-Compliance	Utility
Non-Submission of Details for the tripping which is required for appropriate analysis for GD/GI	1. IEGC 5.2 (r), 5.9.6.c (VI) 2. CEA grid Standard 15.3 3. CEA (Technical standards for connectivity to the Grid) Regulation, 2007-6. 4.d	DVC
Incorrect/ mis-operation / unwanted operation of Protection system	1. CEA Technical Standard for Construction of Electrical Plants and Electric Lines: 43.4.A. 2. CEA (Technical standards for connectivity to the Grid) Regulation, 2007: Schedule Part 1. (6.1, 6.2, 6.3)	DVC
DR/EL not provided within 24 Hours	1. IEGC 5.2 (r) 2. CEA grid Standard 15.3	DVC

Status of Reporting (रिपोर्टिंग की स्थिति):

- DR/EL for all lines awaited from DVC.

Annexure 1: DR Recorded

पावर सिस्टम ऑपरेशन करपोरेशन लिमिटेड
(भारत सरकार का उद्यम)
POWER SYSTEM OPERATION CORPORATION LIMITED
(A Government of India Enterprise)
Eastern Regional Load Despatch Centre: 14, Golf Club Road, Tollygunge, Kolkata-700 033.
CIN: U40105DL2009GOI188682
फ़ोन: 033- 24235755, 24174049 फैक्स : 033-24235809/5029 Website:www.erldc.org, Email ID- erldc@posoco.in

घटना संख्या: **09-09-2022/1** दिनांक: **11-10-2022**

Report on the grid event in Eastern Region (पूर्वी क्षेत्र में ग्रिड घटना पर रिपोर्ट)

1. Summary of the event (घटना का सारांश):

At 12:55 Hrs, 220 kV Tenughat-Govindpur-D/c tripped due to R_B_N fault. 210 MW U#2 and 220 kV Dumka-Govindpur-1 tripped at the same time. This resulted in 150 MW generation loss at Tenughat power plant.

- **Date / Time of disturbance:** 09-09-2022 at 12:55 hrs.
- **Event type:** GI - 1
- **Systems/ Subsystems affected:** 220 kV Tenughat S/s
- **Load and Generation loss**.
  - 150 MW generation loss reported during the event.
  - No load loss reported during the event

2. Important Transmission Line/element if out (महत्वपूर्ण संचरण लाइने जो बंद है):

- NIL

3. Major elements tripped (प्रमुख ट्रिपिंग)

- 220 kV Tenughat-Govindpur-D/c
- 220 kV Dumka-Govindpur-1
- U#2 at Tenughat

4. Network across the affected area (प्रभावित क्षेत्र का नक्शा)

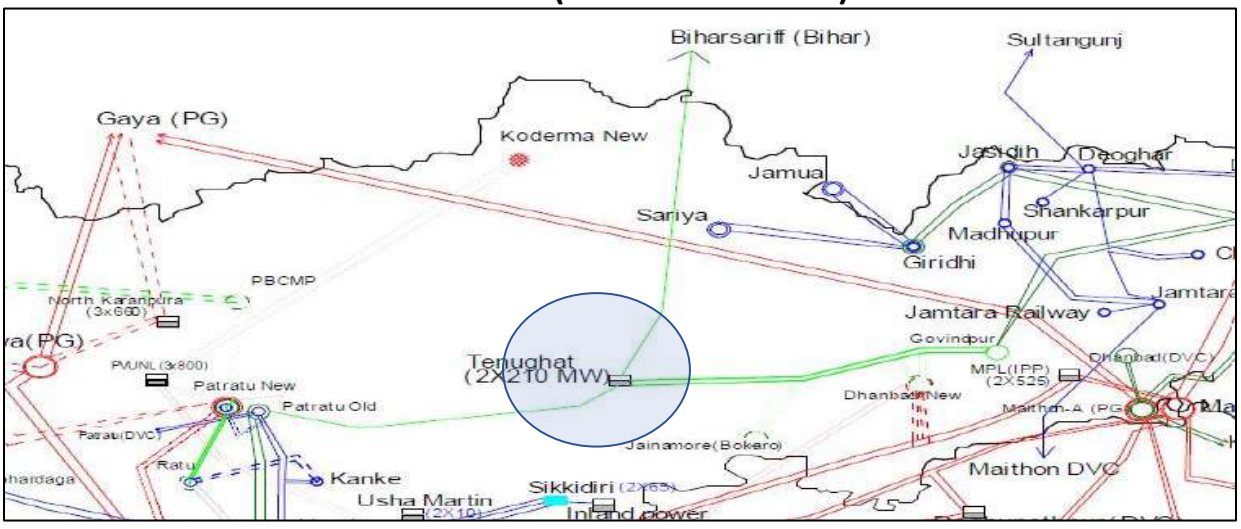


Figure 1: Network across the affected area

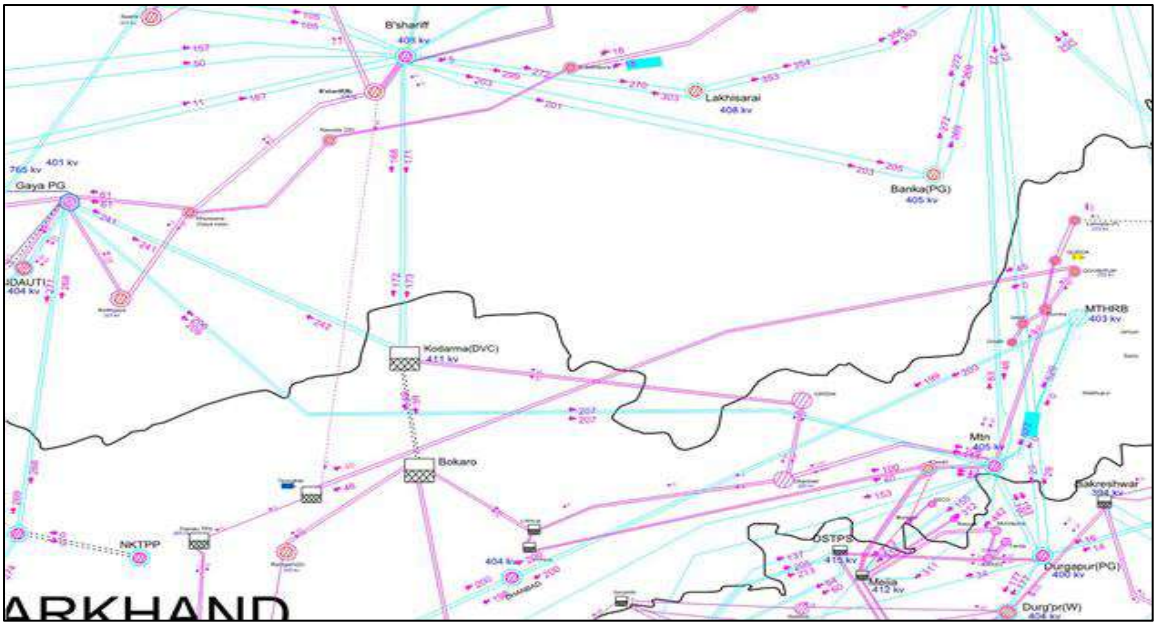


Figure 2: SCADA snapshot for of the system

Relay indication and PMU observation (रिले संकेत और पीएमयू पर्यवेक्षण):

समय	नाम	उप केंद्र 1 रिले संकेत	उप केंद्र 2 रिले संकेत	पीएमयू पर्यवेक्षण
12:55	220 kV Tenughat-Govindpur-1	Tenughat: R_B_N, 15.43 km, Ir: 3.087 kA, Ib: 3.115 kA	Govindpur: R_B_N, Ir: 1.31 kA, Ib: 1.22 kA	65 kV dip in R_ph and 73 kV dip in B_ph voltage at Tenughat. Fault clearance time: 100 msec
	220 kV Tenughat-Govindpur-2	Tenughat: R_B_N, 16.36 km, Ir: 2.642 kA, Ib: 3.041 kA	Govindpur: R_B_N, Ir: 1.32 kA, Ib: 1.12 kA	
	220 kV Dumka-Govindpur-1	-	-	
	210 MW U#2 at Tenughat	O/C E/F		

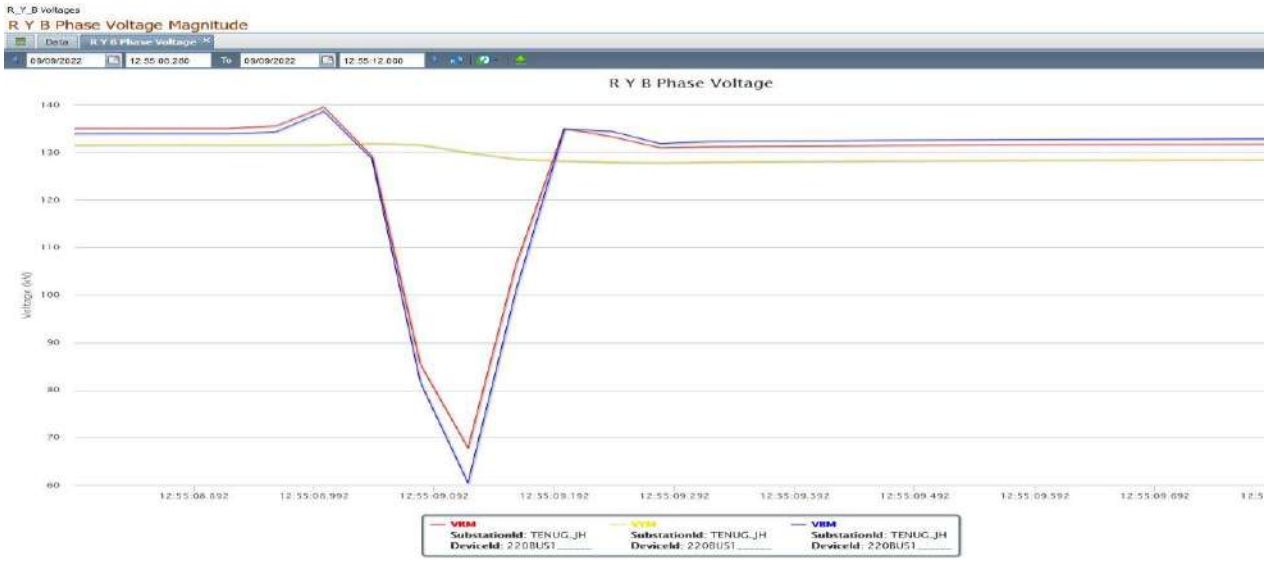


Figure 3: PMU voltage snapshot of 220 kV Tenughat S/s

5. Restoration (पूर्वावस्था की प्रप्ति)

Transmission/Generation element name	Restoration time
220 kV Tenughat-Govindpur-D/c	-
220 kV Dumka-Govindpur-1	-
210 MW U#2 at Tenughat	18:57

6. Analysis of the event (घटना का विश्लेषण) & Protection issue (सुरक्षा समस्या):

- 220 kV Tenughat-Govindpur D/c tripped due to R_B_N fault within 100 msec.
- 210 MW U#2 at Tenughat tripped at the same time on O/c E/F. DR of Unit may be submitted.
- Earlier also, Units at Tenughat tripped on O/c immediately during any fault. Review of Hi-set O/c was recommended in earlier PCC meetings also. Status of the same maybe updated. **TVNL may explain.**
- 220 kV Govidpur-Dumka-1 also tripped at the same time. Details of the same maybe submitted.

7. Non-compliance observed (विनियमन का गैर-अनुपालन):

Issues	Regulation Non-Compliance	Utility
DR/EL not provided within 24 Hours	1. IEGC 5.2 (r) 2. CEA grid Standard 15.3	**TVNL, JUSNL**
Incorrect/ mis-operation / unwanted operation of Protection system	1. CEA Technical Standard for Construction of Electrical Plants and Electric Lines: 43.4.A. 2. CEA (Technical standards for connectivity to the Grid) Regulation, 2007: Schedule Part 1. (6.1, 6.2, 6.3)	**TVNL**
Non-Availability of Numerical Bus Bar/LBB Protection at 220 kV and above S/s	1. CEA Technical Standard for Construction of Electrical Plants and Electric Lines 43.4.A 2. CEA Technical Standard for Construction of Electrical Plants and Electric Lines 43.4.C.4 3. CEA (Technical standards for connectivity to the Grid) Regulation, 2007 – 6.1, 6.4.	**TVNL**
DR/EL are not time synchronized	1. Indian Electricity Grid Code 4.6.3 2. CEA Technical Standard for Construction of Electrical Plants and Electric Lines: 43.4.D. 3. CEA (Technical standards for connectivity to the Grid) Regulation, 2007: Schedule Part 1.7.	**TVNL**

8. Status of Reporting (रिपोर्टिंग की स्थिति):

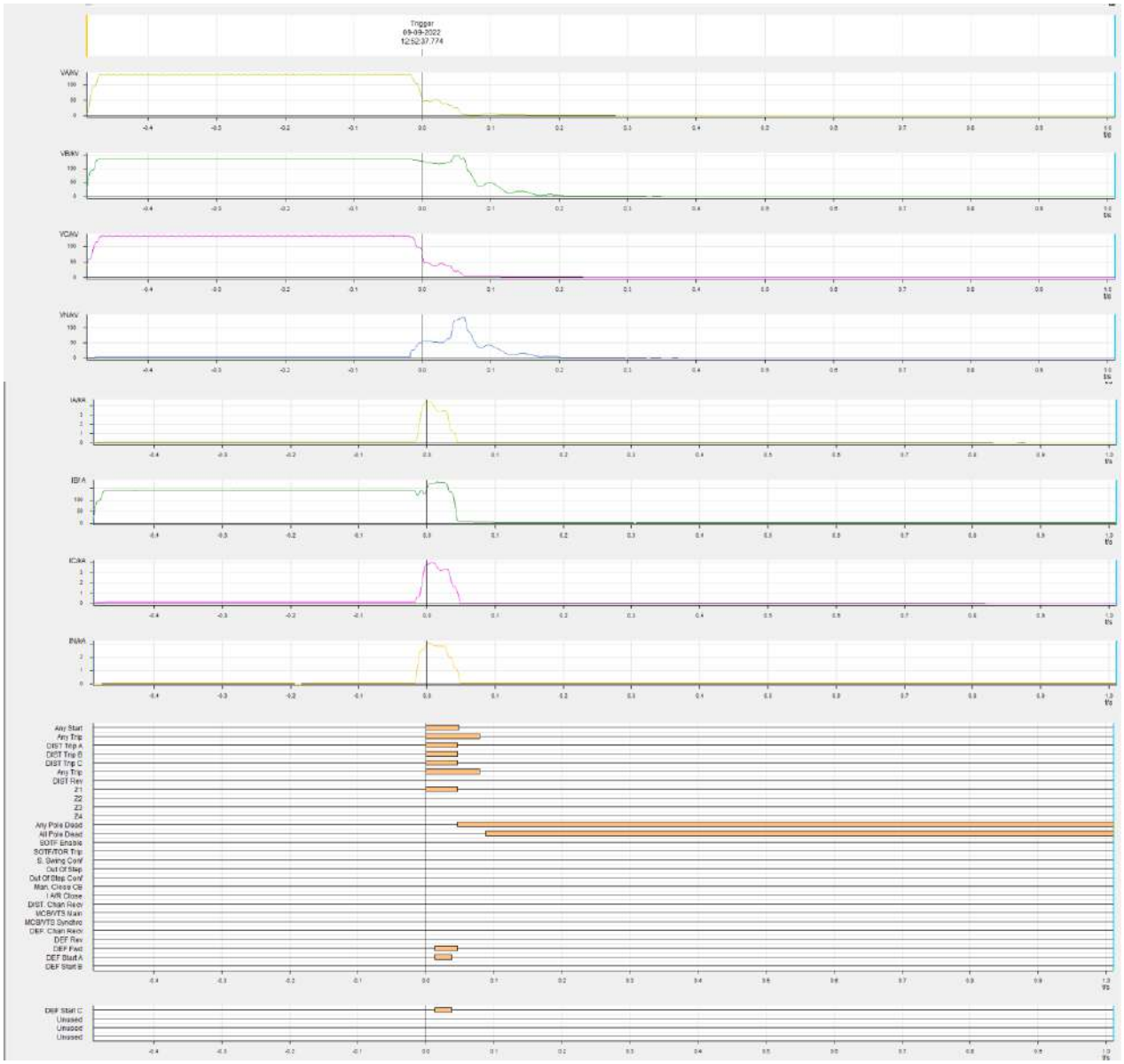
- Complete DR/EL yet to be received from JUSNL, TVNL.

Annexure 1: Sequence of events recorded at ERLDC SCADA data at the time of the event.

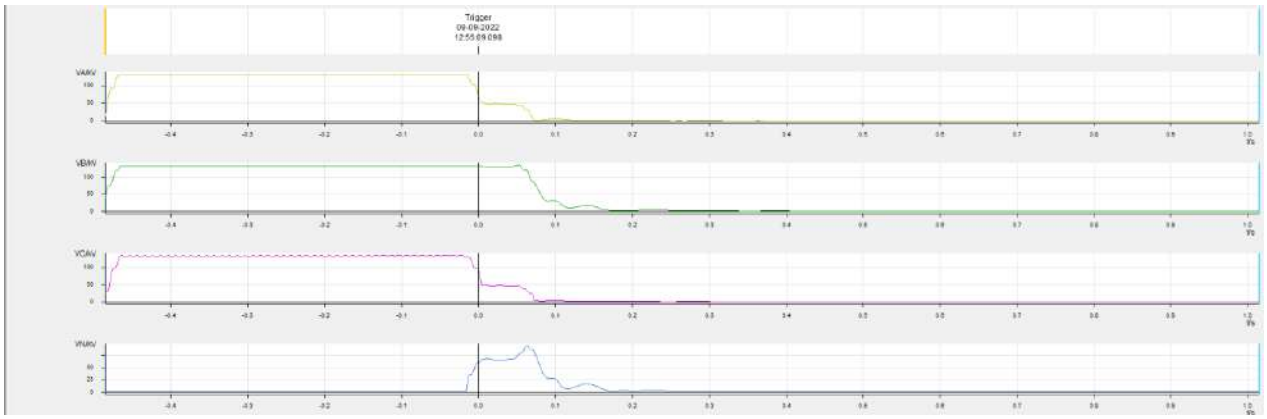
Sequence of event not recorded at time of event.

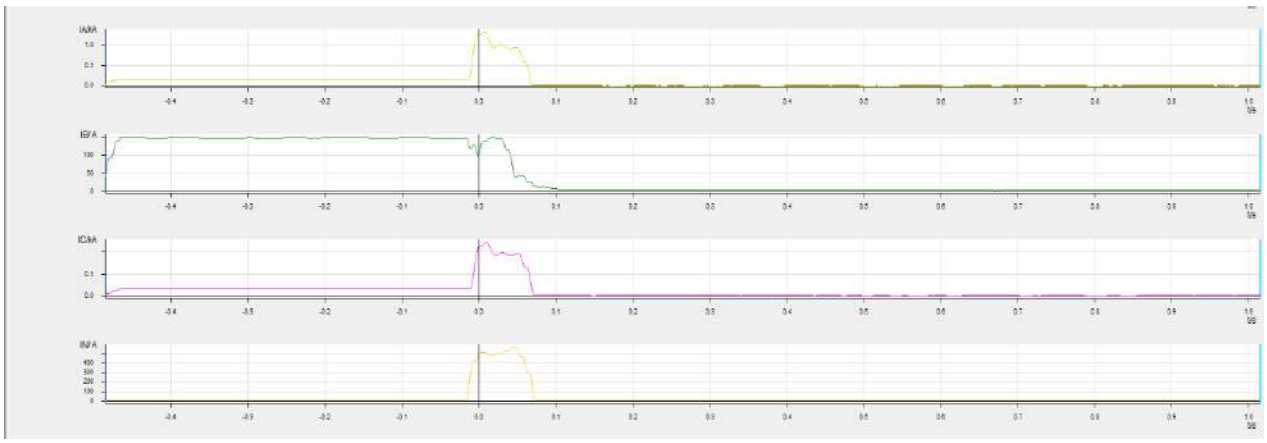
Annexure 2: DR recorded

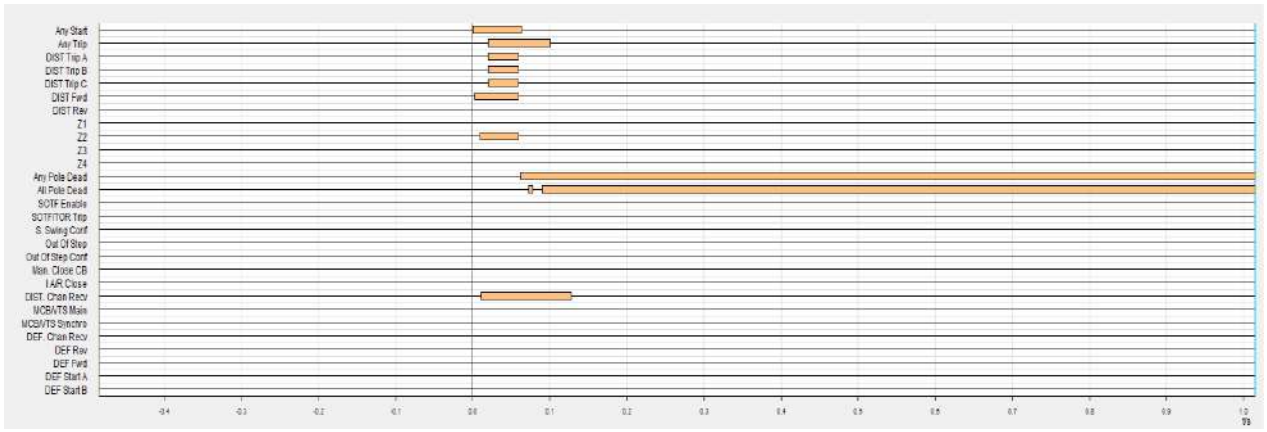
220 kV Tenughat-Govindpur-1 (Tenughat)



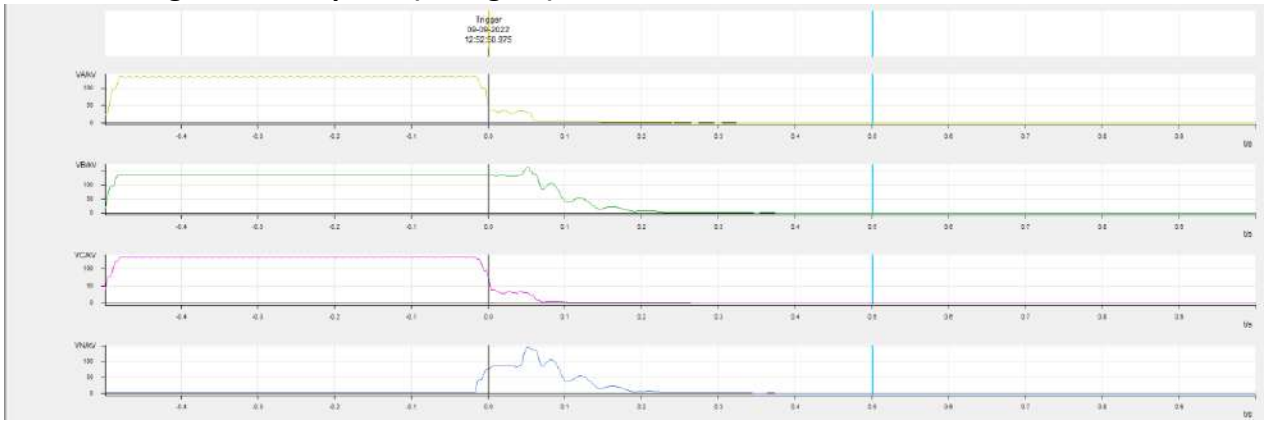
220 kV Tenughat-Govindpur-1 (Govindpur)

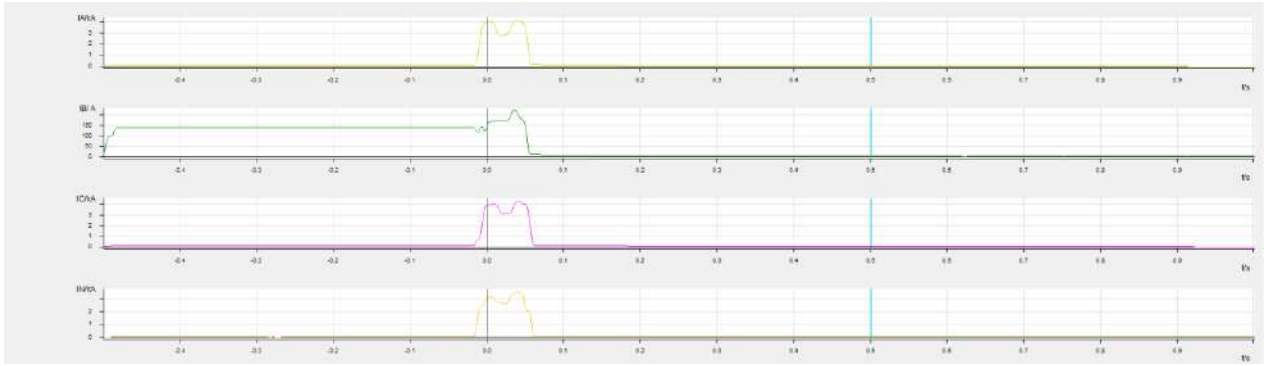


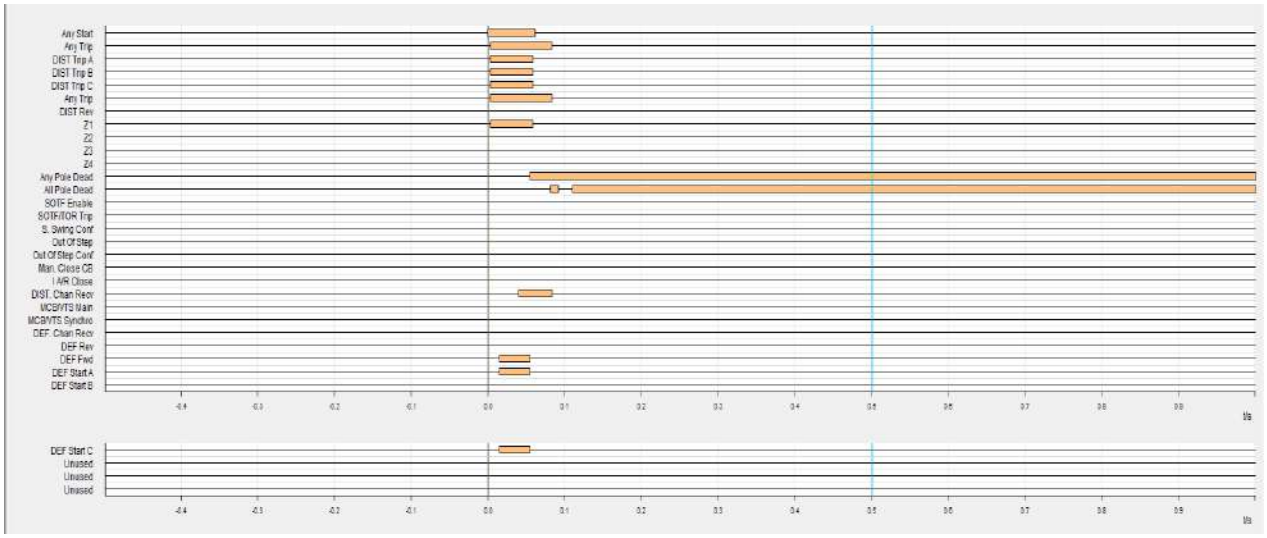




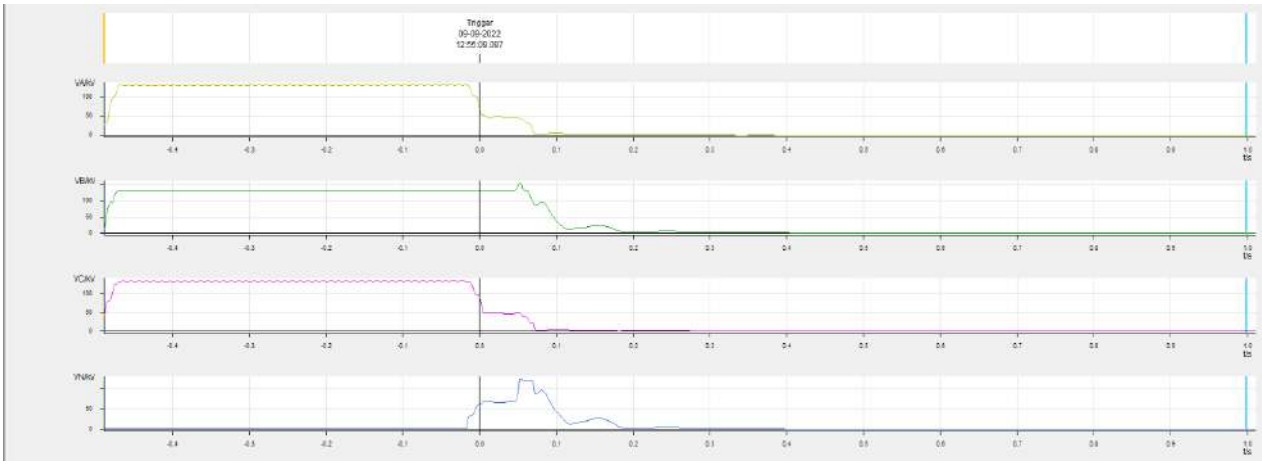
220 kV Tenughat-Govindpur-1 (Tenughat)

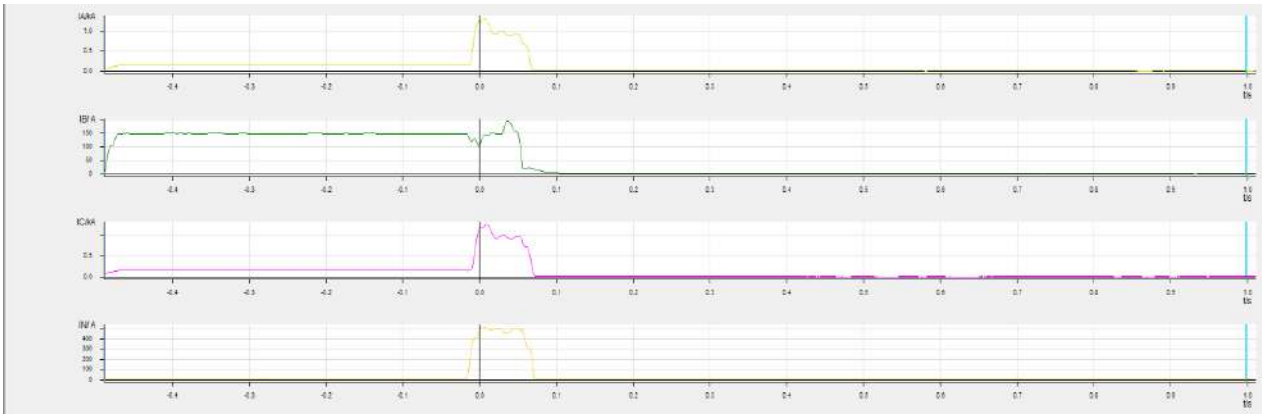


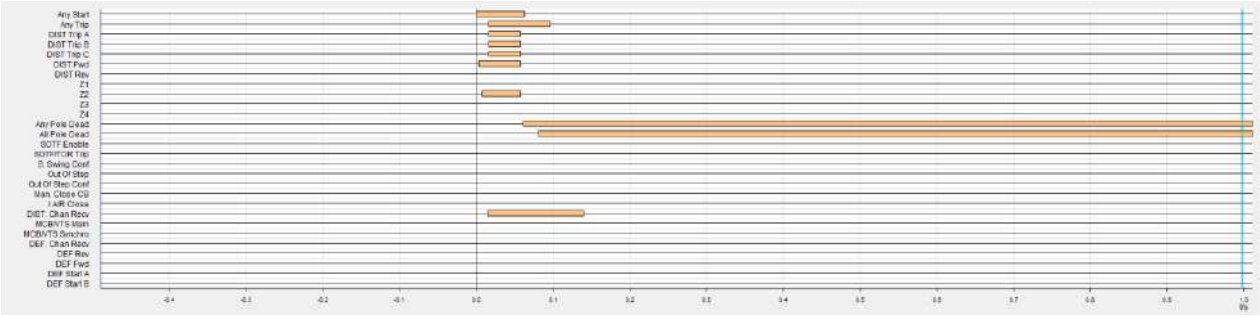




220 kV Tenughat-Govindpur-2 (Govindpur)







पावर सिस्टम ऑपरेशन करपोरेशन लिमिटेड
(भारत सरकार का उद्यम)
POWER SYSTEM OPERATION CORPORATION LIMITED
(A Government of India Enterprise)
Eastern Regional Load Despatch Centre: 14, Golf Club Road, Tollygunge, Kolkata-700 033.
CIN: U40105DL2009GOI188682
फ़ोन: 033- 24235755, 24174049 फैक्स : 033-24235809/5029 Website:www.erldc.org, Email ID- erldc@posoco.in

घटना संख्या: **19-09-2022/1** दिनांक: **11-10-2022**

Report on the grid event in Eastern Region (पूर्वी क्षेत्र में ग्रिड घटना पर रिपोर्ट)

1. Summary of the event (घटना का सारांश):

At 16:50 Hrs, 400 kV Bus-2 at Chandwa tripped during testing work on 400 kV Bus-1 at Chandwa (under shutdown) for interconnection of existing bus with new bus. Total power failure occurred at 400 kV Chandwa S/s (having DMT scheme). No load loss or generation loss occurred.

- **Date / Time of disturbance:** 19-09-2022 at 16:50 hrs.
- **Event type:** GD - 1
- **Systems/ Subsystems affected:** 400 kV Chandwa S/s
- **Load and Generation loss**.
  - No generation loss occurred during the event.
  - No load loss occurred during the event.

2. Important Transmission Line/element if out (महत्वपूर्ण संचरण लाइने जो बंद है):

- 400 kV Main Bus-1 at Chandwa (Under shutdown)

3. Major elements tripped (प्रमुख ट्रिपिंग)

- 400 kV Bus-2 at Chandwa
- 400 kV Gaya-Chandwa D/c
- 400 kV New Ranchi-Chandwa D/c
- 125 MVAr Bus Reactor-1&2 at Chandwa

4. Network across the affected area (प्रभावित क्षेत्र का नक्शा)

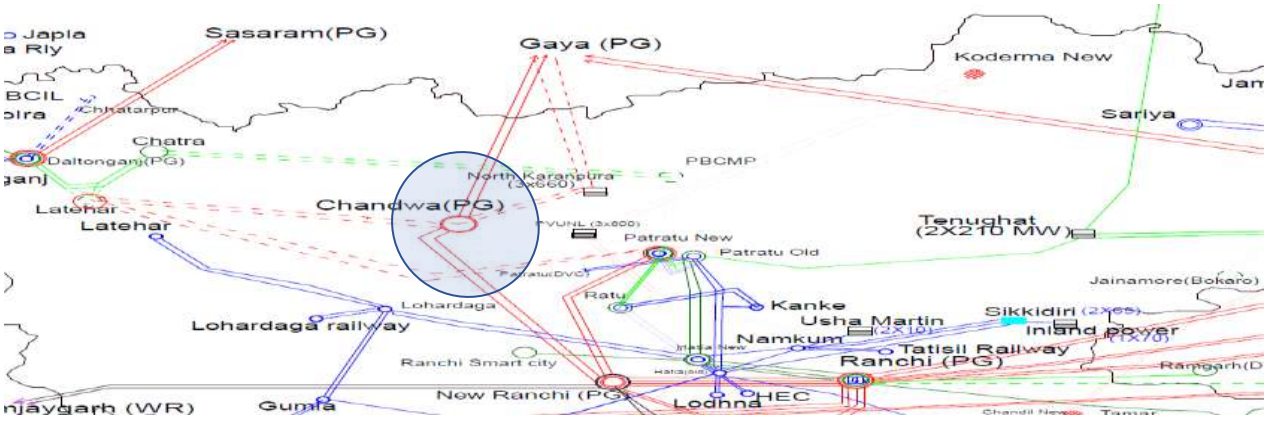


Figure 1: Network across the affected area

5. Relay indication and PMU observation (रिले संकेत और पीएमयू पर्यवेक्षण):

समय	नाम	उप केंद्र 1 रिले संकेत	उप केंद्र 2 रिले संकेत	पीएमयू पर्यवेक्षण
16:50	400 kV Bus-2 at Chandwa	Bus bar protection operated at Chandwa		No fault observed in PMU
	400 kV Gaya-Chandwa D/c		-	
	400 kV New Ranchi-Chandwa D/c		-	
	125 MVAr Bus Reactor-1&2 at Chandwa		-	

Figure 2: PMU Voltage snapshot of 765/400/220 kV Gaya S/s

6. Restoration (पूर्वावस्था की प्रप्ति)

Transmission/Generation element name	Restoration time
400 kV Bus-1 at Chandwa	19:40
400 kV Gaya-Chandwa D/c	19:40/19:51
400 kV New Ranchi-Chandwa D/c	19:44/19:48
125 MVAr Bus Reactor-1&2 at Chandwa	19:56

7. Analysis of the event & Protection issue (घटना का विश्लेषण और सुरक्षा समस्या):

- During testing work in 400 kV Bus-1 at Chandwa, 400 kV Bus-2 tripped. No fault observed from PMU data.
- External trip command triggered as per DR. PG ER-1 may share root cause analysis of the incident along with lessons learnt.

8. Non-compliance observed (विनियमन का गैर-अनुपालन):

Issues	Regulation Non-Compliance	Utility
DR/EL not provided within 24 Hours	1. IEGC 5.2 (r) 2. CEA grid Standard 15.3	**PG ER-1**

9. Status of Reporting (रिपोर्टिंग की स्थिति):

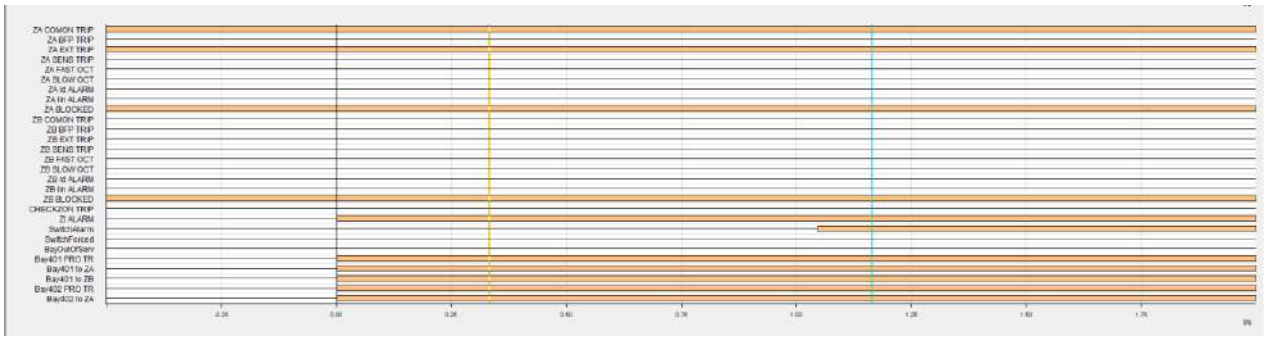
- DR/EL received from PG ER-1

Annexure 1: Sequence of events recorded at ERLDC SCADA data at the time of the event.

Sequence of Event not recorded at the time of event.

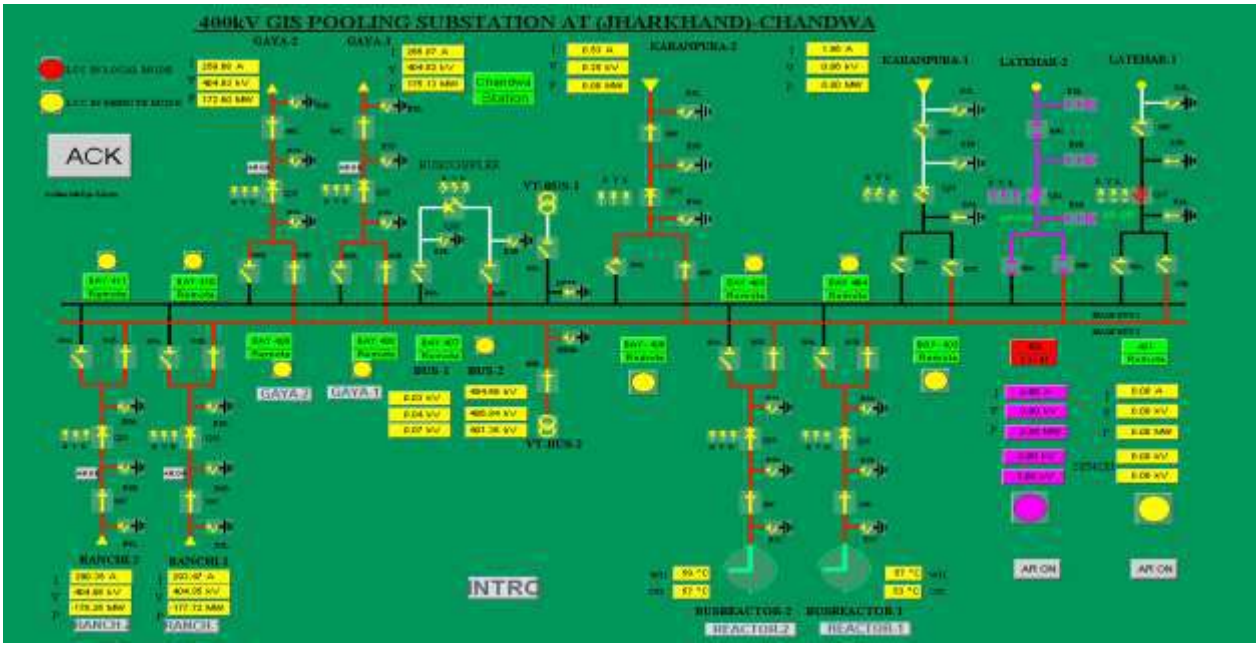
Annexure 2: DR recorded

DR of 400 kV Bus-2 at Chandwa



REPORT ON TRIPPING OF 400 KV BUS-2 AT CHANDWA SUBSTATION ON DTD:19.09.2022 AT16:50HRS.

SLD of Chandwa SS:



SEQUENCE OF EVENTS:

Date	Time	Event
16.09.2022	14:39:40	S/D of 400kV Bus-1 availed
	17:08:32	40352 Gas Low Stage 1 alarm
	17:09:06	40352 Gas Compartment combined trip
	17:09:06	Zone A external trip
19.09.2022	16:50:16	Zone Interconnected alarm
	16:50:16	Busbar trip R-ph/Y-h/B-ph
	16:50:17	Primary Object status alarm for all bays

PRE-TRIPPING CONDITION:

- 400kV Bus-1 was under S/D for GIS bay extension works. Bus extension work from 403 bay (Existing) to extended bus for 401 & 402 bay was going on.

- For interconnecting the GIS modules, Gas pressure in 403 Bus modules was reduced up to 0.3 MPa (in GD2 R/Y/B). Due to this reduction in pressure the Zone-A trip from M1 & M2 Busbar Relay was already in operated condition since 17:09 hrs. of 16.09.2022, however as the status of all the Bus-1 Isolators was open, the tripping was not extended to any feeder.

- The +ve for binary input status to Busbar Relay for all 89A isolators are connected as per scheme attached. The +ve is looped for all 89A isolators starting from 1X04-1 TB for Bay 1 to 2X04-1 TB for Bay 2 and so on.

- It is suspected that the +ve supply for the binary input status of 89A isolators have been removed / got disturbed during Wire checking/termination work at site.

REASON FOR EXTENSION OF TRIPPING:

- Zone-1 Tripping of both Busbar Relay was already high due to reduced Gas pressure in GD2 of 403 bay.

- Due to disturbance in +ve supply for the binary input status of 89A isolators, its open status which was high (1) changed to low (0) in Busbar Relay. The closed status for 89A isolators was already low (0) and hence it sensed as a intermediate status.

- After getting the intermediate status, in the Busbar Relay it got the status of Busbar Protection as “Closed” as per adopted setting. The treatment of auxiliary contact status as per REB670 Relay manual are as follows:

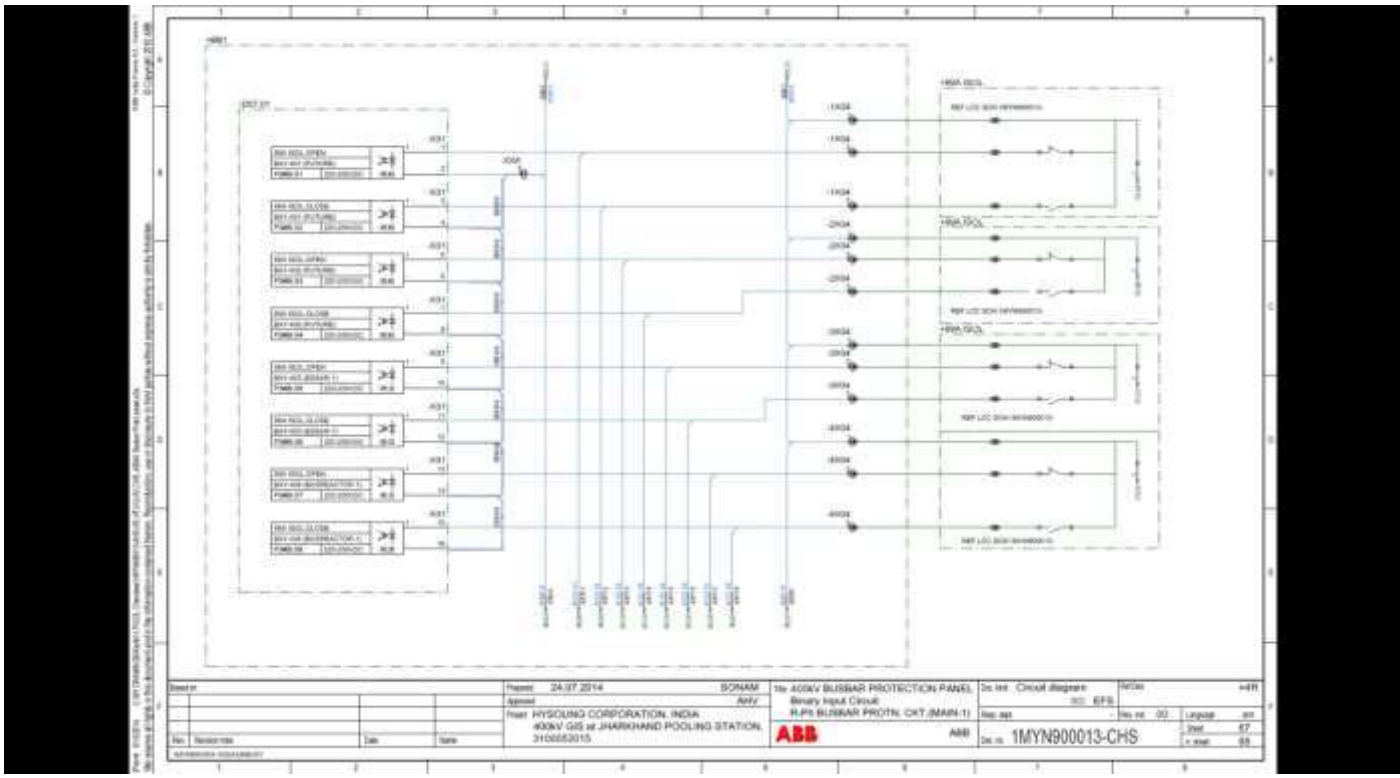
Table 67: Treatment of primary object auxiliary contact status

Primary equipment		Status in busbar protection		Alarm facility	
Normally Open auxiliary contact status (that is, "closed" or "a" contact)	Normally Closed auxiliary contact status (that is, "open" or "b" contact)	when "Scheme 1 RADSS" is selected	when "Scheme 2 INX" is selected	Alarm after settable time delay	Information visible on local HMI
open	open	closed	Last position saved	yes	intermediate_00
open	closed	open	open	no	open
closed	open	closed	closed	no	closed
closed	closed	closed	closed	yes	badState_11

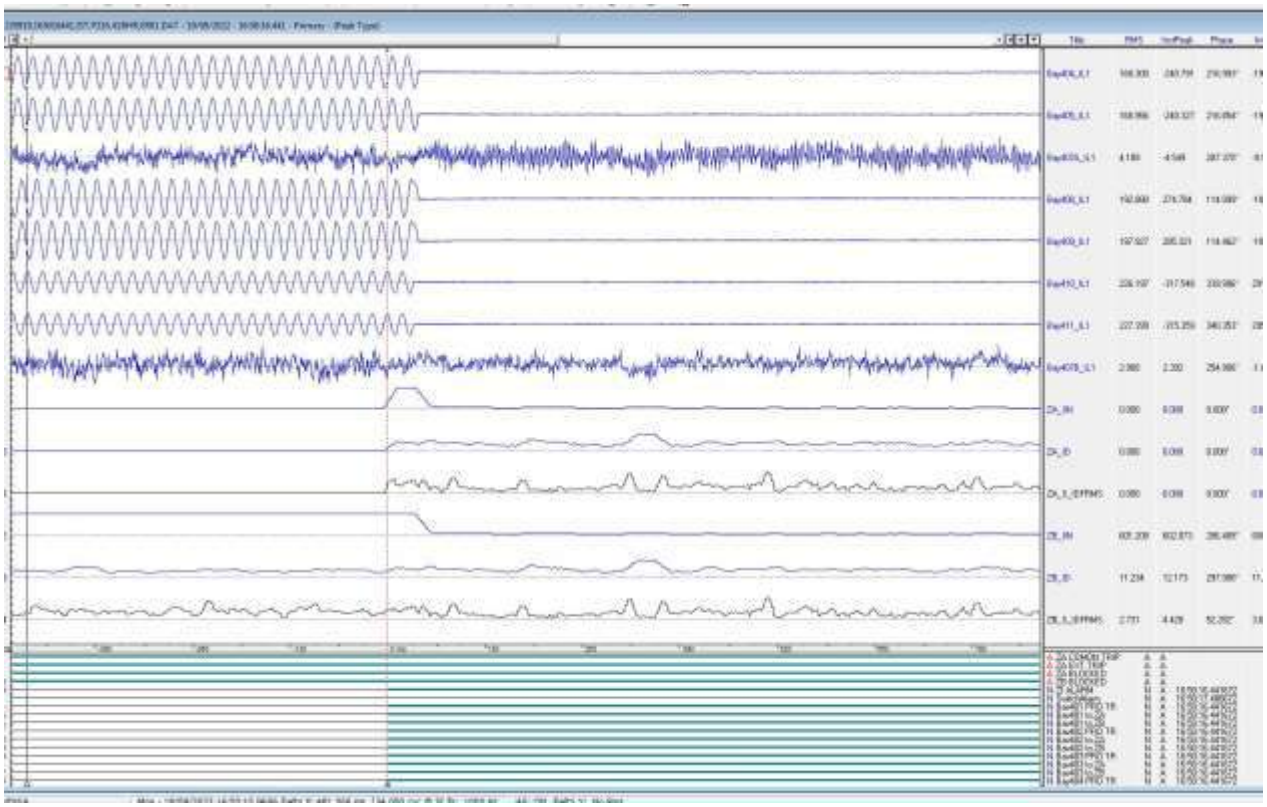
- The implemented scheme as per actual Relay setting is “Scheme1 RADSS” which caused the Relay to consider the 89A isolators as closed.

RECTIFICATION:

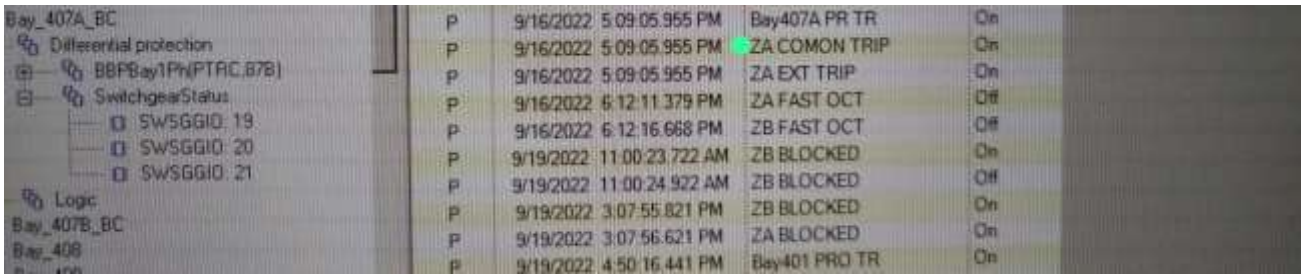
- In Busbar Relay setting the “Scheme1 RADSS” has been changed to “Scheme 2 INX” on 21.09.2022 and the isolator status for some bays was checked on sample basis and found as per the scheme.



DR SNAPSHOT:



EVENT RECORDS



#			Time (ET+EM)	Station	Bay	Device	Object Text
5083	*	<	2022-09-19 16:50:17.485	CHANDWA	QBB1	REBR	Primary object status alarm bay 406
5084	*	<	2022-09-19 16:50:17.485	CHANDWA	QBB1	REBR	Primary object status alarm bay 408
5085	*	<	2022-09-19 16:50:17.485	CHANDWA	QBB1	REBR	Primary object status alarm bay 409
5086	*		2022-09-19 16:50:17.485	CHANDWA	QBB1	REBR	Primary object status alarm bay 410
5087	*		2022-09-19 16:50:17.485	CHANDWA	QBB1	REBR	Primary object status alarm bay 409
5088	*		2022-09-19 16:50:17.485	CHANDWA	QBB1	REBR	Primary object status alarm bay 408
5089	*		2022-09-19 16:50:17.485	CHANDWA	QBB1	REBR	Primary object status alarm bay 406
5090	*		2022-09-19 16:50:17.485	CHANDWA	QBB1	REBR	Primary object status alarm bay 405
5091	*		2022-09-19 16:50:17.485	CHANDWA	QBB1	REBR	Primary object status alarm bay 404
5092	*		2022-09-19 16:50:17.485	CHANDWA	QBB1	REBR	Primary object status alarm bay 403
5093	*	<	2022-09-19 16:50:17.452	CHANDWA	QBB1	REBB	Primary object status alarm bay 410
5094	*	<	2022-09-19 16:50:17.452	CHANDWA	QBB1	REBB	Primary object status alarm bay 403
5095	*	<	2022-09-19 16:50:17.452	CHANDWA	QBB1	REBB	Primary object status alarm bay 404
5096	*	<	2022-09-19 16:50:17.452	CHANDWA	QBB1	REBB	Primary object status alarm bay 405
5097	*	<	2022-09-19 16:50:17.452	CHANDWA	QBB1	REBB	Primary object status alarm bay 406
5098	*	<	2022-09-19 16:50:17.452	CHANDWA	QBB1	REBB	Primary object status alarm bay 408
5099	*	<	2022-09-19 16:50:17.452	CHANDWA	QBB1	REBB	Primary object status alarm bay 409
5100	*		2022-09-19 16:50:17.452	CHANDWA	QBB1	REBB	Primary object status alarm bay 410
5101	*		2022-09-19 16:50:17.452	CHANDWA	QBB1	REBB	Primary object status alarm bay 409
5102	*		2022-09-19 16:50:17.452	CHANDWA	QBB1	REBB	Primary object status alarm bay 408
5103	*		2022-09-19 16:50:17.452	CHANDWA	QBB1	REBB	Primary object status alarm bay 406
5104	*		2022-09-19 16:50:17.452	CHANDWA	QBB1	REBB	Primary object status alarm bay 405
5105	*		2022-09-19 16:50:17.452	CHANDWA	QBB1	REBB	Primary object status alarm bay 404
5106	*		2022-09-19 16:50:17.452	CHANDWA	QBB1	REBB	Primary object status alarm bay 403
5107	*		2022-09-19 16:50:16.838	CHANDWA	408_GAYA-1	REC	CB not ready for reclosing
5108			2022-09-19 16:50:16.823	CHANDWA	411_RANCHI-2	52	Breaker Synchrocheck
5109			2022-09-19 16:50:16.820	CHANDWA	405_BR-2	89C	Disconn. open interlocked
5110			2022-09-19 16:50:16.820	CHANDWA	405_BR-2	89B	Disconn. open interlocked
5111	*		2022-09-19 16:50:16.790	CHANDWA	409_GAYA-2	REC	CB not ready for reclosing
5112	*		2022-09-19 16:50:16.768	CHANDWA	404_BR-1	REC	CB not ready for reclosing
5113			2022-09-19 16:50:16.755	CHANDWA	408_GAYA-1	52	Breaker Synchrocheck
5114			2022-09-19 16:50:16.754	CHANDWA	410_RANCHI-1	52	Breaker Synchrocheck
5115			2022-09-19 16:50:16.734	CHANDWA	409_GAYA-2	52	Breaker Synchrocheck
5116	*		2022-09-19 16:50:16.723	CHANDWA	411_RANCHI-2	REC	CB not ready for reclosing
5117	*		2022-09-19 16:50:16.720	CHANDWA	405_BR-2	REC	CB not ready for reclosing
5118			2022-09-19 16:50:16.720	CHANDWA	405_BR-2	89C	Disconn. open interlocked
5119			2022-09-19 16:50:16.720	CHANDWA	405_BR-2	89B	Disconn. open interlocked
5120	*		2022-09-19 16:50:16.626	CHANDWA	406_KPURA-2	REC	CB not ready for reclosing
5121			2022-09-19 16:50:16.626	CHANDWA	406_KPURA-2	89B	Disconn. open interlocked
5122			2022-09-19 16:50:16.590	CHANDWA	409_GAYA-2	89C	Disconn. open interlocked
5123			2022-09-19 16:50:16.590	CHANDWA	409_GAYA-2	89B	Disconn. open interlocked
5124			2022-09-19 16:50:16.590	CHANDWA	409_GAYA-2	52	Breaker open interlocked
5125			2022-09-19 16:50:16.580	CHANDWA	411_RANCHI-2	RELM1	General start Yph
5126			2022-09-19 16:50:16.577	CHANDWA	411_RANCHI-2	RELM1	Over Voltage Stage-1 Start
5127			2022-09-19 16:50:16.577	CHANDWA	411_RANCHI-2	RELM1	Over Voltage Start
5128			2022-09-19 16:50:16.568	CHANDWA	404_BR-1	89C	Disconn. open interlocked
5129			2022-09-19 16:50:16.568	CHANDWA	404_BR-1	89B	Disconn. open interlocked
5130			2022-09-19 16:50:16.568	CHANDWA	404_BR-1	52	Breaker open interlocked
5131			2022-09-19 16:50:16.566	CHANDWA	408_GAYA-1	RELM1	Fuse fail
5132			2022-09-19 16:50:16.565	CHANDWA	410_RANCHI-1	REC	Fuse fail
5133			2022-09-19 16:50:16.560	CHANDWA	403_KPURA-1	52	Breaker close interlocked
5134	*		2022-09-19 16:50:16.560	CHANDWA	403_KPURA-1	REC	AR block
5135	*		2022-09-19 16:50:16.560	CHANDWA	410_RANCHI-1	REC	AR block
5136			2022-09-19 16:50:16.560	CHANDWA	410_RANCHI-1	89C	Disconn. open interlocked
5137			2022-09-19 16:50:16.560	CHANDWA	410_RANCHI-1	89B	Disconn. open interlocked
5138			2022-09-19 16:50:16.560	CHANDWA	410_RANCHI-1	52	Breaker open interlocked
5139	*		2022-09-19 16:50:16.557	CHANDWA	408_GAYA-1	RELM1	Fuse fail
5140	*		2022-09-19 16:50:16.547	CHANDWA	410_RANCHI-1	REC	Fuse fail
5141	*		2022-09-19 16:50:16.539	CHANDWA	408_GAYA-1	REC	AR block
5142			2022-09-19 16:50:16.539	CHANDWA	408_GAYA-1	89C	Disconn. open interlocked
5143			2022-09-19 16:50:16.539	CHANDWA	408_GAYA-1	89B	Disconn. open interlocked
5144			2022-09-19 16:50:16.539	CHANDWA	408_GAYA-1	52	Breaker open interlocked
5145	*		2022-09-19 16:50:16.538	CHANDWA	411_RANCHI-2	RELM1	General start Yph
5146	*		2022-09-19 16:50:16.537	CHANDWA	411_RANCHI-2	RELM1	Over Voltage Stage-1 Start
5147	*		2022-09-19 16:50:16.537	CHANDWA	411_RANCHI-2	RELM1	Over Voltage Start
5148	*		2022-09-19 16:50:16.526	CHANDWA	406_KPURA-2	REC	AR block
5149			2022-09-19 16:50:16.526	CHANDWA	406_KPURA-2	89C	Disconn. open interlocked
5150			2022-09-19 16:50:16.526	CHANDWA	406_KPURA-2	52	Breaker open interlocked
5151	*		2022-09-19 16:50:16.523	CHANDWA	411_RANCHI-2	REC	AR block
5152			2022-09-19 16:50:16.523	CHANDWA	411_RANCHI-2	89C	Disconn. open interlocked
5153			2022-09-19 16:50:16.523	CHANDWA	411_RANCHI-2	89B	Disconn. open interlocked
5154			2022-09-19 16:50:16.523	CHANDWA	411_RANCHI-2	52	Breaker open interlocked
5155			2022-09-19 16:50:16.520	CHANDWA	405_BR-2	89C	Disconn. open interlocked
5156			2022-09-19 16:50:16.520	CHANDWA	405_BR-2	89B	Disconn. open interlocked
5157			2022-09-19 16:50:16.520	CHANDWA	405_BR-2	52	Breaker open interlocked
5158			2022-09-19 16:50:16.494	CHANDWA	406_KPURA-2	52	Breaker position indication
5159			2022-09-19 16:50:16.494	CHANDWA	406_KPURA-2	CB	Breaker B-Phase Position Indication

#		Time (ET+EM)	Station	Bay	Device	Object Text
5160		2022-09-19 16:50:16.494	CHANDWA	406_KPURA-2	CB	Breaker R-Phase Position Indication
5161		2022-09-19 16:50:16.494	CHANDWA	405_BR-2	7VKBF	LBB start
5162		2022-09-19 16:50:16.494	CHANDWA	404_BR-1	7VKBF	LBB start
5163		2022-09-19 16:50:16.491	CHANDWA	406_KPURA-2	CB	Breaker Y-Phase Position Indication
5164		2022-09-19 16:50:16.491	CHANDWA	409_GAYA-2	52	Breaker position indication
5165		2022-09-19 16:50:16.491	CHANDWA	404_BR-1	52	Breaker position indication
5166		2022-09-19 16:50:16.491	CHANDWA	411_RANCHI-2	52	Breaker position indication
5167		2022-09-19 16:50:16.491	CHANDWA	408_GAYA-1	52	Breaker position indication
5168		2022-09-19 16:50:16.490	CHANDWA	405_BR-2	52	Breaker position indication
5169		2022-09-19 16:50:16.490	CHANDWA	410_RANCHI-1	52	Breaker position indication
5170	*	2022-09-19 16:50:16.490	CHANDWA	409_GAYA-2	REC	AR block
5171	*	2022-09-19 16:50:16.489	CHANDWA	404_BR-1	REC	404 CB Open Position R-Phase
5172	*	2022-09-19 16:50:16.488	CHANDWA	404_BR-1	REC	404 CB Open Position Y-Phase
5173	*	2022-09-19 16:50:16.488	CHANDWA	409_GAYA-2	52	Breaker position indication
5174	*	2022-09-19 16:50:16.487	CHANDWA	404_BR-1	REC	404 CB Open Position B-Phase
5175	*	2022-09-19 16:50:16.487	CHANDWA	410_RANCHI-1	REC	410 CB Open Position Y-Phase
5176	*	2022-09-19 16:50:16.487	CHANDWA	408_GAYA-1	REC	408 CB Open Position B-Phase
5177	*	2022-09-19 16:50:16.487	CHANDWA	408_GAYA-1	REC	408 CB Open Position Y-Phase
5178	*	2022-09-19 16:50:16.487	CHANDWA	411_RANCHI-2	REC	411 CB Open Position R-Phase
5179	*	2022-09-19 16:50:16.486	CHANDWA	405_BR-2	REC	405 CB Open Position Y-Phase
5180	*	2022-09-19 16:50:16.486	CHANDWA	405_BR-2	REC	405 CB Open Position R-Phase
5181	*	2022-09-19 16:50:16.486	CHANDWA	409_GAYA-2	REC	409 CB Open Position Y-Phase
5182	*	2022-09-19 16:50:16.486	CHANDWA	409_GAYA-2	REC	409 CB Open Position R-Phase
5183	*	2022-09-19 16:50:16.486	CHANDWA	410_RANCHI-1	REC	410 CB Open Position B-Phase
5184	*	2022-09-19 16:50:16.486	CHANDWA	410_RANCHI-1	REC	410 CB Open Position R-Phase
5185	*	2022-09-19 16:50:16.486	CHANDWA	408_GAYA-1	REC	408 CB Open Position R-Phase
5186	*	2022-09-19 16:50:16.486	CHANDWA	411_RANCHI-2	REC	411 CB Open Position B-Phase
5187	*	2022-09-19 16:50:16.486	CHANDWA	411_RANCHI-2	REC	411 CB Open Position Y-Phase
5188	*	2022-09-19 16:50:16.485	CHANDWA	405_BR-2	REC	405 CB Open Position B-Phase
5189	*	2022-09-19 16:50:16.485	CHANDWA	409_GAYA-2	REC	409 CB Open Position B-Phase
5190	*	2022-09-19 16:50:16.483	CHANDWA	410_RANCHI-1	7SAM2	Prepare 3ph trip from BCU
5191	*	2022-09-19 16:50:16.482	CHANDWA	406_KPURA-2	7SAM2	Prepare 3ph trip from BCU
5192	*	2022-09-19 16:50:16.482	CHANDWA	411_RANCHI-2	7SAM2	Prepare 3ph trip from BCU
5193	*	2022-09-19 16:50:16.482	CHANDWA	408_GAYA-1	7SAM2	Prepare 3ph trip from BCU
5194		2022-09-19 16:50:16.479	CHANDWA	406_KPURA-2	CB	Breaker B-Phase Position Indication
5195		2022-09-19 16:50:16.479	CHANDWA	406_KPURA-2	CB	Breaker R-Phase Position Indication
5196	*	2022-09-19 16:50:16.479	CHANDWA	410_RANCHI-1	RELM1	Prepare 3ph trip from BCU
5197	*	2022-09-19 16:50:16.479	CHANDWA	409_GAYA-2	7SAM2	Prepare 3ph trip from BCU
5198	*	2022-09-19 16:50:16.477	CHANDWA	408_GAYA-1	RELM1	Prepare 3ph trip from BCU
5199	*	2022-09-19 16:50:16.477	CHANDWA	411_RANCHI-2	RELM1	Prepare 3ph trip from BCU
5200	*	2022-09-19 16:50:16.477	CHANDWA	411_RANCHI-2	RELM1	BCU relay faulty
5201	*	2022-09-19 16:50:16.477	CHANDWA	406_KPURA-2	REDM1	Prepare 3 Ph Trip From BCU
5202		2022-09-19 16:50:16.476	CHANDWA	406_KPURA-2	CB	Breaker Y-Phase Position Indication
5203	*	2022-09-19 16:50:16.474	CHANDWA	409_GAYA-2	RELM1	Prepare 3ph trip from BCU
5204	*	2022-09-19 16:50:16.473	CHANDWA	410_RANCHI-1	REC	Auto reclosure Prephare 3ph trip
5205		2022-09-19 16:50:16.473	CHANDWA	410_RANCHI-1	REC	Auto Reclosure Ready
5206	*	2022-09-19 16:50:16.472	CHANDWA	406_KPURA-2	REC	Auto reclosure Prephare 3ph trip
5207		2022-09-19 16:50:16.472	CHANDWA	406_KPURA-2	REC	Auto Reclosure Ready
5208	*	2022-09-19 16:50:16.472	CHANDWA	408_GAYA-1	REC	Auto reclosure Prephare 3ph trip
5209		2022-09-19 16:50:16.472	CHANDWA	408_GAYA-1	REC	Auto Reclosure Ready
5210	*	2022-09-19 16:50:16.471	CHANDWA	411_RANCHI-2	REC	Auto reclosure Prephare 3ph trip
5211		2022-09-19 16:50:16.471	CHANDWA	411_RANCHI-2	REC	Auto Reclosure Ready
5212	*	2022-09-19 16:50:16.468	CHANDWA	404_BR-1	7VKBF	LBB start
5213	*	2022-09-19 16:50:16.468	CHANDWA	409_GAYA-2	REC	Auto reclosure Prephare 3ph trip
5214		2022-09-19 16:50:16.468	CHANDWA	409_GAYA-2	REC	Auto Reclosure Ready
5215	*	2022-09-19 16:50:16.465	CHANDWA	411_RANCHI-2	PLCC	Direct Trip Send Channel-2
5216	*	2022-09-19 16:50:16.464	CHANDWA	408_GAYA-1	7VKBF	LBB External Start 3ph
5217	*	2022-09-19 16:50:16.464	CHANDWA	408_GAYA-1	7VKBF	Busbar main1/2 operated
5218	*	2022-09-19 16:50:16.464	CHANDWA	410_RANCHI-1	PLCC	Direct Trip Send Channel-2
5219	*	2022-09-19 16:50:16.464	CHANDWA	409_GAYA-2	PLCC	Direct Trip Send Channel-2
5220	*	2022-09-19 16:50:16.464	CHANDWA	408_GAYA-1	PLCC	Direct Trip Send Channel-2
5221	*	2022-09-19 16:50:16.464	CHANDWA	410_RANCHI-1	7VKBF	LBB External Start 3ph
5222	*	2022-09-19 16:50:16.464	CHANDWA	410_RANCHI-1	7VKBF	Busbar main1/2 operated
5223	*	2022-09-19 16:50:16.464	CHANDWA	406_KPURA-2	7VKBF	LBB External Start 3ph
5224	*	2022-09-19 16:50:16.464	CHANDWA	406_KPURA-2	7VKBF	Busbar main1/2 operated
5225	*	2022-09-19 16:50:16.464	CHANDWA	405_BR-2	7VKBF	LBB start
5226	*	2022-09-19 16:50:16.464	CHANDWA	404_BR-1	7VKBF	LBB External Start 3ph
5227	*	2022-09-19 16:50:16.464	CHANDWA	404_BR-1	7VKBF	Busbar main1/2 operated
5228	*	2022-09-19 16:50:16.463	CHANDWA	411_RANCHI-2	7VKBF	LBB External Start 3ph
5229	*	2022-09-19 16:50:16.463	CHANDWA	411_RANCHI-2	7VKBF	Busbar main1/2 operated
5230	*	2022-09-19 16:50:16.463	CHANDWA	405_BR-2	7VKBF	LBB External Start 3ph
5231	*	2022-09-19 16:50:16.463	CHANDWA	405_BR-2	7VKBF	Busbar main1/2 operated
5232	*	2022-09-19 16:50:16.462	CHANDWA	409_GAYA-2	7VKBF	LBB External Start 3ph
5233	*	2022-09-19 16:50:16.462	CHANDWA	409_GAYA-2	7VKBF	Busbar main1/2 operated
5234	*	2022-09-19 16:50:16.459	CHANDWA	406_KPURA-2	REC	Busbar main1/2 operated
5235	*	2022-09-19 16:50:16.459	CHANDWA	405_BR-2	REC	Busbar main1/2 operated
5236	*	2022-09-19 16:50:16.459	CHANDWA	410_RANCHI-1	REC	Busbar main1/2 operated

#			Time (ET+EM)	Station	Bay	Device	Object Text
5237	*		2022-09-19 16:50:16.459	CHANDWA	408_GAYA-1	REC	Busbar main1/2 operated
5238	*		2022-09-19 16:50:16.459	CHANDWA	404_BR-1	REC	Busbar main1/2 operated
5239	*		2022-09-19 16:50:16.459	CHANDWA	411_RANCHI-2	REC	Busbar main1/2 operated
5240	*		2022-09-19 16:50:16.459	CHANDWA	403_KPURA-1	REDM1	Busbar-1 Operated
5241	*		2022-09-19 16:50:16.459	CHANDWA	406_KPURA-2	REDM1	Busbar-1 Operated
5242	*		2022-09-19 16:50:16.459	CHANDWA	406_KPURA-2	PLCC	Direct Trip Send Channel-1
5243	*		2022-09-19 16:50:16.459	CHANDWA	408_GAYA-1	PLCC	Direct Trip Send Channel-1
5244	*		2022-09-19 16:50:16.459	CHANDWA	408_GAYA-1	RELM1	Busbar-1 Optd
5245	*		2022-09-19 16:50:16.459	CHANDWA	411_RANCHI-2	PLCC	Direct Trip Send Channel-1
5246	*		2022-09-19 16:50:16.459	CHANDWA	411_RANCHI-2	RELM1	Busbar-1 Optd
5247	*		2022-09-19 16:50:16.459	CHANDWA	410_RANCHI-1	PLCC	Direct Trip Send Channel-1
5248	*		2022-09-19 16:50:16.459	CHANDWA	410_RANCHI-1	RELM1	Busbar-1 Optd
5249	*		2022-09-19 16:50:16.458	CHANDWA	403_KPURA-1	REC	Busbar main1/2 operated
5250	*		2022-09-19 16:50:16.458	CHANDWA	409_GAYA-2	REC	Busbar main1/2 operated
5251	*		2022-09-19 16:50:16.458	CHANDWA	409_GAYA-2	PLCC	Direct Trip Send Channel-1
5252	*		2022-09-19 16:50:16.458	CHANDWA	409_GAYA-2	RELM1	Busbar-1 Optd
5253	*	<	2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay411 Busbar trip-Bph
5254	*	<	2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay412 Busbar trip-Bph
5255	*	<	2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay413 Busbar trip-Bph
5256	*	<	2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay414 Busbar trip-Bph
5257	*	<	2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay410 Busbar trip-Bph
5258	*	<	2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay417 Busbar trip-Bph
5259	*	<	2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay418 Busbar trip-Bph
5260	*	<	2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay419 Busbar trip-Bph
5261	*	<	2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay415 Busbar trip-Bph
5262	*	<	2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay416 Busbar trip-Bph
5263	*	<	2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay422 Busbar trip-Bph
5264	*	<	2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay423 Busbar trip-Bph
5265	*	<	2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay407B Busbar trip-Bph
5266	*	<	2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay420 Busbar trip-Bph
5267	*	<	2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay421 Busbar trip-Bph
5268	*	<	2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay401 Busbar trip-Bph
5269	*	<	2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay402 Busbar trip-Bph
5270	*	<	2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay403 Busbar trip-Bph
5271	*	<	2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay406 Busbar trip-Bph
5272	*	<	2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay408 Busbar trip-Bph
5273	*	<	2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay404 Busbar trip-Bph
5274	*	<	2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay405 Busbar trip-Bph
5275	*	<	2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay409 Busbar trip-Bph
5276	*		2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay421 Busbar trip-Bph
5277	*		2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay420 Busbar trip-Bph
5278	*		2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay407B Busbar trip-Bph
5279	*		2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay423 Busbar trip-Bph
5280	*		2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay422 Busbar trip-Bph
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5282	*		2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay415 Busbar trip-Bph
5283	*		2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay419 Busbar trip-Bph
5284	*		2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay418 Busbar trip-Bph
5285	*		2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay417 Busbar trip-Bph
5286	*		2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay410 Busbar trip-Bph
5287	*		2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay409 Busbar trip-Bph
5288	*		2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay414 Busbar trip-Bph
5289	*		2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay413 Busbar trip-Bph
5290	*		2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay412 Busbar trip-Bph
5291	*		2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay411 Busbar trip-Bph
5292	*		2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay405 Busbar trip-Bph
5293	*		2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay404 Busbar trip-Bph
5294	*		2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay408 Busbar trip-Bph
5295	*		2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay406 Busbar trip-Bph
5296	*		2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay403 Busbar trip-Bph
5297	*		2022-09-19 16:50:16.442	CHANDWA	QBB1	REBB	M1 Bay402 Busbar trip-Bph
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5300	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay412 Busbar trip-Yph
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5303	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay410 Busbar trip-Yph
5304	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay417 Busbar trip-Yph
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5306	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay419 Busbar trip-Yph
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5309	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay422 Busbar trip-Yph
5310	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay423 Busbar trip-Yph
5311	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay407B Busbar trip-Yph
5312	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay420 Busbar trip-Yph
5313	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay421 Busbar trip-Yph

#			Time (ET+EM)	Station	Bay	Device	Object Text
5314	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay401 Busbar trip-Yph
5315	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay402 Busbar trip-Yph
5316	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay403 Busbar trip-Yph
5317	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay406 Busbar trip-Yph
5318	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay408 Busbar trip-Yph
5319	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay404 Busbar trip-Yph
5320	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay405 Busbar trip-Yph
5321	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay409 Busbar trip-Yph
5322	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay411 Busbar trip-Rph
5323	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay412 Busbar trip-Rph
5324	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay413 Busbar trip-Rph
5325	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay414 Busbar trip-Rph
5326	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay410 Busbar trip-Rph
5327	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay417 Busbar trip-Rph
5328	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay418 Busbar trip-Rph
5329	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay419 Busbar trip-Rph
5330	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay415 Busbar trip-Rph
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5335	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay420 Busbar trip-Rph
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5340	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay406 Busbar trip-Rph
5341	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay408 Busbar trip-Rph
5342	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay404 Busbar trip-Rph
5343	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay405 Busbar trip-Rph
5344	*	<	2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay409 Busbar trip-Rph
5345	*		2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay421 Busbar trip-Yph
5346	*		2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay420 Busbar trip-Yph
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5348	*		2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay423 Busbar trip-Yph
5349	*		2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay422 Busbar trip-Yph
5350	*		2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay416 Busbar trip-Yph
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5352	*		2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay419 Busbar trip-Yph
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5361	*		2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay405 Busbar trip-Yph
5362	*		2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay404 Busbar trip-Yph
5363	*		2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay408 Busbar trip-Yph
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5365	*		2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay403 Busbar trip-Yph
5366	*		2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay402 Busbar trip-Yph
5367	*		2022-09-19 16:50:16.441	CHANDWA	QBB1	REBY	M1 Bay401 Busbar trip-Yph
5368	*		2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay421 Busbar trip-Rph
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5370	*		2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay407B Busbar trip-Rph
5371	*		2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay423 Busbar trip-Rph
5372	*		2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay422 Busbar trip-Rph
5373	*		2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay416 Busbar trip-Rph
5374	*		2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay415 Busbar trip-Rph
5375	*		2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay419 Busbar trip-Rph
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5378	*		2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay410 Busbar trip-Rph
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5384	*		2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay405 Busbar trip-Rph
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5387	*		2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay406 Busbar trip-Rph
5388	*		2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay403 Busbar trip-Rph
5389	*		2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay402 Busbar trip-Rph
5390	*		2022-09-19 16:50:16.441	CHANDWA	QBB1	REBR	M1 Bay401 Busbar trip-Rph

पावर सिस्टम ऑपरेशन करपोरेशन लिमिटेड
(भारत सरकार का उद्यम)
POWER SYSTEM OPERATION CORPORATION LIMITED
(A Government of India Enterprise)
Eastern Regional Load Despatch Centre: 14, Golf Club Road, Tollygunge, Kolkata-700 033.
CIN: U40105DL2009GOI188682
फ़ोन: 033- 24235755, 24174049 फैक्स : 033-24235809/5029 Website:www.erldc.org, Email ID- erldc@posoco.in

घटना संख्या: **28-09-2022/1** दिनांक: **11-10-2022**

Report on the grid event in Eastern Region (पूर्वी क्षेत्र में ग्रिड घटना पर रिपोर्ट)

1. Summary of the event (घटना का सारांश):

At 15:04 Hrs, 400 kV Bus-1 at Chandwa tripped during testing work on 400 kV Bus-2 at Chandwa(under shutdown) for interconnection of existing bus with new bus. Total power failure occurred at 400 kV Chandwa S/s (having DMT scheme). No load loss or generation loss occurred.

- **Date / Time of disturbance:** 28-09-2022 at 15:04 hrs.
- **Event type:** GD - 1
- **Systems/ Subsystems affected:** 400 kV Chandwa S/s
- **Load and Generation loss**.
  - No generation loss occurred during the event.
  - No load loss occurred during the event.

2. Important Transmission Line/element if out (महत्वपूर्ण संचरण लाइने जो बंद है):

- 400 kV Main Bus-2 at Chandwa (Under shutdown)

3. Major elements tripped (प्रमुख ट्रिपिंग)

- 400 kV Bus-1 at Chandwa
- 400 kV Gaya-Chandwa D/c
- 400 kV New Ranchi-Chandwa D/c
- 125 MVAr Bus Reactor-1&2 at Chandwa

4. Network across the affected area (प्रभावित क्षेत्र का नक्शा)

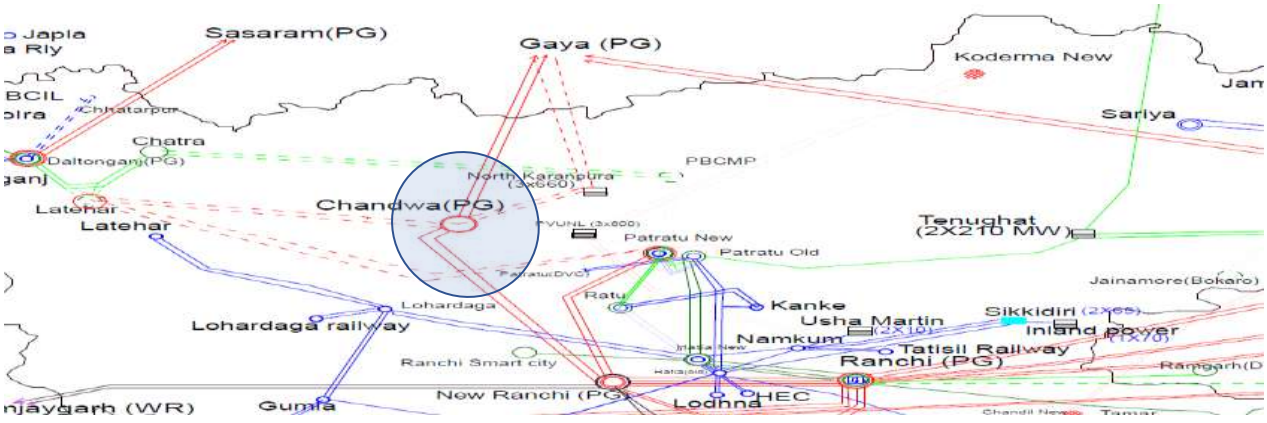


Figure 1: Network across the affected area

5. Relay indication and PMU observation (रिले संकेत और पीएमयू पर्यवेक्षण):

समय	नाम	उप केंद्र 1 रिले संकेत	उप केंद्र 2 रिले संकेत	पीएमयू पर्यवेक्षण
15:04	400 kV Bus-1 at Chandwa	Bus bar protection operated		No fault observed in PMU
	400 kV Gaya-Chandwa D/c		-	
	400 kV New Ranchi-Chandwa D/c		-	
	125 MVAr Bus Reactor-1&2 at Chandwa		-	

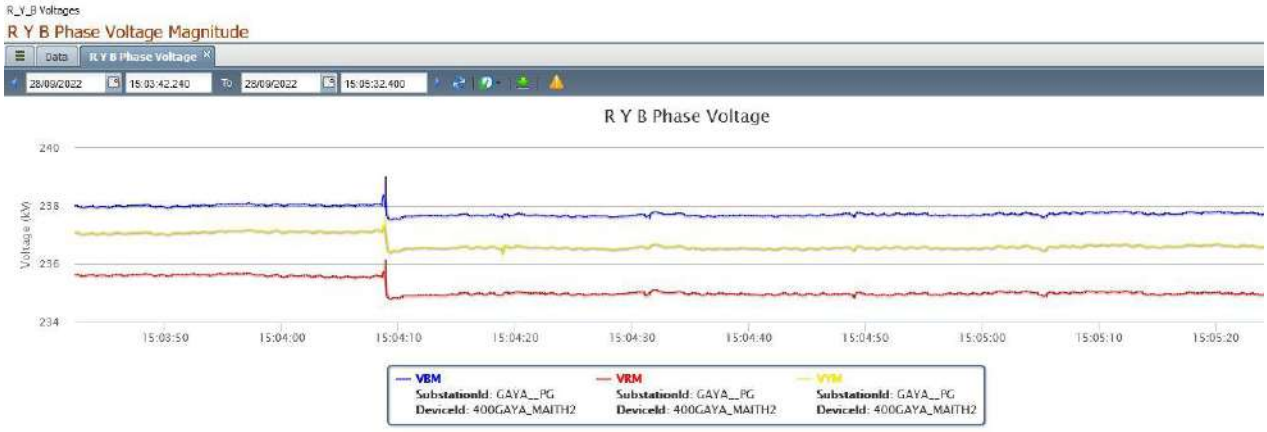


Figure 2: PMU Voltage snapshot of 765/400/220 kV Gaya S/s

6. Restoration (पूर्वावस्था की प्राप्ति)

Transmission/Generation element name	Restoration time
400 kV Bus-1 at Chandwa	17:29
400 kV Gaya-Chandwa D/c	17:29/17:32
400 kV New Ranchi-Chandwa D/c	17:38/17:40

7. Analysis of the event & Protection issue (घटना का विश्लेषण और सुरक्षा समस्या):

- During testing work in 400 kV Bus-2 at Chandwa, 400 kV Bus-1 tripped. No fault observed from PMU data.
- Same kind of incident occurred on 19th September 2022 also. PG ER-1 may share root cause analysis of the incident along with lessons learnt.

8. Non-compliance observed (विनियमन का गैर-अनुपालन):

Issues	Regulation Non-Compliance	Utility
DR/EL not provided within 24 Hours	1. IEGC 5.2 (r) 2. CEA grid Standard 15.3	**PG ER-1**

9. Status of Reporting (रिपोर्टिंग की स्थिति):

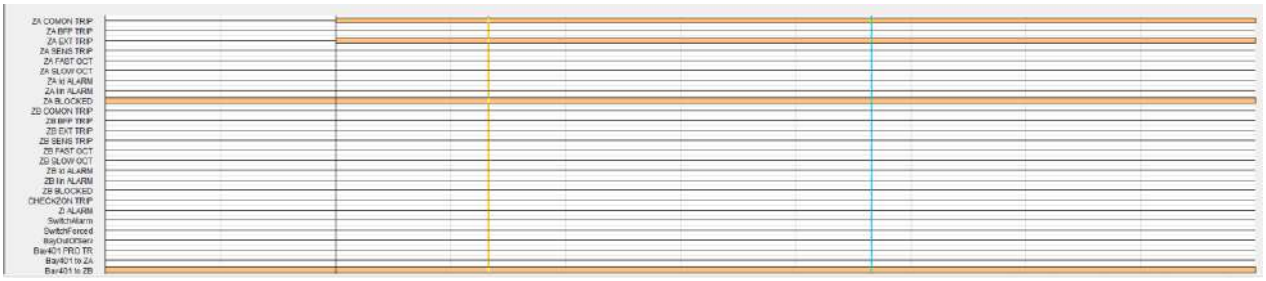
- DR/EL received from PG ER-1

Annexure 1: Sequence of events recorded at ERLDC SCADA data at the time of the event.

Sequence of Event not recorded at the time of event.

Annexure 2: DR recorded

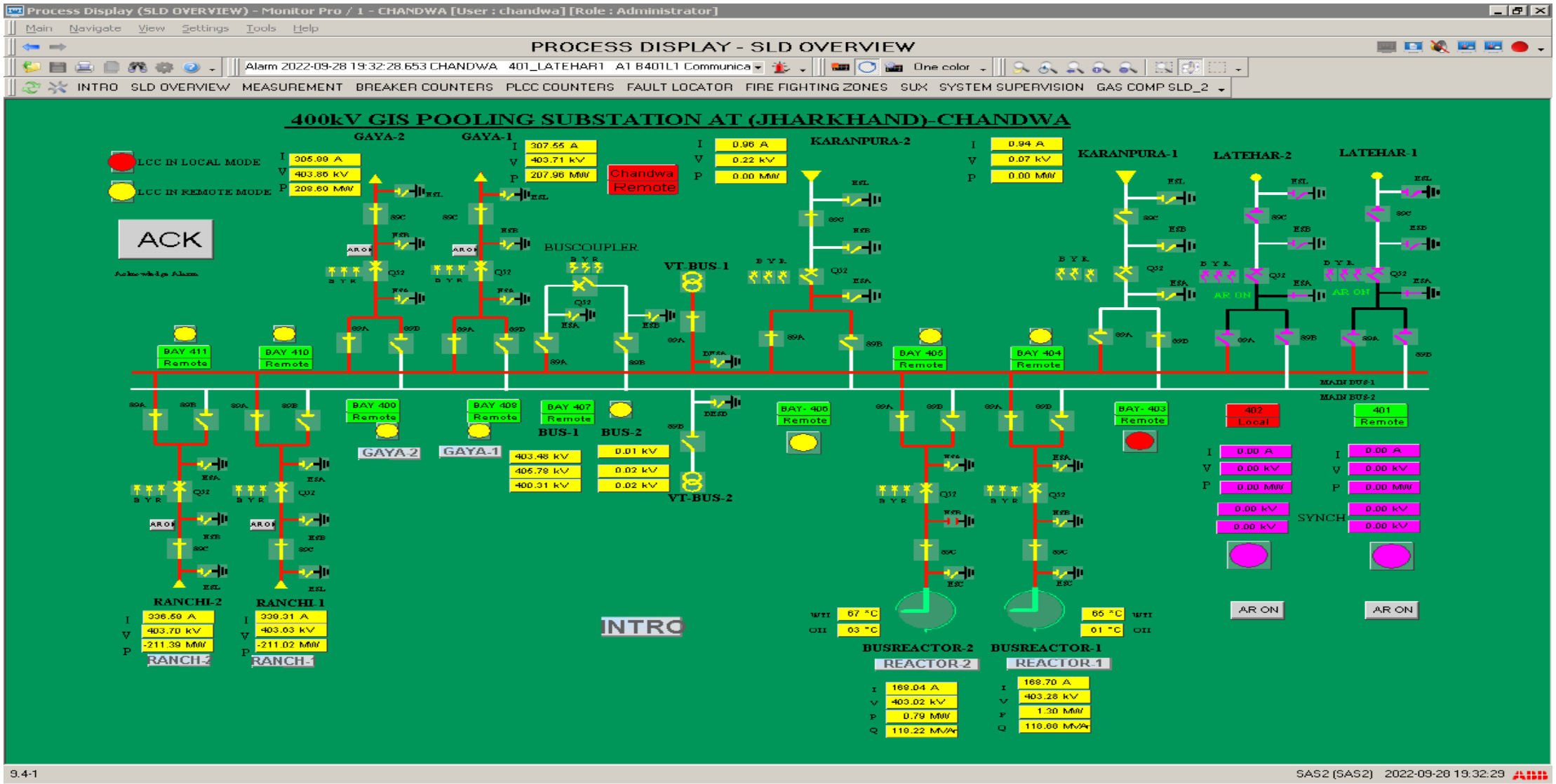
DR of 400 kV Bus-1 at Chandwa



Annexure B.4.2.A

Report on Bus Bar Tripping occurred on 28.09.2022 at 15:04 hr. at GIS Chandwa Sub-station

SLD of GIS Chandwa

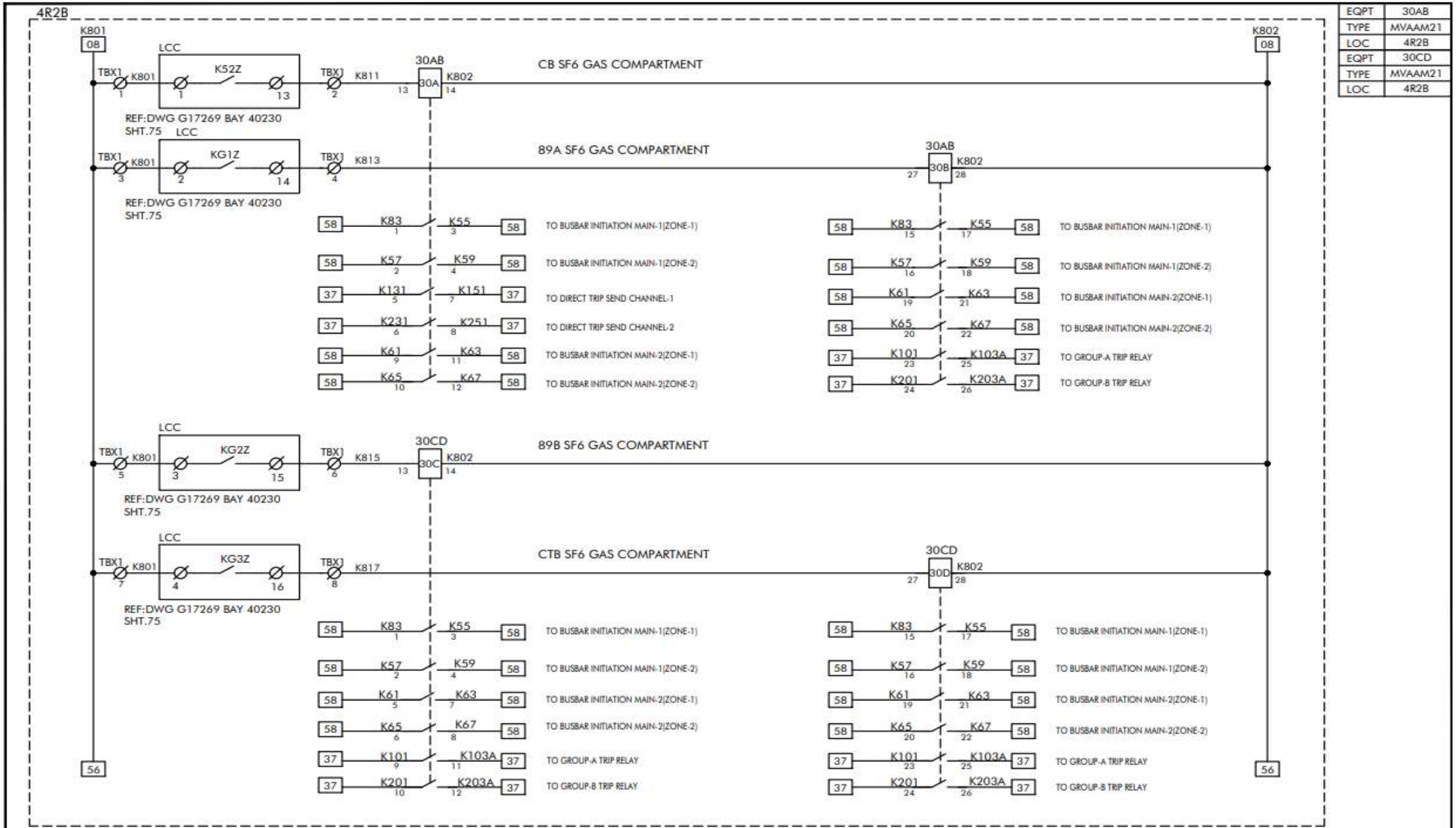


Tripping details

- Main Bus-II was under shutdown for interconnection of extended bus (Bay 401 & 402 Bays) for Latehar bays.
- Tripping Date- 28.09.2022
- Tripping Time- 15:04 hr.
- Fault type- SF6 Gas Compartment Zone trip
- Cause of tripping- while Top up of gas in 402 89B, B phase GD22 section , SF6 Gas Compartment Zone trip extended and caused tripping of Bus Bar-I.

Detailed Analysis of Tripping

1. Main Bus I was already extended and charged on 23.09.2022 and Zone-I tripping was wired in Busbar panel from 401 & 402 bays.
2. All the bus interconnection work (including SF6 gas filling) of Main Bus II was also completed on 27.09.2022.
3. While top up of gas in 402 89B B phase GD22, the Gas zone tripping was initiated for Busbar Zone-I trip and 400 KV BUS I (in service) got tripped.
4. On investigation it has been found that as per approved scheme for bay extension during gas zone tripping for 89A,89B,CTB & CB Gas zone sections, initiation is getting extended to both Zone-I & Zone-II of Busbar protection.



EQPT	30AB
TYPE	MVAAM21
LOC	4R2B
EQPT	30CD
TYPE	MVAAM21
LOC	4R2B

FOR GE REF:	ENGG.REF.NO.: KXL9
SCHEME TYPE: LINE	
BASE FILE:	
SALES ORDER: 3269045761	

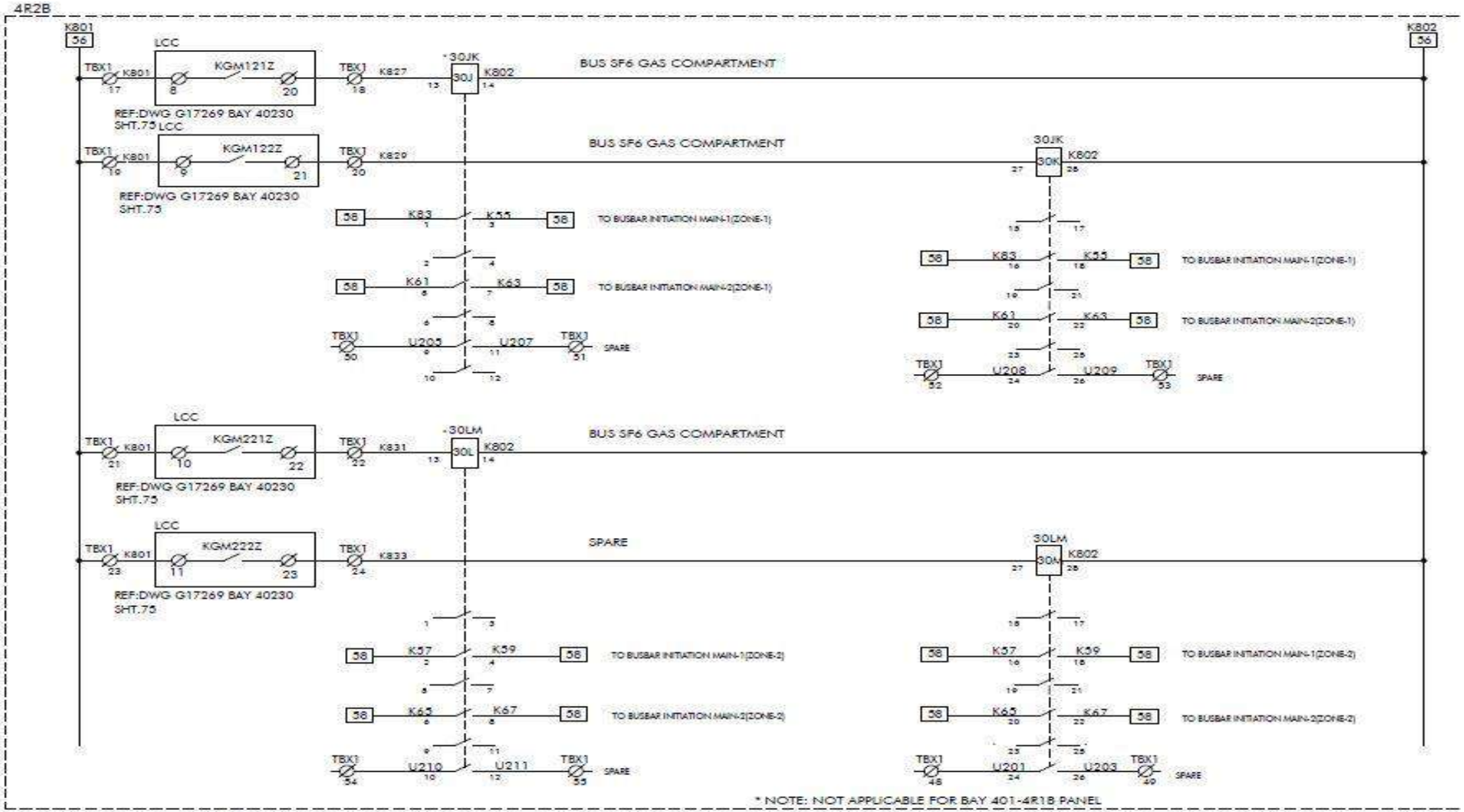
CUSTOMER: POWER GRID CORPORATION OF INDIA LTD.
PROJECT: PG,400KV CHANDWA SS-EXTN
P.O.NO.: Techno/PGCIL/GE/CRP-SAS-PMU/0730/17
Dated 22.09.2017

GE T&D India Ltd.
(Formerly Alstom T&D India Ltd.)
Grid Automation-Pallavaram India

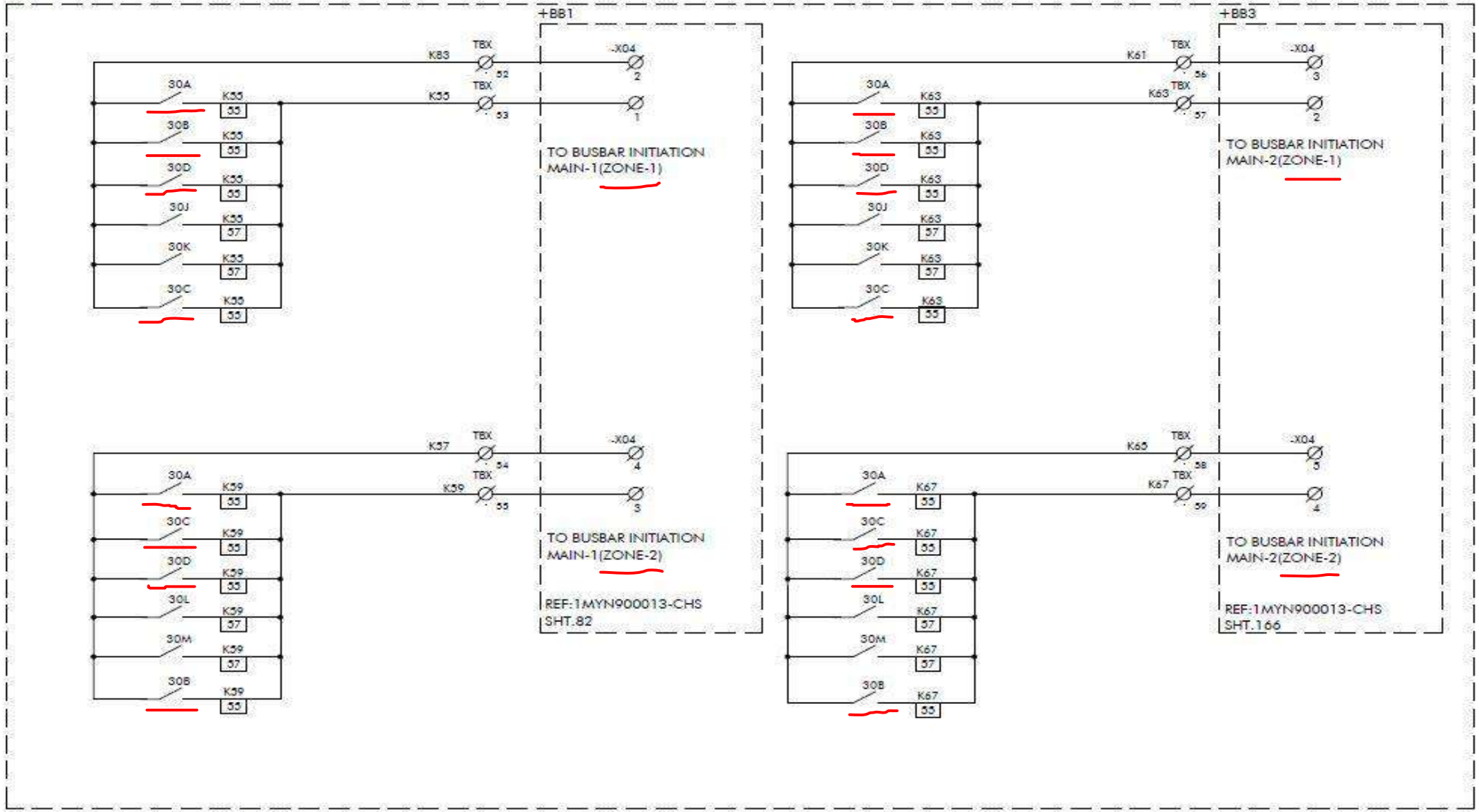
SCHEMATIC DRAWING
PANEL TYPES: 4R2A 4R2B
FILE: DXL91355
TITLE: 400KV LINE PROTECTION CONTACT MULTIPLICATION CKT

PREPARED BY: DP	REVISION: Z
CHECKED BY: JKK	DATE: 30.10.2019
APPROVED BY: SSS	SCALE: --

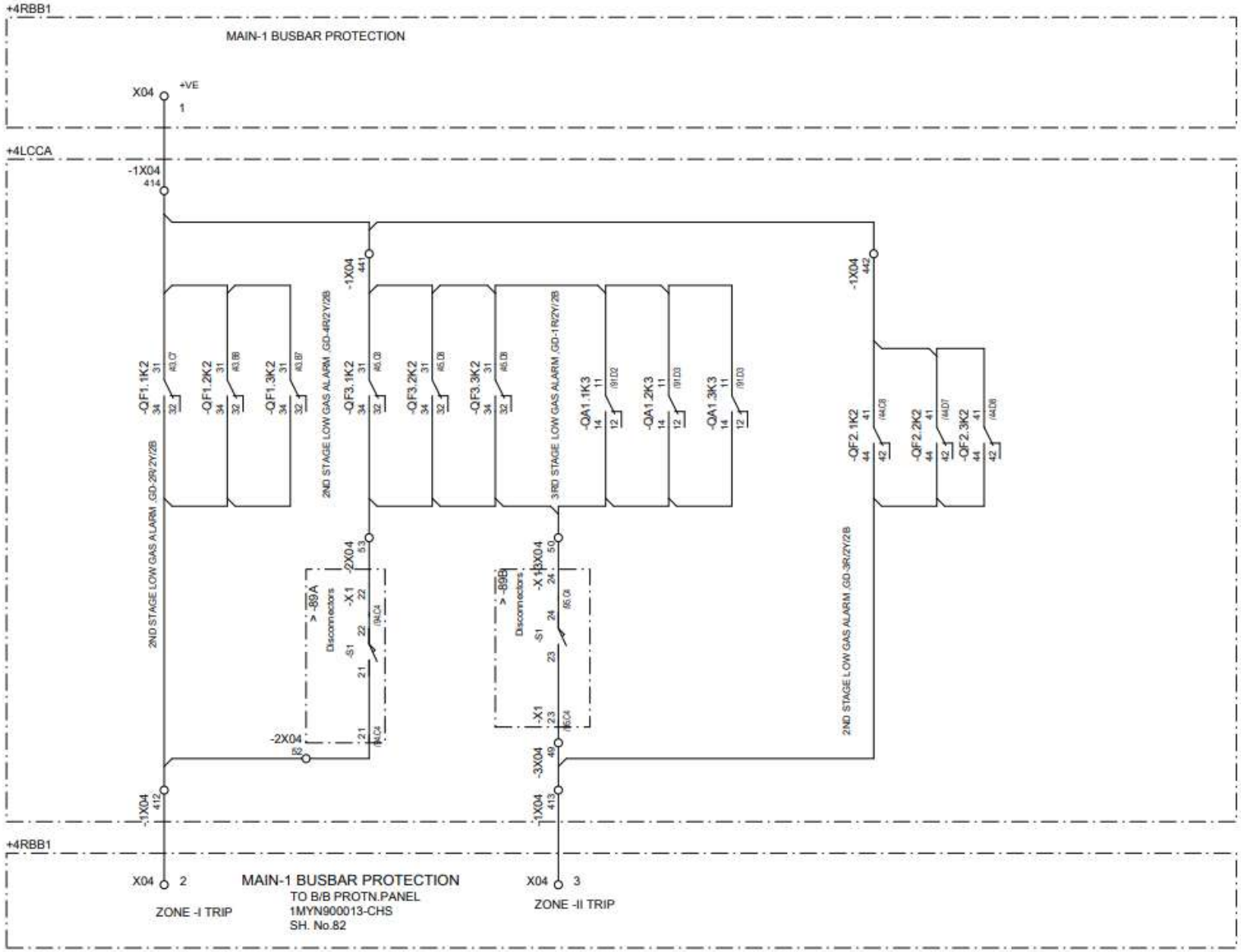
DRG. NO.: CPD KXL9 SC13 SHT 55 OF 61


4R2B
K801
56
K802
56
LCC
KGM121Z
TBX1
K801
17
8
20
TBX1
K827
18
*30JK
13
30J
K802
14
BUS SF6 GAS COMPARTMENT
REF:DWG G17269 BAY 40230
SHT.75
LCC
KGM122Z
TBX1
K801
19
9
21
TBX1
K829
20
BUS SF6 GAS COMPARTMENT
REF:DWG G17269 BAY 40230
SHT.75
30JK
27
30K
K802
28
58
K83
1
K55
3
58
TO BUSBAR INITIATION MAIN-1(ZONE-1)
58
K61
5
K63
7
58
TO BUSBAR INITIATION MAIN-2(ZONE-1)
TBX1
50
U205
9
U207
11
TBX1
51
SPARE
10
12
15
17
58
K83
16
K55
18
58
TO BUSBAR INITIATION MAIN-1(ZONE-1)
19
21
58
K61
20
K63
22
58
TO BUSBAR INITIATION MAIN-2(ZONE-1)
23
25
TBX1
52
U208
24
U209
26
TBX1
53
SPARE
LCC
KGM221Z
TBX1
K801
21
10
22
TBX1
K831
22
*30LM
13
30L
K802
14
BUS SF6 GAS COMPARTMENT
REF:DWG G17269 BAY 40230
SHT.75
LCC
KGM222Z
TBX1
K801
23
11
23
TBX1
K833
24
SPARE
REF:DWG G17269 BAY 40230
SHT.75
30LM
27
30M
K802
28
1
3
58
K57
2
K59
4
58
TO BUSBAR INITIATION MAIN-1(ZONE-2)
5
7
58
K63
6
K67
8
58
TO BUSBAR INITIATION MAIN-2(ZONE-2)
TBX1
54
U210
10
U211
12
TBX1
55
SPARE
9
11
15
17
58
K57
16
K59
18
58
TO BUSBAR INITIATION MAIN-1(ZONE-2)
19
21
58
K63
20
K67
22
58
TO BUSBAR INITIATION MAIN-2(ZONE-2)
23
25
TBX1
48
U201
24
U203
26
TBX1
49
SPARE
* NOTE: NOT APPLICABLE FOR BAY 401-4R1B PANEL
FOR GE REF:
ENGG.REF.NO.: KXL9
SCHEME TYPE: LINE
CUSTOMER: POWER GRID CORPORATION OF INDIA LTD.
GE T&D India Ltd.
SCHEMATIC DRAWING
PREPARED BY: DP
CHECKED BY: JKK

4R2B



FOR GE REF:	ENGG.REF.NO.: KXL9	CUSTOMER: POWER GRID CORPORATION OF INDIA LTD.	GE T&D India Ltd. (Formerly Alstom T&D India Ltd.)	SCHEMATIC DRAWING	PREPARED BY: DP	REVISION: Z
SCHEME TYPE: LINE		PROJECT: PG,400KV CHANDWA SS-EXTN		PANEL TYPES: 4R2A 4R2B	CHECKED BY: JKK	DATE: 30.10.2019
BASE FILE:		P.O.NO.: Techno/PGCIL/GE/CRP-SAS-PMU/0730/17		TITLE: 400KV LINE PROTECTION	APPROVED BY: SSS	SCALE: --
				FILE: DXL01358		



Based on			
01	Revised as per customer comment	18/10/2014	GK
02	As manufactured Drawings	27.02.2015	SB
03	As built(site markup updation)	26.11.2019	EJ
Rev.	Revision note	Date	Name

Prepared	24.06.2014	KARTHI.G
Approved	24.06.2014	KANNAN.R
Project	HYOSUNG CORPORATION, INDIA 400kV GIS at JHARKAND POOLING STATION, 3100053015	

Title: HYOSUNG CORPORATION, INDIA
400KV LINE LCC PANEL
POSITION INDIACTION-REMOTE

ABB -INPS-SASE

Doc. kind.	Circuit diagram	Ref.Des.	=4LCC
DCC	EFS		
Resp. dept.		Rev. ind. 03	Language en
Doc. no.	1MYN900013-CHC	Sheet	84.1
		n. sheet	84.2

1MYN691003-102(A3)REV01

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Rectification

1. Tripping scheme for 89A,89B,CTB & CB Gas zone sections have been modified and implemented.

Annexure B.5

पावर सिस्टम ऑपरेशन करपोरेशन लिमिटेड
(भारत सरकार का उद्यम)
POWER SYSTEM OPERATION CORPORATION LIMITED
(A Government of India Enterprise)
Eastern Regional Load Despatch Centre: 14, Golf Club Road, Tollygunge, Kolkata-700 033.
CIN: U40105DL2009GOI188682
फ़ोन: 033- 24235755, 24174049 फैक्स : 033-24235809/5029 Website:www.erldc.org, Email ID- erldc@posoco.in

घटना संख्या: **04-09-2022/1** दिनांक: **11-10-2022**

Report on the grid event in Eastern Region (पूर्वी क्षेत्र में ग्रिड घटना पर रिपोर्ट)

1. Summary of the event (घटना का सारांश):

At 05:57, 400 kV bus 1 & 2 at Malda (Having Double Main Transfer i.e. DMT switching scheme) tripped due to bus bar protection operation resulting in outage of all 400 kV feeders connected to Malda S/S.

- **Date / Time of disturbance:** 04-09-2022 at 05:57 hrs.
- **Event type:** GD - 1
- **Systems/ Subsystems affected:** 400/220/132 kV Malda S/s
- **Load and Generation loss**.
  - No generation loss occurred during the event.
  - No load loss occurred during the event.

2. Important Transmission Line/element if out (महत्वपूर्ण संचरण लाइने जो बंद है):

NIL

3. Major elements tripped (प्रमुख ट्रिपिंग)

- 400 kV Bus-1 & 2 at Malda
- 400 kV Farakka-Malda D/c
- 400 kV Malda-new Purnea D/c
- 400/220 kV 315 MVA ICT-3 & 5 at Malda

4. Network across the affected area (प्रभावित क्षेत्र का नक्शा)

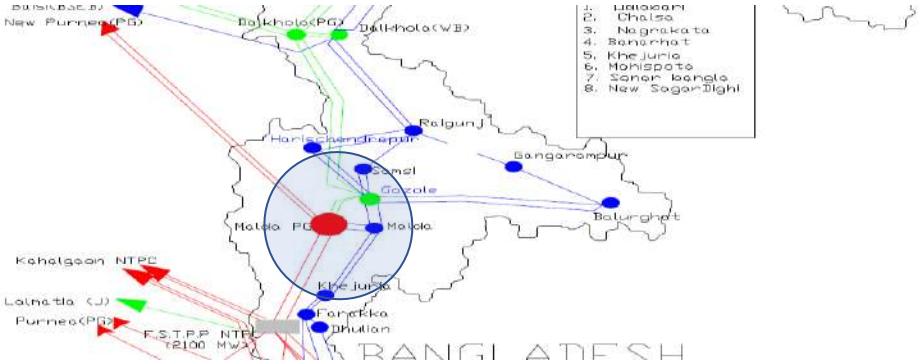


Figure 1: Network across the affected area

5. Relay indication and PMU observation (रिले संकेत और पीएमयू पर्यवेक्षण):

समय	नाम	उप केंद्र 1 रिले संकेत	उप केंद्र 2 रिले संकेत	पीएमयू पर्यवेक्षण
05:57	400 kV Bu-1 & 2 at Malda	Bus bar protection operated at Malda		30 kV dip in B_ph voltage at New Purnea. Fault Clearance Time: 100 msec
	400 kV Farakka-Malda-1			
	400 kV Farakka-Malda-2			
	400 kV Malda-New Purnea D/c			
	400/220 kV 315 MVA ICT-3 & 5 at Malda			

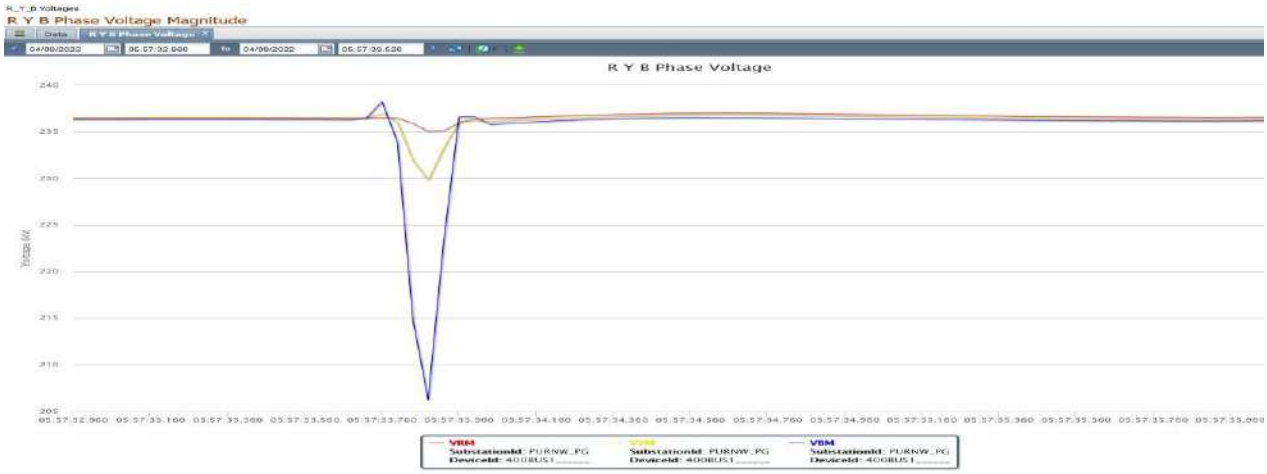


Figure 2: PMU Voltage snapshot of 400/220 kV New Purnea S/s

6. Restoration (पूर्वावस्था की प्रप्ति)

Transmission/Generation element name	Restoration time
400 kV Bus-1 & 2 at Malda	10:07/10:45
400 kV Farakka-Malda D/c	11:02/12:51
400 kV Malda-New Purnea D/c	10:07/10:45
400/220 kV 315 MVA ICT-3 & 5 at Malda	10:47/10:20

7. Analysis of the event & Protection issue (घटना का विश्लेषण और सुरक्षा समस्या):

- B_N fault struck 400 kV FSTPP-Malda-2. A/r was successful from Farakka end.
- However, during the time of tripping, status of bus coupler was not available, which led to operation of bus bar protection as differential relay sensed substantial amount of differential current for both buses as it didn't consider the current through the bus coupler.
- Detailed report of the incident is attached at Annexure-3.

8. Non-compliance observed (विनियमन का गैर-अनुपालन):

Issues	Regulation Non-Compliance	Utility
DR/EL not provided within 24 Hours	1. IEGC 5.2 (r) 2. CEA grid Standard 15.3	**PG ER-2, NTPC FSTPP**

9. Status of Reporting (रिपोर्टिंग की स्थिति):

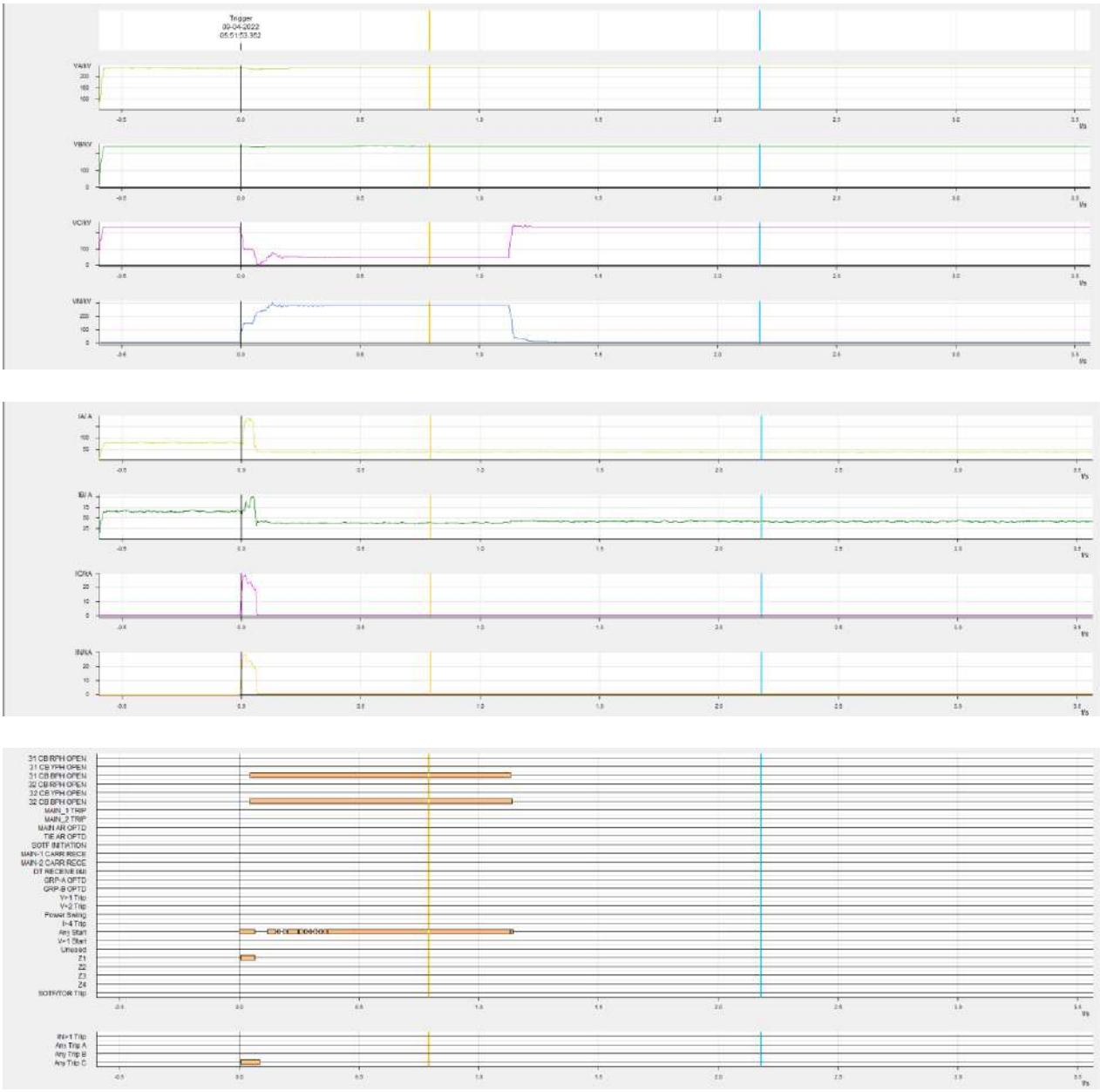
- DR/EL yet to be received from PG ER-2

Annexure 1: Sequence of events recorded at ERLDC SCADA data at the time of the event.

Sequence of Event not recorded at the time of event.

Annexure 2: DR recorded

DR of 400 kV FSTPP-Malda-2 (Farakka)



Report on visit at Malda S/S and NTPC Farakka

Report on Malda S/S Visit

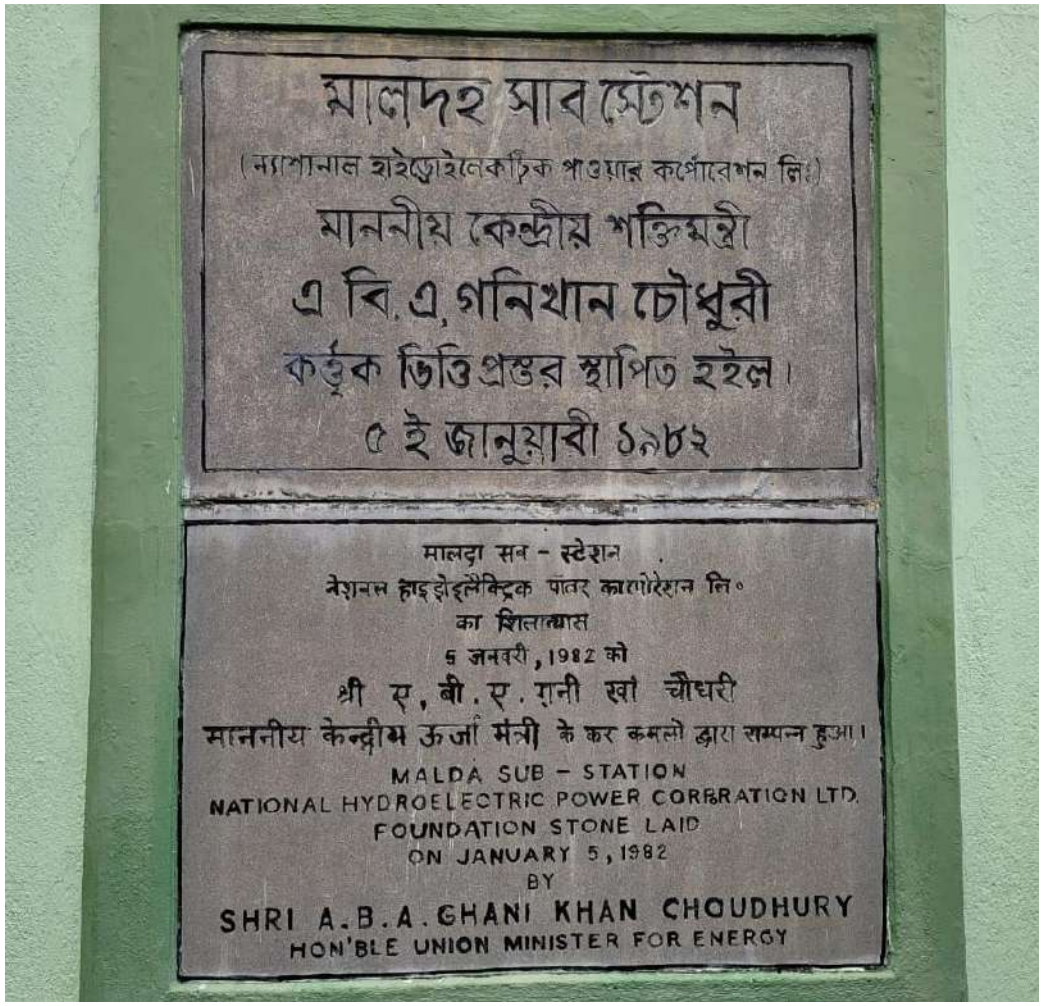
For Root Cause analysis of Repeated Bus bar protection Mal operation

Background of Visit

- On 04-09-2022 at 05:57 hrs, due to heavy lightning near Farakka, 400 kV Farakka – Malda – 2 tripped on B-E fault with fault current 5.13 kA, fault location 41.3 km from Malda end. At the same time, 400 kV bus 1 & 2 tripped due to bus bar differential protection mal operation.
- Similar event took place on 28th May 2018. 400 kV Malda-Purnea – 2 tripped in R-E fault at 19:04:19 Hrs. on dated 28.05.2018. 400 KV Bus-I & II tripped at 19:04:21 Hrs. on dated 28.05.2018 at 400 KV Malda substation. This caused complete 400KV Bus-I & II dead of Malda.
- Malda substation being a strategically important substation for West Bengal and supplying power to the consumers of Malda, Dinajpur district as well as a part of important winter flow gate of eastern region. Therefore reliability of protection system at Malda s/s is extremely important and a committee comprising of following member visited Malda s/s for carrying out root cause analysis in coordination with POWERGRID:

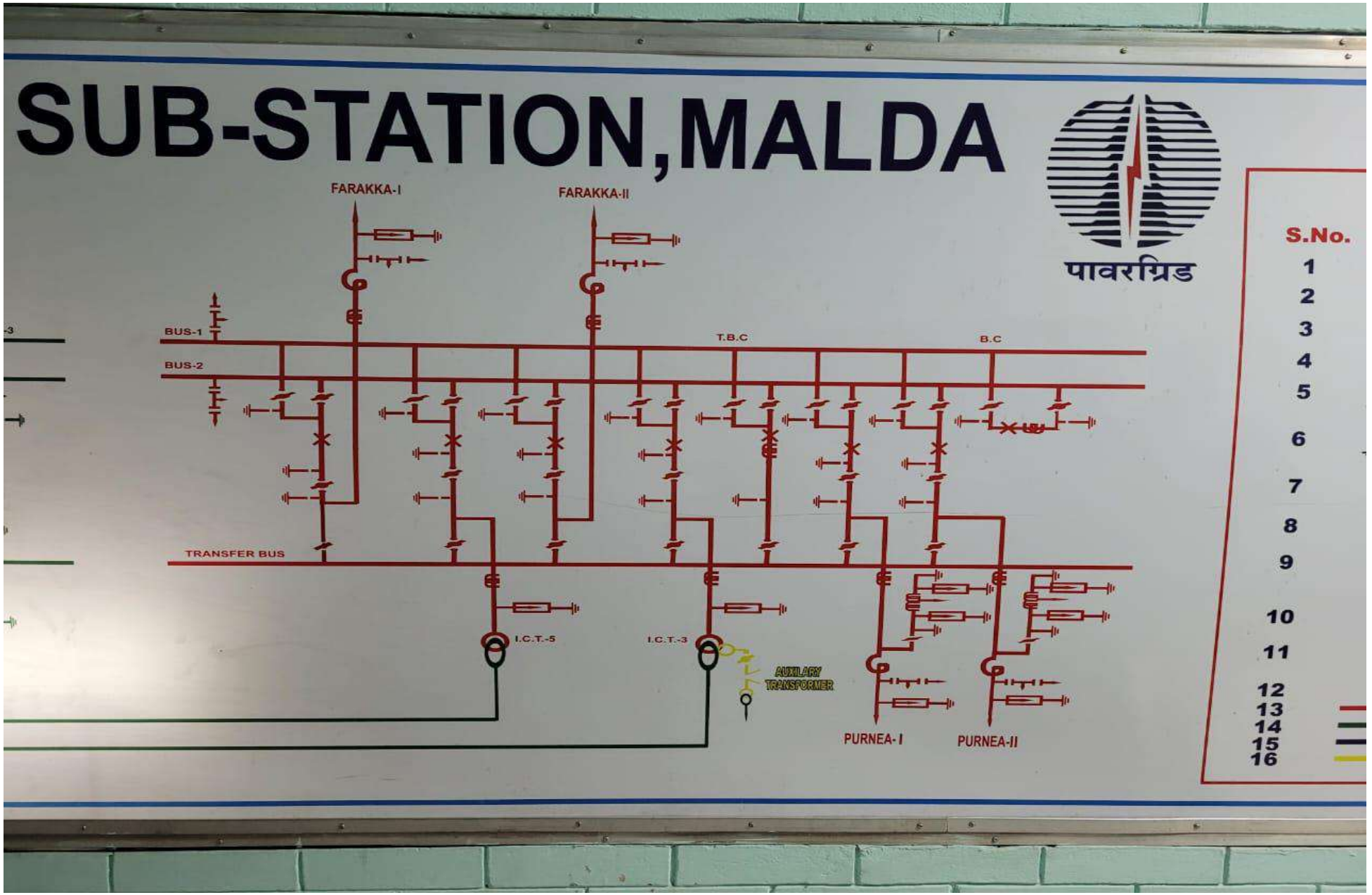
1. Sanatan Sarvesh, Asst. EE, ERPC
2. Raj Protim Kundu, Manager, ERLDC
3. Saibal Ghosh, Manager, ERLDC

History of Malda Substation:



In August 1998, the river breached the marginal and afflux embankments upstream of Farakka Barrage causing a disastrous flood in the Malda District. During that time Malda substation also submerged and many useful substation operation related document got lost.

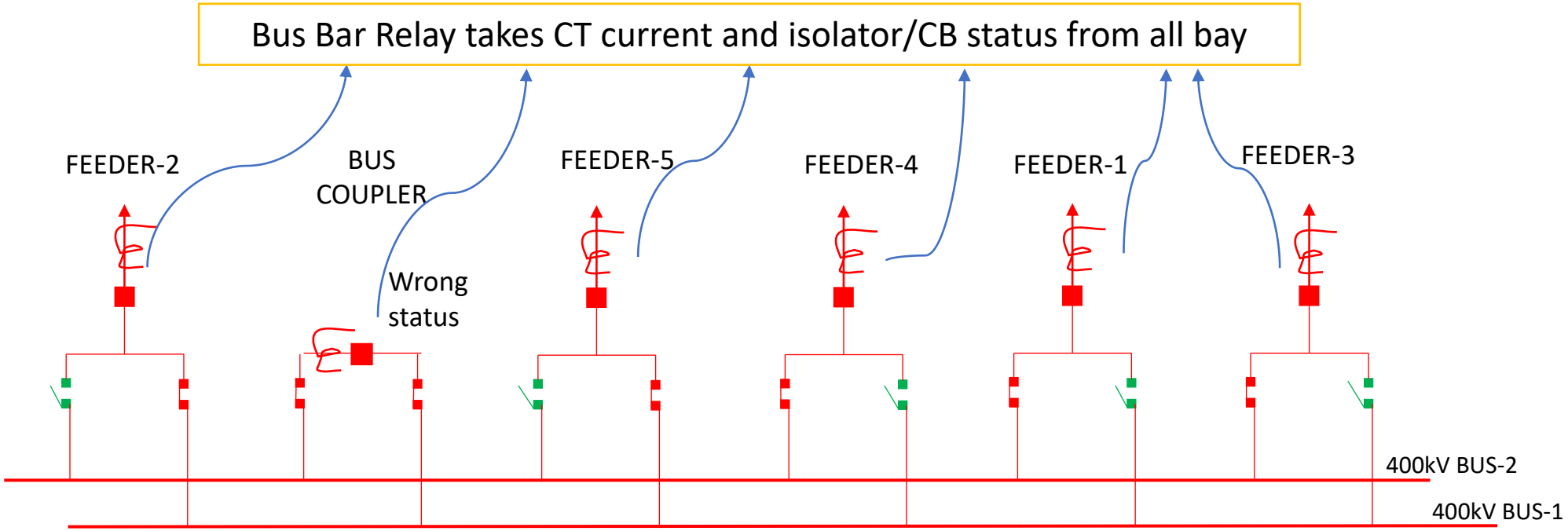
Single line Diagram of 400 kV BUS



Event analysis:

- Malda Substation is almost 40 years old. 400 kV Bus coupler CB and isolator and Purnea-I & II Isolators have crossed their useful life and require replacement.
- Also the control cables for bays are very old and their insulation level have degraded significantly. This causes DC earth fault in the substation.
- In both the 2022 and 2018 event DC earth fault is the primarily responsible for the mal operation. DC earth fault led to wrong status of B/C CB , consequently the bus bar protection mal operated during external fault.
- Check zone feature was disabled in REB670 relay by default. This was also one of the reason for Bus Bar mal operation.
- As many useful engineering drawing are lost during 1998 flood, therefore operation of Malda substation is very much challenging and require highly skilled manpower for its safe operation.

Basic Principapl of Bus Bar equation



In simple form, the basic principal is current summation of protected zone is zero for external fault and greater than zero for internal fault

For Bus-1 $\sum I_{feeder-n} + I_{B/C} = 0$ for external fault

For Bus-2 $\sum I_{feeder-n} - I_{B/C} = 0$ for external fault

During both the event the $I_{B/C}$ gets excluded from the above summation and that's why Bus bar operated. $I_{B/C}$excluded as the status of Bus coupler was wrong due to DC earth fault.

Basic of Bus bar protection

- Bus bar protection need feeder current and Isolator/CB status for its decision making
- For both quantity it depend on the secondary circuit. That mean primary equipment current is replicated by CT and Primary Isolator/CB position is replicated by Auxiliary contact.
- CT saturation, opening of CT secondary wiring etc causes wrong replication of primary current. Similarly fault in DC supply causes wrong replication of position status of switches(isolator/CB)
- This wrong replication of primary quantities may led to bus bar mal operation. There are advance algorithm For eliminating wrong current replication inside the relay. However it is extremely difficult to eliminate the wrong position replication issue.

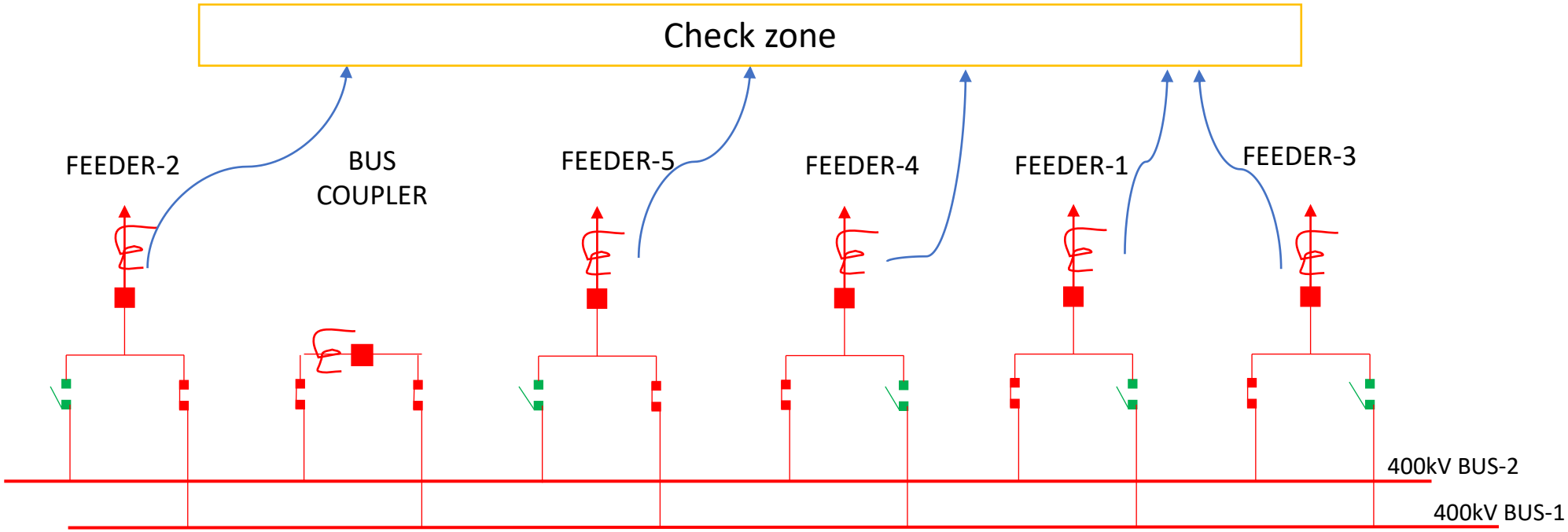
Method of creating replica inside REB 670 relay for Isolator & CB:

- There are two scheme in REB 670 relay for replicating the switch status:
  1. RADSS scheme- If not OPEN then CLOSED
  2. INX scheme- Closed or open if clear indication available otherwise last position saved

Primary equipment		Status in busbar protection		Alarm facility	
Normally Open auxiliary contact status ("closed" or "a" contact)	Normally Closed auxiliary contact status ("open" or "b" contact)	when "Scheme 1 RADSS" is selected	when "Scheme 2 INX" is selected	Alarm after settable time delay	Information visible on local HMI
open	open	closed	Last position saved	yes	intermediate_00
open	closed	open	open	no	open
closed	open	closed	closed	no	closed
closed	closed	closed	closed	yes	badState_11

- RADSS scheme requires minimum contact where as INS scheme gives more reliability. By default RADSS scheme was selected for status determination.

Reason for not enabling Check zone by Default in REB relay



For Check Zone $\sum I_{feeder-n} = 0$ for external fault

$\neq 0$ for internal fault

Check zone gives double check and ensure better stability of main zone. However in REB relay check zone is not by default on for the following reason:

1. In older scheme the CT switching used to happen galvanically based on the Aux. contact status, but in REB 670 the CT switching is made only in software, and CT secondary current circuits do not include any auxiliary contacts.

2. the IED is always supplied with a special zone and phase selective “Open CT Detection” algorithm, which can instantly block the differential function in case of an open CT secondary circuits caused by accidents or mistakes

Action taken after 2018 May event:

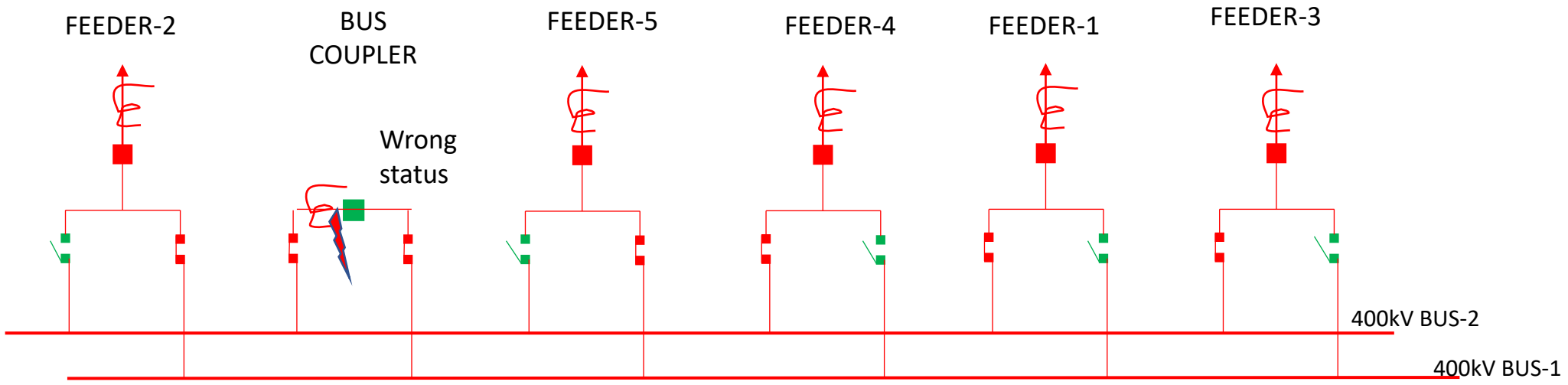
- After May 2018 event an aannunciation for Bus Coupler CB input Status to Relay was made in the control and rely panel.
- It was expected that due to DC earth fault if the CB status become open while actual CB is closed then the annunciation will come and control room person will inform the protection engineer and action will be taken immediately for rectification of the status of CB.

Why repeated in 2022 again….

- As per the previous action taken the annunciation came in the panel just before the event.
- Before any corrective action the fault happen in 400 kV Farakka-Malda line and that’s why as per bus bar logic again both the bus tripped.
- Check Zone of bus bar protection remained in disabled condition.

Action taken after 2022 event:

- The status of the Bus coupler made “forced close” using soft logic. That’s means now the B/C CB status will not be decided based on Auxiliary contact. The possible cons of this arrangement is that when BC will be under shut down and a fault happen between CT and CB(as shown) then both the Bus will be tripped, where as ideally only Bus-2 should trip
- However as switching of BC is planed activity and such fault are very rare that’s why it will not pose any serious lack. Also during B/C shutdown the setting can be changed.



Action taken after 2022 event:

- As the other isolator auxiliary contacts are also vulnerable to DC earth fault. That’s why for improving the reliability “INX” scheme is chosen in place of “RADSS” scheme for isolator and CB replica.
- Check zone of bus bar protection has been enabled.

Recommendation

- As the Bus coupler bay is very old it may be replaced at the earliest along with control cable.
- Old control cable may be replaced.

Other observation

- For Bus coupler replacement both bus shut down is required due to proximity of both main buses. As the observation of the team it is found that as shut down time of individual element could be minimized opening the Bus jumpering of the end bus section where the B/C situated.
- Also the Transfer Bus coupler bay LBB relay is old electromechanical relay, which also maloperated in recent past and needs to be replace. POWERGRID expressed that relay is ready at site for installation and testing they need shut down of any one feeder for checking whether LBB can trigger other line tripping correctly or not.

Shutdown arrangement proposal

The Team….

Report on visit at NTPC Farakka

For prolonged outage of unit 6

Background & finding

- Farakka STPP unit 6 tripped on 20-06-2022 due to turbine vibration. Later it was taken under annual overhauling. Then unit was revived on 15-08-2022. However, Unit tripped again 23-08-2022 due to vibration problem.
- NTPC informed that 2 out of 14 bolts of generator (shown in right side) were damaged and alignment was disturbed.
- LP turbine blade also got damaged and same is replaced.
- The reason for second tripping is vibration issue of next bearing.

Other issues discussed

- Repeated tripping of units:
  - NTPC Farakka was apprised about repeated tripping of units. NTPC Farakka informed that direct water from feeder canal is used as coolant for stage 1 generating units due to unavailability of cooling tower.
  - During cooling process, condenser is vulnerable to the debris in the water. Problem is the most critical for unit 3.
- Unavailability of SCADA data:
  - Due to firewall issue, analog data were not available few days back. Now it is solved.
  - For digital data, they are in process of procurement of new system.
- Initially NTPC Farakka did not share the information about auto-reclose operation at their end for the Malda event on 04-09-2022. They were requested to pass on such critical information without any delay to both RLDC control room and remote end coordinator.

The Team...

Record note of discussion regarding tripping incident of 400 kV bus 1 & 2 at 400/220/132 kV Malda S/S on 04-09-2022

On 04-09-2022 at 05:57 hrs, due to heavy lightning near Farakka, 400 kV Farakka – Malda – 2 tripped on B-E fault with fault current 5.13 kA, fault location 41.3 km from Malda end. At the same time, 400 kV bus 1 & 2 tripped due to bus bar differential protection in B phases. Similar event took place on 28th May 2018. Several other Bus bar mal operation incidents also took place due to old LBB relay of transfer bus coupler.

Considering the importance of Malda substation, a team comprising of executives from ERLDC and ERPC visited 400/220/132 kV Malda S/S on 13-09-2022 for root cause analysis of maloperation of bus bar protection.

During the visit, the team interacted with site in-charge and protection team and following major observations are found:

- The main issue observed during both the events of 2018 and 2022 was the bus coupler circuit breaker NC contact dropping. In REB 670 relay the Bus coupler (B/C) CT current is excluded from both the zones when the circuit breaker status doesn't come to the relay.
- After 2018 event, the auxiliary contact was rectified and an extra annunciation LED was added in the control panel for control room personal to monitor the status. Also, the zone switching setting was made "force in" in relay. The function of this setting is to add zero B/C current to both bus bar zones (main zones) when B/C CB status become unknown.
- However, during 2022 event the annunciation came just prior to the event and control person did not get adequate time to attend it.
- After investigation it was found that Check zone was also not enabled. This was not in operation since 2016 when the bus bar protection upgradation took place and in REB relay check zone by default is not enabled in setting and that's why it remained inactive.
- Remedial action taken after the event on 04-09-2022:
    - Same is rectified and check zone is enabled after the event.
    - The status of the Bus coupler CB is not taken from the contact. Instead, it is kept as "forced closed" from soft logic. The B/C current will always be added to the both zones differential calculation.
    - In place of "RADSS" scheme "INX-Scheme" has been enabled which takes both NO and NC input for isolator and CB status. This ensures better reliability of the scheme
- However, the main issue is ageing of equipment. The B/C CB condition is very much vulnerable and new CB is ready for replacement at site.
- Also Due to ageing, the condition of control and power cable of bays are very critical and prone to failure. Failure of circuit breaker status repeatedly is indicting the same. Therefore, not only the CB but also the control cable upgradation in required in long run.

Saikat Ghosh
ERLDC

13.09.22
R.P. KUNDU
ERLDC

S. Sarvesh
(S. Sarvesh)
ERPC

13/09/2022
(R.P. Tirkey)
DGM, Malda

17/9/22
M. R. BEHERA
CHIEF MANAGER / POWERGRID

B. K. DAS
SE/Powergrid

Annexure B.7

Sl. No.	LINE NAME	TRIP DATE	TRIP TIME	RESTORATION DATE	RESTORATION TIME	Relay Indication LOCAL END	Relay Indication REMOTE END	Reason	Remarks from BSPTCL
1	220 KV NEW PURNEA-KHAGARIA-2	16-09-2022	11:27	16-09-2022	12:25	New Purnea: B_N, 82.2 km, 2.638 kA	Khagaria: B_N, 53.3 km, 3.761 kA	B-Earth	A/r lockout due to fault in Reclaim time.
2	220 KV NEW PURNEA-KHAGARIA-2	18-09-2022	10:52	18-09-2022	17:39	New Purnea: B_N, 72 km, 1.9 kA	Khagaria: B_N, 28 km, 3.2 kA	B-Earth	A/r lockout due to fault in Reclaim time.
3	220 KV NEW PURNEA-KHAGARIA-2	28-09-2022	10:25	28-09-2022	19:58	New Purnea: B_N, 23.379 km, 5.658 kA	Khagaria: B_N, 71.13 km, 1.342 kA	B-Earth	A/r lockout due to fault in Reclaim time.
4	220 KV NEW PURNEA-KHAGARIA-2	29-09-2022	22:39			New Purnea: R_N, 71.69 km, 2.7 kA, Continuous DT receipt	Khagaria: Didn't trip	R-Earth	Faulty PLCC at Purnea PG end.

Annexure B.8

Sl. No.	LINE NAME	TRIP DATE	TRIP TIME	RESTORATION DATE	RESTORATION TIME	Relay Indication LOCAL END	Relay Indication REMOTE END	Reason	Remarks from BSPTCL
1	220 KV NEW PURNEA-KHAGARIA-2	28-09-2022	10:25	28-09-2022	19:58	New Purnea: B_N, 23.379 km, 5.658 kA	Khagaria: B_N, 71.13 km, 1.342 kA	B-Earth	A/r lockout due to fault in Reclaim time.
2	220 KV SAHARSA-KHAGARIA-1	25-09-2022	00:47	25-09-2022	01:35	Saharsa: Didn't trip	Khagaria: Master Trip Relay operated	No fault	M/s Siemens Enginneer visited Khagaria new for testing and configuration of LBB relay in 220 KV Saharsa D/c bays.After doing it , he also revised logic of distance protection relays in the Bay.During the process , he unintentionally enabled non directional Z5 with zero time setting in Siemens distance protection relay. This caused tripping of Siemens distance protection relay of 220 KV saharsa bay, whenever there was fault in other bays.The Problem was rectified on dt-26/9/22
3	220 KV SAHARSA-KHAGARIA-1	25-09-2022	04:14	25-09-2022	05:13	Saharsa: R_N, 2 kA	Khagaria: R_N, 86.7 km, 0.96 kA, master trip operated	R-Earth	
4	220 KV SAHARSA-KHAGARIA-1	25-09-2022	09:09	25-09-2022	10:02		Khagaria: R_N, 213.7 km, 0.58 kA	R-Earth	
5	220 KV NEW PURNEA-KHAGARIA-2	18-09-2022	10:52	18-09-2022	17:39	New Purnea: B_N, 72 km, 1.9 kA	Khagaria: B_N, 28 km, 3.2 kA	B-Earth	A/r lockout due to fault in Reclaim time.
6	220 KV NEW PURNEA-KHAGARIA-2	16-09-2022	11:27	16-09-2022	12:25	New Purnea: B_N, 82.2 km, 2.638 kA	Khagaria: B_N, 53.3 km, 3.761 kA	B-Earth	A/r lockout due to fault in Reclaim time.

7	220 KV NEW PURNEA-KHAGARIA-1	16-09-2022	11:27	16-09-2022	12:23	New Purnea: Didn't trip	Khagaria: Master Trip Relay operated	No fault	May be due to PLCC maloperation. Although no counter increased. No such operation afterwards.
8	220 KV KHAGARIA-NEW PURNEA-1	12-09-2022	13:18	12-09-2022	20:58	Khagaria: Y_B, 38.9 km, Iy: 3.8 kA, Ib: 3.81 kA	New Purnea: Y_B, 57.3 km, 3.86 kA	Y-B	Phase to phase fault

List of important transmission lines in ER which tripped in September-2022

Sl. No.	LINE NAME	TRIP DATE	TRIP TIME	RESTORATION DATE	RESTORATION TIME	Relay Indication LOCAL END	Relay Indication REMOTE END	Reason	Fault Clearance time in msec	Remarks	DR Configuration Discrepancy	DR/EL RECEIVED FROM LOCAL END	DR/EL RECEIVED FROM REMOTE END	UTILITY RESPONSE

1	220 KV BEGUSARAI-SAHARSA-1	03-09-2022	11:29	03-09-2022	15:45	Begusarai : Didn't trip	Saharsa: R_N, 24.9 km, 5.09 kA	R-Earth	100	A/r failed after 1 sec from Saharsa. Line didn't trip from Begusarai. Voltage in healthy phase reached around 280 kV		No	Yes	For rectification of import/export reversal issuesin Energy meters of 200 KV Saharsa D/c bays at Begusarai GSS, M/s KPM reversed CT secondary starpoint of all cores (both protection and metering).This resulted in wrong CT secondary starpoint of Distance relays. On dt-3/9/22, Begusarai end could not clear fault in 220 KV Saharsa-1 bay due to inverted CT secondary starpoint of Distance relays.
2	220 KV BEGUSARAI-SAHARSA-2	03-09-2022	11:29	03-09-2022	15:47	Begusarai : R_N, 140 km, Zone-3	Saharsa: R_N, Zone-3, 0.665 kA	R-Earth	100	After 900 msec of tripping of Ckt-1, Ckt-2 also tripped from Saharsa. BSPTCL and PG ER-1 may expalin		No	Yes	

3	220 KV JODA-RAMCHANDRAPUR-1	04-09-2022	11:43	04-09-2022	12:24	Joda: Y_N, 4.689 km, 4.64 kA	Ramchandrapur: Y_N, 137 km, 1.58 kA	Y-Earth	350	Tripped in Zone-2 from Ramchandrapur. A/r successful from Joda end		Yes	No	OPGW to be installed
4	220 KV BEGUSARAI-SAHARSA-2	04-09-2022	22:35	05-09-2022	12:25	Begusarai: Master relay operated	Saharsa: Didn't trip	No fault	NA	No fault observed in PMU		No	No	Due to inverted CT secondary starpoint of Distance relays of 220 KV Saharsa bays at GSS Begusarai,220 KV SAHARSA-2 tripped due to internal Grid fault of GSS Begusarai.Inverted CT secondary starpoint fault was rectified on dt-6/9/22
5	400 KV BAHARAMPUR-SAGARDIGHI-1	09-09-2022	08:05	09-09-2022	09:12	Baharampur: DT received		No fault	NA	No fault observed in PMU. PG ER-2 / WBPDCL may explain		No	Yes	PLCC checked but no issue found. ER-2 suggested WBPDCL to check for DC Earth fault
6	220 KV BOLANGIR-KESINGA-1			10-09-2022	11:26	Bolangir: B_N, 0.7 km, 10.34 kA	Kesinga: Didn’t trip	B-Earth	100	A/r attempt failed after 1 sec		Yes	No	

7	220 KV BOLANGIR-SADEIPALLI-1	10-09-2022	10:49	10-09-2022	11:24	Bolangir: Didn't trip	Sadeipalli: B_N, 14.9 km, 1.6 kA	B-Earth	100	OPTCL may explain		No	No	Zone-2 tripping within 100 msec, OPTCL to check
8	220 KV BOLANGIR-SADEIPALLI-2			10-09-2022	11:25	Bolangir: Didn't trip	Sadeipalli: O/c E/f	B-Earth	100	OPTCL may explain		No	No	Tripped on OverLoad
9	400 KV NEW PPSP-NEW RANCHI-1	10-09-2022	16:17	10-09-2022	17:04	Spurious DT sent from New PPSP due to moisture ingress in one of bus duct modules		No fault	NA	WBSETCL may explain		Yes	No	Moisture ingress in GD monitor compartment

10	400 KV BIHARSHARIF-LAKHISARAI-1	11-09-2022	13:20	11-09-2022	23:16	Biharsharif: O/V St-1	Lakhisarai: DT received	No Fault	NA	As per PMU, some issue with R_ph CVTafter one A/r on 08.09.22. R_ph voltage 10 kV higher than other two phases. On the day of tripping, voltage suddenly touched 460 kV. PG may explain		Yes	No	CVT secondary earthing issue.
11	220 KV MAITHON-DUMKA-2	13-09-2022	14:09	13-09-2022	15:12	Maithon: R_N, 6.1 km, 13.18 kA		R-Earth	100	Three phase tripping for single phase fault at Maithon. A/r successful at Dumka		Yes	NA	PLCC was not healthy

12	220 KV RANCHI-MEJIA (MTPS)-1	14-09-2022	12:27	14-09-2022	15:32	Ranchi: R_N, 169.1 km, 1.112 kA, A/r successful	Mejia: R_N, 51.37 km	R-Earth	100	A/r successful from Ranchi only		Yes	No	A/r kept off at Mejia end
13	220 KV TSTPP-MERAMUNDALI-1	15-09-2022	15:07	15-09-2022	16:06	Tripped due to 48 V DC charger trouble	Meramundali: Didn't trip	No fault	NA	TSTPP may explain		No	NA	Problem with battery charger
14	220 KV TSTPP-MERAMUNDALI-2	15-09-2022	15:07	15-09-2022	16:06	Tripped due to 48 V DC charger trouble	Meramundali: Didn't trip	No fault	NA	TSTPP may explain		No	NA	
15	400/220 KV ICT-2 AT MERAMUNDALI	15-09-2022	15:07	20-09-2022	12:38		LV side: B/U relay, Ir: 5.62 kA, iy: 5.64 kA,. R_ph line isolator dropper snapped	R-Earth	1000	OPTCL may explain		Yes	Yes	220 kV Bus bar protection not available.

16	400 KV MAITHON-MEJIA-1	15-09-2022	22:21	16-09-2022	16:45	Maithon: R_N, 58.819 km, 7.361 kA		R-Earth	100	A/r failed after 1 sec		Yes	Yes	A/r kept off at Mejia end
17	220 KV NEW PURNEA-KHAGARIA-1	16-09-2022	11:27	16-09-2022	12:23	New Purnea: Didn't trip	Khagaria: Master Trip Relay operated	No fault	NA	BSPTCL may explain		NA	No	May be due to PLCC maloperation. Although no counter increased. No such operation afterwards.
18	400 KV KHSTPP-LAKHISARAI-1	18-09-2022	02:17	18-09-2022	02:42	KhSTPP: A/r successful	Lakhisarai: R_N, 11.236 kA, 1.101 km	R-Earth	100	A/r successful at kahalgaon only. Three phase tripping at Lakhisarai.		No	Yes	PLCC became unhealthy momentarily.
19	220 KV NEW PURNEA-KHAGARIA-2	18-09-2022	10:52	18-09-2022	17:39	New Purnea: B_N, 72 km, 1.9 kA	Khagaria: B_N, 28 km, 3.2 kA	B-Earth	100	Three phase tripping for single phase fault		Yes	No	A/r lockout due to fault in Reclaim time.
20	220 KV RANCHI-CHANDIL-1	19-09-2022	15:33	19-09-2022	16:23	Ranchi: Y_N, 29.6 km, 5.3 kA	Chandil: Y_N, 74.9 km, 1.85 kA	Y-Earth	100	A/r successful from Ranchi only		Yes	Yes	PLCC not healthy

21	400 KV MALDA-NEW PURNEA-1	25-09-2022	03:40	25-09-2022	04:03	Malda: Y_N, 113.08 km, 3.925 kA	New Purnea: Y_N, A/r successful	Y-Earth	100	A/r operated at Malda after 1 sec but breaker opened again immediately. Other two phase at malda tripped after 2.5 seconds. PG may explain		Yes	Yes	Tripping command remained extended thereby tripping the line aat Malda again after A/r

22	220 KV SAHARSA-KHAGARIA-1	25-09-2022	04:14	25-09-2022	05:13	Saharsa: R_N, 2 kA	Khagaria: R_N, 86.7 km, 0.96 kA, master trip operated	R-Earth	100	A/r couldn't be ascertained from PMU. PMTL/BSPTCL may explain		Yes	No	M/s Siemens Enginneer visited Khagaria new for testing and configuration of LBB relay in 220 KV Saharsa D/c bays.After doing it , he also revised logic of distance protection relays in the Bay.During the process , he unintentionally enabled non directional Z5 with zero time setting in Siemens distance

23	220 KV SAHARSA-KHAGARIA-1	25-09-2022	09:09	25-09-2022	10:02		Khagaria: R_N, 213.7 km, 0.58 kA	R-Earth	100	A/r couldn't be ascertained from PMU. PMTL/BSPTCL may explain		No	No	protection relay. This caused tripping of Siemens distance protection relay of 220 KV saharsa bay, whenever there was fault in other bays.The Problem was rectified on dt-26/9/22
24	220 KV RANCHI-MEJIA (MTPS)-1	25-09-2022	15:47	25-09-2022	17:15	Ranchi: R_N, 9.556 km, 10.38 kA, A/r successful	Mejia: R_N, 224.24 km	R-Earth	100	A/r successful from Ranchi only		Yes	No	
25	400 KV KOLAGHAT-KHARAGPUR-1	26-09-2022	15:58	26-09-2022	16:30	Kolaghat: Didn't trip	Kharagpur: DT received	No fault	NA	DT received at Kharagpur. Details maybe shared by WBPDCL		No	Yes	Line tripped during changeover from main bay to TBC

26	220 KV NEW PURNEA-KHAGARIA-2	28-09-2022	10:25	28-09-2022	19:58	New Purnea: B_N, 23.379 km, 5.658 kA	Khagaria: B_N, 71.13 km, 1.342 kA	B-Earth	100	A/r failed after 1 sec		Yes	No	A/r lockout due to fault in Reclaim time.
27	220 KV SUBHASHGRAM-BARUIPUR-1	28-09-2022	12:18	28-09-2022	17:15	Subhashgram: R_N, 7.2 km, 15.73 kA	Baruipur: R_N, 17.07 km, 2.220 kA	R-Earth	100	Three phase tripping at Baruipur.		No	Yes	A/r kept off at Subhshgram end as the line is not loaded yet
28	220 KV RANCHI-MEJIA-1	28-09-2022	13:40	28-09-2022	15:53	Ranchi: R_N, 181.20 km, 0.934 kA, A/r successful		R-Earth	100	A/r successful from Ranchi only		Yes	No	A/r kept off at Mejia end
29	220 KV NEW PURNEA-KHAGARIA-2	29-09-2022	22:39			New Purnea: R_N, 71.69 km, 2.7 kA, Continuous DT receipt	Khagaria: Didn't trip	R-Earth	100	Three phase tripping at New Purnea.		Yes	No	Faulty PLCC at Purnea PG end.

30	220 KV BOLANGIR-KESINGA-1	30-09-2022	22:15	01-10-2022	12:56	Bolangir: B_N, 80.56 km, 1.95 kA, A/r successful	Kesinga: B_N, 8.6 km, 3.56 kA	B-Earth	100	B_ph voltage at Kesinga end was not available. OPTCL may share the findings		Yes	No	B_ph jumper snapped

Annexure C.2

220kV Bus Bar Protection status at BSPTCL

Sl. no.	Name of the GSS	Status	Remarks
01	Fatuha	GE make Bus Bar Panel available at site. Its commissioning work is pending as one of the relay found defective during panels testing. Relay replacement and further commissioning work to be done by agency.	Continuous follow up from site is needed.
02	Khagaul	Bus Bar Protection Panel not available. One main one transfer bus scheme.	New installation and commissioning is needed.
03	Biharsharif	• Installation and commissioning of new Bus Bar Protection Panel was awarded to M/s GE in 2015, but work remained partially completed and executing agency left midway. • At present 18 no of 220kV bays are available which cannot be integrated in existing Bus Bar Protection Relays. • Also, suitable space is not available in cable trench.	• As per service engineer of m/s GE following modification in old Bus Bar scheme is needed. a) Scheme modification b) Hardware modification c) Software modification d) Firmware modification. • Suitable space in cable trench also needed.
04	Dehri	Bus Bar Panel not available. One main one transfer bus scheme.	New installation and commissioning is needed.
05	Bodhgaya	Bus Bar Panel not available. One main one transfer bus scheme.	New installation and commissioning is needed.
06	Sampatchak	• ABB make Electromechanical type Bus Bar Panel available but not in service due to cases of mal operation. • An estimate for new bus bar scheme prepared and submitted, as per field officials. • Fault Data extraction facility not available in present scheme.	Retrofitting with Numerical type Bus Bar Relay or change of complete Bus Bar Panel is needed for Proper Data Extraction and Fault Analysis
07	Begusarai	ABB make Electromechanical type Bus Bar Panel available but not in service. Fault	Retrofitting with Numerical type Bus Bar Relay or

		Data extraction facility not available in present scheme.	change of complete Bus Bar Panel is needed for Proper Data Extraction and Fault Analysis
08	Bihta new	Alstom make Bus Bar Protection scheme available. Not in service since 28.08.21 due to repeated operation of Y phase Bus Bar Relay. Matter communicated to OEM for rectification of Y phase relay.	Defective relay needs to be replaced to take the Bus Bar Protection system in service
09	Pusauli	ERL make numerical type Bus Bar Protection panel available, but out of service due to mal operation just after commissioning of the GSS.	As it is not working properly since its commissioning in 2015, thorough inspection from OEM is needed.
10	Gopalganj	• As reported, Bus Bar Protection panel was not working properly after its commissioning in 2005. • Easun make **Digital type** Bus Bar Panel available but out of service. Fault Data extraction facility not available.	Retrofitting with Numerical type Bus Bar Relay or change of complete Bus Bar Panel is needed for Proper Data Extraction and Fault Analysis
11	Hajipur	• ABB make **Electromechanical type** Bus Bar panel available but out of service since 03 nos. GSS Bays of BGCL commissioned in same switchyard in 2016. • Fault Data extraction facility not available in present scheme.	Retrofitting with Numerical type Bus Bar Relay or change of complete Bus Bar Panel is needed for Proper Data Extraction and Fault Analysis
12	Darbhanga	• As reported, Bus Bar Protection Panel was not working properly after its commissioning in 2006. • Easun make **Digital type** Bus Bar Panel available but out of service. Fault Data extraction facility not available.	Retrofitting with Numerical type Bus Bar Relay or change of complete Bus Bar Panel is needed for Proper Data Extraction and Fault Analysis
13	Sonenagar NEW	Working	Bus Bar Protection testing done in July 2021 for integration of 220/132 kV 160 MVA ICT.
14	Motipur	Working	
15	Musahari	Working	

16	Khagaria new	Working	Bus Bar Protection testing done on 18/01/22 for integration of 220kV Saharsa New (PGCIL) d/c bays
17	Kisanganj new	Working	Bus Bar Protection testing done on 05/03/22 for integration of 220kV Thakurganj (u/c) d/c bays
18	Madhepura	Not Working	• Existing Bus Bar scheme has 04 nos. of bays. • 06 nos. of bays not integrated. • Electromechanical type Bus Bar scheme, fault Data extraction facility not available.
19	Laukahi	Working	

Present Status of Busbar Protection for 220 KV System of OPTCL					
Name of Substation	**Relay Make**	**Relay Model**	**Numerical/Static**	**Busbar Status**	**Remarks**
400/220/132/33 KV Mendhasal	SIEMENS	7SS5231-5CA01-0AA1/HH	Numerical	Healthy	
220/132/33 KV Atri	ALSTOM	BCU-P40 AGILE,P743; MCU-P40 AGILE,P741	Numerical	Healthy	
220/132/33 KV Chandaka-B	SIEMENS	MICOM P741	Numerical	Healthy	
220/132/33kV Goda	GE	B-90	Numerical	Healthy	
220/132/33 KV Balasore	SIEMENS	SIPROTEC 7SS52	Numerical	Healthy	
400/220/33 KV New Duburi	SIEMENS	SIPROTEC 7SS52	Numerical	Healthy	
220/132/33 KV Duburi Old	SIEMENS	SIPROTEC 7SS52	Numerical	Healthy	
220/132/33 KV Joda	SIEMENS	SIPROTEC 7SS52	Numerical	Healthy	
220/132/33 KV Kesinga	SCHNEIDER	MCU-MICOM P741;BCU-MICOM P43	Numerical	Healthy	
220/132/33 KV Jayapatna	GE	B90 Multiline	Numerical	Healthy	
220/132/33 KV Bhanjanagar	SIEMENS	SIPROTEC 7SS52	Numerical	Healthy	
220/132/33 KV Aska New	ALSTOM	MVAJM	Numerical	Healthy	
220/132/33 KV Bargarh New	GE	B90 Multiline	Numerical	Healthy	
220/132/33 KV Nayagarh					Not Available. New Numerical Relay will be commissioned.
220/132/33 KV Samangara	SIEMENS	SIPROTEC 7SS52	Numerical	Unhealthy	01no. Bay Unit (Bus Coupler) is defective. 220kV power supply is not available due to breakdown of D/C Lines during cyclone.
220/132/33 KV Chandaka	SIEMENS	SIPROTEC 7SS52	Numerical	Unhealthy	02nos. Bay Units are defective. M/s SIEMENS is not responding to the call.
220/132/33 KV Cuttack	SIEMENS	SIPROTEC 7SS5251	Numerical	Unhealthy	01no. Bay Unit is defective & sent to SIEMENS Factory for repair.
220/132/33 KV Bidanasi	SIEMENS	SIPROTEC 7SS52	Numerical	Unhealthy	02nos. Bay Units are defective. M/s SIEMENS has been contacted for rectification.
220/132/33 KV Paradeep	ALSTOM	BCU-P40 AGILE,P743; MCU-P40 AGILE,P741	Numerical	Not Commissioned	Will be commissioned during ongoing SAS Project.
220/33 KV Rengali	ER	B3, B24H2	Electromagnetic	Defunct	To be replaced by Numerical Relay
400/220/132/33 KV Meramundali	SIEMENS	SIPROTEC 7SS52	Numerical	Unhealthy	Central Unit & 01no. Bay Unit are defective.M/s SIEMENS has been contacted for rectification.
220/132/33 KV Bhadrak	AREVA	P141	Numerical	Defunct	To be replaced by Numerical Relay.
220/132/33 KV Bolangir New	ABB	REB500	Numerical	Not Commissioned	To be replaced by Numerical Relay of new version.
220/132/33 KV Narendrapur	SIEMENS	SIPROTEC 7SS52	Numerical	Unhealthy	01no. Bay Unit is defective.M/s SIEMENS has been contacted for rectification.

Name of Substation	Relay Make	Relay Model	Numerical/Static	Busbar Status	Remarks
400/220/132/33 KV Lapanga	SIEMENS	SIPROTEC 7SS52	Numerical	Not Commissioned	Will be Commissioned after procurement of CT Primary links for higher CT Ratio.
220/132/33 KV Katapalli	ABB	REB500	Numerical	Not Commissioned	To be replaced by Numerical Relay of new version.
220/132/33 KV Budhipadar	SIEMENS	SIPROTEC 7SS52	Numerical	Unhealthy	03nos. Bay Units are defective.M/s SIEMENS has been contacted for rectification.
220/132 KV Tarkera	SIEMENS	SIPROTEC 7SS52	Numerical	Unhealthy	03nos. Bay Units are defective.M/s SIEMENS has been contacted for rectification.
220/132/33 KV Jayanagar	SIEMENS	SIPROTEC 7SS52	Numerical	Unhealthy	01no. Bay Unit is defective.M/s SIEMENS has been contacted for rectification.
220/132/33 KV Therubali	SIEMENS	SIPROTEC 7SS52	Numerical	Unhealthy	03nos. Bay Units are defective.M/s SIEMENS has been contacted for rectification.
220/33 KV Infocity-2	SIEMENS	SIPROTEC 7SS54	Numerical	Healthy	
220/33 KV Narsinghpur	GE	B90 Multiline	Numerical	Healthy	
220/33 KV Ranki/ Keonjhar	TOSHIBA	GRB200	Numerical	Healthy	
220/33 KV Barkote	ALSTOM	FAC34RF111B	Electromechanical	Not Commissioned	To be replaced by Numerical Relay of new version.
220/33 KV Bonai	GE	B30 Multiline	Numerical	Not Commissioned	To be replaced by Numerical Relay of new version.
220/33 KV Malkangiri	SIEMENS	SIPROTEC 7SS52	Numerical	Healthy	
220/33 KV Balimela	ABB	SPAE 010	Static	Defunct	To be replaced by Numerical Relay of new version.
220/33 KV Kashipur	GE	B90 Multiline	Numerical	Unhealthy	Central Unit & 01no. Bay Unit are defective.M/s GE has been contacted for rectification.
220/33 KV Laxmipur	SCHNEIDER	MICOM P741	Numerical	Unhealthy	01no. Communication Cable of Bay Unit is defective.

Present Status of Busbar Protection for 220 KV System (JUSNL)

Name of Substation	Relay Make	Relay Model	Numerical/Static	Busbar Status	Remarks
220/132KV Hatia-II GSS	Siemens	SIPROTEC 7SS525	Numerical	Working	
220/132/33 KV Burmu (Ratu) GSS	ABB	REB670	Numerical	Working	
220/132KV Dumka-II (Madanpur) GSS	Schendier (MiCOM)	MiCOM P743(Bay Unit) MiCOMP741(Central Unit)	Numerical	Working	
220/132/33 KV Godda GSS	ZIV	Central Unit-DBC Bay Unit-DBP	Numerical	Working	
220/132/33 KV Jasidih GSS	ZIV	Central Unit-DBC Bay Unit-DBP	Numerical	Working	
220/132/33 KV Giridih GSS	Siemens	SIPROTEC 7SS85	Numerical	Working	
220/132/33 KV Lalmatia GSS	N/A				Single main bus With transfer bus
220/132 KV Chandil GSS	N/A				Single main bus With transfer bus
220/132KV Ramchanderpur GSS	GE	Multilin B90	Numerical	Working	Spurious operation of busbar protection was observed in recent past. The scheme requires detail checking.
220/132KV Chaibasa-II GSS (Ulijhari)	Schendier (MiCOM)	MiCOM P743(Bay Unit) MiCOM P741(Central Unit)	Numerical	Working	During 3rd party protection audit, busbar protection is found to be not in operation due to issue in peripheral unit.
220/132KV Bhagodih (Garhwa New) GSS	ZIV	Central Unit-DBC Bay Unit-DBP	Numerical	Working	
220/132/33 KV PTPS Switchyard	N/A				All the 220KV Bays will be shifted to 400/220KV PTPS_New GSS
220/132/33 KV Govidpur GSS	ZIV	Central Unit-DBC Bay Unit-DBP	Numerical	Working	
220/132/33 KV Itakhori GSS	ZIV	Central Unit-DBC Bay Unit-DBP	Numerical	Working	

Present Busbar Protection Status of 220 KV System under WBSETCL

Name of Substation	Relay Make	Type	Numerical/Static	Status	Remarks
Alipurduyar 220 KV	Siemens	7SS52	Numerical	Functional	
New Jalpaiguri 220 KV	Abb	RADSS	Static	Functional	
Dalkhola 220 KV	Abb	RADHA	Static	Functional	
Gazole 220 KV	Siemens	7SS85	Numerical	Functional	
Gokarna 400 KV	Abb	REB670	Numerical	Static relay replacing by Numerical	Expected to be put into service with in May-22
Rejinagar 220 KV	Alstom	Micom P741/743	Numerical	Functional	
Sagardighi 220 KV	ZIV	DBC/DBP	Numerical	Functional	
Jeerat 400 KV	Abb	REB670	Numerical	Functional	
Dharampur 220 KV	Alstom	Micom P746	Numerical	Functional	
Krishnanagar 220 KV	Areva	FAC34	Static	Functional	
Kasba 220 KV	Abb	REB670	Numerical	Functional	
KLC 220 KV	Abb	REB670	Numerical	Functional	
NewTown 220 KV	Abb	RADHA	Static	Functional	
Barasat 220 KV	Siemens	7SS85	Numerical	Functional	
Subhasgram 220 KV	Areva	FAC34	Static	Functional	
Laxmikantapur 220 KV	Abb	REB670	Numerical	Functional	
New Haldia 220 KV	Abb	RADHA	Static	Functional	
Domjur 220 KV	Abb	RADHA	Static	Functional	
Foundry Park 220 KV	Siemens	7SS52	Numerical	Functional	
Howrah 220 KV	Areva	FAC34	Static	Functional	
Rishra 220 KV	Abb	RADHA	Static	Functional	
Chanditala 400 KV	Alstom	Micom P741/743	Numerical	Functional	
Midnapore 220 KV	Abb	RADHA	Static	Functional	
Kharagpur 400 KV	Alstom	Micom P741/743	Numerical	Functional	
Vidyasagar Park 220 KV	Alstom	MFAC34	Static	Functional	
Egra 220 KV	Siemens	7SS85	Numerical	Functional	
New Bishnupur 220 KV	Abb	REB670	Numerical	Functional	
Arambag 400 KV	Abb	REB670	Numerical	Work in progress	Expected to be put into service with in April--22
Satgachia 220 KV	Abb	REB670	Numerical	Static relay replacing by Numerical	Expected to be put into service with in May-22
Durgapur 220 KV	Abb	REB670	Numerical	Functional	
Sadaipur 220 KV	Abb	REB670	Numerical	Functional	
Asansol 220 KV	Abb	RADHA	Static	Functional	
Hura 220 KV	Siemens	7SS52	Numerical	Functional	

Annexure C.2.1

Present Status of Busbar Protection for 220 KV System of OPTCLAs on 31.10.2022					
Name of Substation	**Relay Make**	**Relay Model**	**Numerical/Static**	**Busbar Status**	**Remarks**
400/220/132/33 KV Mendhasal	SIEMENS	7SS5231-5CA01-0AA1/HH	Numerical	Healthy	
220/132/33 KV Atri	ALSTOM	BCU-P40 AGILE,P743; MCU-P40 AGILE,P741	Numerical	Healthy	
220/132/33 KV Chandaka-B	SIEMENS	MICOM P741	Numerical	Healthy	
220/132/33kV Goda	GE	B-90	Numerical	Healthy	
220/132/33 KV Balasore	SIEMENS	SIPROTEC 7SS52	Numerical	Healthy	
400/220/33 KV New Duburi	SIEMENS	SIPROTEC 7SS52	Numerical	Healthy	
220/132/33 KV Duburi Old	SIEMENS	SIPROTEC 7SS52	Numerical	Healthy	
220/132/33 KV Joda	SIEMENS	SIPROTEC 7SS52	Numerical	Healthy	
220/132/33 KV Kesinga	SCHNEIDER	MCU-MICOM P741;BCU-MICOM P43	Numerical	Healthy	
220/132/33 KV Jayapatna	GE	B90 Multiline	Numerical	Healthy	
220/132/33 KV Bhanjanagar	SIEMENS	SIPROTEC 7SS52	Numerical	Healthy	
220/132/33 KV Aska New	ALSTOM	MVAJM	Numerical	Healthy	
220/132/33 KV Bargarh New	GE	B90 Multiline	Numerical	Healthy	
220/132/33 KV Nayagarh					New Numerical Relay will be commissioned during ongoing SAS Project.

220/132/33 KV Samangara	SIEMENS	SIPROTEC 7SS52	Numerical	Unhealthy	01no. Bay Unit (Bus Coupler) is defective. 220kV power supply is not available due to breakdown of D/C Lines during cyclone.
220/132/33 KV Chandaka	SIEMENS	SIPROTEC 7SS52	Numerical	Healthy	
220/132/33 KV Cuttack	SIEMENS	SIPROTEC 7SS5251	Numerical	Healthy	
220/132/33 KV Bidanasi	SIEMENS	SIPROTEC 7SS52	Numerical	Healthy	
220/132/33 KV Paradeep	ALSTOM	BCU-P40 AGILE,P743; MCU-P40 AGILE,P741	Numerical	Not Commissioned	Will be commissioned during ongoing SAS Project.
220/33 KV Rengali	ER	B3, B24H2	Electromagnetic	Defunct	To be replaced by Numerical Relay
400/220/132/33 KV Meramundali	SIEMENS	SIPROTEC 7SS52	Numerical	Unhealthy	Central Unit & 01no. Bay Unit are defective.M/s SIEMENS has been contacted for rectification.
220/132/33 KV Bhadrak	AREVA	P141	Numerical	Defunct	To be replaced by Numerical Relay.
220/132/33 KV Bolangir New	ABB	REB500	Numerical	Not Commissioned	New Numerical Relay will be commissioned during ongoing SAS Project.
220/132/33 KV Narendrapur	SIEMENS	SIPROTEC 7SS52	Numerical	Healthy	
400/220/132/33 KV Lapanga	SIEMENS	SIPROTEC 7SS52	Numerical	Not Commissioned	Will be Commissioned after procurement of CT Primary links for higher CT Ratio.
220/132/33 KV Katapalli	ABB	REB500	Numerical	Not Commissioned	New Numerical Relay will be commissioned during ongoing SAS Project.

220/132/33 KV Budhipadar	SIEMENS	SIPROTEC 7SS52	Numerical	Healthy	
220/132 KV Tarkera	SIEMENS	SIPROTEC 7SS52	Numerical	Healthy	
220/132/33 KV Jayanagar	SIEMENS	SIPROTEC 7SS52	Numerical	Healthy	
220/132/33 KV Therubali	SIEMENS	SIPROTEC 7SS52	Numerical	Healthy	
220/33 KV Infocity-2	SIEMENS	SIPROTEC 7SS54	Numerical	Healthy	
220/33 KV Narsinghpur	GE	B90 Multiline	Numerical	Healthy	
220/33 KV Ranki/ Keonjhar	TOSHIBA	GRB200	Numerical	Healthy	
220/33 KV Barkote	ALSTOM	FAC34RF111B	Electromechanical	Not Commissioned	To be replaced by Numerical Relay of new version.
220/33 KV Bonai	GE	B30 Multiline	Numerical	Not Commissioned	To be replaced by Numerical Relay of new version.
220/33 KV Malkangiri	SIEMENS	SIPROTEC 7SS52	Numerical	Healthy	
220/33 KV Balimela	ABB	SPAE 010	Static	Defunct	To be replaced by Numerical Relay of new version.
220/33 KV Kashipur	GE	B90 Multiline	Numerical	Unhealthy	Central Unit & 01no. Bay Unit are defective.M/s GE has been contacted for rectification.
220/33 KV Laxmipur	SCHNEIDER	MICOM P741	Numerical	Healthy	

ANNEXURE-C.4

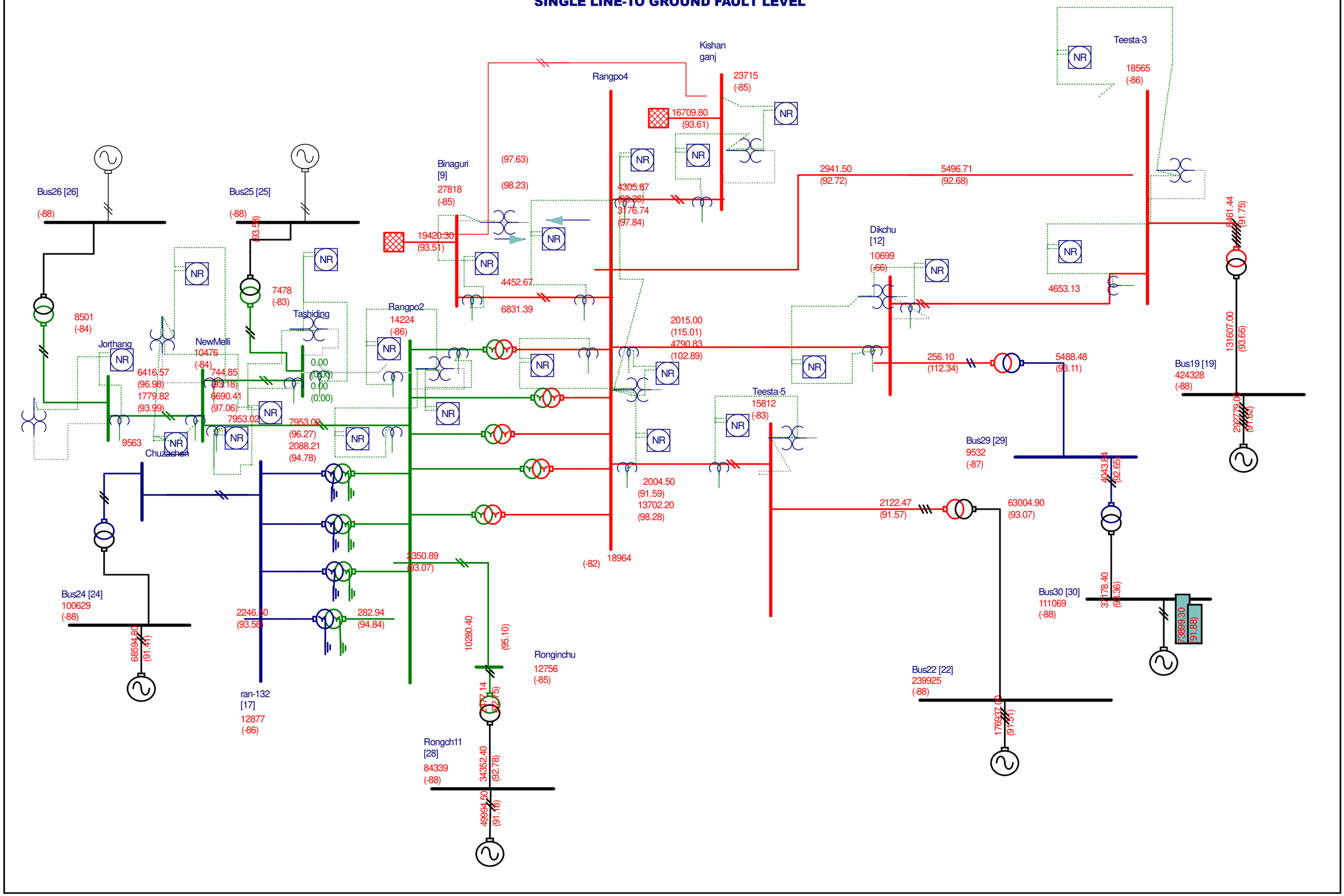
Sl No.	Name of the incidence	PCC Recommendation	Latest status
118th PCC Meeting			
1.	Disturbance at 220 kV Burmu(JUSNL) S/S on 01.08.2022 at 11:56 Hrs	PCC advised JUSNL that the carrier protection scheme may be checked and end to end testing shall be carried out to test the healthiness of PLCC/carrier communication for the line. JUSNL was advised to review the time setting of backup overcurrent relay of both the ICTs and coordinate the same to avoid unwanted tripping of the transformer for faults at lower voltage level.	*JUSNL representative informed that Powergrid has been communicated to revise the hiigh set timer settings from 50 ms to 100 ms. The settings would be revised when ICT will be put into service.*
2.	Disturbance at 400 kV Dikchu S/s on 10.08.2022 at 11:57 Hrs	PCC advised Dikchu HEP to expedite the visit of relay engineer and resolve the issue by Sep-22. PCC also raised serious concern about long outage of the main bus-2 of Dikchu HEP and advised DIkchu HEP to continuously take up with the vendor for supply of the breaker at the earliest. Further, Dikchu HEP was advised to submit a firm time-line for restoration of the main bus-2 which would be monitored in PCC meeting.	*Dikchu HEP representative informed that breaker will be supplied by end of Nov 2022 and main Bus-2 will be restored by Dec 2022.* *He further added that relay engineer will visit site within a week to resolve the autorecloser issue.*
117th PCC Meeting			
3.	Total Power failure at 220 kV Joda (OPTCL) S/s on 27.07.2022 at 11:30 Hrs	OPTCL representative replied that they would take necessary action for implementing autorecloser without PLCC at TTPS end. Further he informed that OPGW for the above line has been commissioned and after completion of DTPC commissioning work, the A/R scheme with OPGW communication would be implemented subsequently.	OPTCL updated that their team would visit to TTPS S/s within a week. Further they are coordinating with NTPC for early implementation of A/R without PLCC in 220 kV Joda-TTPS line. No update in 119th PCC Meeting.
116th PCC Meeting			

4.	Total Power failure at 220 kV Chatra(JUSNL) S/s on 17.06.2022 at 11:36 Hrs	PCC advised JUSNL to share PUTT scheme implemented at Chatra end to ERPC/ERLDC for review. PCC further advised JUSNL to ensure implementation of weak infeed protection at Chatra end with a delay of 50 ms for current reversal guard timer for 220 kV Daltonganj-Chatra D/C line. JUSNL was also advised to configure the disturbance recorders at Chatra end as per the guidelines approved by PCC. In 118th PCC, JUSNL representative updated that the work could not be completed due to non-availability of relay engineer. PCC advised JUSNL CRITL team to visit the Chatra Station and try to resolve the issue by their in-house team.	*In 119th PCC, JUSNL representative informed that relay settings were revised on 30/09/2022 and disturbance recorders were also configured at Chatra end on 30/09/2022.*
113th PCC Meeting			
5.	Disturbance at 220 kV Tenughat (TVNL) S/S On 24.03.2022 at 21:37 hrs	PCC advised JUSNL to complete the A/R testing for 220 kV Tenughat-Govindpur line and put the autorecloser in service at the earliest. In 114th PCC, JUSNL representative updated that analog card failure was found in PLCC panel. New card is already received at site. The card would be replaced when service engineer visits the site.	*JUSNL representative informed that PLCC issue had been rectified.*

Annexure C.5

SIKKIM NETWORK

SINGLE LINE-TO GROUND FAULT LEVEL



Line	Relay Connected at	CT Ratio in A	Fault Location	Fault Current seen by the Relay	Existing			Proposed			
					Ie> in A (Primary)	TMS	Top in sec	Ie> in A (Primary)	TMS	Top in sec	TMS (correct)
Binaguri-Rangpo	Rangpo end	2000/1	Binaguri	4453	200	0.568	1.241985	400	0.564	1.6	0.56
Binaguri-Rangpo	Binaguri end	2000/1	Rangpo	6831	200	0.638	1.220696	400	0.667	1.6	0.67
Kishangunj-Rangpo	Rangpo end	3000/1	Kishangunj	3177	1200	0.514	3.65964	600	0.387	1.6	0.39
Kishangunj-Rangpo	Kishangunj end	3000/1	Rangpo	4306	400	0.28	0.805367	600	0.459	1.6	0.46
Rangpo- Dikchu	Rangpo end	3000/1	Dikchu	4791	200	0.61	1.302136	600	0.333	1.1	0.33
Rangpo- Dikchu	Dikchu end	3000/1	Rangpo	2015	600	1.5 (DT)	1.5	600	0.21	1.2	0.21
Rangpo- TeesthaV	Rangpo end	2000/1	Teestha V	13702	200	0.6	0.952209	400	0.575	1.1	0.58
Rangpo- TeesthaV	TeesthaV end	2000/1	Rangpo	2005	-	-		400	0.281	1.2	0.28
Rangpo-Teestha III	Rangpo end	3000/1	Teestha III	5497	1200	0.28	1.268379	600	0.356	1.1	0.4
Rangpo-Teestha III	Teestha III end	2000/1	Rangpo	2942	-	-		400	0.349	1.2	0.35
Dikchu-Teestha III	Dickchu end	3000/1	Teestha III	4653	400	1.5 (DT)	1.5	600	0.358	1.2	0.36
Dikchu-Teestha III	Teestha III end	3000/1	Dikchu	5832	-	-		600	0.399	1.2	0.40
Rangpo 220Kv Bus											
Rangpo- Newmelli	Rangpo end	1600/1	Newmelli	7953	320	0.399	0.841655	320	0.427	0.9	0.43
Rangpo- Newmelli	Newmelli end	1600/1	Rangpo	2088	320	0.33	1.208623	320	0.246	0.9	0.25

Tasheding-Newmelli	Tasheding end	800/1	Newmelli	745	160	0.24	1.075464	160	0.223	1	0.22
Tasheding-Newmelli	Newmelli end	1600/1	Tasheding	6690	320	0.314	0.701258	320	0.403	0.9	0.40
Newmelli-Jorethang	Newmelli end	400/1	Jorethang	6417	-	0.473		80	0.589	0.9	0.59
Newmelli-Jorethang	Jorethang end	400/1	Newmelli	1780	300	0.09	0.347553	300	0.155	0.6	0.16
Rangpo - Ronginchu	Rangpo end	1600/1	Ronginchu	10280	208	0.52	0.897307	208	0.522	0.9	0.52
Rangpo - Ronginchu	Ronginchu end	400/1	Rangpo	2351	60	0.5 (DT)	0.5	80	0.500	1	0.50

This is the condition by taking peak generation at all individual substation

Protection Audit Recommendations for the Stations audited protection audit team of ERPC				
Sl No.	**Name of Substation**	**Owner**	**Date of Audit**	**Remarks/Recommendation**
1	765/400 kV Sundergarh S/s	Powergrid	25.04.2022	1.Switchyard equipments are in good and healthy condition. Switchyard area as well as overall station is well maintained.
				2.Provision for nameplate with bay/line name may be done in front of SPR(Kiosk) in switchyard for easy identification.
2	400/220/132 kV Lapanga(OPTCL) S/s	OPTCL	26.04.2022	1.Event logger is not available for 220 kV System. The same shall be provided.
				2.Time synchronising equipment is not available for 220 kV system.
				3.Busbar/LBB protection is not available for 220 kV system . The same shall be commissioned at the earliest.
				4.Autorecloser is implemented without PLCC for all the 220 kV feeders. It was informed that OPGW for these lines are under commissioning.
				5.OPGW/DTPC commissioning may be expedited and thereafter carrier based autorecloser as well as intertripping scheme may be implemented for 220 kV lines.
				6.For 220 kV control room housing the relay panels, air conditioning shall be provided for proper functioning of protection system panels & to prevent failure of numerical protection systems.
				7.Zone settings(zone-2, zone-3 & zone-4) in distance protection relay may be reviewed for all the 400 & 220 kV lines in line with the ERPC Protection philosophy.
				8.Group protection for 400 kV Lapanga-Meramundali line may be enabled and two group settings may be kept in the relay. One group considering 400 kV M'mundali-Bolangir in service and another group setting when 400 kV M'mundali-Bolangir is not in service. Group to be selected as per the actual configuration.
				9.Autorecloser in 400 kV Lapanga-Meramundali line is having some issue. The same may be rectified.
				10.Power swing blocking enabled for all zones. It may reviewed and blocking may be done all the zones except zone-1.
				11.Grading in terms of time/voltage setting shall be done in Overvoltage settings of 400 kV lines.
3	220/132 kV Budhipadar(OPTCL) S/s	OPTCL	26.04.2022	1. Time synchronising equipment in substation control room is not working. The same may be rectified & put into service.
				2.Main-I relay of 220 kV Budhipadar-Lapanga-I feeder and main-2 relay of 220 kV Budhipadar-SMC feeder was found to be defective and not in operation. Defective relay shall be changed with spare/new relay immediately.

				3.Main-1 relay of following fedders are of static type. 220 kV Budhipadar-IB TPS line, 220 kV Budhipadar-Tarkera D/c line, 220 kV Budhipadar-Raigarh PG. All Electro Static Relays may be replaced with latest version of Numerical relays for quick and accurate analysis of Trippings.
				4.DC earth leakage were found in both DC-I & II sources. The same may be attended. Continous monitoring of dc earth leakage measurements to be done.
				5.PLCC is not in service for most of the lines. Autorecloser w/o PLCC is implemented for some of the feeders like 220 kV Tarkara D/C, 220 kV Lapanga D/C feeder. For rest of the feeders auto recloser was not in service.
				It was informed that OPGW for these lines are under commissioning. OPGW/DTPC commissioning may be expedited and thereafter carrier based autorecloser as well as intertripping scheme shall be implemented for 220 kV lines.
				6.For 220 kV Budhipadar-Korba-1 &2, the PLCC is not working and found to be out of service since long. Being inter-regional line, matter may be taken up with appropriate authority for restoring the PLCC communication in the line. Alternatively, It is suggested that carrier communication through OPGW network may be planned & implemented.
				7.Zone settings for all 220 kV lines need to be reviewed in line ith ERPC Protection Philosophy & considering the present network configuration at the remote end substations.
				8.Busbar protection is available for a single bus only. For other bus, it is out of service due to defective bay units. It is advised to restore the busbar protection for the second bus at the earliest. Similarily zone-4 settings of feeders corresponding to the bus for which busbar is out of service may be reduced to 250 msec.
				9. Oil leakages was observed in 220/132 kV Auto-I. Action may be taken to address the same.
				10.Vegetation shall be cleared & proper PCC and gravelling should be done in the switchyard.
				General:
				1. Uniform protection philosophy may be adopted across OPTCL network
				2. Protection co-ordination to be done as and when there is change in network configuration or commissioning of new lines
				3. O/V voltage/time gradation to be done for S/s level
				4. Periodic internal review of implemented protection settings
4	220 kV IB TPS	OPGC	27.04.2022	1. Event logger is not available for 220 kV system. The same shall be provided.
				2. Zone-2 tmer setting may be reviewed considering the shortest line at remote end(budhipadar) for all 220 kV lines

				3. Zone-4 reach and time delay may be reviewed for all 220 kV lines
				4. Zone-3 time delay may be reviewed as it is encroaching next voltage level (220 kV Lines)
				5. PLCC not operational for all four 220 kV feeders. It was informed that OPGW/DTPC based communication system will be commissioned in near future.
				6. OPGW/DTPC commissioning may be expedited and thereafter carrier based autorecloser as well as intertripping scheme may be implemented for 220 kV lines.
				7. Busbar relay is of static type. It was informed that renovation & upgradation of 220 kV switchyard is under proposal stage.
5	400 kV OPGC S/s	OPGC	27.04.2022	1. At 400 kV level, it was found the both main-1 & main-2 relays of outgoing transmission lines are of same make & model employing different characteristic. It is recommended that different make & model for main-1 &2 relay is preferable and same may be implemented.
				2. Overvoltage setting for the lines need to be reviewed. Time grading / voltage grading may be done in the overvoltage settings for different lines/for overall substation
				3. DR time window may be increased. DR configuration may be done in line with guidelines approved in ERPC PCC meeting.
				4. Overcurrent protection in 400 kV lines may be disabled.
				5. Provision for sending DT signal to other end during operation of DEF protection may be implemented.
				6. Line length for 400 kV OPGC-Lapanga line may be verfied in consultation with OPTCL.
				7. Zone-2 & Zone-3 settings of all 400 kV lines need to be reviewed and set as per the ERPC Protection philosophy.
				8. Adjacent shortest and longest line length maybe verified and zone settings maybe implemented accordingly
				9. Power swing block enabled for all zones. May be reviewed
6	765 kV Darlipali(NTPC) S/s	NTPC	28.04.2022	1. Time grading to be done in stage-I overvoltage settings for 765 kV Darlipalli-Jharsuguda D/c line.
				2. Power Swing blocking enabled for all zones. May be reviewed.
				3. Relay setting data is not available in Protection database of ERPC. The same may be updated at the earliest.

Annexure C.6.2

Annexure-A

Protection Audit Recommendations for the Stations audited by protection audit team of ERPC

Sl No.	Name of Substation	Owner	Date of Audit	Remarks/Recommendation
1	400/220 kV Jamshedpur S/s	Powergrid	20.07.2022	1.Time synchronization for some of the relays are not as per the GPS clock. The same may be rectified.
				2.Zone-2 timer setting for all 400 kV lines is set to 500 msec. The same may be reviewed in line with ERPC Protection guidelines.
				3. TMS value of backup overcurrent IDMT relay is different for three ICTs whereas the pickup value is same for all the ICTs. Similarly TMS of backup earthfault relay for ICT-1 & ICT-2 is different than ICT-3. It is recommended to set TMS value for overcurrent relay as well as backup E/F relays uniform among all three ICTs.
2	400/220 kV Chaibasa S/s	Powergrid	21.07.2022	1.Switchyard equipments are in good and healthy condition. Switchyard area as well as overall station is well maintained.
				2.Though Overvoltage stage 1 settings are graded in time or voltage magnitude between the two ckts of Rourkella or Chaibasa or jamshedpur ,they are not so clearly graded as whole(Rourkella 1 and Jamshedpur 1 having identical settings).This part may be reviewed and the shorter line may be made to have higher magnitude or time value relative to the longer lines. No two 400 KV line should have exactly same settings in voltage triggering value or time delay.

3	220/132 kV Chandil(JUSNL) S/s	JUSNL	20.07.2022	**General:**
				1. Uniform protection philosophy shall be adopted across JUSNL network in line with ERPC Protection philosophy.
				2. Protection co-ordination to be done as and when there is change in network configuration or commissioning of new lines.
				3. Review of implemented protection settings need to be carried out periodically for JUSNL system..
				4.Measures shall be taken to ensure healthiness of busbar/LBB protection relay & PLCC system in the substation.
				1. Time synchronising equipment in substation is not available.
				2.For 220 kV Ranchi Feeder, only main-I protection relay is present along with separate back-up overcurrent relay. Main-2 protection relay shall be installed for this line.
				3. Peak load served by the station is 240 MVA,however three out of four 100 MVA 220/132 KV ATR are functional. 4th ATR is out since 30.4.2020 and replacement status is not available.N-1 relibility criteria is being not satisfied during peak condition. Steps may be taken at the earliest to bring 4th ATR into service.
				4.Oil leakage found in ATR-1. However due to high demand, the shutdown is not being allowed and the issue can not be attended. The same may be looked into urgently.
				5.220 kV is having sing main & transfer bus scheme. As intimated by S/s incharge, proposal for bus sectionalizer in 220 kV bus is under consideration.
				6.Busbar/LBB protection is not available.
				7.Zone 4 delay time for all 220 kV lines is 300 ms.it may be made 250 ms as Bus bar protection is not commissioned.
				8.Disturbance recorders shall be configured as per the DR standard guidelines of ERPC.
				9. For Santaldih ckt, zone 2 reach has been setting has been done as 18.97 Ω which seems to be on the higher as it is appearing to be 120% of line length + 50% of Shortest adjacent line. As per ERPC guideline, the same for 220 KV line should be either 120% of line length or (100% of length+ 50% of shortest adjacent line).
				10.For Ramchandrapur line, zone 3 value is 23.87 Ω. However, this value is encroaching the 2x150 MVA 220/132 KV ATR impedance in Ramchandrapur as seen from chandil,so the time delay of zone 3 may be suitably reviewed and coordinated with fault clearing time of the said ATR.
				11.Only one DC battery source is found in service while other is in spare and not in service simultaneously. For 220 KV, Two separate Dc sources are recommended feeding to main 1 and main 2 relays with separate trip coils as per CEA construction standards.
				12.Power swing block is enabled for all the zones in 220 kV lines. It is recommended to block zone 2 and above with unblocking time of 2 seconds
				13.REF protection for ATRs is not available in all but one. For one ATR, though REF protection is avaialble, REF has been kept disabled after it maloperated during through faults. It is advised to implement REF protection for all the transformers.
				14.DC earth leakage was found. Battery connectors were found to have oxidized etching marks. Action may be taken to rectify the above issue.
				15.PLCC channels are not healthy for Ranchi line.For Sanataldih circuit, the autorecloser dead time setting may be checked and set to 1 sec.
				16.Bus CVT is being used for distance protection relay of 220 kV feeders. Provision for line CVT in 220 kV Feeders may be envisaged and implemented.
				17.PCC & Gravelling may be done for complete area of 220 kV Switchyard.
				18.LA counter is missing in ATR-2. The same may be provided.
				19.Zone settings for all 220 kV lines need to be reviewed in line ith ERPC Protection Philosophy & considering the present network configuration at the remote end substations.

4	220 kV Ramchandrapur	JUSNL	21.07.2022	1. Bus 2 PT is not in service. Only bus 1 PT is present and it is being used in distance relay for covering short line section between the 220 KV side 400/220 KV Jamshedpur ICT terminals to 220 KV Ramchandrapur bus .Bus-2 PT may be replaced at the earliest.
				2.Requirement of distance protection on RCP end for the line section of 220 kV RCP-Jamshedpur(PG) may be reviewed. In case distance protection remain in operation, provision for line CVT may be envisaged where distance protection is in service.
				3.Only one DC battery source is found in service while other is in spare and not in service simultaneously. For 220 KV level, Two separate Dc sources are recommended feeding to main 1 and main 2 relays with separate trip coils as per CEA construction standards. Necessary action may be taken to operate two sources in parallel.
				4.DR is not GPS time synchronised. The same may be rectified.
				5. DR time window may be increased. DR configuration may be done in line with guidelines approved in ERPC PCC meeting.
				6.Busbar relay panel is placed in old control room without Air Conditioning.Action may be taken to place the busbar panel in a AC room.
				7.Zone settings for chandil line shall be reviewed in line with ERPC protection philosophy.
				8. Zone-2 & zone-3 reach setting may be reviewed for Chaibasa fedder
				9.Zone-3 setting may be reviewed for 220 kV RCP-Joda feeder.
				10. LBB relays are not for individual bay as a result LBB protection is not functional although busbar protection is in service. As per CEA grid connectivity regulation, LBB is mandatory for 220 kV S/s. Action may be taken to implement the same.
				11.Power swing block is enabled for all the zones in 220 kV lines. It is recommended to block zone 2 and above with unblocking time of 2 seconds
				12.Autoreclose scheme is implemented without PLCC . Dead time is seen to be 1.2 sec ,while recommendation is 1 sec. Reclaim time is 3 seconds while recommendation is 25 seconds.Above settings may be reviewed.
				13.PLCC is healthy only for 220 kV Chaibasa lines. For rest 220 kV feeders, steps may be taken to address the PLCC issue and put into service at the earliest.
				14.N-1 relaibility criteria is not being satisfied for 200/132 kV ATRs in both peak & off-peak period.Out of 3 ATRs available, one is out of service due to bushing failure since long wheras another transformer is being operated in very critical condition having heavy oil leakge. As per the reports submitted in S/s, the parametes w.r.t. transformer oil and bushing is not as per the standard. It is recommended that complete overhauling/replacement of ATR-2 may be done at the earliest. SImilarly action may be taken for bushing replacement for ATR-1 which is out of service since long.
				15.PCC & Gravelling may be done for transformer bays in 220 kV Switchyard.
				16.REF protection is not in service for both the 220/132kV transformers. The same may be implemented.

5	220 kV Chaibasa S/s	JUSNL	21.07.2022	1. Disturbance recorders are not time synchronised.
				2. DR time window may be increased. DR configuration may be done in line with guidelines approved in ERPC PCC meeting.
				3. Zone-2 reach setting & zone-3 timer setting for Ramchandrapur feeder shall be reviewed in line with ERPC protection philosophy.
				4. Overvoltage protection was seen to be enabled with stage 1 at 110%,5 sec delay. The same may be disabled or set to a higher value(greater than 112 %).
				5.For Ramchandrapur feeders, autorecloser is not in service for both the circuits due to issue in BCU panel. The issue may be looked into at the earliest.
				6. Zone-3 & Zone-4 reach setting to be reviewed for 220 kV Chaibasa-Chaibasa(PG) line.
				7. In 150 MVA 220/132 KV ATR, low set current pickup setting in backup O/C relay is 1048 A ,which is 260% of transformer rated current. This current pick up setting may be reviewed.
				8.The bus bar protection relay is not functional due to fibre communication error as shown in relay display. Being a imporatant protection in the substation, immediate measure shall be taken to rectify the issue and bring the busbar relay into service.
				9. Air conditioning is not working in the kiosks housing the relay panel for different bays. AC shall be provided for proper functioning of protection system panels & to prevent failure of numerical protection systems.
				10.It is seen in the switchyard that both bus side isolators of 220 KV Chaibasa Chaibasa ckt 2 and 220 KV Chaibasa Ramchandrapur ckt 1 are in closed condition. This may be immediately changed to a single bus only as whenever there is a bus fault in either of 220 KV bus,both lines will trip during fault clearance. Necessary modification may be made in wiring of bus bar relay and Peripheral units.
				11.DC earth leakage was observed in one of the DC sources. The same may be attended.
6	220 kV Jamshedpur S/s	DVC	22.07.2022	1.PLCC is not working for 220 kV JSD-Jindal line. Therefore autorecloser scheme is kept disabled for the line. PLCC panel is present at Jamshedpur end however there is no information of PLCC at JSPL end. The matter may be taken up with appropriate authority for commissioning PLCC in the line.
				2. Disturbance recorder configuration to be done as per DR standard guidelines by ERPC. CB close status(CB open shall be configured in DR instead of CB Close) to be rectified and DR window size to be increased in DR.
				3. Time synchronising equipment in substation control room is not working. The same may be rectified & put into service.
				4.DC earth leakage were found in both DC-I & II sources. The same may be attended. Continous monitoring of dc earth leakage measurements to be done.
				5.For JSPL circuit, Zone 2 reach is encroaching half of next shortest adjacent line,so time delay is seen to be 500 ms. Alternatively,reach may be reduced from 120% of length to line length plus 50% of SAL ,while time delay can be maintained at 350 msec. To be reviewed.
				6. Zone-2 reach setting for Bokaro line may be reviewed considering the shortest adjacent line as 220 kV BTPS-CTPS.
				7.As informed by S/s Incharge, in the LBB protection there is no provision of sending DT signal to other end of the line. The scheme may be reviewed and transmitting DT signal to other end in LBB protection may be incorporated.