Agenda
for
119th PCC Meeting

Date:18.10.2022
Eastern Regional Power Committee
14, Golf Club Road, Tollygunge
Kolkata: 700 033

EASTERN REGIONAL POWER COMMITTEE

AGENDA FOR 119th PROTECTION COORDINATION SUB-COMMITTEE MEETING TO BE HELD ON 18.10.2022 AT 11:00 HOURS AT ERPC, KOLKATA

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.

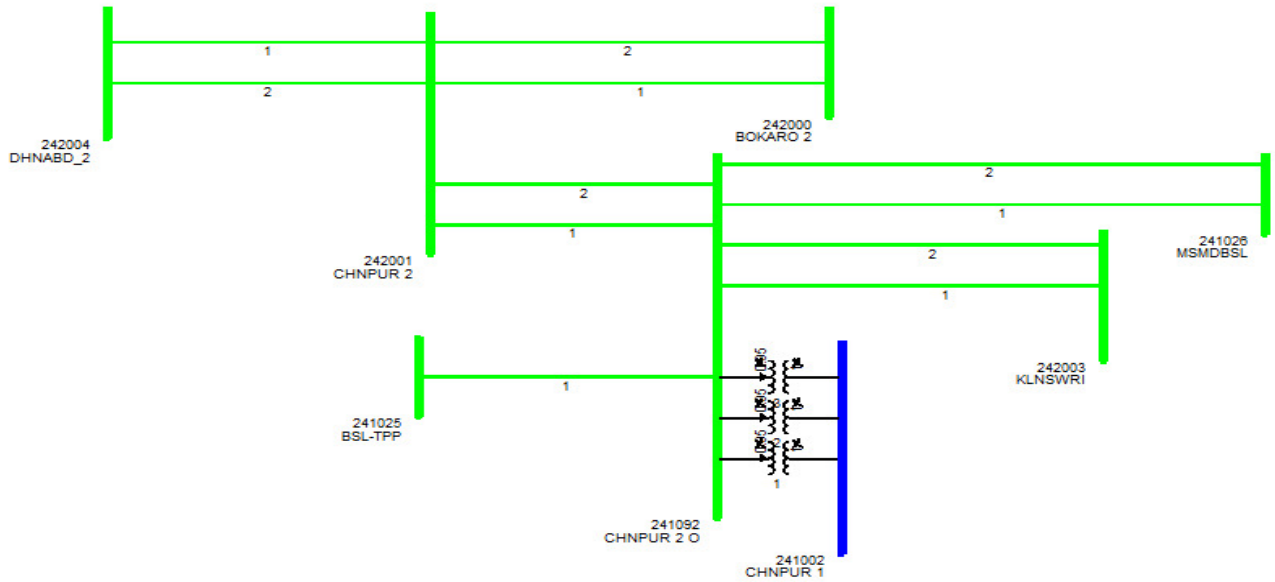
PART – B

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.**

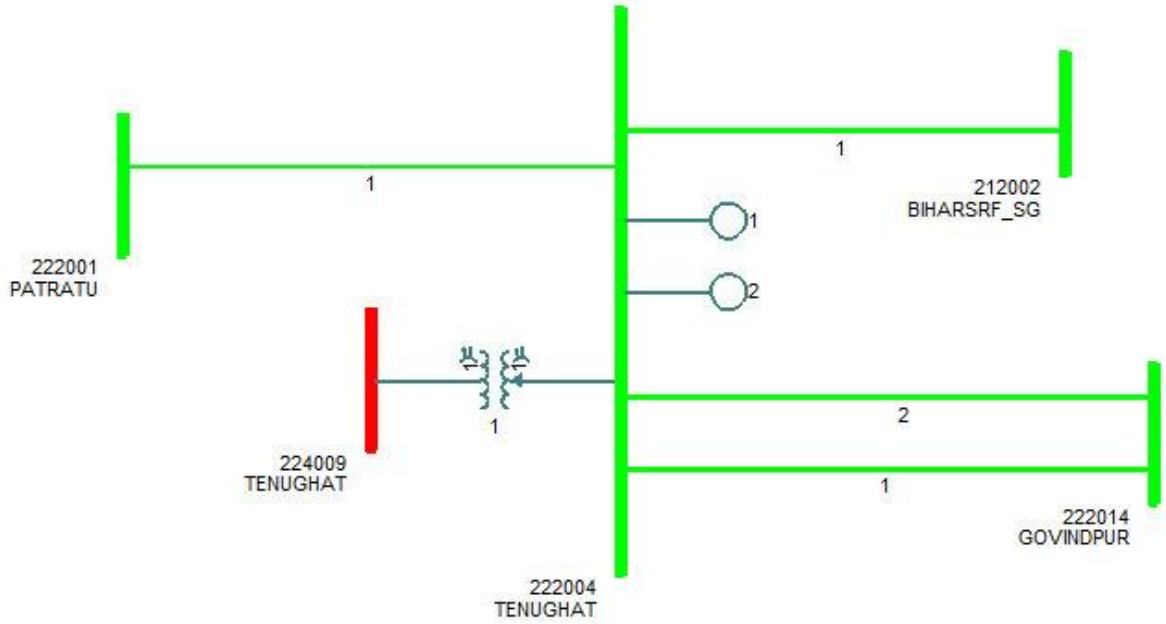
Load Loss: 400 MW, Gen. Loss: 393 MW
Outage Duration: 00:10 Hrs

DVC may explain.

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.

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.

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.

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.

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.

Detailed report received from ERLDC is attached at **Annexure B.5.1.**

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. The report is enclosed at **Annexure B.5.2.**

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.

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 13:00 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.

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.

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, Zone-1 Fault Location: 71.13km Ifault: 1.342kA	28-09-2022	19:58
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 kM,3.761 kA	16-09-2022	12:25
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.

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 at **Annexure B.9.**

Concerned utilities may explain.

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.

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.

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.**

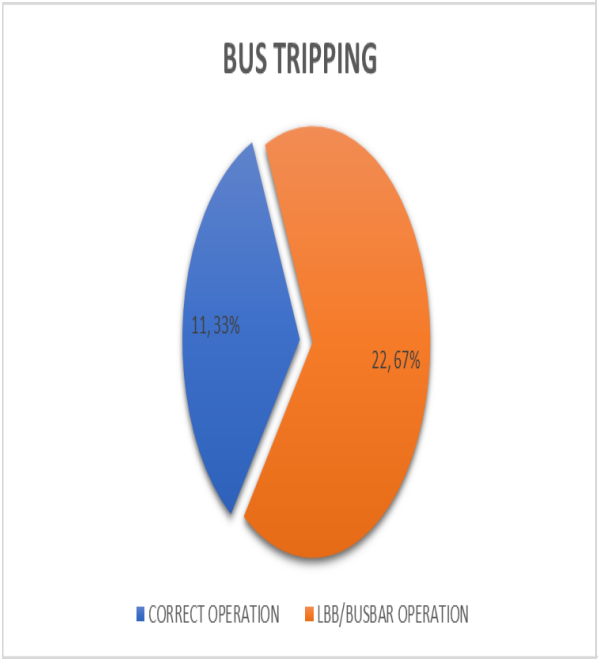
In 46th TCC Meeting,
BSPTCL representative updated that out of twelve substations where busbar protection is not available, proposal for ten no of substations has been sent for funding through PSDF.
Busbar protection of Fatuha S/s will be commissioned in August'22. For Biharsharif S/s, there is space 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.

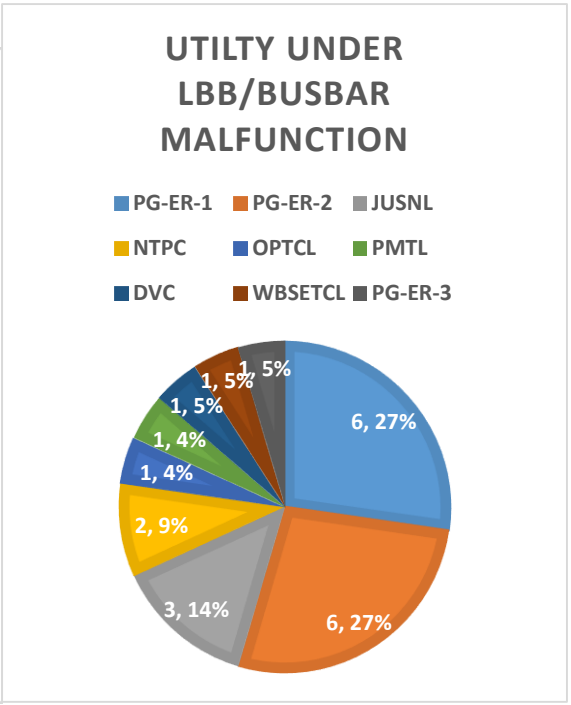
TCC opined that the requirement of having busbar protection in 220 kV substations is mandatory as per CEA grid connectivity standard and advised concerned transmission utilities to take necessary action for operationalizing busbar protection in all the 220 kV substations in their respective jurisdiction.

Concerned utilities may update the present status.

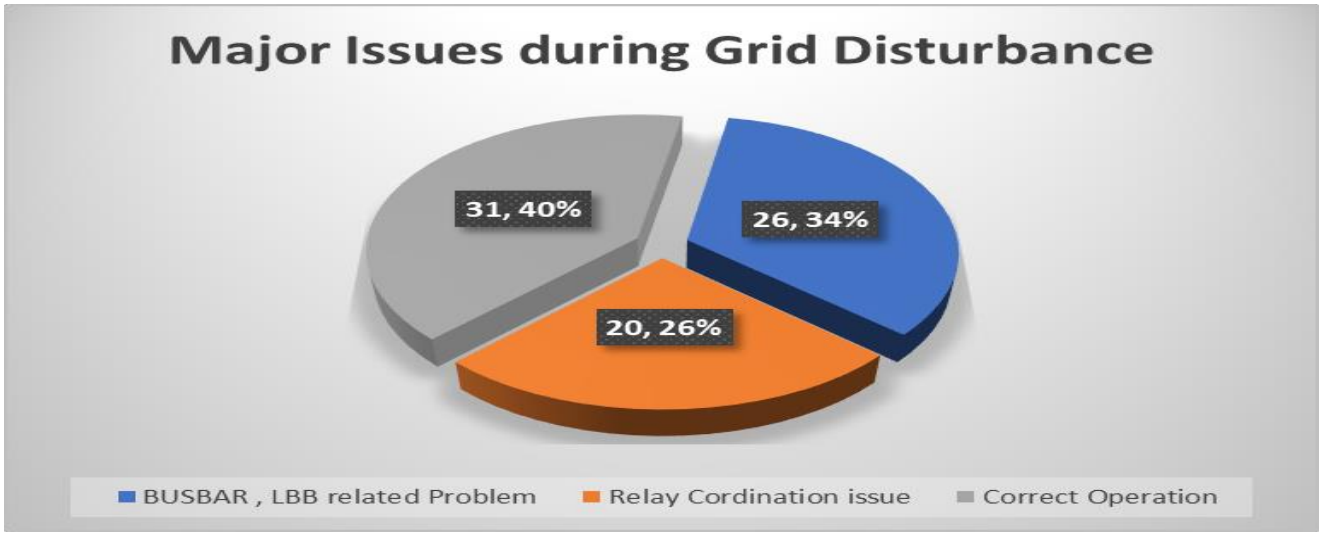
ITEM NO. C.3: Bus tripping occurring in Eastern Region due to LBB or Busbar Mal operation

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.

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

The decisions of previous PCC meetings are attached at **Annexure C.4.**

Members may update the latest status.

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.

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.

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.

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.

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

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
LILO of 220 kV Daltonganj-Chatra-2 at Latehar	220 kV Daltonganj-Latehar-2	Daltonganj, Latehar	PG ER-1, JUSNL	Protection coordination to be done for newly connected elements as per ERPC guidelines.
	220 kV Daltonganj-Chatra-1	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.
		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.

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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: **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)

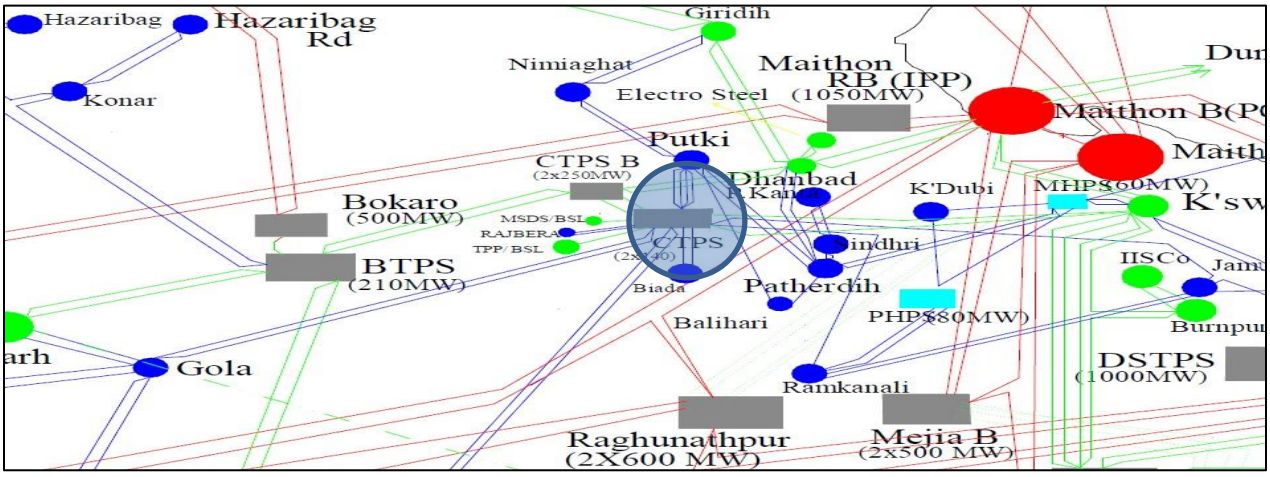


Figure 1: Network across affected area

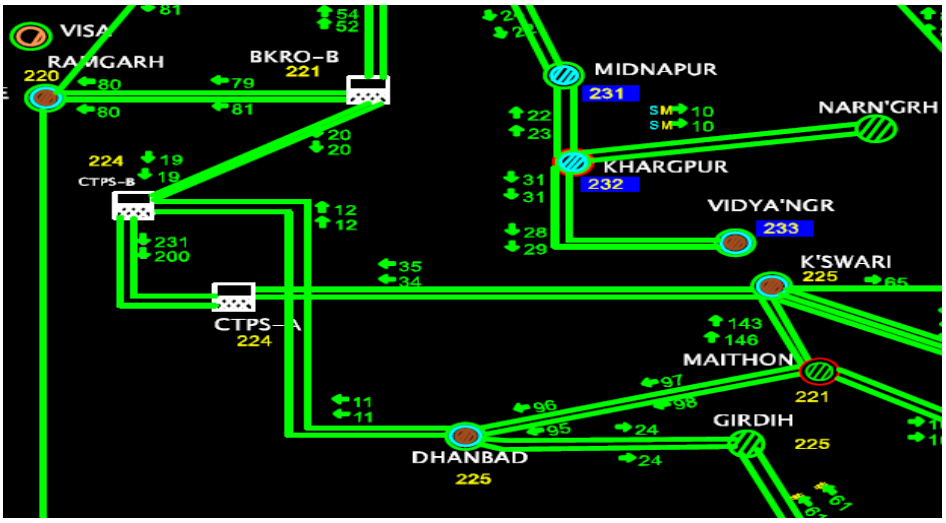


Figure 2: SCADA snapshot of the system

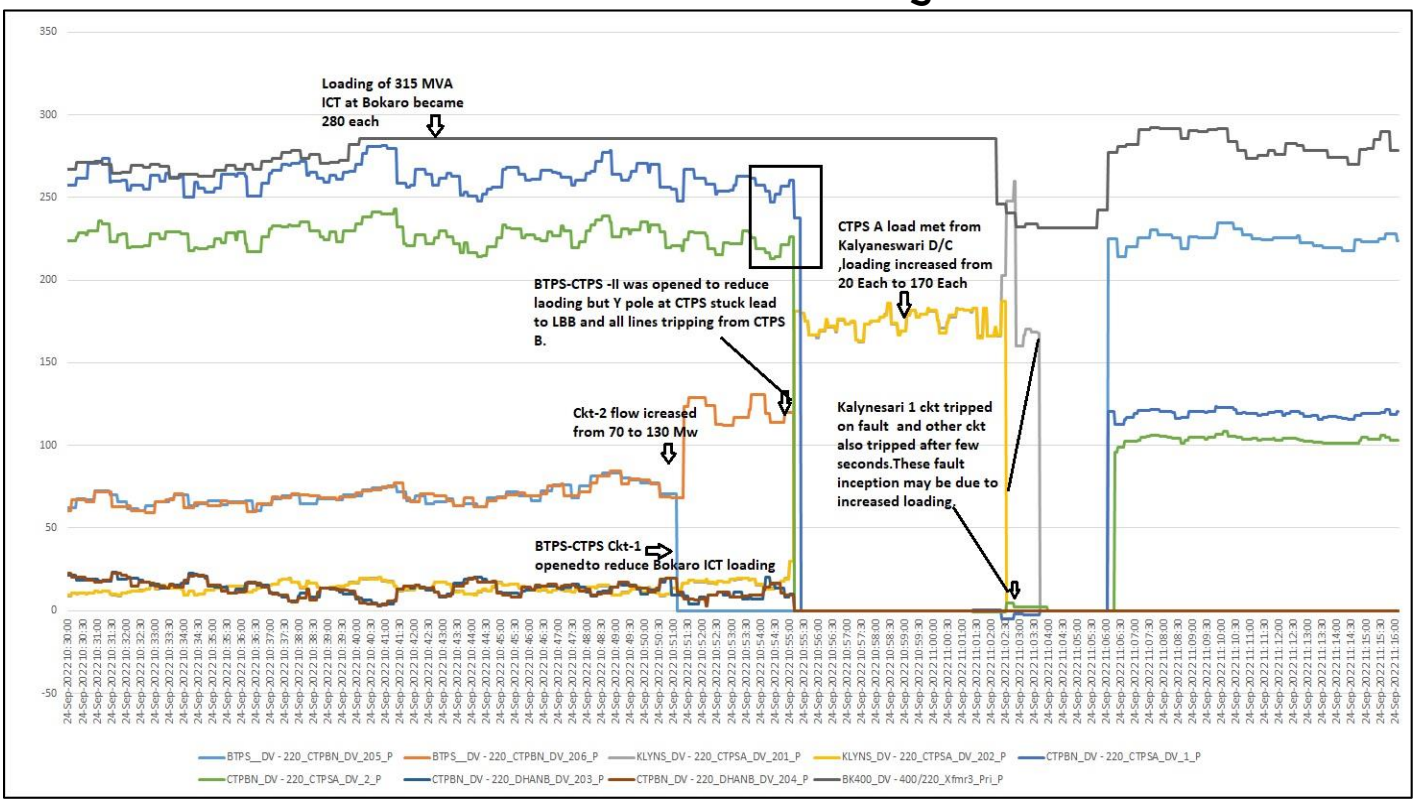
Relay indication and PMU observation (रिले संकेत और पीएमयू पर्यवेक्षण):

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):

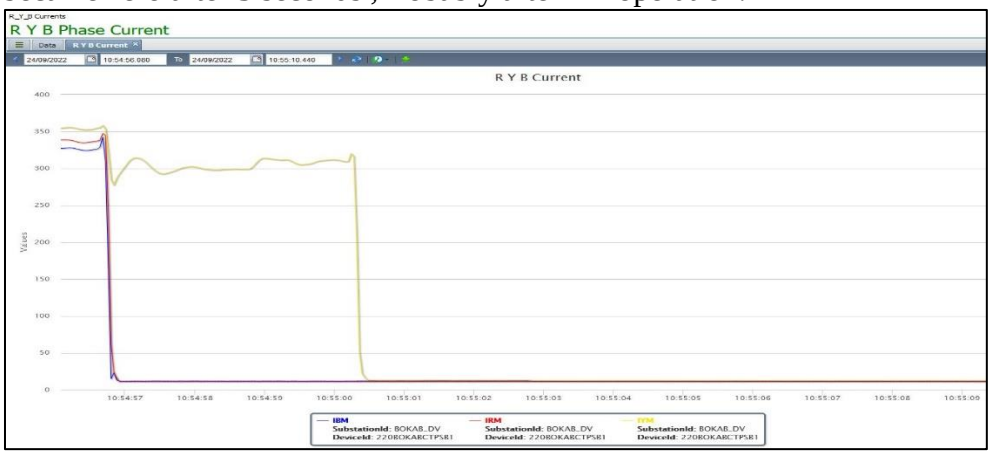
- Load normalized at 11:05 Hrs through 220 kV CTPS- BTPS-1 and 220 kV JSPL-Jamshedpur(D) opened to restrict loading of ICTs at Bokaro-A. 132 kV Maithon - Jamtara also opened to restrict loading of the ICTs.

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



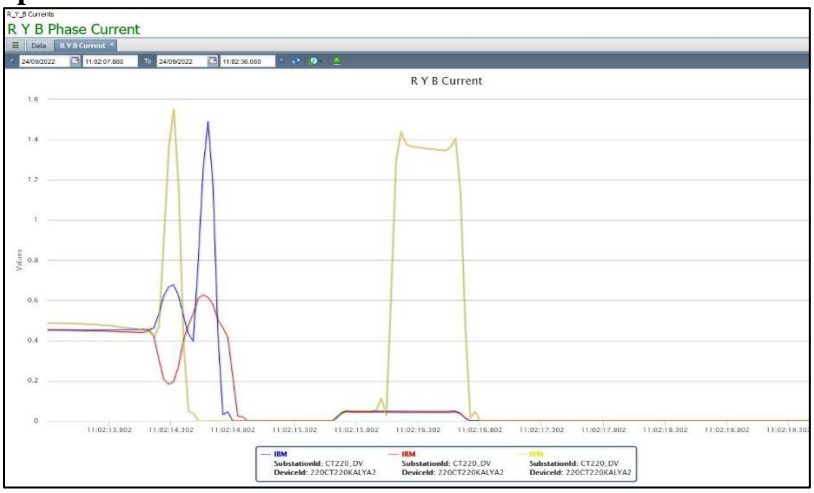
Power flow SCADA plot for the event.

- 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.



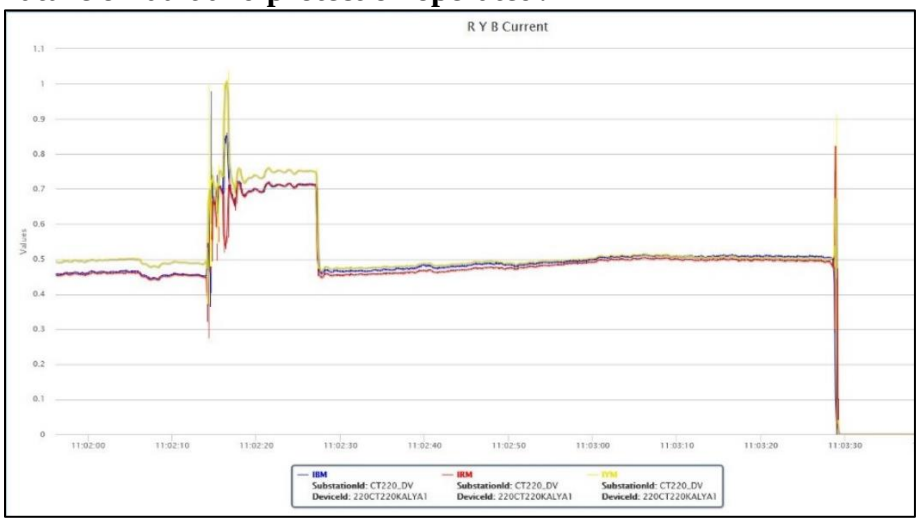
- Under such condition of stuck one pole of breaker PD should have operated and tripped the remaining phase but apart from this all other lines with main bus-1 and 2 at CTPS B tripped.

- 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)

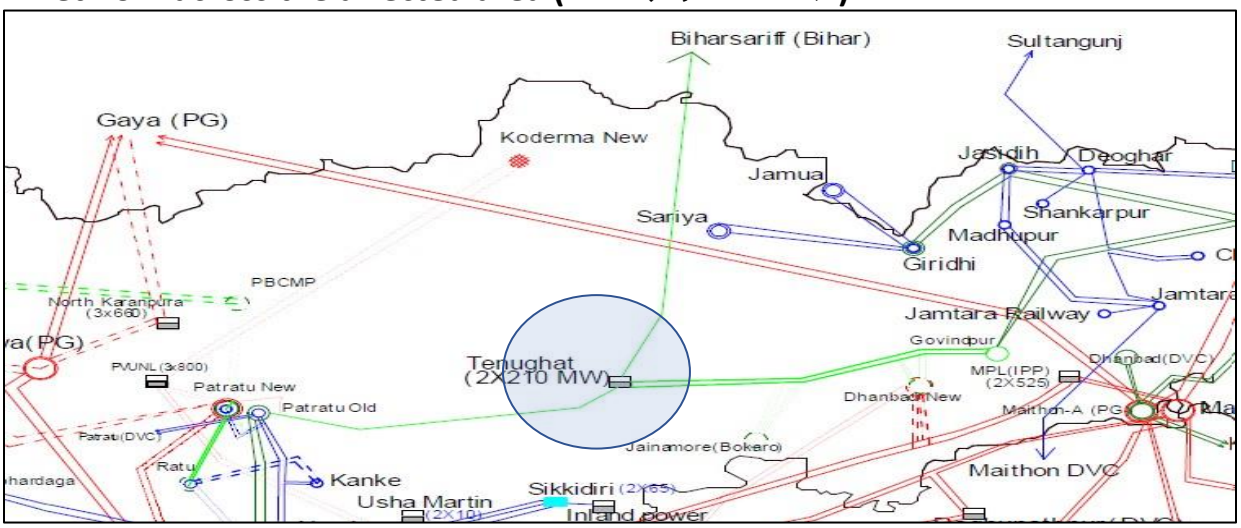


Figure 1: Network across the affected area

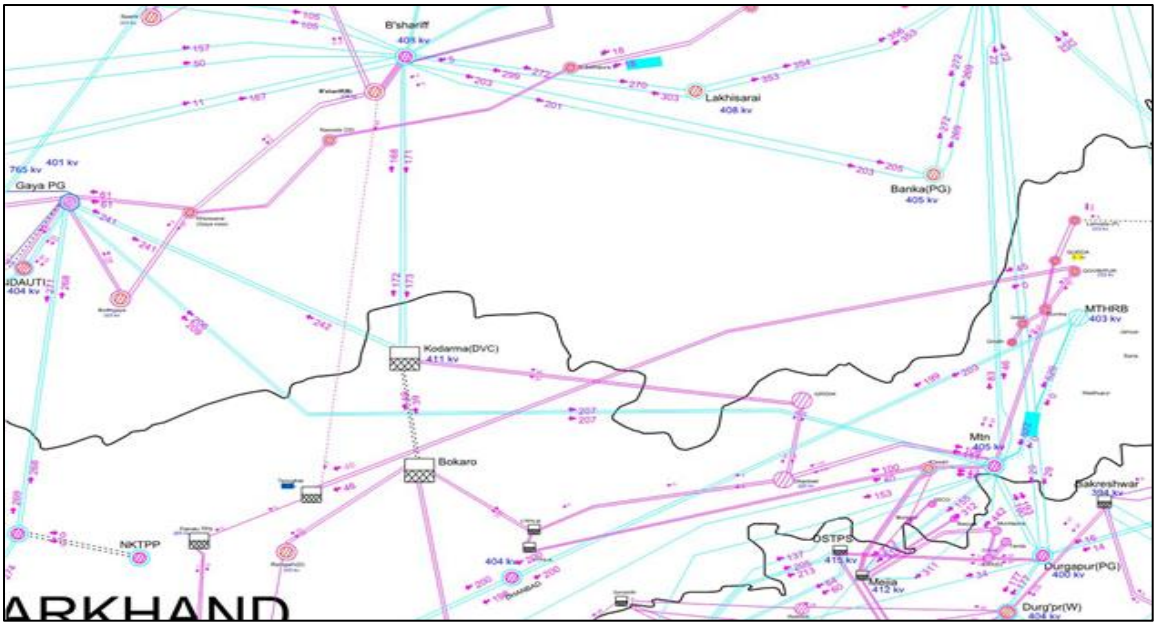


Figure 2: SCADA snapshot for of the system

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		

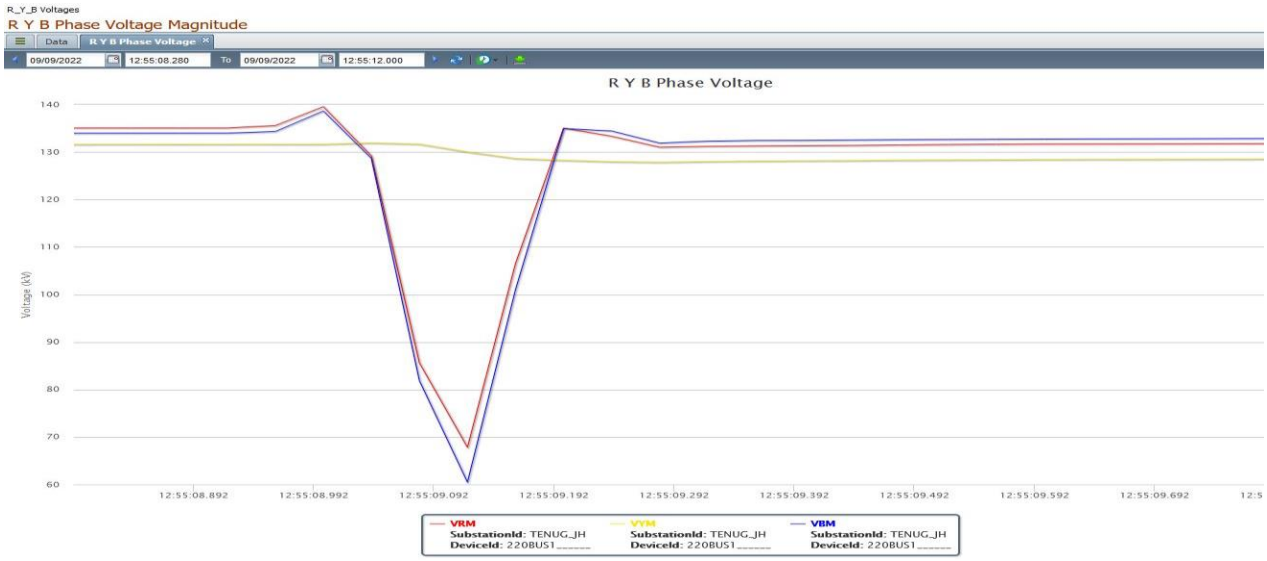


Figure 3: PMU voltage snapshot of 220 kV Tenughat S/s

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):

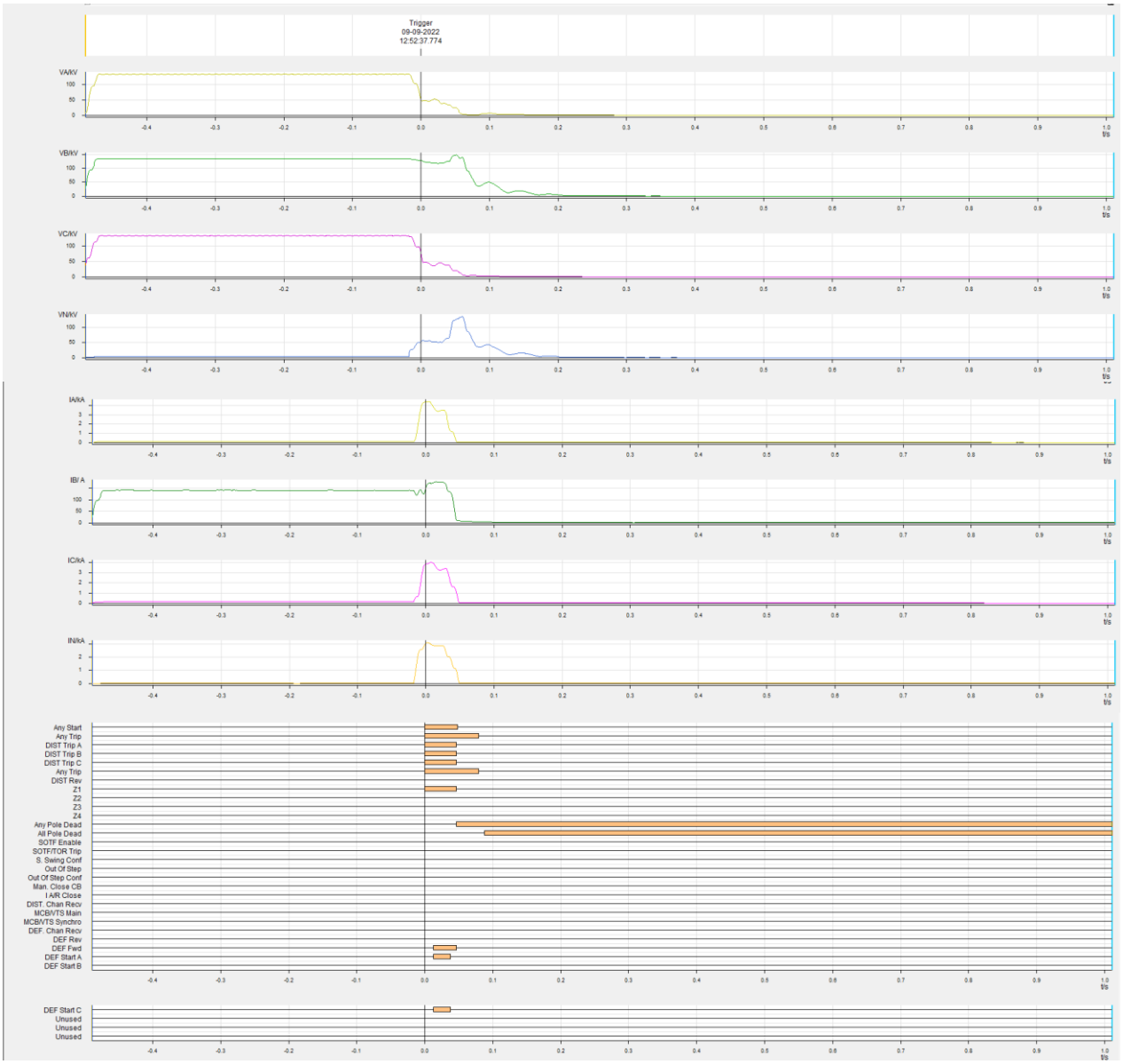
- Complete DR/EL yet to be received from JUSNL, TVNL.

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

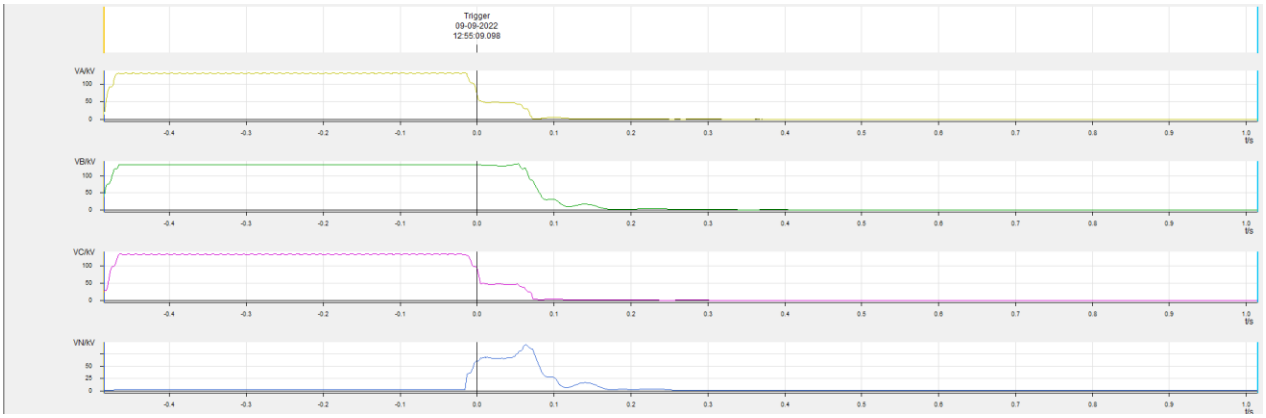
Sequence of event not recorded at time of event.

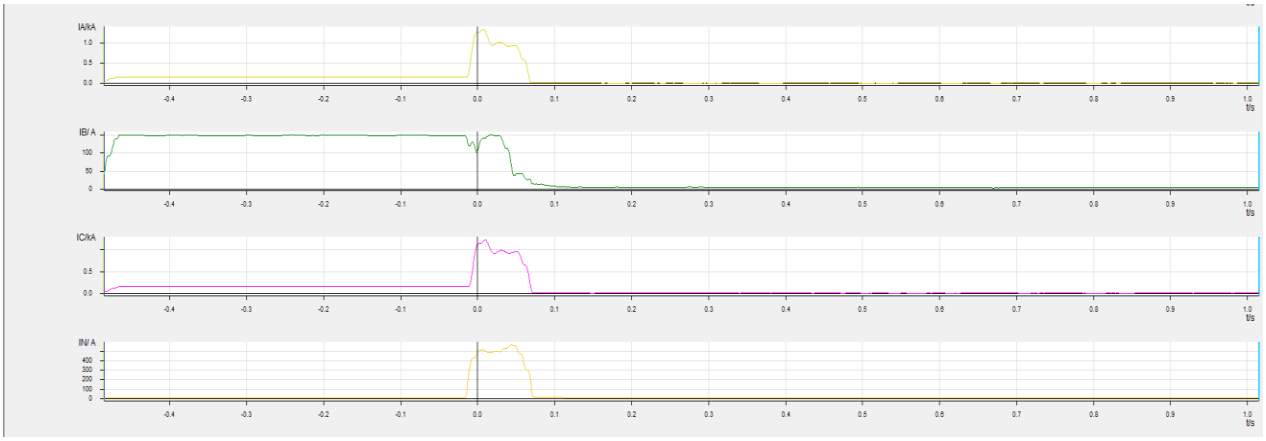
Annexure 2: DR recorded

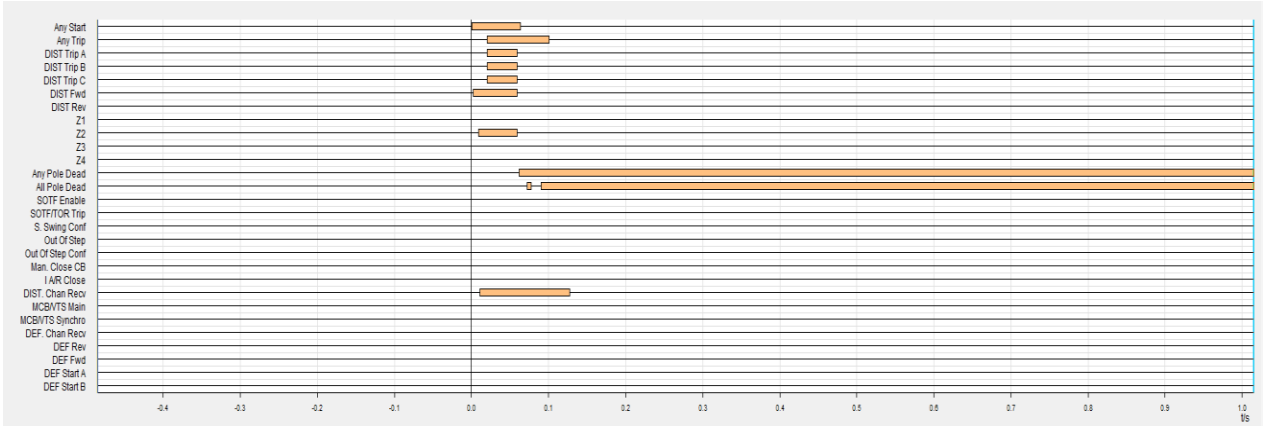
220 kV Tenughat-Govindpur-1 (Tenughat)



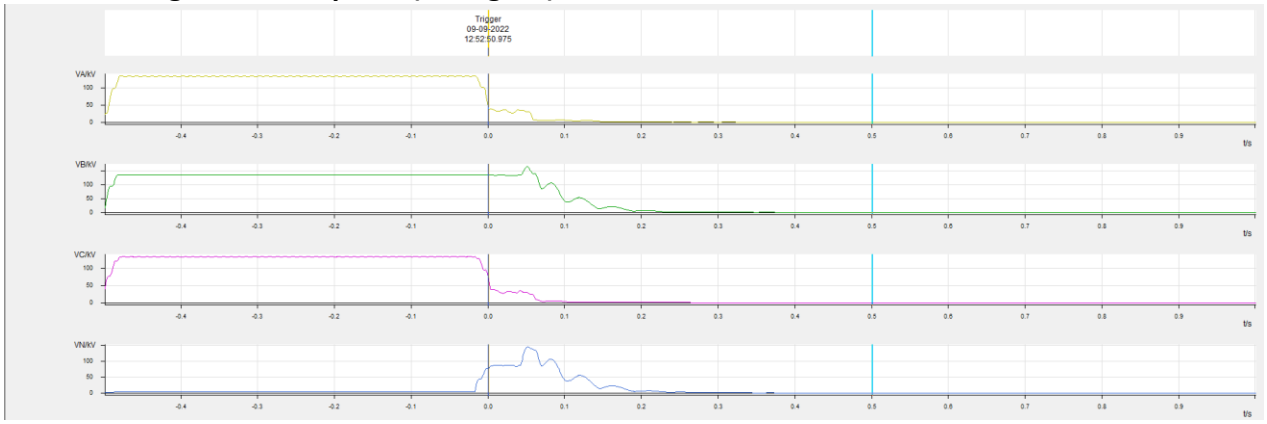
220 kV Tenughat-Govindpur-1 (Govindpur)

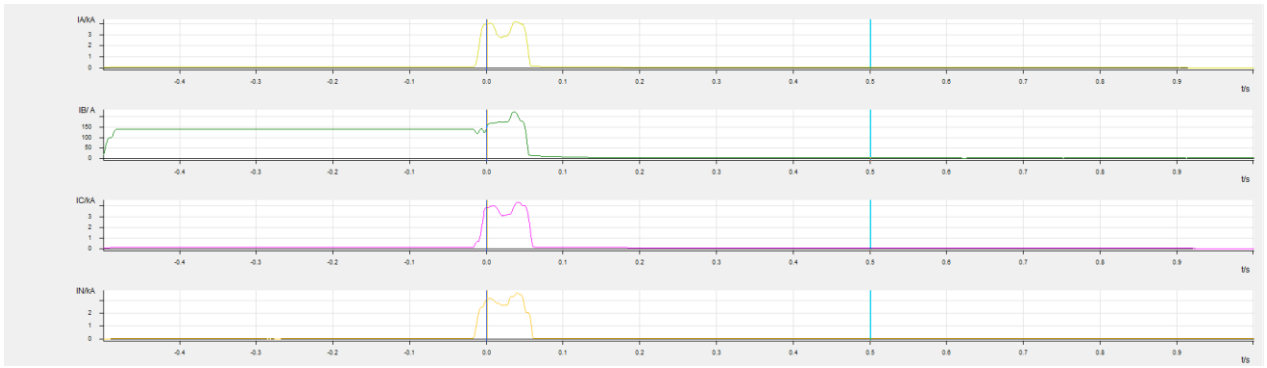


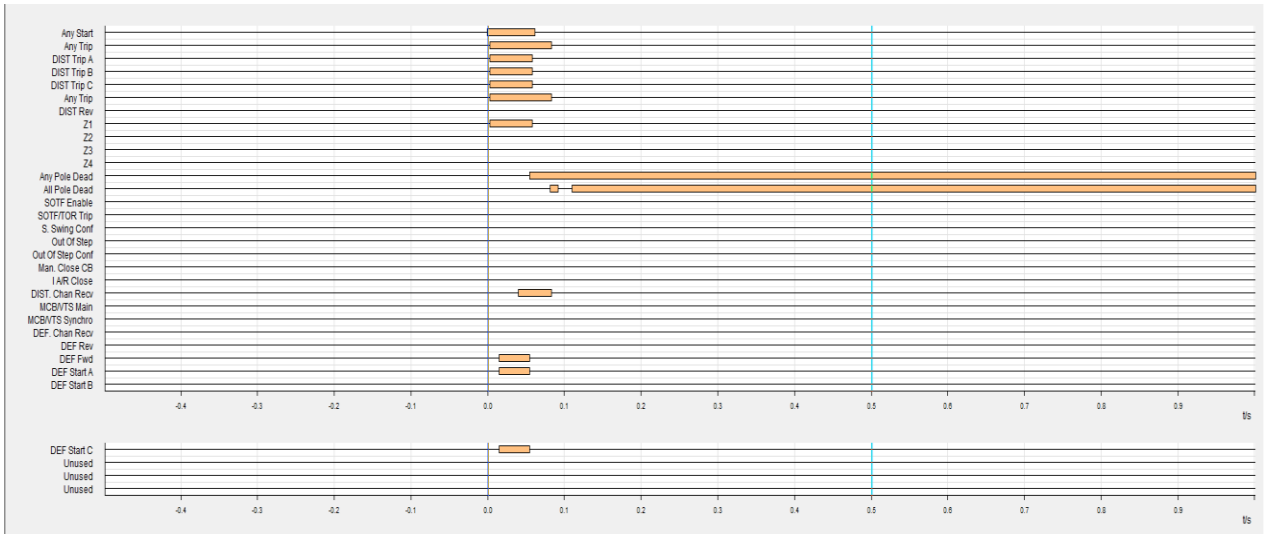




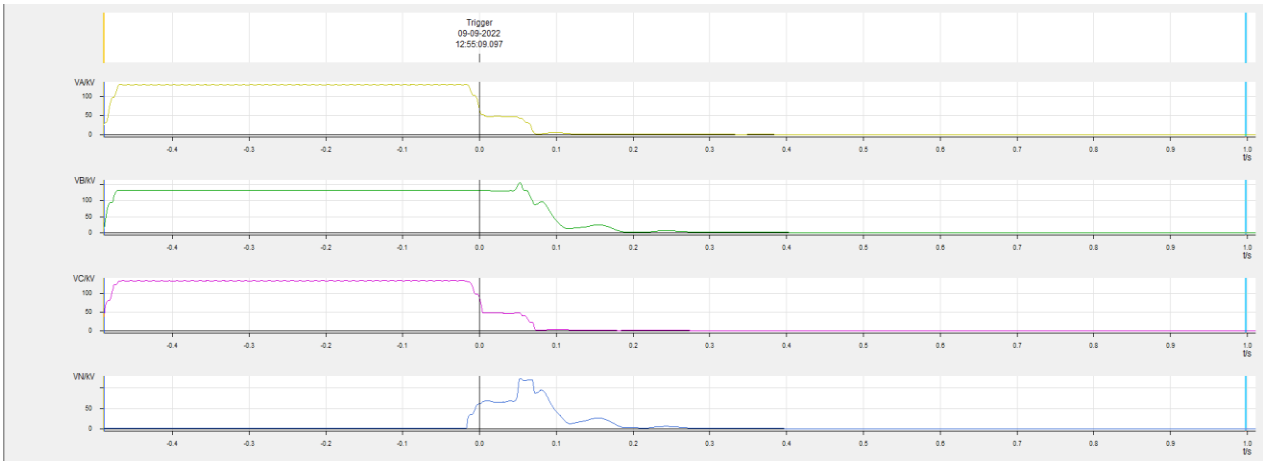
220 kV Tenughat-Govindpur-1 (Tenughat)

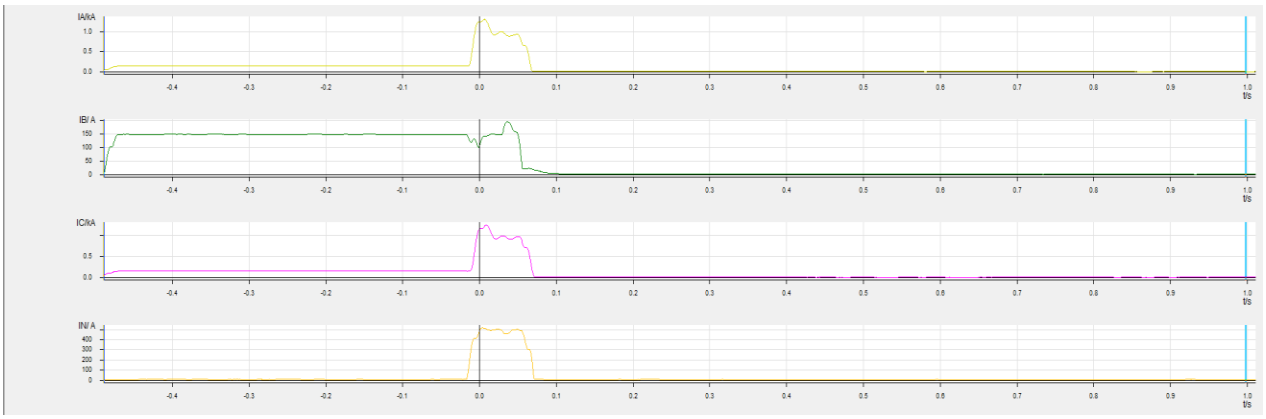


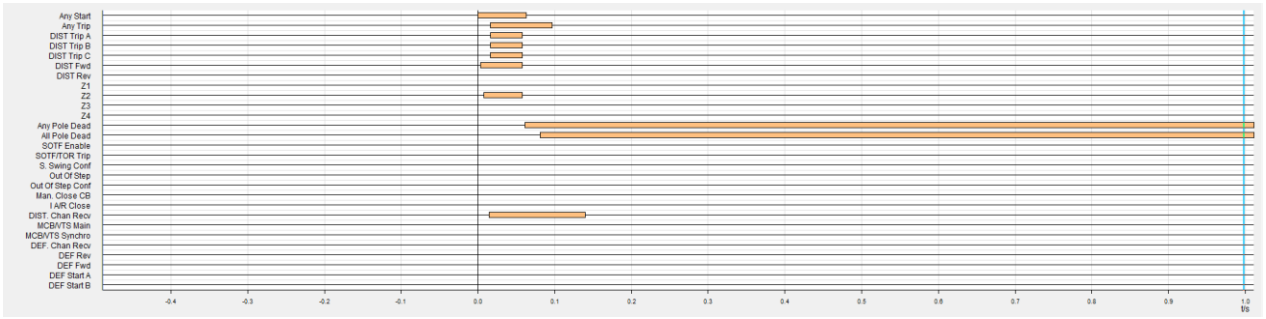




220 kV Tenughat-Govindpur-2 (Govindpur)







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)

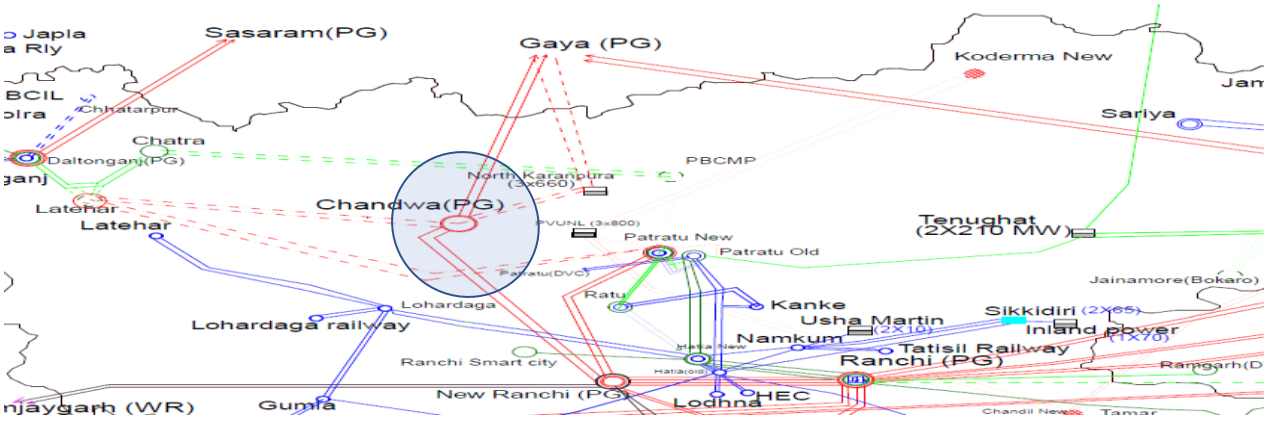


Figure 1: Network across the affected area

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):

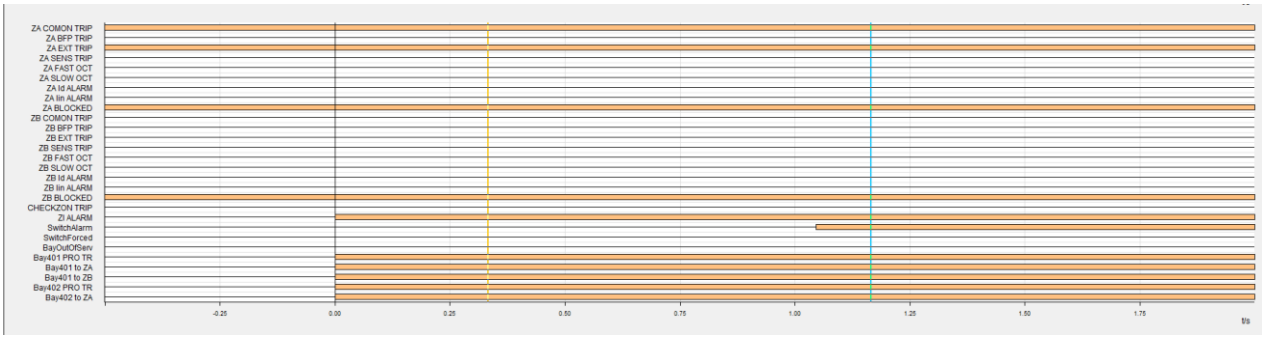
- DR/EL received from PG ER-1

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



पावर सिस्टम ऑपरेशन करपोरेशन लिमिटेड
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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)

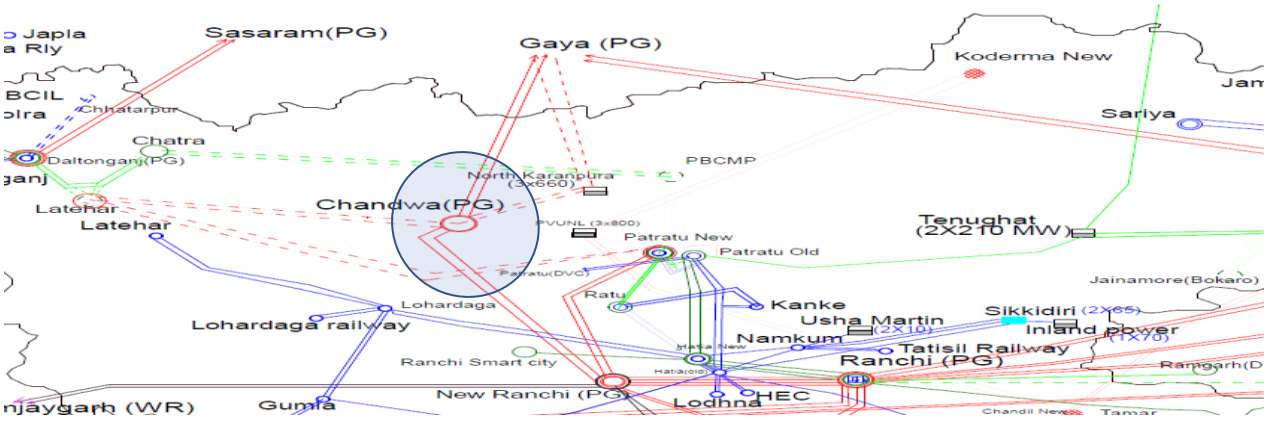


Figure 1: Network across the affected area

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		-	

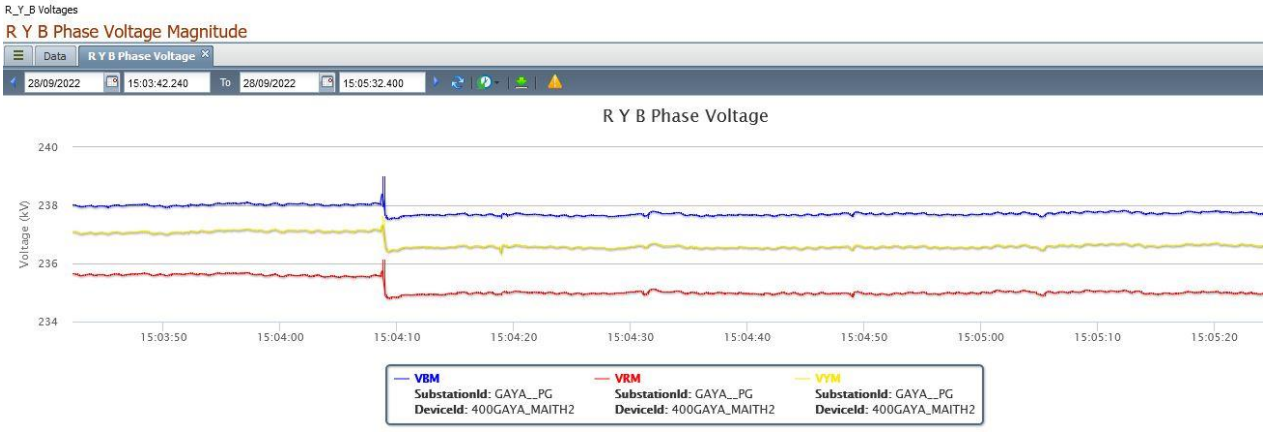


Figure 2: PMU Voltage snapshot of 765/400/220 kV Gaya S/s

6. Restoration (पूर्वावस्था की प्रप्ति)

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):

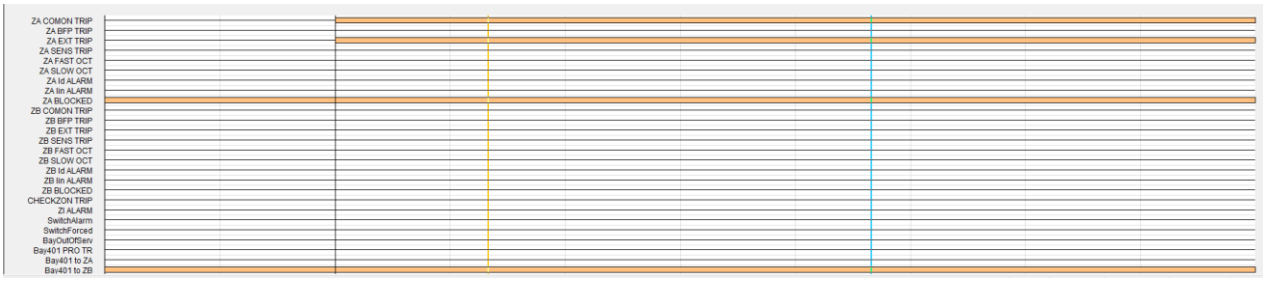
- DR/EL received from PG ER-1

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



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)

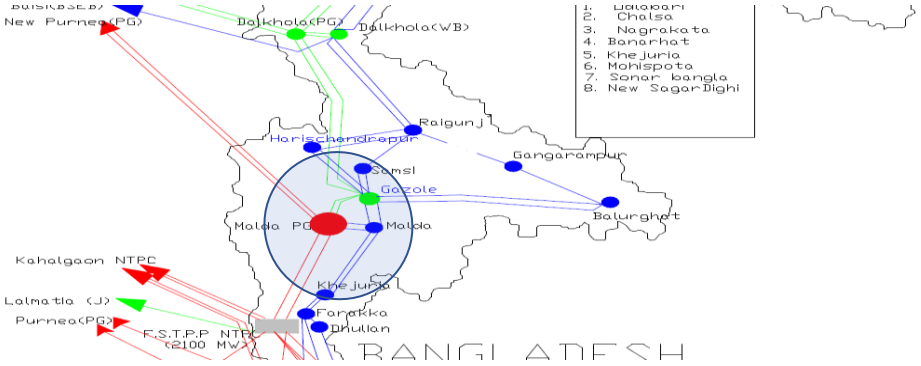


Figure 1: Network across the affected area

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):

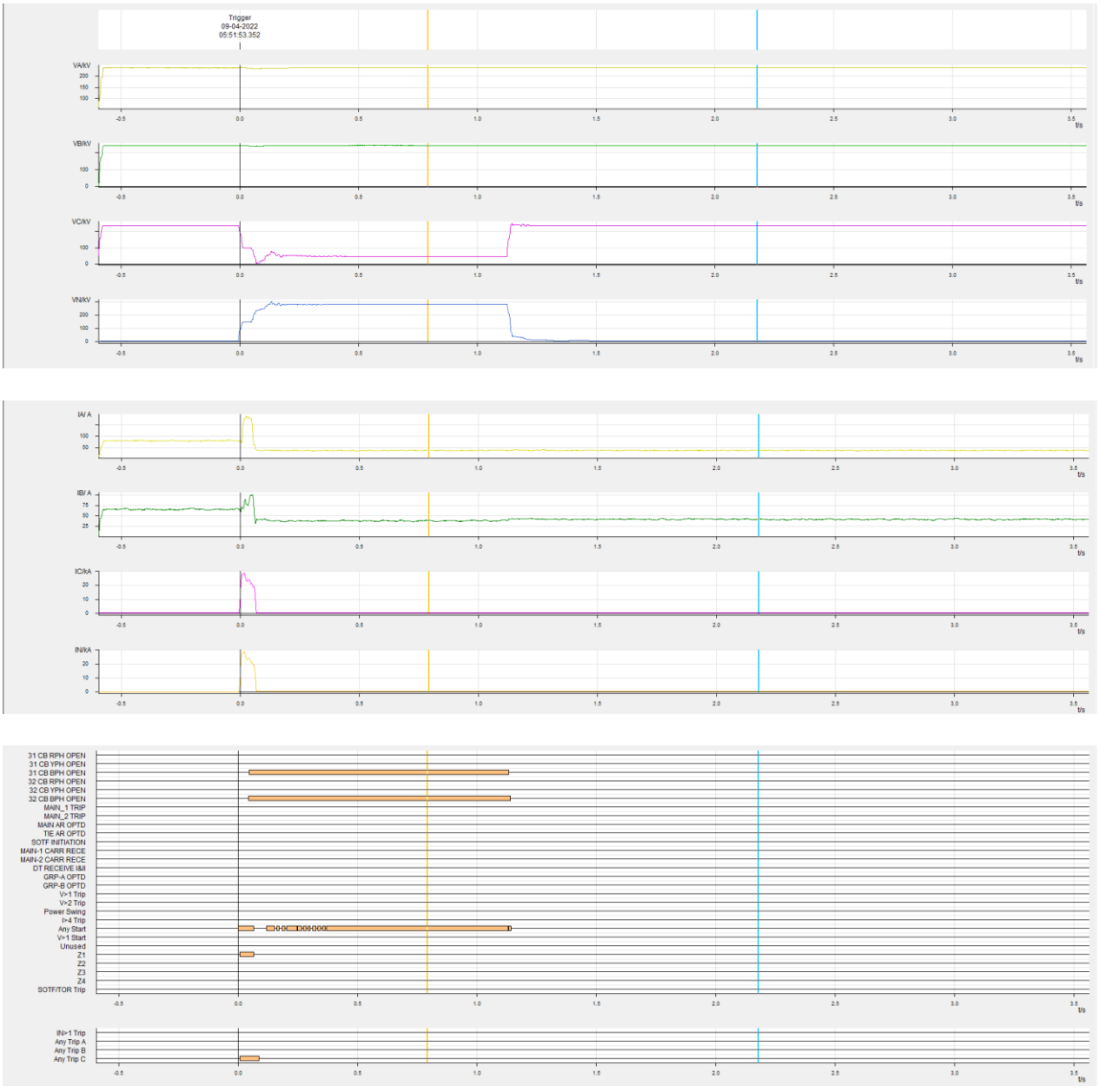
- DR/EL yet to be received from PG ER-2

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

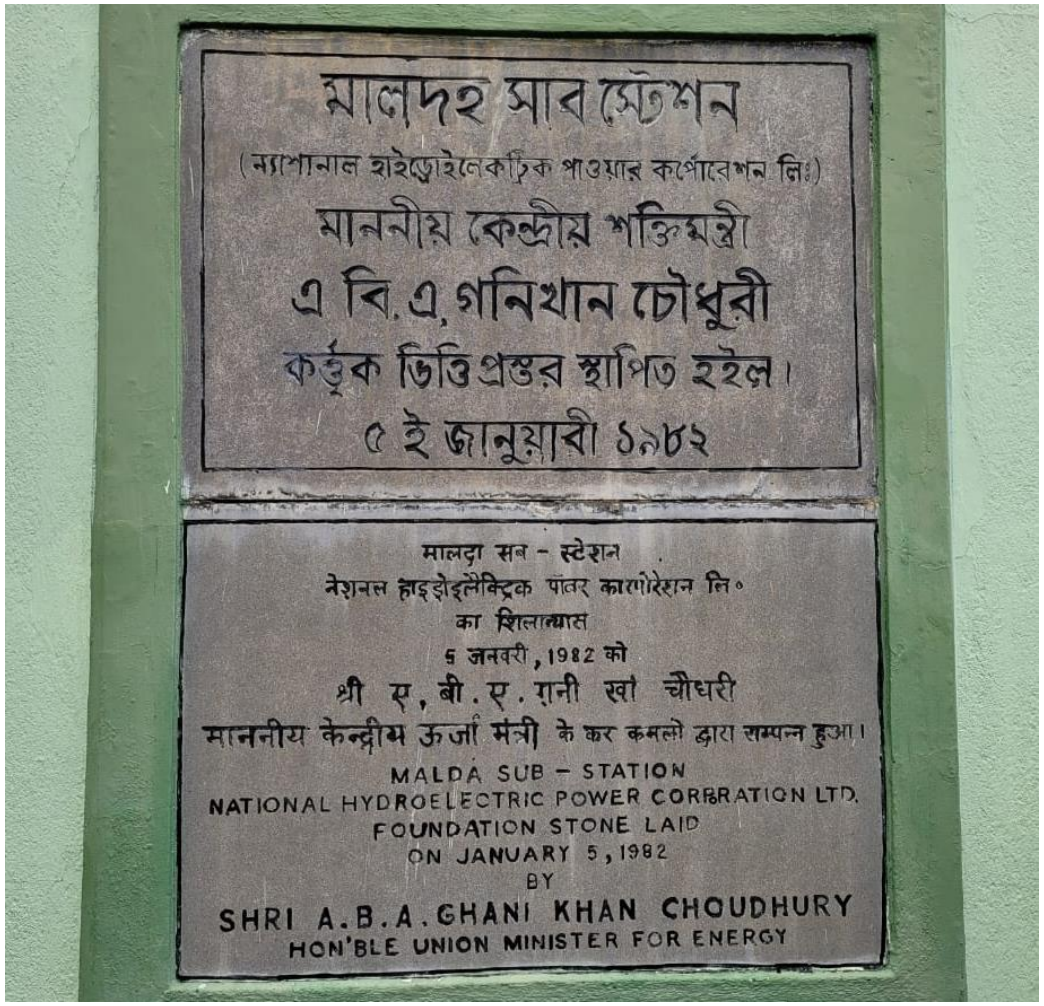
For Root Cause analysis of Repeated Bus bar protection Mal operation

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:

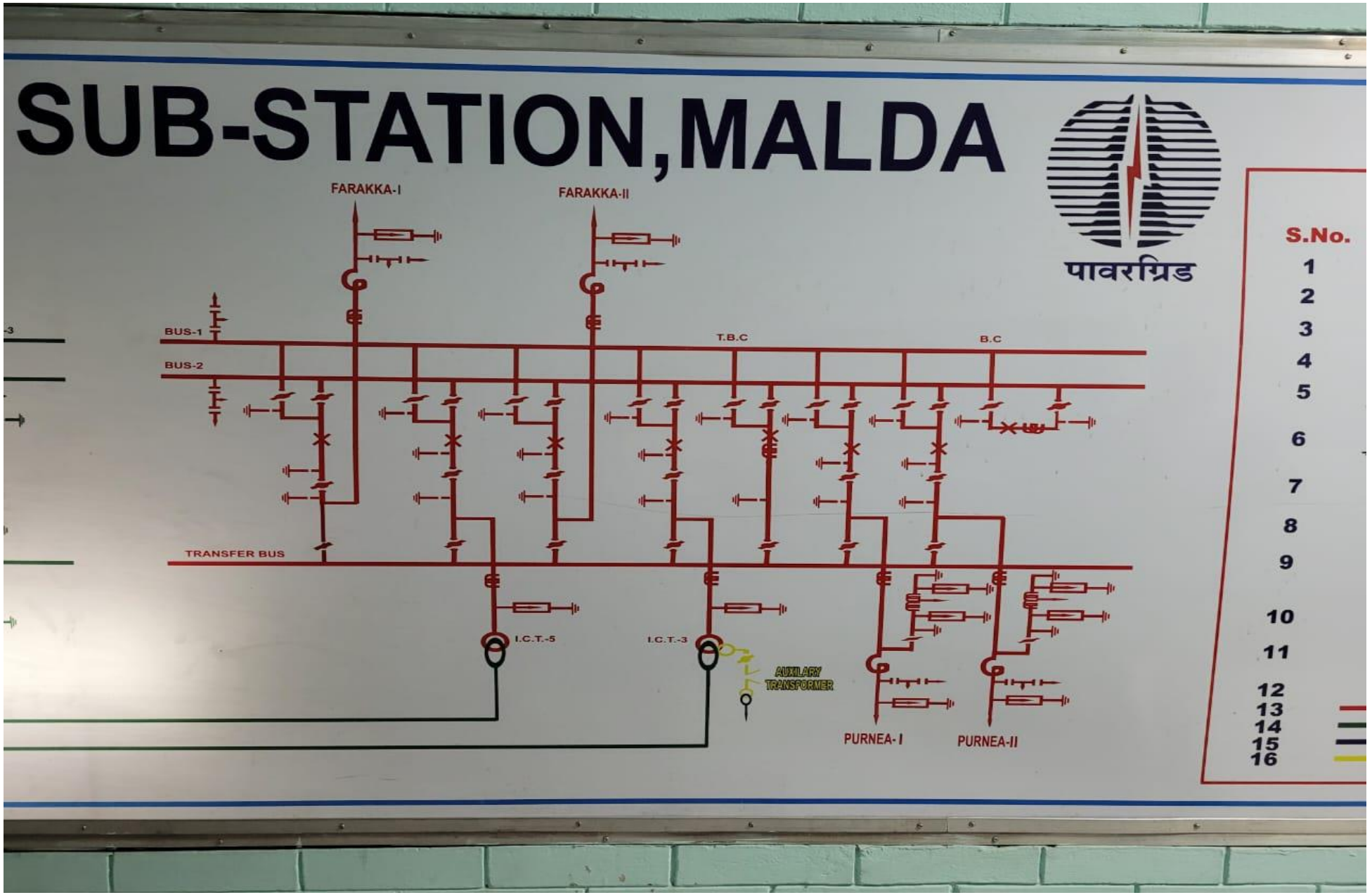
1. Sanatan Sarvesh, Asst. EE, ERPC
2. Raj Protim Kundu, Manager, ERLDC
3. Saibal Ghosh, Manager, ERLDC

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.

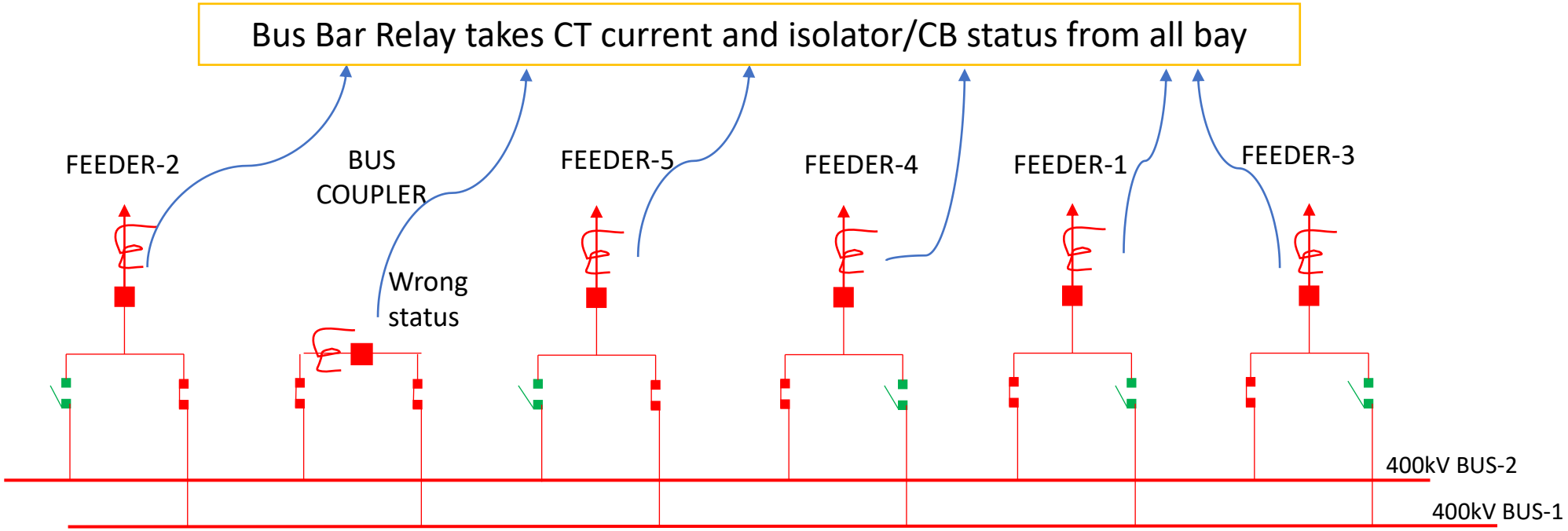
Single line Diagram of 400 kV BUS



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.

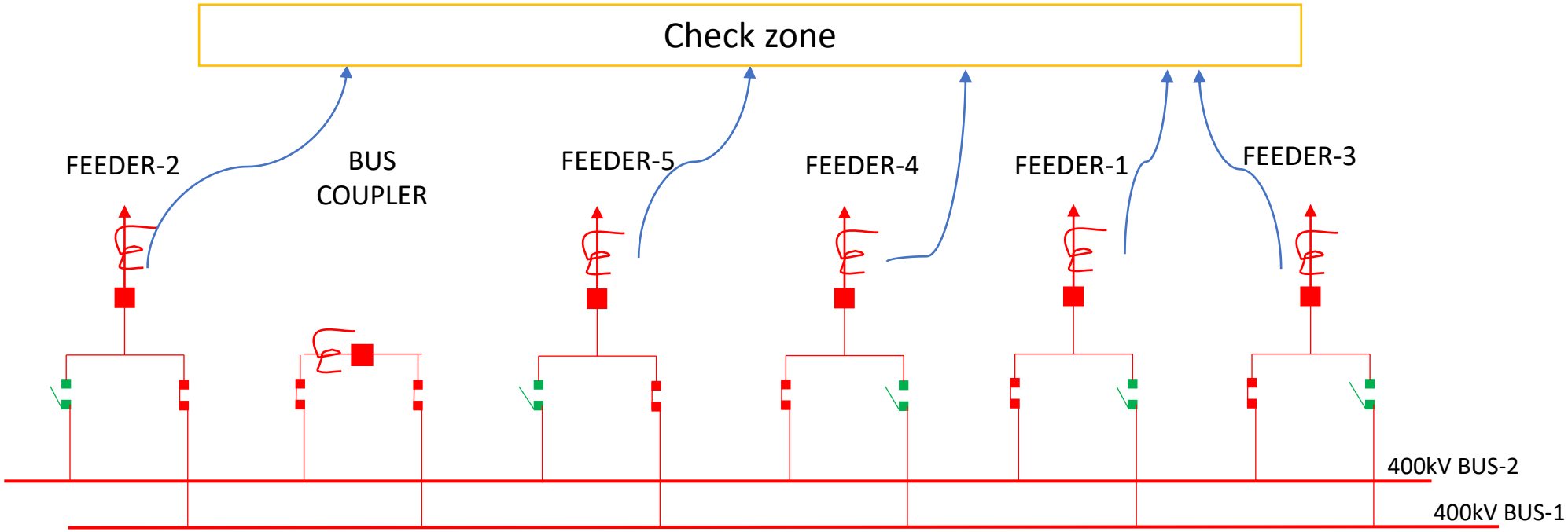
Method of creating replica inside REB 670 relay for Isolator & CB:

- 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:

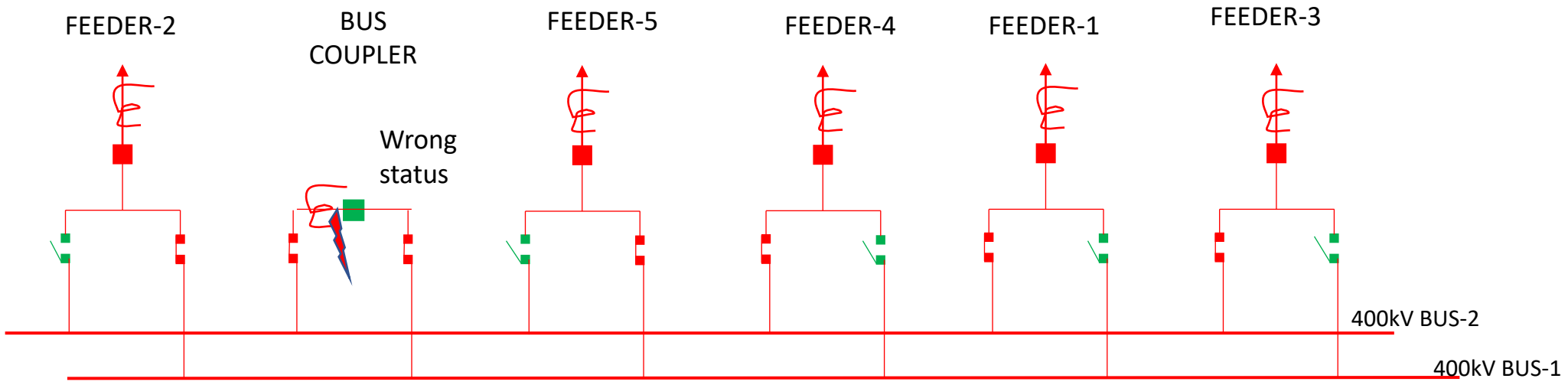
- After May 2018 event an aannunciation for Bus Coupler CB input Status to Relay was made in the control and rely panel.
- It was expected that due to DC earth fault if the CB status become open while actual CB is closed then the annunciation will come and control room person will inform the protection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

Annexure B.5.2

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
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ERLDC

S. Sarvesh
(S. Sarvesh)
ERPC

13/09/2022
(R.R. Tirkey)
Dgm, Malda

M. R. BEHERA
Engg. / POWERGRID.

B. K. DAS
SE/Powergrid

Annexure B.9

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	400 KV GAYA-MAITHON-1	01-09-2022	13:19	01-09-2022	19:54	Gaya: R-B, 21.4 km, Ir: 5 kA, Ib: 14 kA	Maithon: R-B, 192 km, Ir: 3.3 kA, Ib: 3.1 kA	R-B-Earth	100	Phase to phase fault		Yes	Yes	
2	220 KV NEW PURNEA-MADHEPURA-2	02-09-2022	11:03	02-09-2022	16:49	New Purnea: Y-B, 63.5 km, Iy: 3.4 kA, Ib: 3.3 kA	Madhepura: Y_B, 31.3 kA, Iy: 4 kA, Ib: 4.1 kA	Y-B	100	Phase to phase fault		Yes	Yes	

3	400 KV PPSP-BIDHANNAGAR-1	02-09-2022	12:24	02-09-2022	12:45	PPSP: R_N, 40 km	Bidhannagar: R_N, Zone-2, 152 km, 2.3 kA	R-Earth	100	A/r not in service as per OEM advise		No	Yes	
4	400 KV MERAMUNDALI-LAPANGA-1	02-09-2022	12:46	02-09-2022	15:54	Meramundali: R_N, 154.5 km, 2.66 kA	Lapanga: R_N, 10.7 km, 11.5 kA	R-Earth	100	A/r failed after 1 sec. Tie bay A/r attempt after failure of main bay A/r attempt at Lapanga		Yes	Yes	
5	220 KV TENUGHAT-BIHARSHARIF-1	02-09-2022	16:44	02-09-2022	17:31	Tenughat: B_N, 3.4 km, 8.69 kA	Biharsharif: B_N, 153 km, 1.562 kA	B-Earth	350	Tripped in Zone-2 from Biharsharif		No	Yes	
6	220 KV JEYPORE-JAYNAGAR-3	02-09-2022	17:53	02-09-2022	18:10	Tripped during charging of 220 kV Jaynagar-Laxmipur-2		R-B	100	As per PMU, phase to phase fault occurred. OPTCL may explain		No	No	
7	220 KV BUDHIPADAR-RAIGARH-1	03-09-2022	11:09	03-09-2022	15:58	Budipadar: R_N, Zone-1, 1.1 km, 29.6 kA, A/r successful	Raigarh: R_N, 76.148 km, 2.36 kA	R-Earth	100	A/r successful from Budhipadar only. Fault current around 30 kA		Yes	NA	
8	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	

9	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	
10	400 KV PPSP-BIDHANNAGAR-2	03-09-2022	21:50	03-09-2022	22:12		Bidhannagar: B_N, 86 km, 3.78 kA	B-Earth	100	A/r not in service as per OEM advise		No	Yes	
11	220 KV PANDIABILI-PRATAPSASAN-1	04-09-2022	09:20	04-09-2022	10:23	Pandiabili: B_N, Zone-1, 34.9 km, 2.33 kA		B-Earth	100	No A/r attempt observed from PMU		No	No	
12	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		No	No	
13	220 KV BUDHIPADAR-KORBA-2	04-09-2022	13:27	04-09-2022	14:49	Budhipadar: B-N	Korba: B_N, Zone-2, 152.63 km, 1.142 kA	B-Earth	350	Carrier scheme not available	Only EL data uploaded	No	NA	
14	400 KV BINAGURI-BONGAIGAON-1	04-09-2022	19:29	04-09-2022	20:35	Binaguri: R_B_N, 180.48 km, Ir: 2.56 kA, Ib: 2.63 kA	Bongaigaon: R_B_N, 63.68 km, Ir: 4.8 kA, ib: 5.08 kA	R-B-Earth	100	Phase to phase fault		No	NA	

15	400 KV BINAGURI-BONGAIGAON-2	04-09-2022	19:29	04-09-2022	20:51	Binaguri: R_B_N, 183.8 km, Ir: 2.29 kA, Ib: 2.43 kA	Bongaigaon: R_B_N, 63.21 km, Ir: 4.83 kA, ib: 5.04 kA	R-B-Earth	100	Phase to phase fault		No	NA	
16	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	
17	220 KV JAMSHEDPUR-JINDAL-1	06-09-2022	12:40	06-09-2022	13:06	Jamshedpur: Y_N, Zone-1, 35.4 km, 2.59 kA		Y-Earth	100	Carrier scheme not available		Yes	No	
18	220 KV DARBHANGA(DMTCL)-SAMASTIPUR-1	06-09-2022	19:18	06-09-2022	19:49	Darbhanga: R_N, A/r successful	Samastipur: R_N, 33.7 km, 2.7 kA	R-Earth	100	A/r successful from DMTCL after 700 msec		Yes	No	
19	400 KV BIHARSHARIF-MUZAFFARPUR-1	08-09-2022	11:31	08-09-2022	17:21	Biharsharif: R_Y, 108.8 km, Ir=4.33 kA	Muzaffarpur: R_Y, 24.76 km, Ir: 14.7 kA, Iy: 14.43 kA	R-Y-Earth	100	Phase to phase fault		Yes	Yes	
20	400 KV NEW PURNEA-BIHARSHARIF-2	08-09-2022	11:43	08-09-2022	13:31	New Purnea: B_N, 59.13 km, 4.259 kA	Biharsharif: B_N, 204 km, 2.41 kA	B-Earth	100	A/r successful. Tripped again within reclaim time after 100 msec		Yes	Yes	

21	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	No	
22	400 KV ALIPURDUAR-PUNATSANGCHUN-1	09-09-2022	09:14	09-09-2022	09:58		Punatsangchun: DT received	No fault	NA	Tripped during availing shutdown of its main bay at Alipurduar. PG ER-2 may explain		No	NA	
23	220 KV MAITHON-DUMKA-1	09-09-2022	10:21	09-09-2022	11:09	Maithon: B_N, 23 km, 1.2 kA		B-Earth	3000	Highly resistive fault	only cfg file uploaded from Dumka	No	Yes	
24	220 KV RENGALI(PH)-TSTPP-1	09-09-2022	12:46	09-09-2022	15:34	Rengali: R_N, 33.7 km, 1.89 kA	TSTPP: R_N, 2.2 km, 10.7 kA	R-Earth	350	Carrier scheme not healthy		No	No	
25	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		No	No	

26	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	
27	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	
28	400 KV ALIPURDUAR-BONGAIGAON-2	10-09-2022	11:12	10-09-2022	12:15	Alipurduar: Y_N, 30 km, 7.1 kA	Bongaigaon: Y_N, 71.27 km, 2.4 kA	Y-Earth	100	A/r successful. Tripped again within reclaim time		No	NA	
29	22 KV RENGALI-TTPS-1	10-09-2022	11:51	10-09-2022	14:04	Rengali: Y_N, 27.3 km, 6.2 kA	TTPS: Y_N, 10.3 km, 9.4 kA	Y-Earth	350	Tripped in Zone-2 time from Rengali		No	No	
30	400 KV PATNA-NAUBATPUR-1	10-09-2022	13:56	10-09-2022	17:36	Patna: Y_B, Iy: 15 kA, Ib: 14 kA	Naubatpur: Y_B, 10.3 km, Iy: 10.91 kA, Ib: 11.93 kA	Y--B	100	Phase to phase fault		Yes	No	
31	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		No	No	

32	400 KV BIHARSHARIF-LAKHISARAI-1	11-09-2022	13:20	11-09-2022	23:16	Biharsharif: O/V	Lakhisarai: DT received			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		No	No	
33	220 KV KARMNASHA-SAHUPURI-1	11-09-2022	17:21	11-09-2022	18:52	Karmnasha: O/c in R_ph and Y_ph		Y-Earth	100	Fault in adjacent line. Line tripped within 100 msec		Yes	NA	
34	400 KV ANGUL-JITPL-1	12-09-2022	10:42	12-09-2022	11:25	Angul: B_N, 37.1 km, 6.8 kA	JITPL: B_N, 34 km	B-Earth	100	A/r failed after 1 sec		No	No	
35	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	100	Phase to phase fault		No	Yes	
36	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	

37	765 KV ANGUL-SRIKAKULAM-1	13-09-2022	20:20	18-09-2022	22:02	Angul: DT received	Srikakulam: B_N, 0.4 km, 6.7 kA	B-Earth	100	Flashover occurred in Main Bay (Bay-819-89B) DS module of B-Phase at Srikakulam s/s		No	No	
38	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	
39	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	
40	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	
41	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	
42	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	No	

43	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	
44	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	100	A/r failed after 1 sec		Yes	No	
45	220 KV DALTONGANJ-CHATRA-1	16-09-2022	13:27	16-09-2022	14:12	Daltonganj: B_N, 60.916 km, 1.041 kA		B-Earth	200	Resistive fault. A/r successful from Daltonganj only		No	Yes	
46	220 KV CHUKHA-BIRPARA-1	16-09-2022	22:57	17-09-2022	01:12		Birpara: B_N, 40.41 km, 3.268 kA	B-Earth	100	Fault in B_ph. After clearing of the fault,a nother fault struck Y_ph		NA	Yes	
47	220 KV MUZAFFARPUR-GORAUL-2	17-09-2022	03:50	17-09-2022	04:32	Muzaffarpur: R_N, 16.3 kA, A/r successful	Goraul: R_N, Zone-1	R-Earth	100	No A/r from Goraul		Yes	No	
48	220 KV DALKHOLA-PURNEA-1	17-09-2022	06:25	17-09-2022	16:12	Dalkhola: R_Y, 12.21 km, Ir: 9.53 kA, Iy: 9 kA	Purnea: R_Y, 26.69 km, Ir=Iy=7.14 kA	R-Y-Earth	100	Phase to phase fault		Yes	Yes	
49	400 KV DURGAPUR-KHSTPP-2	17-09-2022	12:02	17-09-2022	12:55	Durgapur: R_N, 157 km, 2.1 kA	KhSTPP: R_N, 67 km, 4.8 kA	R-Earth	100	A/r successful. Tripped again within reclaim time		Yes	No	

50	400 KV BIHARSHARIF-VARANASI-1	17-09-2022	19:24	17-09-2022	20:11	Biharsharif: R_N, 32.65 km, 8.002 kA		R-Earth	100	A/r failed after 1 sec		Yes	NA	
51	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	
52	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	
53	400 KV BINAGURI-RANGPO-1	18-09-2022	11:05	18-09-2022	13:42	Binaguri: R_N, 77 km, 1.4 kA	Rangpo: R_N, 5.7 kA	R-Earth	100	A/r failed after 1 sec		Yes	Yes	
54	220 KV JAMSHEDPUR-JINDAL-1	18-09-2022	11:19	18-09-2022	12:34	Jamshedpur: B_N, 35 km, 2.6 kA	Jindal: B_N, 124 km, 1.08 kA	B-Earth	100	Three phase tripping. Carrier scheme not available		No	No	
55	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	
56	220 KV RANCHI-HATIA-2	20-09-2022	05:22	20-09-2022	09:56	Ranchi: Didn't trip		No fault	NA	JUSNL may explain		NA	No	
57	220 KV KARMNASHA-SAHUPURI-1	21-09-2022	00:44	21-09-2022	02:34	Karmnasha: O/c in Y_ph and B_ph		Y-Earth	100	Fault in adjacent line. Line tripped within 100 msec	Only cfg file uploaded	No	NA	

58	400 KV ANGUL-JITPL-2	21-09-2022	08:30	21-09-2022	09:17	Angul: B_N, 11.4 km, 14.3 kA		B-Earth	100	No A/r attempt observed from PMU		No	No	
59	400 KV BARIPADA-KHARAGPUR-1	21-09-2022	11:57	21-09-2022	20:15	Baripada: Y_N, 70.9 km, 3.7 kA	Kharagpur: Y_N, 21.66 km, 7.682 kA	Y-Earth	100	A/r failed after 1 sec		No	Yes	
60	220 KV CHUKHA-BIRPARA-1	22-09-2022	02:19	22-09-2022	02:57	Chukha: R_B, 28.39 km, Ir: 2.21 kA, Ib: 2.68 kA	Birpara: R_B, 50.03 km, Ir: 2.606 kA, Ib: 2.633 kA	R-B-Earth	100	Phase to phase fault		NA	Yes	
61	220 KV CHUKHA-BIRPARA-2	22-09-2022	02:19	22-09-2022	03:13	Chukha: R_B, 27.177 km, Ir: 2.20 kA, Ib: 2.87 kA	Birpara: R_B, 50.0 km, Ir: 2.52 kA, Ib: 2.80 kA	R-B-Earth	100	Phase to phase fault		NA	Yes	
62	220 KV CHUKHA-BIRPARA-2	22-09-2022	03:25	22-09-2022	07:20	Chukha: R_B, 33.18 km, Ir: 1.083 kA, Ib: 1.404 kA	Birpara: R_B, 47.57 km, Ir: 3.052 kA, Ib: 3.345 kA	R-B-Earth	100	Phase to phase fault		NA	Yes	
63	220 KV CHUKHA-BIRPARA-1	22-09-2022	03:25	22-09-2022	07:09	Chukha: R_B, 28.37 km, Ir: 1.401 kA, Ib: 1.531 kA	Birpara: R_B, 48.38 km, Ir: 2.78 kA, Ib: 3.128 kA	R-B-Earth	100	Phase to phase fault		NA	Yes	

64	400 KV ALIPURDUAR-JIGMELLING-2	22-09-2022	04:15	22-09-2022	06:03	Alipurduar: Didn't trip	Jigmelling: R_Y_B, pick up, Zone-2, 56.5 km	R-Y	100	PG may share the findings if any		No	NA	
65	400 KV ALIPURDUAR-JIGMELLING-1	22-09-2022	05:24	22-09-2022	07:21	Alipurduar: DT received	Jigmelling: O/V St-1	No fault	NA	Voltage at Alipurduar around 413 kV. PG may share the findings, if any.		Yes	NA	
66	400 KV ANGUL-JITPL-1	22-09-2022	09:57	22-09-2022	10:22	Angul: B_N, 72 km, 5.9 kA		B-Earth	100	A/r failed after 1 sec		No	No	
67	220 KV DALTONGANJ-CHATRA-2	22-09-2022	11:20	22-09-2022	12:13	Daltonganj: B_N, 58.4 km, 1.9 kA, A/r successful		B-Earth	100	A/r successful from Daltonganj only		Yes	No	
68	220 KV BIRPARA-MALBASE-1	23-09-2022	21:12	23-09-2022	22:08	Birpara: R_B_N, 2.505 km, Ir: 9.838 kA, Ib: 12.55 kA		R-B-Earth	100	Phase to phase fault		Yes	NA	
69	400 KV ALIPURDUAR-JIGMELLING-1	24-09-2022	02:17	24-09-2022	03:41	Alipurduar: Y_B, 68.73 km, Iy: 5.3 kA, Ib: 4.7 kA		Y-B-Earth	100	Phase to phase fault		Yes	NA	
70	400 KV ALIPURDUAR-JIGMELLING-2	24-09-2022	02:17	24-09-2022	04:35	Alipurduar: Y_B, 57.16 km, Iy: 2.1 kA, Ib: 1.9 kA		Y-B-Earth	100	Phase to phase fault		Yes	NA	

71	400 KV ALIPURDUAR-PUNATSANGCHUN-JIGMELLING-2	24-09-2022	02:17			Alipurduar: Y_B, 220 km		Y-B-Earth	1500	As per PMU, fault cleared in Zone-3. PG may explain		No	NA	
72	400 KV JEERAT-BAKRESHWAR-1	24-09-2022	12:40	24-09-2022	13:40	Jeerat: B_N, 150.9 km, 2.9 kA	Bakreshwar: B_N, Zone-1	B-Earth	100	A/r successful from Bakreswar. Other two phase at Jeerat tripped after 1.5 sec		Yes	No	
73	400 KV BIHARSHARIF-MUZAFFARPUR-1	24-09-2022	13:17	24-09-2022	19:58	Biharsharif: Y_N, 132 km, 3.29 kA	Muzaffarpur: Y_N, 2.3 km, 22 kA	Y-Earth	100	A/r failed after 1 sec		Yes	Yes	
74	220 KV DARBHANGA(DMTCL)-MOTIPUR-1	24-09-2022	14:00	24-09-2022	14:58	Darbhanga: R_N, 71 km, 2.05 kA		R-Earth	100	Three phase tripping at Darbhanga. A/r successful from Motipur		Yes	Yes	
75	220 KV DALTONGANJ-CHATRA-2	24-09-2022	14:01	24-09-2022	15:05	Daltonganj: B_N, 14.21 km, 2.16 kA, A/r successful	Chatra: B_N	B-Earth	100	A/r successful from Daltonganj only		Yes	No	

76	220 KV RANCHI-HATIA-2	24-09-2022	14:04			Ranchi: B_N, 30.37 km, 4.7 kA	Hatia: B_N, 11.15 km, 8.396 kA	B-Earth	100	Another fault struck Y_ph after 380 msec which was cleared in Zone-2 time		Yes	No	
77	220 KV DARBHANGA(DMTCL)-MOTIPUR-2	24-09-2022	14:16	24-09-2022	15:31	Darbhanga: R_N, Zone-1, 9.17 kA	Motipur: R_N, 88.61 km, 1.577 kA	R-Earth	100	Three phase tripping at Darbhanga. A/r successful at Motipur		Yes	Yes	
78	220 KV BINAGURI-BIRPARA-2	24-09-2022	19:44	24-09-2022	20:23	Binaguri: R_Y, 43.3 km, Ir: 3.73 kA, Iy: 5.001 kA	Birpara: R_Y, 33.6 km, Ir: 3 kA, Iy: 4.8 kA	R-Y-Earth	100	Phase to phase fault		Yes	Yes	
79	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	NA	BSPTCL may explain		NA	No	
80	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	

81	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	
82	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	
83	220 KV BUDHIPADAR-KORBA-2	25-09-2022	15:11	26-09-2022	14:16	Budhipadar: R_N, 143.7 km, 1.18 kA	Korba: R_N, 14.10 km, 8.465 kA	R-Earth	100	Three phase tripping for single phase fault		Yes	NA	
84	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	
85	220 KV NEW PURNEA-MADHEPURA-1	26-09-2022	11:53	26-09-2022	13:17	New Purnea: Didn't trip	Madhepura: Master trip operated	No fault	NA	No fault observed in PMU		NA	No	
86	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	

87	400 KV JEERAT-BAKRESHWAR-1	26-09-2022	22:00	26-09-2022	22:33	Jeerat: DT received	Bakreshwar: Didn't trip	No fault	NA	DT received at Jeerat. Details maybe shared by WBPDCL		Yes	No	
88	220 KV RANCHI-CHANDIL-1	27-09-2022	11:52	27-09-2022	12:34	Ranchi: B_N, 24.59 km, 3.4 kA	Chandil: B_N, 77.5 km, 1.06 kA	B-Earth	100	Three phase tripping for single phase fault		Yes	No	
89	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	
90	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	
91	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	
92	220 KV RANCHI-HATIA-1	28-09-2022	14:22	28-09-2022	15:02	Ranchi: R_N, 18.86 km, 7.88 kA, A/r successful		R-Earth		A/r successful from Ranchi only		Yes	No	
93	220 KV JODA-RAMCHANDRAPUR-1	28-09-2022	15:49	28-09-2022	20:34		Ramchandrapur: B_N, 6 km, 12.78 kA	B-Earth	100	A/r not attempted from either end		No	No	

94	400 KV LAPANGA-OPGC-2	28-09-2022	16:46	28-09-2022	16:55	Lapanga: Y_N, 18.2 km, 9.2 kA, A/r successful		Y-Earth	100	A/r successful from Lapanga only		Yes	No	
95	220 KV CHUKHA-BIRPARA-1	28-09-2022	18:06	28-09-2022	18:59		Birpara: R_Y_N, 46.89 km, Ir: 2.66 kA, Iy: 2.41 kA	R-Y-B-Earth	100	Three phase fault		NA	Yes	
96	220 KV CHUKHA-BIRPARA-2	28-09-2022	18:06	28-09-2022	19:01		Birpara: R_Y_N, 46.45 km, Ir: 2.74 kA, Iy: 2.37 kA	R-Y-B-Earth	100	Three phase fault		NA	Yes	
97	220 KV DALTONGANJ-CHATRA-1	28-09-2022	18:15	28-09-2022	19:38	Daltonganj: DT received	Chatra: B_ph bus coupler PT burst	B-Earth	100	JUSNL may explain the event		No	No	
98	400 KV DARBHANGA(DMTCL)-SAHARSA-2	29-09-2022	03:55	29-09-2022	04:30	Darbhanga: R_N, 40.42 km, 5.5 kA	Saharsa: R_N, 46 km, 5.4 kA, A/r successful	R-Earth	100	A/r successful from Saharsa only		Yes	Yes	
99	400 KV MAITHON-JAMSHEDPUR-1	29-09-2022	16:26	29-09-2022	16:51	Maithon: B_N, 19.88 km, 10.1 kA	Jamshedpur: B_N, 121.65 km, 3.321 kA	B-Earth	100	A/r kept in non-auto mode for PID testing of insulators		Yes	Yes	
100	220 KV KATAPALLI-BOLANGIR-1	29-09-2022	16:37	29-09-2022	17:10	Katapalli: R_N, 84.7 km, 2.018 kA, A/r successful	Bolangir: R_N, R_N, 21.8 km, 3.83 kA	R-Earth	100	Three phase A/r from Katapalli end.		Yes	No	

101	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	
102	220 KV BIRPARA-MALBASE-1	30-09-2022	12:03	30-09-2022	12:57		Malbase: Bus bar protection operated	No fault	NA	Bus bar operated at Birpara. No fault observed in PMU		No	NA	
103	220 KV DARBHANGA(DMTCL)-MOTIPUR-2	30-09-2022	12:31	30-09-2022	13:16	Darbhanga: B_N, Zone-2, 87.57 km, 1.54 kA		B-Earth	100	Three phase tripping at Darbhanga	Only cfg file uploaded	No	No	
104	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		No	No	

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.4

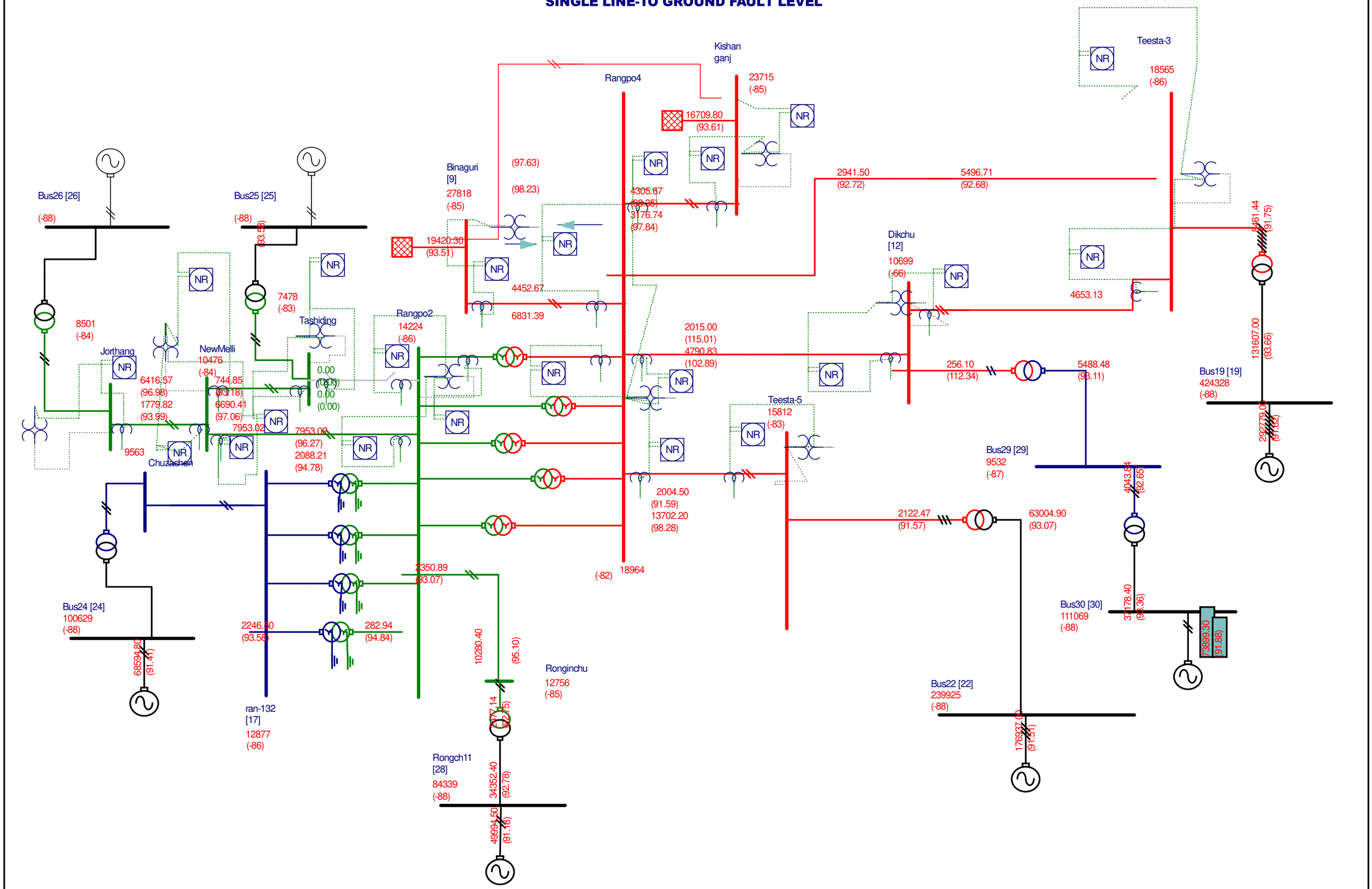
Sl No.	Name of the incidence	PCC Recommendation	Latest status
118th PCC Meeting			
1	Disturbance at 220 kV Burmu(JUSNL) S/S on 01.08.2022 at 11:56 Hrs	PCC advised JUSNL that the carrier protection scheme may be checked and end to end testing shall be carried out to test the healthiness of PLCC/carrier 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.	
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.	
117th PCC Meeting			
2	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.*
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.*
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.	

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.