



Agenda
for
115th PCC Meeting

Date: 20.06.2022
Eastern Regional Power Committee
14, Golf Club Road, Tollygunge
Kolkata: 700 033

EASTERN REGIONAL POWER COMMITTEE

AGENDA FOR 115th PROTECTION COORDINATION SUB-COMMITTEE MEETING TO BE HELD ON 20.06.2022 AT 10:30 HOURS

PART – A

ITEM NO. A.1: Confirmation of Minutes of 114th Protection Coordination sub-Committee Meeting held on 13th May 2022 through MS Teams online platform.

The minutes of 114th Protection Coordination sub-Committee meeting held on 13.05.2022 was circulated vide letter dated 30.05.2022.

Members may confirm the minutes of meeting.

PART – B

ITEM NO. B.1: Disturbance at 400/220/132 kV Lapanga(OPTCL) S/s on 27.05.2022 at 15:56 hrs.

At 15:56 Hrs, B_{ph} of 220 kV Katapalli-Lapanga-1 cross bus snapped and fell over the 220 kV Main Bus-1 & 2 at Lapanga. This led to complete outage of 220 kV Lapanga S/s. At the same time blackout occurred at Vedanta and Bhushan CPP also.

Total 840 MW captive generation loss and 884 MW captive load loss occurred at Vedanta.

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

Relay Indications:

Name	End1	End 2
220 kV Katapalli-Lapanga-1	Z-3, B -N	Z-1, B-N
220 kV Budhipadar Lapanga-1	Z-3, R-Y-B	Z-4, R-Y-B
220 kV Budhipadar Lapanga-2	Z-2, R-Y-B	Z-4, R-Y-B
20 kV Budhipadar Vedanta-1		Tripped on SPS
220 kV Budhipadar Vedanta-2		Tripped on SPS
400/220 kV ICT-1 at Lapanga	Backup O/C	
400/220 kV ICT-2 at Lapanga		Hi set O/C
220/132 kV ICT-1 & 2 at Lapanga	REF	

OPTCL may explain.

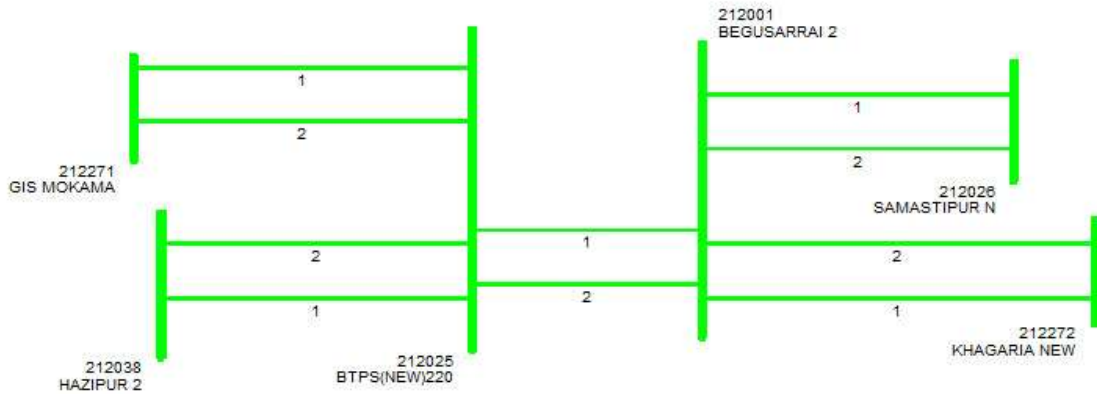
ITEM NO. B.2: Disturbance at 220 kV Barauni S/s on 19.05.2022 at 17:25 Hrs

220 kV Barauni-Begusarai D/C got tripped during a fault in 220 kV Begusarai-Samastipur D/C line. With tripping of 220 kV Barauni TPS-Begusarai D/C line, Barauni TPS got islanded with Mokama S/s load however the island did not survive.

Report from ERLDC is attached at **Annexure B.2.**

Relay Indications:

Time	Name	End1	End 2
17:22	220 Kv Begusarai – Samastipur -1	-	B ,Z-2,66KM
17:22	220 Kv Begusarai – Samastipur -2	B ,Z-1,6KM	B ,Z-1,44KM
17:25	220 kV Barauni_TPS- Begusarai-1	O/V	-
17:25	220 kV Barauni_TPS- Begusarai-2	O/V	-



Load Loss: 34 MW
Gen. Loss: 260 MW

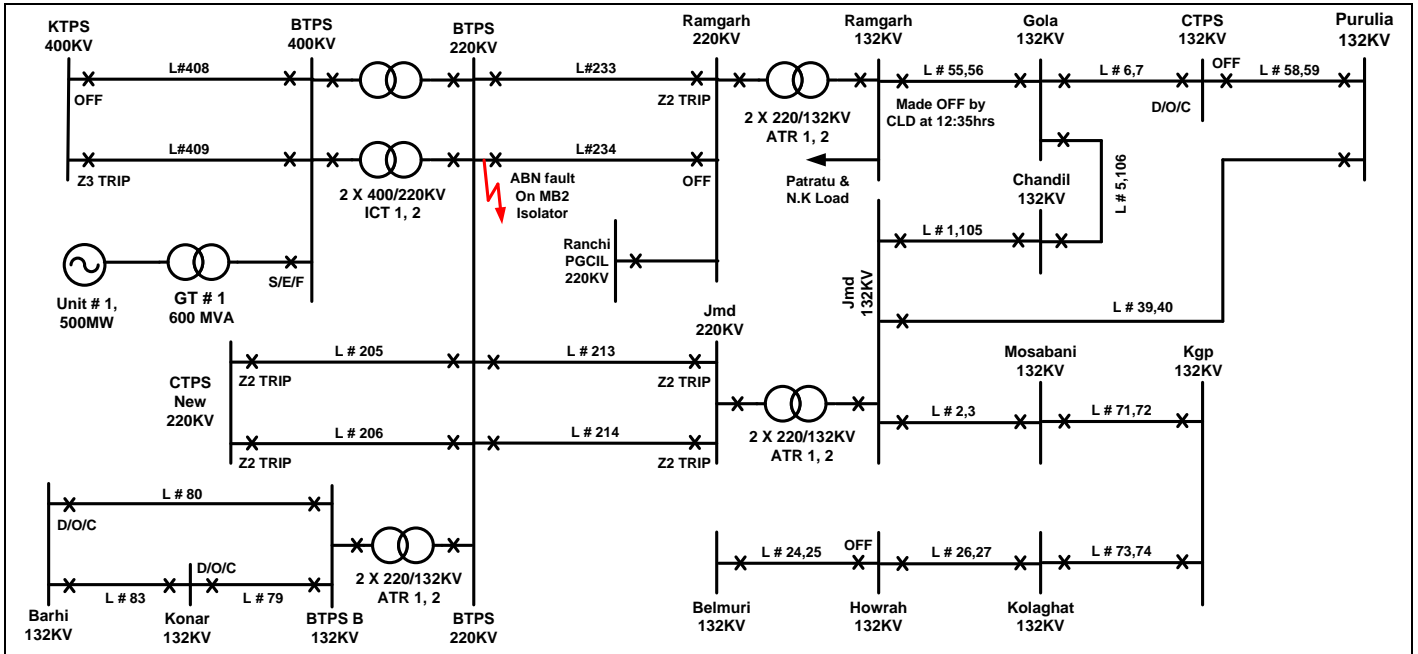
Outage Duration: 01:58 Hrs

BSPTCL may explain.

ITEM NO. B.3: Disturbance at 400/220 kV Bokaro A(DVC) S/s on 12.05.2022 at 13:56 Hrs

As reported, during testing of main bay of 400 kV Bokaro A-Koderma-2 at Bokaro A, LBB protection had mal-operated and subsequently tripped both the 400 kV buses at Bokaro A.

Detailed report from DVC is attached at **Annexure B.3.**



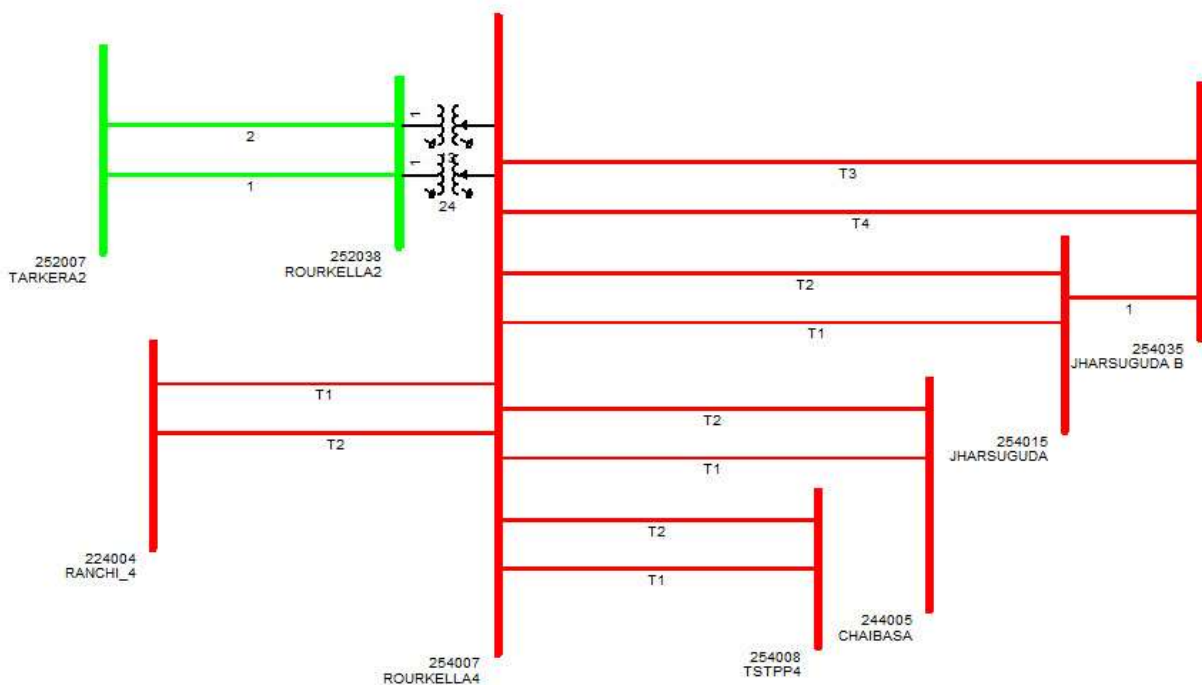
Gen. Loss: 450 MW
Outage Duration: 00:30 Hrs

DVC may explain.

ITEM NO. B.4: Disturbance at 400/220 kV Rourkela(PG) S/s on 31.05.2022 at 11:09 Hrs

On 31.05.2022 at 11:09 Hrs, both 400 kV Bus at Rourkela became dead while trying to open line isolator of 400 kV TSTPP-Rourkela-1 at Rourkela end. During the incident, Teed protection had operated however B phase breaker of Talcher-1 at Rourkela was stuck resulting in triggering of LBB protection. Thereafter LBB operated however it didn't function properly due to which all lines got tripped from remote ends in Zone-2. This resulted in total power failure in 400/220 kV Rourkela S/s.

Detailed report from ERLDC is attached at **Annexure B.4.**



Load Loss: Nil, Gen. Loss: Nil
Outage Duration: 00:42 Hrs

Powergrid & TSTPP(NTPC) may explain.

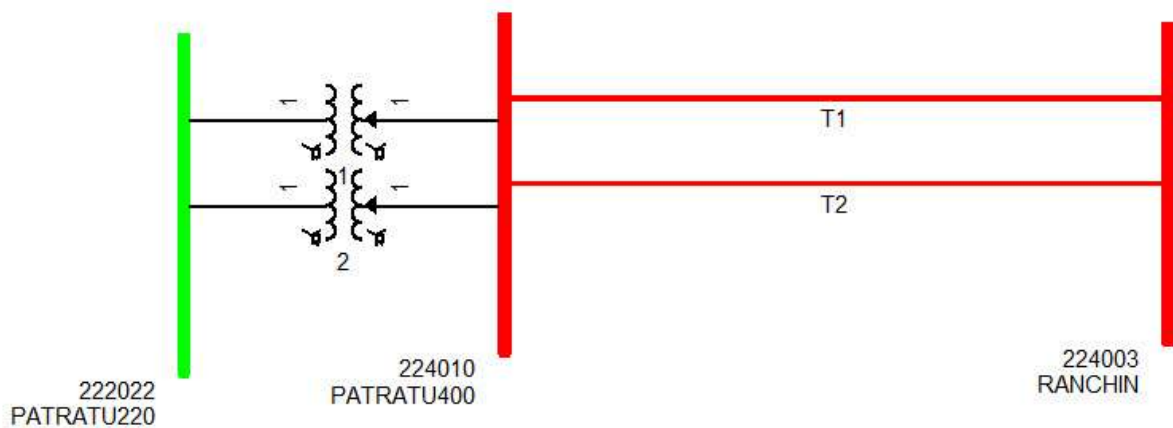
ITEM NO. B.5: Total Power failure at 400/220 kV Patratu(JUSNL) S/s on 14.05.2022 at 16:04 Hrs

400 kV New Ranchi-Patratu D/c got tripped due to B phase to earth fault. This led to total power failure at 400/220 kV Patratu S/s.

Disturbance report is attached at **Annexure B.5.**

Relay Indications:

Time	Name	End 1	End 2	PMU Observations
16:04	400 kV New Ranchi-Patratu-1	New Ranchi: B_N, 2.28 km, 24.5 kA	-	145 kV dip in B_ph voltage at New Ranchi. After 450 msec, around 150 kV dip in Y_ph observed at New Ranchi
	400 kV New Ranchi-Patratu-2	New Ranchi: B_N, 2.17 km, 24.37 kA	-	



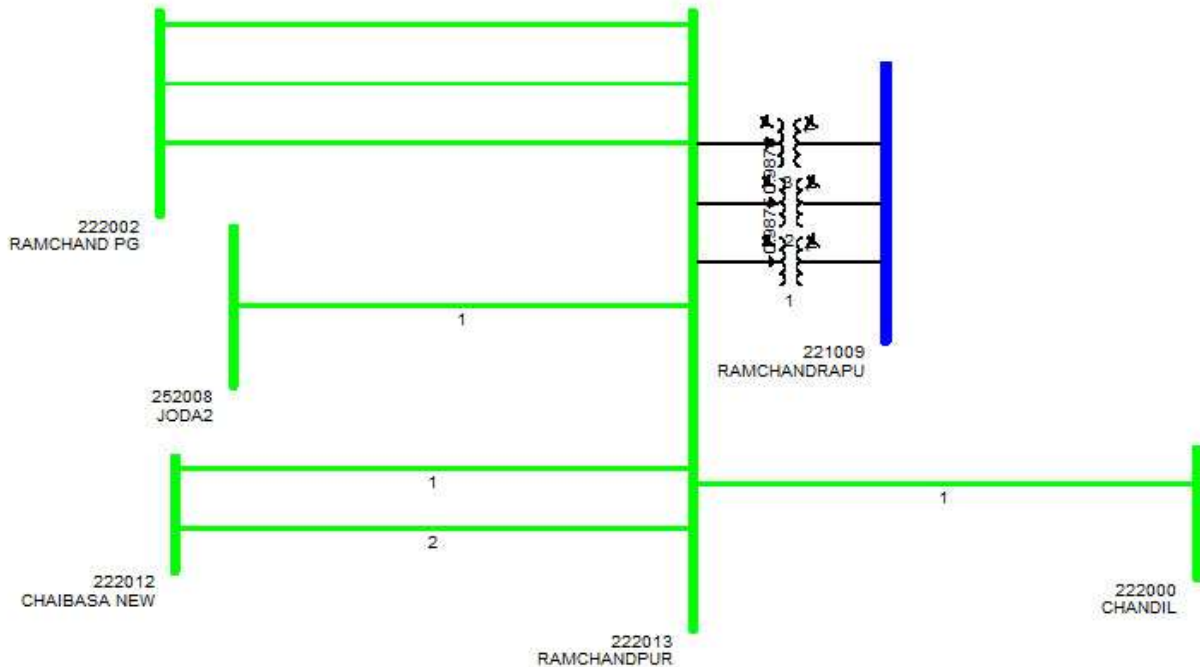
Load Loss: 60 MW
Outage Duration: 01:36 Hrs

JUSNL may explain.

ITEM NO. B.6: Disturbance at 220 kV Ramchandrapur(JUSNL) S/S on 21.05.2022 at 01:33 Hrs

R &Y phase bus side jumper of 220 kV Joda-Ramchandrapur-1 got snapped at Ramchandrapur which created a bus fault. Subsequently all the elements of bus-1 & bus coupler got tripped leading to load loss of around 80 MW at Adityapur, Jadugoda & Golmuri area.

Disturbance report is attached at **Annexure B.6.**



Load Loss: 80 MW
Outage Duration: 00:59 Hrs

JUSNL may explain.

ITEM NO. B.7: Total Power failure at 220 kV Chatra(JUSNL) S/s on 01.05.2022 at 17:40 Hrs

On 01.05.2022 at 17:40 Hrs 220 kV Daltonganj-Chatra D/c tripped from Daltonganj end leading to total power failure at 220/132 kV Chatra S/s. As reported both lines got tripped in zone-3 which indicates the fault was in downstream of chatra S/s.

Disturbance report is attached at **Annexure B.7.**

Relay Indications:

Time	Name	End1	End2	PMU Observations
17:40	220 kV Daltonagnj-Chatra-1	Daltonganj: B_N, 0.8 kA	Didn't trip	27 kV dip in B_ph voltage for 800 msec at Daltonganj
	220 kV Daltonagnj-Chatra-2	Daltonganj: B_N, 0.8 kA	Didn't trip	

Load Loss: 13 MW

Outage Duration: 02:48 Hrs

JUSNL & Powergrid may explain.

ITEM NO. B.8: Repeated disturbances at 220 kV Garhwa(JUSNL) S/s

A. Total Power failure at 220 kV Garhwa(JUSNL) S/s on 01.05.2022 at 15:53 Hrs

On 01.05.2022 at 15:53 Hrs, 220 kV Daltonganj-Garhwa D/c tripped subsequently total power failure occurred at 220 kV Garhwa S/s.

Detailed report from ERLDC is attached at **Annexure B.8.A.**

Relay Indications:

Time	Name	End 1	End 2	PMU Observations
15:43	220 kV Daltonganj-Garhwa-2	Daltonganj: R_N, Zone-1, 3.83 kA, 18.34 km,	Garhwa: R_N, Zone-1, 3.4 kA, 65 km	40 kV dip in R_ph and 45 kV dip in Y_ph voltage at Daltonganj.
15:53	220 kV Daltonganj-Garhwa-1	Daltonganj: R_Y, 4.9 km, 3.8 kA	Garhwa: Didn't trip	

Load Loss: 30 MW

Outage Duration: 01:34 Hrs

B. Total Power failure at 220 kV Garhwa(JUSNL) S/s on 23.05.2022 at 19:59 Hrs

220 kV Daltonganj-Garhwa (New) D/c tripped on R-N fault leading to total power failure at 220/132 kV Garhwa S/s.

Load Loss: 30 MW

Outage Duration: 01:21 Hrs

JUSNL may explain.

ITEM NO. B.9: Grid events other than GD/GI

B.9.1: Bus tripping occurred in Eastern Region during April 2022

During May 2022, following incidents of bus bar tripping have been observed in eastern Region.

Element Name	Tripping Date	Reason	Utility
400 kV Main Bus-1 at Saharsa	13.05.22 at 17:12 Hrs	Bus bar protection operated	PMTL
400 kV Main Bus-2 at Kahalgaon (KhSTPP)	17.05.22 at 10:47 Hrs	LBB of Tie CB of U#2 and Bus Reactor#1 operated	NTPC
400 kV Bus-2 at TSTPP	22.05.22 at 03:49 Hrs	Relay of 400 kV TSTPP-Meramundali-2 was not	NTPC

		reset at TSTPP end. LBB Protection operated.	
400 kV North Bus-2 at Pusauli	23.05.22 at 17:42 Hrs	BPI damaged of 400 kV Pusauli-Allahabad line at Pusauli end.	PG ER-1
400 kV Bus-2 at Durgapur	31.05.22 at 11:30 Hrs	Bus bar protection operated	PG ER-2

Concerned utilities may explain.

B.9.2: Repeated Tripping of Transmission Lines.

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

S.No.	Name of the Element	No. of times Tripped	Remarks	Utility
1	400 kV TSTPP-Meramundali-2	4	Fault in R phase in all instances. around 15 km from Meramundali	OPTCL
2	400 kV PPSP-Bidhannagar-1	4	Fault in R phase in three instances.	WBSETCL
3	220 kV Daltonganj-Garhwa-1	5	This line has tripped in past on multiple occasions duet to ROW and clearance issues as well as damaged Insulators.	JUSNL
4	220 kV Daltonganj-Chatra-2	5	Fault in either B phase or Y_B phase	JUSNL
5	220 kV Daltonganj-Chatra-1	4	Fault in either B phase or Y_B phase	JUSNL
6	220 kV Budhipadar-Korba-1	4	Fault in B phase around 40 km in two instances.	OPTCL

Concerned utilities may explain.

ITEM NO. B.10: Tripping Incidence in month of May-2022

Single line tripping incidents in the month of May-2022 which needs explanation from constituents of either of the end is attached at **Annexure B.10.**

Concerned utilities may explain.

PART-C :: OTHER ITEMS

ITEM NO. C.1: Follow-up of Decisions of the Previous Protection Sub-Committee Meeting(s)

The decisions of previous PCC meetings are attached at **Annexure C.1**.

Members may update the latest status.

ITEM NO. C.2: Total Power Failure at 220 kV Hazipur S/s on 05/04/2022 at 18:03 Hrs

The disturbance occurred due to failure of Y-phase LA of 220 kV Barauni-Hazipur circuit-1 at Hazipur end. Subsequently all lines emanating from 220 kV Hazipur tripped resulting in total supply failure at Hazipur & Amnour.

Load Loss: 260 MW

Outage Duration: 00:21 Hrs

In 115th PCC Meeting, after detailed deliberation the followings were decided:

- *SLDC Bihar would coordinate with Barauni end to get the DR/EL from their end for 220 kV Hazipur-Barauni-2 line.*
- *BSPTCL would submit the DR of Hazipur end to ERLDC immediately and further they would investigate the root cause of the tripping of all feeders at Hazipur end during the disturbance and submit a report to ERPC/ERLDC before next PCC Meeting.*
- *The CT switching scheme w.r.t. LBB protection may be checked at Hazipur end.*

BSPTCL may update.

ITEM NO. C.3: Review of Line Reactor Tripping Schemes for mitigating Resonance O/V and secondary arcing--ERLDC

Three phase line reactor tripping scheme is implemented in few lines to avoid resonance overvoltage and secondary arcing problem during dead time of auto reclose. However, as the lines are being reconfigured due to LILO at various places hence for such lines with line reactor, it is important to check the compensation & subsequently review is needed.

At some places after reconfiguration there may be a need of implementing these schemes with proper study, while at some places where it is already implemented there may not be the needed so it may be disabled after validating with study.

Lines where this scheme is already implemented and which had been liloed subsequently are as follows-

1. 400 kV MPL-Ranchi liloed at Dhanbad.
2. 400 kV Patna -NPGC liloed at Jakkanpur.
3. 400 kV Darbhanga -Kishanganj liloed at Sahrsa.

Similarly, wherever line compensation is being changed due to reconfiguration, it should be reviewed and studied beforehand for implementing L/R tripping scheme to avoid any instances of high O/V & stage-2 tripping which impacts the end equipment's health.

Members may discuss.

ITEM NO. C.4: Philosophy of O/V protection settings in 765 kV lines--ERLDC

It has been observed that at various 765 kV S/s in ER, O/V settings had been kept at 105% with 5 seconds or 6 seconds time delay, which appears to be on conservative side. The existing settings may be discussed and reviewed.

Members may discuss.

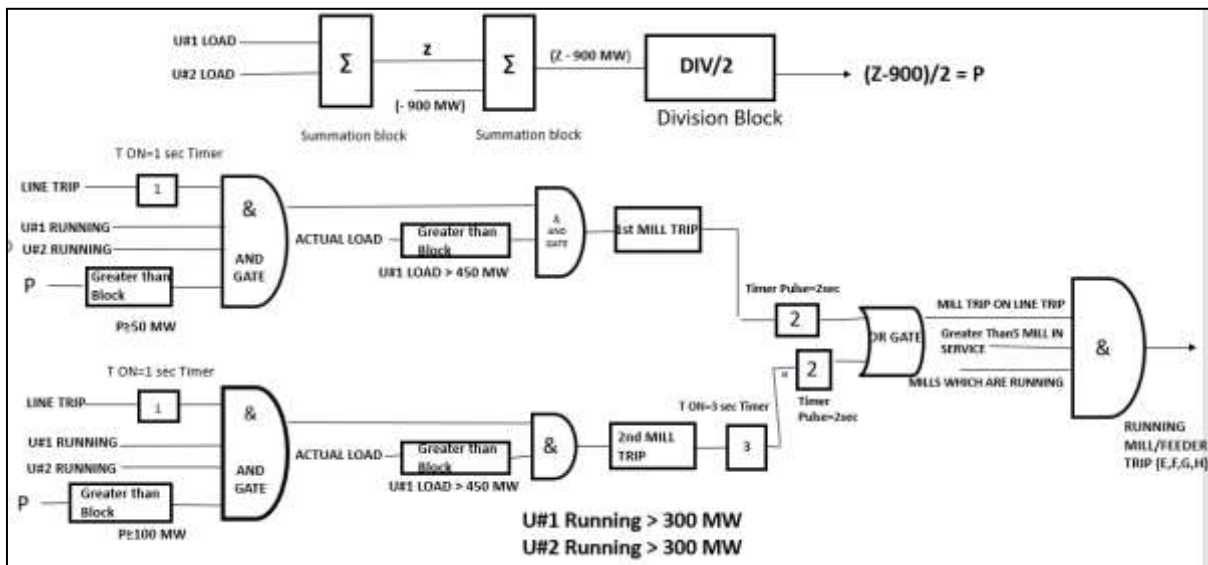
ITEM NO. C.5: SPS schemes implemented at TALA & JITPL

A. SPS at JITPL end: To avoid overloading of 400kV Angul - JITPL lines under N-1 contingency and when both units at JITPL are running at full load, SPS at JITPL had been implemented which will trip the mills for fast generation reduction.

When line trip occur with both the units are running with load more than 300 MW & “P” is greater than or equal to 50 MW & unit load is greater than 450 MW then one mill trips from the top.

If $P \geq 100$ MW then after 3 sec. one more mill trips from the top elevation

Note: Mill will trip only when more than 4 mills are in running condition.



Following queries regarding the above SPS need to be clarified by JITPL:

- What would be the total reduction with each mill tripping at full generation of both units
- How many mill would trip for reducing load below 900 MW in above case.
- Maximum limit of line loading as observed by SPS at 900 MW.

JITPL may update.

B. SPS at Tala end:

- Currently only 2 number of circuits are present for Tala generation evacuation, one is direct to Binaguri and one is via Malbase, so in order to avoid overloading of single remaining circuit under N-1 contingency, SPS at Tala end had been incorporated which will trip units depending on the power generation of Tala.
- Manual switch will be used for enabling unit selection which will be tripped depending upon power generation of TALA which is as follows

- P GEN> 623 & one breaker opened at Tala end – Trip 1 Unit of TALA.
- P GEN> 810 & one breaker opened at Tala end – Trip 2 Units of TALA.
- P GEN> 935 & one breaker opened at Tala end – Trip 3 Units of TALA.

Note: Status of Master Trip will be considered for opening of line.

In a joint meeting it had been decided to explore the possibility for Analog Power sensing based SPS to overcome the shortcomings of existing schemes.

Until power sensing based SPS is being implemented, Malbase protection will be bypassed and protection will be changed at Tala end such that it will covers complete line length so that for fault in section of Malbase to Binaguri also, it trips from Tala end so that, SPS can operate as desired.

Members may note.

ITEM NO. C.6: 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. A list has been prepared based on the information available through OCC/PCC forum and the same is enclosed at **Annexure C.6**.

Concerned utilities are advised to upload the relay settings in PDMS or send the relay settings to erpc-protection@gov.in .

Members may note and comply.

ITEM NO. C.7: 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.7**.

In 114th PCC meeting, concerned utilities were advised to comply the recommendations submitted by audit team.

Concerned utilities may update.

ITEM NO. C.8: Schedule for 3rd party Protection Audit by ERPC Protection Team.

It is proposed to conduct 3rd Party protection audit for the following substations in the month July-22.

1. 400 kV Jamshedpur (Powergrid) S/s
2. 220 kV Ramchandrapur (JUSNL) S/s
3. 220 kV Chandil (JUSNL) S/s
4. 220 kV Jamshedpur (DVC) S/s
5. 400/220 kV Chaibasa (Powergrid) S/s
6. 220 kV Chaibasa New (JUSNL) S/s

Members may discuss.

ITEM NO. C.9: Automation of Protection Settings extraction from PDMS

To facilitate protection co-ordination and protection audit, automation of protection setting extraction from the database is required. In this regard, a model excel sheet was shared with PRDC and automation of extraction of settings from PDMS was also discussed.

In 113th PCC, ERPC secretariat informed that a meeting would be held on 19th April 2022 among ERPC, ERLDC & PRDC to discuss the above issue.

In 114th PCC, PRDC representative informed that development of facility for relay data extraction from protection database is under progress and it is expected to be implemented within 45 days.

PRDC may update.

ITEM NO. C.10: New Element Integration

C.10.1: FTC of 400 kV Gokarna-New Chanditala D/c

As per information received at ERLDC, 400 kV Gokarna-New Chanditala D/C is going to be first time charged.

Line parameters are as below:

Name	Conductor Type	Length
400 kV Gokarna - New Chanditala D/c	Twin Moose	177.31 km

Protection Co-ordination maybe reviewed as per following table (Based on information available at ERLDC):

Reason	Settings to be reviewed	At S/s	Utility	Remarks
FTC of 400 kV Gokarna-New Chanditala D/c	400 kV Gokarna-New Chanditala D/c	Gokarna, New Chanditala	WBSETCL	Protection coordination to be done for newly connected element as per ERPC guidelines.
	400 kV Kolaghat-New Chanditala	Kolaghat	WBPDC	Adjacent longest line for these lines will now be 400 kV Gokarna-New Chanditala D/c (177.31 km-TM). Hence Zone-3 settings at respective S/s may be reviewed keeping in view it should not encroach next voltage level
	400 kV Medinipur-New Chanditala D/c	Medinipur	PMJTL	
	400 kV Arambagh-New Chanditala	Arambagh	WBSETCL	
	400 kV Jeerat-New Chanditala	Jeerat	WBSETCL	
	400 kV Bidhannagar-New Chanditala	Bidhannagar	WBSETCL	

- PLCC end-to-end testing confirmation maybe furnished before FTC of the line.

- All utilities are requested to review the settings accordingly and confirm if any changes required or not. If any changes are envisaged, then updated settings maybe shared with ERLDC and ERPC.

C.10.2: FTC of 220 kV Subhashgram-Baruipur D/c

As per information received at ERLDC, 220 kV Subhashgram (PG)- Baruipur D/c is going to be first time charged.

Line parameters are as below:

Name	Conductor Type	Length
220 kV Subhashgram(PG)-Baruipur D/c	ACSR Zebra	33 km

Protection Co-ordination maybe reviewed as per following table (Based on information available at ERLDC):

Reason	Settings to be reviewed	At S/s	Utility	Remarks
FTC of 220 kV Subhashgram(PG)-Baruipur D/c	220 kV Subhashgram (PG)-Baruipur D/c	Subhashgram (PG), Baruipur	PG ER-2, WBSETCL	Protection coordination to be done for newly connected elements as per ERPC guidelines.
	220 kV Subhashgram (PG)-NewTown AA-3	NewTown AA-3	WBSETCL	Adjacent longest line will now be 220 kV Subhashgram(PG)-Baruipur D/c (33 km). Hence Zone-3 settings at 220 kV NewTown AA-3 S/s may be reviewed keeping in view it should not encroach next voltage level.
	220 kV Subhashgram(PG)-Bantala	Bantala	WBSETCL	Adjacent longest line will now be 220 kV Subhashgram(PG)-Baruipur D/c (33 km). Hence Zone-3 settings at 220 kV Bantala S/s may be reviewed keeping in view it should not encroach next voltage level.

- PLCC end to end testing 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 setting with ERLDC and ERPC at the earliest.

Concerned utilities may update.

पावर सिस्टम ऑपरेशन करपोरेशन लिमिटेड

(भारत सरकार का उद्यम)

POWER SYSTEM OPERATION CORPORATION LIMITED

(A Government of India Enterprise)



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घटना संख्या: 27-05-2022/2

दिनांक: 31-05-2022

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

Summary of the event (घटना का सारांश):

At 15:56 Hrs, B_ph of 220 kV Katapalli-Lapanga-1 cross bus snapped and fell over 220 kV Main Bus-1 & 2 at Lapanga. This led to complete outage of 220 kV Lapanga. At the same time blackout occurred at Vedanta and Bhushan CPP also. Total 840 MW captive generation loss and 884 MW captive load loss occurred at Vedanta.

Date / Time of disturbance: 27-05-2022 at 15:56 hrs

- **Event type:** GD-1
- **Systems/ Subsystems affected:** 220/132 kV Lapanga, 220 kV Vedanta S/s
- **Load and Generation loss.**
 - Captive generation loss of 840 MW at Vedanta reported during the event.
 - 884 MW captive load loss occurred at Vedanta

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

- 220 kV Lapanga-Katapalli-2

Major elements tripped (प्रमुख ट्रिपिंग):

- 220 kV Lapanga-Katapalli-1
- 220 kV Budhipadar-Lapanga-D/c
- 220 kV Budhipadar-Vedanta D/c
- 400/220 kV ICT-1 & 2 at Lapanga
- 220/132 kV ICT-1 & 2 at Lapanga

Network across the affected area (प्रभावित क्षेत्र का नक्शा)

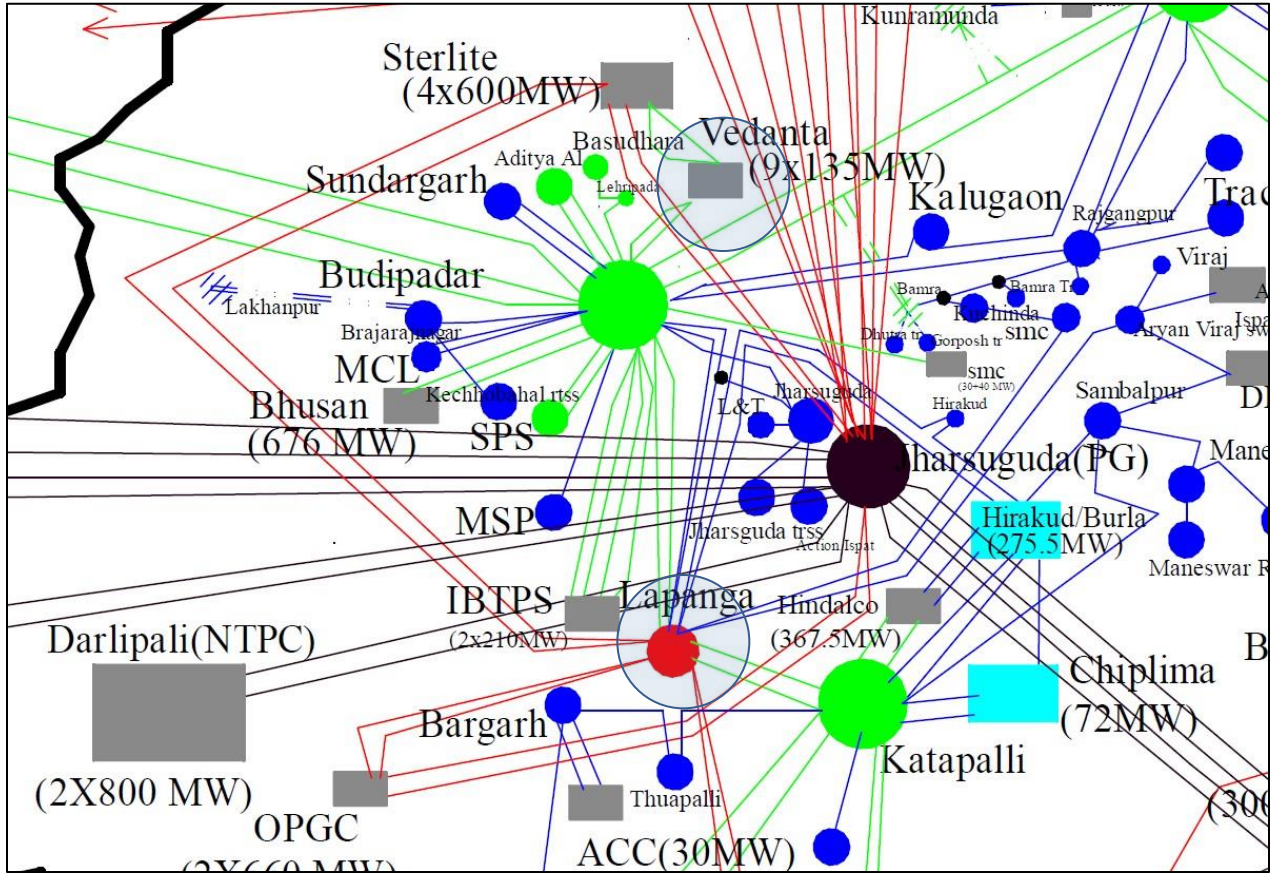


Figure 1: Network across the affected area

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

समय	नाम	उप केंद्र 1 रिले संकेत	उप केंद्र 2 रिले संकेत	पीएमयू पर्यवेक्षण
15:56	220 kV Katapalli-Lapanga-1	Z-3 , B -N	Z-1, B-N	13 kV dip in all three phases at Meramundali. Fault clearance time: 1.7 seconds
	220 kV Budhipadar-Lapanga-1	Z-3, R-Y-B	Z-4, R-Y-B	
	220 kV Budhipadar-Lapanga-2	Z-2,R-Y-B	Z-4, R-Y-B	
	220 kV Budhipadar-Vedanta-1		Tripped on SPS	
	220 kV Budhipadar-Vedanta-2		Tripped on SPS	
	400/220 kV ICT-1 at Lapanga	B/UP O/C		
	400/220 kV ICT-2 at Lapanga		Hi set O/C	
	220/132 kV ICT-1 & 2 at Lapanga	REF		

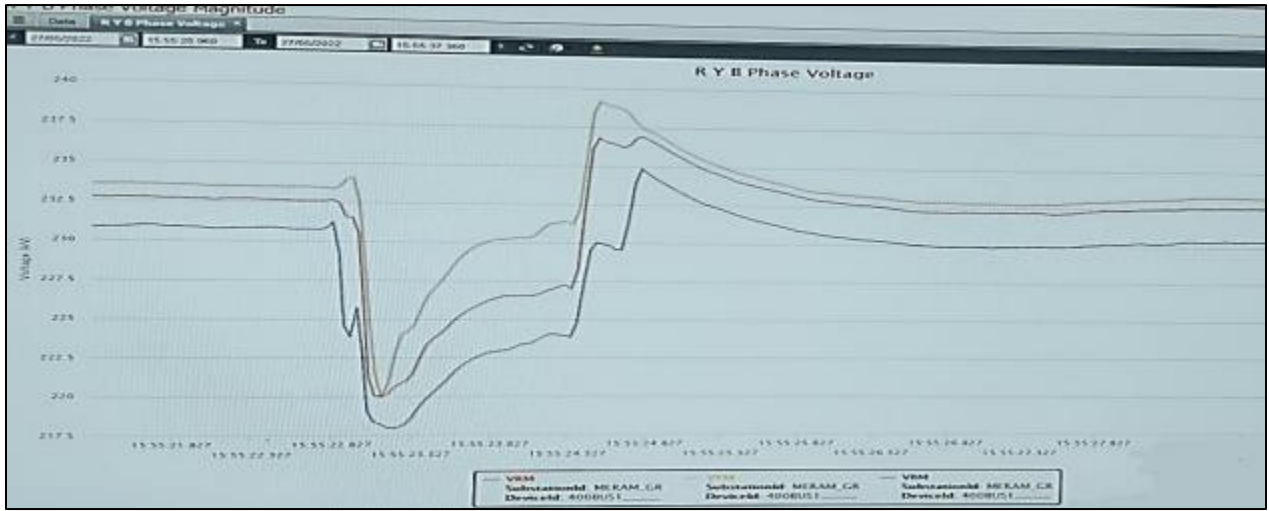
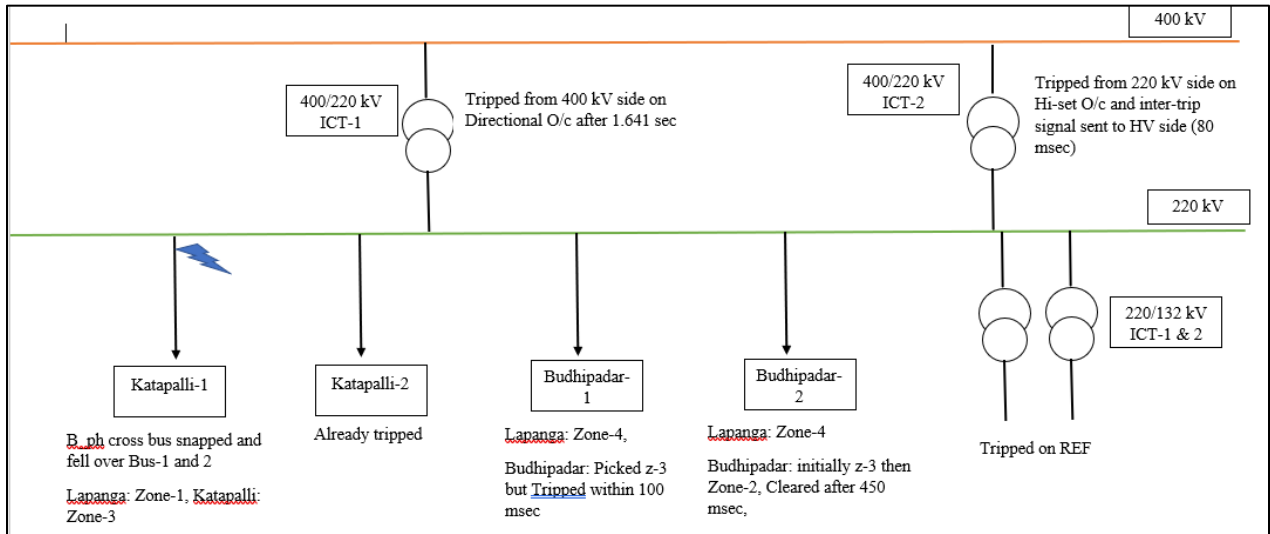


Figure 2: PMU snapshot of 400/220 kV S/s

Restoration (पूर्वावस्था की प्रप्ति)

Transmission/Generation element name	Restoration time
220 kV Katapalli-Lapanga-1	28/05/22 ,00:57
220 kV Budhipadar-Lapanga-1	28/05/22 ,01:17
220 kV Budhipadar-Lapanga-2	28/05/22 ,01:17
220 kV Budhipadar-Vedanta-d/c	27/05/22 ,16:11
400/220 kV ICT-1&2 at Lapanga	28/05/22 ,00:30
220/132 kV ICT-1&2 at Lapanga	28/05/22 ,00:43

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



- 220 kV Lapanga-Katapalli-2 tripped 4 times since 13:24 Hrs that day. After 4th tripping, ckt-1 loading was 260 Mw and cross bus of ckt-1 snapped at Lapanga at 15:56 Hrs and fell on both 220 kV buses and created three phase fault. High loading in the remaining circuit-1 may have initiated the fault.
- Bus bar protection at 220 kV Lapanga is not available.
- 220 kV Katapalli-Lapanga-1 tripped from Lapanga in Zone-1 detecting B phase fault and all 3 phase tripped. However, from Katapalli end same line tripped in zone-3 after 1 second.
- 220 kV Budhipadar-Lapanga-1 tripped immediately in Zone-1 from Budhipadar although it sensed the fault in zone-3 , T1 became high. **Time setting to be checked by OPTCL for Budhipadar end.**, line tripped in Zone-4 from Lapanga after 300 msec.
- 220 kV Budhipadar-Lapanga-2 tripped after 450 msec in Zone-2 initially it was picked in zone-3 but got reset as current reduced then again with increase in current picked in z-2 from Budhipadar, line tripped in Zone-4 from Lapanga after 300 msec.
- Both 220/132 ATR tripped on REF instantaneously which should not occur , as per information received it has been changed to low impedance scheme so Bias etc to be reviewed **and REF stability to be checked by OPTCL .**
- 400/220 kV ICT-2 tripped on high-set O/c within 80 msec from LV side and sent intertrip command to HV side. As per DR, current in Y_ph and B_ph was above 7 kA in LV side. However, this current is higher than the current value in HV side after adjusting transformation ration. **ICT backup O/C to be tested for healthiness by OPTCL.**
- 400/220 kV ICT-1 tripped from HV side on Directional O/c after 1.64 seconds and fault was isolated from the system. Directional O/c setting to be co-ordinated. At this point all other sources were out and only source was ICT-1 so CT saturation may take place needs to be checked so **ICT backup O/C to be tested for healthiness by OPTCL.**
- At the same time, 220 kV Budhipadar-Vedanta tripped from Vedanta end only as voltage remained less than 0.65 pu and current was more than 600 A for around 350 msec. 220 kV Vedanta Island did not survive causing total power failure at Vedanta S/s.

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	OPTCL
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)	OPTCL
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.	OPTCL

Status of Reporting (रिपोर्टिंग की स्थिति):

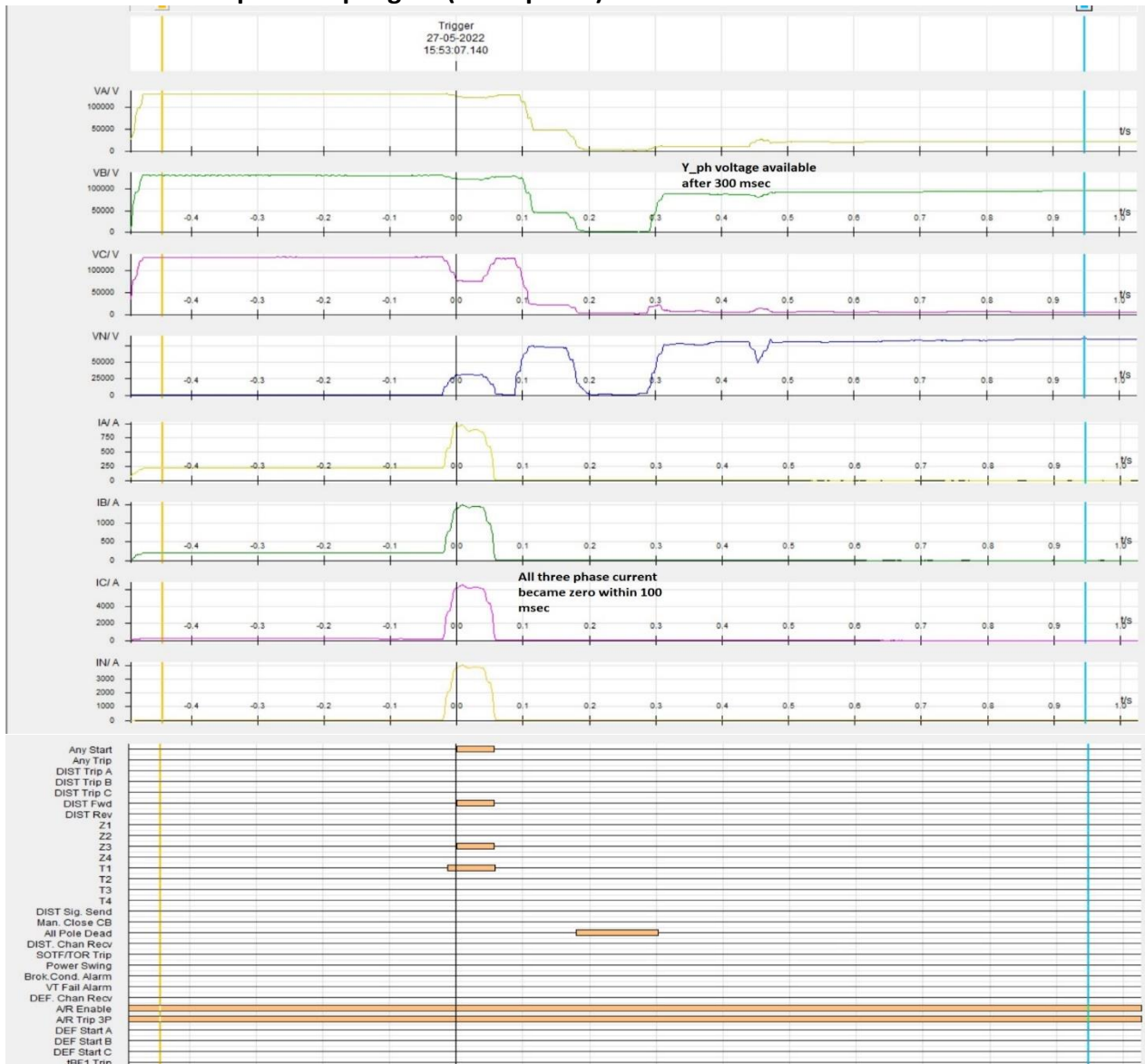
- DR/EL received from OPTCL

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

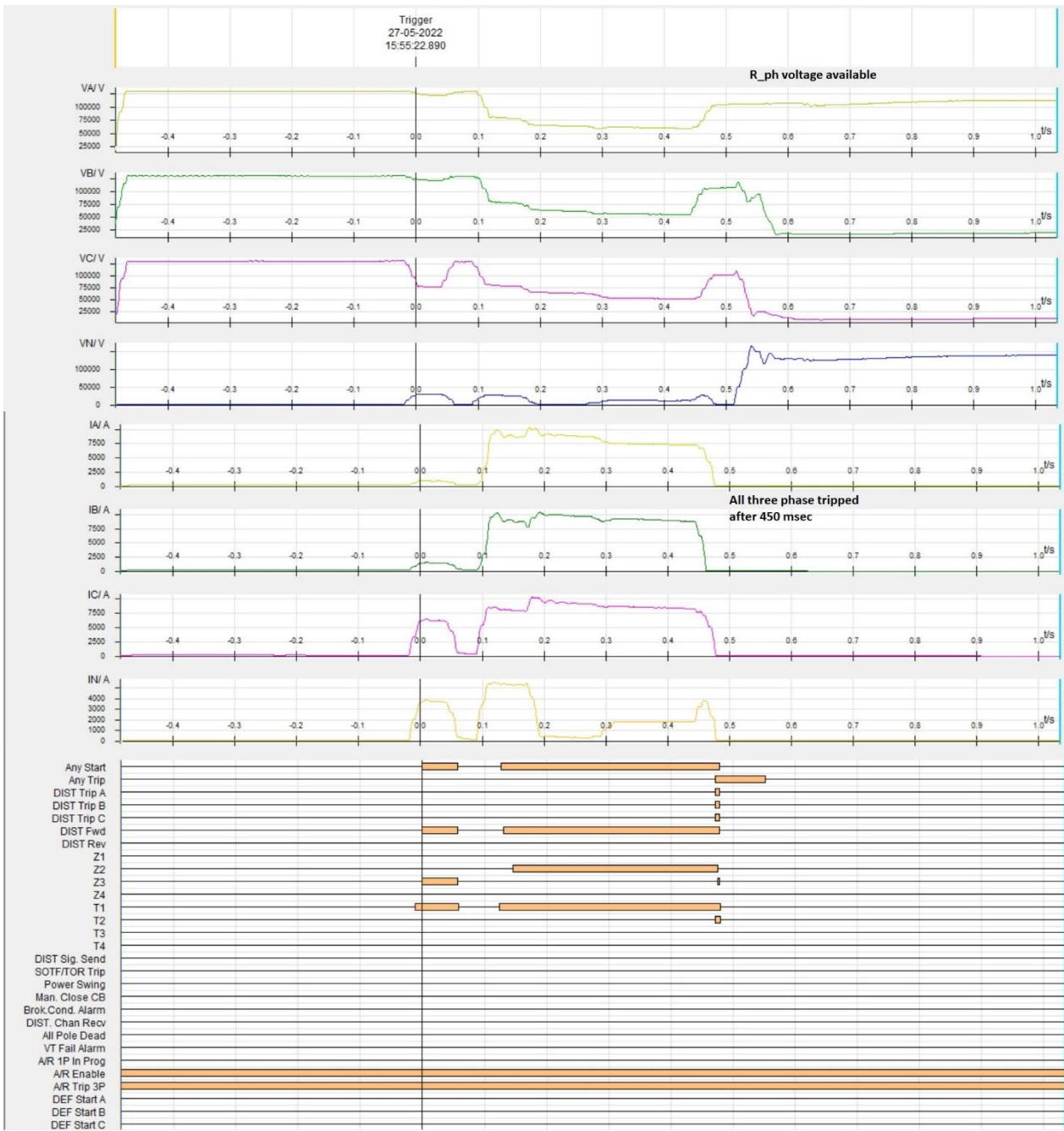
Sequence of event not recorded at time of event.

Annexure 2: DR recorded

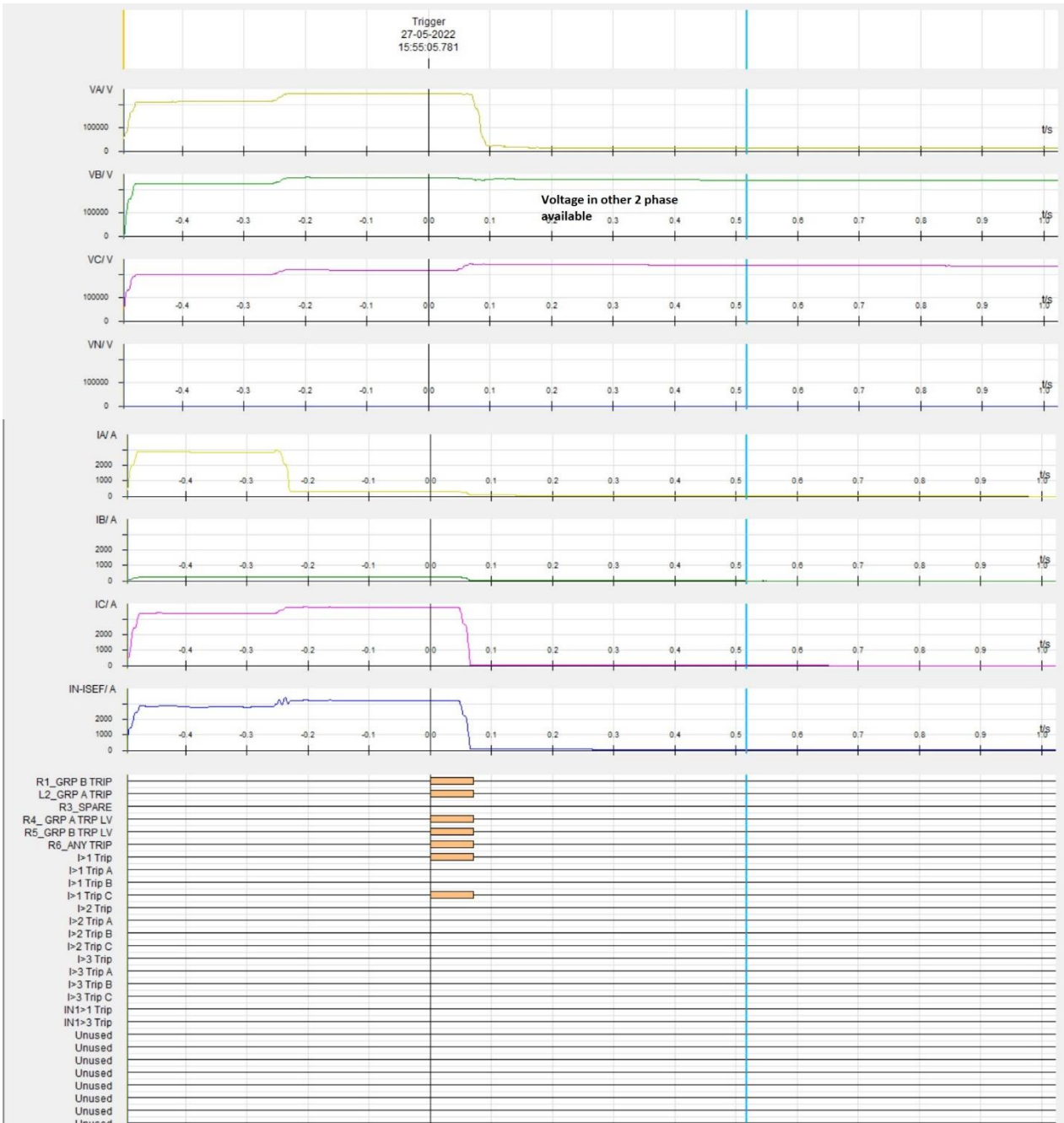
DR of 220 kV Budhipadar-Lapanga-1 (Budhipadar)



DR of 220 KV Budhipadar-Lapanga-2 (Budhipadar)

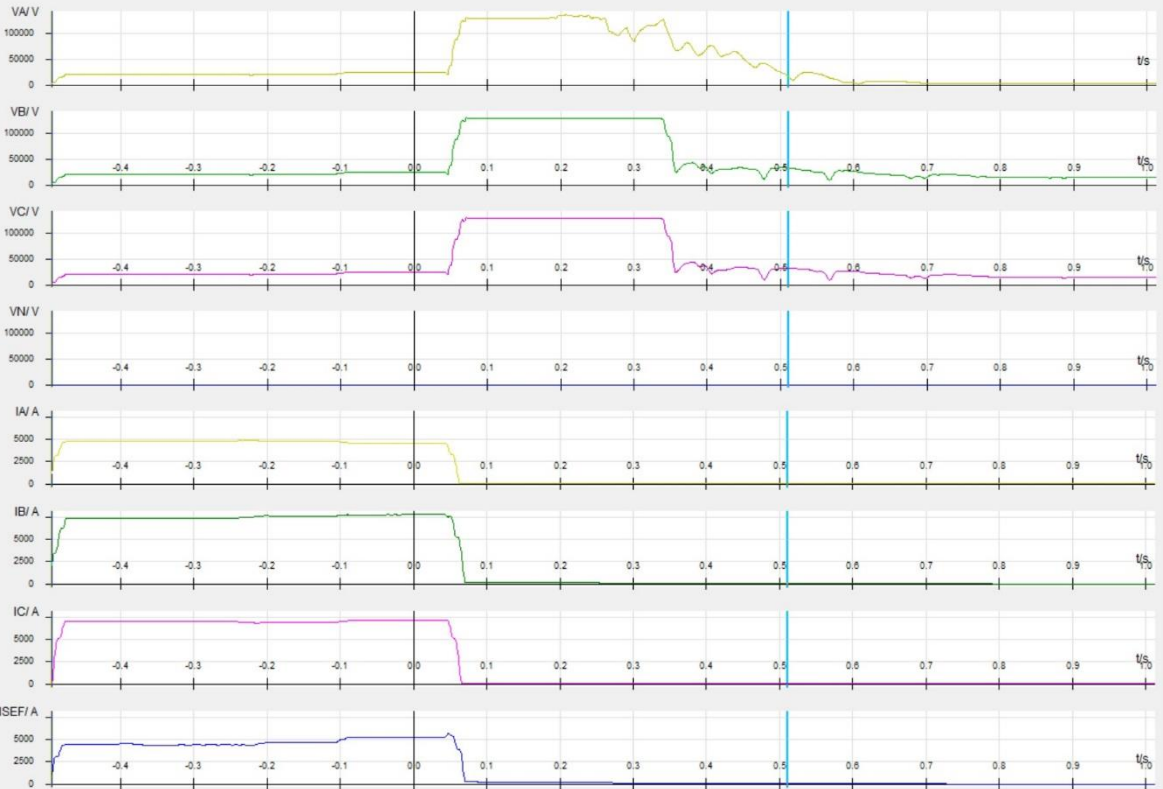


DR of 400/220 kV ICT-1 at Lapanga (HV side)



DR of 400/220 kV ICT-2 (LV side)

Trigger
27-05-2022
16:57:11.520



R1 HVGRP-A TRP	
R2 HVGRP-B TRP	
Output R3	
R4 LVGRP-A TRP	
R5 LVGRP-B TRP	
R6 ANN	
I-1 Trip	
I-1 Trip A	
I-1 Trip B	
I-1 Trip C	
I-2 Trip	
I-2 Trip A	
Input L1	
Input L2	
Input L3	
Input L4	
I-2 Trip B	
I-2 Trip C	
I-3 Trip	
I-3 Trip A	
I-3 Trip B	
I-3 Trip C	
IN1-1 Trip	
IN1-3 Trip	

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 फ़ैक्स : 033-24235809/5029 Website: www.erldc.org, Email ID- erldc@posoco.in

घटना संख्या: 05-05-2022/1

दिनांक: 19-05-2022

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

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

At 17:25 Hrs. 220 kV Barauni_TPS- Begusarai-D/C tripped. At that time, 220kV Mokama was radially connected with Barauni TPS through 220kv Barauni_TPS-Mokama D/C line & feeding Hatidah, Barh & Varshaliganj area. With tripping of 220 kV Barauni_TPS- Begusarai-D/C line, Barauni TPS (generating 260MW) got islanded along with Mokama S/s (34MW load) but didn't survive.

Date / Time of disturbance: 19-05-2022 at 17:25 hrs.

- **Event type:** GD- 1

Systems/ Subsystems affected: Hatida , Barh , Varshalihanj , & Barauni

Load and Generation loss.

- 34 Mw load loss of Hatida , Barh , Varshalihanj.
- 260 Mw generation loss of Barauni during the event.

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

1. 220kV-Barauni_TPS-Hazipur-DC (under shutdown)
2. 220kV-Mokama-Biharsariff-DC (kept open to feed Mokama radially)

3. Major elements tripped (प्रमुख ट्रिपिंग)

Transmission/Generation element name संचरण लाइन / विद्युत उत्पादन इकाई का नाम	Trip Date बंद होने की तिथि	Trip Time बंद होने का समय	Restoration Date वापस आने की तिथि	Restoration time वापस आने का समय
220 Kv Begusarai – Samastipur -1	19-05-2022	17:22		18:25
220 Kv Begusarai – Samastipur -2	19-05-2022	17:22		18:25
220 kV Barauni_TPS- Begusarai-1	19-05-2022	17:25		18:25
220 kV Barauni_TPS- Begusarai-2	19-05-2022	17:25		
220 kV Barauni_TPS- Hazipur-2	Was under S/D		19-05-2022	19:23

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

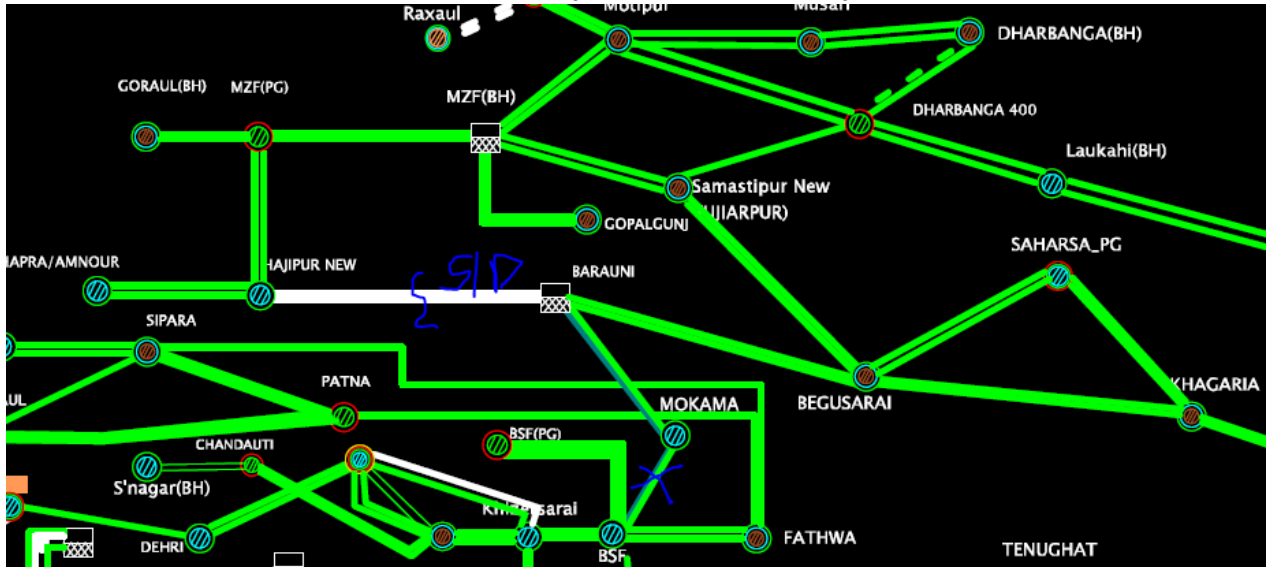


Figure 1: SCADA snapshot for of the system

Relay indication and PMU observation (रिले संकेत और पीएमयू पर्यवेक्षण):
10 kv dip in Y&B Phase

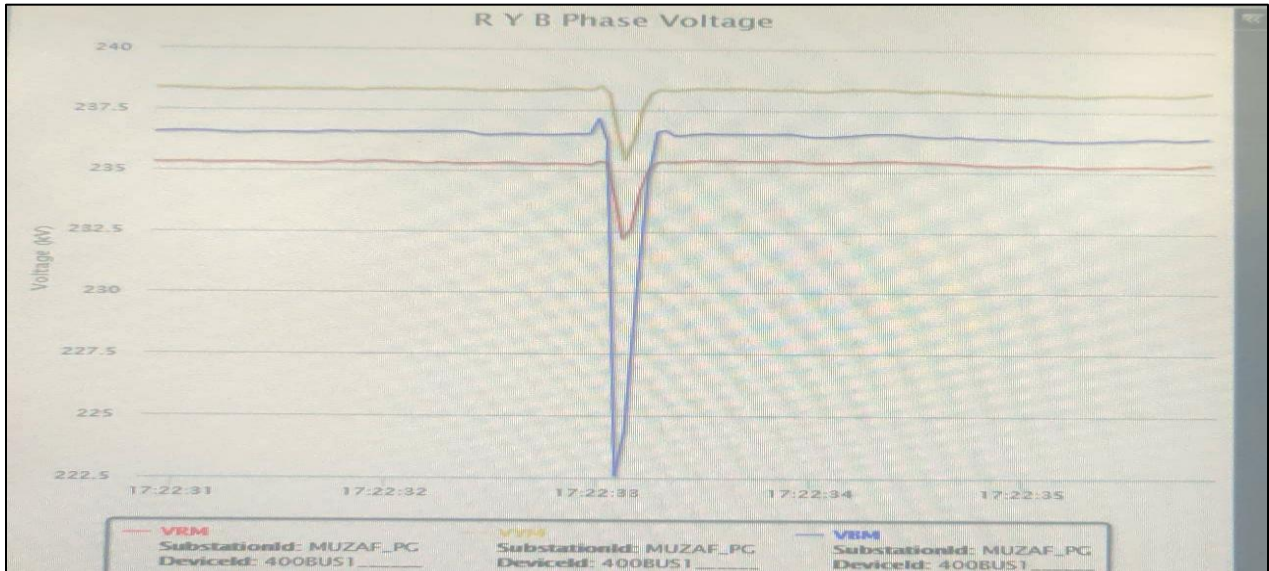


Figure 2: PMU voltage snapshot of 400/220 kV Muzafferpur S/s

5. Relay Indication

Transmission/Generation element name संचरण लाइन / विधुत उत्पादन इकाई का नाम	Trip Date बंद होने की तिथि	Trip Time बंद होने का समय	Relay local end	Remote end
220 Kv Begusarai – Samastipur -1	19-05-2022	17:22		B ,Z-2,66KM
220 Kv Begusarai – Samastipur -2	19-05-2022	17:22	B ,Z-1,6KM	B ,Z-1,44KM
220 kV Barauni_TPS- Begusarai-1	19-05-2022	17:25	O/V	
220 kV Barauni_TPS- Begusarai-2	19-05-2022	17:25	O/V	
220 kV Barauni_TPS- Hazipur-2	Was under S/D			

6. Analysis of the event (घटना का विश्लेषण):

- Weather prior to the event was stormy and rainy and During heavy wind ,cyclone, rain , A palm tree found burnt and fallen over 220 KV Begusarai-Samastipur new II transmission line at about 10 KM from Begusarai end. Fault was in cleared in ZONE-1 time from both ends .
- Although ckt-2 fault was cleared in z-1 from both end why Ckt-1 tripped in z-2 from samastipur end .**BSPTCL to explain?**
- **At 17:25 Hrs** 220 kV Barauni_TPS- Begusarai D/C tripped on overvoltage from Barauni end as reported but same needs confirmation from DR as well along with the setting.
- Prior to event 220 kV Barauni_TPS- Hazipur-2 was under shutdown and 220kV-Mokama-Biharsariff-DC (kept open to feed Mokama radially).
- As there was no evacuation path for BTPS units , BTPS plant with 260 Mw generation got islanded with 38 Mw of Mokama load but due to high generation -load mismatch units tripped on over frequency and load loss of 38 Mw also occurred along with 260 Mw generation ,loss.
- 220 kv Mokama to Biharshariff D/C connection may be explored to avoid such situations .

7. Protection issue (सुरक्षा समस्या):

8. Although ckt-2 fault was cleared in z-1 from both end why Ckt-1 tripped in z-2 from samastipur end .**BSPTCL to explain? This should be checked by BSPTCL .**
- DR of Barauni end not yet received to verify the overvoltage tripping.
- In case of Shutdown 220 kv Mokama to Biharshariff D/C connection may be explored to avoid such situations of single evacuation path.

9. 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	BGCL,BSPTCL

Incorrect/ mis-operation / unwanted operation of Protection system	<ol style="list-style-type: none"> 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) 	BSPTCL
Non-Availability of Numerical Bus Bar/LBB Protection at 220 kV and above S/s	<ol style="list-style-type: none"> 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. 	
DR/EL are not time synchronized	<ol style="list-style-type: none"> 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. 	BSPTCL

10. Status of Reporting (रिपोर्टिंग की स्थिति):

DR/EL not received from **BGCL** for 220 kV Barauni_TPS- Begusarai-D/C.

11. Annexure DR: For Barauni – Begusarai DR not available.

Report on 400KV TPF at BTPS

Date of incidence:- 12-05-2022

Brief History:-

BTPS O&M team was planning to do DCRM testing on the circuit breaker (GIS) of 400KV BTPS-KTPS Line#1. The O&M team had planned to close the circuit breaker by manually extending the DC supply to the Terminal Blocks (TB) assigned for the closing of the Circuit Breaker.

After shorting the necessary points in the TB, as soon as the MCB was switched on for closing the circuit breaker, all the 400KV circuit breakers tripped causing 400KV TPF at BTPS.

Investigation Carried Out:-

CTC team visited BTPS on 12-05-2022 for investigating the cause of the above TPF. After going through the DR and events of the PU relays of KTPS Line#1, it was found that the Binary Input assigned for 2nd/3rd stage low SF6 gas pressure of isolator/breaker had got high in both the PU relays of KTPS Line#1. Activation of this Binary Input led to the tripping of all the 400KV breakers as per the logic mentioned the PSL of the PU relays. This had caused TPF of 400KV BTPS bus.

Testing Carried Out:-

CTC & OS&U team visited BTPS - 'A' again on 17-05-2022 to replay the shorting activity, which was the cause of 400 KV TPF on 12-05-2022 during connection of circuit breaker analyzer. Before starting of shorting activity tripping through Bus-Bar Differential/LBB relay was deactivated in all the 400 KV bays (Output Block E & F of PU relays were taken out). OFC connectivity of PU#A & PU#B relays of Line#408 with CU#A & CU#B relay were taken out. Line # 408 was kept in OFF and isolated condition.

After above isolation following shorting (which was supposed to be on 12-05-2022) was done in LCC panel of KTPS Line # 1:

- (i) Terminal point 65, 69 and 73 of TB-X04B (for closing command of breaker)
- (ii) Terminal point 13,14 and 15 of TB-X10A (for tripping command of breaker)

On application of DC voltage no initiation of Binary Input occurred in PU#A or PU#B relay of KTPS Line#1. The experiment was repeated multiple times but in none of the cases BI 16 got HIGH. It indicated that the shorting of terminal points done by BTPS (O & M) on 12-05-22 may not be at the same points as done by them on 17-05-22.

Probable Cause of TPF on 12-05-22: It was clear from circumstantial evidence of both PU and both CU event records that that tripping of both buses was due to inadvertent initiation of Binary Input 16 (i.e. 2nd/3rd stage low SF6 gas pressure of isolator/breaker of Line#408) in both PU#A and PU#B relay which as per PSL logic should correctly activate the Bus-Bar interlock protection. It is anticipated (although cannot be proved) that Binary Input 16 got high due to shorting of terminal point 65, 69 and 73 of TB-X04 instead of TB-X04B by mistake.

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 फ़ैक्स : 033-24235809/5029 Website:www.erldc.org, Email ID- erldc@posoco.in

घटना संख्या: 31-05-2022/1

दिनांक: 10-06-2022

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

Summary of the event (घटना का सारांश):

At 11:09 Hrs on 31.05.2022, both 400 kV Bus at Rourkela became dead while trying to open line isolator of 400 kV TSTPP-Rourkela-1 at Rourkela end. Teed protection operated, however, B_ph breaker of Talcher-1 at Rourkela was stuck, thereafter LBB operated which didn't function properly due to which all lines tripped from remote ends in Zone-2. Total power failure occurred at 400/220 kV Rourkela S/s. No load loss or generation loss occurred.

- **Date / Time of disturbance:** 31-05-2022 at 11:09 hrs
- **Event type:** GD-1
- **Systems/ Subsystems affected:** 400 kV Rourkela S/s
- **Load and Generation loss.**
 - No load loss or generation loss occurred during the event.

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

- 400 kV TSTPP-Rourkela II
- 400 kV Ranchi-Rourkela-1

Major elements tripped (प्रमुख ट्रिपिंग):

- 400 kV Rourkela-Jharsuguda Q/c
- 400 kV Rourkela-Ranchi-2
- 400 kV Rourkela-Chaibasa D/c
- 400/220 kV 315 MVA ICT-1,2,3&4
- 220 kV Rourkela-Tarkera D/c

Network across the affected area (प्रभावित क्षेत्र का नक्शा)

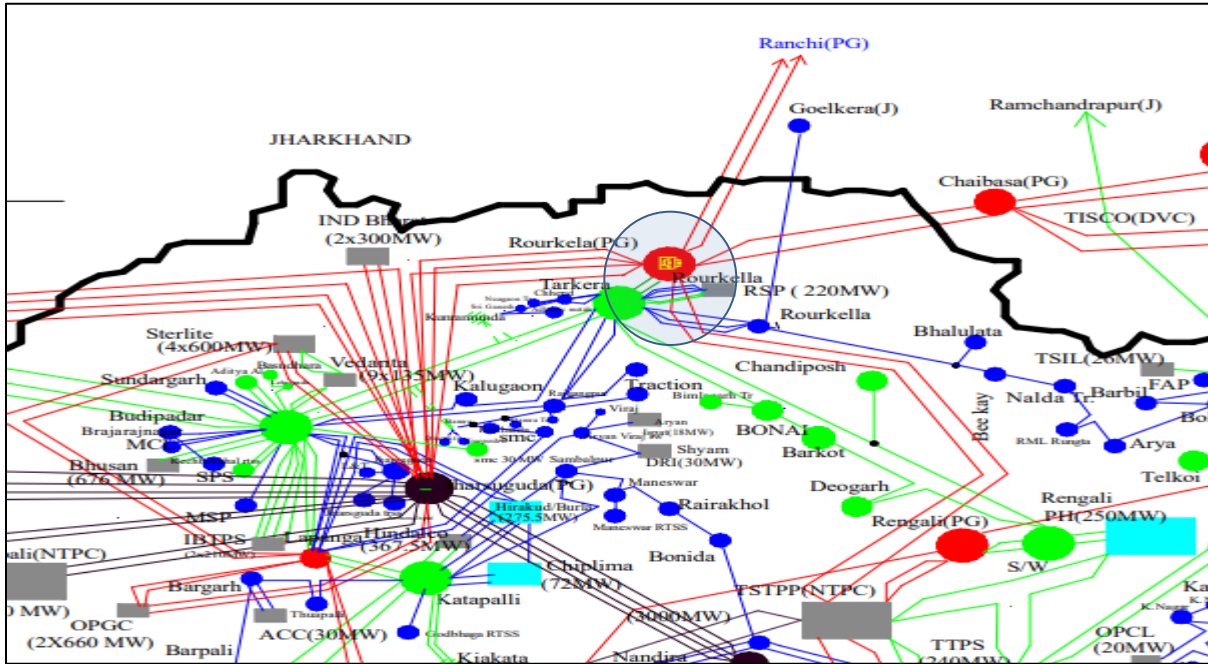


Figure 1: Network across the affected area

Figure 2: SCADA snapshot of the system

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

Chronology of event:

1. CKT-1 opened on 30 May at 17:12 hrs to take out L/R at TALCHER END due to oil leakage, but B phase not opened since then as observed from below PMU plot healthy B phase line voltage was persisting.

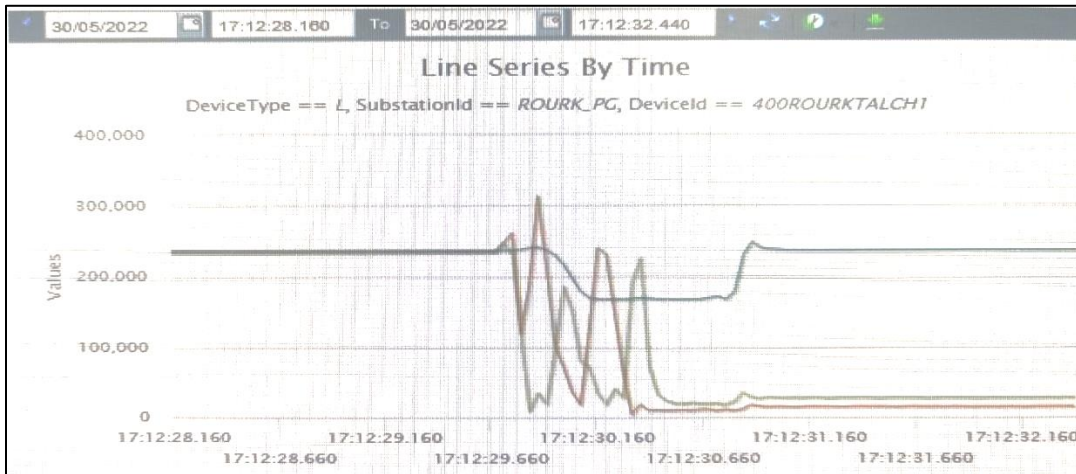
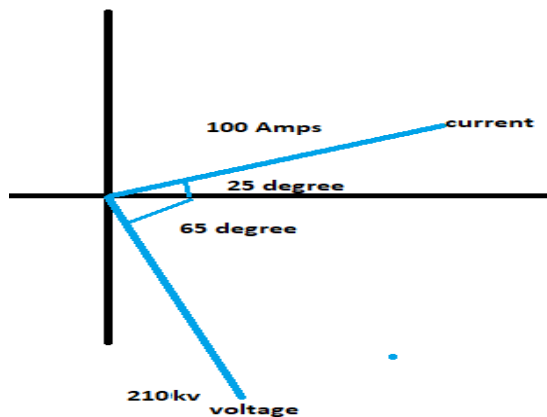


Fig 2: Ckt-1 Line voltage at Rourkella end.

Apart from this R&Y phase also 50 kv voltage was persisting due to unbalance and high zero sequence current mutual coupling induced voltage was of the range of 50kv .

- This line B phase voltage and current was due to stuck breaker condition was also checked by PMU as shown below, Voltage of stuck B phase and current are 90 degree apart and current is leading voltage showing capacitive charging current flow .



2. Although B phase line voltage was extended till the line CVT at Talcher end and Talcher end was also getting healthy B phase voltage (also evident from below pmu plot) still Isolator opening was carried out from Talcher end .**NTPC Talcher to reply.**

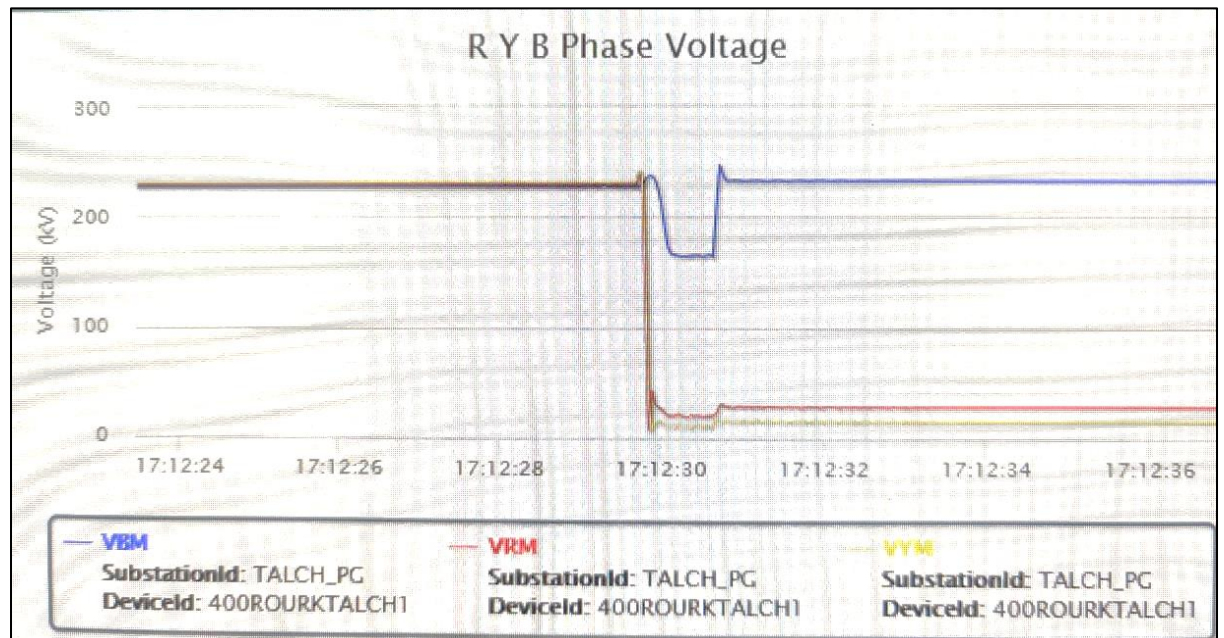


Fig 3: Ckt-1 Line voltage at Talcher end.

3. At 17:32 Hrs on 30 May, as Talcher tried to open B phase L/R isolator this created fault till 20 sec and isolator mechanism also failed and isolator did not opened and got jammed. For line -1 also DT was received, $IN > 1$ ad any trip started as seen from DR but as the B

phase breaker was stuck ,LBB also initiated but it did not extended trip command to other elements due to faulty O/P contacts .So fault in line 1 was persisting till 20 sec.

- During the same time ckt 2 also tripped due to the arc fault in vicinity with ckt-1 after 300 ms from Talcher end and DT was sent to Rourkela. **Ntpc Talcher to intimate yet What protection operated at Talcher end ?**

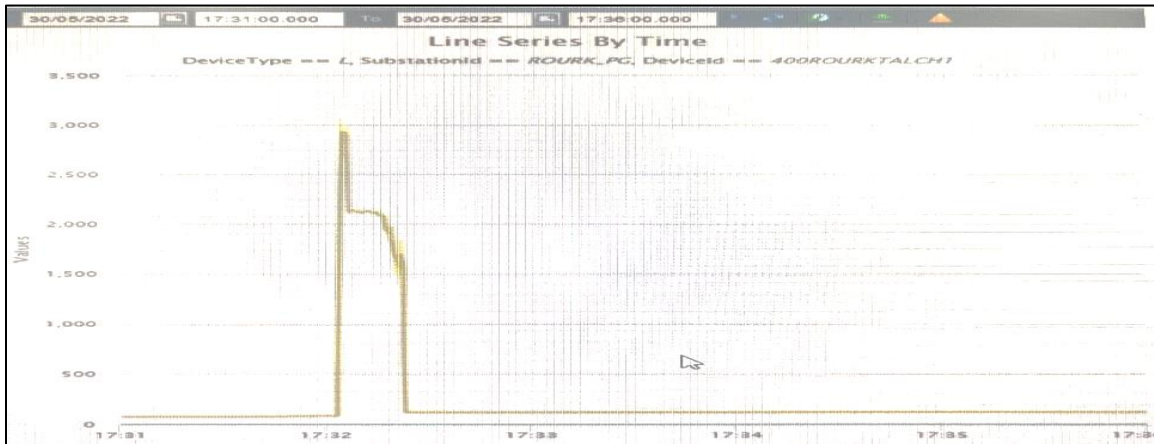


Fig 4: Ckt-1 B phase Line current at Rourkella end

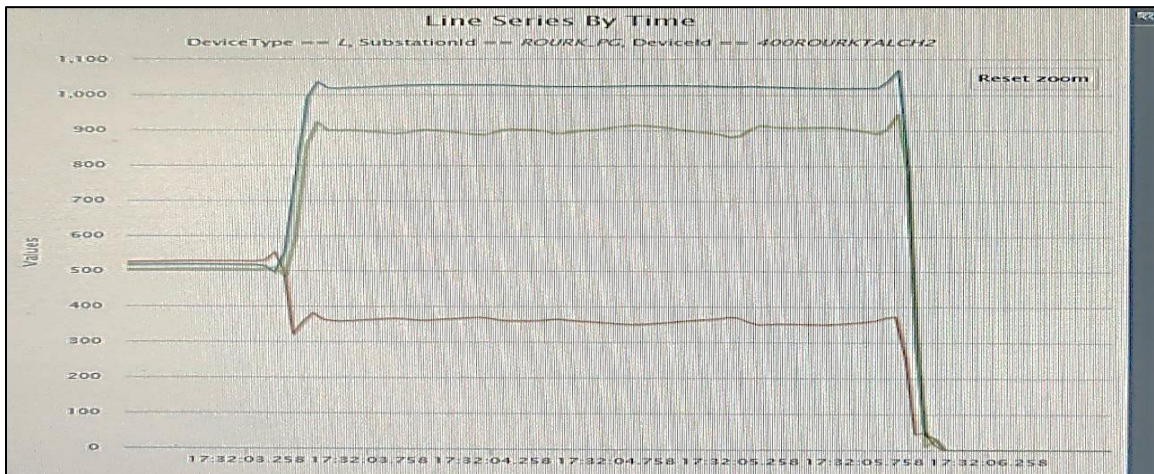


Fig 5: Ckt-2 Line current at Rourkella end

- Why no information regarding arcing fault while line reactor isolator opening of CKT-1 was shared with RLDC ? **NTPC to reply.**
 - Although Rourkella S/S and RTAMC was able to see the B phase line current and B phase healthy voltage for ckt-1 from 30 May onwards **no information shared to RLDC in real time else** these co-relations of PMUs can be made and suggested accordingly to take Bus shutdown to attend stuck breaker condition, **could have avoided the blackout event . PG-ER-3 to reply?**
4. On 31st May Ckt 2 S/D was asked as they were seeing MCB and TCB as open ,but they were getting voltage of B phase healthy voltage upto Y-B= 210kv & R-B=190KV and

current of 120 Amps in B phase so to rule out any cross connection with ckt -2 jumper connection etc at 10:45 Hrs ckt -2 was made off .

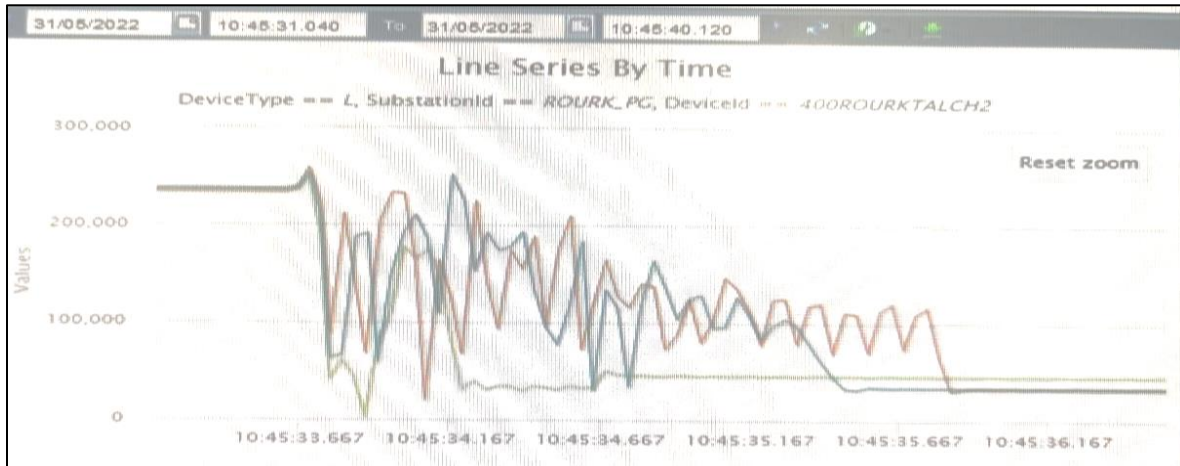


Fig 6: Ckt-2 Line volateg at Rourkella end

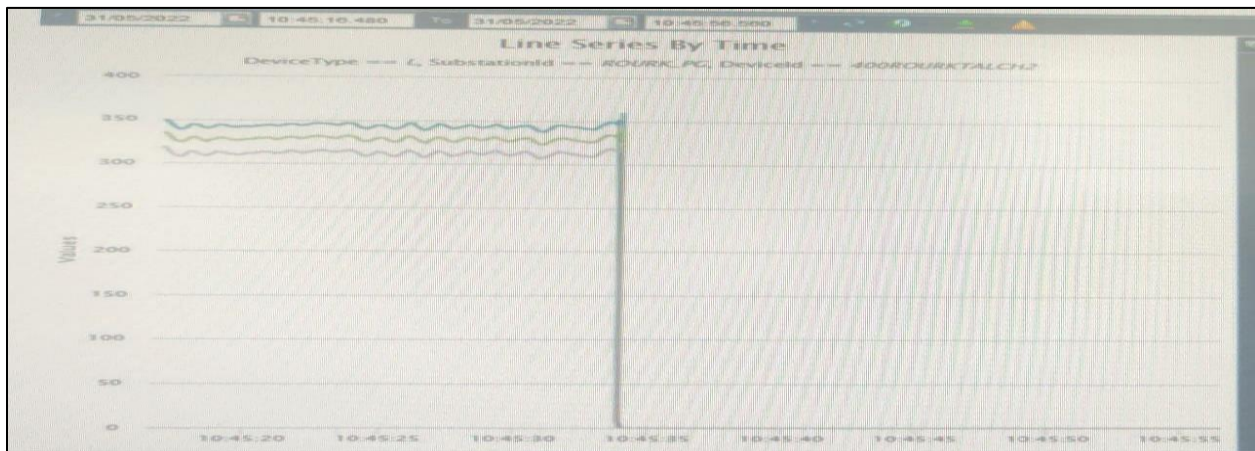


Fig 7: Ckt-2 Line current at Rourkella end

5. Still after opening of ckt-2 , B phase voltage was persisting in ckt -1, so at Rourkela they tried to open the isolator, so it was almost online opening where at one end reactor was connected which created arcing and fault. **Even though the possibility of B phase voltage from Ckt-2 was ruled out why line isolator opening at Rourkela end done ? PG-ER-3 to reply?**

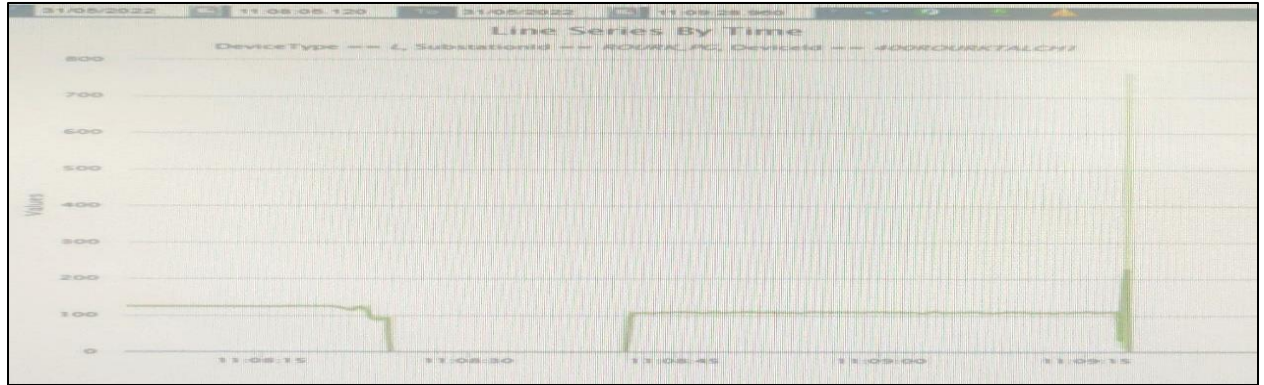
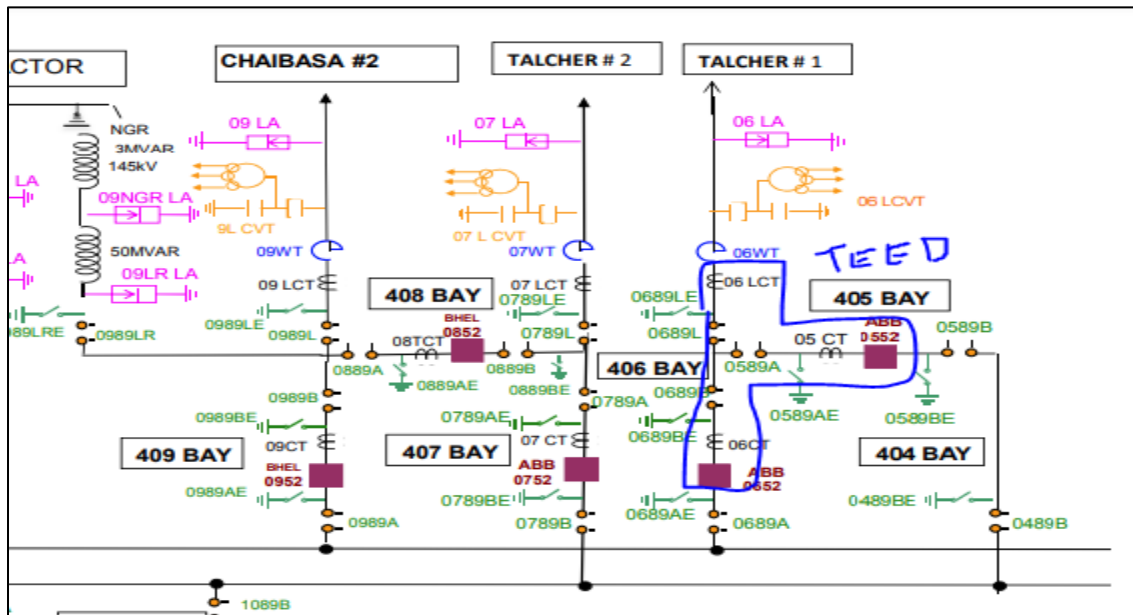


Fig 7: Ckt-1 Line current at Rourkella end

- Now with fault, Teed protection operated but as breaker was stuck it did not open hence LBB started and gave trip command but this also not operated properly ,and did not extended trip signal to other elements due to faulty o/p contacts, so all lines tripped from remote end in zone-2 and ICT tripped on backup impedance .



As Rourkela substation is quite old and all relay healthiness, auxiliary contacts needs to be ensured for proper protection operation .Many relays are of static nature also leading to non-availability of DR files .Multiple wrong operation from the substation and non -information sharing to RLDC and between utilities led to the situation of blackout of Rourkela substation.

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-3 , NTPC TSTPP
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)	PG-ER-3
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.	PG-ER-3

Status of Reporting (रिपोर्टिंग की स्थिति):

- DR/EL not received from TSTPP.
- LBB is STATIC type so no DR available .

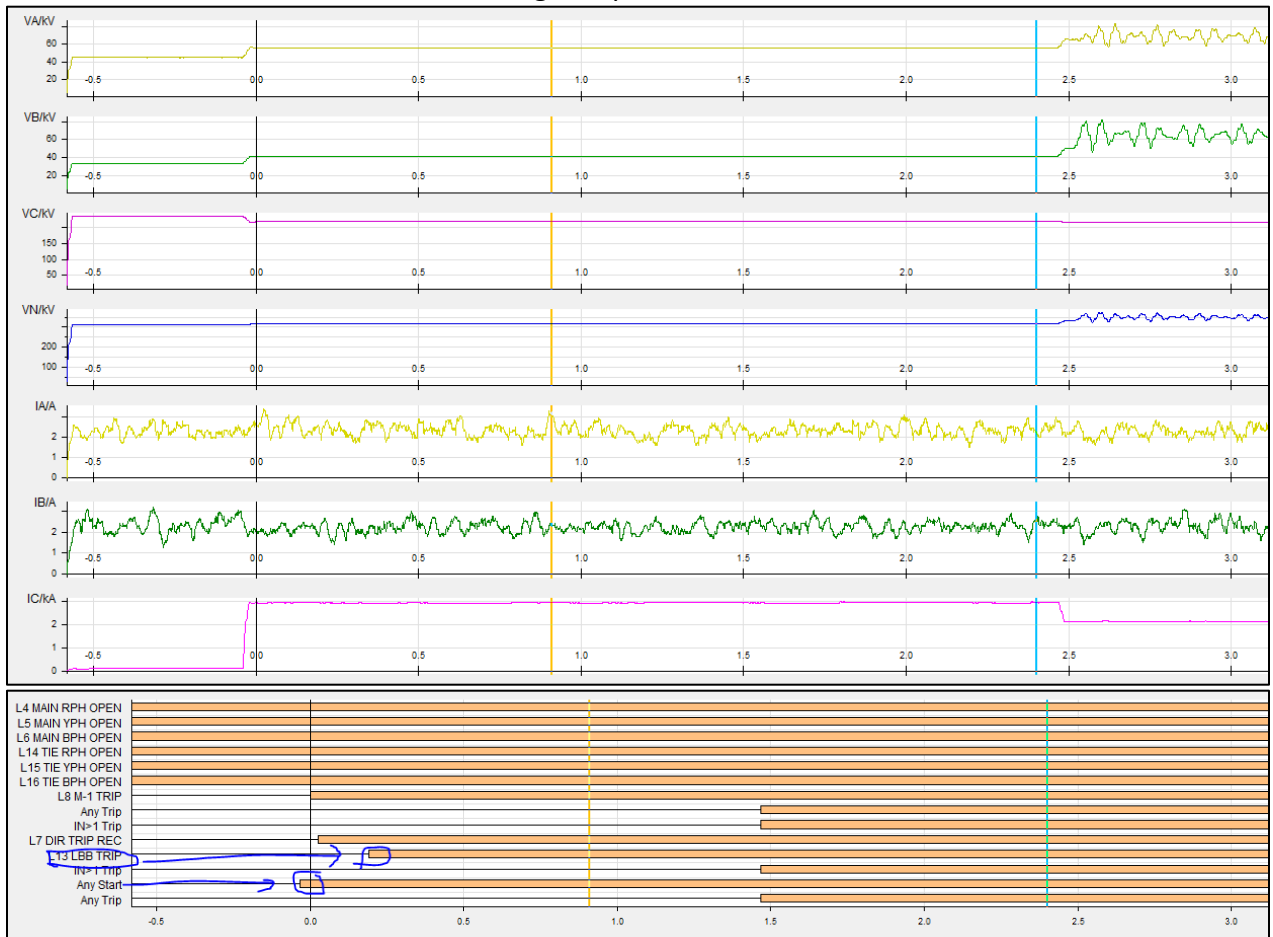
Annexure 1: Sequence of events recorded at ERLDC SCADA data at the time of the event.

Sequence of event not recorded at time of event.

Annexure 2: DR recorded

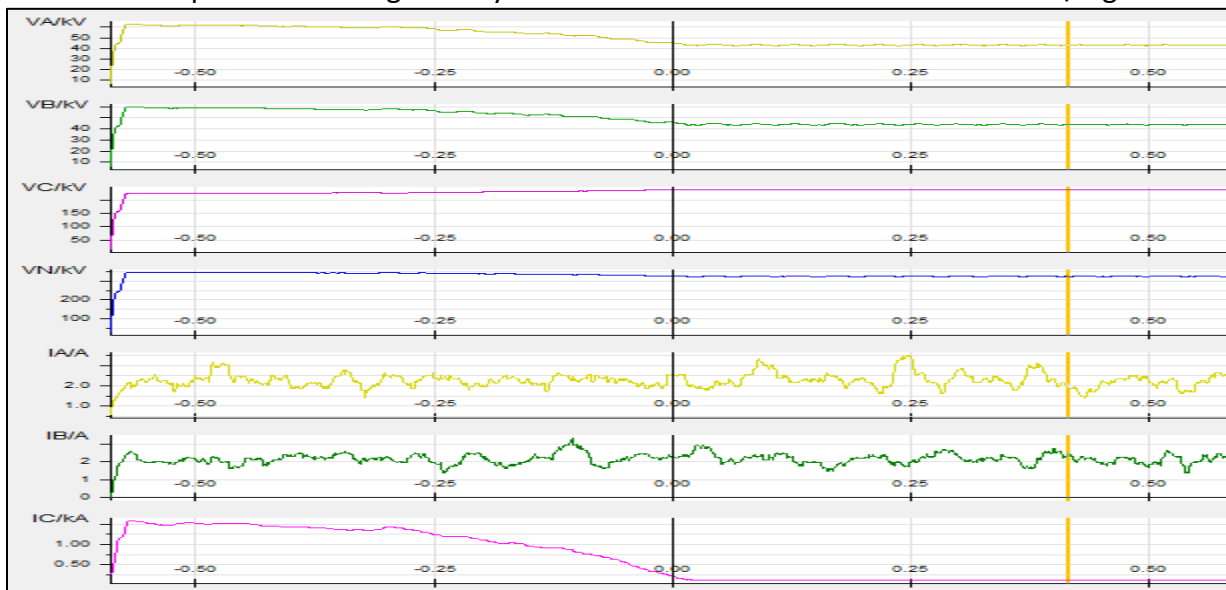
30 MAY AT 17:32 Hrs CKT-1 DR AT ROORKELLA END

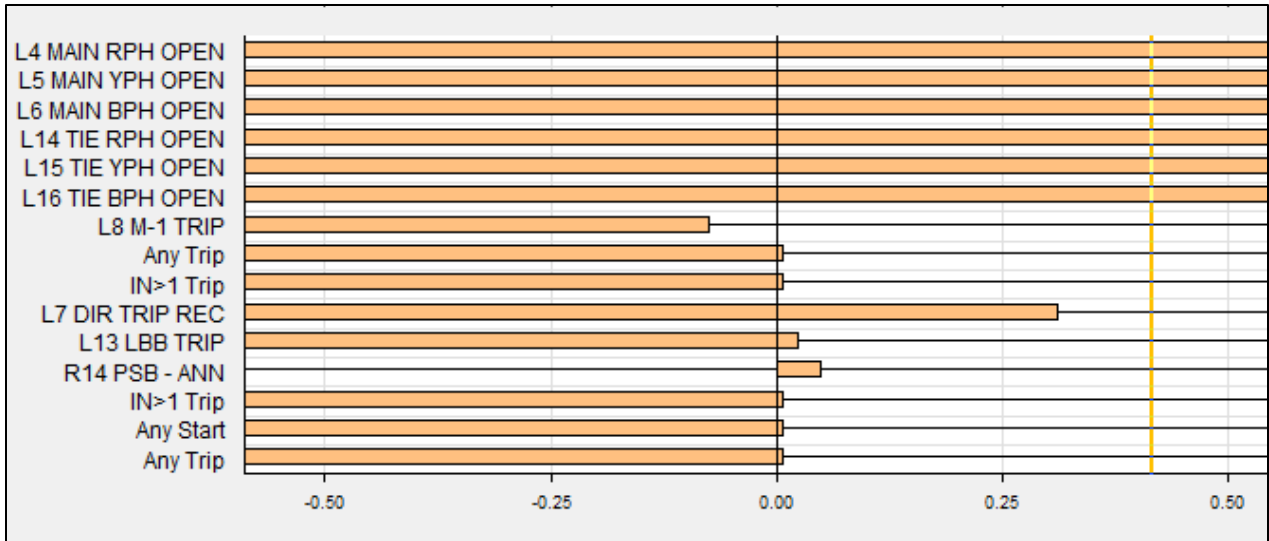
Breaker status of MCB & TCB also showing as Open



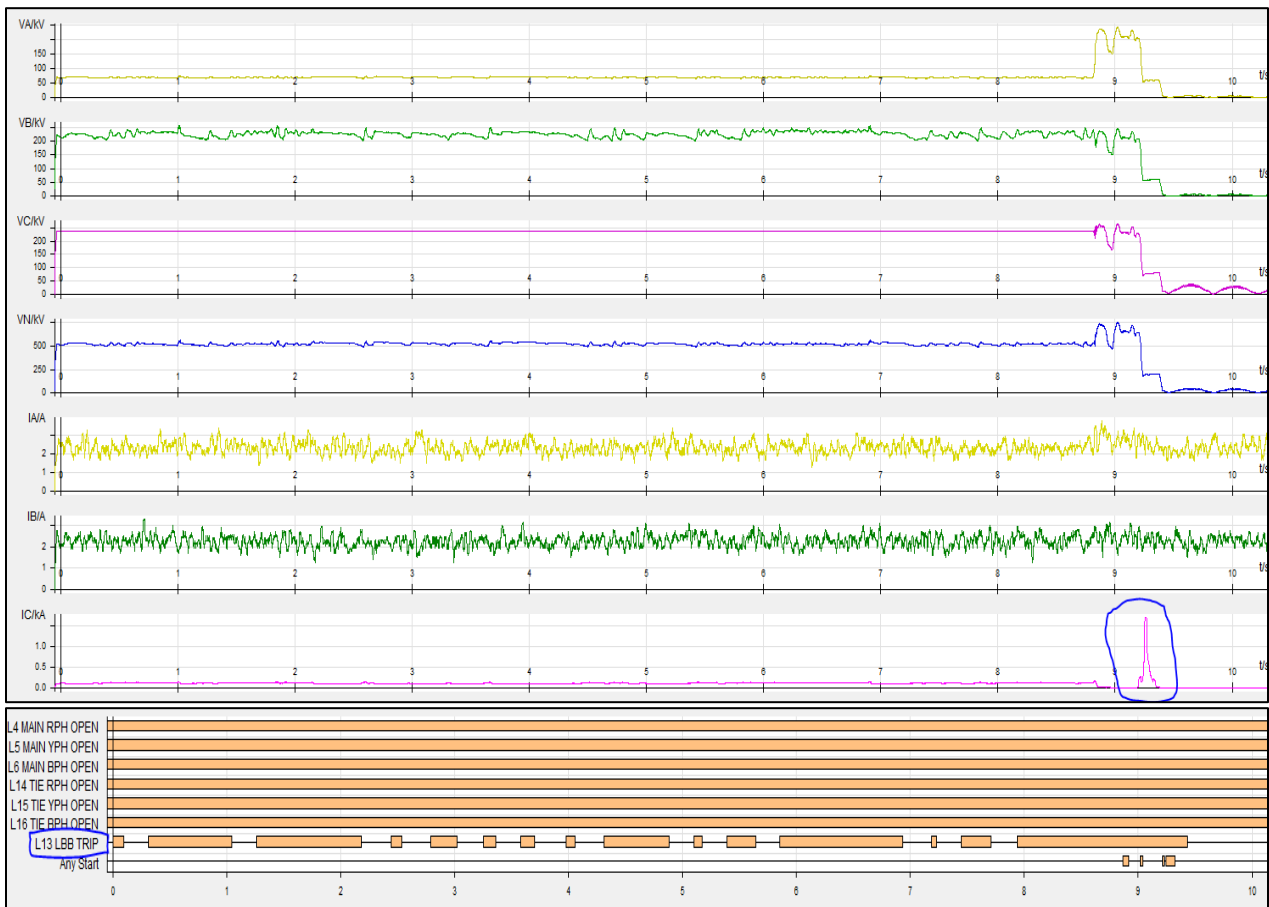
30 MAY AT 17:32 Hrs CKT-1 DR AT ROORKELLA END AFTER 20 SEC

After 20 sec B phase current gradually reduced as arc vanished when isolator of L/R got closed





31st MAY AT 11:09 Hrs CKT-1 DR AT ROURKELLA END (Line isolator opening instant at Rourkella end)



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 फ़ैक्स : 033-24235809/5029 Website: www.erldc.org, Email ID- erldc@posoco.in

घटना संख्या: 14-05-2022/1

दिनांक: 28-04-2022

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

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

At 16:04 Hrs, 400 kV New Ranchi-Patratu D/c tripped due to B_N fault. This led to total power failure at 400/220 kV Patratu S/s. Load loss of around 60 MW occurred in Kanke and Burmu area which were radially fed from Patratu.

- **Date / Time of disturbance:** 14-05-2022 at 16:04 hrs.
- **Event type:** GD - 1
- **Systems/ Subsystems affected:** 400/220 kV Patratu S/s
- **Load and Generation loss.**
 - No generation loss occurred during the event.
 - 60 MW load loss reported during the event by SLDC Jharkhand

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

- NIL

3. Major elements tripped (प्रमुख ट्रिपिंग)

- 400 kV New Ranchi-Patratu D/c

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

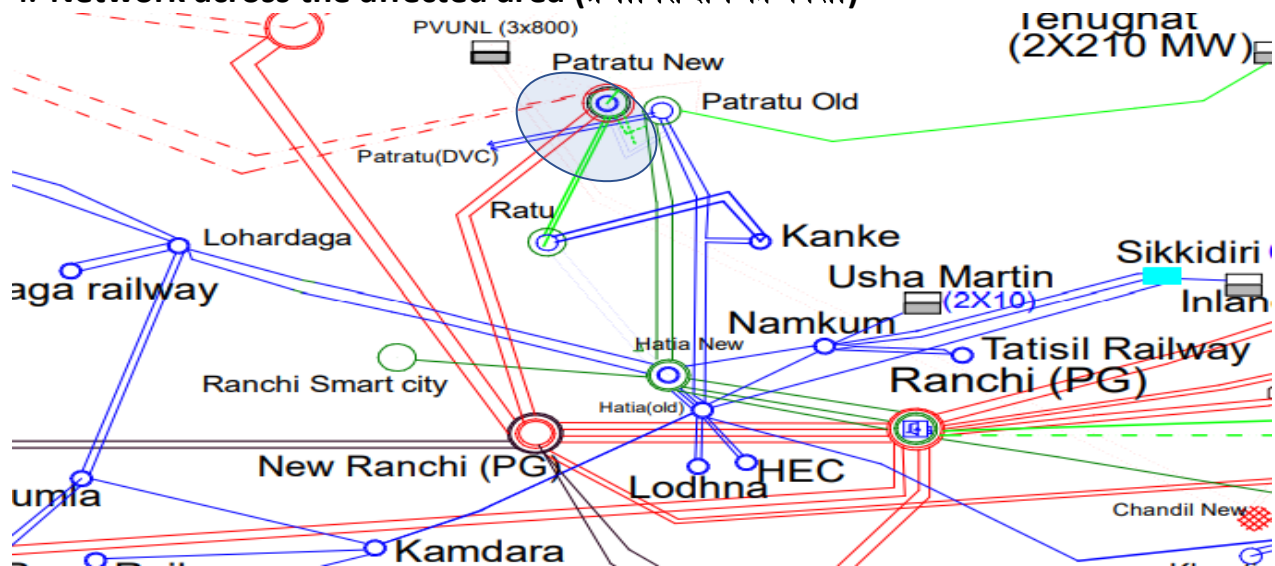


Figure 1: Network across the affected area

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

समय	नाम	उप केंद्र 1 रिले संकेत	उप केंद्र 2 रिले संकेत	पीएमयू पर्यवेक्षण
16:04	400 kV New Ranchi-Patratu-1	New Ranchi: B_N, 2.28 km, 24.5 kA	-	145 kV dip in B_ph voltage at New Ranchi. After 450 msec, around 150 kV dip in Y_ph observed at New Ranchi
	400 kV New Ranchi-Patratu-2	New Ranchi: B_N, 2.17 km, 24.37 kA	-	



PMU Voltage snapshot of 400 kV New Ranchi S/s

5. Restoration (पूर्वावस्था की प्रप्ति)

Transmission/Generation element name	Restoration time
400 kV New Ranchi-Patratu-1	17:40
400 kV New Ranchi-Patratu-2	17:52

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

- From PMU, SoE data and relay indications provided, it seems a B_ph fault struck Ckt-1 first at 16:03:55 Hrs. A/r attempt seems successful, however, line tripped again in reclaim time.
- At 16:04:02 Hrs, B_ph fault struck Ckt-2. A/r attempt seems successful, however, line tripped again in reclaim time.
- Proper analysis couldn't be done due to unavailability of DR from both ends. It is requested to send the DRs at the earliest.

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	JUSNL, PG

8. Status of Reporting (रिपोर्टिंग की स्थिति):

- DR/EL yet to be received from PG ER-1 and JUSNL.

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

TIME	STATION	DESCRIPTION	STATUS
16:03:55.697	NRANC_PG	400_PATRA_JH_2_Main_CB	Open
16:04:02.862	NRANC_PG	400_PATRA_JH_1_Main_CB	Open

Annexure 2: DR recorded

DR not received yet.

पावर सिस्टम ऑपरेशन करपोरेशन लिमिटेड

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घटना संख्या: 05-05-2022/1

दिनांक: 21-05-2022

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

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

At 01:33 Hrs R & Y Phase jumper (Bus side) of 220 kV Ramchandrapur – Joda got snapped and created bus fault. Eventually, all the elements of Bus- I and Bus coupler got tripped which further lead to total power failure at 220 kV Ramchandrapur GSS. Total load loss was around 80 MW at Adityapur, Jadugoda and Golmuri area.

Date / Time of disturbance: 21-05-2022 at 01:33 hrs.

- Event type: GD- 1

Systems/ Subsystems affected: Adityapur, Jadugoda and Golmuri

Load and Generation loss.

- 80 Mw load loss of Adityapur, Jadugoda and Golmuri.

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

- Nil.

3. Major elements tripped (प्रमुख ट्रिपिंग)

Transmission/Generation element name संचरण लाइन / विद्युत उत्पादन इकाई का नाम	Trip Date बंद होने की तिथि	Trip Time बंद होने का समय	Restoration Date वापस आने की तिथि	Restoration time वापस आने का समय
220KV-RCP-JAMSHEDPUR-D/C	21/05/2022	01:33	21/05/2022	03:43,03:46
220KV-JODA-RCP-1	21/05/2022	01:33	21/05/2022	04:32
220KV- RCP - CHANDIL	21/05/2022	01:33	21/05/2022	03:48
220KV- RCP- CHAIBASA-I	21/05/2022	01:33	21/05/2022	02:33
220KV- RCP- CHAIBASA-II	21/05/2022	01:33	21/05/2022	02:32

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



Figure 1: SCADA snapshot for of the system

Relay indication and PMU observation (रिले संकेत और पीएमयू पर्यवेक्षण):
12 kv dip in Y&R Phase with fault clearance of 600 ms.

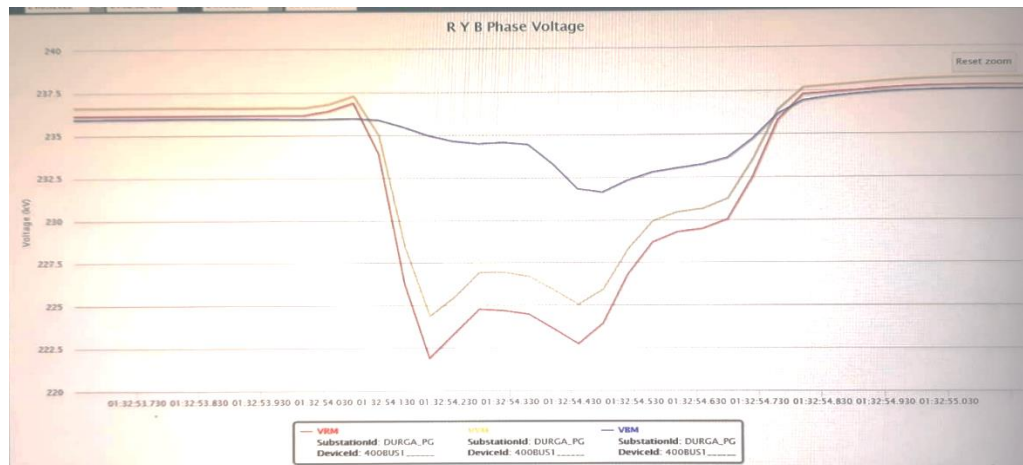
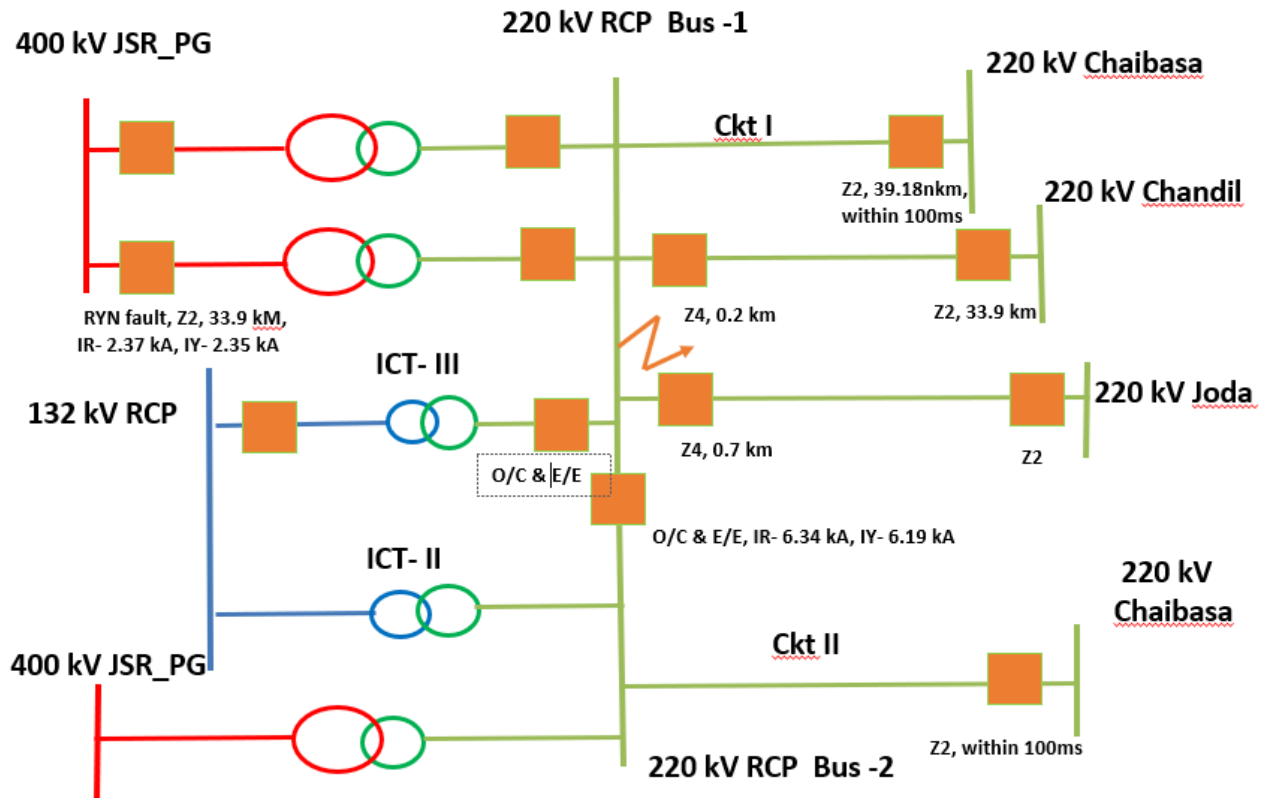


Figure 2: PMU voltage snapshot of 400/220 kV Durgapur S/s

5. Relay Indication

Element Name	Relay indication at End 1	Relay indication at End 2	Remarks
220 kV Bus Coupler	RYN fault, O/C & E/F, IR- 6.34 kA, IY- 6.19 kA, IB – 0.21 kA (within 100 ms)		
220 kV RCP – Chaibasa ckt- 01	Did not tripped.	RYN fault, Z2 (within 100 ms), 39.18 km, IR- 2.37 kA, IY- 2.37 kA	
220 kV RCP – Chaibasa ckt- 02	Did not tripped.	RYN fault, Z2 SOTF/TOR (within 100 ms), IR- 1.82 kA, IY – 2.56 kA	
220 kV RCP - Chandil	RYN fault, Z4, 0.2 km, IR- 3.33 kA, IY – 3.30 kA	RYN fault, Z2, 33.9 km, IR -2.37 kA, IY- 2.35 kA	tZ4- 300 ms
220 kV RCP - Joda	RYN fault, Z4, 0.7 km, IR- 1.47 kA, IY – 1.57 kA, IB – 0.14 kA	RN fault, Z2	tZ4- 300 ms
220 KV Jamshedpur-Ramchandrapur I, II	Both ICT Tripped from HV side. ICT 1- within 300 ms. ICT- 2 Within 600ms.		
150 MVA, 220/132 kV ICT - III	Back up O/C and E/f in both HV and LV side (Electromechanical relay)		

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



- At 01:33 Hrs R & Y Phase jumper (Bus side) of 220 kV Ramchandrapur – Joda got snapped and created bus fault, prior to event Busbar was out of service due to some rectification work & timing of zone-4 was set to 300 ms for all feeders.
- All emanating lines from Ramchandrapur picked Zone-4 and all remote ends picked zone-2 and 220 Kv RCP-Joda & Chandil line tripped in zone -4 after 300 ms from RCP end.
- Bus coupler between Bus-1 & 2 tripped within 100 ms on o/c e/F .
- While the Chaibasa line-1 which also picked zone-2 from its end tripped within 100 ms from Chaibasa ,which should not occur and from DR it appears with Zone-2 ,T1 became high which corresponds to zone-1 timing .Also from DR it appears that at Chaibasa end line voltage for ckt 1 was persisting till the Bus -1 became dead and fault got isolated as RCP end breaker was closed as zone-4 got reset with tripping of line from chaibasa end within 100ms.**Timer for zone-2 to be checked by JUSNL .**
- 400/220 kv ICT 1&2 tripped from HV side sensing the same fault on Back up ,O/C ,ICT-1 tripped within 300 Ms and ICT-2 within 600 ms. Reason for difference of 300 ms duration for parallel ICT to be checked ,faster fault clearance could have been achieved.
- 220/132 KV ict-III on bus 1 tripped on O/C e/f , which also seems to be operated after 600 ms as bus 2 voltage was low till that time as bus-2 was connected via 132 kv level to Bus -1.
- Also it appears that 400/220 kv ICT-3 did not tripped which was on Bus-2 and on the same bus chaibasa line-2 was also there which tripped instantaneously from chaibasa end although sensed

the fault in zone-2 ,same as the case with line -1 ,but after 600 ms healthy line voltage was observed AS RCP end breaker was closed as zone-4 got reset with tripping of line from chaibasa end within 100ms. So the only source to Bus- 2 which was providing healthy line voltage was 400/220 kv ICT-3. Reason for non-tripping of 400/220 kv ICT -3 to be explained ?

- Whether 220/132 KV ict-II on bus 2 tripped or not? If not it must have been feeding some load .

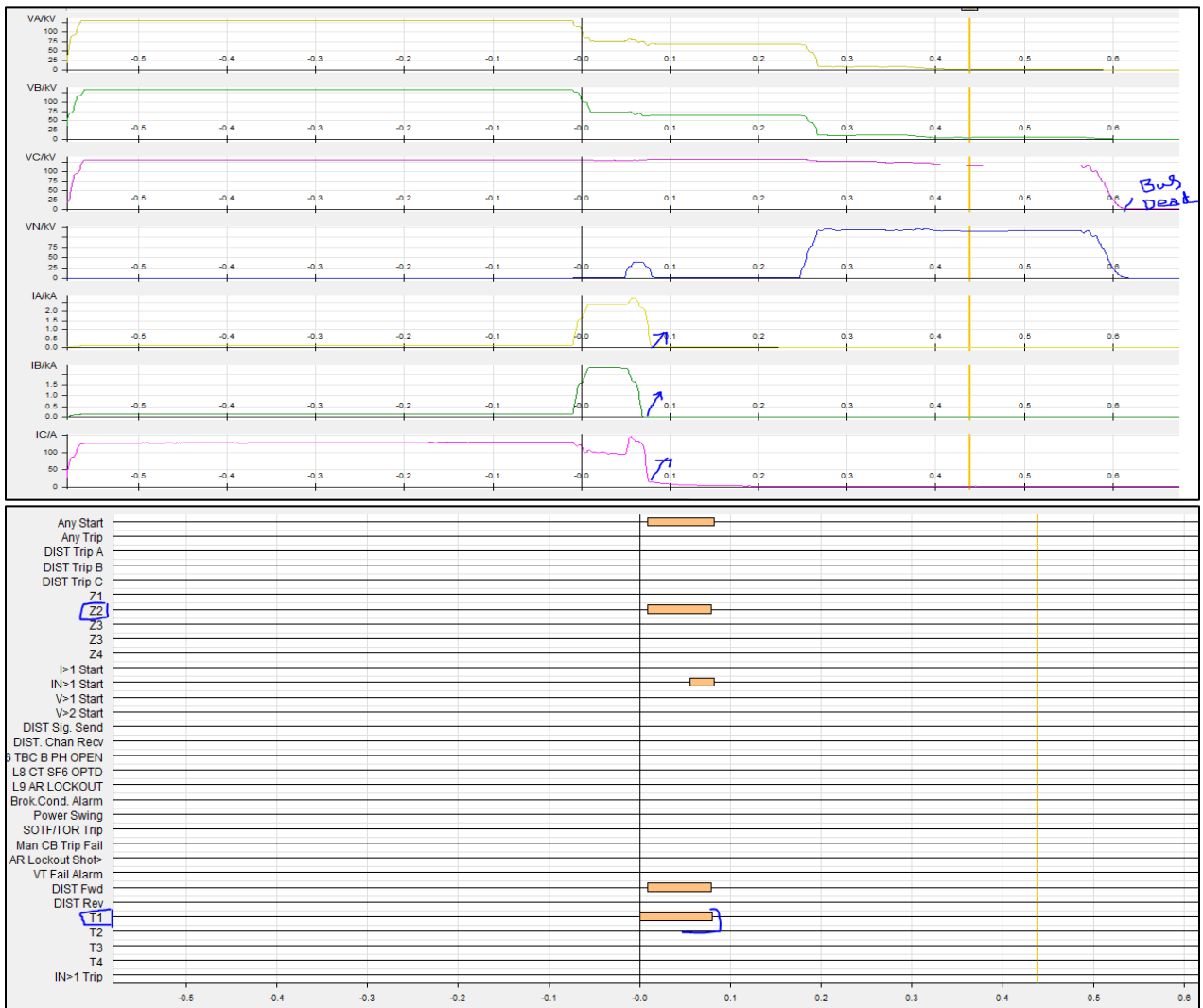
7. Non-compliance observed (विनियमन का गैर-अनुपालन):

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

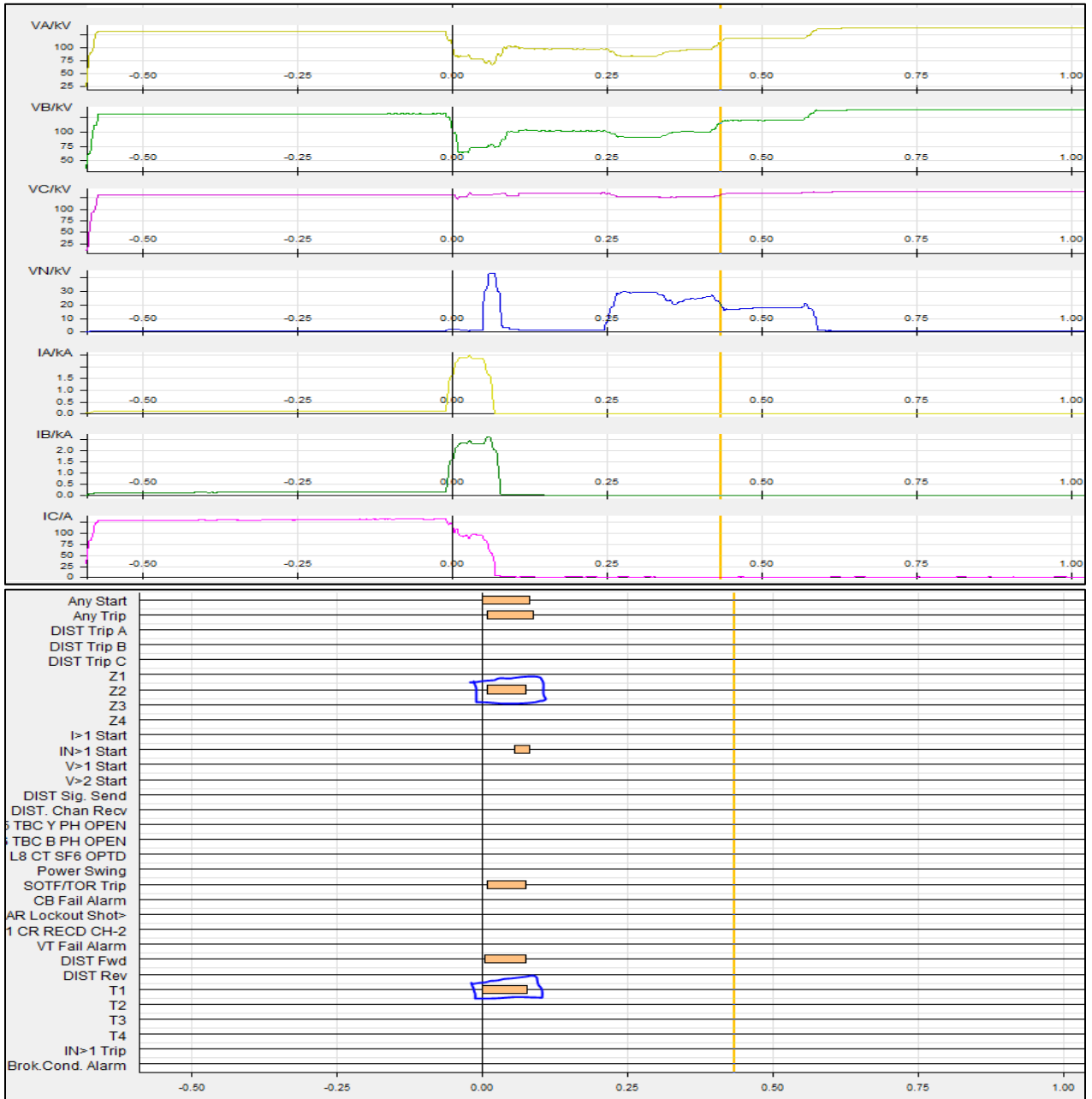
8. Status of Reporting (रिपोर्टिंग की स्थिति):

9. Annexure DR:

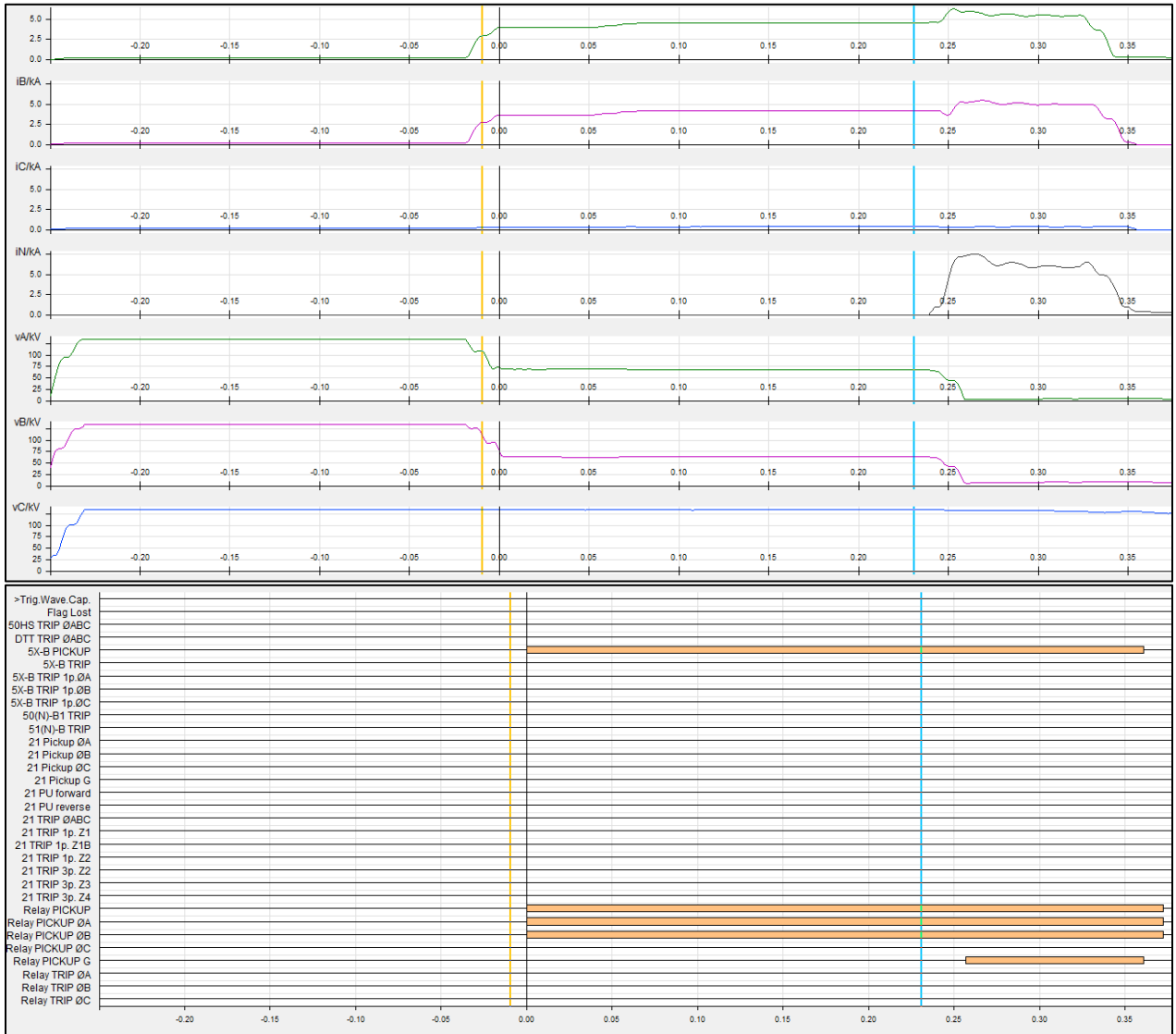
DR of Chaibasa end for RCP line-1



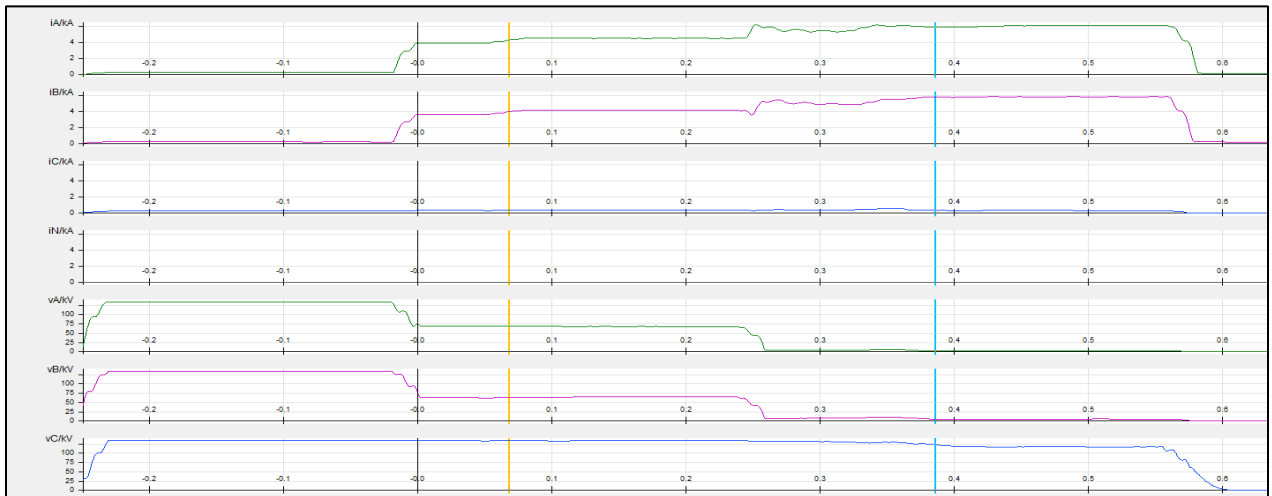
DR of Chaibasa end for RCP line-2:



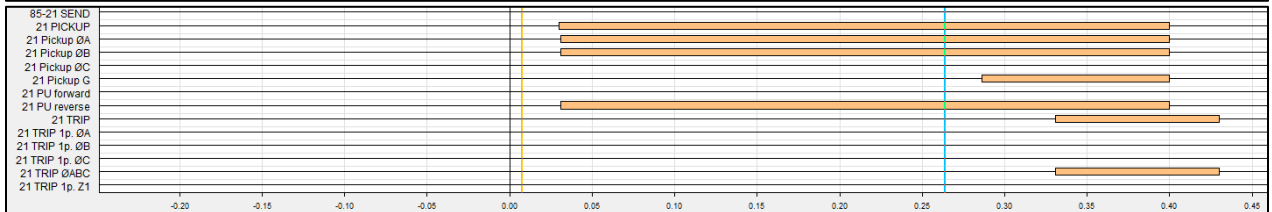
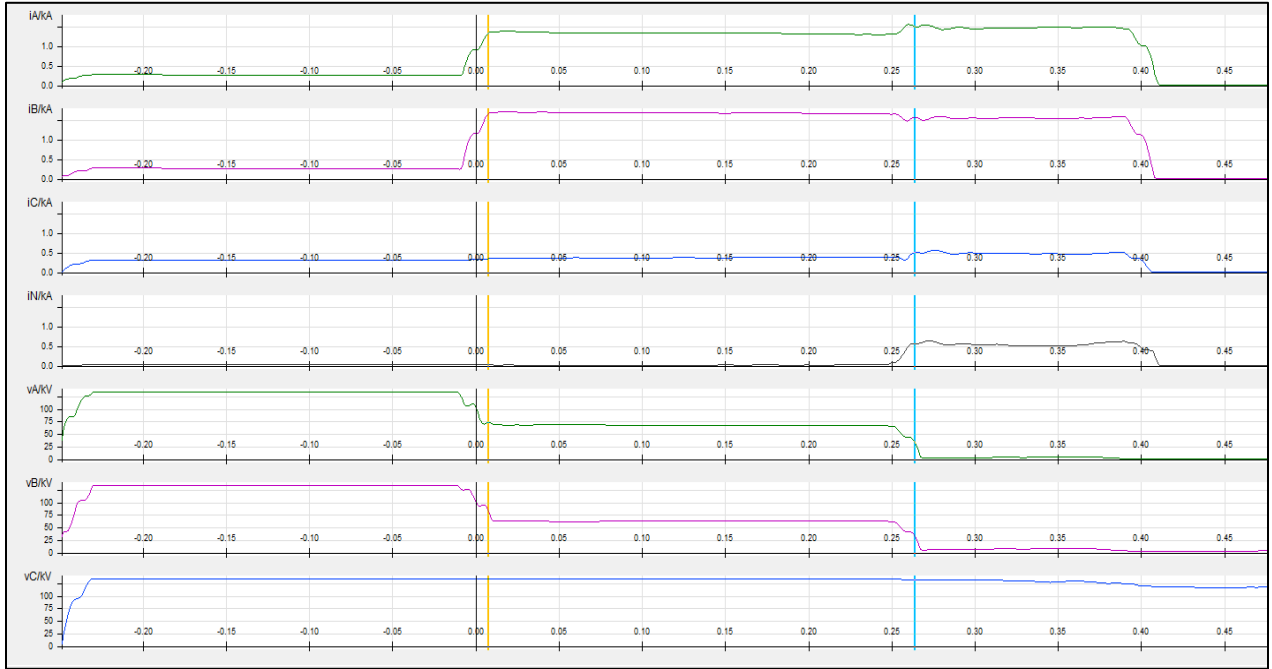
400/220 KV ICT-1 DR:



400/220 KV ICT-2 DR:



RCP-JODA AT RCP END:



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घटना संख्या: 01-05-2022/2

दिनांक: 28-05-2022

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

Summary of the event (घटना का सारांश):

At 17:40 Hrs, 220 kV Daltonganj-Chatra D/c tripped from Daltonganj end only, leading to total power failure at 220/132 kV Chatra S/s. Load loss of 13 MW reported during the event by Jharkhand SLDC.

Date / Time of disturbance: 01-05-2022 at 17:40 hrs

- Event type: GD-1
- Systems/ Subsystems affected: 220/132 kV Chatra
- Load and Generation loss.
 - No generation loss was reported during the event.
 - Around 13 MW load loss reported during the event at Chatra by Jharkhand SLDC.

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

- NIL

Major elements tripped (प्रमुख ट्रिपिंग):

- 220 kV Daltonganj-Chatra D/c

Network across the affected area (प्रभावित क्षेत्र का नक्शा)

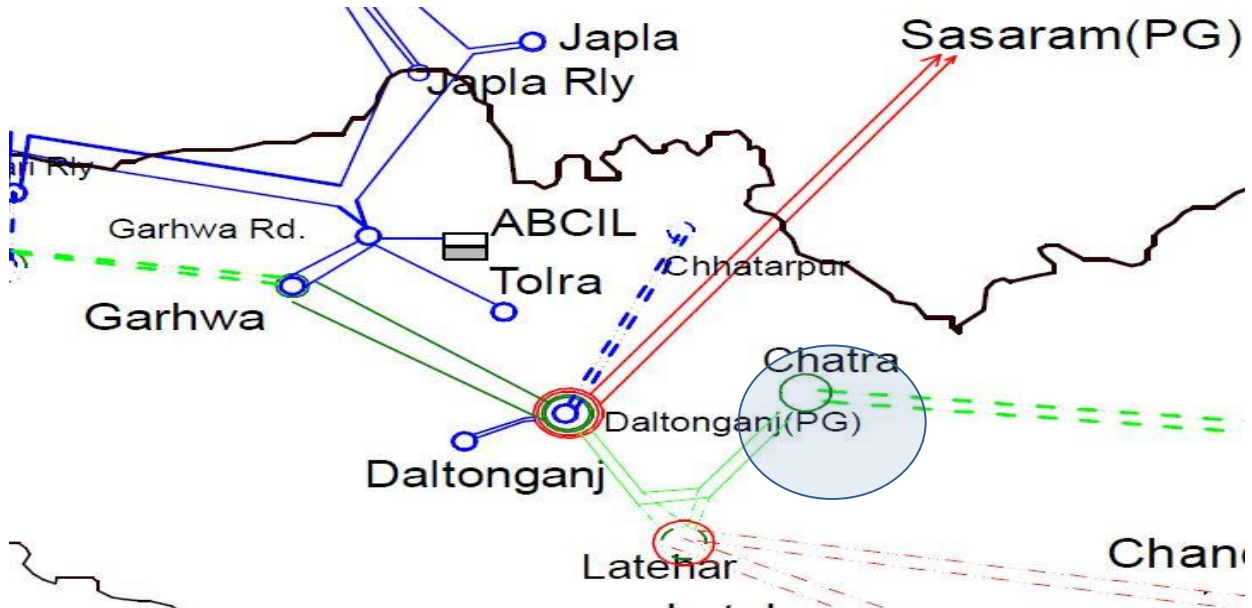


Figure 1: Network across the affected area

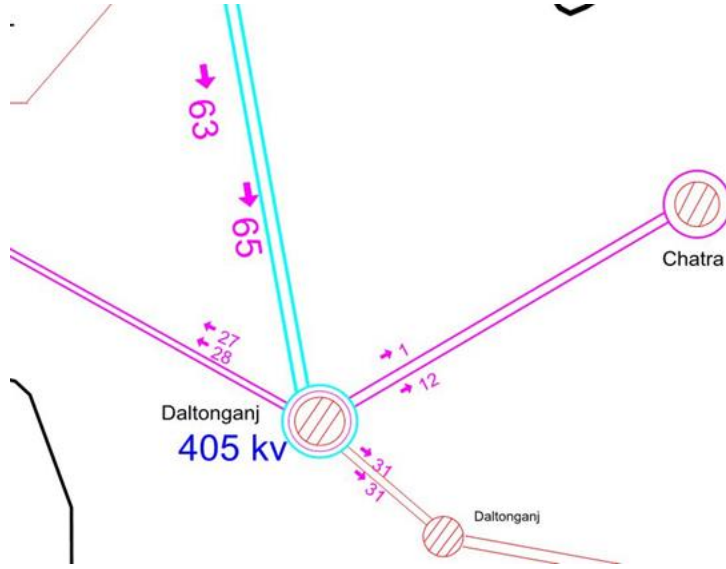


Figure 2: SCADA snapshot of the system

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

समय	नाम	उप केंद्र 1 रिले संकेत	उप केंद्र 2 रिले संकेत	पीएमयू पर्यवेक्षण
12:44	220 kV Daltonagnj-Chatra-1	Daltonganj: B_N, 0.8 kA	Didn't trip	27 kV dip in B_ph voltage for 800 msec at Daltonganj
	220 kV Daltonagnj-Chatra-2	Daltonganj: B_N, 0.8 kA	Didn't trip	

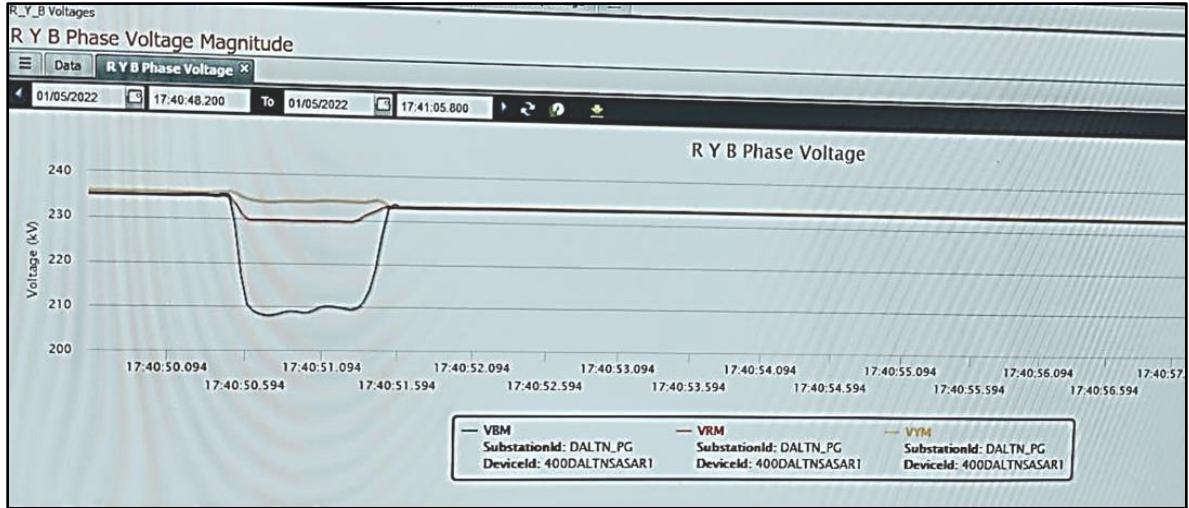


Figure 3: PMU snapshot of 400/220 kV Daltonganj S/s

Restoration (पूर्वावस्था की प्रप्ति)

Transmission/Generation element name	Restoration time
220 kV Daltonganj-Chatra-1	20:28
220 kV Daltonganj-Chatra-2	20:29

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

- 220 kV Daltonganj-Chatra-1 tripped from Daltonganj due to fault in B_ph after 800 msec in Zone-3.
- As reported, both lines tripped from Daltonganj in Zone-3. DR of ckt-2 was not submitted.
- From above details, it seems that there was a fault in downstream of Chatra which was finally cleared by Daltonganj in Zone-3.
- JUSNL to co-ordinate protection setting of 220/132 kV ICTs w.r.t 220 kV lines, so that 220 kV lines should not trip for downstream faults.

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-I

Status of Reporting (रिपोर्टिंग की स्थिति):

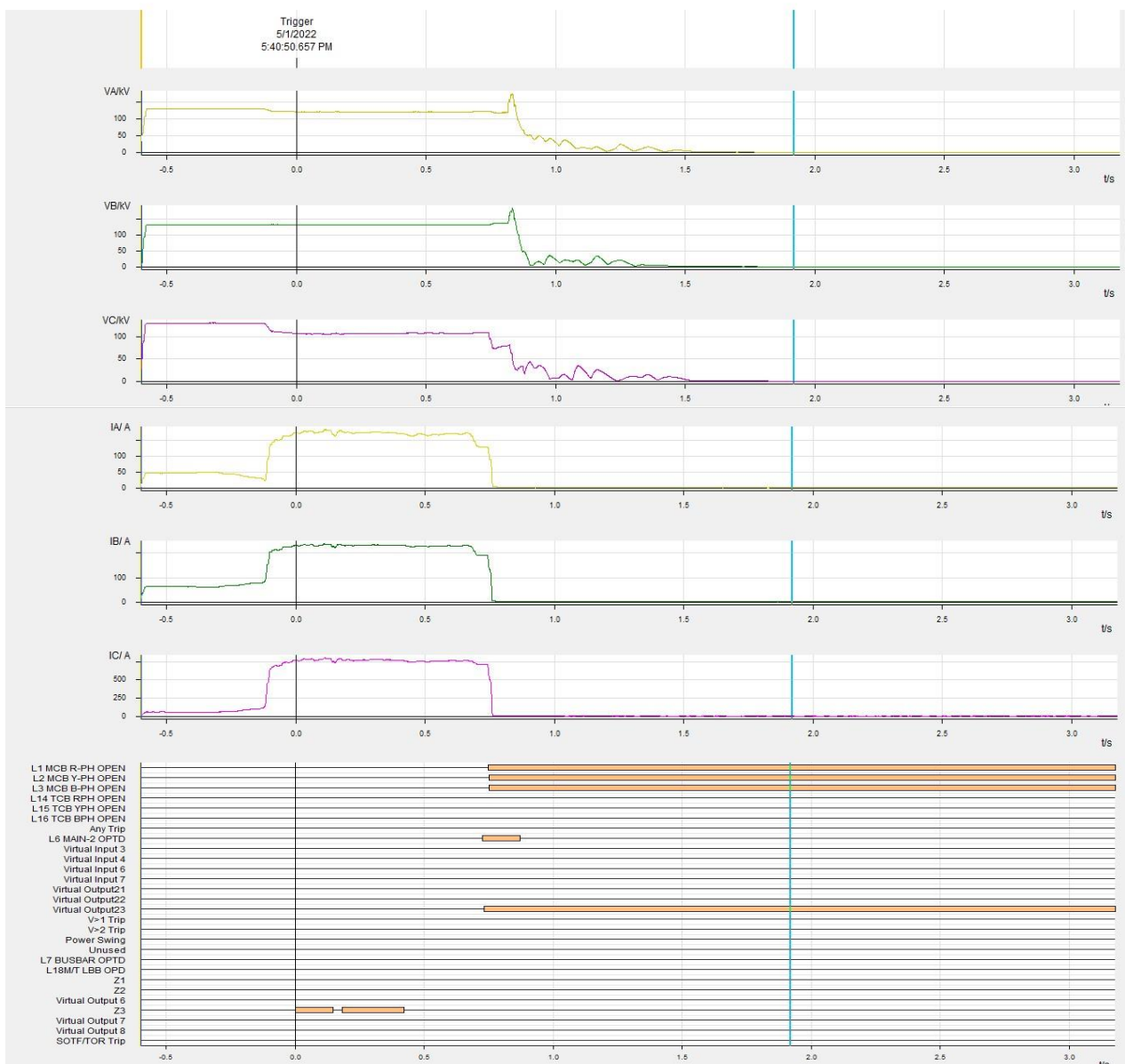
- Complete DR/EL yet to be received from PG ER-I

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

TIME	STATION	DESCRIPTION	STATUS
17:40:51.402	DALTN_PG	220_LATHEHAR_1_CB	Open
17:40:51.473	DALTN_PG	220_LATHEHAR_2_CB	Open

Annexure 2: DR recorded

DR of 220 kV Daltonganj-Chatra-I (Daltonganj end)



पावर सिस्टम ऑपरेशन करपोरेशन लिमिटेड

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घटना संख्या: 01-05-2022/1

दिनांक: 28-05-2022

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

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

At 15:53 Hrs on 01st May 2022, 220 kV Daltonganj-Garhwa-1 tripped leading total supply failure at Garhwa and radially fed downstream S/s as 220 kV Daltonganj-Garwah tripped already at 15:43 Hrs. As reported by SLDC Jharkhand, 30 MW load loss occurred at Garhwa and Meral area.

- **Date / Time of disturbance:** 01-05-2022 at 15:53 hrs.
- **Event type:** GD - 1
- **Systems/ Subsystems affected:** 220/132 kV Garhwa S/s
- **Load and Generation loss.**
 - No generation loss occurred during the event.
 - 30 MW load loss reported during the event by SLDC Jharkhand

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

- 220 kV Daltonganj-Garhwa-2 (Tripped at 15:43 Hrs)

3. Major elements tripped (प्रमुख ट्रिपिंग)

- 220 kV Daltonganj-Garhwa-1

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

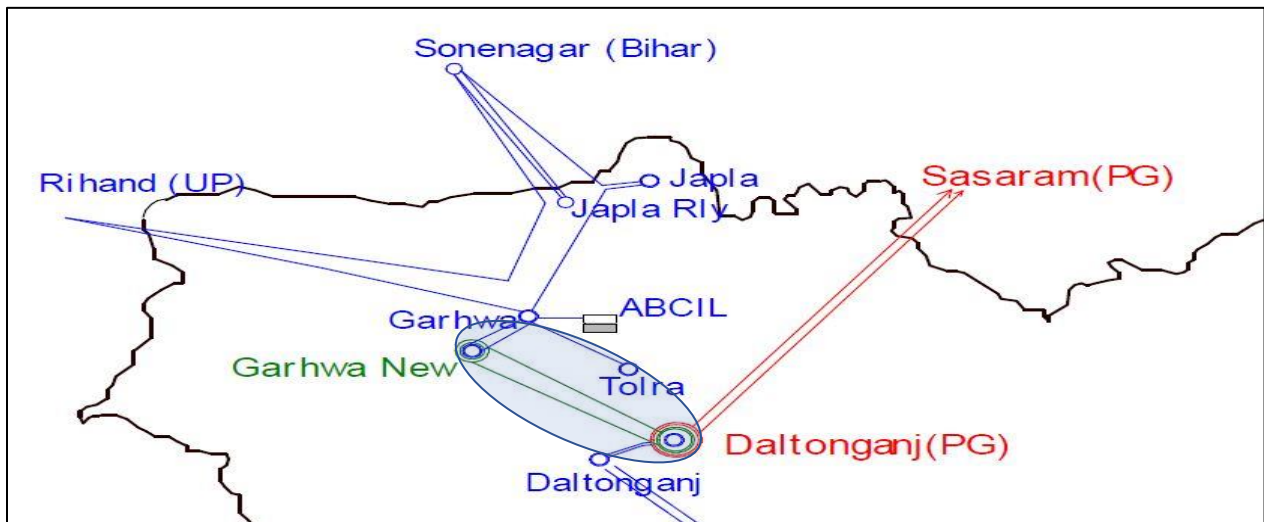


Figure 1: Network across the affected area

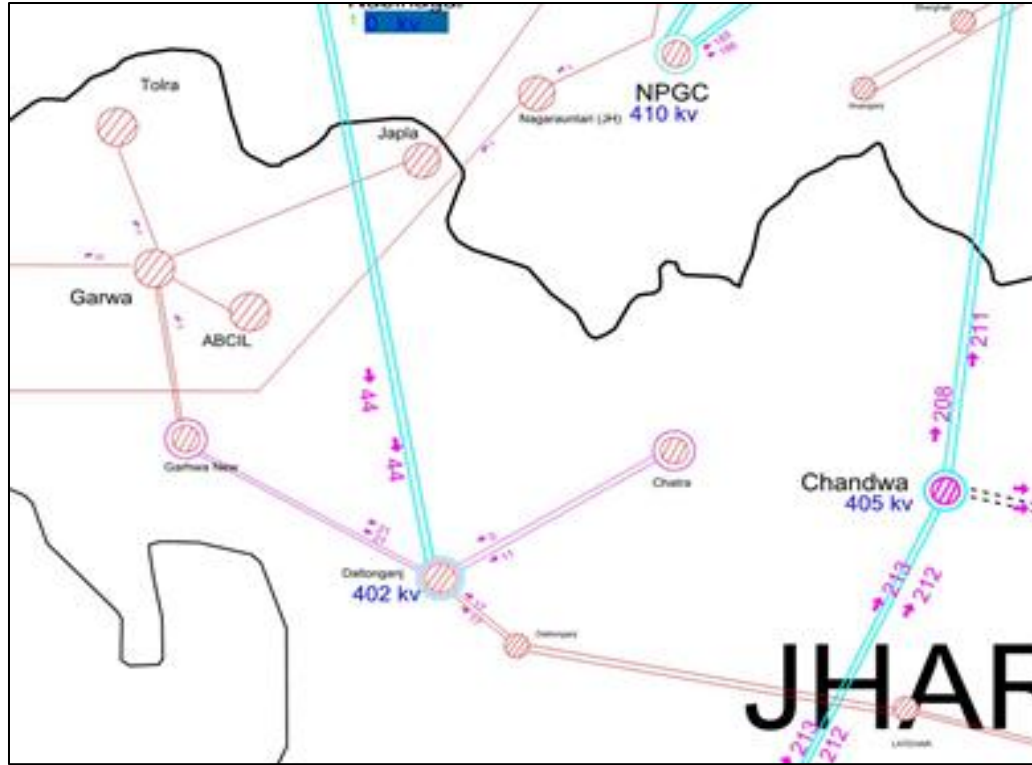
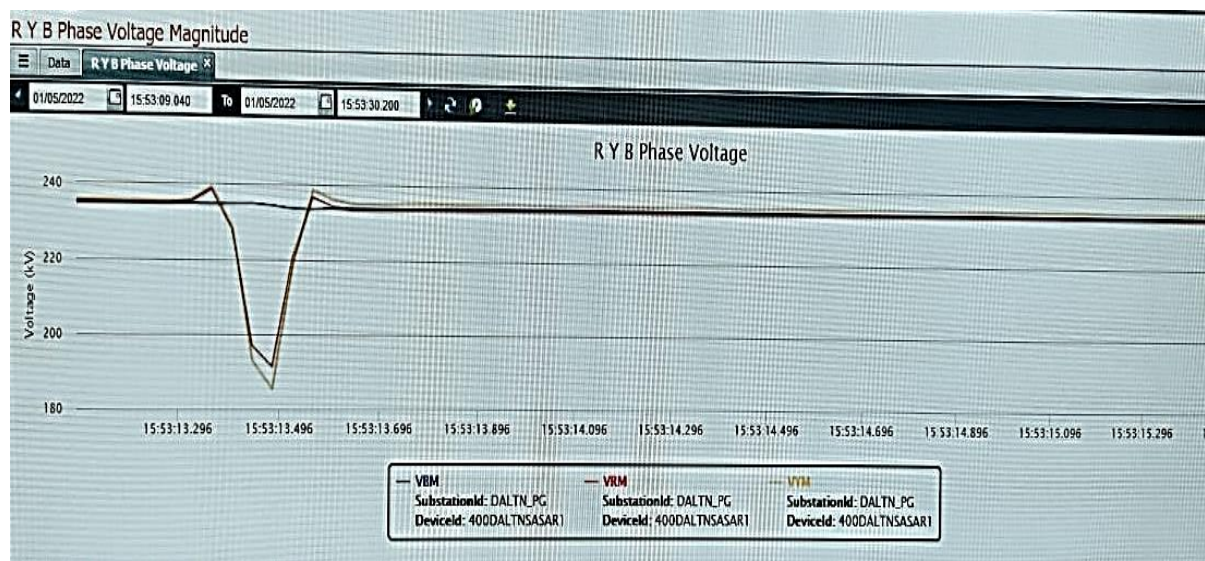


Figure 2: SCADA snapshot for of the system

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

समय	नाम	उप केंद्र 1 रिले संकेत	उप केंद्र 2 रिले संकेत	पीएमयू पर्यवेक्षण
15:43	220 kV Daltonganj-Garhwa-2	Daltonganj: R_N, Zone-1, 3.83 kA, 18.34 km,	Garhwa: R_N, Zone-1, 3.4 kA, 65 km	40 kV dip in R_ph and 45 kV dip in Y_ph voltage at Daltonganj.
15:53	220 kV Daltonganj-Garhwa-1	Daltonganj: R_Y, 4.9 km, 3.8 kA	Garhwa: Didn't trip	



PMU Voltage snapshot of 400/220 kV Daltonganj S/s

5. Restoration (पूर्वावस्था की प्रप्ति)

Transmission/Generation element name	Restoration time
220 kV Daltonganj-Garhwa-1	19:06
220 kV Daltonganj-Garhwa-2	17:27

6. Analysis of the event (घटना का विश्लेषण):

- At 15:43 Hrs, 220 kV Daltonganj-Garhwa-2 tripped due to R_N fault. A/r attempt taken from both ends failed after 1 sec.
- At 15:53 Hrs, 220 kV Daltonganj-Garhwa-1 tripped due to R_Y fault and total power failed at Garhwa.

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	JUSNL, PG

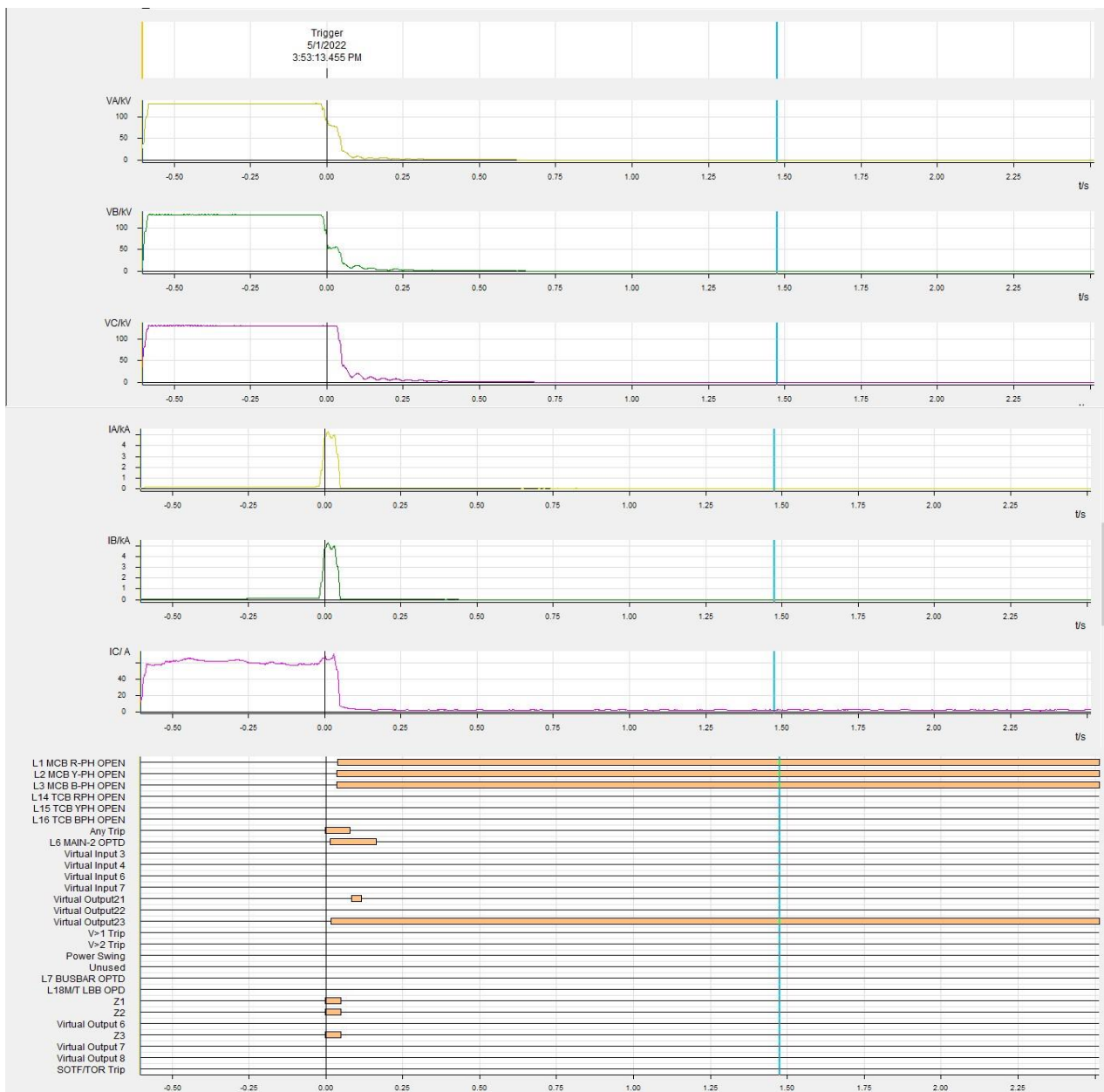
8. Status of Reporting (रिपोर्टिंग की स्थिति):

- DR/EL received from PG ER-1 and JUSNL.

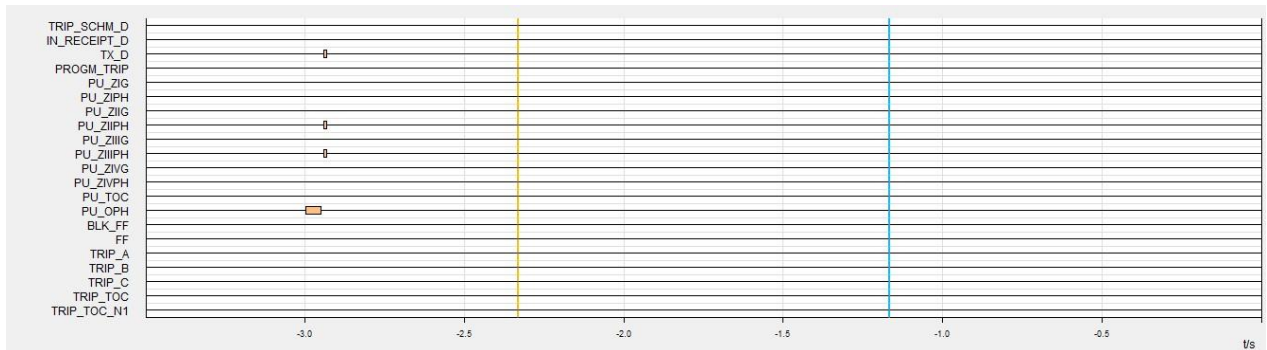
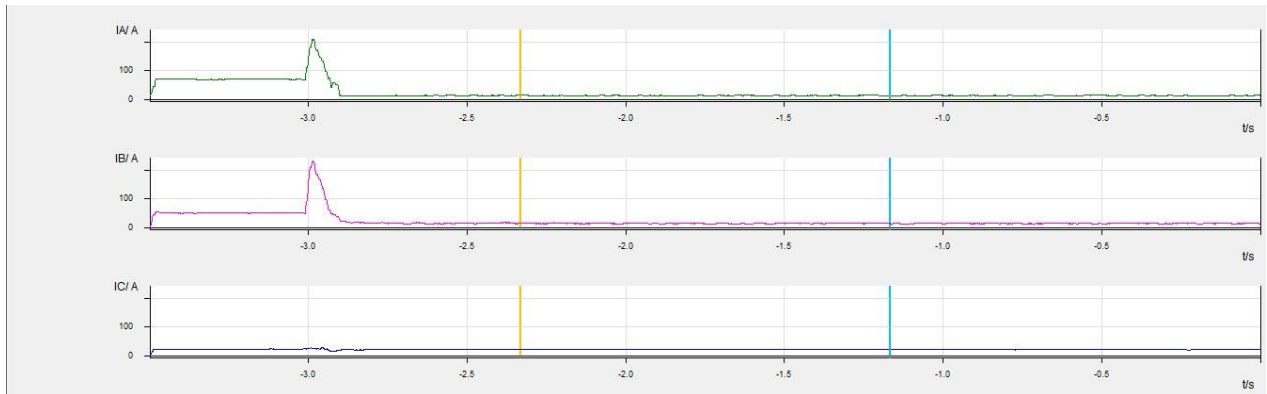
Annexure 1: Sequence of events recorded at ERLDC SCADA data at the time of the event.

TIME	STATION	DESCRIPTION	STATUS
15:43:12.684	DALTN_PG	220_GARHWA_2_CB	Closed
15:43:12.745	DALTN_PG	220_GARHWA_2_CB	Open
15:43:13.488	DALTN_PG	220_GARHWA_1_CB	Open

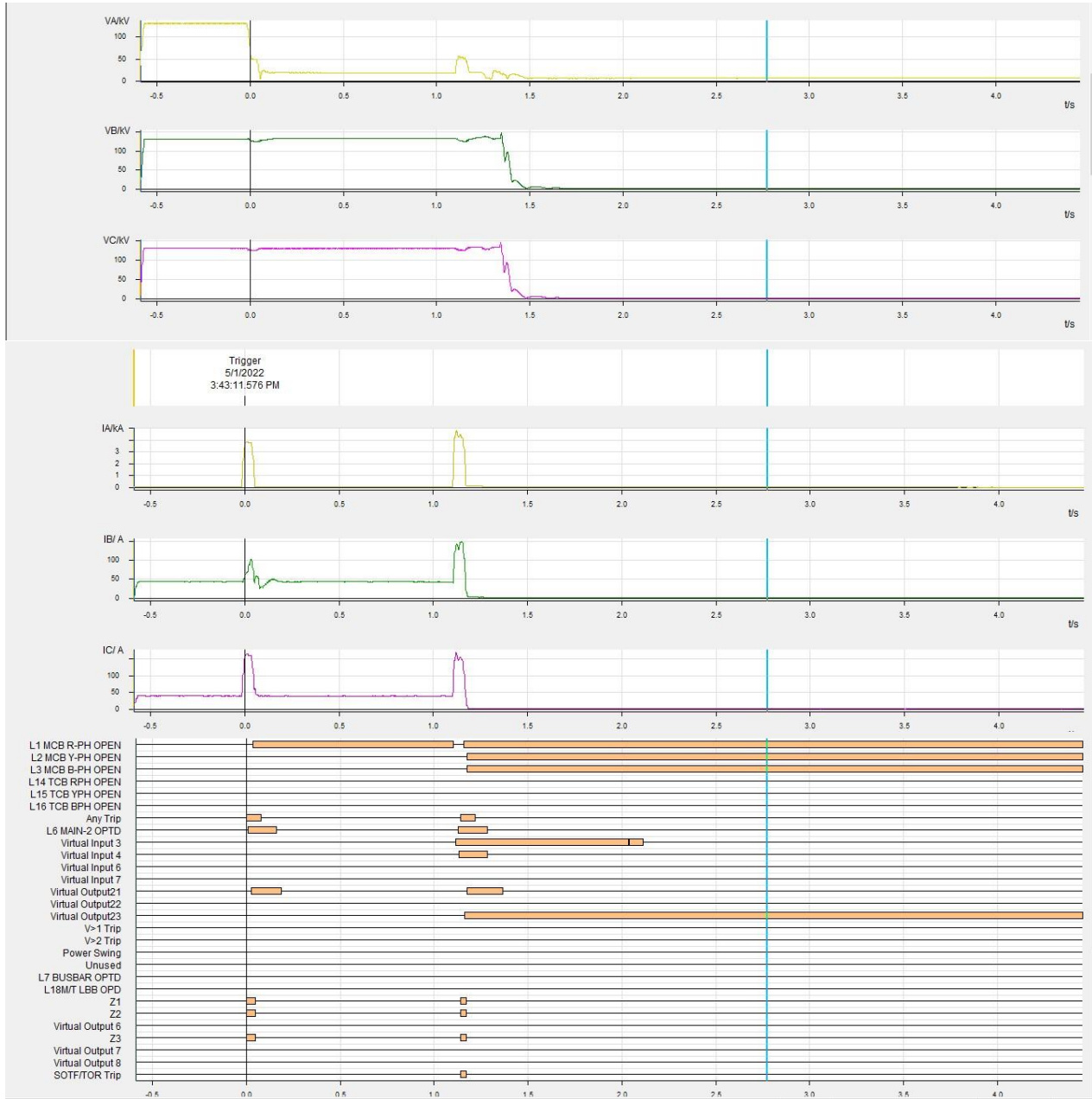
Annexure 2: DR recorded 220 kV Daltonganj-Garhwa-1 (Daltonganj)



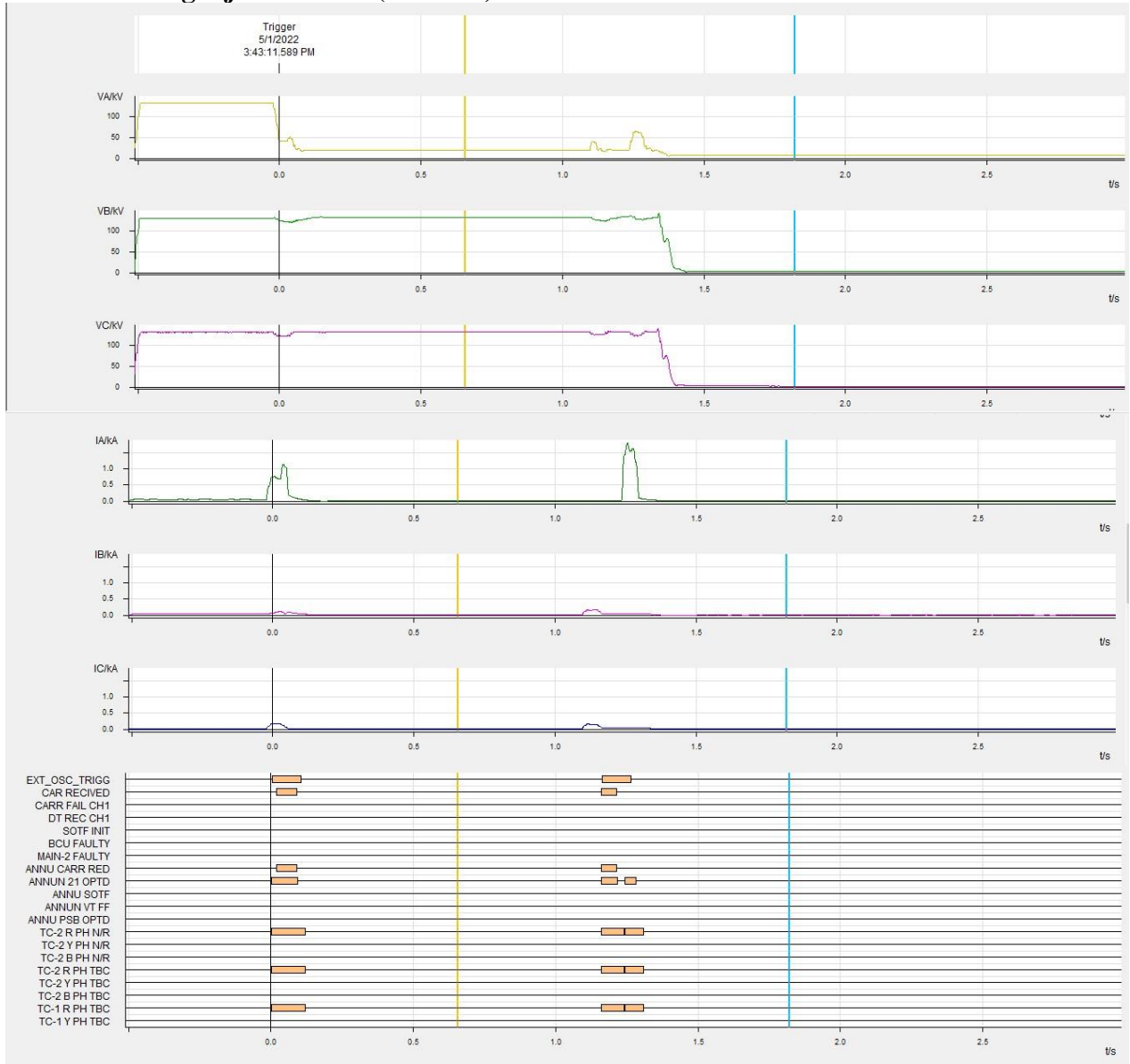
220 kV Daltonganj-Garhwa-1 (Garhwa)



220 kV Daltonganj-Garhwa-2 (Daltonganj)



220 kV Daltonganj-Garhwa-2 (Garhwa)



List of important transmission lines in ER which tripped in May-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 Disclosure	DR/ELRECEIVED FROM LOCAL END	DR/ELRECEIVED FROM REMOTE END	UTILITY RESPONSE
1	400KV-JAMSHEDPUR-ANDAL-1	01-05-2022	20:15	01-05-2022	22:26	Jamshedpur: B_N, Z1, 156.2km, 2.81kA	Andal (DSTPS) : B-N, Z-1, 11.39 km, Ib=5 kA	B-Earth	100	A/r successful. Tripped again within reclaim time	Yes	Yes		

2	400KV- BIDHANNAG AR-NEW CHANDITAL A-1	01-05-2022	20:30	01-05-2022	21:18	Bidhannagar : R-N, Z1, 7.1 km, Ir=16.48 kA	New Chanditala: R- N, 137.4 km, Ir=0.2557 kA	R- Earth	100	A/r failed after 1 second		Yes	Yes
3	220KV- SUBHASGRA M(PG)-NEW TOWN-1	01-05-2022	23:00	01-05-2022	23:37	Subhasgram : R-N, 21.145 km, 6.420 kA	New Town : R-N, Z -1, 2.59 km	R- Earth	100	Three phase tripping for single phase fault		Yes	No
4	400KV-TSTPP- MEERAMUN DALI-1	02-05-2022	13:25	02-05-2022	16:30	TSTPP : B-N , Zone 1	Meramundali : B-N ; 43.7 km; Ib= 4.9 kA	B- Earth	100	A/r failed after 1 second		Yes	Yes
5	220KV- MAITHON- DUMKA-1	03-05-2022	04:31	03-05-2022	06:58	Maithon: A/r successful	Dumka: R_N, Z-1, 11 km Ir=3.64 kA	R- Earth	100	Three phase tripping at Dumka end	DR lent h less at Mait	Yes	Yes
6	220KV- DARBHANGA (DMTCL)- MOTIPUR-2	03-05-2022	00:32	03-05-2022	09:37	Darbhanga: R-N, Z1, 33.18km, 3.988 kA		R- Earth	100	A/r failed after 1 second		No	Yes
7	220KV- MUZAFFARP UR-KANTI-1	03-05-2022	00:09	03-05-2022	12:35	Muzaffarpur: R-N, 19.23 km, 8.55kA	MTPS: R-N, 3 km, 12kA	R- Earth	120	A/r not observed. Single phase tripping. Other two phase tripped after 1.6 seconds at Muzaffarpur		Yes	No
8	220KV- CHANDIL- RANCHI-1	03-05-2022	14:49	03-05-2022	15:27	Chandil: R_Y, Z-1, 65 km, Ir=2.64kA, Iy= 2.60kA	Ranchi: R-Y, 15km, Ir=Iy=4.27kA	R-Y- Earth	100	Phase-to-phase fault		Yes	Yes

9	400KV-MEERAMUN DALI-TSTPP-2	03-05-2022	18:26	03-05-2022	20:27	Meramundali : R_N 15.7 km , 9.63 KA	TSTPP : R_N , 37.3 km, Ir =8.685 kA	R- Earth	100	A/r failed after 1 second		Yes	Yes
10	400KV-KHSTPP-BANKA (PG)-1	03-05-2022	02:30	03-05-2022	22:23		Banka : Y_N, 1.8 km, 10.8kA	Y- Earth	100	A/r failed after 1 second		Yes	No
11	400KV-NEW DUBURI-MEERAMUN DALI-2	03-05-2022	18:26	03-05-2022	23:28	Tripped with ICT at New Duburi which is in same dia. Main bay at New Duburi was out of service.		No fault	NA	Main bay at New Duburi out of service. Tripped due to tripping of dia element		Yes	Yes
	315 MVA ICT-2 at New Duburi	03-05-2022	18:26			Differential relay operated		R- Earth	100	Differentail relay operated. Findings maybe shared by OPTCL		Yes	NA
12	400KV-BIHARSARIF(PG)-PUSAULI-1	04-05-2022	09:37	04-05-2022	11:25	Biharshariff : Y_N , Z- 4 , Iy=5.4 KA	Pusauli: Y_N, 2.9 kA	Y- Earth	350	Tripped in Zone-2 time from both ends. PG may explain.		Yes	Yes
13	400KV-MAITHON-GAYA-2	04-05-2022	07:17	06-05-2022	01:16	Maithon:R-Y, 245 km, Ir 2.6kA, Iy 2.5kA	Gaya:R-Y 37 km ,Ir 12.84 kA,Iy 12.96 kA	R-Y- Earth	100	Phase-to-phase fault		Yes	Yes

14	220KV- CHAIBASA(P G)- CHAIBASA(J USNL)-1	04-05-2022	09:30	04-05-2022	16:34		Chaibasa(JUSNL): CT SF6 operation	No fault	NA	Details maybe shared by JUSNL		NA	No
15	220KV- DALTONGAN J-GARWAH (NEW)-1	04-05-2022	09:47	04-05-2022	18:19		Daltonganj: R_N, 9.91km, 4.7 kA	R- Earth	100	A/r failed after 1 second at Daltonganj		Yes	No
16	220KV- DALTONGAN J-CHATRA-1	04-05-2022	19:46	04-05-2022	21:45		Daltonganj : Y_B, 4.84 km, Iy= 4.85kA, Ib= 4.84 kA,	Y-B	100	Phase-to-phase fault		Yes	No
17	400KV- MAITHON- KHSTPP-2	05-05-2022	14:38	05-05-2022	15:57		Maithon : R-N, 59.1 km, Ir= 3.49 kA	R- Earth	100	A/r successful from Maithon end only. Other two phae at Kahalgaon tripped after 2.5 seconds on PD		No	No

18	765KV- ANGUL- SRIKAKULA M-1	05-05-2022	14:46	05-05-2022	16:42	Angul: B_N, Z- 1, 242 km, Ib= 2.89 kA		B- Earth	100	A/r successful from Angul end only		Yes	NA	
19	765KV- ANGUL- SRIKAKULA M-2	05-05-2022	14:51	05-05-2022	17:44	Angul : R-N, Z-1, 78.3km, Ir=5.82 kA		R- Earth	100	No A/r observed. Other two phase tripped after 1.1 second from Angul		Yes	NA	
20	400KV- ALIPURDUAR (PG)- BINAGURI-3	06-05-2022	12:33	06-05-2022	16:23	Alipurduar: B-N, 47.7 km, 3.49 kA	Binaguri: B-N, 84 km, 2.8 kA	B- Earth	100	A/r successful. Tripped again within reclaim time		Yes	Yes	
21	220KV-NEW MELLI- TASHIDING-2	06-05-2022	16:53	06-05-2022	17:25	New Melli: Directional E/F	Tashiding: DT received.	B- Earth	1200	Highly resistive fault. Tripped on DEF at New Melli		Yes	No	

22	220KV-DARBHANGA (DMTCL)-LAUKAHI-2	06-05-2022	17:54	06-05-2022	19:00	Darbhanga : B_N Z-2, 102.8 km , 1.789 kA		B-Earth	100	Three phase tripping at Laukahi	DR not time synchronized at Laukahi	No	Yes
23	220KV-DARBHANGA (DMTCL)-LAUKAHI-1	06-05-2022	17:54	06-05-2022	19:50		Laukahi: B-Ph Z-1, 4.28 km, 5.89 kA	B-Earth	100	Three phase tripping at Laukahi	DR not time synchronized at Laukahi	No	Yes
24	220KV-DEHRI-GAYA-2	08-05-2022	21:02	08-05-2022	22:08	Dehri : B-N, Z-1, 58.2 km, 1.78 kA	Gaya: B_N, 43.1 km, 1.77kA	B-Earth	800	Highly resistive fault. Tripped in Zone-2 time from Gaya.		Yes	Yes
25	400KV-SAHARSA-DARBHANGA (DMTCL)-2	09-05-2022	00:24	09-05-2022	03:17	Saharsha : Y-N, Z-1, 3.3 km, 13.13 kA	Darbhanga : Y_N, 49 km, 1.75 kA	Y-Earth	100	O/V St.-2 operated after 400 msec. Line reactor didn't trip during single phase tripping at Darbhanga.		Yes	Yes
26	400KV-KISHANGANJ-RANGPO-2	09-05-2022	13:48	09-05-2022	16:33	Kishanganj: DEF, B_N, 2.43 kA, NGR Buchholz operated	Rangpo: DEF, 4.8 kA	B-Earth	1250	Tripped on DEF from both ends		Yes	Yes

27	400KV- MEERAMUN DALI-TSTPP-2	10-05-2022	15:24	10-05-2022	16:52	Meeramundali : R_N 15.5 km Ir=10.24 kA	Talcher R_N 37.6 km Ir=8.87 kA	R- Earth	100	A/r failed after 1 second	Yes	Yes
28	220KV- ARRAH- NAUBATPUR- 1	11-05-2022	14:56	11-05-2022	15:40	Arrah: DR_N, A/r successful	Naubatpur: R_N, 37.5 km. 2.96 kA	R- Earth	100	A/r successful from Ara end only	Yes	No
29	220KV- BINAGURI- SILIGURI-1	12-05-2022	13:16	12-05-2022	15:22	Binaguri: B_N, 7.39 km, 11.3 kA	Siliguri: B_N, 2.66 km, 7.18 kA	B- Earth	100	A/r successful. Line tripped again within reclaim time	Yes	No
30	400KV- BIHARSHARI F-VARANASI- 1	12-05-2022	14:47	12-05-2022	16:54	Biharsharif: R_N, 198.5 km, 2.289 kA	Varanasi: Didn't trip	R- Earth	100	A/r failed after 1 second	Yes	NA
31	220KV- TENUGHAT- BIHARSHARI F-1	12-05-2022	22:06	12-05-2022	22:46	Tenughat: Y_N, Zone- 1, 10.12 km, 6.919 kA	Biharsharif: Y_N, 143.1 km, 1.5 kA	Y- Earth	100	Three phase tripping for single phase fault	Yes	No
32	220 KV- DALKHOLA- PURNEA-1	13-05-2022	04:35	13-05-2022	06:33	Dalkhola: R_N, Zone- 1, 11.45 km, 7.39 kA	Purnea: R_N, 25.689 km, 5.6 kA, A/r successful	R- Earth	100	Other two phase tripped after 1.1 second at Dalkhola. A/r successful at Punrea	Yes	Yes
33	220KV- KARMNASHA (NEW)- PUSAULI-1	13-05-2022	09:48	13-05-2022	11:55	Karmnasah: Master trip relay operated		No fault	NA	Detials maybe shared by BSPTCL	Yes	No

34	220KV- CHANDIL- SANTALDIH- 1	13-05-2022	12:30	13-05-2022	12:50	Chandil: B_N, Zone-1, 18.1 km, 1.97 kA	Santalalih: B_N, Zone-2, 101.33 km, 1.585 kA	B- Earth	500	Tripped in Zone-2 time from Santalalih. Single phase tripping at Chandil	DR leng th less at Cha ndil	Yes	Yes
35	400KV- DURGAPUR- KHSTPP-1	13-05-2022	14:41	13-05-2022	15:42	Durgapur: Y_N, 5.1 kA	KhSTPP: Master trip relay faulty	Y- Earth	100	A/r successful from Durgapur end only		Yes	Yes
36	220 KV DARBHANGA (DMTCL)- LAUKAHI-1	13-05-2022	16:22	13-05-2022	17:17	Darbhangha: R_N, 57.55 km, 2.448 kA	Laukahi: R_N, 3.08 kA	R- Earth	100	Three phase tripping for single phase fault		No	Yes
37	220 KV DARBHANGA (DMTCL)- LAUKAHI-2	13-05-2022	16:22	13-05-2022	22:39	Darbhangha: R_N, 59.5 km, 2.74 kA		R- Earth	100	Three phase tripping at Laukahi		No	Yes
38	400KV PATNA- BALIA-1	13-05-2022	18:38	13-05-2022	19:41	Patna: O/V St.1		O/V	NA	Voltage in R_ph & B_ph touched 480 kV while Y_ph voltage was 230 kV. O/V St.1 operated at Patna. PG may explain		Yes	NA

39	400KV GAYA- MAITHON-2	13-05-2022	19:02	13-05-2022	23:36	Gaya: R_Y, 37.58 km, Ir=Iy=13 kA	Maithon: R_Y, Ir- 2.6 kA, Iy-2.47 kA	R-Y- Earth	100	Phase-to-phase fault		Yes	Yes
40	220 KV DALTONGAN J-CHATRA-2	14-05-2022	09:30	14-05-2022	10:13	Daltonganj: Y_B, Iy=Ib=2.4 kA	Chatra: Y_B, 118.54 km	Y-B	100	Phase-to-phase fault	DR chan nels not conf igur ed prop erly	Yes	Yes
41	400 KV RANCHI- SIPAT-1	14-05-2022	16:04	15-05-2022	07:46	Ranchi: Y_N, 41.5 km, 6.02 kA		Y- Earth	100	Another fault in B_ph after 800 msec		Yes	NA
42	400 KV RANCHI-NEW RANCHI-3	14-05-2022	16:04	15-05-2022	06:20	Ranchi: R_N, 78.6 km, 1.48 kA	New Ranchi: R_N, 1.51 kA	R- Earth	100	Another fault in Y_ph after 250 msec. One more fault after 300 msec in B_ph		Yes	Yes
43	400 KV RANCHI-NEW RANCHI-4	14-05-2022	16:04	15-05-2022	06:22	Ranchi: R_N, 78.1 km, 8.9 kA	New Ranchi: R_N, 19.1 kA	R- Earth	100	Three phase tripping occurred.		Yes	Yes

44	220 KV RANCHI- HATIA-2	14-05-2022	16:12	14-05-2022	16:38	Ranchi: B_N, 32 km, 3.14 kA, A/r successful	Hatia: B_N, 102.5 km	B- Earth	100	A/r failed after 1 sec		Yes	Yes
45	220 KV RANCHI- HATIA-3	14-05-2022	16:12	14-05-2022	18:14	Ranchi: B_N, 40.1 km, 2.4 kA		B- Earth	100	A/r failed after 1 sec		Yes	Yes
46	400 KV RANCHI- ROURKELA-1	14-05-2022	18:17	14-05-2022	23:10	Ranchi: R_B, 13 km, Ir 10.34 kA, Ib-10.52 kA	Rourkela: R_B, 97.4 km, Ir-4.78 kA, Ib-5.21 kA	R-B- Earth	100	Phase-to-phase fault		Yes	Yes
47	400 KV PPSP- BIDHANNAG AR-1	14-05-2022	18:23	14-05-2022	19:00	PPSP: R_N, Zone-1, 132.3 km	Bidhannagar: R_N, Zone-1, 42.09 km, 7.045 kA	R- Earth	100	Three phase tripping for single phase fault. A/r kept in non-auto as per OEM advise		No	Yes
48	400 KV JEERAT- BAKRESWAR- 1	14-05-2022	19:15	14-05-2022	19:48	Jeerat: B_N, Zone-2, 141 km, 3.154 kA	Bakreswar: B_N, Zone-1, 39.16 km, 9.388 kA	R- Earth	100	Three phase tripping for single phase fault. A/r kept in non-auto as per OEM advise		Yes	No
49	400 KV KHARAGPUR- CHAIBASA-1	14-05-2022	20:02	14-05-2022	21:18	Kharagpur: B_N, Zone- 1, 124.3 km, 1.454 kA	Chaibasa: B_N, Zone-1, 0.727 km, 15.669 kA	B- Earth	100	A/r successful. Line tripped again within reclaim time		Yes	Yes

50	400 KV PPSP-BIDHANNAG AR-1	15-05-2022	12:20	15-05-2022	12:56	PPSP: R_N, Zone-1, 120 km	Bidhannagar: R_N, Zone-1, 42 km, 6.82 kA	R-Earth	100	Three phase tripping for single phase fault. A/r kept in non-auto as per OEM advise		No	Yes
51	220 KV DALTONGAN J-CHATRA-1	15-05-2022	12:56	15-05-2022	13:35	Daltonganj: B_N, 106.45 km, 1.1 kA	Chatra: B_N, 0.9 kA	B-Earth	400	Three phase tripping for single phase fault.	DR channels not configured properly	Yes	No
52	220 KV CHANDIL-SANTALDIH-1	15-05-2022	17:22	15-05-2022	17:37	Chandil: Y_N, Zone-1, 39.1 km, 2.95 kA	SantalDIH: Didn't trip	Y-Earth	100	A/r was in blocked condition at Chandil. Three phase tripped	DR length less	Yes	Yes
53	400 KV JAMSHEDPUR-MAITHON-1	15-05-2022	17:28	15-05-2022	18:04	Jamshedpur: Y_N, Zone-1, 59.14 km, 3.2 kA	Maithon: Y_N, 59.14 km, 3.2 kA	Y-Earth	100	A/r successful. Tripped again within reclaim time		Yes	Yes
54	220 KV BUDHIPADA R-RAIGARH-1	15-05-2022	21:51	15-05-2022	23:47	Budhipadar: R_N, Zone-1, 1.4 km, 22.8 kA	Raigarh: R_N, 37 km, 2.47 kA	R-Earth	100	Three phase tripping for single phase fault		Yes	NA

55	400 KV GAYA-MAITHON-1	16-05-2022	15:35	17-05-2022	08:18	Gaya: R_N, 187.3 km, 2.2 kA	Maithon: R_N, 95.3 km, 4.04 kA	R-Earth	100	A/r successful. Line tripped again within reclaim time	Yes	Yes	
56	400 KV PPSP-BIDHANNAG AR-1	16-05-2022	17:20	16-05-2022	17:58	PPSP: R_N, 157.7 km	Bidhannagar: R_N, Zone-1, 20.9 km, 10.58 kA	R-Earth	100	Three phase tripping for single phase fault. A/r kept in non-auto as per OEM advise	No	Yes	
57	400 KV PPSP-BIDHANNAG AR-2	16-05-2022	17:20	16-05-2022	17:55	PPSP: Y_N, Zone-1, 162.5 km	Bidhannagar: Y_N, Zone-1, 20.09 km, 10.6 kA	Y-Earth	100	Three phase tripping for single phase fault. A/r kept in non-auto as per OEM advise	No	Yes	
58	400 KV FSTPP-KHSTPP-2	16-05-2022	19:30	16-05-2022	20:07	FSTPP: Y_N	KhSTPP: Y_N, 40.03 km, 6.9 kA	Y-Earth	100	A/r successful at FSTPP end only (Main bay A/r successful).	No	No	
59	400 KV KISHANGANJ-RANGPO-2	17-05-2022	01:54	17-05-2022	06:48	Kishanganj: R_B, 65.06 km, Ir=Ib=9.977 kA	Rangpo: R_B, Zone-1, 132.2 km, Ir=3.69 kA, Ib=4.16 kA	R-B-Earth	100	Phase-to-phase fault	Yes	Yes	
60	400 KV NEW PPSP-NEW RANCHI-1	17-05-2022	04:58	17-05-2022	08:18	New PPSP: Didn't trip	New Ranchi: PLCC malfunction	No fault	NA	Details maybe shared by PG/WBSETCL	No	No	
61	400 KV FSTPP-KAHALGAON-1	17-05-2022	10:46	17-05-2022	16:01	FSTPP: DT receipt	Kahalgaon: Didn't trip	No fault	NA	Details maybe shared by NTPC KhSTPP/FSTPP	No	No	
62	RANCHI-RAGHUNATH PUR-3	17-05-2022	15:05	17-05-2022	16:12	Ranchi: B_N, 57.6 km, 6.15 kA	Raghunathpur: B_N, 132 km, 3.54 kA	B-Earth	100	A/r successful. Tripped again within reclaim time	Yes	Yes	
63	400 KV NEW RANCHI-NEW PPSP-2	17-05-2022	16:29	17-05-2022	17:26	New Ranchi: B_N, 112 km, 3.59 kA	New PPSP: B_N, 17.6 km, 7 kA	B-Earth	100	A/r failed after 1 sec at New PPSP. Another fault struck in Y_ph after 1 sec at New Ranchi	Yes	Yes	

64	400 KV GAYA-MAITHON-1	17-05-2022	16:52	17-05-2022	17:30	Gaya: R_N, 88.9 km, 3.59 kA	Maithon: R_N, 220.1 km, 2.11 kA	R-Earth	100	A/r failed after 1 sec		Yes	Yes	
65	220 KV CHANDAUTI (PMTL)-SONENAGAR-2	18-05-2022	12:55	18-05-2022	18:08	Chandauti: Y_B, 22.36 km, Iy:10.15 kA, Ib: 6.97 kA	Sonenagar: Y_B, 50.41 km, Iy-1.7 kA, Ib-1.9 kA	Y-B	100	Phase-to-phase fault		Yes	Yes	
66	220 KV ARRAH-NAUBATPUR-1	18-05-2022	14:03	18-05-2022	15:39	Arrah: B_N, 29.6 km, 1.456 kA, A/r successful	Naubatpur: B_N, 5.96 kA	B-Earth	100	A/r successful at Arrah only. BGCL may explain		Yes	No	
67	220 KV ARRAH-NAUBATPUR-2	18-05-2022	14:03	18-05-2022	15:40	Arrah: Didn't trip		B-Earth	100	BGCL may explain.		No	No	
68	400 KV KISHANGANJ-RANGPO-1	18-05-2022	15:10	18-05-2022	15:53	Kishanganj: B_N, 187 km, 2.7 kA	Rangpo: B_N, 11.8 km, 5.66 kA	B-Earth	600	Highly resistive fault. A/r successful. Tripped again within reclaim time		Yes	Yes	
69	400 KV BIHARSHARI F-BALIA-2	19-05-2022	14:20	19-05-2022	15:45	Biharsharif: Y_N, 27.48 km, 9.5 kA		Y-Earth	100	Three phase tripping for single phase fault. No A/r observed		Yes	NA	
70	400 KV BARH-MOTIHARI-1	19-05-2022	15:02	19-05-2022	16:17	Barh: Y_N, 172.5 km, 2.38 kA	Motihari: Y_N, 10.2 km, 8.68 kA	Y-Earth	100	A/r failed after 1 sec		Yes	No	

71	400 KV MUZAFFARPUR- GORAKHPUR-1	19-05-2022	16:11	19-05-2022	19:20	Muzaffarpur: R_N, 9.78 kA		R- Earth	100	Three phase tripping for single phase fault		Yes	NA	
72	220 KV MUZAFFARPUR- HAJIPUR-2	19-05-2022	16:25	19-05-2022	18:28		Hajipur: B_N, 51.95 km, 1.344 kA	B- Earth	100	Three phase tripping for single phase fault		No	Yes	
73	400 KV MUZAFFARPUR- DHALKEBAR-2	19-05-2022	16:39	20-05-2022	01:53	Muzaffarpur: R_N, 43.6 km, 6.2 kA		R- Earth	100	PG may explain. Multiple A/r attempts at Muzaffarpur		No	No	
74	220 KV KHAGARIA- NEW PURNEA-1	19-05-2022	17:11	19-05-2022	19:33	Khagaria: Y_B, 38 km, Iy-4.1 kA, Ib-4.04 kA	New Purnea: Y_B, 58.3 km, Iy-3.31 kA, Ib-3.71 kA	Y-B	100	Phase-to-phase fault		Yes	Yes	
75	220 KV KHAGARIA- NEW PURNEA-2	19-05-2022	17:26	19-05-2022	20:02	Khagaria: Y_B, 38 km, Iy-4.1 kA, Ib-4.04 kA	New Purnea: Y_B, 50.4 km, Iy=Ib=4.04 kA	Y-B	100	Phase-to-phase fault		Yes	Yes	
76	400 KV BARH- MOTIHARI-2	19-05-2022	17:51	19-May	18:55	Barh: Y_N, 4.1 km, 21 kA	Motihari: Y_N, 212 km, 1.76 kA	Y- Earth	100	Three phase tripping for single phase fault. No A/r observed		No	No	
77	220 KV KHAGARIA- NEW PURNEA-1	19-05-2022	19:48	20-05-2022	10:03	Khagaria: Y_B, Iy=Ib=2.8 kA	New Purnea: Y_B, 58.8 km, Iy-3.3 kA, Ib-3.72 kA	Y-B	100	Phase-to-phase fault		Yes	Yes	

78	220 KV JSPL- JAMSHEDPU R-1	20-05-2022	17:05	20-05-2022	18:13	JSPL: Y_N, 1.19 kA	Jamshedpur: Y_N, 19.5 km	Y- Earth	400	Three phase tripping for single phase fault		No	Yes
79	400 KV SAHARSA- KISHANGANJ- 2	21-05-2022	00:39	21-05-2022	00:57	Saharsa: B_N, 101 km, 3.13 kA	Kishanganj: B_N, 78.3 km, 4.8 kA	B- Earth	100	A/r failed after 1 sec		Yes	Yes
80	220 KV KHAGARIA- NEW PURNEA-1	21-05-2022	00:55	21-05-2022	17:38	Khagaria: Y_B_N, 43.71 km, Iy-3.2 kA, Ib- 2.553 kA	New Purnea: Y_B_N, 3 km, Iy: 18.05 kA, Ib: 17.7 kA	Y-B- Earth	100	Phase-to-phase fault		Yes	No
81	220 KV KHAGARIA- NEW PURNEA-2	21-05-2022	00:55	21-05-2022	17:36	Khagaria: Y_B, 94.08 km, Iy-1.67 kA, Ib- 1.80 kA		Y-B- Earth	100	Phase-to-phase fault		Yes	No
82	220 KV SAHARSA- KHAGARIA-1	21-05-2022	00:56	21-05-2022	02:58	Saharsa: R_N, 6.3 kA, DT received	Khagaria: LBB operated	R- Earth	100	DT received at Saharsa. Bus bar protection operated at Khagaria. BSPTCL may explain.		Yes	Yes
83	220 KV SAHARSA- KHAGARIA-2	21-05-2022	00:56	21-05-2022			Khagaria: LBB operated	R- Earth	100	DT received at Saharsa. Bus bar protection operated at Khagaria. BSPTCL may explain.		Yes	Yes
84	400 KV BINAGURI- MALBASE-1	21-05-2022	01:50	21-05-2022	02:15	Binaguri: B_N, 15.24 km, 7.9 kA, A/r successful		B- Earth	100	A/r successful from Binaguri only		Yes	NA

85	400 KV MALDA-NEW PURNEA-1	21-05-2022	01:59	21-05-2022	02:34	Malda: Y_N, 7.73 kA, 32.54 km	New Purnea: A/r successful	Y- Earth	100	A/r successful at New Purnea. DT received at Malda after 1 sec. PG may explain.		Yes	Yes	
86	400 KV FSTPP- MALDA-2	21-05-2022	02:13	21-05-2022	23:37	FSTPP: R_N, 42 km, 8.392 kA	Malda: R_N, Zone- 1, 19.29 kA	R- Earth	100	A/r failed after 1 sec		No	Yes	
87	765 KV MEDINIPUR- NEW JEERAT- 2	21-05-2022	02:34	21-05-2022	03:49	Medinipur: Y_N, 16 km, 7.7 kA	New Jeerat: Y_N, 132 km	Y- Earth	100	A/r successful. Line tripped again within reclaim time		Yes	Yes	
88	400 KV KHARAGPUR- CHAIBASA-2	21-05-2022	03:41	21-05-2022	03:57	Kharagpur: R_N, 4.73 kA	Chaibasa: R_N, 101.8 km, 3.2 1A	R- Earth	100	A/r failed after 1 sec		Yes	Yes	
89	400 KV BAHARAMPU R- BHERAMARA- 2	21-05-2022	03:53	21-05-2022	04:38	Baharampur: R_N, 39.05 km, 7.144 kA		R- Earth	100	DT received at Behrampur		Yes	NA	
90	400 KV BAHARAMPU R- BHERAMARA- 3	21-05-2022	04:07	21-05-2022	04:40	Baharampur: R_N, 37.518 km, 4.436 kA		R- Earth	100	DT received at Behrampur		Yes	NA	

91	400 KV ALIPURDUAR- BONGAIGAO N-1	21-05-2022	07:40	21-05-2022	08:11	Alipurduar: R_N, 3.69 kA	Bongaigaon: R_N, 56 km, 5.1 kA	R- Earth	1300	DEF operated at Alipurduar. Resistive fault	Yes	NA	
92	220 KV RANCHI- HATIA-3	21-05-2022	13:05	21-05-2022	13:57	Ranchi: B_N, 27.9 km, 5 kA		B- Earth	100	A/r successful from Ranchi only	Yes	Yes	
93	400 KV DHANBAD- RANCHI-1	21-05-2022	13:14	21-05-2022	13:41	Dhanbad: B_N, Zone- 2, 130 km, 2.68 kA	Ranchi: B_N, Zone- 1, 13.5 km, 15.67 kA	B- Earth	100	A/r failed after 1 sec	No	Yes	
94	400 KV DHANBAD- RANCHI-2	21-05-2022	13:14	21-05-2022	13:50	Dhanbad: R_N, Zone- 2, 153.5 km, 1.63 kA	Ranchi: R_N, Zone- 1, 10.3 km, 15.39 kA	R- Earth	100	A/r failed after 1 sec	No	Yes	
95	400 KV NEW RANCHI-NEW PPSP-1	21-05-2022	12:51	21-05-2022	20:08	New Ranchi: Y_B, 0.9 km, Iy-24.27 kA, Ib- 27.3 km	New PPSP: Y_B, Zone-2, 105 km, 1.722 kA	Y-B- Earth	100	Phase-to-phase fault	Yes	Yes	
96	400 KV DURGAPUR- JAMSHEDPU R-1	21-05-2022	14:38	21-05-2022	15:47	Durgapur: R_N, 135.2 km, 2.01 kA	Jamshedpur: R_N, 25.82 km, 3.06 kA	R- Earth	100	A/r successful. Tripped again within reclaim time	Yes	Yes	
97	400 KV MEDINIPUR- NEW CHANDITAL A-2	21-05-2022	15:42	21-05-2022	16:24	Medinipur: B_N, 52 km, 5.034 kA		B- Earth	100	A/r successful. Tripped again within reclaim time	Yes	No	

98	400 KV BIDHANNAGAR-NEW CHANDITAL A-1	21-05-2022	15:49	21-05-2022	16:12	Bidhannagar: B_N, 102.7 km, 3.61 kA		B- Earth	100	A/r successful. Tripped again within reclaim time		No	Yes
99	400 KV JEERAT-NEW CHANDITAL A-1	21-05-2022	16:00	21-05-2022	17:26	Jeerat: B_N, Zone-2, 85.69 km, 4.395 kA	New Chanditala: R_Y, 0.284 km, Ir:29.32 kA, Iy: 19.68 kA	R-Y- Earth	100	Phase-to-phase fault. WBSETCL may explain.		Yes	Yes
100	400 KV RAJARHAT- JEERAT-1	21-05-2022	16:55	21-05-2022	18:03	Rajarhat: Y_N, 0.2 km, 11.4 kA	Jeerat: Y_N, 36.2 km, 6.6 kA	Y- Earth	100	A/r successful. Tripped again within reclaim time		Yes	Yes
101	400 KV RAJARHAT- GOKARNA-1	21-05-2022	17:05	21-05-2022	17:51	Rajarhat: B_N, 3.58 km, 11.06 kA	Gokarna: B_N, 249.7 km, 1.89 kA	B- Earth	100	Initially fault in Y_ph. Another fault struck B_ph after 1 sec		Yes	Yes
102	220 KV BUDHIPADA R-KORBA-1	21-05-2022	17:55	22-05-2022	16:10	Budhipadar: R_N, 1 km, 23.5 kA		R- Earth	100	Three phase tripping for single phase fault		Yes	NA

103	765 KV ANGUL- JHARSUGUD A-1	21-05-2022	17:59	21-05-2022	20:13	Angul: Y-B, 254.3 km, Iy-2.34 kA, Ib-2.31 kA	Jharsuguda: Y-B, 19.5 km, Iy-22.62 kA, Ib-21.7 kA	Y-B- Earth	100	Phase-to-phase fault		Yes	Yes
104	220 KV BUDHIPADA R-RAIGARH-1	21-05-2022	18:27	22-05-2022	16:13	Budhipadar: Y_N, 6.1 km, 12.19 kA		Y- Earth	100	Three phase tripping for single phase fault		Yes	NA
105	400 KV LAPANGA- STERLITE-1	21-05-2022	19:59	21-05-2022	23:00	Lapanga: B_N, Zone- 1, 11.07 km, 4.46 kA		B- Earth	100	A/r failed after 1 second		Yes	No
106	765 KV JHARSUGUD A-RAIPUR (PS)-1	21-05-2022	20:27	22-05-2022	02:16	Jharsuguda: R_N, 57.1 km, 2.4 kA	Raipur: R_N, 233 km, 1.7 kA	R- Earth	600	DEF operated.		Yes	NA
107	765 KV GAYA- VARANASI-2	21-05-2022	22:04	21-05-2022	23:21	Gaya: B_N, 70.9 km, 6.144 kA		B- Earth	100	A/r failed after 1 second		Yes	NA
108	400 KV TSTPP- MERAMUND ALI-2	21-05-2022	22:10	21-05-2022	22:45	TSTPP: R_N, Zone-1, 36.8 km, 9.076 kA	Meramundali: R_N, 15.6 km, 10.28 kA	R- Earth	100	A/r failed after 1 second		Yes	Yes

109	400 KV LAPANGA- STERLITE-1	21-05-2022	23:00	22-05-2022	16:44	Lapanga: B_N, 22.1 kA		B- Earth	100	Tripped on O/c at Lapanga. Zone-4 picked at Lapanga. Sterlite DR not available. OPTCL may explain	Yes	No
110	400 KV TSTPP- MERAMUND ALI-2	21-05-2022	23:05	22-05-2022	05:19	TSTPP: R_N, 8.6 kA	Meramundali: R_N, 8.87 kA	R- Earth	100	A/r successful. Line tripped again within reclaim time	Yes	Yes
111	220 KV DALOTNGAN J-GARHWA-1	22-05-2022	12:59	22-05-2022	16:22	Daltonganj: Y_B, 85.3 km	Garhwa: Y_B, 24.66 km, Iy=Ib=1.48 kA	Y-B	100	Phase-to-phase fault	Yes	Yes
112	220 KV DALTONGAN J-GARHWA-2	22-05-2022	12:59	22-05-2022	14:37	Daltonganj: Didn't trip	Garhwa: Y_B, 46 km	Y-B	100	Phase-to-phase fault	Yes	Yes
113	220 KV DALTONGAN J-CHATRA-1	22-05-2022	13:56	22-05-2022	15:06	Daltonganj: Y-B, 3.7 km, Iy=Ib=5.08 kA		Y-B	100	Phase-to-phase fault	Yes	No
114	220 KV TENUGHAT- BIHARSHARI F-1	22-05-2022	16:41	22-05-2022	17:28	Tenughat: Y_N, 10.17 km, 7.3 kA	Biharsharif: Y_N, 142 km, 1.5 kA	Y- Earth	100	Three phase tripping for single phase fault	Yes	Yes
115	220 KV DALTONGAN J-CHATRA-2	22-05-2022	16:16	22-05-2022	17:37	Daltonganj: Y-B, Iy-1.77 kA, Ib-1.31 kA	Chatra: Y_B, 34.9 km, Iy-1.011 kA, Ib-0.993 kA	Y-B- Earth	100	Phase-to-phase fault	Yes	No

116	400 KV RANCHI- RAGHUNATH PUR-3	22-05-2022	17:18	22-05-2022	18:31	Ranchi: Y_N, Zone-1, 35.8 km, 7.73 kA	Raghunathpur: Y_N, 149.73 km, 2.810 kA	Y- Earth	100	Three phase tripping at Ranchi. A/r successful at Raghunathpur, tripped again within reclaim time	Yes	Yes
117	400 KV RANCHI- DHANBAD-1	22-05-2022	18:33	22-05-2022	18:54	Ranchi: Y_N, 124.5 km, 3.18 kA	Dhanbad: Y_N, Zone-1, 49.2 km, 4.649 kA, A/r successful	Y- Earth	100	A/r successful at Dhanbad. Single phase tripping at Ranchi, however, no A/r attempt taken.	Yes	No
118	765 KV JHARSUGUD A-RAIPUR (PS)-2	22-05-2022	18:36	22-05-2022	23:09	Jharsuguda: Y_B, 33.8 km, Iy-19.07 kA, Ib- 17.52 kA	Raipur: Y_B, 265 km, 5.5 kA	Y-B- Earth	100	Phase-to-phase fault	Yes	No
119	220 KV KARAMNASH A-SAHUPURI- 1	23-05-2022	02:04	23-05-2022	03:05	Karamnasha: Master trip relay operated		No fault	NA	Details maybe shared by BSPTCL	Yes	NA
120	220 KV JODA- RAMCHAND RAPUR-1	23-05-2022	09:48	23-05-2022	10:49	Joda: Y-B, 2.32 km, Iy- 1.304 kA, Ib-0.43 kA	Ramchandrapur: Y- B, 118.5 km, 2 kA	Y-B	450	Phase-to-phase fault	Yes	Yes
121	400 KV RANCHI- RAGHUNATH PUR-2	23-05-2022	19:10	23-05-2022	20:23	Ranchi: B_N, 123.6 km, 3.8 kA	Raghunathpur: B_N, 80.67 km, 3.593 kA	B- Earth	100	A/r successful. Line tripped again within reclaim time	Yes	Yes
122	400 KV RANCHI- SIPAT-1	23-05-2022	21:00	23-05-2022	22:16	Ranchi: R_N, 21.24 km, 9.8 kA, A/r successful		R- Earth	100	A/r successful from Ranchi	Yes	NA

123	220 KV BUDHIPADA R-KORBA-1	23-05-2022	19:31	24-05-2022	00:51	Budhipadar: Pole discrepancy		No fault	NA	OPTCL may explain		Yes	NA
124	765 KV ANGUL- SRIKAKULA M-1	23-05-2022	22:37	23-05-2022	23:37	Angul: Y_N, 3.945 kA, 276.4 km		Y-Earth	100	A/r successful from Angul end only. Three phase tripping occurred at Srikakulam		Yes	NA
125	220 KV TENUGHAT- BIHARSHARI F-1	23-05-2022	22:54	23-05-2022	23:43	Tenughat: Y_N, 9.7 km, 7 kA	Biharsharif: Y_N, 141.8 km, 1.55 kA	Y-Earth	100	Three phase tripping for single phase fault		Yes	Yes
126	400 KV BIHARSHARI F-BALIA-2	24-05-2022	20:16	25-05-2022	22:23	Biharsharif: B_N, 165.9 km, 2.6 kA	Balia: B_N, 72.2 km, 5.8 kA	B-Earth	100	A/r failed after 1 sec		Yes	NA
127	220 KV DALTONGAN J-CHATRA-2	25-05-2022	00:35	25-05-2022	02:15	Daltonganj: B_N, 147 km, 1.028 kA		B-Earth	800	Three phase tripping for single phase fault	DR channels not configured properly	Yes	No
128	400 KV MERAMUND ALI- LAPANGA-2	26-05-2022	08:24	26-05-2022	11:53	Meramundali: Y_N, 18.2 km, 8.24 kA	Lapanga: Y_N, 150 km, 2.563 kA	Y-Earth	100	A/r failed after 1 sec		Yes	Yes

129	400 KV JAMSHEDPUR-ADHUNIK-1	26-05-2022	09:55	26-05-2022	19:27	Jamshedpur: DEF operated		R-Earth	600	R_ph current became zero at Jamshedpur first. Other two phases tripped after 14 seconds. Details maybe shared by PG/APNRL		Yes	No
130	220 KV DALTONGANJ-CHATRA-2	26-05-2022	14:06	26-05-2022	16:45	Daltonganj: B_N, Zone 3, 200.4 km, .8 kA	Chatra: Didn't trip	B-Earth	800	Three phase tripping.		Yes	No
131	220 KV KARAMNASHA-SAHUPURI-1	26-05-2022	16:34	26-05-2022	17:44	Master trip relay operated		R-Y-Earth	500	Zone-3 picked up at Karmnasha. Details maybe shared by BSPTCL		Yes	NA
132	400 KV RANGPO-TEESTA 5 - 2	26-05-2022	19:56	26-05-2022	20:10	Rangpo: Didn't trip		No fault	NA	Tripped from Teesta-5 end only. Details maybe shared by Teesta-5		NA	No
133	220 KV SASARAM-NADOKHAR-1	27-05-2022	14:14	27-05-2022	15:02		Tripped during changeover of power to Bus-2 from Bus-1 at Nadokhar	No fault	NA	Details maybe shared by BSPTCL		Yes	No
134	220 KV TSTPP-TTPS-1	27-05-2022	20:16	27-05-2022	21:35	TSTPP: R_N, 5.80 km, 11.68 kA	TTPS: R_N, 42.23 km, 5.5 kA	R-Earth	100	Three phase tripping for single phase fault		No	No

135	400 KV NAUBATPUR- BALIA-1	28-05-2022	01:14	28-05-2022	09:57		Balia: Y_N, 17.31 kA, 14 km	Y-Earth	100	As per PMU, A/r successful. Tripped again within reclaim time.	No	NA	
136	400/220 KV ICT-2 T NAUBATPUR	28-05-2022	01:14	28-05-2022	07:53		Differential protection operated			Details maybe shared by BGCL	No	NA	
137	400 KV NAUBATPUR- BALIA-2	28-05-2022	03:23	28-05-2022	05:01		Naubatpur: Y_B	Y-B-Earth	100	As per PMU, phase-to-phase fault occurred	No	NA	
138	220 KV NEW PURNEA- KHAGARIA-2	28-05-2022	12:42	28-05-2022	13:13		New Purnea: Y_B, 58.3 km, Iy-3.42 kA, Ib-3.40 kA Khagaria: Y_B, Iy=Ib=3.5 kA	Y-B-Earth	100	Phase-to-phase fault	Yes	Yes	
139	400 KV RENGALI- INDRAVATI-1	28-05-2022	17:58	28-05-2022	21:05		PRV operated due to DC earth fault at sudden pressure switch of NGR	No fault	NA	DT sent from Indravati. Details maybe shared by PG	Yes	Yes	
140	220 KV BUDHIPADA R-KORBA-1	29-05-2022	12:21	29-05-2022	14:17		Budhipadar: B_N, 43.7 km, 2.8 kA	B-Earth	300	Tripped in Zone-2 time. Highly resistive fault	Yes	No	
141	400 KV MEDINIPUR- KHARAGPUR- 1	29-05-2022	13:24	30-05-2022	14:22		Medinipur: Y-B, 103.4 km, Iy-4.33 kA, Ib-4.41 kA Kharagpur: Y_B, 5.09 km, Iy-18.38 kA, Ib-17.26 kA	Y-B-Earth	100	Phase-to-phase fault	No	Yes	
142	220 KV BUDHIPADA R-KORBA-1	29-05-2022	14:34	29-05-2022	20:27		Budhipadar: B_N, 37.7 km, 2.58 kA Korba: B_N, Zone-2, 1.041 kA	B-Earth	100	Three phase tripping for single phase fault	Yes	NA	

SI No.	Name of the incidence	PCC Recommendation	Latest status
114th PCC Meeting			
1.	Disturbance at 220 kV Ramgarh (DVC) S/s on 09/04/2022 at 12:31 Hrs	PCC advised DVC to explore the possibility of reducing the bus coupler overcurrent setting so as to enable it to isolate the bus fault in case of the failure of busbar protection. Initially the setting may be reduced and coordinated for relays at substations where busbar is out of service or the busbar relay is of electro-mechanical type	
2.	Total Power Failure at 220 kV Garhwa S/S on 05/04/2022 at 12:19 Hrs	Both Powergrid & JUSNL were advised to reverify whether the fault was present in the circuit-2. PCC opined that SOTF shall be enabled for zone-1 operation too to avoid single phase tripping during fault in reclaim time.	
3.	Total Power Failure at 400 kV Teesta V S/s on 23/04/2022 at 12:37 Hrs	PCC advised Powergrid to test the healthiness of PLCC of the line in coordination with NHPC.	
4.	Repeated tripping of 220 kV Tenughat-Biharsharif line	PCC advised BSPTCL to share the observation of OEM with TVNL immediately and coordinate with TVNL in order to implement PLCC at respective ends.	
5.	Information regarding auto-synchronization settings	Powergrid ER-II representative informed that they would share their practice and auto-synchronization settings to ERPC and ERLDC. PCC opined that ERLDC may send a separate communication with a format for required details with concerned utilities and advised all the utilities to share the requisite information to ERLDC.	
113th PCC Meeting			

6.	Disturbance at 220/132 kV CTPS A (DVC) S/s on 18.03.2022 at 20:05 Hrs	<p>PCC advised DVC to check power swing block settings for 220 kV CTPS B - BTPS B D/c line at BTPS end. The DR at BTPS end may also be checked.</p> <p>PCC advised DVC to recheck the settings of pole slip protection in the CTPS units. In case the settings are in order, then study may be carried out to find out the critical clearing time for the units for a 3-phase fault at CTPS bus.</p>	
7.	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.	JUSNL representative informed that A/R testing was not done due to PLCC issue at Tenughat end . He added that during inspection, card issue was found in PLCC at Tenughat end for which replacement work is in progress.The work will be completed within one month.
8.	Total Power failure at 220 kV Garhwa(JUSNL) S/s on 30.03.2022 at 18:22 Hrs	<p>PCC advised JUSNL to review the ICT overcurrent setting in coordination with Powergrid. The zone-3 timer setting at Daltonganj end may be increased to 1000msec and TMS of overcurrent relay for 220/132 kV ICT at Garwah may be reduced accordingly by JUSNL.</p> <p>114th PCC advised Powergrid & JUSNL to review the settings at respective end in line with the decision of 113th PCC meeting.</p>	
111th PCC Meeting			
9.	DEF protection setting review in Sikkim complex in view of LILO of 400 kV Teesta 3-Kishanganj at Rangpo	In 111 th PCC, PCC decided that M/s PRDC would carry out the study for DEF relay setting coordination for Sikkim Complex with revised configuration of transmission network. PRDC was advised to coordinate with ERLDC for	

		necessary information related to the study. In 114 th PCC, PRDC was advised to complete the study at the earliest.	
106th PCC Meeting			
10.	Total Power Failure at Dumka S/s on 15/05/2021 at 12:01 Hrs	JUSNL intimated that there was card issue in PLCC panel. The OEM (M/s ABB) had been communicated regarding the issue and the same would be resolved by September' 21.	JUSNL representative informed that a fresh proposal would be initiated for the said work.
11.	Grid event at 132 kV Motihari (DMTCL) S/S on 21-04-2021 at 20:19 hrs	In 109 th PCC Meeting, PMTL representative informed that they are in process of placing the work order with TBEA authorized partners. The quotation has been received and work order would be placed by end of December 2021. In 114 th PCC, PMTL representative informed that material had been received at site and the work could be completed within May 22.	

Annexure C.6

SL NO	UTILITY	ELEMENT	DETAILS OF ELEMENT
1	PMTL	ICT	400/220kV 500MVA ICT-1 AT SAHARSA
2	PGCIL	ICT	400/220kV 315MVA ICT-4 AT JEYPORE
3	PMTL	T/L	400 kV-SAHARSA KISHANGANJ-1 (LILO OF 400 kV Patna-Kishanganj-1 at Saharsa)
4	PMTL	T/L	400kV-PATNA SAHARSA-1 (LILO OF 400 kV Patna Kishanganj-1 at Saharsa)
5	PMTL	ICT	220kV MAIN BAY OF 400KV/220KV 500 MVA ICT 1 AT SAHARSA
6	PMTL	T/L	220kV MAIN BAY OF KHAGARIA-1 AT SAHARSA
7	PMTL	T/L	220kV MAIN BAY OF KHAGARIA-2 AT SAHARSA
8	PMTL	T/L	220KV MAIN BAY OF BEGUSARAI-1 AT SAHARSA
9	PMTL	T/L	220KV MAIN BAY OF BEGUSARAI-2 AT SAHARSA
10	PMTL	T/L	132KV MAIN BAY OF SONEBARSA (BH) -1 AT SAHARSA
11	PMTL	T/L	132KV MAIN BAY OF MADHEPURA (BH) -1 AT SAHARSA
12	BSPTCL	T/L	220KV-BEGUSARAI KHAGARIA-1
13	BSPTCL	T/L	220KV-KHAGARIA NEW PURNEA
14	BSPTCL	T/L	132KV MADHEPURA (BH)- SAHARSA(PMTL)-1
15	BSPTCL	T/L	132KV SONEBARSA (BH)- SAHARSA(PMTL)-1
16	NKTL	T/L	220KV MAIN BAY OF GOVINDPUR -1 AT DHANBAD (NKTL)
17	NKTL	T/L	220KV MAIN BAY OF GOVINDPUR -2 AT DHANBAD (NKTL)
18	NKTL	T/L	220KV MAIN BAY OF JAINAMORE -2 AT DHANBAD (NKTL)
19	NKTL	T/L	220KV MAIN BAY OF JAINAMORE -1 AT DHANBAD (NKTL)
20	PGCIL	T/L	400KV DURGAPUR KAHALGAON 2
21	PGCIL	T/L	400KV DURGAPUR KAHALGAON 1
22	PMTL	T/L	400KV MAIN BAY OF PATNA -1 AT SAHARSA
23	TVNL	ICT	400KV MAIN BAY OF 400KV/220KV 250 MVA ICT 1 AT TENUGHAT
24	JUSNL	ICT	220KV MAIN BAY OF 400KV/220KV 250 MVA ICT 1 AT TENUGHAT
25	JUSNL	T/L	400KV TIE BAY OF NEW RANCHI -2 AND FUTURE AT PATRATU
26	JUSNL	T/L	400KV MAIN BUS - 1 AT PATRATU
27	JUSNL	ICT	400kv MAIN BAY OF 400/220KV 315MVA ICT-2 AT PATRATU
28	JUSNL	ICT	220kv MAIN BAY OF 400/220KV 315MVA ICT-2 AT PATRATU
29	JUSNL	T/L	400KV-NEW RANCHI- PATRATU-1
30	JUSNL	T/L	400KV-NEW RANCHI- PATRATU-2
31	JUSNL	T/L	400KV MAIN BUS-2 AT PATRATU
32	JUSNL	T/L	400KV MAIN BAY OF NEW RANCHI -2 AT PATRATU
33	PGCIL	T/L	LILO of 400 kV Teesta III Kishanganj S/C at Rangpo SS (400KV-RANGPO-TEESTA- III 1)
34	OPTCL	B/R	125MVAR 400KV B/R-1 AT MEERAMUNDALI
35	JUSNL	T/L	400KV TIE BAY OF NEW RANCHI -1 AND FUTURE AT PATRATU
36	NKTL	ICT	400KV MAIN BAY OF 400KV/220KV 500 MVA ICT 2 AT MERAMUNDALI B
37	OPTCL	T/L	400KV MAIN BUS - 1 AT MERAMUNDALI B

SL NO	UTILITY	ELEMENT	DETAILS OF ELEMENT
38	PGCIL	ICT	400/220KV 500MVA ICT-2 AT MERAMUNDALI B
39	BSPTCL	T/L	LILO of 220 KV PUSAULI SAHUPURI-I AT KARAMNASHA(NEW) (220KV KARAMNASHA (NEW)- SAHUPURI-1)
40	BSPTCL	T/L	LILO of 220 KV PUSAULI SAHUPURI-I AT KARAMNASHA(NEW) (220KV KARAMNASHA (NEW)- PUSAULI-1)
41	BSPTCL	T/L	'LILO of 220 KV Gaya Chandauti D/C LILO at Bodhgaya(220KV-CHANDAUTI (PMTL)-BODHGAYA-1)
42	BSPTCL	T/L	'LILO of 220 KV Gaya Chandauti D/C LILO at Bodhgaya(220KV-CHANDAUTI (PMTL)-BODHGAYA-2)
43	PGCIL	ICT	400KV MAIN BAY OF 400KV/220KV 315 MVA ICT 3 AT BINAGURI
44	PGCIL	ICT	220KV MAIN BAY OF 400KV/220KV 315 MVA ICT 3 AT BINAGURI
45	PGCIL	ICT	220KV MAIN BAY OF 400KV/220KV 500MVA ICT5 AT MALDA (PG)
46	PGCIL	ICT	400KV MAIN BAY OF 400KV/220KV 500MVA ICT5 AT MALDA (PG)
47	PGCIL	ICT	220KV MAIN BAY OF 220KV/132KV 100MVA ICT4 AT RANGPO
48	PGCIL	ICT	132KV MAIN BAY OF 220KV/132KV 100MVA ICT4 AT RANGPO
49	PGCIL	T/L	LILO OF 400 KV TEESTA III-KISHANGANJ S/C AT RANGPO SS(400KV KISHANGANJ(PG)-RANGPO-2)
50	JUSNL	ICT	400KV MAIN BAY OF 400KV/220KV 315MVA ICT1 AT PATRATU
51	BSPTCL	T/L	LILO of 132 KV RAFIGUNJ CHANDAUTI(BH)-I AT CHANDAUTI(PMTL) (132KV-CHANDAUTI (PMTL)- CHANDAUTI (BH)-2)
52	BSPTCL	T/L	LILO of 132 KV RAFIGUNJ CHANDAUTI(BH)-I AT CHANDAUTI(PMTL) (132KV-CHANDAUTI (PMTL)-RAFIGANJ (BH)-1)
53	BSPTCL	T/L	LILO of 132 KV SONENAGAR CHANDAUTI(BH)-I AT CHANDAUTI(PMTL) (132KV-CHANDAUTI (PMTL)-CHANDAUTI (BH)-1)
54	OPTCL	T/L	220KV-BOLANGIR (PG)- KESINGA-1
55	BGCL	T/L	LILO of 400 KV PATNA BALIA-3 AT NAUBATPUR(BGCL) (400KV NAUBATPUR(BH)- BALIA-1)
56	BGCL	T/L	LILO of 400 KV PATNA BALIA-3 AT NAUBATPUR(BGCL) (400KV-PATNA NAUBATPUR(BH)-1)
57	BGCL	T/L	LILO of 400 KV PATNA BALIA-4 AT NAUBATPUR(BGCL) (400KV NAUBATPUR(BH)- BALIA-2)
58	BGCL	T/L	LILO of 400 KV PATNA BALIA-4 AT NAUBATPUR(BGCL) (400KV-PATNA NAUBATPUR(BH)-2)
59	PGCIL	ICT	220KV MAIN BAY OF 400KV/220KV 315 MVA ICT 1 AT PATRATU
60	BGCL	T/L	400KV MAIN BAY OF PATNA -1 AT NAUBATPUR(BH)
61	BGCL	T/L	00KV MAIN BAY OF PATNA -2 AT NAUBATPUR(BH)
62	BGCL	T/L	400KV MAIN BAY OF BALIA-1 AT NAUBATPUR(BH)
63	BGCL	T/L	400KV TIE BAY OF BALIA-1 AND PATNA-2 AT NAUBATPUR(BH)
64	BGCL	T/L	400KV MAIN BAY OF BALIA-2 AT NAUBATPUR(BH)
65	BGCL	ICT	400KV MAIN BAY OF 500 MVA ICT-2 AT NAUBATPUR(BH)
66	BGCL	ICT	400KV TIE BAY OF BALIA -2 AND 500 MVA ICT-2 AT NAUBATPUR(BH)
67	OPTCL	ICT	220KV MAIN BAY OF 400KV/220KV 500 MVA ICT 1 AT MERAMUNDALI B
68	OPTCL	ICT	400KV MAIN BAY OF 400KV/220KV 500 MVA ICT 1 AT MERAMUNDALI B
69	BGCL	T/L	400KV MAIN BUS - 2 AT NAUBATPUR(BH)
70	BGCL	T/L	400KV MAIN BUS - 1 AT NAUBATPUR(BH)
71	JUSNL	ICT	400KV MAIN BAY OF 400KV/220KV 315 MVA ICT 1 AT PATRATU
72	SIKKIM	T/L	220KV-NEW MELLI-TASHIDING-2
73	BSPTCL	T/L	220KV SAHARSA(PMTL)- KHAGARIA(NEW)-1
74	PGCIL	ICT	400KV MAIN BAY OF 400KV/220KV 315 MVA ICT 2 AT FARAKKA(NTPC)

SL NO	UTILITY	ELEMENT	DETAILS OF ELEMENT
75	PGCIL	ICT	200KV MAIN BAY OF 400KV/220KV 315 MVA ICT 2 AT FARAKKA(NTPC)
76	PGCIL	ICT	400KV MAIN BAY OF 400KV/220KV500 MVA ICT 4 AT MUZAFFARPUR
77	PGCIL	ICT	200KV MAIN BAY OF 400KV/220KV500 MVA ICT 4 AT MUZAFFARPUR
78	BGCL	ICT	400KV MAIN BAY OF 400KV/220KV500 MVA ICT 1 AT JAKKANPUR
79	BSPTCL	T/L	220KV-SAHARSA(PMTL)-KHAGARIA(NEW)-2
80	BGCL	T/L	220KV-ARRAH (PG)-NAUBATPUR(BH)-2
81	PGCIL	T/L	LILO of 400 KV PATNA- NABINAGAR(NPGC)-1 AT JAKKANPUR(BGCL)400KV-JAKKANPUR(BH)-PATNA-1)
83	PGCIL	T/L	LILO of 400 KV PATNA- NABINAGAR(NPGC)-2 AT JAKKANPUR(BGCL) (400KV-JAKKANPUR(BH)-PATNA-2)
85	PGCIL	T/L	LILO of 400 KV KISHANGANJ- DARBHANGA(DMTCL)-1 AT SAHARSA(PMTL) (400KV-SAHARSA-DARBHANGA (DMTCL)-1)
86	PGCIL	T/L	LILO of 400 KV KISHANGANJ-DARBHANGA(DMTCL)-1 AT SAHARSA (PMTL) 400KV-SAHARSA-KISHANGANJ-3)
87	PGCIL	T/L	LILO of 400 KV KISHANGANJ-DARBHANGA (DMTCL) -1 AT SAHARSA (PMTL) (400KV-SAHARSA-DARBHANGA (DMTCL) -1)
88	PGCIL	T/L	LILO of 400 KV KISHANGANJ-DARBHANGA (DMTCL) -2AT SAHARSA (PMTL) (400KV-SAHARSA-DARBHANGA (DMTCL) -2)
89	PGCIL	T/L	220KV-RANGPO-NEW MELLI-2

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

				<p>3.Main-1 relay of following feeders 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.</p>
				<p>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.</p>
				<p>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.</p>
				<p>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.</p>
				<p>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.</p>
				<p>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.</p>
				<p>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. Similarly zone-4 settings of feeders corresponding to the bus for which busbar is out of service may be reduced to 250 msec.</p>
				<p>9. Oil leakages was observed in 220/132 kV Auto-I. Action may be taken to address the same.</p>
				<p>10.Vegetation shall be cleared & proper PCC and gravelling should be done in the switchyard.</p>
				<p>General:</p>
				<p>1. Uniform protection philosophy may be adopted across OPTCL network</p>
				<p>2. Protection co-ordination to be done as and when there is change in network configuration or commissioning of new lines</p>
				<p>3. O/V voltage/time gradation to be done for S/s level</p>
				<p>4. Periodic internal review of implemented protection settings</p>
4	220 kV IB TPS	OPGC	27.04.2022	<p>1. Event logger is not available for 220 kV system. The same shall be provided.</p>
				<p>2. Zone-2 timer setting may be reviewed considering the shortest line at remote end(budhipadar) for all 220 kV lines</p>

				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 verified 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.