



Agenda  
for  
**134<sup>th</sup> PCC Meeting**

**Date: 16.04.2024**  
**Eastern Regional Power Committee**  
**14, Golf Club Road, Tollygunge**  
**Kolkata: 700 033**

# EASTERN REGIONAL POWER COMMITTEE

## **AGENDA FOR 134<sup>th</sup> PROTECTION COORDINATION SUB-COMMITTEE MEETING to BE HELD ON 16<sup>TH</sup> APRIL 2024 AT 11:00 HRS AT ERPC, KOLKATA**

### **PART – A**

#### **ITEM NO. A.1: Confirmation of Minutes of 133<sup>rd</sup> Protection Coordination sub-Committee Meeting held on 12<sup>th</sup> March 2024 through MS Teams.**

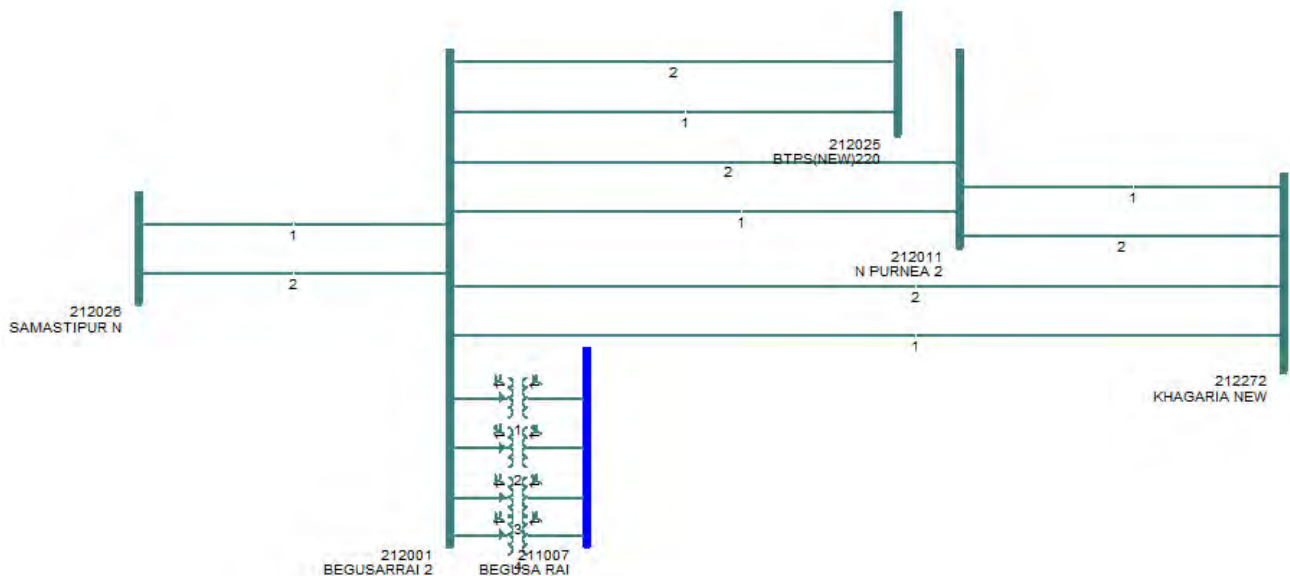
The minutes of 133<sup>rd</sup> Protection Coordination sub-Committee meeting held on 12.03.2024 was circulated vide letter dated 28.03.2024.

**Members may confirm the Minutes of the Meeting.**

### **PART – B**

#### **ITEM NO. B.1: Total Power Failure at 220 kV Begusarai(BSPTCL) S/s on 05.03.2024 at 11:56 Hrs**

At 11:56 hrs, a fault(Y-B-N) occurred in 220 kV Begusarai-IOCL-1, which was kept idle charged from Begusarai end. The distance protection operated at Begusarai end but the breaker didn't open. Since LBB and bus bar protection is not available for 220 kV Begusarai S/s, other feeders got tripped from remote ends resulting in total power failure at Begusarai S/s.



Disturbance Report from ERLDC is attached at **Annexure B.1**.

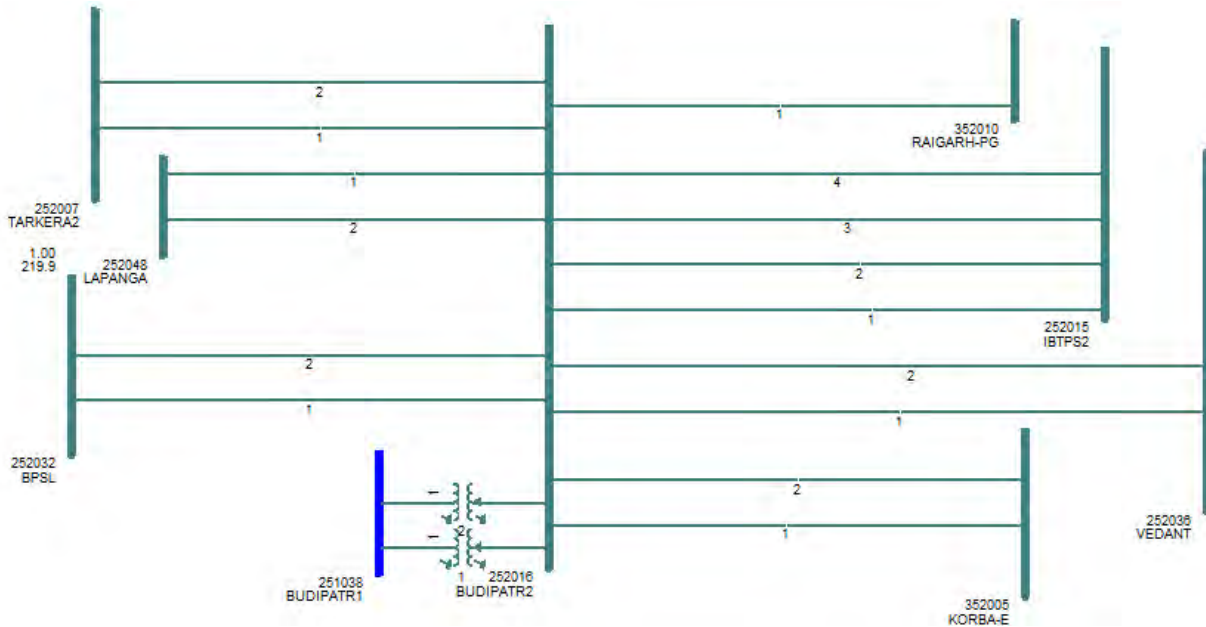
**Load Loss: 100 MW**

**Outage Duration: 00:29 Hrs**

**BSPTCL may explain.**

**ITEM NO. B.2: Disturbance at 220 kV Budhipadar (OPTCL) S/s on 09.03.2024 at 14:07 Hrs**

On 9th March 2024, at 13:45 Hrs, 220 kV Budhipadar-Lapanga-2 got tripped due to B phase-Earth fault. Subsequently at 14:00 hrs, Budhipadar-Lapanga-1 was hand tripped as the loading of the line had reached 350 MW. Thus, entire Budhipadar complex generation with IBTPS and Vedanta, SMC, Bhushan Steel, AAL, Concast CPPs had started evacuating through remaining interconnection with grid through 220 kV Budhipadar-Raigarh and 220 kV Budhipadar-Korba D/C line, which got tripped further one by one due to high loading and subsequently at 14:07 Hrs, this complex was isolated from the grid and formed an island which didn't survive due to large load generation imbalance.



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

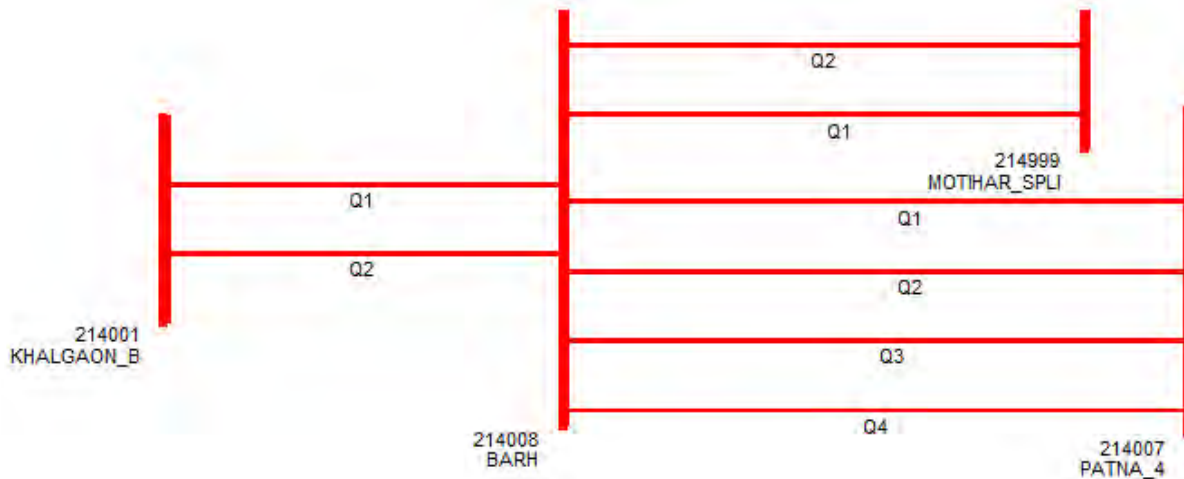
**Load Loss: 100 MW, Gen. Loss: 620 MW**  
**Outage Duration: 00:45 Hrs**

**OPTCL & SLDC Odisha may explain.**

**ITEM NO. B.3: Disturbance at 400 kV Barh (NTPC) S/s on 31.03.2024 at 07:29 Hrs**

As per the information received, B phase CT of main bay of Barh-Patna-2 got burst at Barh end and at that time 400 kV Bus-3 & Bus-4 and all associated elements tripped including Unit 4 & Unit 5 (660 MW each).

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



**Gen. Loss: 1251 MW**  
**Outage Duration: 02:19 Hrs**

**NTPC Barh may explain the event in detail.**

**ITEM NO. B.4: Multiple disturbances at 220 kV Garhwa (JUSNL)S/s**

- **On 30.03.2024 at 22:27 Hrs**

On 30.03.2024, at 22:27 hrs , 220 kV Daltongunj - Garhwa (New) D/C tripped due to single Phase to ground fault leading to total power failure at 220 kV Garhwa S/s.

Disturbance Report is attached at **Annexure B.4.1.**

**Load Loss: 80 MW**  
**Outage Duration: 01:08 Hrs**

- **Disturbance at 220 kV Garhwa (JUSNL)S/s on 31.03.2024 at 07:29 Hrs**

220 kV Daltonganj-Garhwa (New)-2 was already under breakdown prior to the event. 220 kV Daltonganj-Garhwa(New)-1 got tripped due to B phase fault which led to total power failure at 220 kV Garhwa(New) S/s.

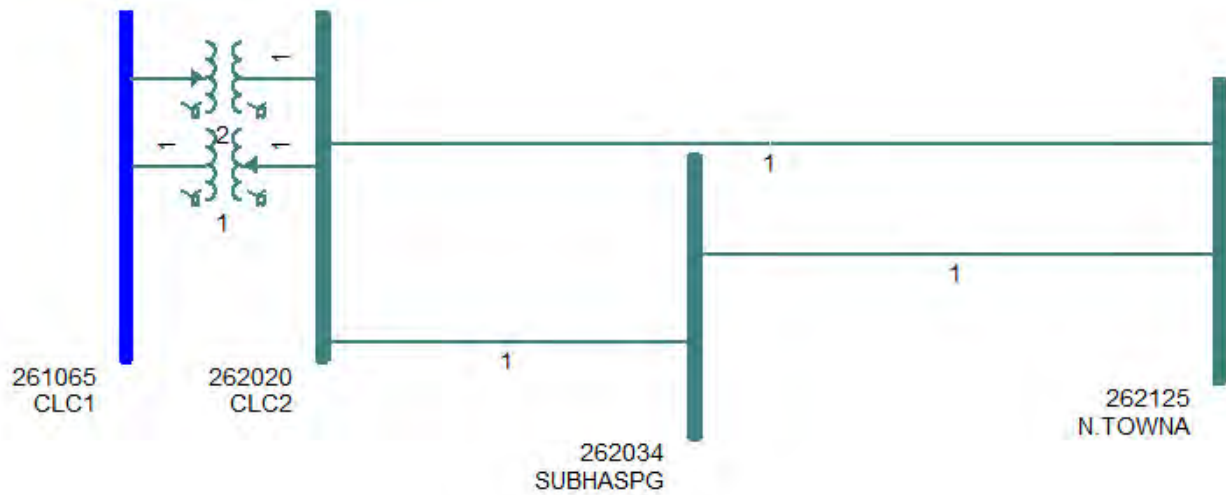
Disturbance report is attached at **Annexure B.4.2.**

**Load Loss: 30 MW**  
**Outage Duration: 00:07 Hrs**

**JUSNL may explain.**

**ITEM NO. B.5: Total Power Failure at 220 kV Bantala S/s on 31.03.2024 at 21:49 Hrs**

Y Phase CT of 220 kV New Town AA3- Bantala line got burst at Bantala end leading to tripping of the said line. At the same time 220 kV Subhasgram- Bantala also got tripped from Subhasgram end with Y phase fault leading to total power failure at 220 kV Bantala S/s.



Detailed report from ERLDC is attached at **Annexure B.5.**

**Load Loss: 78 MW**

**Outage Duration: 00:11 Hrs**

**WBSETCL & Powergrid may explain.**

**ITEM NO. B.6: Bus tripping occurred in Eastern Region during March'24**

Element Name	Tripping Date	Reason	Utility
220 kV Bus-2 at Laukahi	17.03.24 at 18:30 Hrs	Bus bar protection operated	BSPTCL

**BSPTCL may explain.**

**ITEM NO. B.7: Single Line Tripping Incidences in month of March 2024**

Single line tripping incidents in the month of March 2024 which needs explanation from constituents of either end is attached at **Annexure B.7.**

**Members may discuss.**

## **PART- C: OTHER ITEMS**

### **ITEM NO. C.1: Protection Philosophy of Eastern Region**

In 129<sup>th</sup> PCC Meeting, ERPC Secretariat pointed out the relevant clauses of IEGC 2023 regarding Protection code which will be in force w.e.f. 01.10.2023. He intimated that the existing protection philosophy of ER is not comprehensive and have not been reviewed since long. In compliance to the IEGC regulation and to form a comprehensive protection philosophy, it was suggested to form a committee of protection experts from state transmission utilities, Powergrid, NTPC/NHPC, IPPs as well as representative from SLDCs, ERLDC & ERPC secretariat to review the existing protection philosophy of ERPC and suggest necessary changes to be incorporated in the philosophy.

PCC agreed for the formation of committee as mentioned above and requested concerned utilities to nominate member from their respective organization.

Subsequently ERPC Secretariat vide email dated 26<sup>th</sup> Feb 2024 had shared draft protection philosophy to committee members which is attached at **Annexure C.1**. However, no comments have been received till date.

**Members may discuss.**

### **ITEM NO. C.2: Furnishing and approval of protection settings by ERPC**

As per clause 14(2) of IEGC 2023,

All users connected to grid shall:

- Furnish the protection settings implemented for each element to respective RPC in a format as prescribed by concerned RPC
- Obtain approval of concerned RPC for (i) any revision in settings, and (ii) implementation of new protection system
- Intimate to concerned RPC about the changes implemented in protection system or protection settings within a fortnight of such changes.

To comply the above it is proposed that

- Utilities may intimate nodal officer responsible for furnishing the protection settings implemented for each element to ERPC secretariat. Utilities may nominate more than one officers, if required.
- Utilities may send their proposal of revision in protection settings as well as new settings two weeks advance to ERPC secretariat for approval.
- Utilities may send intimation to ERPC secretariat after implementation of approved settings within a fortnight.

**Members may discuss.**

### **ITEM NO. C.3: Submission of protection performance indices on monthly basis by users to RPC and RLDC for 220 kV and above lines**

In 131<sup>st</sup> PCC meeting, all utilities were advised to submit mentioned protection preformation indices of 220 kV and above system (132 kV and above for Sikkim) to ERPC/ERLDC every month in compliance to the Grid Code.

In 133<sup>rd</sup> PCC Meeting, The Protection indices in respect of Powergrid Odisha, NKSTPP, JUSNL has been received.

DVC representative informed that SLDC DVC must be communicated to get these data.

PCC suggested that intra-state entities including state transmission utilities may submit protection performance incidences to SLDCs and further SLDC is advised to coordinate all concerned transmission and generating utilities in their control area for getting data and further submission to ERPC/ERLDC.

As representatives of SLDCs (except SLDC Odisha) are not present in the meeting, PCC decided to refer the issue to OCC meeting for discussion and compliance.

For the month of March'24, only NTPC NKSTPP and West Bengal had submitted the same, which are attached as **Annexure C.3**.

**Other Utilities are requested to submit the details every month for necessary compliance.**

#### **ITEM NO. C.4: Internal Protection Audit Plan of Sub stations for the Year 2024-25**

The Clause (5) of Regulation 15 of IEGC Regulations, 2023 envisages as below:

Quote

*(1) All users shall conduct internal audit of their protection systems annually, and any shortcomings identified shall be rectified and informed to their respective RPC. The audit report along with action plan for rectification of deficiencies detected, if any, shall be shared with respective RPC for users connected at 220 kV and above (132 kV and above in NER). .....*

*(5) Annual audit plan for the next financial year shall be submitted by the users to their respective RPC by 31st October. The users shall adhere to the annual audit plan and report compliance of the same to their respective RPC."*

Unquote

All utilities are requested to submit the annual audit plan for the substations 220kV and above voltage level for FY 2024-25 to ERPC by 31.10.2023. Annual audit plans for internal audit of their protection systems and third-party protection audit shall be furnished separately.

In 131<sup>st</sup> PCC Meeting, PCC advised all utilities to submit annual audit plan for the substations 220kV and above voltage level for FY 2024-25 to ERPC at earliest.

The audit plan was received from NHPC & JUSNL.

*In 133<sup>rd</sup> PCC Meeting, It was informed that audit plan had been received from WBSETCL, NHPC and JUSNL.*

*OPTCL representative informed that detailed protection audit plan will be submitted soon. BSPTCL representative informed that during winter maintenance activities, protection audit of substations was done however it had not been done as per prescribed format. He further informed that detailed protection audit plan will be submitted soon.*

*PCC advised Powergrid, NTPC, DVC and IPPs to share their protection audit plan at the earliest.*

**Concerned Utilities are requested to submit the audit plan at the earliest.**

#### **ITEM NO. C.5: O/C Setting in 132 kV & 220 kV lines after reconductoring. --ERLDC**

Reconductoring had been done in many 132 kV & 220 kV feeders in Eastern region. For 220 kV feeders wherever Main-1 & Main-2 protection is available, O/c setting needs to be disabled. For 132 kV feeders, O/c setting may be revised as per increased capacity of lines.

**Members may note.**

**ITEM NO. C.6: Maintaining adequate relay spares**

It has been observed that at some places adequate number of relay spares are not available which compromises with the reliability of protection schemes as many features will be lost in case of any faulty relay.

**Members may discuss.**

**ITEM NO. C.7: Disturbance at Kahalgaon S/s on 30.01.2024**

The disturbance occurred at NTPC Kahalgan on 30.01.2024 was discussed in 132<sup>nd</sup> PCC meeting and NTPC Kahalgaon was advised following:

- I. To submit action taken report on the observations made by the technical committee in its disturbance analysis report as well as for discrepancies discussed in this meeting. The report shall include compliance for all the observations/discrepancies as discussed along with the timeline.
- II. To submit last test report of failed circuit breakers and data regarding last successful operation of the breaker.
- III. To submit data of relay functionality test last carried out for the relays where discrepancies were observed during this disturbance, and the periodicity of testing of the relays followed at site
- IV. To carry out the testing of 400 kV busbar protection at the earliest
- V. To carry out periodical protection audit of all substations as per the IEGC 2023 and compliance of the audit observations in time bound manner.
- VI. To make the event logger of the station functional at the earliest
- VII.** To ensure time synchronization of all the relays with GPS clock and configuration DR with proper DR time length. After completion of the task, sample DR for all the relays shall be submitted for verification.

*In 133<sup>rd</sup> PCC Meeting, NTPC representative updated that the site visit at Kahalgaon is going on and the report will be submitted after completion of the site visit.*

**NTPC Kahalgaon may update.**

**ITEM NO. C.8: Follow-up of Decisions of the Previous Protection Sub-Committee Meeting(s)**

The decisions of previous PCC meetings are attached at **Annexure C.8.**

**Members may update the latest status.**

\*\*\*\*\*





**ग्रिड-इंडिया**  
GRID-INDIA

**ग्रिड कंट्रोलर ऑफ इंडिया लिमिटेड**  
(भारत सरकार का उद्यम)  
**GRID CONTROLLER OF INDIA LIMITED**  
(A Government of India Enterprise)  
[formerly Power System Operation Corporation Limited (POSOCO)]




**पूर्वी क्षेत्रीय भार प्रेषण केन्द्र / Eastern Regional Load Despatch Centre**

कार्यालय : 14, गोल्फ क्लब रोड, टॉलीगंज, कोलकाता - 700033  
Office : 14, Golf Club Road, Tollygunge, Kolkata - 700033  
CIN : U40105DL2009GOI188682, Website : www.erldc.in, E-mail : erldcinfo@grid-india.in, Tel.: 033 23890060/0061

**पूर्वी क्षेत्र के 220/132 केवी बेगूसराय उप-केन्द्र में ग्रिड घटना पर विस्तृत रिपोर्ट / Detailed Report of grid event at 220/132 kV Begusarai S/s of Eastern Region**

**(To be submitted by RLDC/NLDC during Grid Disturbances/Grid Incidents/Near Miss Event as per IEGC section 37.2 (f))**

**(आई ई जी सी 37.2 (एफ) के अनुपालन में)**

**Date(दिनांक):22-03-2024**

**1. Event Summary (घटना का सारांश):**

At 11:56 Hrs on 05.03.2024, Y\_B\_N fault occurred in 220 kV Begusarai-IOCL-1, which was kept idle charged from Begusarai end. Distance protection operated at Begusarai bu the breaker didn't open. Since LBB and bus bar protection is not available at Begusarai, other feeders tripped in Zone-3 from remote ends and total power failure occurred at Begusarai S/s. Around 100 MW load loss reported at Begusarai.

**2. Time and Date of the Event (घटना का समय और दिनांक): 11:56 hrs of 05.03.2024**

**3. Event Category (ग्रिड घटना का प्रकार): Grid Disturbance (GD)-1**

**4. Location/Control Area (स्थान/नियंत्रण क्षेत्र): Bihar**

**5. Report submitted by Utility on: 20.03.2024**

**6. Antecedent Conditions (पूर्ववर्ती स्थिति):**

	Frequency	Regional Generation	Regional Demand	State Generation	State Demand
				Bihar	Bihar
Pre-Event (घटना पूर्व)	50.03 Hz	25304 MW	19707 MW	347 MW	3032 MW
Post Event (घटना के बाद)	50.03 Hz	25304 MW	19607 MW	347 MW	2932 MW

*\*Pre and post data of 1 minute before and after the event*

Important Transmission Line/Unit if under outage (महत्वपूर्ण संचरण लाइने/ विधुत उत्पादन इकाइयां जो बंद है)	Nil
Weather Condition (मौसम स्थिति)	Rainy weather

**7. Load and Generation loss (लोड और जेनरेशन हानि): Generation loss: NIL; Load loss: 100 MW.**

8. Duration of interruption (रूकावट की अवधि): 00:29 Hrs

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

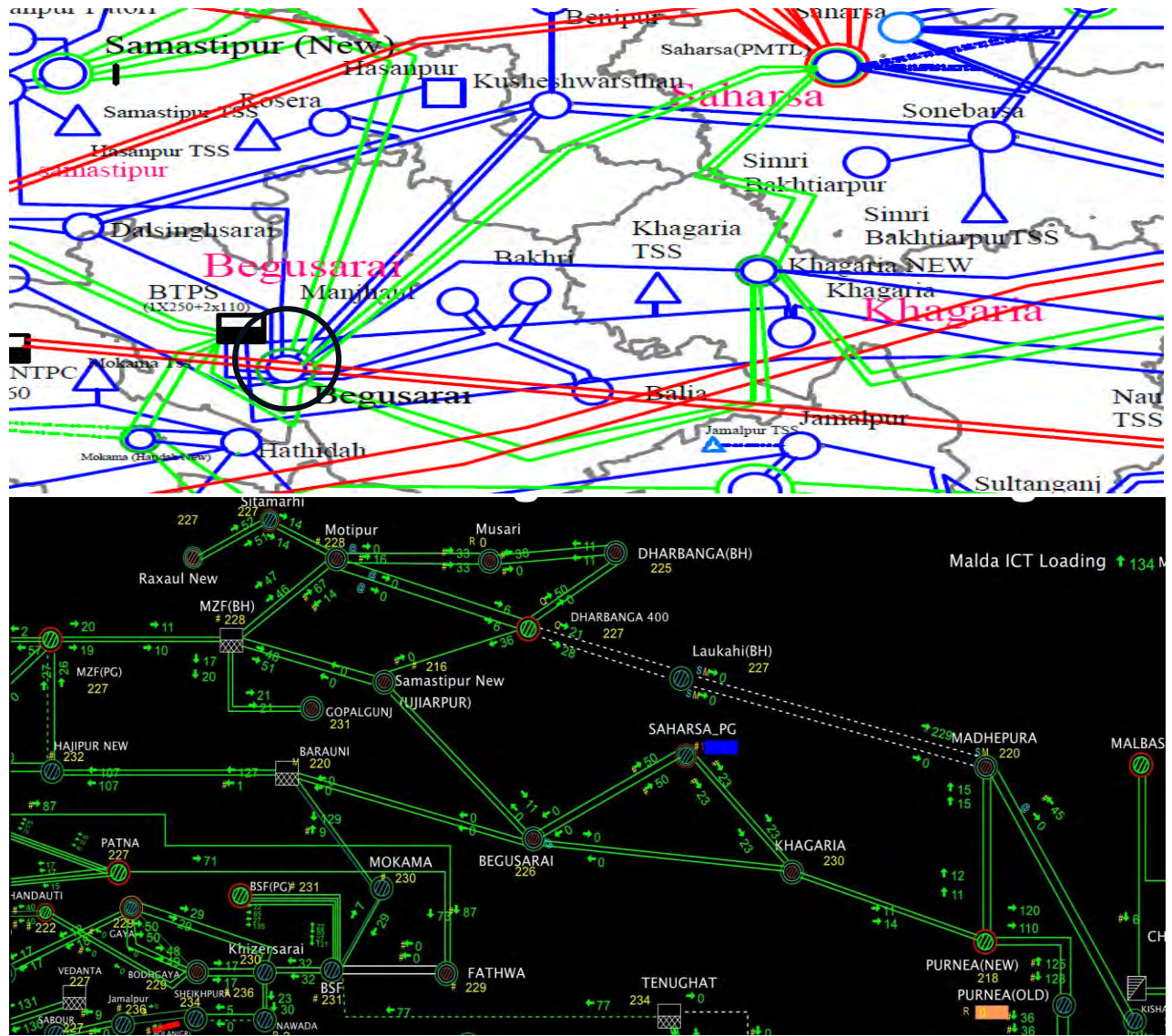


Figure 1: Network across the affected area

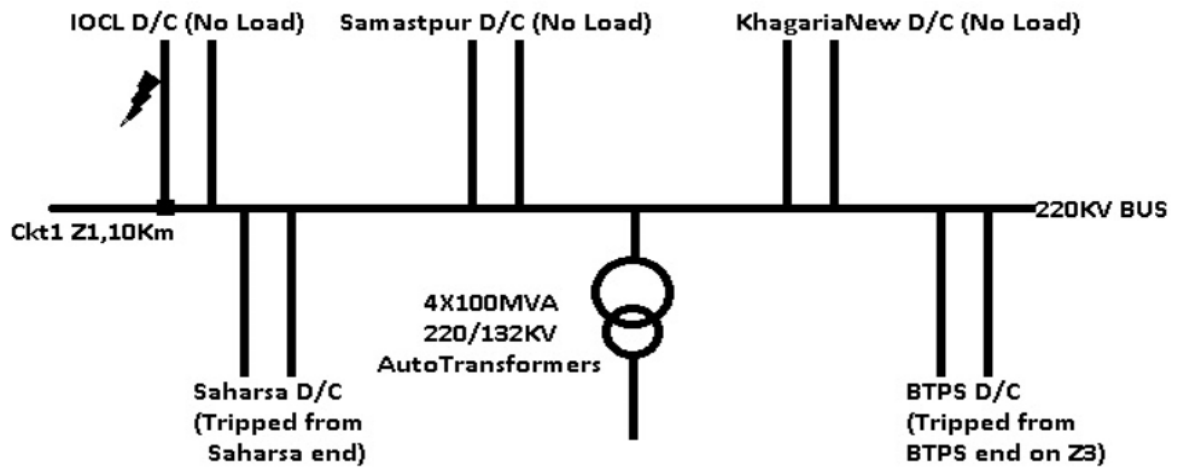
10. Details of Equipment Failure (if any during the event) (उपकरण विफलता का विवरण): NA

11. Major Elements Tripped (प्रमुख ट्रिपिंग)

क्र०सं०	नाम	Trip time (hh:mm:ss)	उप केंद्र 1 रिले संकेत	उप केंद्र 2 रिले संकेत	Restoration time
1	220 kV Begusarai-IOCL-1 (Idle charged from Begusarai)	11:56:39	Begusarai: Y_B_N, Zone-1, 10 km, Iy=Ib=11kA	-	-

2	220 kV Begusarai-IOCL-2 (Idle charged from Begusarai)		Didn't trip	-	15:45
3	220 kV Begusarai-Saharsa D/c	11:56:39	Didn't trip	Saharsa: Y_B_N, I <sub>y</sub> =I <sub>b</sub> =1.4 kA	15:50
4	220 kV Begusarai-BTPS D/c		Didn't trip	BTPS: Y_B_N, I <sub>y</sub> =I <sub>b</sub> =4.18 kA	13:35/13:36

## 12. Event Analysis (Based on PMU, SCADA & DR) (घटना का विश्लेषण):



**Figure 2: SLD of 220/132 kV Begusarai S/s (As shared by BSPTCL)**

- At 11:56 Hrs, a Y\_B\_N fault struck 220 kV Begusarai-IOCL-1, which was kept idle charged from Begusarai at 10 km from Begusarai, which was in Zone-1. Distance relay gave tripping command at Begusarai but breaker failed to open and the fault persisted.
- As there is no LBB and Bus bar protection available at Begusarai, the fault was cleared by opening of all other feeders from remote end one by one.
- 220 kV Begusarai-Saharsa D/c tripped from Saharsa after 800 msec in Zone-3.
- 220 kV Begusarai-BTPS(Barauni) D/c tripped from Barauni after 1.5 seconds in Zone-3.
- With opening of 220 kV Begusarai-BTPS(Barauni) D/c, total power failure occurred at Begusarai as other lines, i.e. 220 kV Begusarai-Khagaria D/c, 220 kV Begusarai-Samastipur D/c and 220 kV Begusarai-IOCL-2 were kept idle charged from Begusarai end only.

- Power supply was restored by charging 220 kV Begusarai-Samastipur-1 at 12:25 Hrs.
- Report received from BSPTCL is attached at Annexure-3.

### PMU Snapshot:



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

### 13. Protection/Operational issues observed (सुरक्षा/परिचालन संबंधी समस्या):

- Breaker of 220 kV Begusarai-IOCL-1 didn't open despite operation of distance relay in Zone-1, Zone-2 and Zone-3. The reason for the same may be explained.
- Since the faulty line was idle charged from Begusarai end only, time delay for Zone-2 and Zone-3 should be kept instantaneous as decided in ERPC PCC meeting. The same may be rectified.
- Zone-3 time delay of 220 kV Begusarai-Barauni D/c at Barauni is set at 1.5 seconds. The reason for the same may be explained.
- Expected timeline of commissioning of bus bar protection at Begusarai may be shared.

### 14. Action Taken/Remedial Measures (सुधारात्मक उपाय): Nil

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

S.No.	Issues	Regulation Non-Compliance	Utilities
2.	Whether DR/EL provided within 24 Hours?	1. IEGC section 37.2 (c) 2. CEA grid Standard 15.3	BSPTCL, PG ER-1 (No)

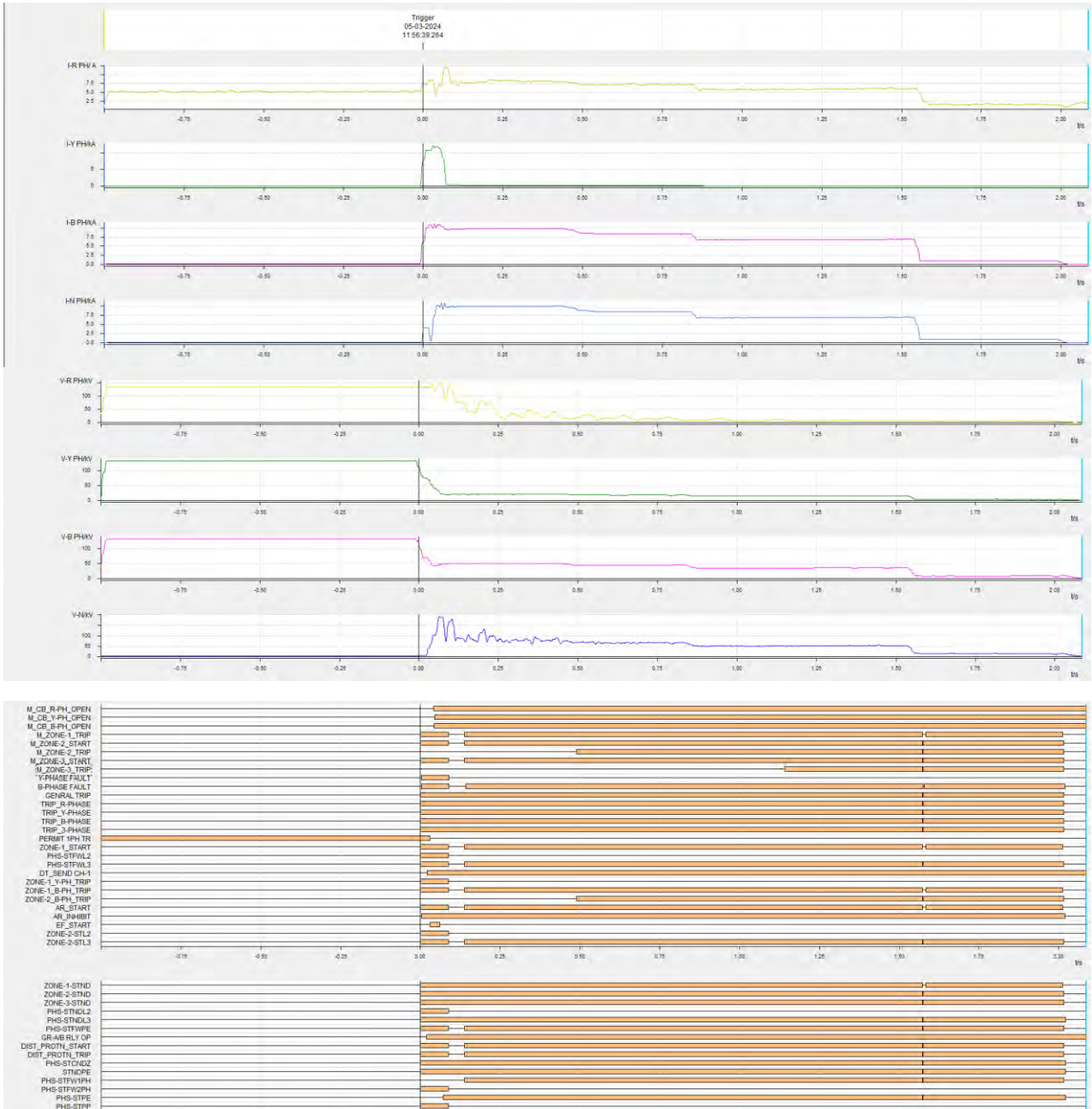
### 16. Key Lessons Learnt (प्रमुख अधिगम बिंदु): Nil

# Annexure 1: (Sequence of Events-As per ERLDC SCADA)

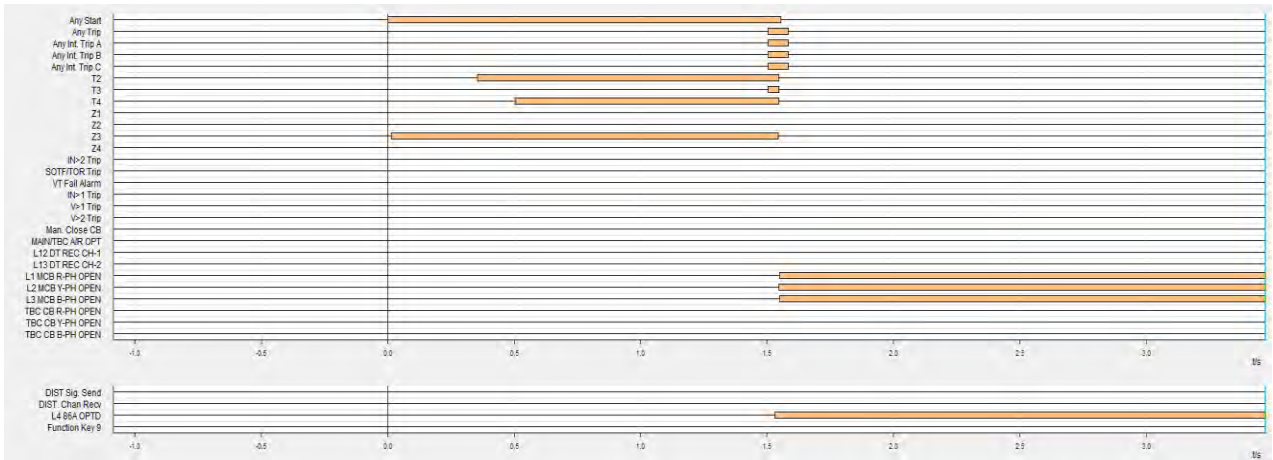
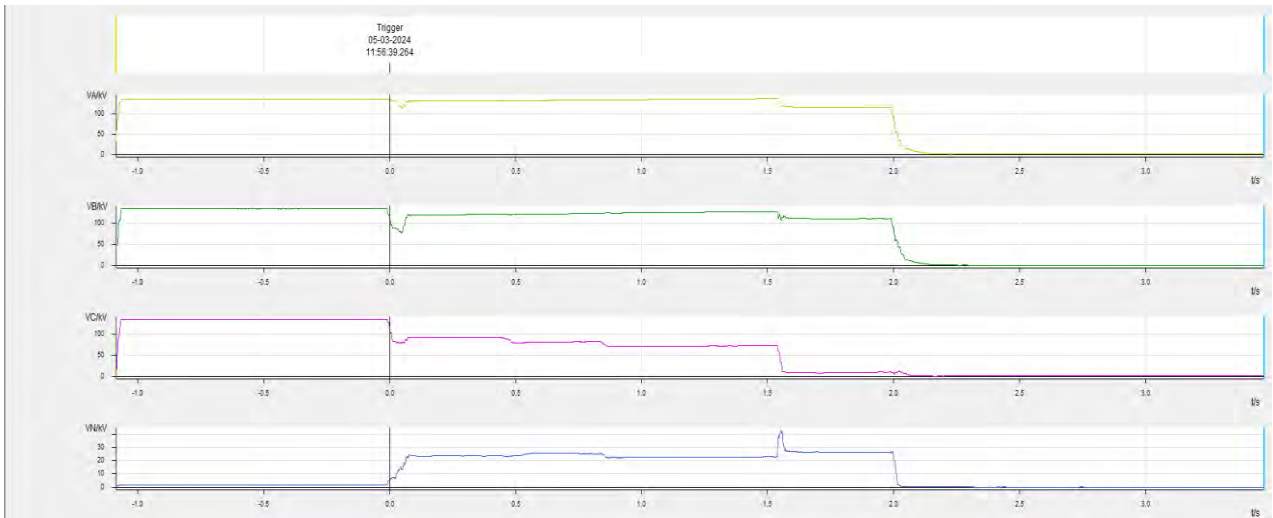
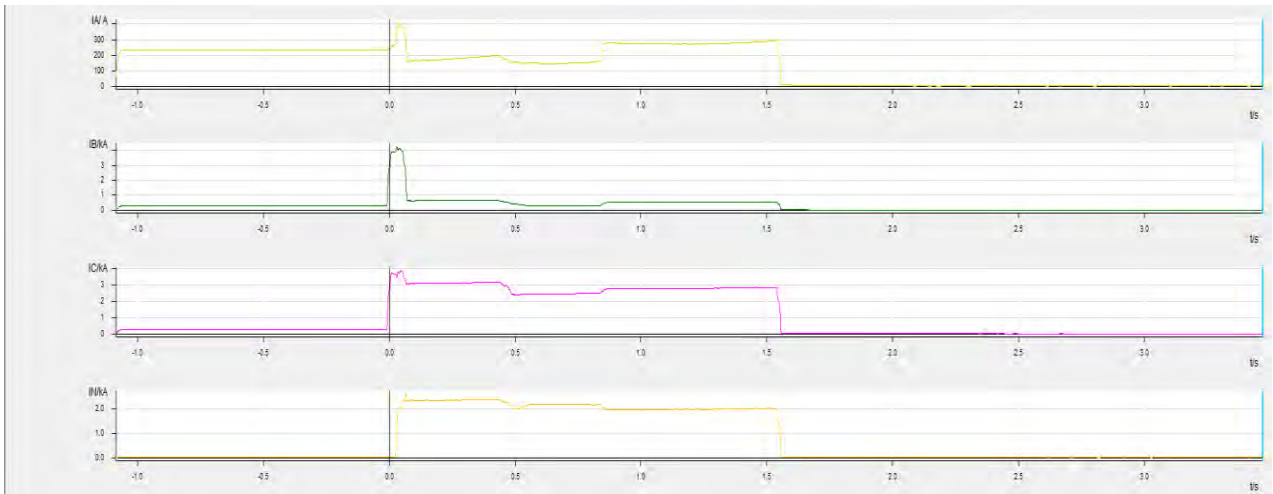
SoE data not available for the event.

## Annexure 2:

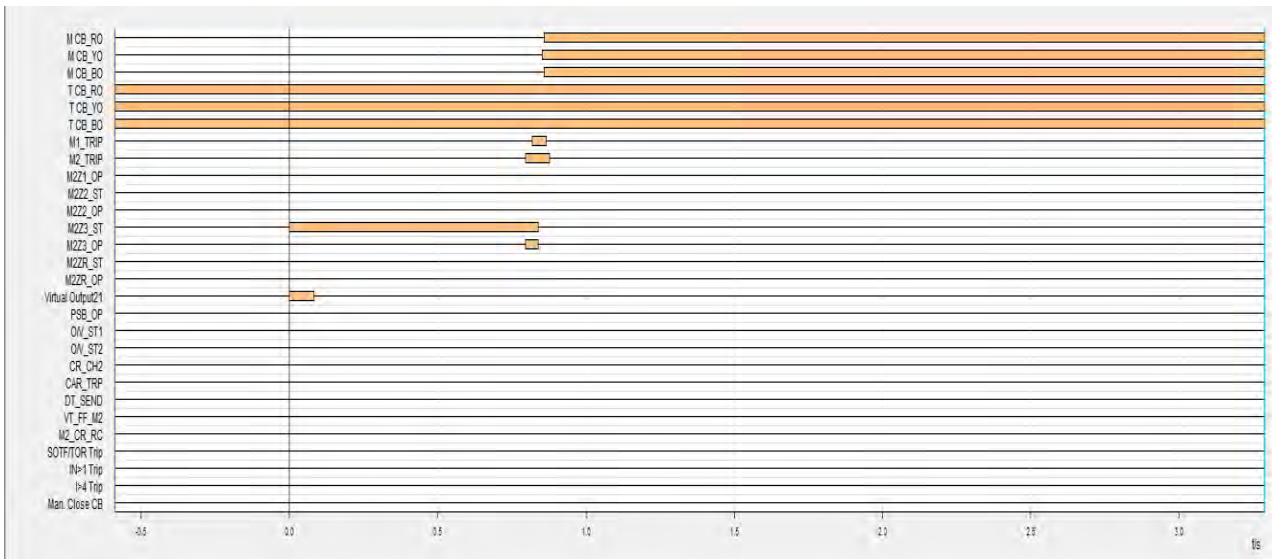
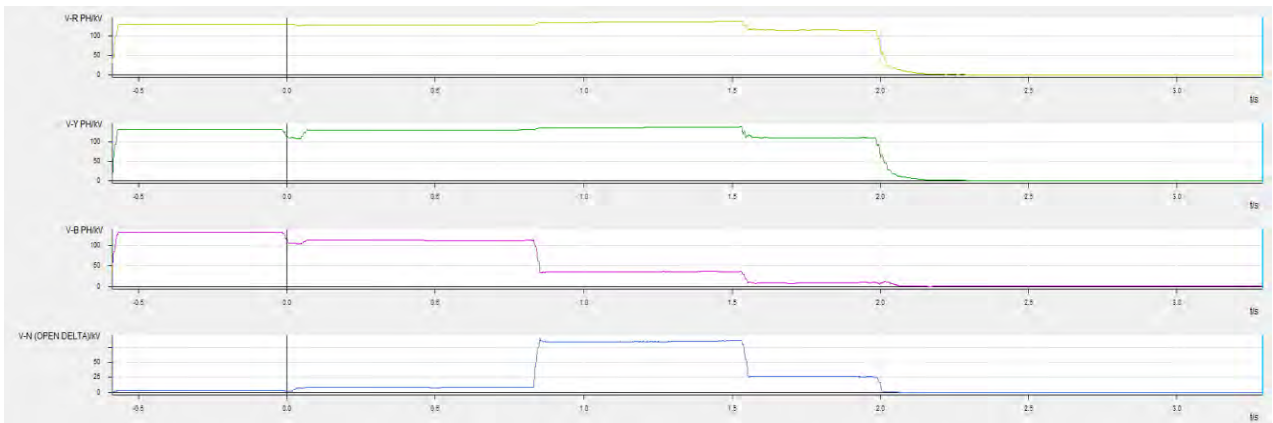
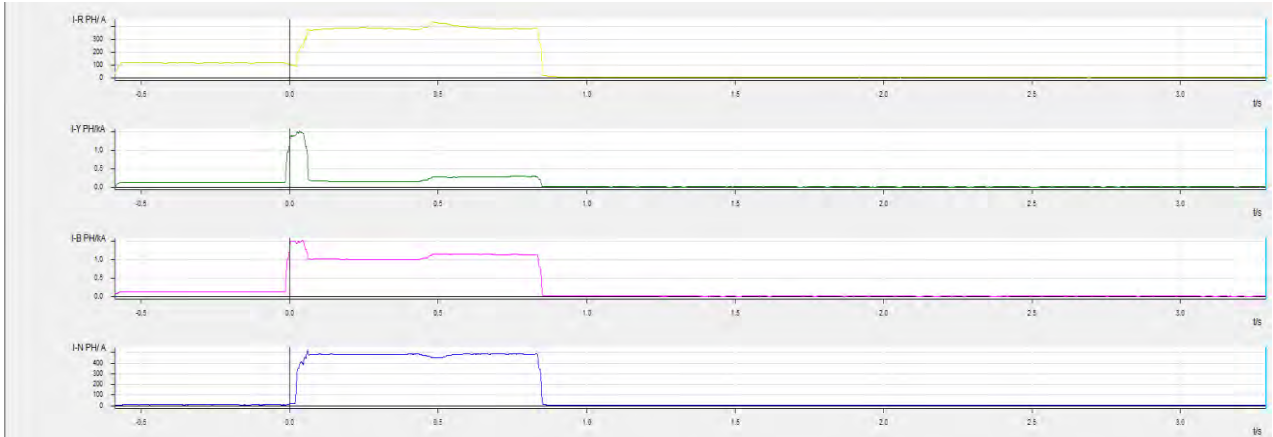
### DR of 220 kV Begusarai-IOCL-1 (Begusarai)



# DR of 220 kV Begusarai-BTPS-1 (BTPS-Barauni)



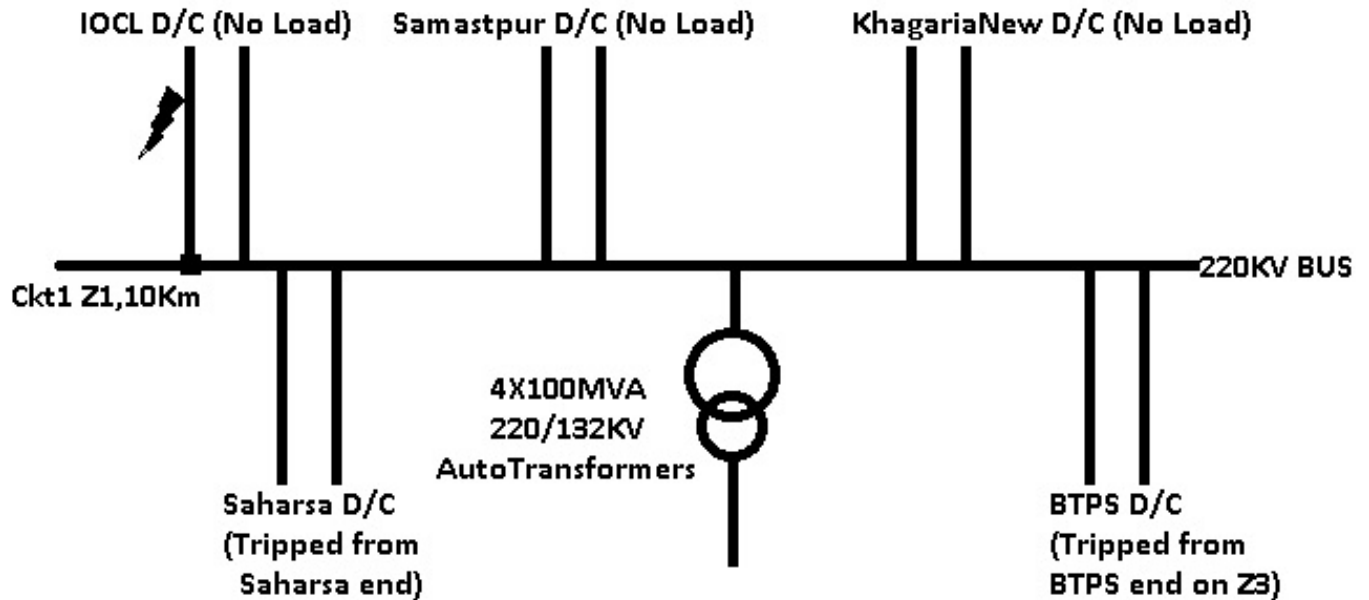
# DR of 220 kV Begusarai-Saharsa-1 (Saharsa)



**Report of TPF at 220/132/33KV Begusarai S/s(BSPTCL)**

**1. Date and Time of Incident:-Dt-05/03/2024; 11:56Hrs**

**2. SLD of 220KV Bus at Begusarai**



**3. Prefault Condition (11:00Hrs)**

Sl. No.	Name of Element	Load(11:00Hrs)	Remarks
1	220KV IOCL D/C	0	No Load
2	220KV Samastipur D/C	0	No Load
3	220KV Khagaria New D/C	0	No Load
4	220KV Saharsa D/C	-(2X51 MW)	
5	4X100;220/132KV Autotransformers	-(4X26 MW)	
6	220KV BTPS D/C	2X104 MW	

**4. Root Cause of Tripping and Analysis**

A Bamboo tree came in range of the 220KV Begusarai-IOCL ckt1, approx.10KM from Begusarai. Weather was rainy and windy. The Relay operated correctly on Z1 and gave output command to the Circuit Breaker and the Breaker opened mechanically in approx. 30ms. But the Circuit Breaker (make-CGL) failed to clear the fault in B (Blue) phase. This caused tripping of 220KV Begusarai- Saharsa D/C lines and 220KV Begusarai-BTPS D/C lines from respective remote ends.

The Circuit Breaker (make-CGL) in 220KV IOCL Ckt1 bay is in warranty period. The Executing Agency M/s ABN Tower and Transmission Private Ltd. has been asked to investigate the issue of non-clearance of the Circuit Breaker on fault and take necessary measures to avoid any such incidents in future.



## 5. Relay indication

Sl. No.	Name of Element	Relay indication	Remarks
1	220KV IOCL Ckt1	Tripped from Begusarai end on (Z1,Iy=Ib=11KA,FD=10KM)	
2	220KV IOCL Ckt2	No Tripping	No Load
3	220KV Samastipur D/C	No Tripping	No Load
4	220KV Khagaria New D/C	No Tripping	No Load
5	220KV Saharsa D/C	Tripped from Saharsa End.	
6	220KV BTPS D/C	Tripped from BTPS end on (Z3)	

## 6. Restoration

Sl. No.	Name of Element	Restoration time
1	220KV BTPS- 1	13:35 Hrs
2	220KV BTPS- 2	13:36 Hrs
3	220KV Samastipur- 1	12:25 Hrs
4	220KV Samastipur- 2	14:00 Hrs
5	220KV Khagaria New- 1	Open from Beg. End
6	220KV Khagaria New- 2	Open from Beg. End
7	220KV Saharsa- 1	15:50 hrs
8	220KV Saharsa - 2	15:50 Hrs
9	220KV IOCL- 1	Not Charged till date
10	220KV IOCL- 2	15:45 Hrs
11	4 X 100MVA Transformer	12:40 Hrs

## 7. DRs

Following two DRs have been attached:-

- I) 220KV IOCL1(BEGUSARAI end) 05032024 1156
- II) 220KV BEGUSARAI 1(BTPS end) 05032024 1156


**ग्रिड-इंडिया**  
**GRID-INDIA**

**ग्रिड कंट्रोलर ऑफ इंडिया लिमिटेड**  
 (भारत सरकार का उद्यम)  
**GRID CONTROLLER OF INDIA LIMITED**  
 (A Government of India Enterprise)  
 [formerly Power System Operation Corporation Limited (POSOCO)]

**पूर्वी क्षेत्रीय भार प्रेषण केन्द्र / Eastern Regional Load Despatch Centre**

कार्यालय : 14, गोल्फ क्लब रोड, टॉलिंगंज, कोलकाता - 700033  
 Office : 14, Golf Club Road, Tollygunge, Kolkata - 700033  
 CIN : U40105DL2009GOI188682, Website : www.erldc.in, E-mail : erldcinfo@grid-india.in, Tel.: 033 23890060/0061

**पूर्वी क्षेत्र के 220/132 केवी उप-केन्द्र में ग्रिड घटना पर विस्तृत रिपोर्ट / Detailed Report of grid event in  
 220/132 kV Budhipadar, 220 kV IBTPS, 220 kV Vedanta S/s of Eastern Region  
 (To be submitted by RLDC/NLDC during Grid Disturbances/Grid Incidents/Near Miss  
 Event as per IEGC section 37.2 (f))  
 (आई ई जी सी 37.2 (एफ) के अनुपालन में)**

**Date(दिनांक):28-03-2024**

**1. Event Summary (घटना का सारांश):**

At 13:45 Hrs on on 9<sup>th</sup> March 2024, 220 kV Budhipadar-Lapanga-2 tripped due to B-Earth fault. Loading of Budhipadar-Lapanga-1 reached around 350 MW, which was hand-tripped at 14:00 Hrs. Entire Budhipadar complex generation with IBTPS and Vedanta, SMC, Bhushan Steel, AAL, Concast CPPs started evacuating through remaining interconnection with grid through 220 kV Budhipadar-Raigarh and 220 kV Budhipadar-Korba D/c, which tripped one by one due to high loading and at 14:07 Hrs, this complex was isolated from the grid and formed an island which didn't survive due to large load generation imbalance. Net generation loss of around 600 MW occurred and load loss of around 100 MW occurred.

**2. Time and Date of the Event (घटना का समय और दिनांक): 14:07 hrs of 22-03-2024**

**3. Event Category (ग्रिड घटना का प्रकार): Grid Disturbance (GD)-1**

**4. Location/Control Area (स्थान/नियंत्रण क्षेत्र): Odisha**

**5. Report Submitted by utility on: 22.03.2024**

**6. Antecedent Conditions (पूर्ववर्ती स्थिति):**

	Frequency	Regional Generation	Regional Demand	State Generation	State Demand
Pre-Event (घटना पूर्व)	49.98 Hz	26093 MW	19888 MW	3095 MW	4967 MW
Post Event (घटना के बाद)	49.97 Hz	25473 MW	19788 MW	2475 MW	4867 MW

*\*Pre and post data of 1 minute before and after the event*

Important Transmission Line/Unit if under outage महत्वपूर्ण संचरण लाइने/ विद्युत उत्पादन इकाइयां जो बंद है	220 kV Budhipadar-Kuarmunda 220 kV Budhipadar-Bamra 132 kV Budhipadar-Kalunga 132 kV Bamra-Rajgangpur
Weather Condition (मौसम स्थिति)	Normal

7. Load and Generation loss (लोड और जेनरेशन हानि): Generation loss: 620 MW; Load loss: 100 MW.

8. Duration of interruption (रूकावट की अवधि): 00:45 Hrs

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

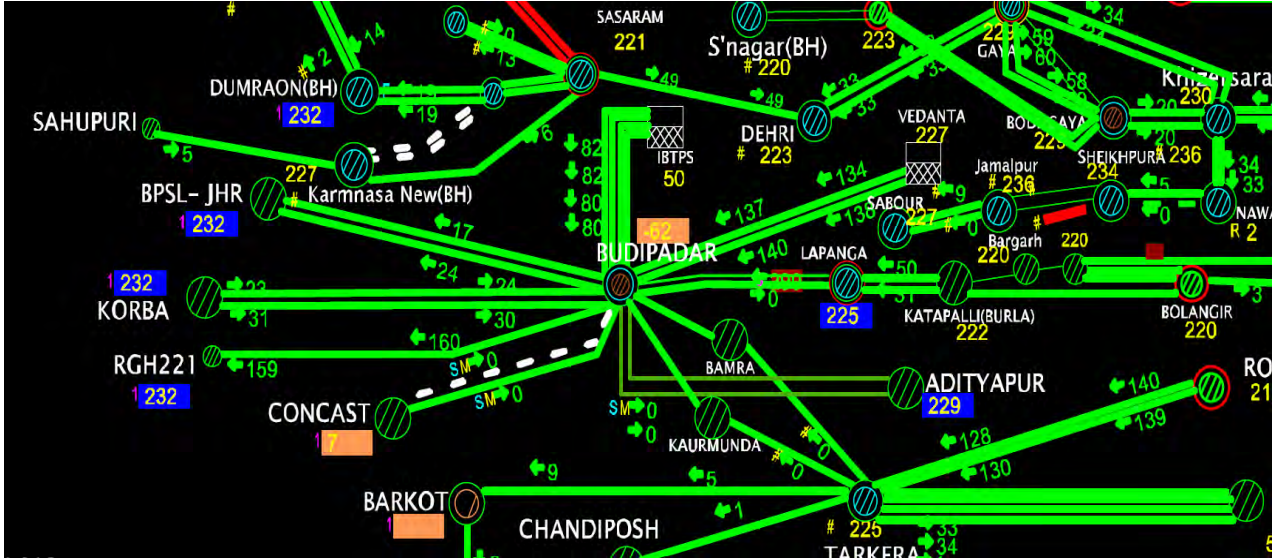


Figure 1: Network across the affected area

10. Details of Equipment Failure (if any during the event) (उपकरण विफलता का विवरण): NA

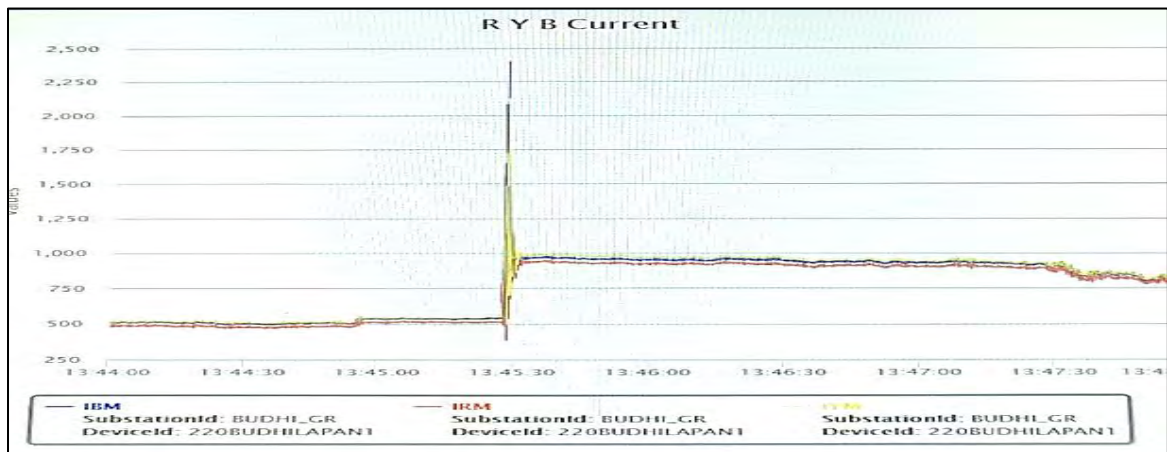
11. Major Elements Tripped (प्रमुख ट्रिपिंग):

क्र०स०	नाम	Trip time (hh:mm)	उप केंद्र 1 रिले संकेत	उप केंद्र 2 रिले संकेत	Restoration time
1	220 kV Budhipadar-Lapanga-2	13:45	Budhipadar: B_N, Zone-2, 15.25 km, 10.62 kA	Lapanga: B_N, 0.2 km, 22.16 kA	14:35 (10.03.24)
2	220 kV Budhipadar-Lapanga-1	14:00	Hand Tripped	-	14:52
3	132 kV Budhipadar-Lapanga-1	14:01	Budhipadar:Y_B_Earth, 9.9 km, Iy: 5.8 kA, Ib: 6.38 kA	Lapanga: Y_B_Earth, 6.8 km, Iy: 7.08 kA, Ib: 7.84 kA	19:26
4	220 kV Budhipadar-Raigarh-1	14:05	Budhipadar: B_N, 57.29 km, 2.448 kA	Raigarh: B_N, 20.38 km, 5.94 kA	22:24

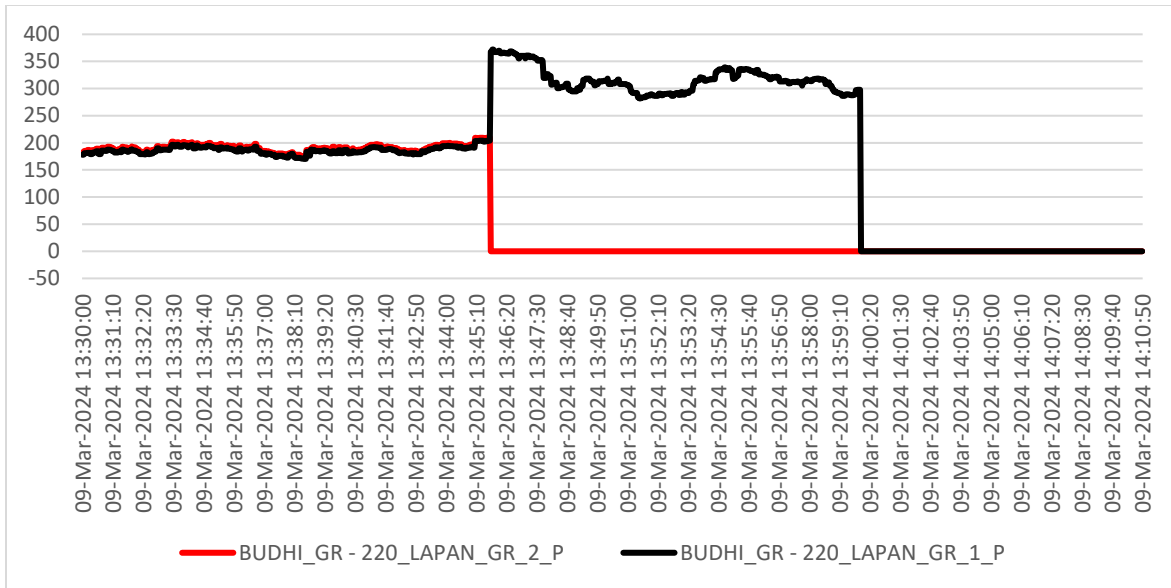
5	220 kV Budhipadar-Korba-1	14:07	Budhipadar: Didn't trip	Korba:B_N, 302.8 km, Zone-2	15:41
6	220 kV Budhipadar-Korba-2		Budhipadar: Y_N, 77.46 km, 1.75 kA, Power swing	Korba: R_Y_B_N, Zone-2, 181.9 km, Ir: 2.368 kA, Iy: 2.471 kA, Ib: 2.55 kA	21:35
7	220 kV Budhipadar- IBTPS-1&2		Budhipadar: DT received	IBTPS: OverVoltage	14:40/-
8	220 kV Budhipadar-IBTPS-3&4		Budhipadar: Didn't trip	-	-
9	220 kV Budhipadar-Vedanta-1&2		Budhipadar: Didn't trip	-	-
10	U#1 & U#2 at IBTPS		Overspeed		23:46/22:24

## 12. Event Analysis (Based on PMU, SCADA & DR) (घटना का विश्लेषण):

- Initially at 13:45 Hrs, a B-Earth fault struck 220 kV Budhipadar-Lapanga-2 which persisted for around 500 msec. B\_ph Conductor snapping between gantry and First tower at Lapanga end reported.

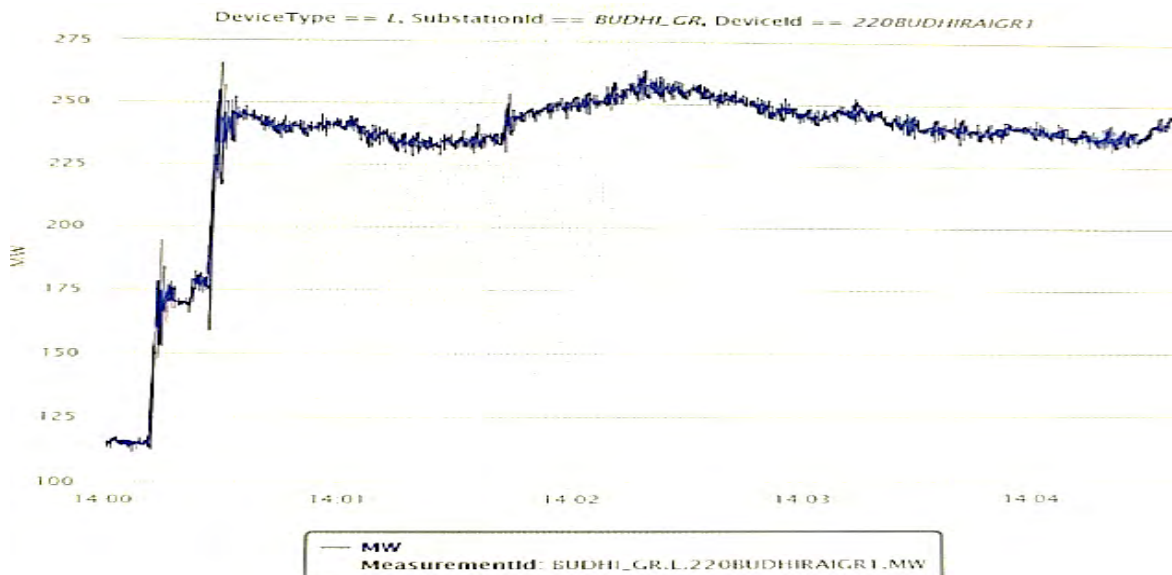


- Loading of 220 kV Budhipadar-Lapanga-1 reached around 350 MW. This line was hand-tripped at 14:00 Hrs.

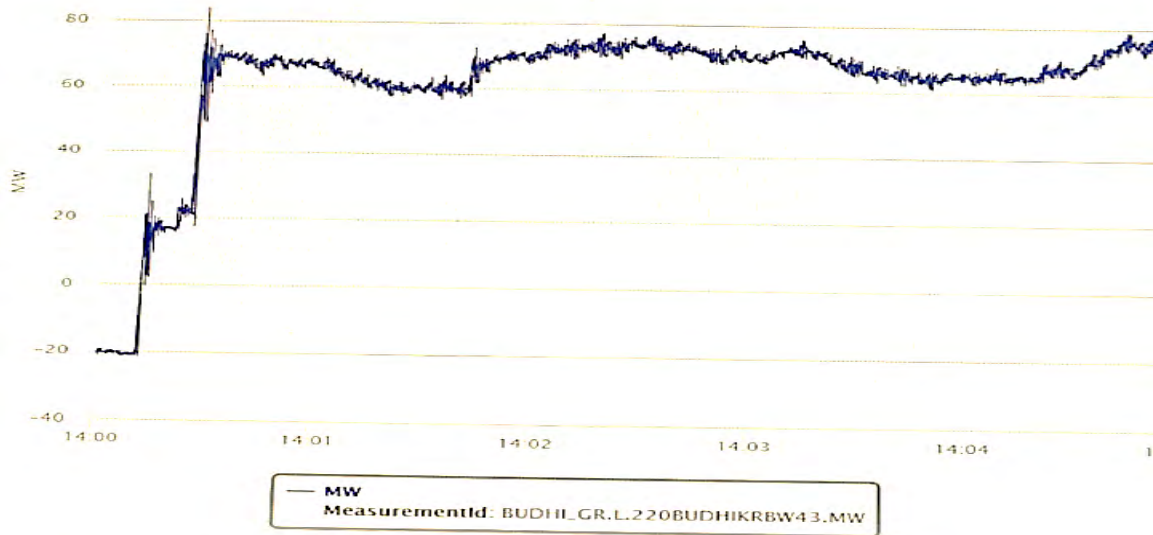


- 132 kV Budhipadar-Lapanga tripped at 14:01 Hrs due to Y\_B-Earth fault. Line tripped due to snapping of B-phase conductor & jumper over Y-Phase conductor near SMC-1 plant.
- After tripping of 220 kV Budhipadar-Lapnga D/c, 132 kV Budhipadar-Lapanga and outage of 220 kV Budhipadar-Bamra and 220 kV Budhipadar-Kuarmunda, interconnection point with the grid was with 220 kV Budhipadar-Raigarh and 220 kV Budhipadar-Korba D/c.
- Entire generation of IBTPS (Around 320 MW) and surplus export from 220 kV Vedanta (280 MW), total around 600 MW started evacuating through 220 kV Budhipadar-Raigarh and 220 kV Budhipadar-Korba D/c with some exchange with other CPPs connected at Budhipadar.

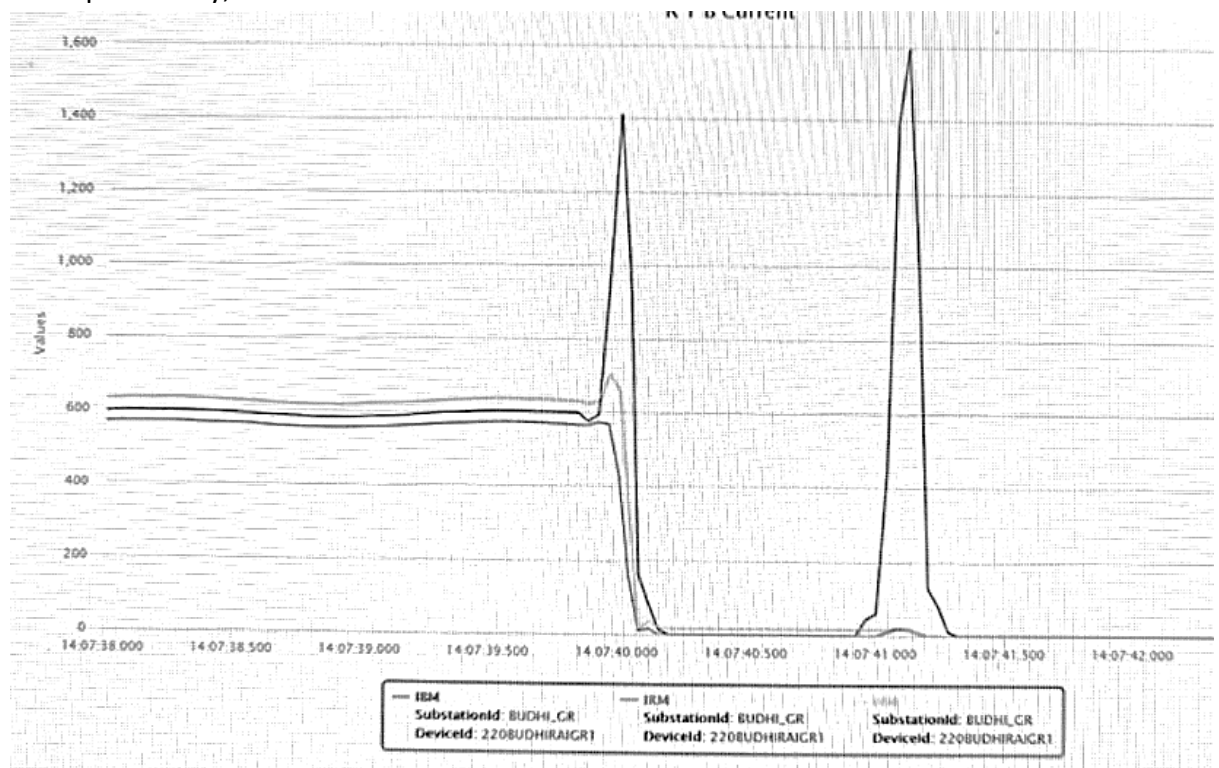
### Flow of 220 kV Budhipadar-Raigarh



## Flow of 220 kV Budhipadar-Korba-2



- At 14:07 Hrs, 220 kV Budhipadar-Raigarh tripped due to B-Earth fault. A/r attempted from Budhipadar only, however it was unsuccessful.

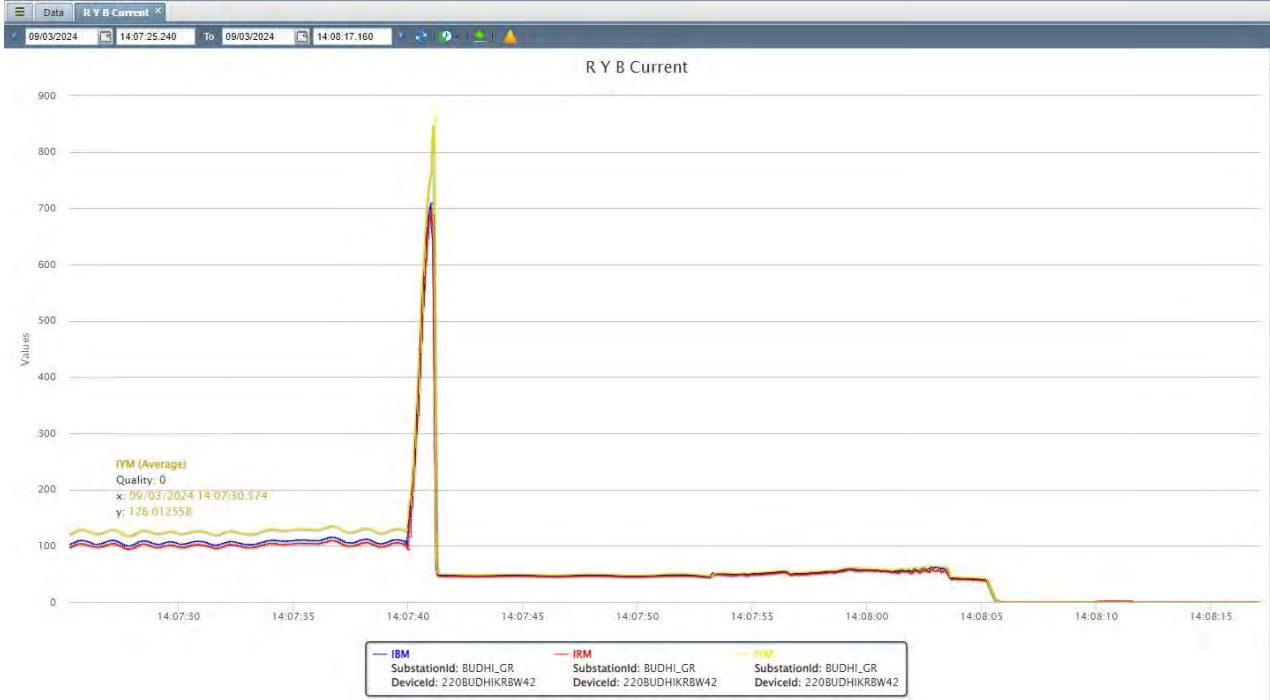


- After tripping of 220 kV Budhipadar-Raigarh line remaining 220 kV Budhipadar-Korba D/C loading increased to more than 200 MW each and Korba line 1 also encountered a 3-phase

fault and tripped, and other circuit observed large power swing up to 600 MW and tripped at 14:07:53 Hrs.

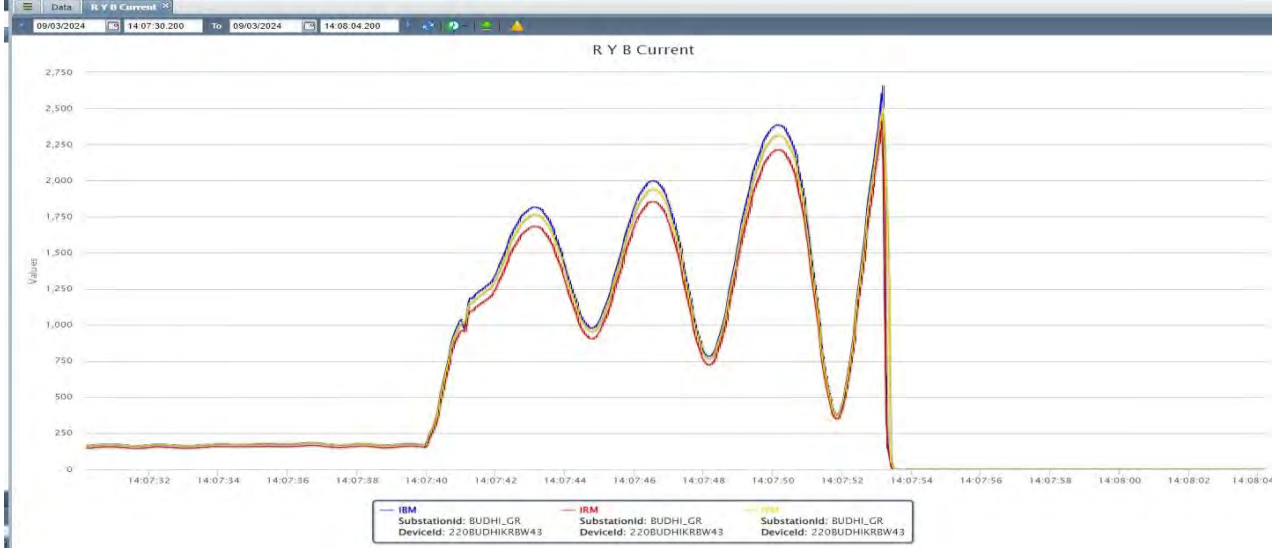
### Tripping of 220 kV Budhipadar-Korba-1

#### R Y B Phase Current



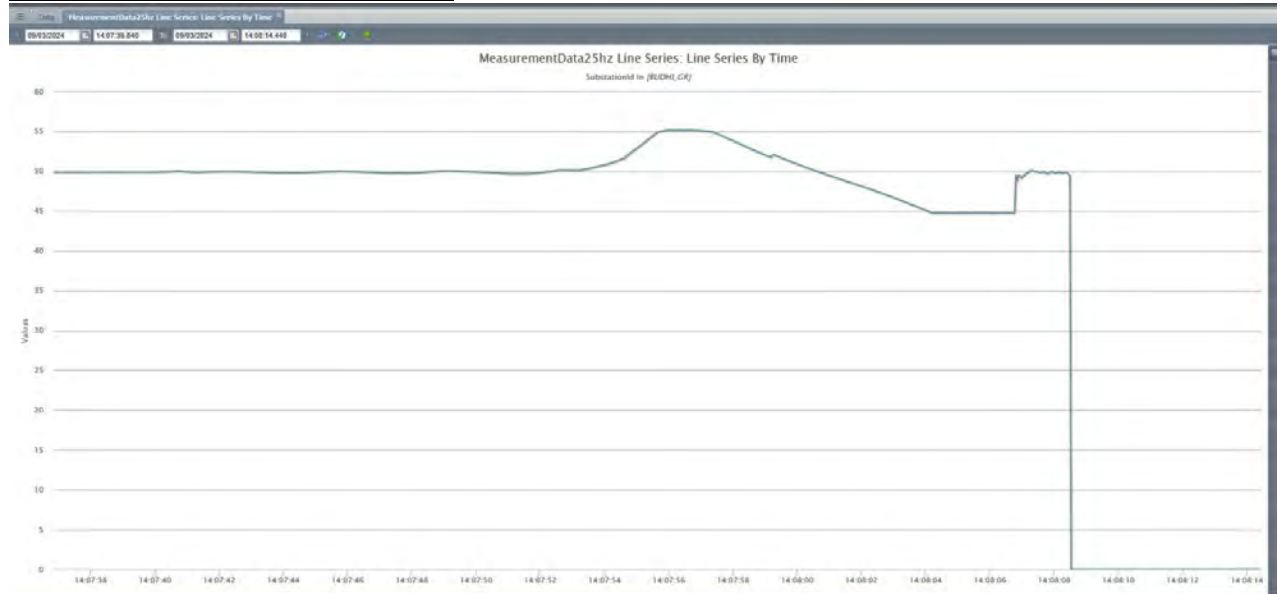
### Power Swing & Subsequent tripping of 220 kV Budhipadar-Korba-2

#### R Y B Phase Current



- After tripping of 220 kV Budhipadar-Raigarh and 220 kV Budhipadar-Korba D/C lines, IB TPS and Vedanta generation lost all grid interconnections only radial load of CPP was there.
- All units at IBTPS tripped on over-frequency due to large imbalance in load generation.

### **Frequency of the islanded system**



- Vedanta and BPSL got islanded but did not survive.
- As reported, 220 kV AAL islanded successfully. Details of islanding of other CPPs not available.

### **13. Protection/Operational issues observed (सुरक्षा/परिचालन संबंधी समस्या):**

- 220 kV Budhipadar-Lapanga-2 tripped in Zone-2 time from Budhipadar. No carrier received at Budhipadar. No A/r attempt taken at Lapanga. OPTCL may explain.
- After tripping of 220 kV Budhipadar-Lapanga-2, line loading of parallel circuit reached to around 350 MW. 220 kV Budhipadar-Lapanga-1 was hand tripped after 15 minutes of the first fault in parallel circuit. Reason for hand-tripping may be explained. Also, whether any instruction given to IB TPS and Vedanta to reduce generation or not?
- Later, 220 kV Budhipadar-Raigarh and 220 kV Budhipadar-Korba-1 tripped one by one. The root cause analysis for tripping may be shared. It is suspected line tripped due to increased sag or low clearance. 220 kV Budhipadar-Korba-1 tripped from Korba end only on Zone-2.
- Power swing of around 600 MW observed in 220 kV Budhipadar-Korba-2 and line tripped later on power swing when impedance came in Zone-1.
- Islanding performance of all CPPs may be submitted and reason for non-survival of islands may be furnished.



- Immediate SPS scheme may be planned for Budhipadar as one single line tripping along with planned outage in one corridor led to a cascading event and loss of around 600 MW net generation. Whether any SOP was prepared before allowing shutdown of 220 kV Budhipadar-Bamra and 220 kV Budhipadar-Kuarmunda?
- PLCC scheme of 220 kV Budhipadar-Raigarh and 220 kV Budhipadar-Korba D/c is not in service. A/r is enabled at Budhipadar end only without PLCC communication. This may be taken up immediately.

**14. Action Taken/Remedial Measures (सुधारात्मक उपाय):**

- Preventive maintenance to be done at regular intervals to avoid tripping of line during overloading for short duration.
- SPS should be planned immediately for pockets which are heavily congested.
- Proper SOP should be in place for heavily congested corridors while allowing any shutdown for accounting further contingency.
- SLDC should intimate RLDC of instar-state line shutdowns, outage of which is affecting reliability of tie lines.
- Proactive response from generators is needed in following SLDC instructions.

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

S.No.	Issues	Regulation Non-Compliance	Utilities
2.	Whether DR/EL provided within 24 Hours?	1. IEGC section 37.2 (c) 2. CEA grid Standard 15.3	OPTCL (Not

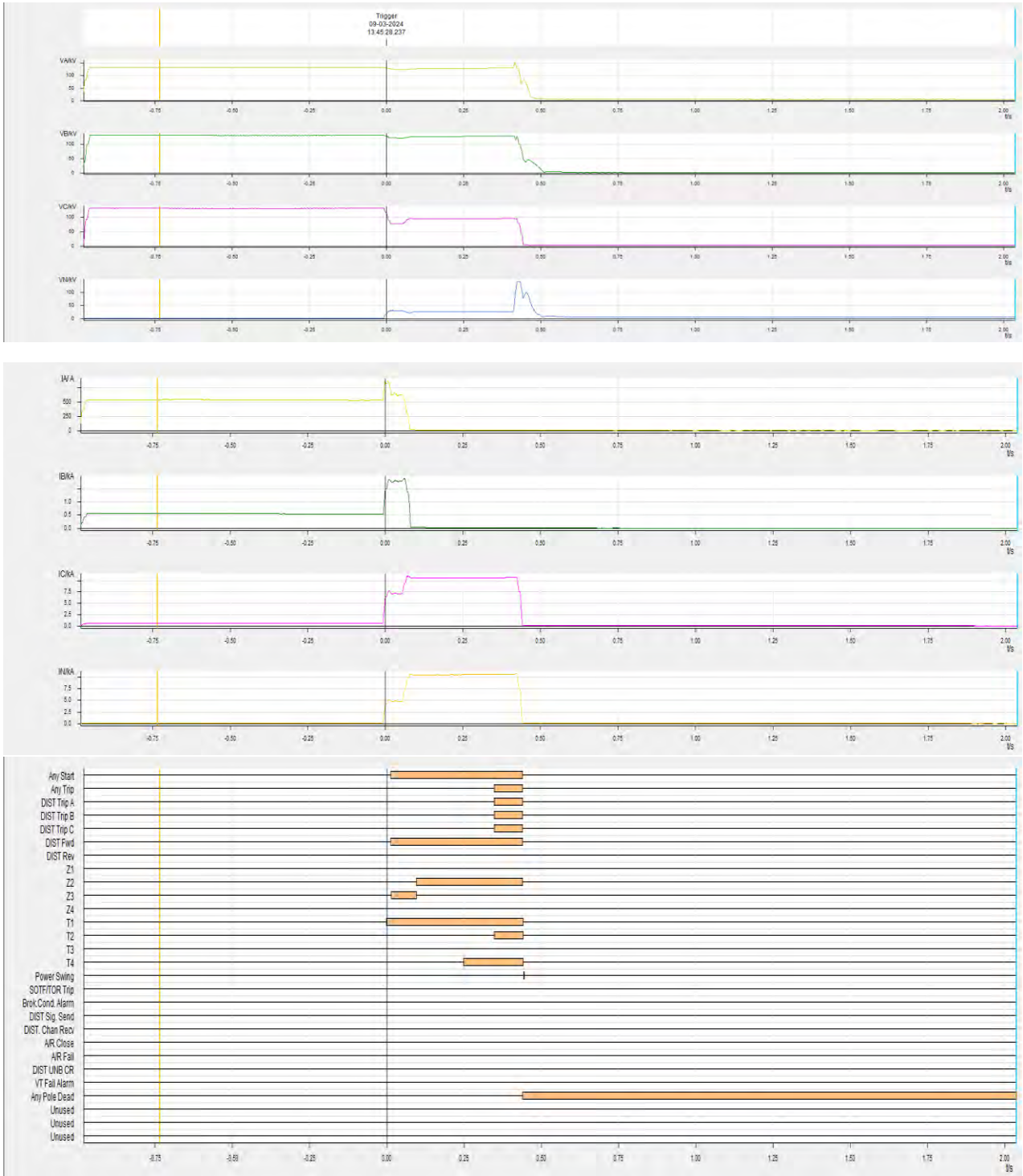
**16. Key Lessons Learnt (प्रमुख अधिगम बिंदु): Nil**

## Annexure 1: (Sequence of Events-As per ERLDC SCADA):

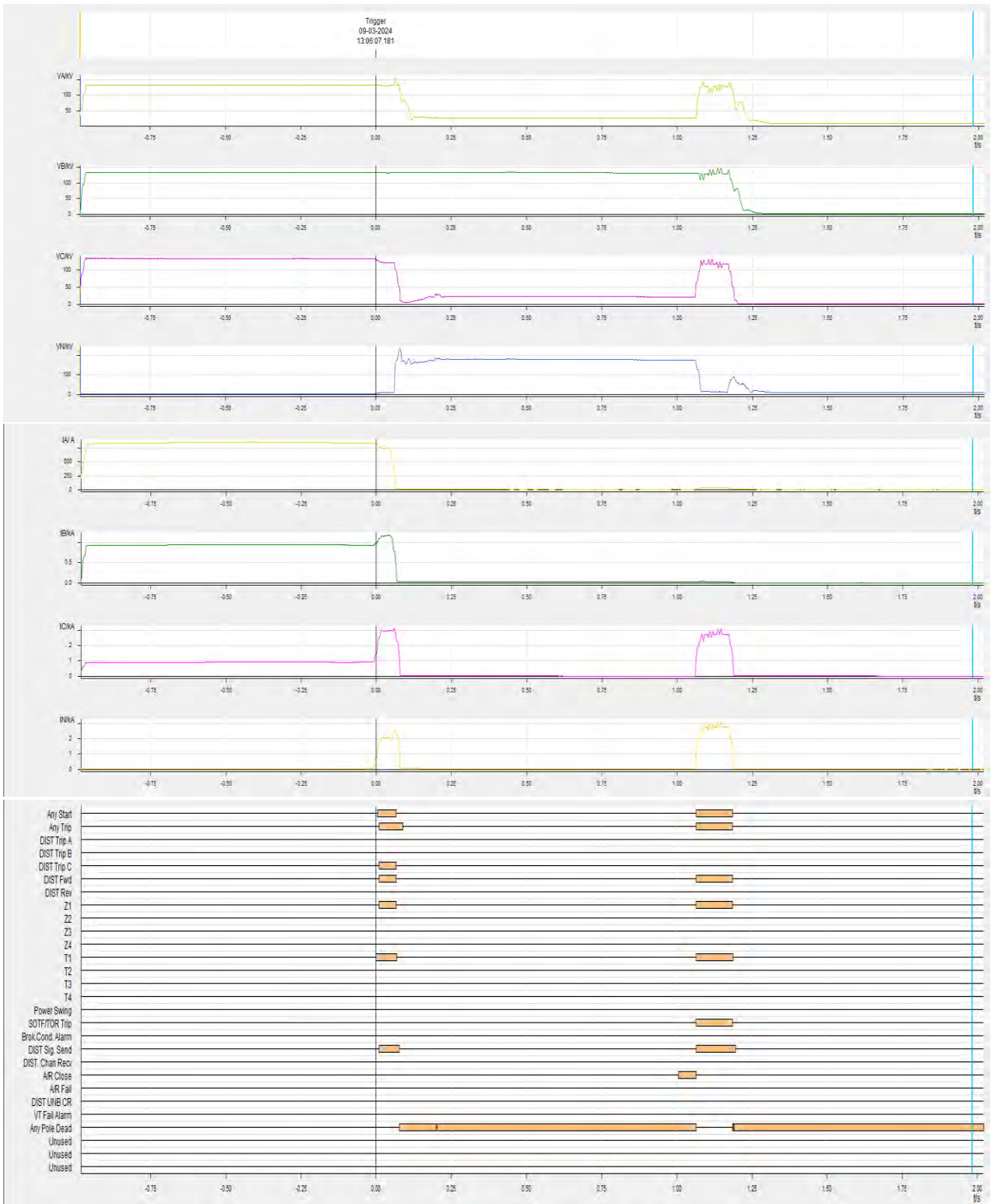
SoE data not available for the event.

## Annexure 2:

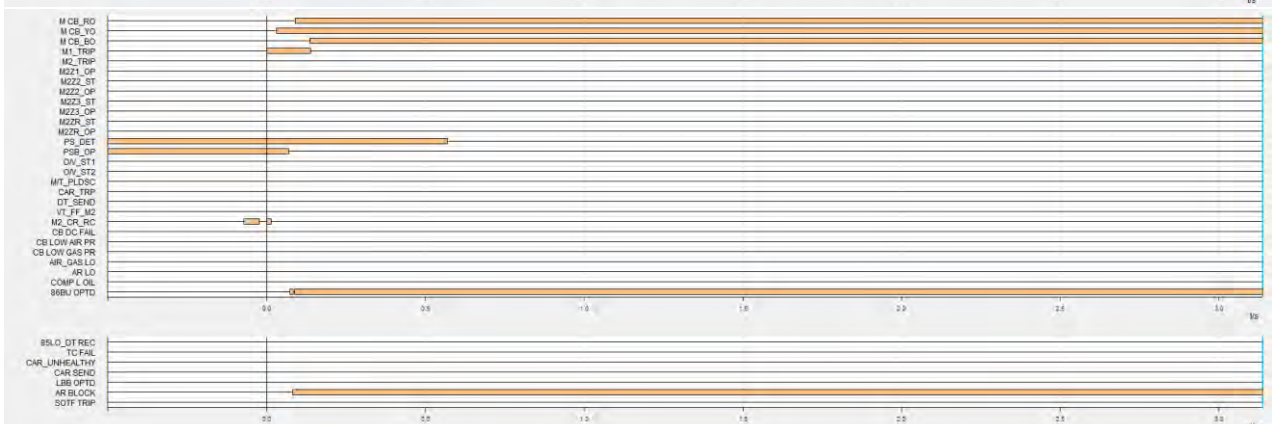
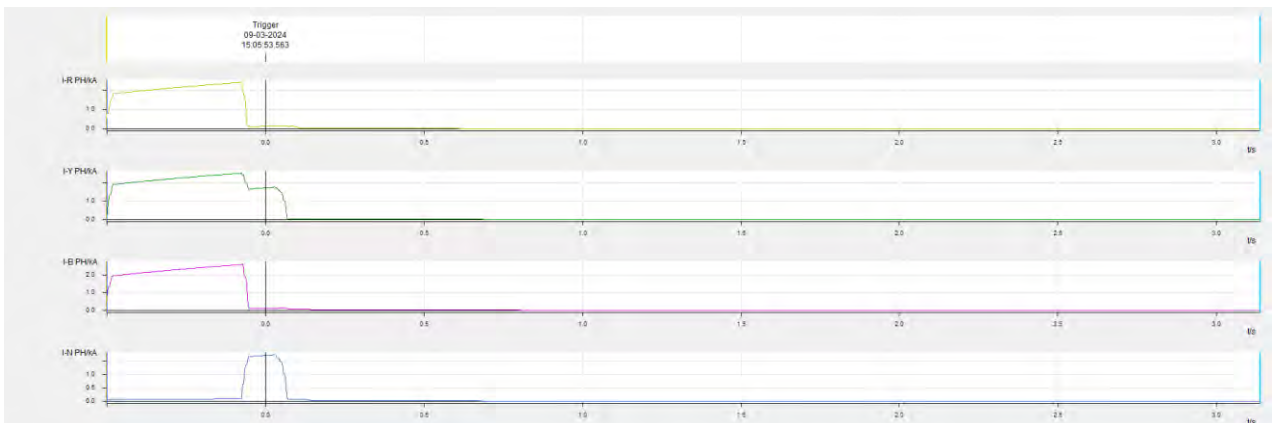
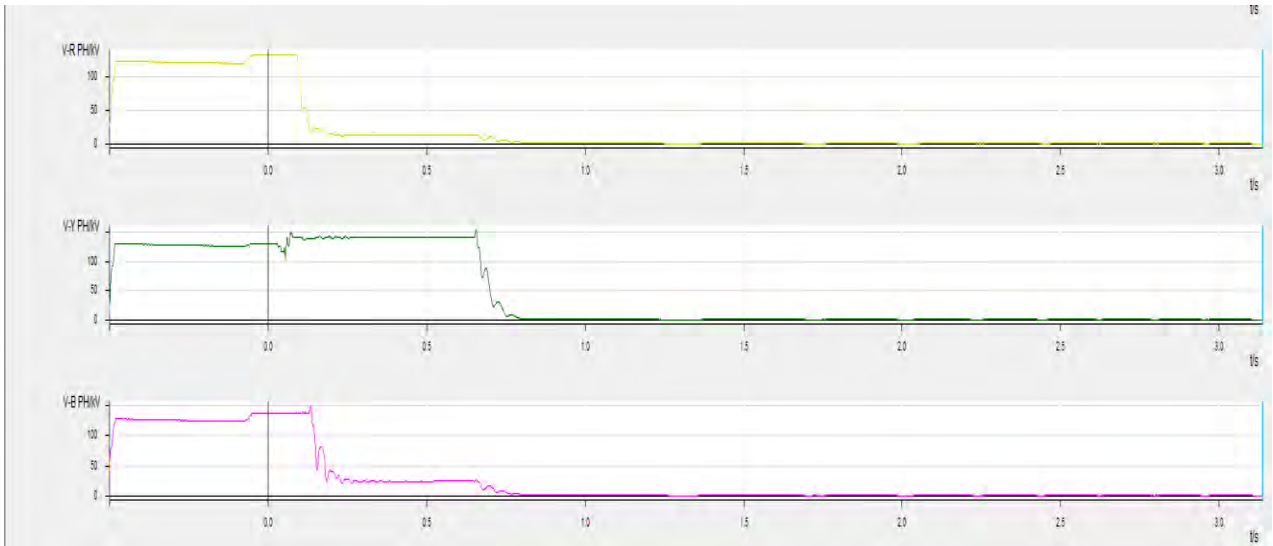
### DR of 220 kV Budhipadar-Lapanga-1 (Budhipadar)



# DR of 220 kV Budhipadar-Raigarh-1 (Budhipadar)



# DR of 220 kV Budhipadar-Korba-2 (Budhipadar)




**ग्रिड-इंडिया**  
**GRID-INDIA**

**ग्रिड कंट्रोलर ऑफ इंडिया लिमिटेड**  
 (भारत सरकार का उद्यम)  
**GRID CONTROLLER OF INDIA LIMITED**  
 (A Government of India Enterprise)  
 [formerly Power System Operation Corporation Limited (POSOCO)]

**पूर्वी क्षेत्रीय भार प्रेषण केन्द्र / Eastern Regional Load Despatch Centre**

कार्यालय : 14, गोल्फ क्लब रोड, टॉलिंगंज, कोलकाता - 700033  
 Office : 14, Golf Club Road, Tollygunge, Kolkata - 700033  
 CIN : U40105DL2009GOI188682, Website : www.erldc.in, E-mail : erldcinfo@grid-india.in, Tel.: 033 23890060/0061

**400 केवी बाढ़ (एनटीपीसी) उपकेंद्र पूर्वी क्षेत्र में ग्रिड घटना की विस्तृत रिपोर्ट / Detailed Report of grid event at 400 kV Barh (NTPC) Substation in Eastern Region**

**(To be submitted by RLDC/NLDC during Grid Disturbances/Grid Incidents/Near Miss Event as per IEGC section 37.2 (f))**  
**(आई ई जी सी 37.2 (एफ) के अनुपालन में)**

**Date(दिनांक):09-04-2024**

**1. Event Summary (घटना का सारांश):**

At 04:41 Hrs on 31.03.2024, 400 kV Bus-3 & Bus-4 at Barh tripped. As reported, B\_ph CT of main bay of Barh-Patna-2 burst at Barh and 400 kV Bus-4 tripped. After 910 msec, R\_ph CT of main bay of 400 kV Barh-Patna-1 got damaged at Barh and 400 kV Bus-3 tripped. Consequently, all elements associated with 400 kV Bus-3 & Bus-4 tripped including U#4 & U#5 (660 MW each). Total generation loss of around 1251 MW occurred.

**2. Time and Date of the Event (घटना का समय और दिनांक):** 04:41 hrs of 31.03.2024

**3. Event Category (ग्रिड घटना का प्रकार):** Grid Incident (GI)-2

**4. Location/Control Area (स्थान/नियंत्रण क्षेत्र):** Barh

**5. Report submitted by Utility on: Not received yet.**

**6. Antecedent Conditions (पूर्ववर्ती स्थिति):**

	Frequency	Regional Generation	Regional Demand	Barh St-II Generation
Pre-Event (घटना पूर्व)	50.03 Hz	29220 MW	20609 MW	1251 MW
Post Event (घटना के बाद)	49.91 Hz	27969 MW	20609 MW	0 MW

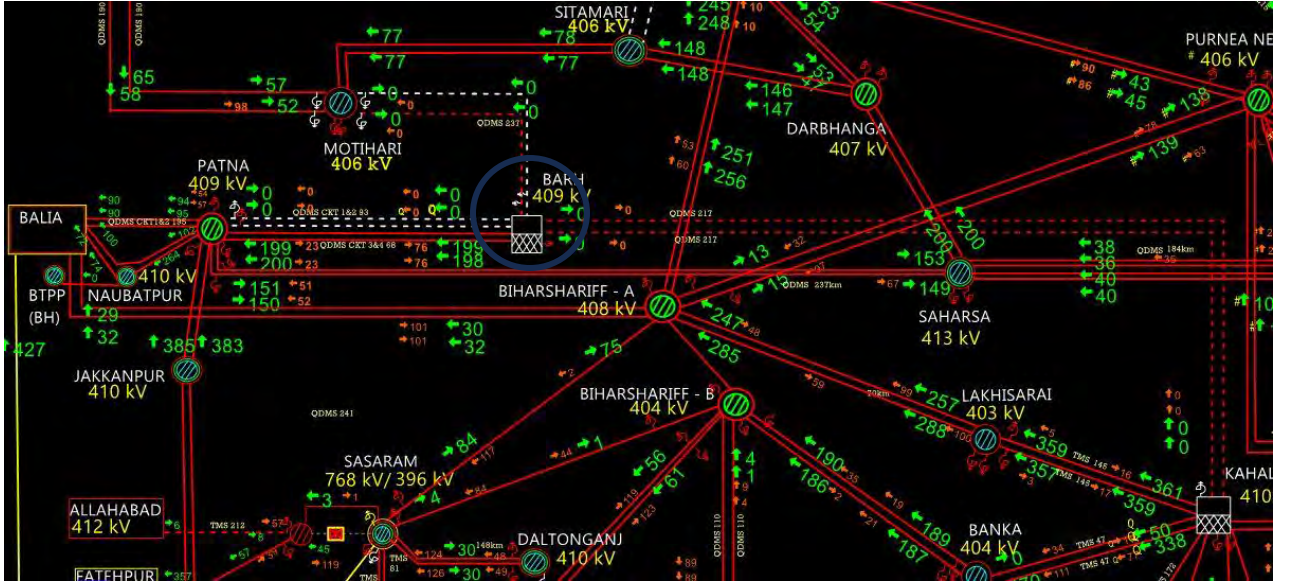
*\*Pre and post data of 1 minute before and after the event*

Important Transmission Line/Unit if under outage (महत्वपूर्ण संचरण लाइने/ विद्युत उत्पादन इकाइयां जो बंद हैं)	NIL
Weather Condition (मौसम स्थिति)	Normal

**7. Load and Generation loss (लोड और जेनरेशन हानि):** No load loss and Generation loss was 1251 MW.

**8. Duration of interruption (रुकावट की अवधि):** 04:41 hrs to 07:00 hrs.

**9. Network across the affected area (प्रभावित क्षेत्र का नक्शा):**



**Figure 1: Scada Network Snapshot of affected area**

**10. Details of Equipment Failure (if any during the event) (उपकरण विफलता का विवरण):** B\_ph CT of main bay of 400 kV Barh Patna-2 at Barh and R\_ph CT of main bay of 400 kV Barh-Patna-1 at Barh failed.

**11. Major Elements Tripped (प्रमुख ट्रिपिंग):**

क्र०स०	नाम	Trip time (hh:mm:ss)	उप केंद्र 1 रिसे संकेत	उप केंद्र 2 रिसे संकेत	Restoration time
1	400 kV Barh-Patna-2	04:41:05.680	Barh: Bus bar protection operated; Teed protection operated	Patna: DT received	18:28 (02.04.24)
2	400 kV Bus-4 at Barh		Barh: Bus bar protection operated		07:00
3	400 kV Bus-3 at Patna	04:41:06.520	Barh: Bus Bar protection operated		07:24
4	400 kV Barh-Kahalgaon-1		Barh: Bus bar protection & Teed protection operated	Kahalgaon: Didn't trip	08:32
5	400 kV Barh-Motihari-1		Barh: Bus bar protection operated	Motihari: DT received	07:00
6	U#4 & U#5 at Barh		Barh: Bus bar protection operated		14:00/13:02
7	400 kV Barh-Patna-1	04:41:06:957	Barh: LBB operated after bus bar protection	Patna: DT received	11:15
8	400 kV Barh-Motihari-2	04:41:11.600	Barh: O/V St.1	Motihari: DT received	07:24
9	400 kV Barh-Kahalgaon-2		Barh: DT received	Kahalgaon: O/V St.1	08:25

12. Event Analysis (Based on PMU, SCADA & DR) (घटना का विश्लेषण):

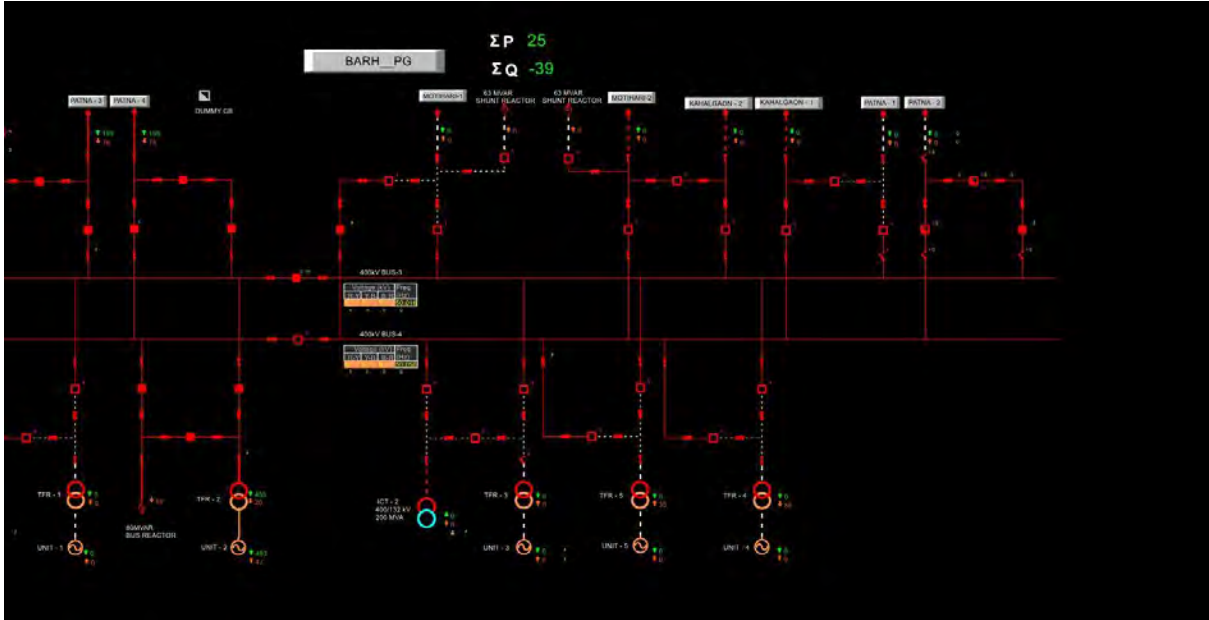


Figure 2: SLD of 400 kV Barh S/s

- At 04:41:05.680 Hrs, B\_ph CT of Main Bay of 400 KV Barh-Patna-2 at Barh burst leading to operation of Bus bar protection of Bus-4 at Barh and operation of Teed protection of the bay. Consequently, all breakers connected to 400 kV Bus-4 tripped. Due to operation of Teed differential, DT was sent to Patna for 400 kV Barh-Patna-2.

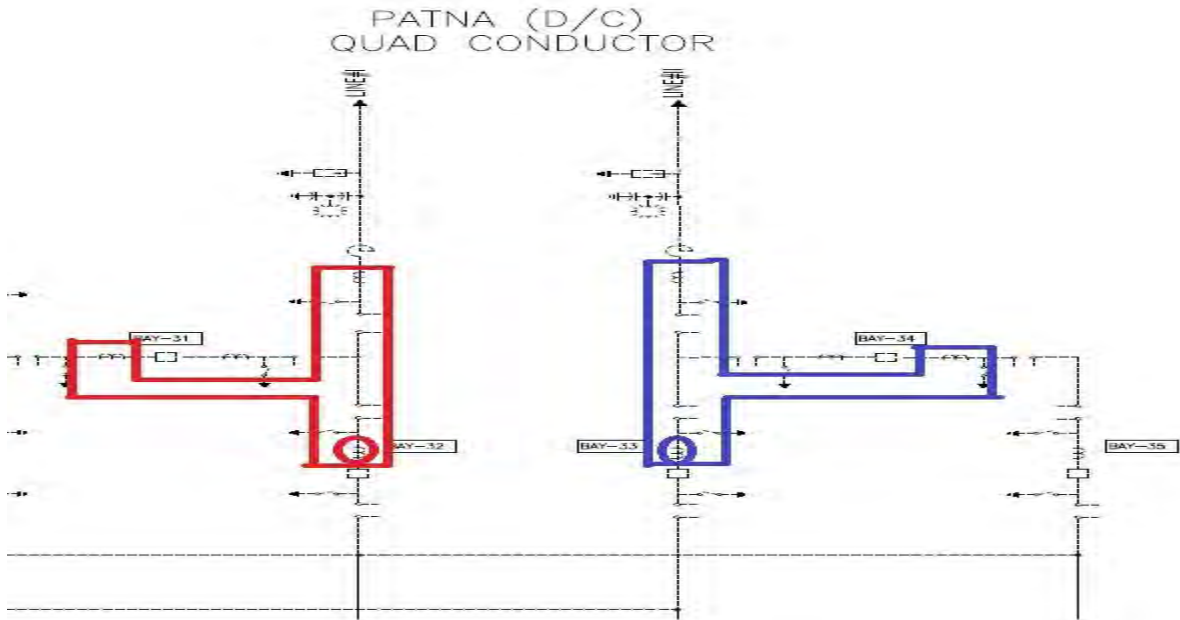
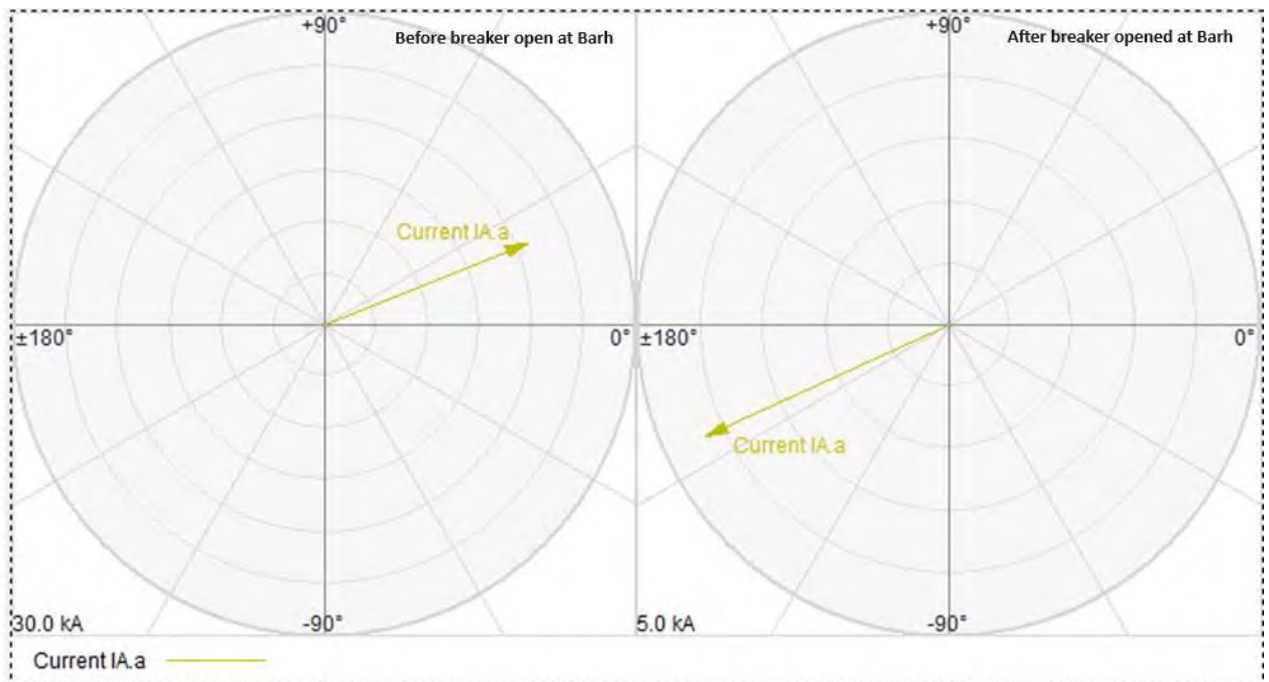


Figure 3: Fault in Barh Switchyard & operation of TEED

- At 04:41:06.520 Hrs, R\_ph CT of Main Bay of 400 kV Barh-Patna-1 at Barh damaged leading to operation of Bus bar protection of Bus-3 at Barh and operation of Teed protection of the bay. Consequently, all breakers connected to 400 kV Bus-3 tripped.
- However, during teed operation of this bay, DT was not received at remote end immediately and since fault was in CT, remote end continued feeding the fault which can be confirmed by reversal of current direction as in below figure at Barh end. LBB signal got high at Barh, however all breakers already opened on bus bar protection. After 350 msec, DT was received at Patna and all three phases at Patna opened. Barh may confirm when DT was sent and the reason for delay in DT receipt may be examined.

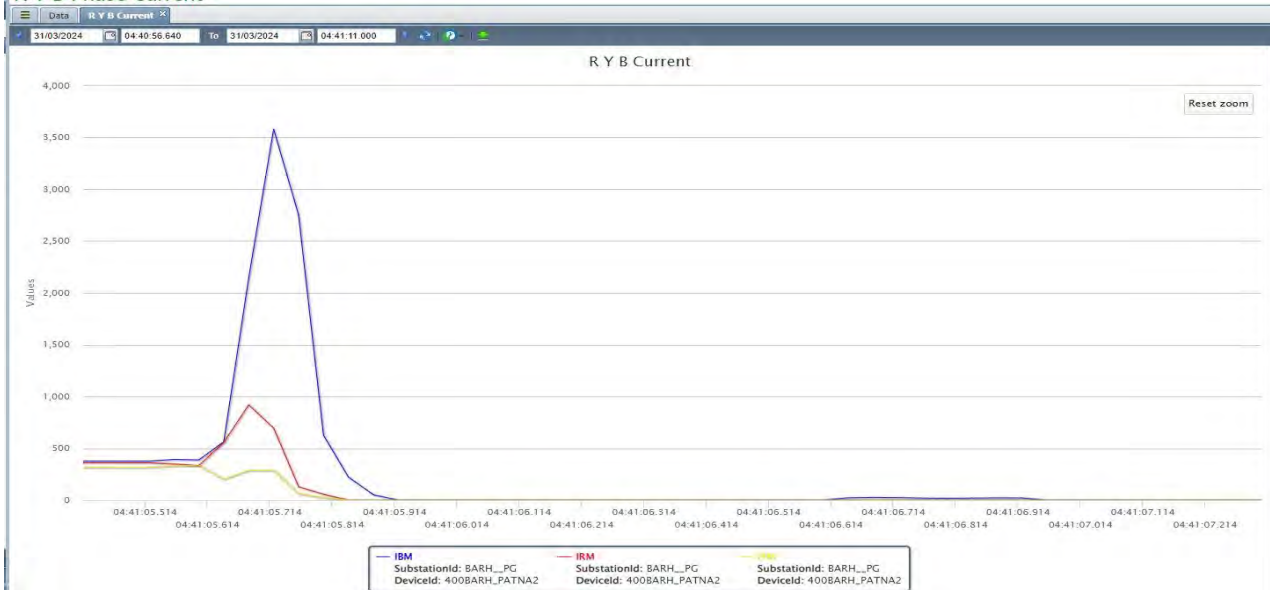


**Figure 4:R\_ph current of 400 kV Barh-Patna-1 at Barh (Pre and Post opening of breaker at Barh)**

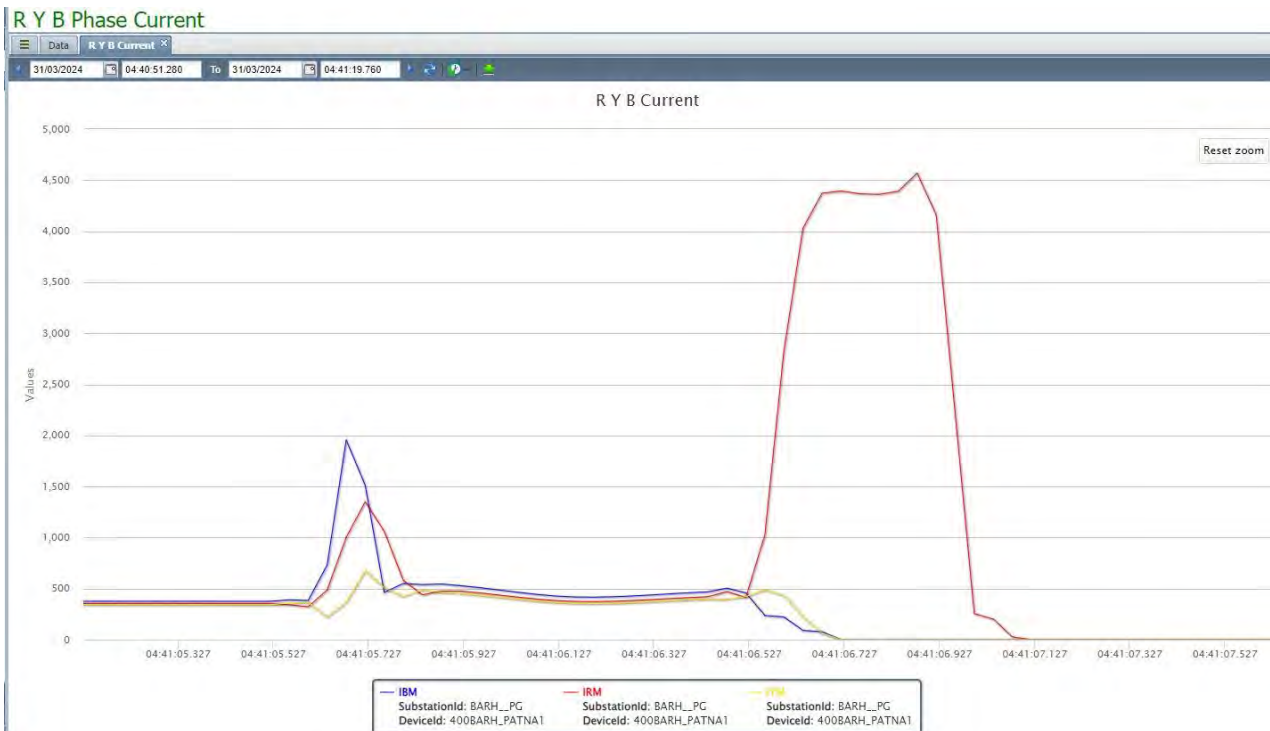
- 400 kV Barh-Kahalgaon-1(from Barh only), 400 kV Barh-Motihari-1, U#4 and U#5 tripped.
- During fault in 400 kV Barh-Patna-1, 400 KV Barh-Kahalgaon-2 tripped from Kahalgaon. Reason for the same may be explained by NTPC.
- The dia with 400 kV Kahalgaon-2 and Motihari-2 remained charged from Motihari with tie bay being closed at Barh. Both lines later tripped at 04:41:11.600 on O/V St.1.
- Root cause analysis of failure of the 2 CTs may be done at the earliest.



### PMU Snapshot: R Y B Phase Current

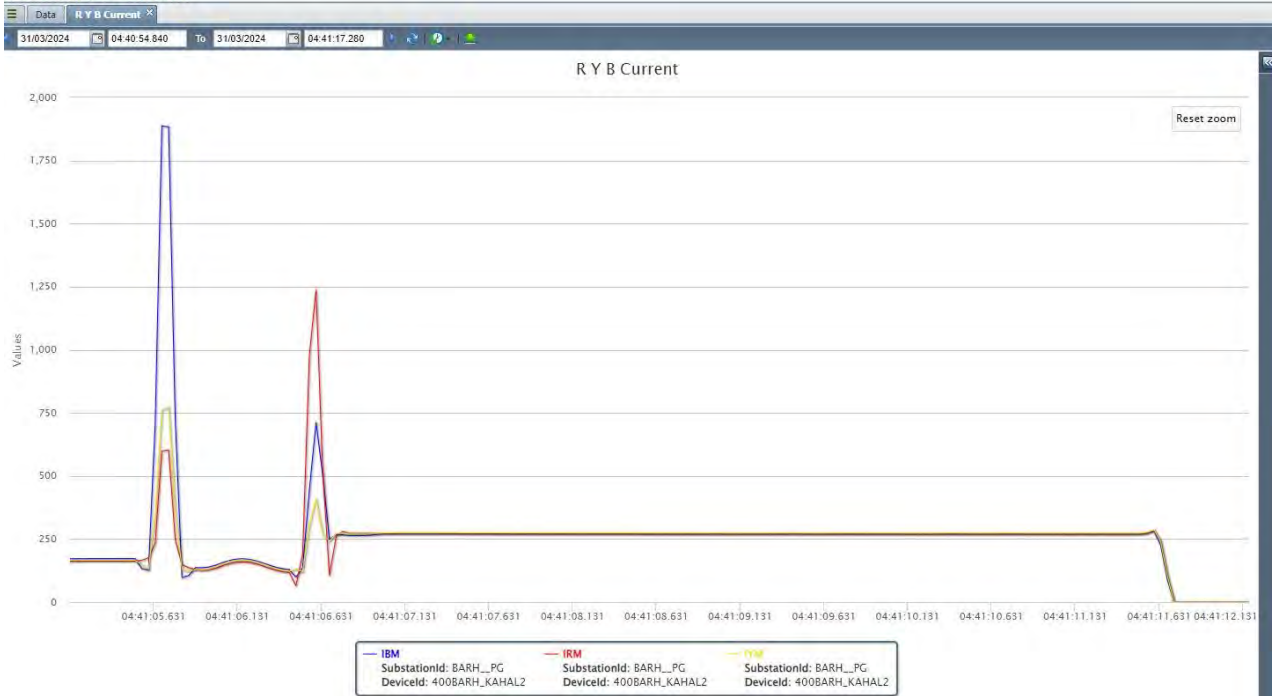


**Figure 5 : PMU Current snapshot of 400 KV Barh-Patna-2 at Barh**

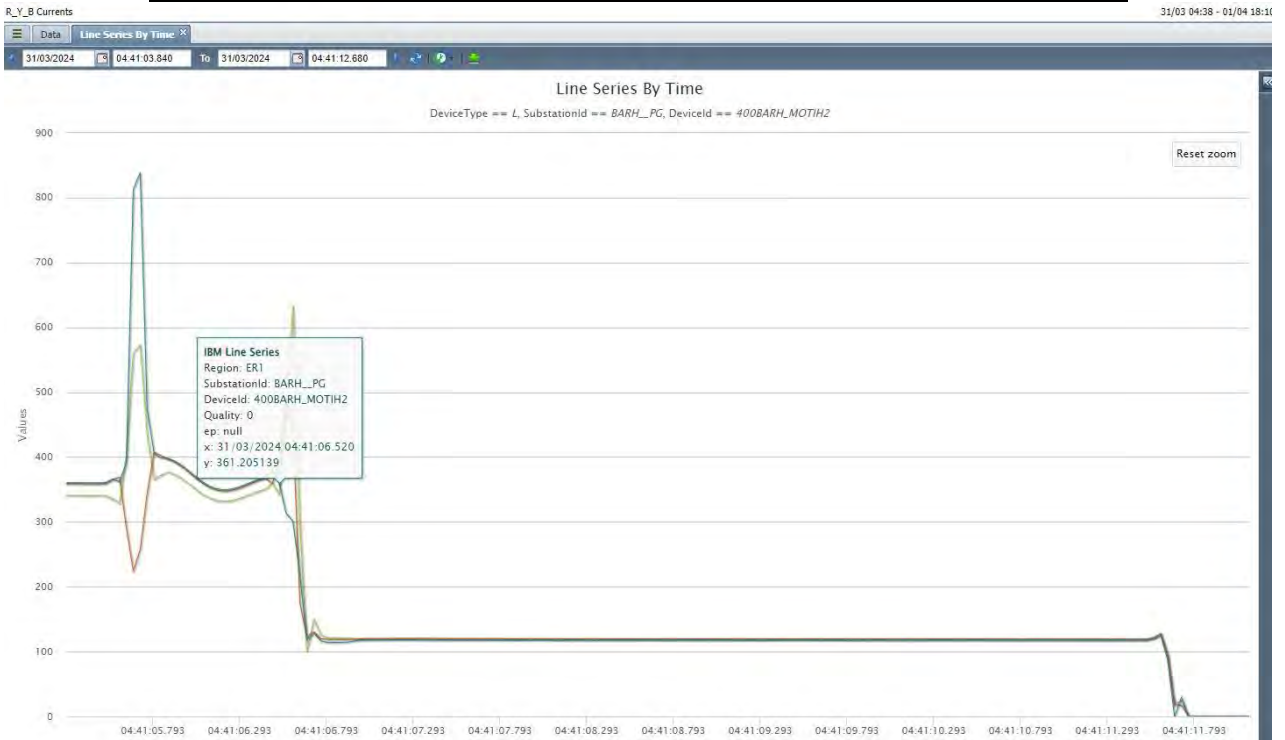


**Figure 6: PMU Current snapshot of 400 KV Barh-Patna-1 at Barh**

### R Y B Phase Current



**Figure 7: PMU Current snapshot of 400 KV Barh-Kahalgaon-2 at Barh**



**Figure 8: PMU Current snapshot of 400 KV Barh-Motihari-2 at Barh**

**13. Protection/Operational issues observed (सुरक्षा/परिचालन संबंधी समस्या):**

- Delayed DT receipt is suspected for 400 kV Barh-Patna-1 after TEED operation. Reason for the same may be examined.
- 400 kV Barh-Kahalgaon-2 tripped from Kahalgaon end during bus bar operation at Barh end. It is in separate dia and shouldn't have tripped from Kahalgaon. NTPC may explain.
- DR from NTPC Kahalgaon is yet to be received.
- Detailed report from Barh is also awaited.

**14. Action Taken/Remedial Measures (सुधारात्मक उपाय):**

- Root cause analysis of CT failure may be done and possibility of avoiding such failure may be explored.

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

S.No.	Issues	Regulation Non-Compliance	Utilities
1.	DR/EL not provided within 24 Hours	1. IEGC section 37.2 (c) 2. CEA grid Standard 15.3	NTPC Barh, PG ER-1, DMTCL, NTPC Kahalgaon
2.	Submission of detailed report by user	1. IEGC section 37.2 (f)	NTPC Barh

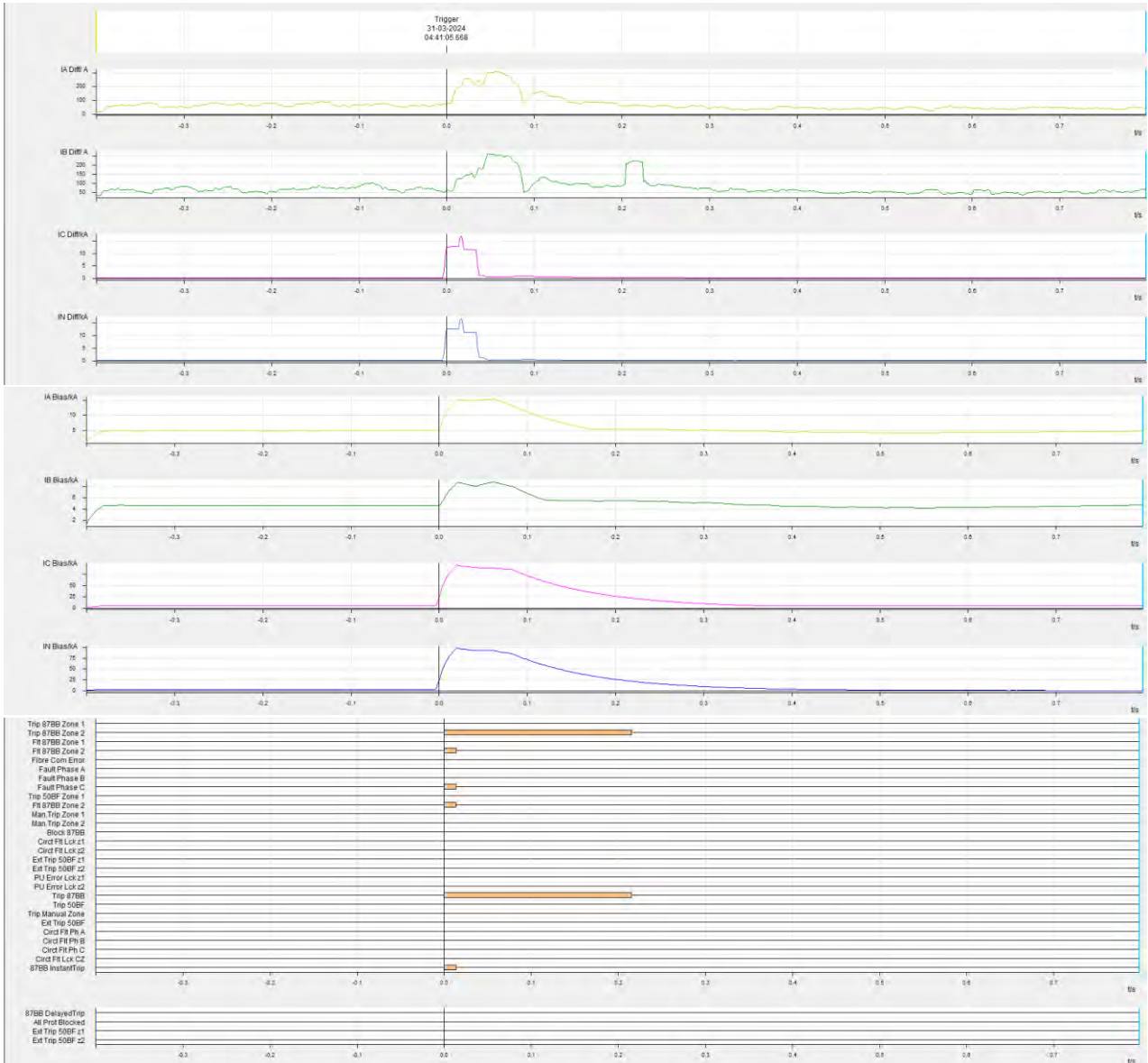
**16. Key Lessons Learnt (प्रमुख अधिगम बिंदु): Nil**

**Annexure 1: (Sequence of Events-As per ERLDC SCADA)**

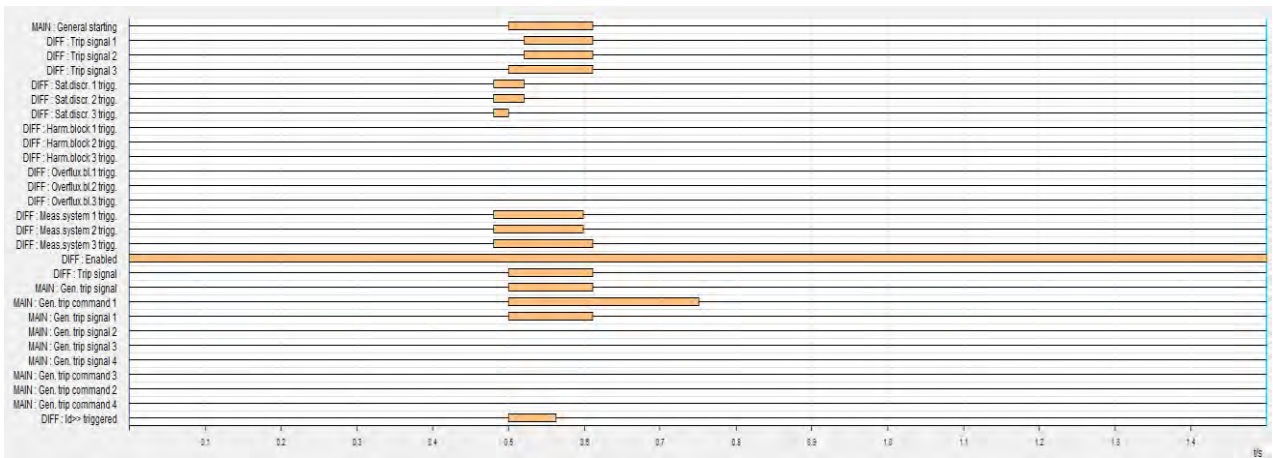
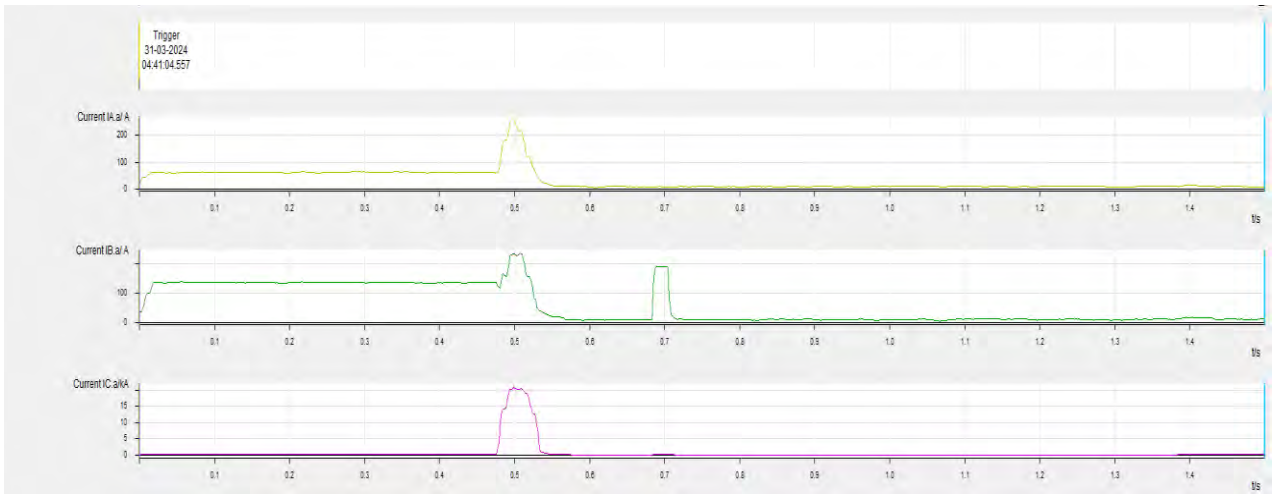
TIMESTAMP	STATION	DESCRIPTION	STATUS
04:41:05.754	PATNA_PG	400_BALIA_NR_1_BARH_PG_2_Tie	Open
04:41:05.759	PATNA_PG	400_BARH_PG_2_Main_CB	Open
04:41:05.764	PATNA_PG	400_BARH_PG_2_R_CB	Open
04:41:06.662	MOTIH_PG	400_BARH_PG_1_Main_CB	Open
04:41:06.666	MOTIH_PG	400_BARH_PG_1_R2_Tie	Open
04:41:06.673	MOTIH_PG	400_BARH_PG_1_R_CB	Open
04:41:06.957	PATNA_PG	400_BARH_PG_1_Main_CB	Open
04:41:06.958	PATNA_PG	400_BALIA_NR_2_BARH_PG_1_Tie	Open
04:41:06.966	PATNA_PG	400_BARH_PG_1_R_CB	Open
04:41:11.720	MOTIH_PG	400_BARH_PG_2_Main_CB	Open
04:41:11.724	MOTIH_PG	400_BARH_PG_2_R1_Tie	Open
04:41:11.725	MOTIH_PG	400_BARH_PG_2_R_CB	Open

# Annexure 2:

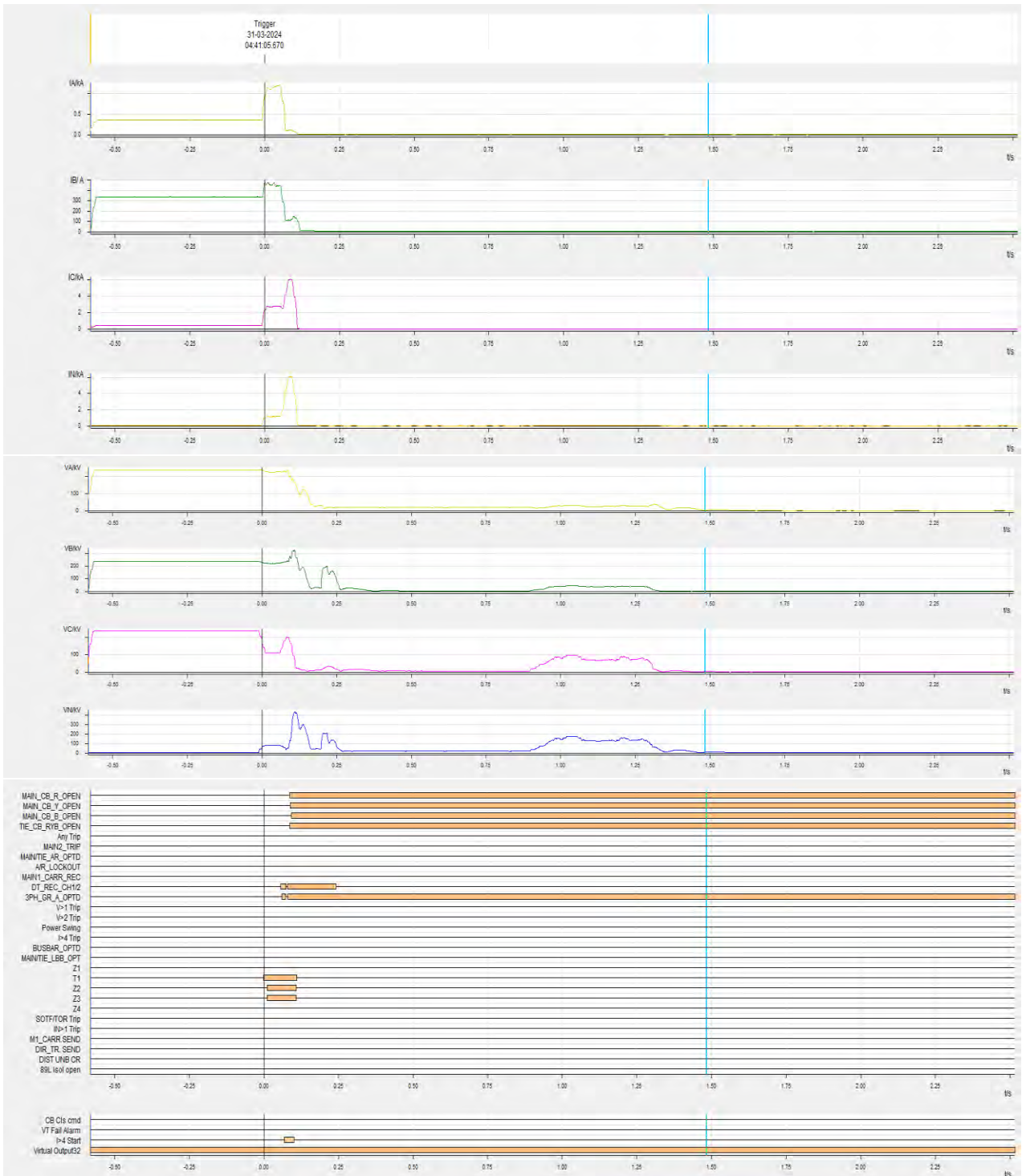
## DR of 400 kV Bus-4 at Barh (Differential)



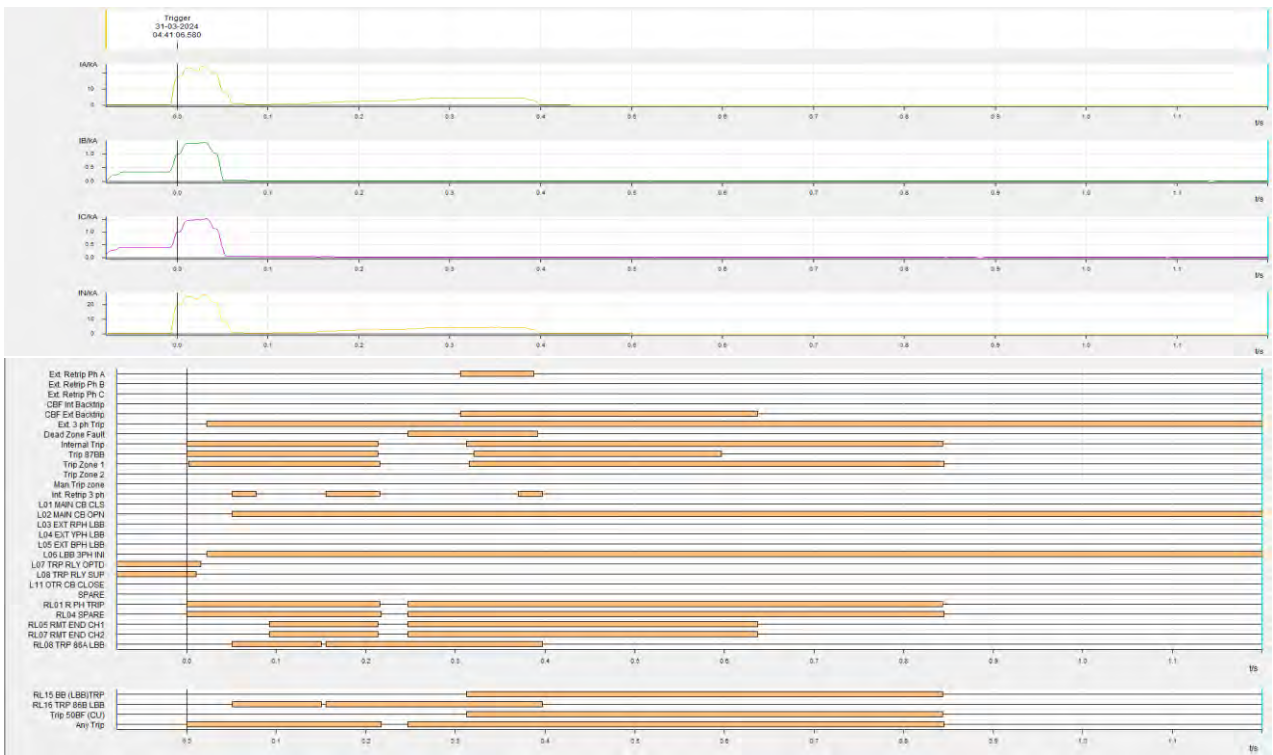
# DR of Teed operation of 400 kV Barh-Patna-2 main bay at Barh



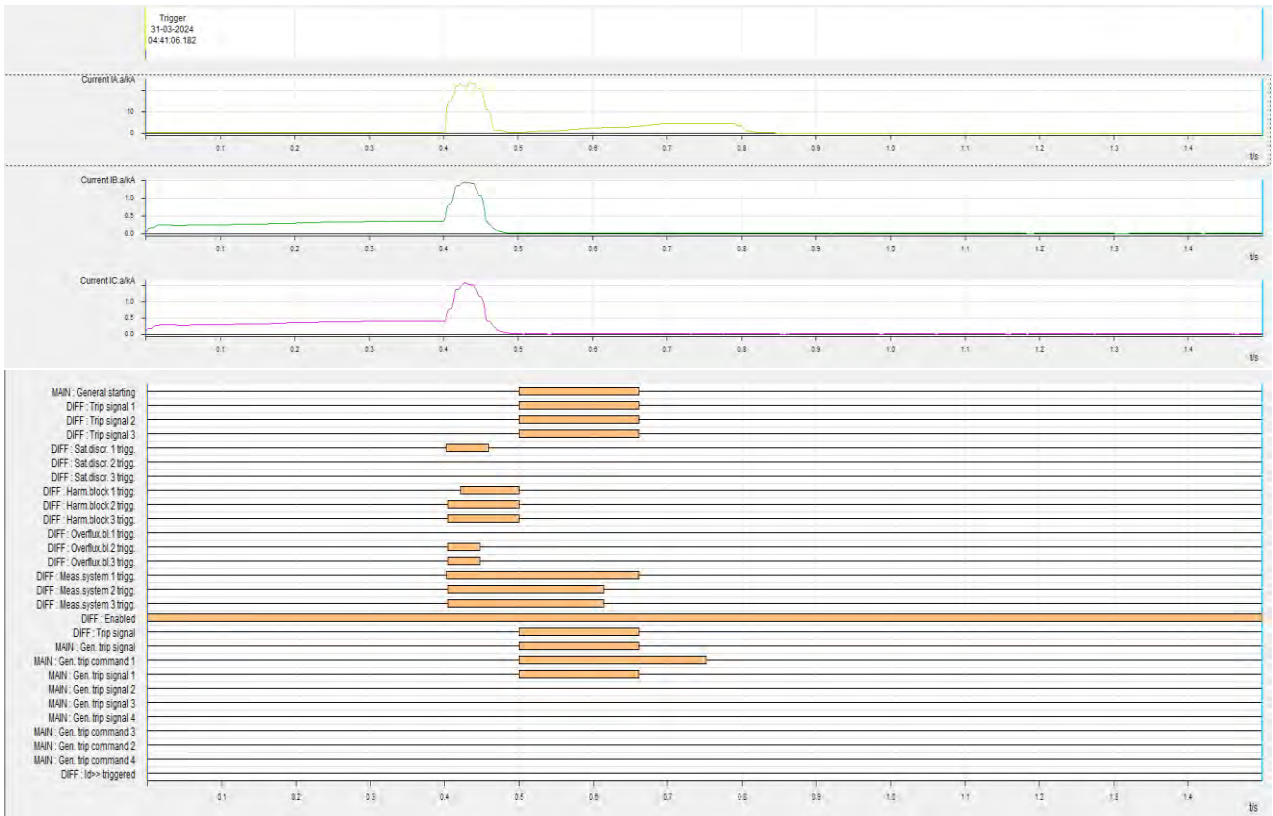
# DR of 400 kV Barh-Patna-2 (Patna)



## DR of 400 kV Barh-Patna-1 at Barh (Bus bar differential for 400 kV Bus-3)

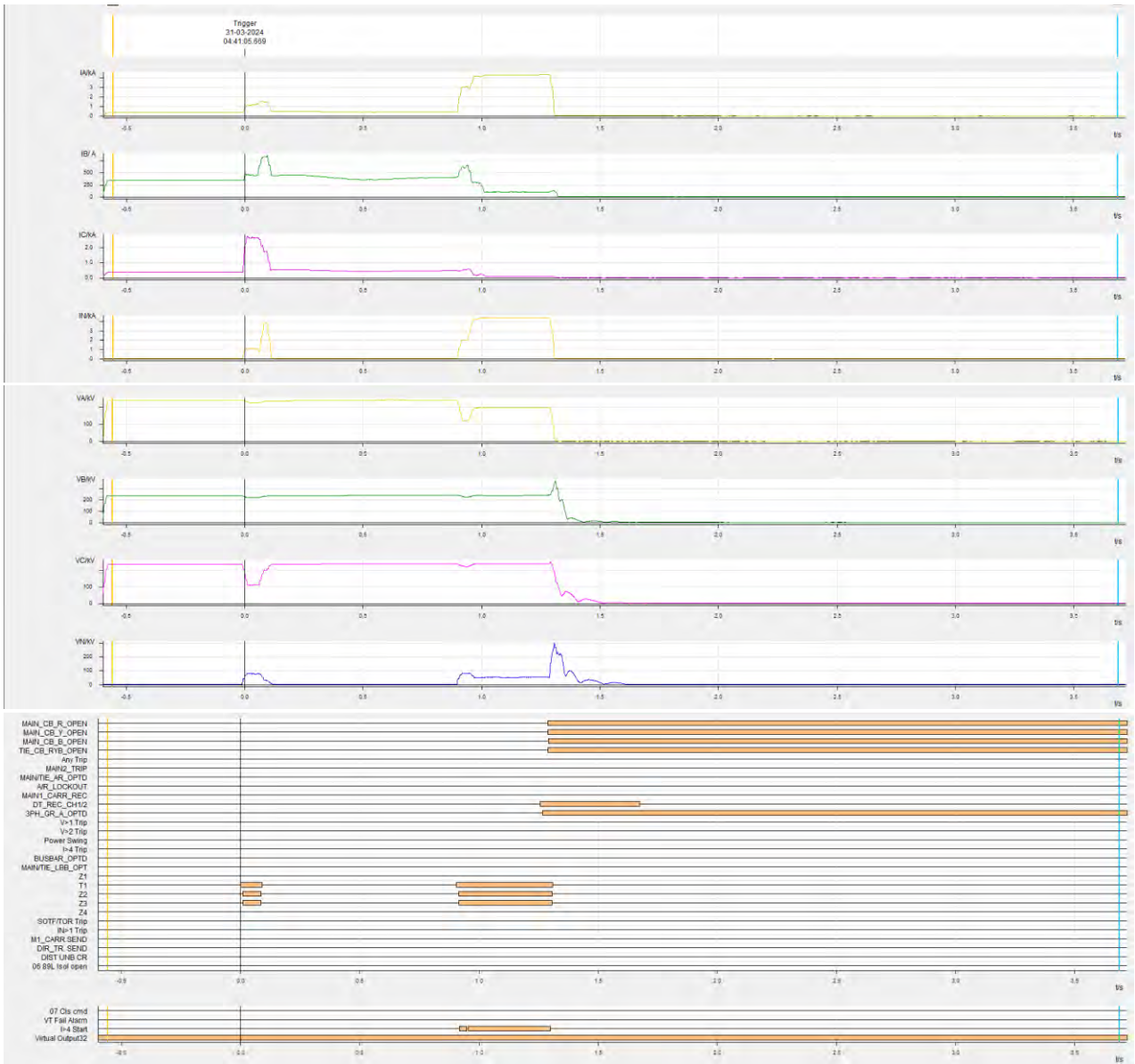


## DR of Teed operation of 400 kV Barh-Patna-1 main bay at Barh

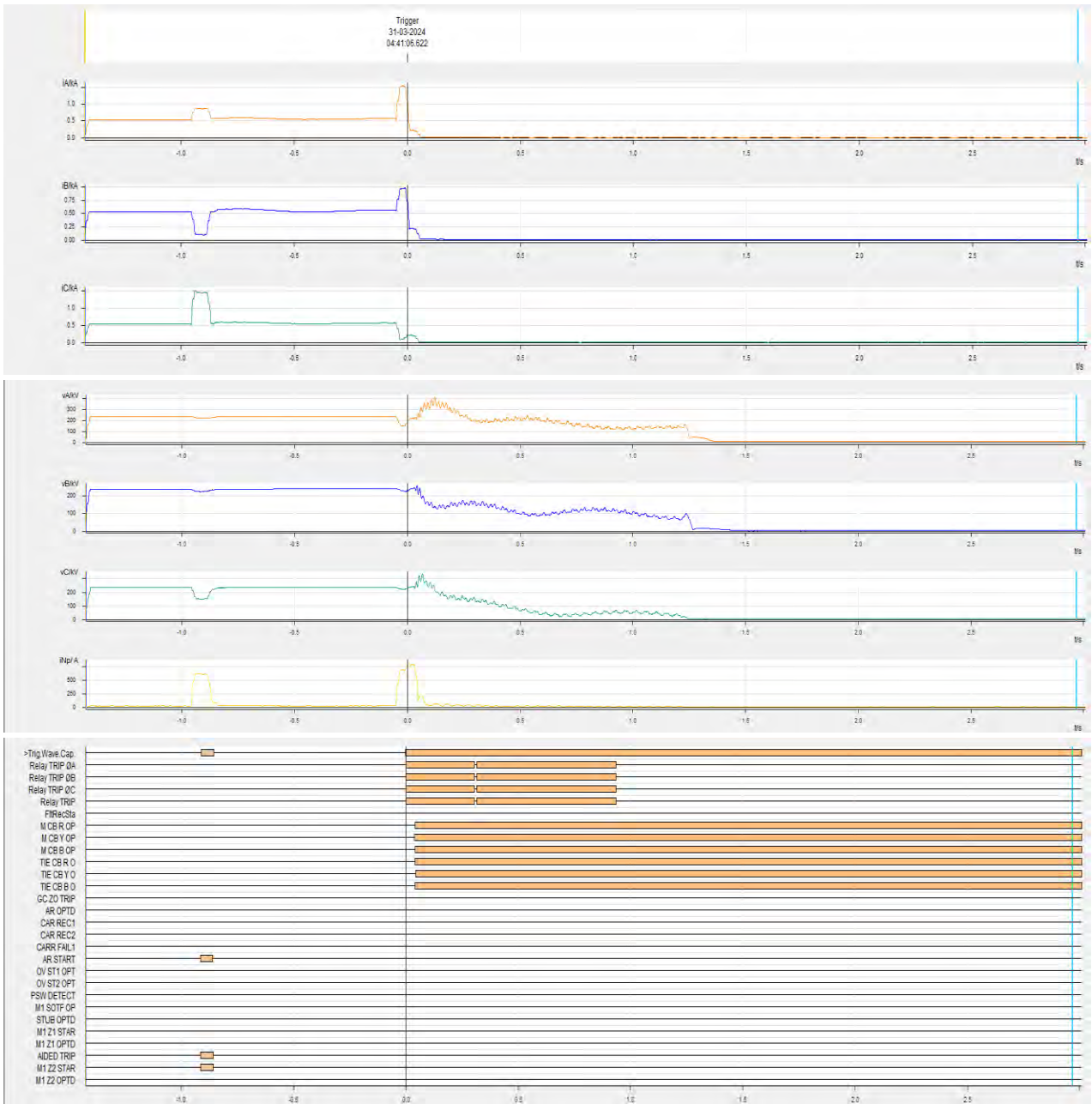




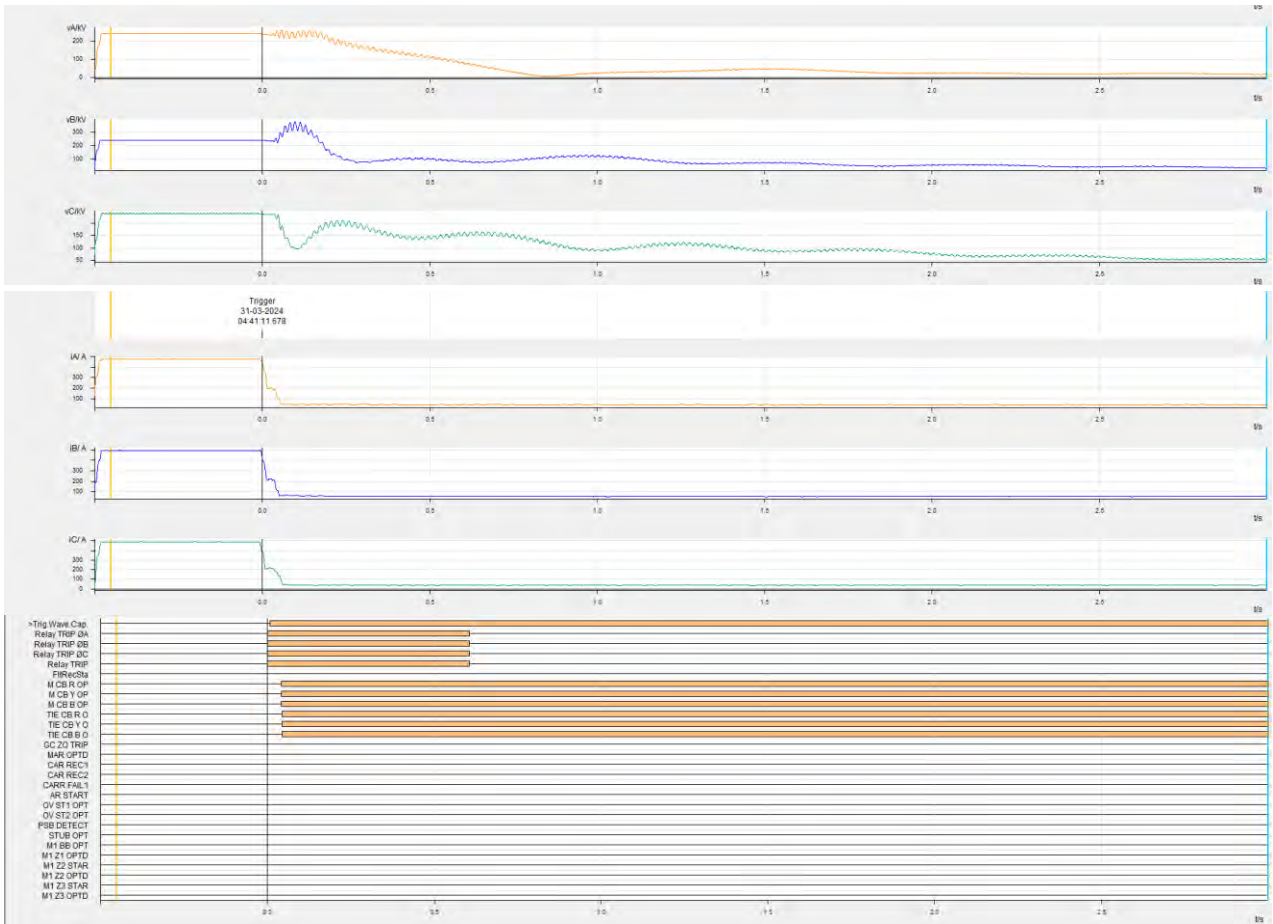
# DR of 400 kV Barh-Patna-1 (Patna)



# DR of 400 kV Barh-Motihari-1 (Motihari)



# DR of 400 kV Barh-Motihari-2 (Motihari)





ग्रिड कंट्रोलर ऑफ इंडिया लिमिटेड  
(भारत सरकार का उद्यम)  
GRID CONTROLLER OF INDIA LIMITED  
(A Government of India Enterprise)



[formerly Power System Operation Corporation Limited (POSOCO)]

पूर्वी क्षेत्रीय भार प्रेषण केन्द्र / Eastern Regional Load Despatch Centre

कार्यालय : 14, गोल्फ क्लब रोड, टॉलिंगंज, कोलकाता - 700033  
Office : 14, Golf Club Road, Tollygunge, Kolkata - 700033

CIN : U40105DL2009GOI188682, Website : www.erlhc.in, E-mail : erlhcinfo@grid-india.in, Tel.: 033 23890060/0061

## ग्रिड घटना की विस्तृत रिपोर्ट 220 केवी गढ़वा (न्यू) पूर्वी क्षेत्र का सबस्टेशन / Detailed Report of grid event 220 kV Garhwa (New) Substation of Eastern Region

(To be submitted by ERLDC/NLDC during Grid Disturbances/Grid Incidents/Near Miss Event as per IEGC section 37.2 (f))  
(आई ई जी सी 37.2 (एफ) के अनुपालन में)

Date(दिनांक):10-04-2024

### 1. Event Summary (घटना का सारांश):

At 22:27 Hrs on 30.03.2024, 220 kV Daltonganj – Garhwa(New) D/C tripped due to consecutive B\_N fault leading to complete power failure at 220 kV Garhwa(New) S/s with a load loss of around 80 MW. As per SLDC Jharkhand, the lines tripped due to inclement weather conditions in the area.

### 2. Time and Date of the Event (घटना का समय और दिनांक): 22:27 hrs of 30.03.2024

### 3. Event Category (ग्रिड घटना का प्रकार): Grid Disturbance (GD)-1

### 4. Location/Control Area (स्थान/नियंत्रण क्षेत्र): Jharkhand

### 5. Name of the Substation/Generating Station/Pooling Station Affected (सब-स्टेशन का नाम):

(Along with LV/HV voltage level): 220 kV Garhwa (New) Substation

### 6. Report submitted by Utility on: 08.04.2024

### 7. Antecedent Conditions (पूर्ववर्ती स्थिति):

	Frequency	Regional Generation	Regional Demand	State Generation	State Demand
				Jharkhand	Jharkhand
Pre-Event (घटना पूर्व)	50.01 Hz	31097 MW	26025 MW	321 MW	1543 MW
Post Event (घटना के बाद)	50.01 Hz	31097 MW	25945 MW	321 MW	1463 MW

\*Pre and post data of 1 minute before and after the event

Important Transmission Line/Unit if under outage (महत्वपूर्ण संचरण लाइने/ विद्युत उत्पादन इकाइयां जो बंद हैं)	NIL
Weather Condition (मौसम स्थिति)	Severe dust storms and gusty winds

### 8. Load and Generation loss (लोड और जेनरेशन हानि): Approximate load loss of 80 MW and Generation loss is nil.

### 9. Duration of interruption (रूकावट की अवधि): 22:27 hrs to 23:35 hrs.

10. Details of Equipment Failure (if any during the event) (उपकरण विफलता का विवरण): Tower damaged at loc. 198.

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

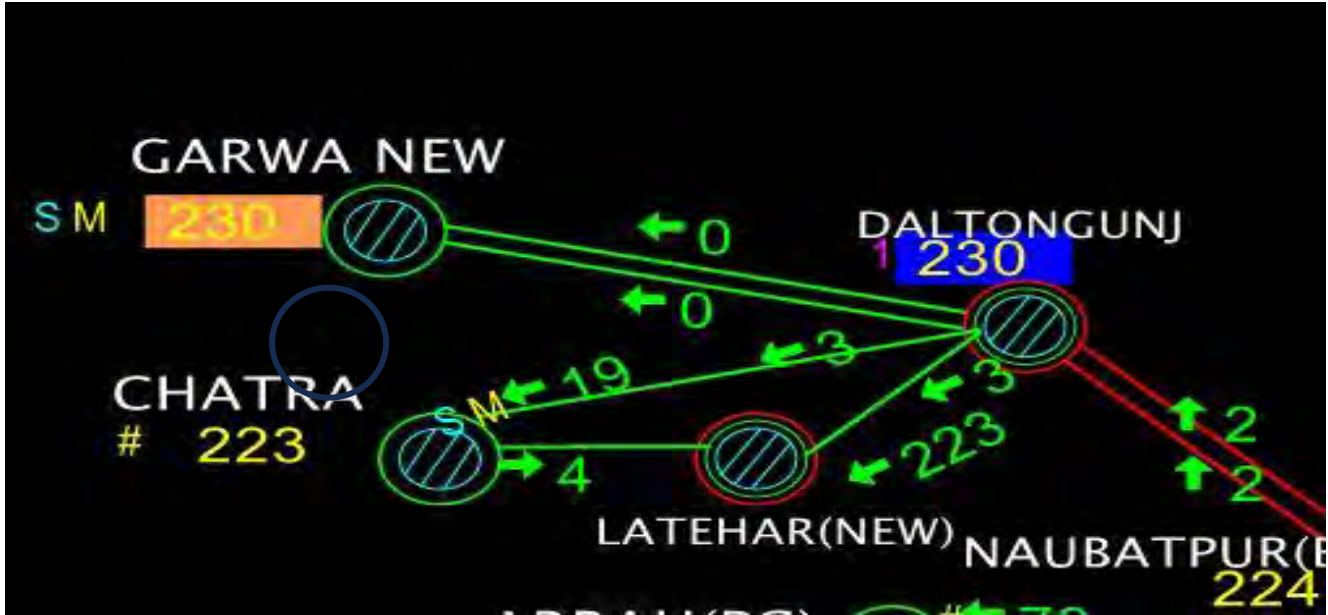


Figure 1: Network across the affected area

12. Transmission/Generation element Tripped during the event (संचरण लाइन / विद्युत उत्पादन इकाई जो घटना के दौरान बंद हो गयी):

क्र०स०	नाम	Trip time (hh:mm:ss)	उप केंद्र 1 रिले संकेत	उप केंद्र 2 रिले संकेत	Restoration time
1	220 kV Daltonganj-Garhwa (New)-1	22:27:50	Daltonganj: B_N, 36 km, 2.26 kA	Garhwa: B_N, 58.271 km	23:34
2	220 kV Daltonganj-Garhwa (New)-2	22:27:02	Daltonganj: B_N, 35.4 km, 2.27 kA	Garhwa: B_N, 0.6 kA, 148.645 km	Not restored yet.

### 13. Event Analysis (Based on PMU, SCADA & DR) (घटना का विश्लेषण):

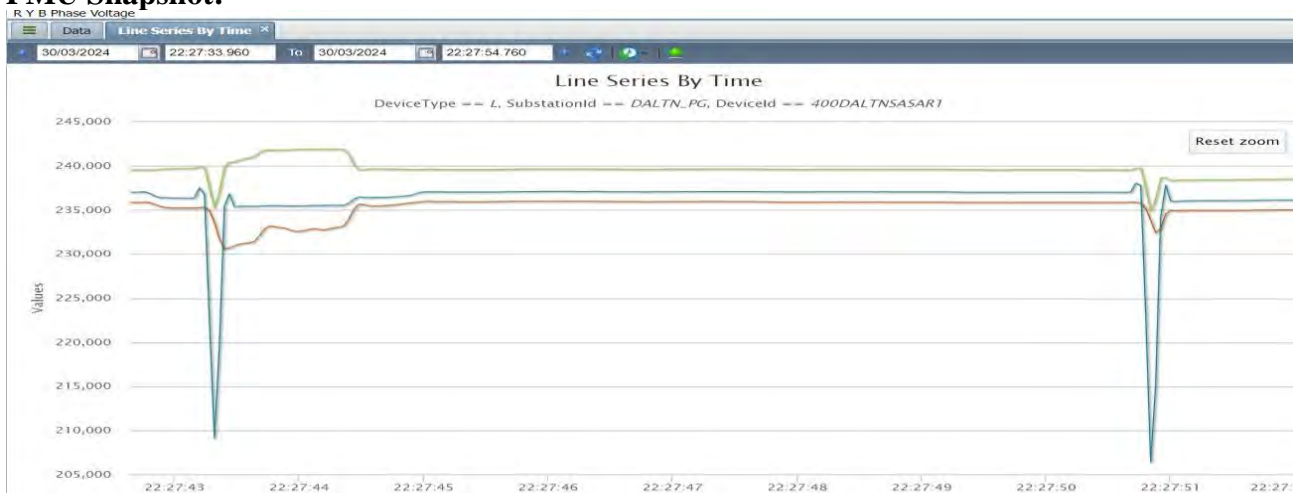
- At 22:27:02 Hrs, 220 kV Daltonganj-Garhwa-2 tripped due to B\_N fault. A/r was successful from both ends. After 600 msec, line tripped again and three phase opened at both ends.



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

- At 22:27:43 Hrs, 220 kV Daltonganj-Garhwa-1 tripped due to B\_N fault. Line tripped from Daltonganj end only. From DR of Garhwa, it seems that no breaker opened at Garhwa. Whether bus bar protection is available at Garhwa. JUSNL may confirm.
- A/r was successful from Daltonganj after 1 second. However, line tripped again within reclaim time after 7 seconds.

#### PMU Snapshot:



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

**14. Protection/Operational issues observed (सुरक्षा/परिचालन संबंधी समस्या):**

- Breaker of faulty phase of 220 kV Daltonganj-Garhwa-1 didn't open despite getting trip command. Reason for the same may be ascertained.

**15. Action Taken/Remedial Measures (सुधारात्मक उपाय): Nil**

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

S.No.	Issues	Regulation Non-Compliance	Utilities
1.	DR/EL not provided within 24 Hours	1. IEGC section 37.2 (c) 2. CEA grid Standard 15.3	JUSNL, PG ER-1

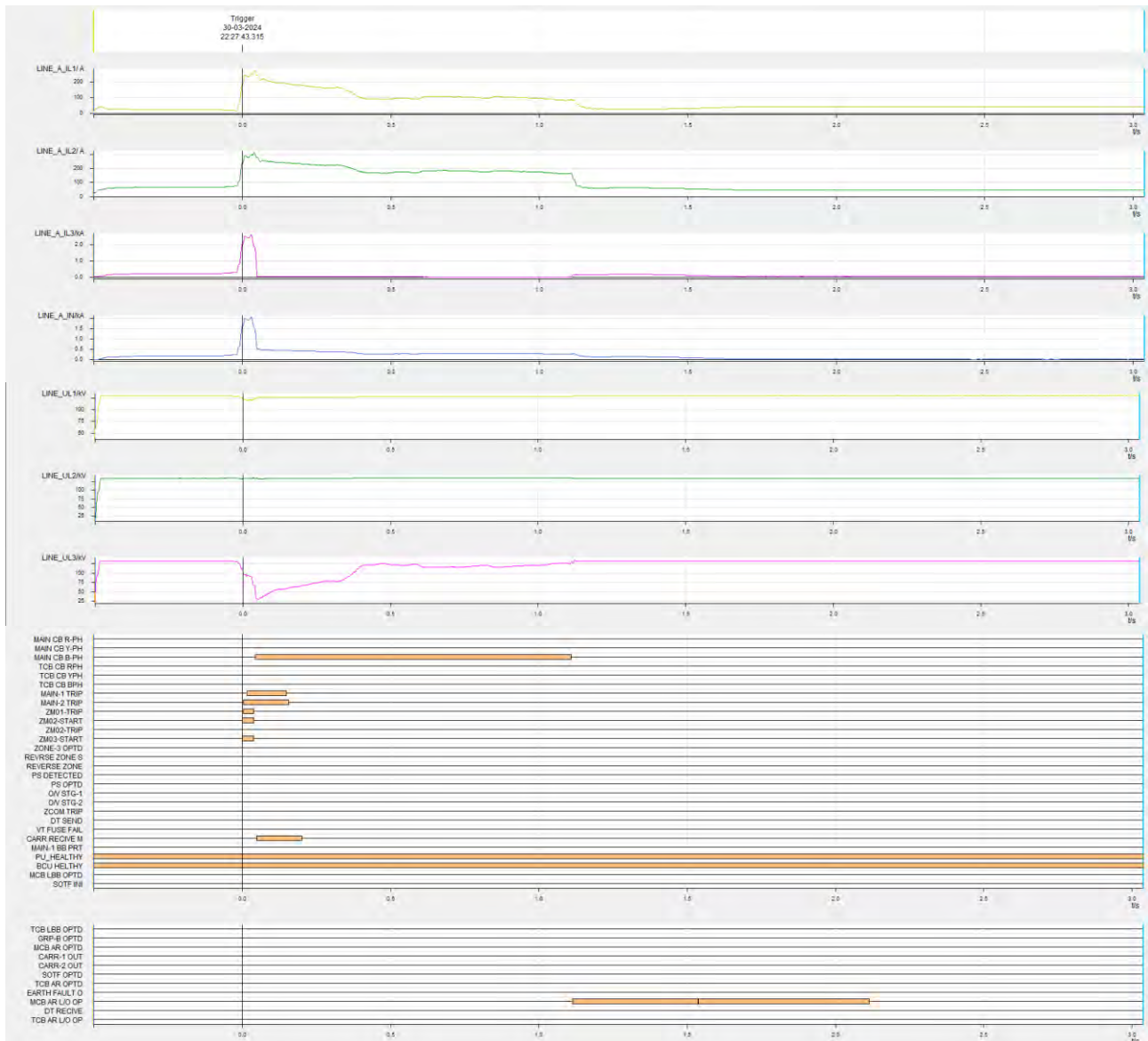
**17. Key Lessons Learnt (प्रमुख अधिगम बिंदु): Nil**

### Annexure 1: (Sequence of Events-As per ERLDC SCADA)

TIMESTAMP	STATION	DESCRIPTION	STATUS
22:27:03.024	DALTN_PG	220_GARHWA_2_CB	Travel
22:27:04.104	DALTN_PG	220_GARHWA_2_CB	Closed
22:27:04.694	DALTN_PG	220_GARHWA_2_CB	Open
22:27:43.346	DALTN_PG	220_GARHWA_1_CB	Travel
22:27:44.424	DALTN_PG	220_GARHWA_1_CB	Closed
22:27:50.912	DALTN_PG	220_GARHWA_1_CB	Open

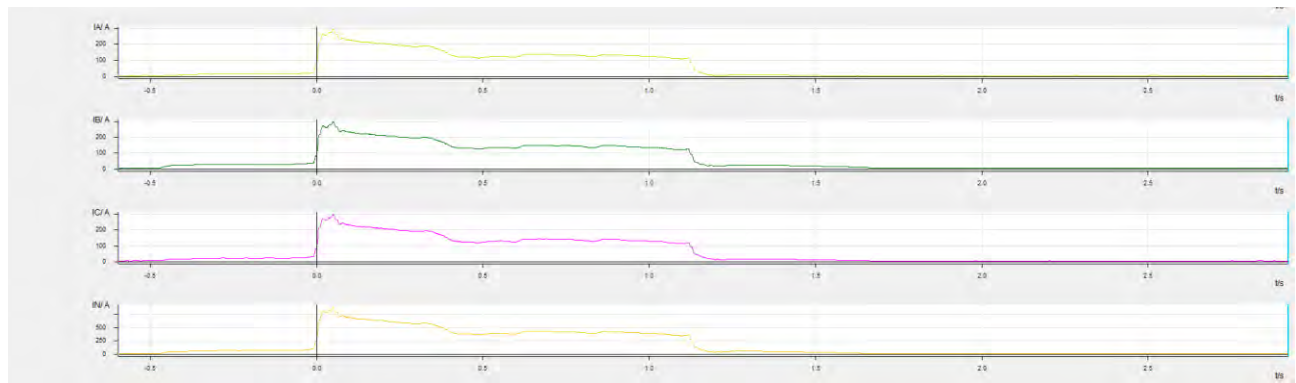
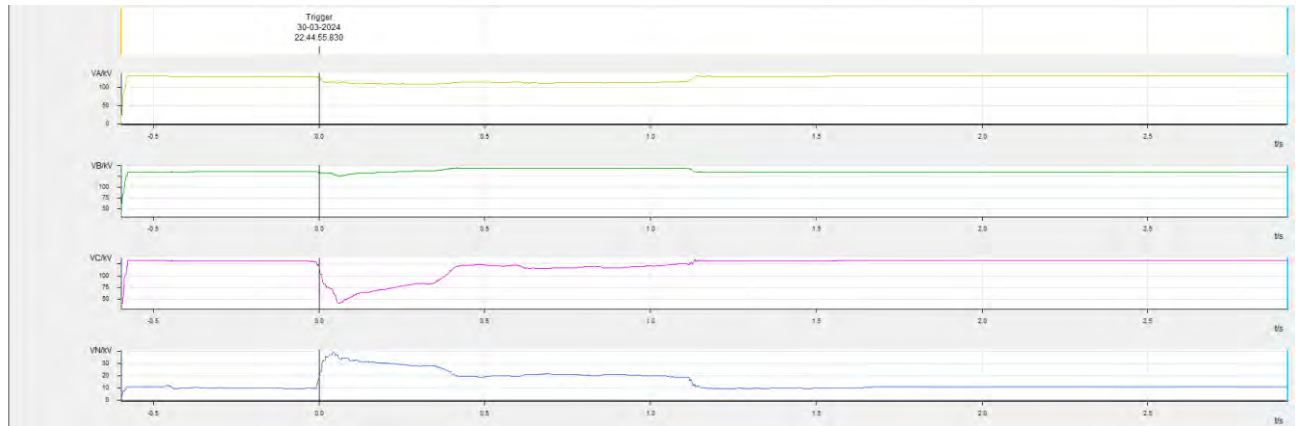
### Annexure 2:

#### DR of 220 kV Daltonganj-Garhwa-1 (Daltonganj)-1<sup>st</sup> instance

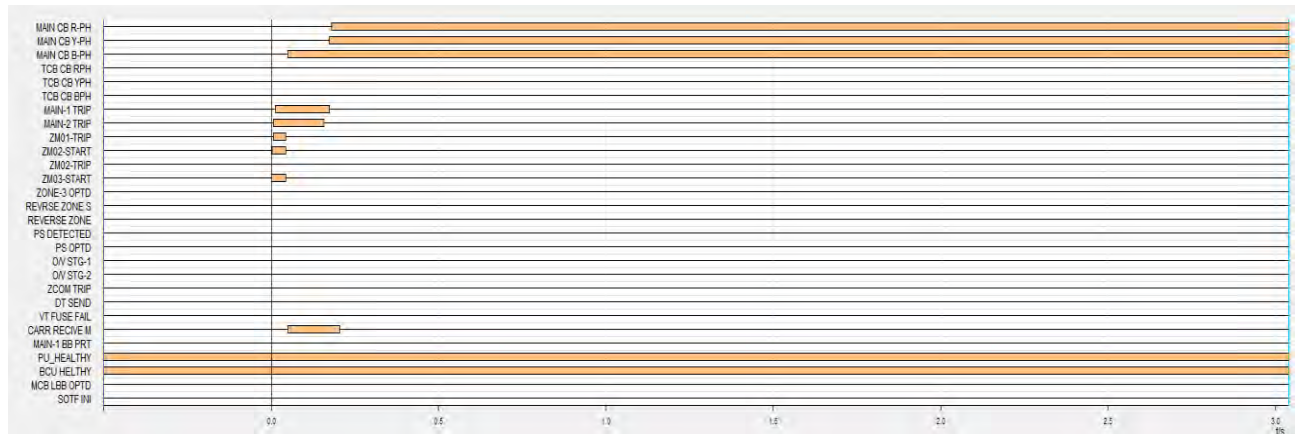
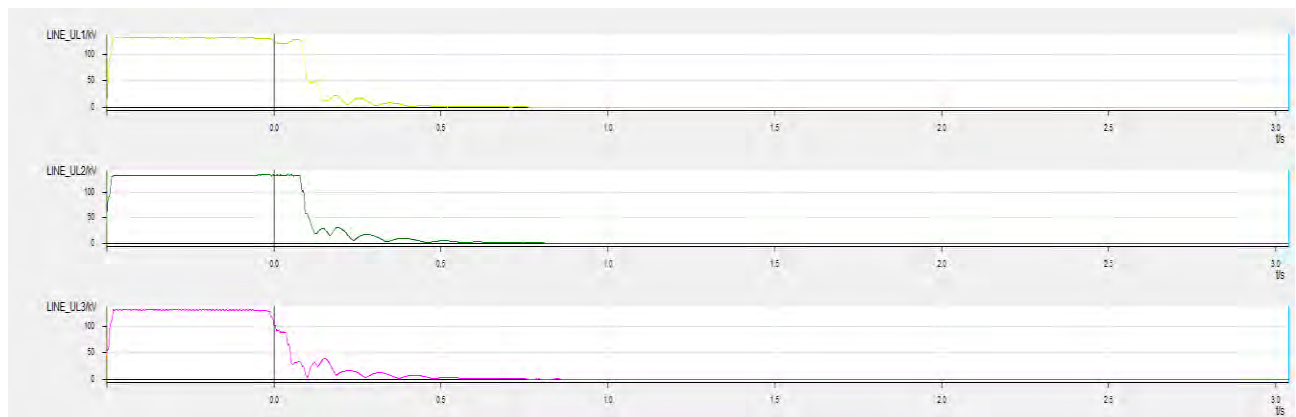
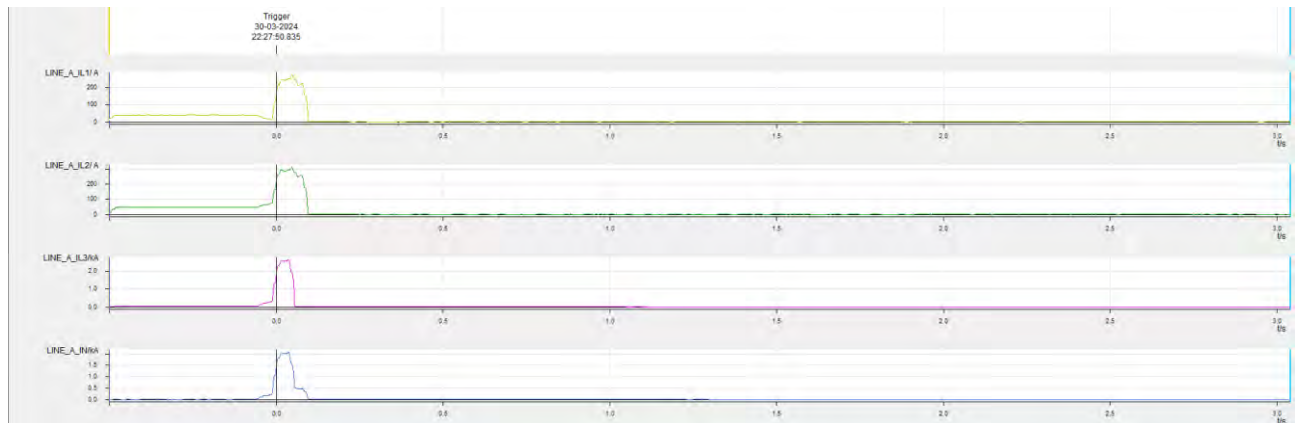




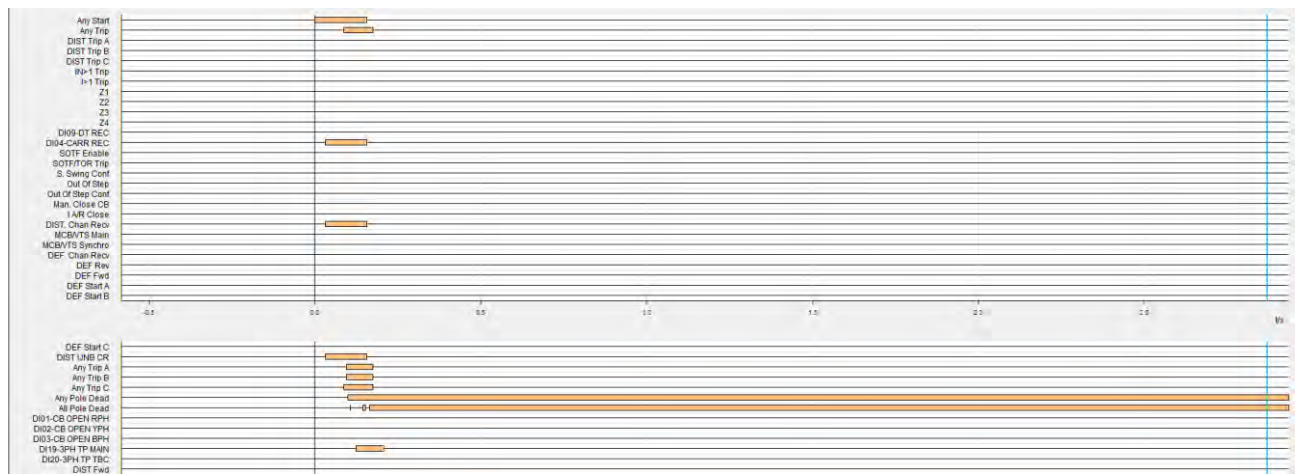
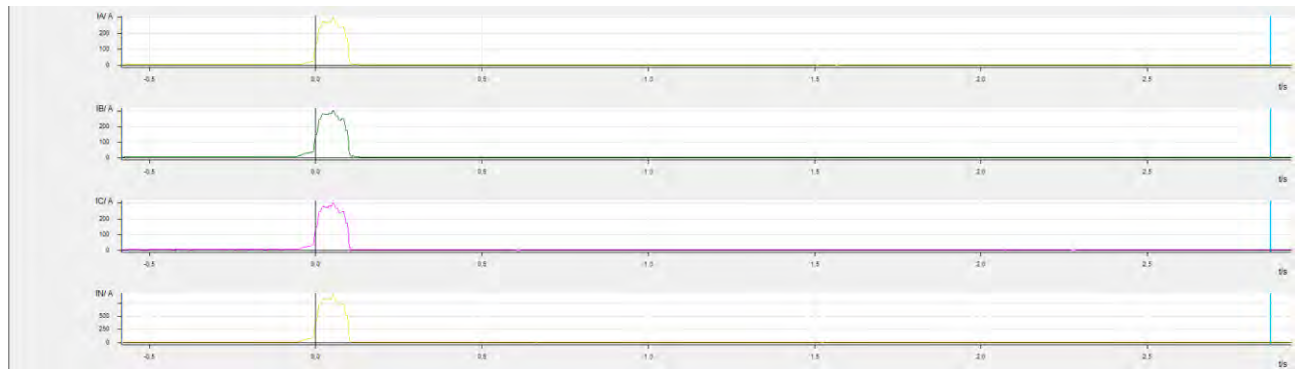
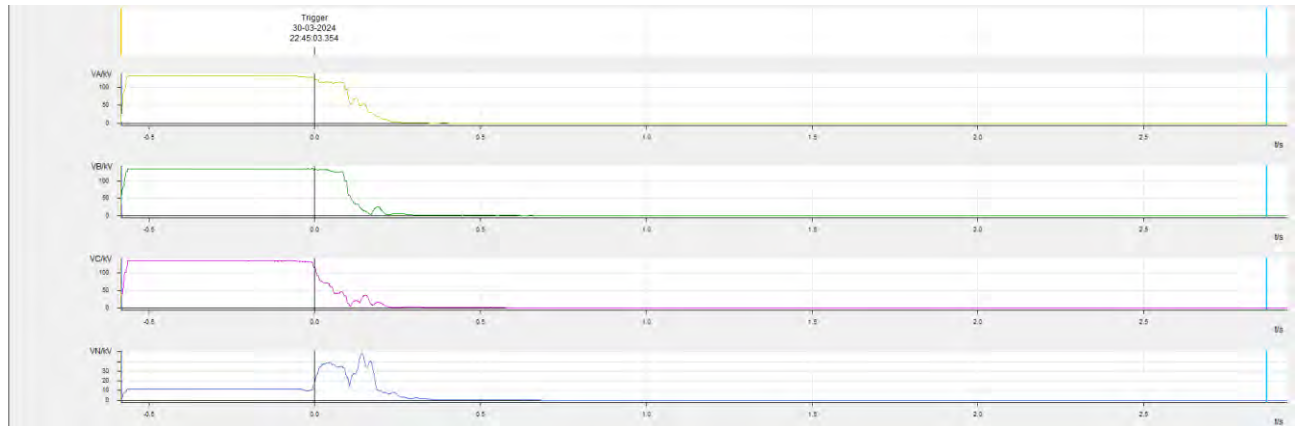
# DR of 220 kV Daltonganj-Garhwa-1 (Garhwa)-1<sup>st</sup> instance.



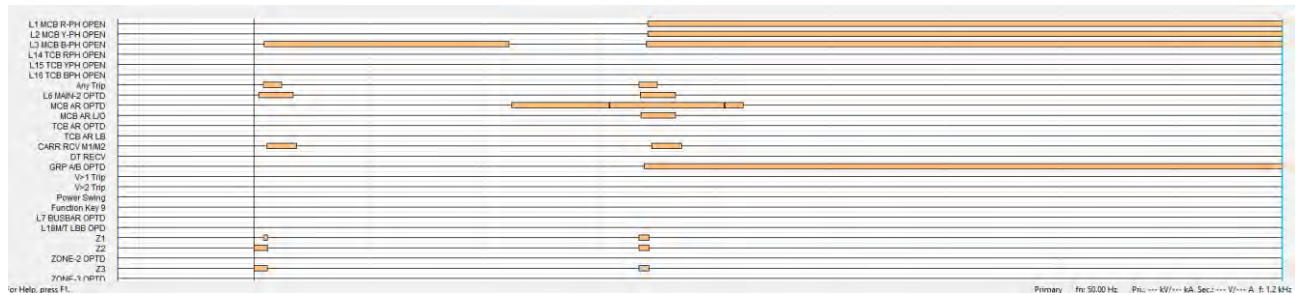
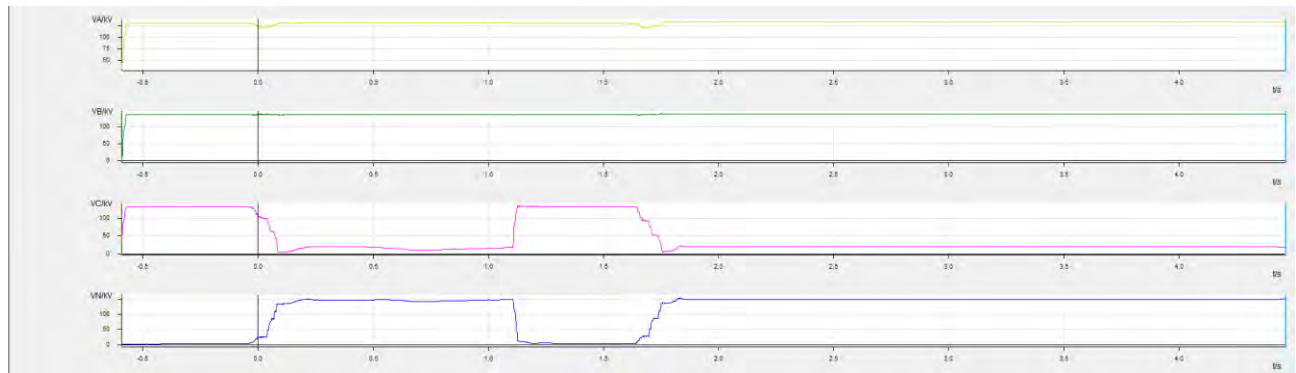
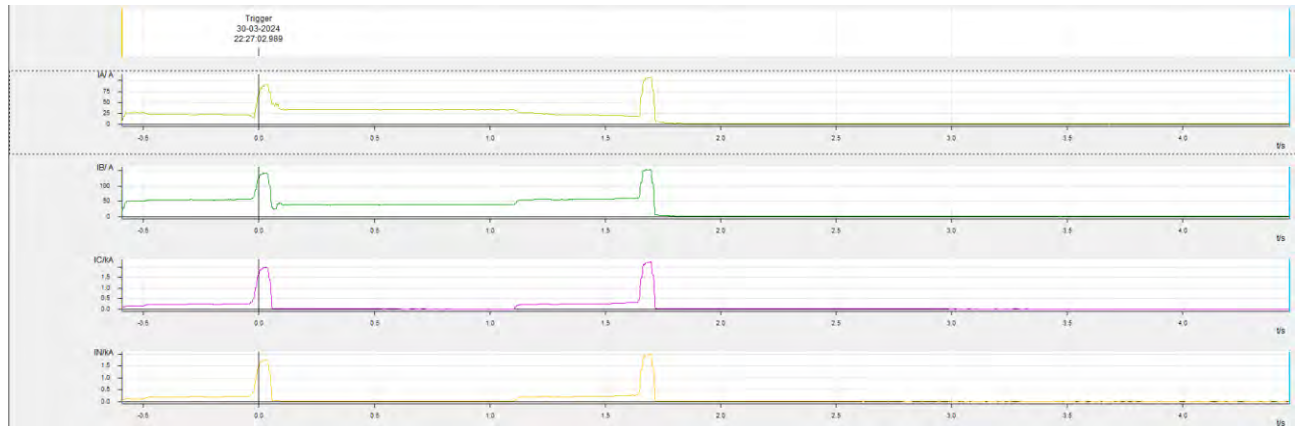
## DR of 220 kV Daltonganj-Garhwa-1 (Daltonganj)-2<sup>nd</sup> instance (Reclaim time)



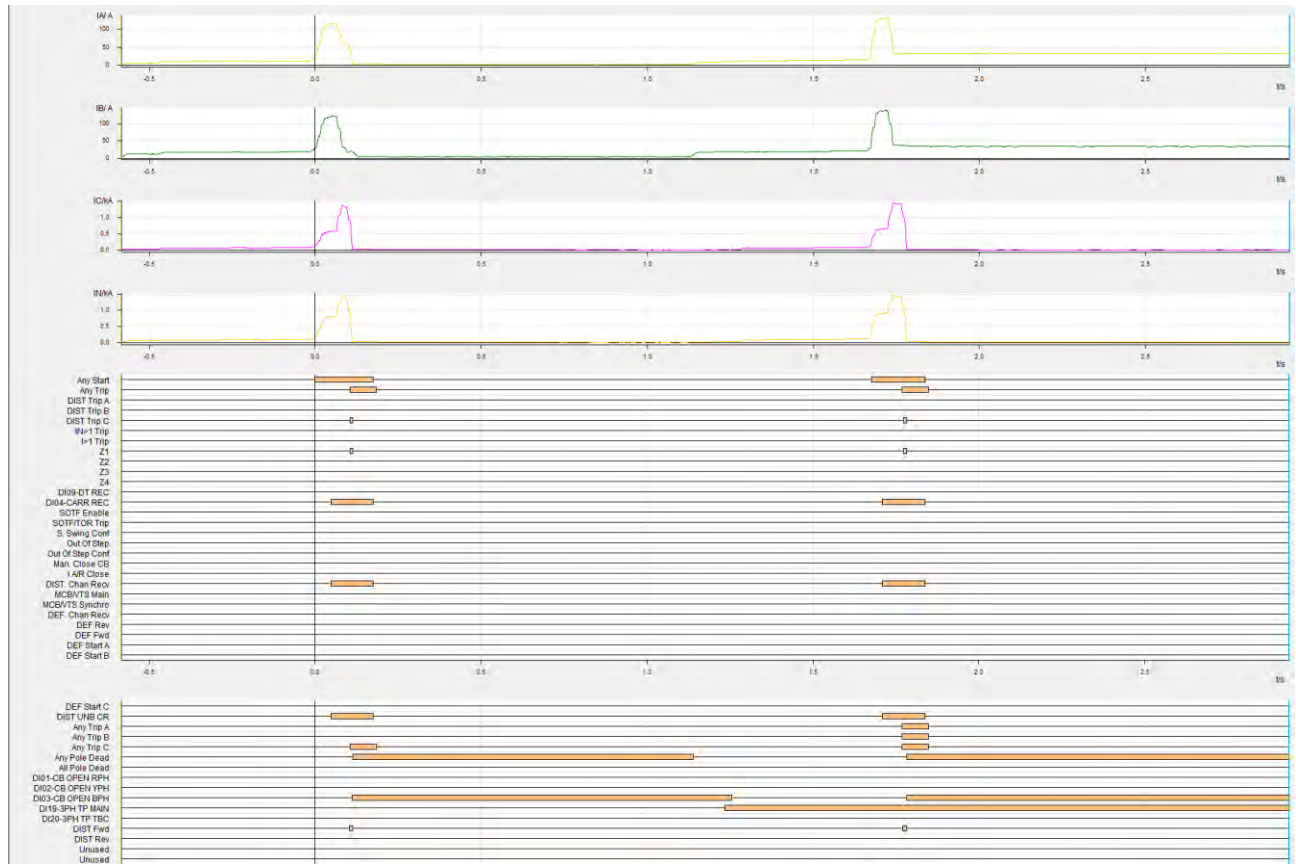
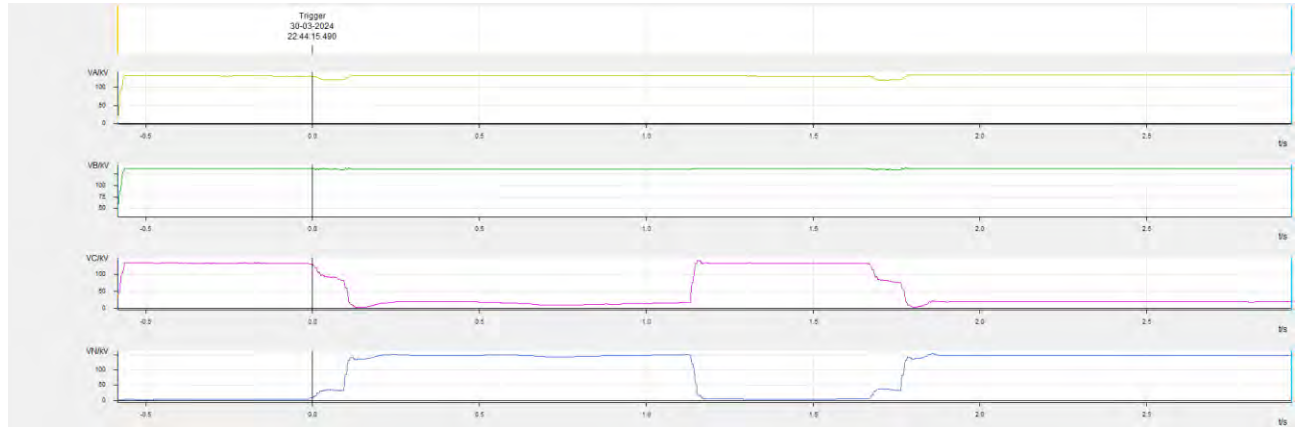
## DR of 220 kV Daltonganj-Garhwa-1 (Garhwa)-2<sup>nd</sup> instance (Reclaim time)



# DR of 220 kV Daltonganj-Garhwa-2 (Daltonganj)



# DR of 220 kV Daltonganj-Garhwa-2 (Garhwa)





ग्रिड कंट्रोलर ऑफ इंडिया लिमिटेड  
(भारत सरकार का उद्यम)  
GRID CONTROLLER OF INDIA LIMITED  
(A Government of India Enterprise)



[formerly Power System Operation Corporation Limited (POSOCO)]

पूर्वी क्षेत्रीय भार प्रेषण केन्द्र / Eastern Regional Load Despatch Centre

कार्यालय : 14, गोल्फ क्लब रोड, टॉलीगंज, कोलकाता - 700033

Office : 14, Golf Club Road, Tollygunge, Kolkata - 700033

CIN : U40105DL2009GOI188682, Website : www.erldc.in, E-mail : erldcinfo@grid-india.in, Tel.: 033 23890060/0061

## ग्रिड घटना की विस्तृत रिपोर्ट 220 केवी गढ़वा (न्यू) पूर्वी क्षेत्र का सबस्टेशन / Detailed Report of grid event 220 kV Garhwa (New) Substation of Eastern Region

(To be submitted by ERLDC/NLDC during Grid Disturbances/Grid Incidents/Near Miss Event as per IEGC section 37.2 (f))  
(आई ई जी सी 37.2 (एफ) के अनुपालन में)

Date(दिनांक):09-04-2024

### 1. Event Summary (घटना का सारांश):

At 07:29 Hrs on 31.03.2024, 220 kV Daltonganj – Garhwa(New)-1 tripped due to B\_N fault leading to complete power failure at 220 kV Garhwa(New) S/s with a load loss of around 30 MW as Ckt-2 was already under breakdown.

### 2. Time and Date of the Event (घटना का समय और दिनांक): 07:29 hrs of 31.03.2024

### 3. Event Category (ग्रिड घटना का प्रकार): Grid Disturbance (GD)-1

### 4. Location/Control Area (स्थान/नियंत्रण क्षेत्र): Jharkhand

### 5. Name of the Substation/Generating Station/Pooling Station Affected (सब-स्टेशन का नाम):

(Along with LV/HV voltage level): 220 kV Garhwa (New) Substation

### 6. Report submitted by Utility on: 08.04.2024

### 7. Antecedent Conditions (पूर्ववर्ती स्थिति):

	Frequency	Regional Generation	Regional Demand	State Generation	State Demand
				Jharkhand	Jharkhand
Pre-Event (घटना पूर्व)	50.09 Hz	27709 MW	19938 MW	403 MW	1200 MW
Post Event (घटना के बाद)	50.09 Hz	27709 MW	19908 MW	403 MW	1170 MW

\*Pre and post data of 1 minute before and after the event

Important Transmission Line/Unit if under outage महत्वपूर्ण संचरण लाइने/ विद्युत उत्पादन इकाइयां जो बंद हैं)	NIL
Weather Condition (मौसम स्थिति)	Severe dust storms and gusty winds

### 8. Load and Generation loss (लोड और जनरेशन हानि): Approximate load loss of 30 MW and Generation loss is nil.

9. Duration of interruption (रुकावट की अवधि): 00:07 Hrs (Partial load supplied through alternate arrangement)

10. Details of Equipment Failure (if any during the event) (उपकरण विफलता का विवरण): Tower collapsed at loc. 198, 195,196,197 & 202.

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

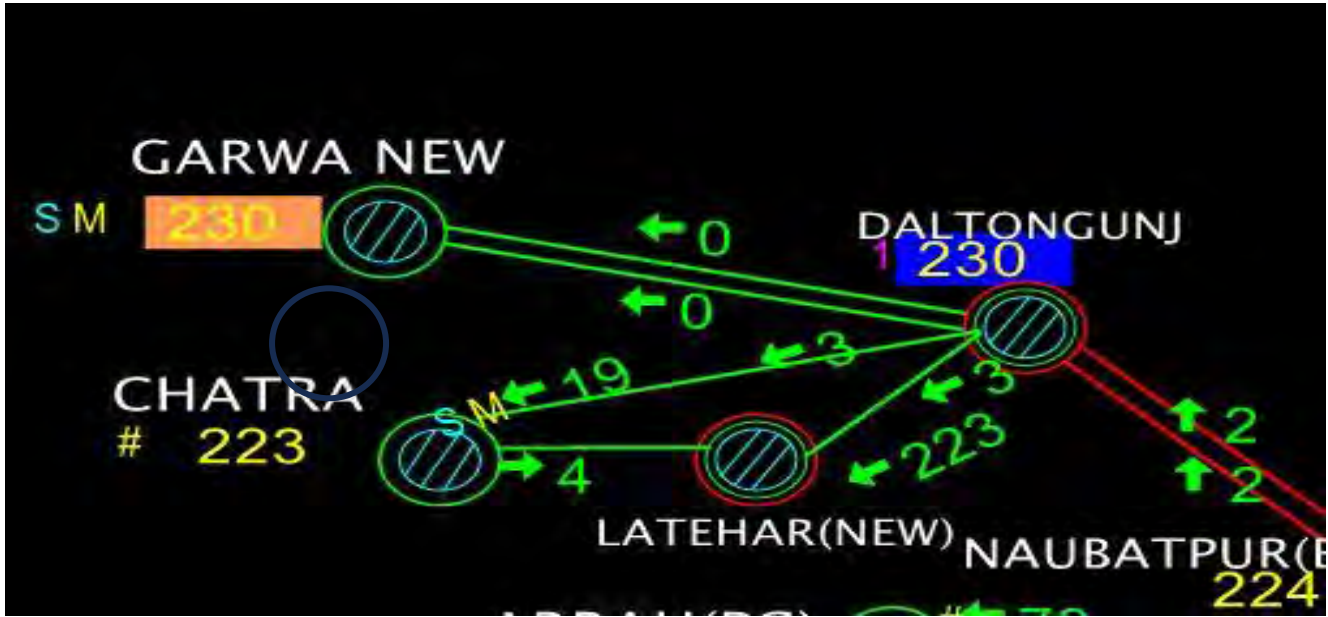


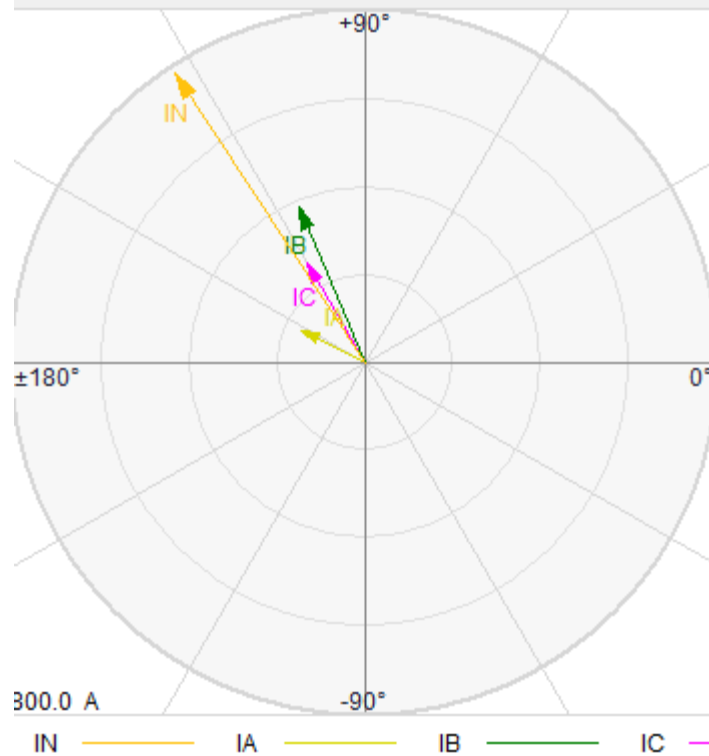
Figure 1: Network across the affected area

12. Transmission/Generation element Tripped during the event (संचरण लाइन / विद्युत उत्पादन इकाई जो घटना के दौरान बंद हो गयी):

क्र०स०	नाम	Trip time (hh:mm:ss)	उप केंद्र 1 रिले संकेत	उप केंद्र 2 रिले संकेत	Restoration time
1	220 kV Daltonganj-Garhwa (New)-1	07:29:01	Daltonganj: B_N, 33.29 km, 2.724 kA	Garhwa: B_N, O/c E/f, 0.93 kA	Not restored yet.

13. Event Analysis (Based on PMU, SCADA & DR) (घटना का विश्लेषण):

- A B-Earth fault struck 220 kV Daltonganj-Garhwa-1. Single phase tripping occurred at Garhwa within 100 msec. After 875 msec, O/C E/f operated at Garhwa end and DT sent to Daltonganj.
- Fault current seen from Garhwa was very less. However, resultant sum of all three phase current was much higher as current was almost in phase due to tower damage and E/f picked up and line tripped after 875 msec from Garhwa.



**Figure 2: Phasor diagram of current at Garhwa during fault**

- As reported, tower at loc. 198 which was partially damaged on 30.03.24 night due to localised thunderstorm, completely collapsed during morning of 31.03.24. Alongwith this tower, towers at loc. 195, 196, 197 & 202 also collapsed.
- 220 kV Daltonganj-Garhwa (New) D/c are under breakdown and loads are being fed through 132 kV Sonenagar-Japla-Garhwa and 132 kV Rihand-Garhwa.

### PMU Snapshot:



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



**14. Protection/Operational issues observed (सुरक्षा/परिचालन संबंधी समस्या): Nil**

**15. Action Taken/Remedial Measures (सुधारात्मक उपाय):**

- Tower restoration work may be completed at the earliest and possibilities of sourcing ERS may be explored.

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

S.No.	Issues	Regulation Non-Compliance	Utilities
2.	DR/EL provided within 24 Hours?	1. IEGC section 37.2 (c) 2. CEA grid Standard 15.3	JUSNL, PG ER-1

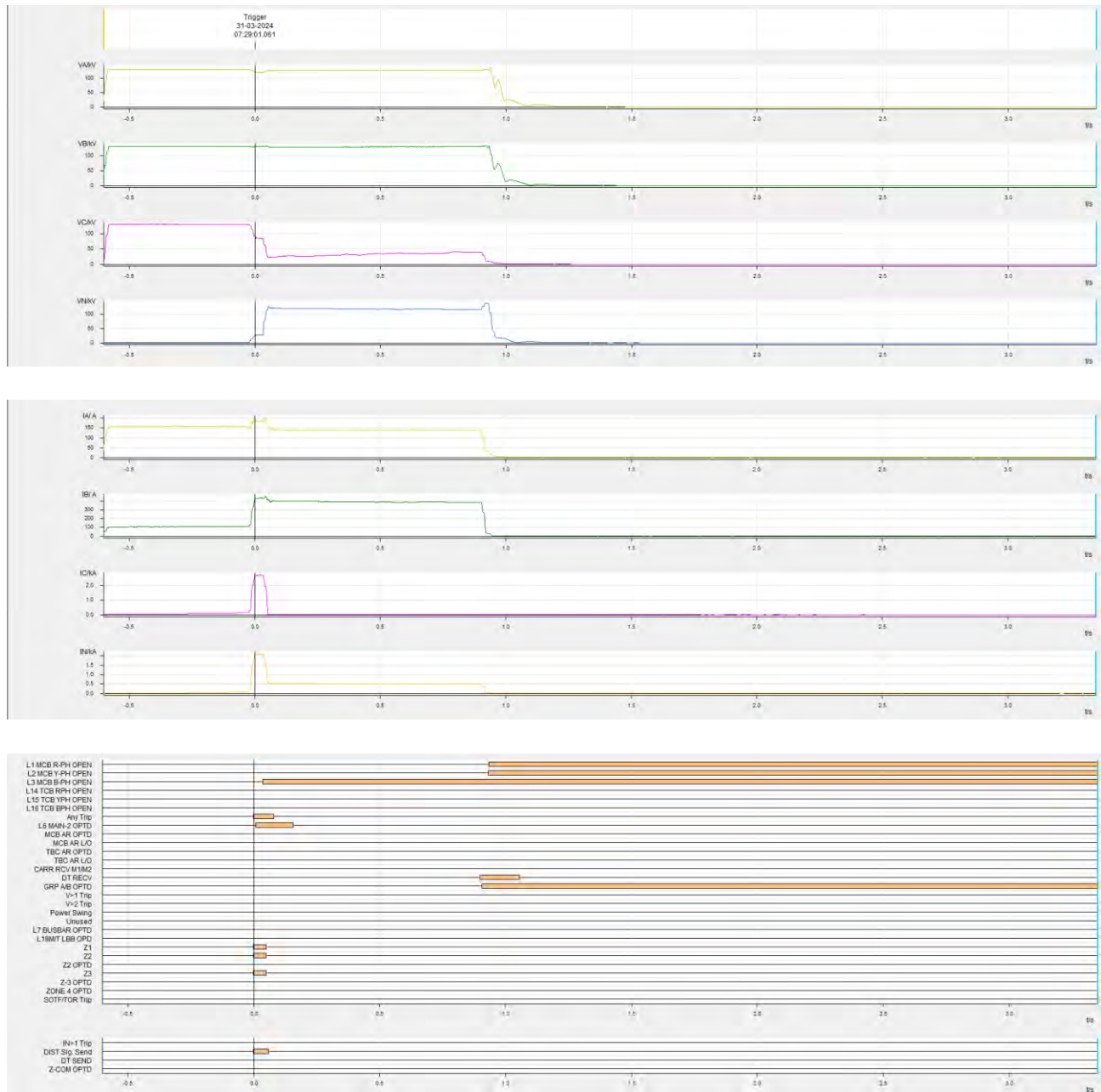
**17. Key Lessons Learnt (प्रमुख अधिगम बिंदु): Nil**

## Annexure 1: (Sequence of Events-As per ERLDC SCADA)

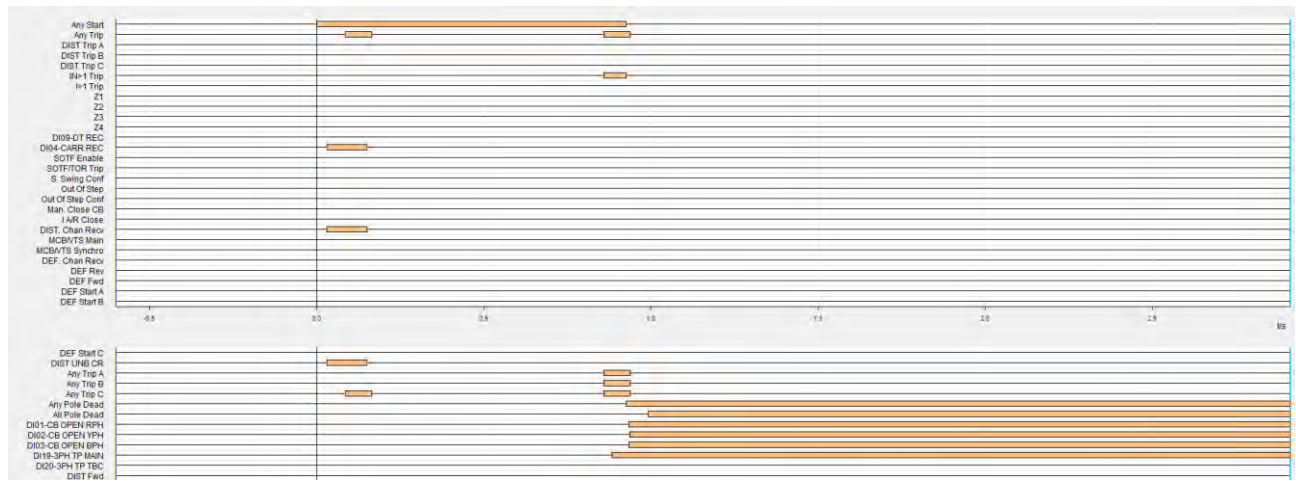
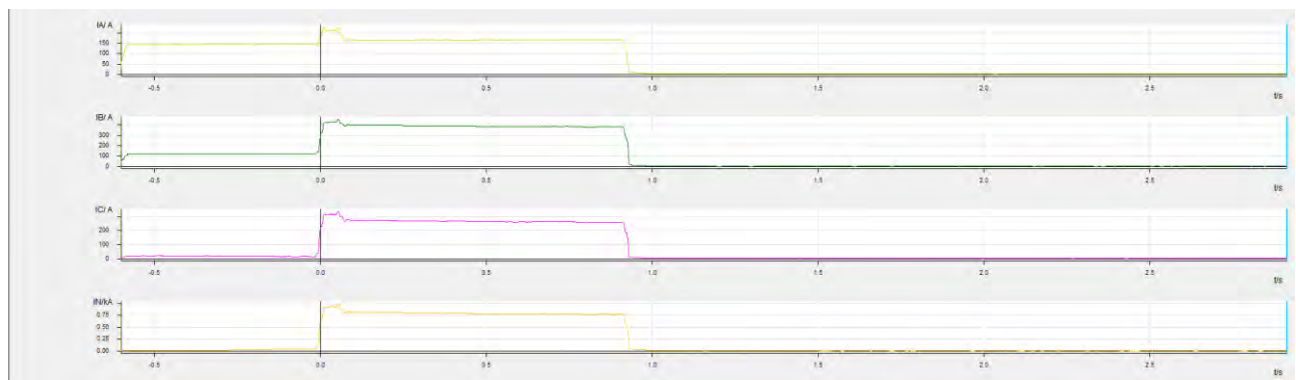
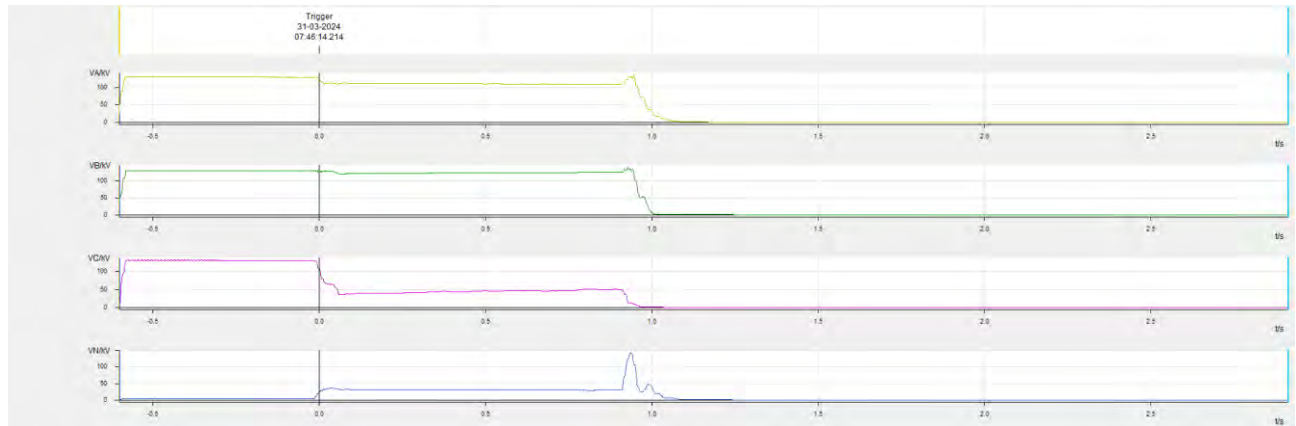
TIMESTAMP	STATION	DESCRIPTION	STATUS
07:29:01.088	DALTN_PG	220_GARHWA_1_CB	Travel
07:29:01.987	DALTN_PG	220_GARHWA_1_CB	Open

## Annexure 2:

### DR of 220 kV Daltonganj-Garhwa-1 (Daltonganj)



# DR of 220 kV Daltonganj-Garhwa-1 (Garhwa)





**ग्रिड-इंडिया**  
GRID-INDIA

**ग्रिड कंट्रोलर ऑफ इंडिया लिमिटेड**  
(भारत सरकार का उद्यम)  
**GRID CONTROLLER OF INDIA LIMITED**  
(A Government of India Enterprise)  
[formerly Power System Operation Corporation Limited (POSOCO)]

**पूर्वी क्षेत्रीय भार प्रेषण केन्द्र / Eastern Regional Load Despatch Centre**

कार्यालय : 14, गोल्फ क्लब रोड, टॉलिंगंज, कोलकाता - 700033  
Office : 14, Golf Club Road, Tollygunge, Kolkata - 700033  
CIN : U40105DL2009GOI188682, Website : www.erldc.in, E-mail : erldcinfo@grid-india.in, Tel.: 033 23890060/0061




**पूर्वी क्षेत्र के 220/132 केवी बानतला एस/एस में ग्रिड घटना की विस्तृत रिपोर्ट / Detailed Report of grid event at 220/132 kV Bantala S/s of Eastern Region**

**(To be submitted by RLDC/NLDC during Grid Disturbances/Grid Incidents/Near Miss Event as per IEGC section 37.2 (f))**

**(आई ई जी सी 37.2 (एफ) के अनुपालन में)**

**Date(दिनांक):09-04-2024**

**1. Event Summary (घटना का सारांश):**

**At 21:49 Hrs of 3103.2024, Y-Ph CT of 220 kV New Town AA3- Bantala(KLC) at Bantala end burst leading to tripping of the said line. At the same time, 220 kV Subhasgram- Bantala line also tripped from Subhasgram end with Y-Ph fault leading to total power failure at 220 kV Bantala(KLC) S/s with a load loss of 78 MW.**

**2. Time and Date of the Event (घटना का समय और दिनांक): 21:49 hrs of 31.03.2024**

**3. Event Category (ग्रिड घटना का प्रकार): Grid Disturbance (GD)-1**

**4. Location/Control Area (स्थान/नियंत्रण क्षेत्र): 220 kV Bantala (West Bengal) Substation**

**5. Report submitted by Utility on: 04-04-2024**

**6. Antecedent Conditions (पूर्ववर्ती स्थिति):**

	Frequency	Regional Generation	Regional Demand	State Generation	State Demand
				West Bengal	West Bengal
Pre-Event (घटना पूर्व)	49.99 Hz	32052 MW	25701 MW	6817 MW	9146 MW
Post Event (घटना के बाद)	49.99 Hz	32052 MW	25623 MW	6817 MW	9068 MW

*\*Pre and post data of 1 minute before and after the event*

Important Transmission Line/Unit if under outage (महत्वपूर्ण संचरण लाइने/ विद्युत उत्पादन इकाइयां जो बंद हैं)	Nil
Weather Condition (मौसम स्थिति)	Normal

**7. Load and Generation loss (लोड और जेनरेशन हानि): Approximate load loss of 78 MW and Generation loss is nil.**

8. Duration of interruption (रूकावट की अवधि): 21:49 Hrs to 22:00 hrs.

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

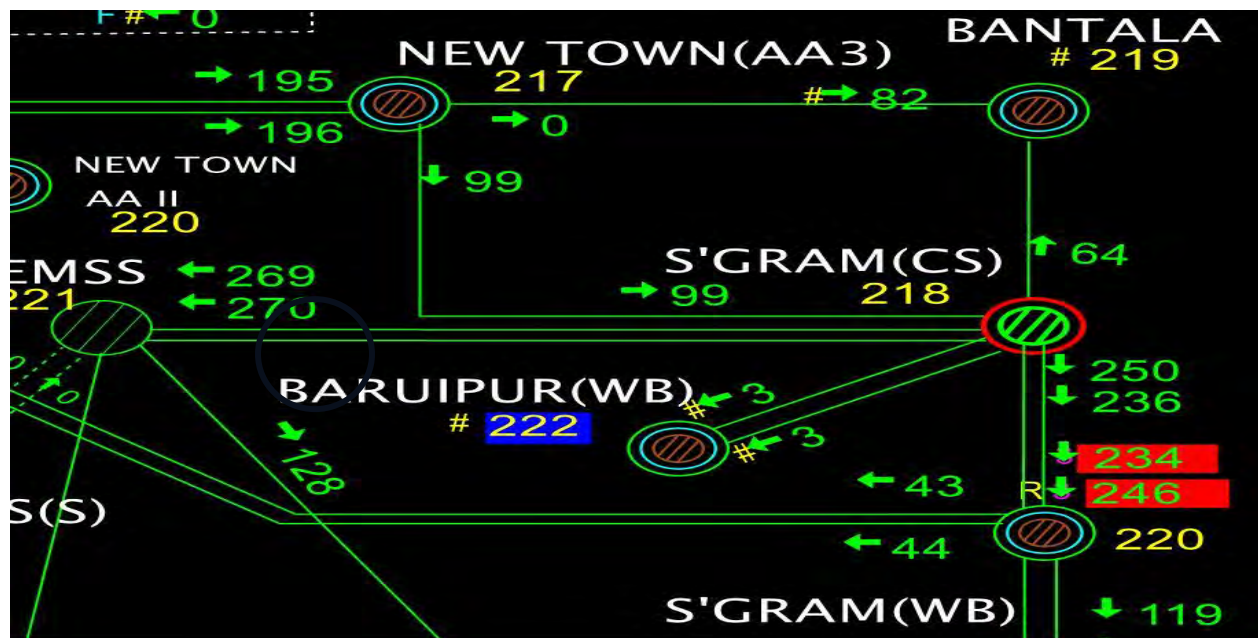


Figure 1: Network across the affected area

10. Details of Equipment Failure (if any during the event) (उपकरण विफलता का विवरण): Y<sub>ph</sub> CT of 220 kV Bantala(KLC)-NewTown AA III at Bantala burst.

11. Major Elements Tripped (प्रमुख ट्रिपिंग):

क्र०स०	नाम	Trip time (hh:mm:ss.ms)	उप केंद्र 1 रिले संकेत	उप केंद्र 2 रिले संकेत	Restoration time
1	220 kV New Town AA-III-KLC(Bantala)	21:49:25:720	NewTown AA III: Y <sub>N</sub> , Zone-2, 10.1 kA	KLC: Y <sub>N</sub> , Zone-1, 0.157 km, 8.18 kA	17:47 (01.04.24)
2	220 kV Subhashgram-KLC (Bantala)	21:49:26.290	Subhashgram: Y <sub>N</sub> , Zone-1, 13.7 kA	KLC: Didn't trip	22:22

## 12. Event Analysis (Based on PMU, SCADA & DR) (घटना का विश्लेषण):

- Y<sub>ph</sub> CT of 220 kV NewTown AA III-Bantala burst at Bantala. This fault was seen in Zone-1 from Bantala end and breaker opened within 100 msec and line tripped in Zone-2 time (350 msec) from NewTown AA III due to non-receipt of carrier signal.
- Despite the breaker got opened from Bantala end, its CT still had the fault current as its CT was damaged and NewTown was feeding the fault. The current became zero after opening of breaker from NewTown AA III.
- During this fault, Zone-4 picked for 220 kV Subhahsgram-Bantala at Bantala and Zone-2 picked at Subhashgram. When Bantala-NewTown AA III tripped from Bantala, Subhashgram was still feeding around 500 A in all three phases suggesting some evolving fault at Bantala bus.
- After 500 msec, A/r attempt was taken by Bantala for 220 kV NewTown AA-III line, which failed. During this event, 220 kV Subhashgram-Bantala tripped in Zone-1 from Subhashgram end as it remained the only source radially feeding Bantala. Three phase tripping occurred in this line as carrier channel was unhealthy and total power failure occurred at Bantala S/s.
- Report received from West Bengal is attached at Annexure-3.

### PMU Snapshot:



**Figure 2: PMU Voltage snapshot of 400/220 kV Subhashgram S/S**

## 13. Protection/Operational issues observed (सुरक्षा/परिचालन संबंधी समस्या):

- 220 kV Bantala has single main bus and transfer scheme and its bus bar protection is out of service. Status of the same may be updated.
- Carrier signal was sent from Bantala for 220 kV NewTown AA III feeder but not received at remote end.
- Carrier channels of 220 kV Subhashgram-Bantala were also not healthy.
- DR/EL of Bantala, NewTown AA III are not time synchronized.

**14. Action Taken/Remedial Measures (सुधारात्मक उपाय):**

- Bus bar protection may be commissioned at Bantala at the earliest.
- Periodic checking of carrier signal may be planned to ensure its healthiness.
- Root cause analysis of CT failure may be done.

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

S.No.	Issues	Regulation Non-Compliance	Utilities
1.	DR/EL provided within 24 Hours	1. IEGC section 37.2 (c) 2. CEA grid Standard 15.3	WBSETCL, PG ER-2

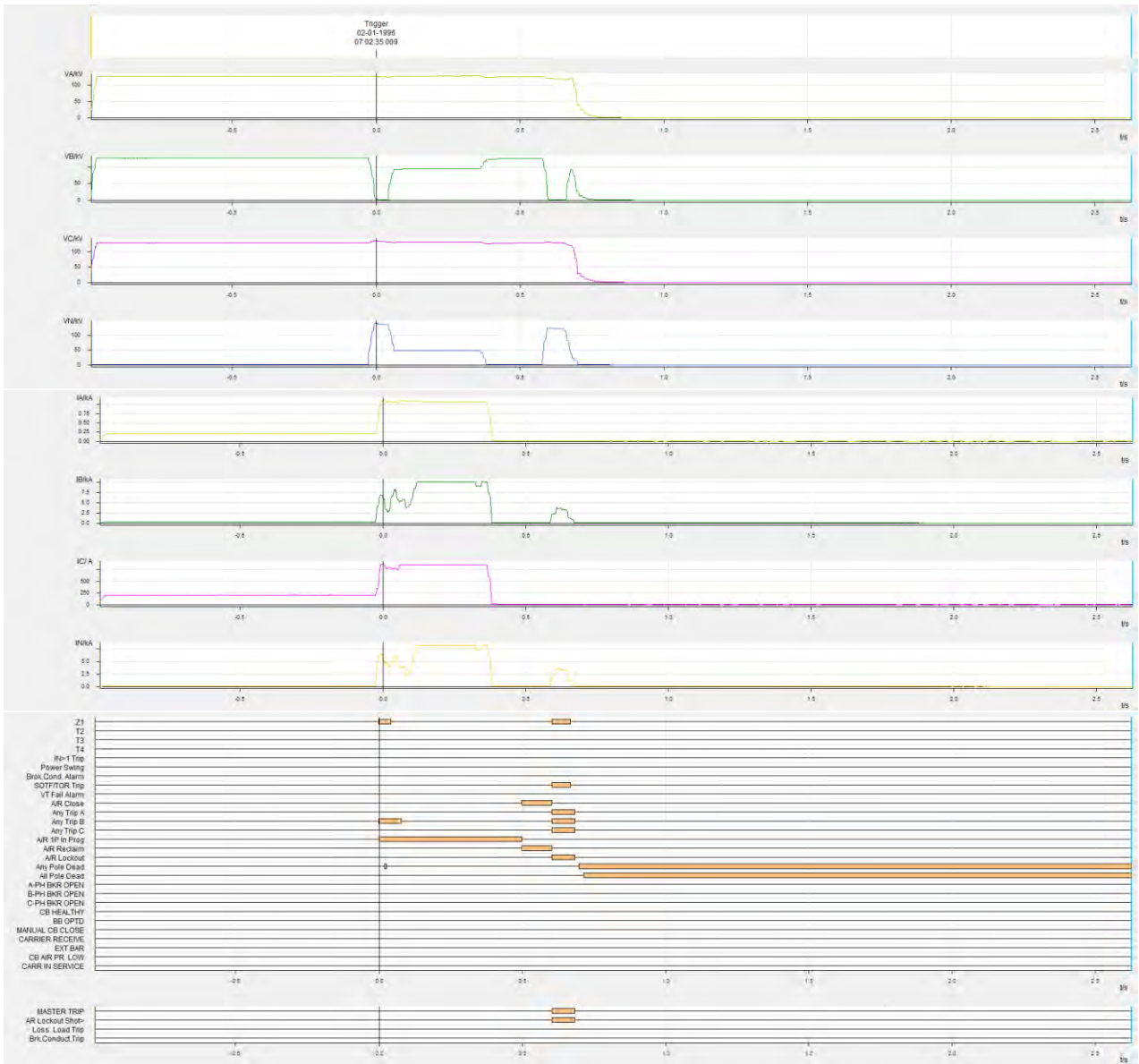
**16. Key Lessons Learnt (प्रमुख अधिगम बिंदु): Nil**

### Annexure 1: (Sequence of Events-As per ERLDC SCADA)

TIMESTAMP	STATION	DESCRIPTION	STATUS
21:49:25.358	SUBHA_PG	220_KLCBN_WB_CB	Open

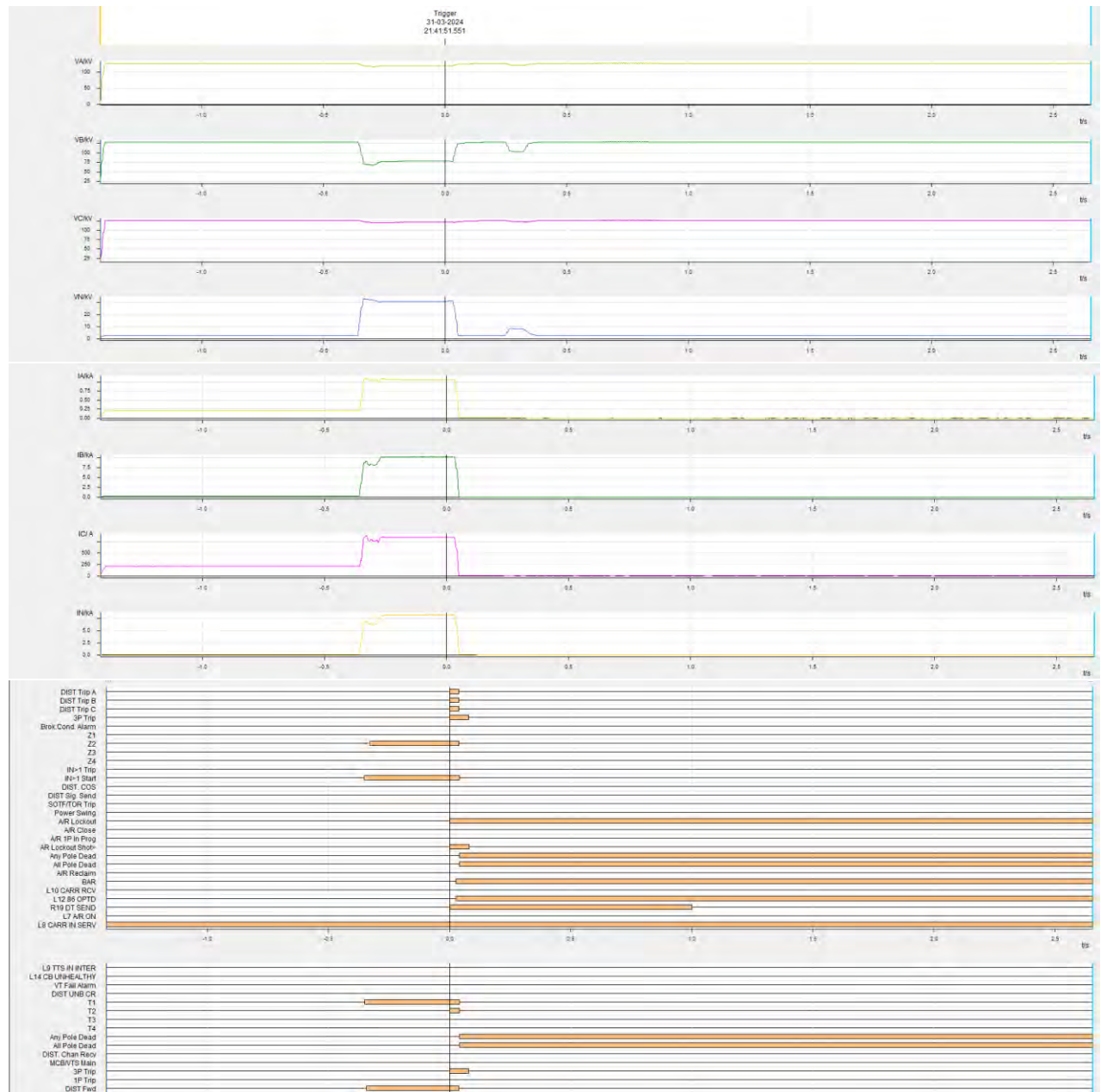
### Annexure 2:

#### DR of 220 kV Bantala (KLC)-NewTown AA III (Bantala)

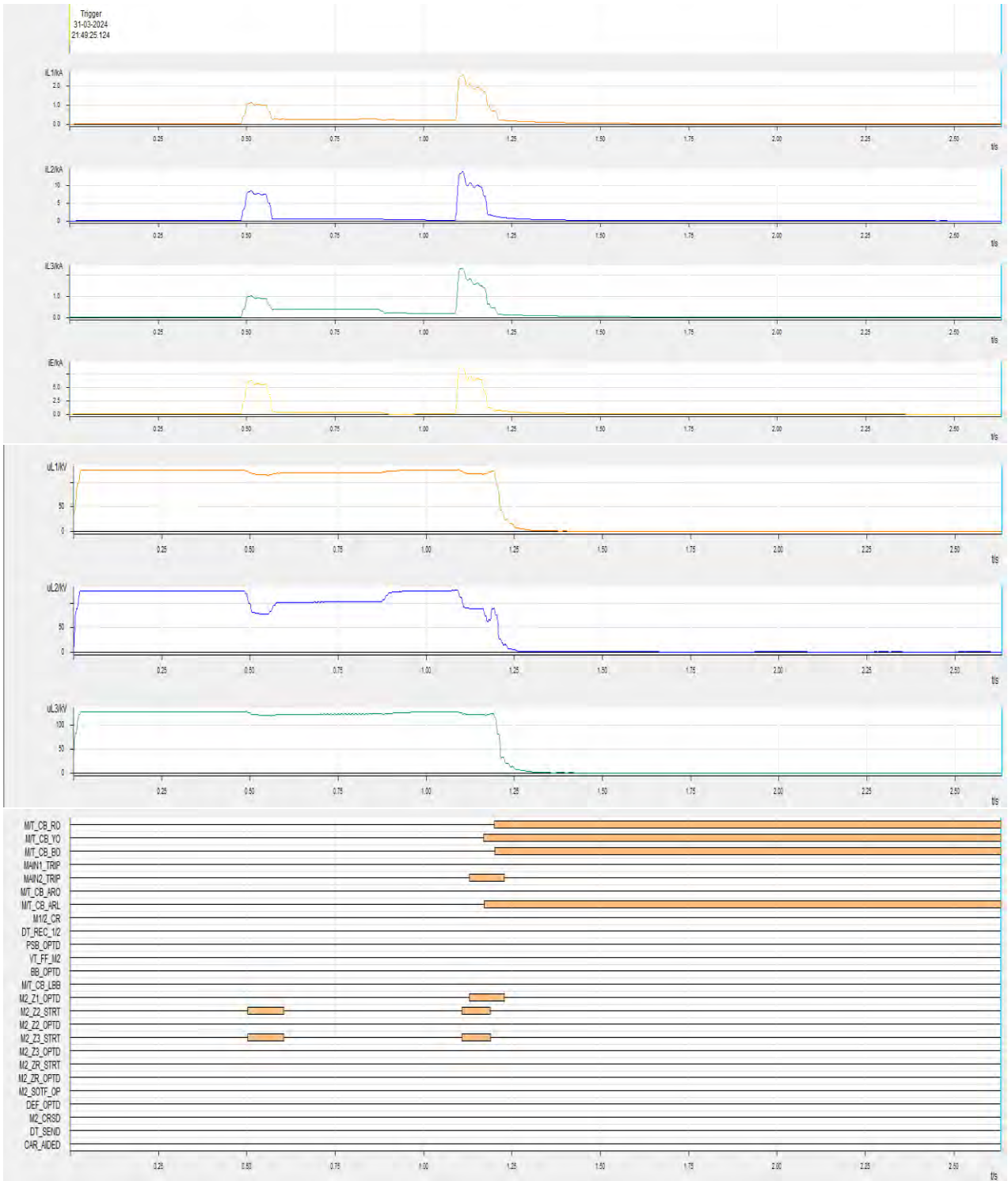




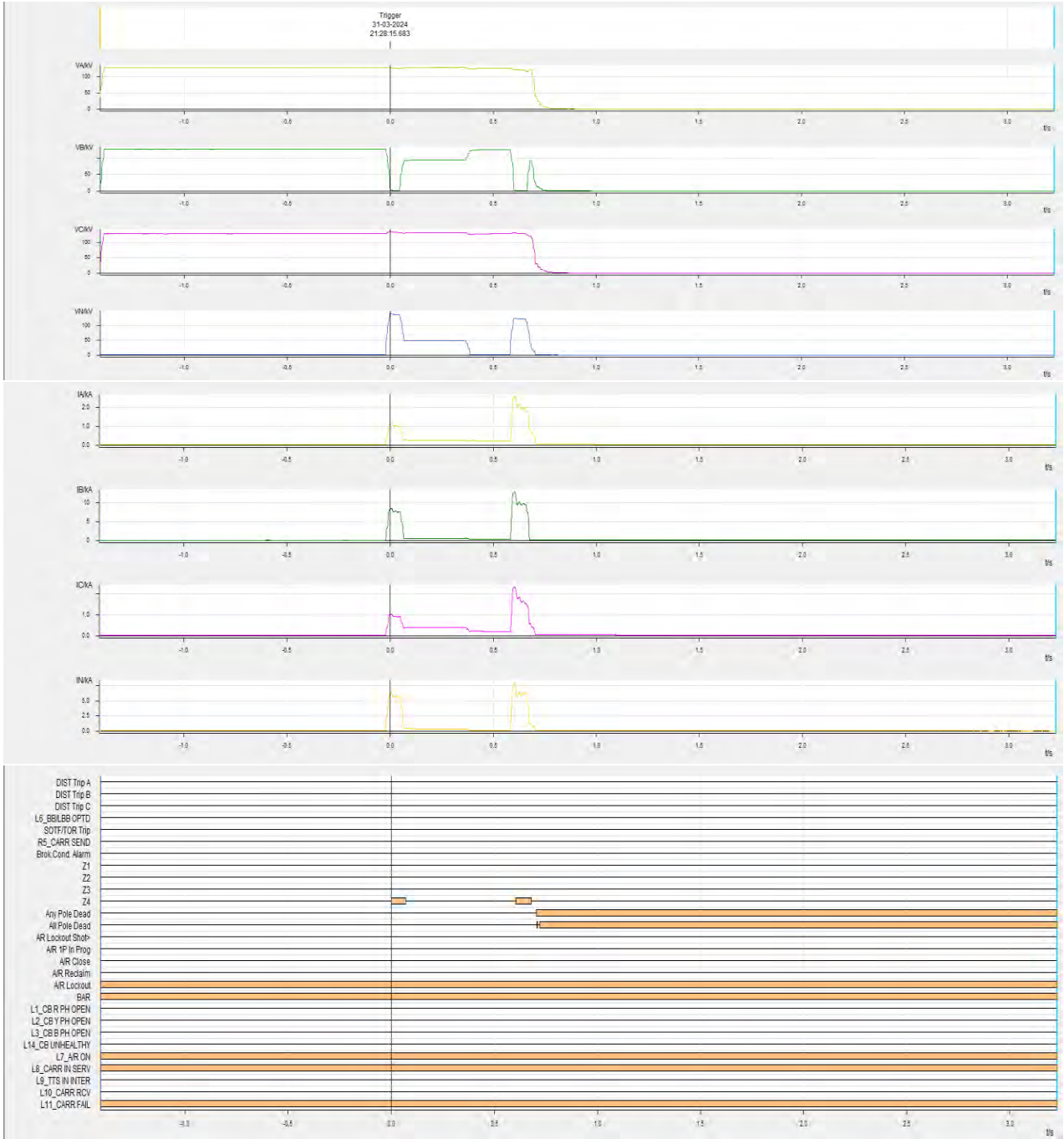
# DR of 220 kV Bantala (KLC)-NewTown AA III (NewTown AA III)



# DR of 220 kV Subhashgram-Bantala (KLC)-(Subhashgram)



# DR of 220 kV Subhashgram-Bantala (KLC)-(Bantala)



**Annexure-3**

INCIDENT / EVENT REPORTING

SUB: Tripping of 220KV KLC-NAA-III Ckt. along with 220KV KV KLC-PGCL Ckt. at KLC-220KV substation end on 31.03.2024.

	<b>DETAILS</b>	<b>REMARKS</b>
(i)	Time and date of event	21:47 Hr. on31.03.2024
(ii)	Location	KLC-Bantala220 KV Sub-Station.
(iii)	Plant and/or Equipment directly involved	220KV KLC-NAA-III Feeder bay at KLC end.
iv)	List of Lines tripped during the event	220 KV KLC-AA3 & 220 KV KLC-SUBG. PG circuit tipped
(v)	Description and cause of event	220KV Y-PH CT Burst out i.r.o.220KV KLC-NAA-III Ckt resulting total power failure at 220KV bus. 220KV KLC-PGCL Ckt tripped at PGCL end with Zone-1 , yellow phase fault.
(vi)	Antecedent conditions	KLC-220KV substation was drawing power through 220KV KLC-PGCL ckt and 220KV KLC-NAA-III ckt. 200MVA Tr-I and 200MVA Tr-II was under normal condition.220kv bus transfer bus was completely free.Load flow was 40MW through 220KV KLC-NAA-III Ckt and 12MW was through 220KV KLC-PGCL ckt.
(vii)	Demand and/or Generation (in MW) interrupted and duration of interruption	PLS Occurred from 21:47 hrs to 22:04 approx. 76MW.
(viii)	All Relevant system data including copies of records of all recording instruments including Disturbance Recorder, Event, Logger, DAS etc.	220KV KLC-PGCL Ckt tripped only at PGCL end. As discussed from far end relay details given below Tripped Phase-BN, Zone -1 tripped,Dist-11.42km. No tripping at KLC end.
(ix)	Sequence of trippings with time	220KV KLC-NAA-III Ckt tripped at both end on 21:47 hrs. 220KV KLC-PGCL Ckt tripped at PGCL end . <b>KLC 220KV Substation received power from 132KV Kasba-KLC-Saltlakeckt on 22:04 hrs.</b> After obtaining charging code from SLDC the 220KV KLC-PGCL ckt was charged on 22:22 hrs.
(x)	Details of Relay Flags	Active Group-I,Started Phase-BN,Started element distance, E/F start IN1,Dist trip Z1, Yellow-phase,Fault location-157.3 mtr(At KLC end)
(xi)	Remedial measure	Failure of 220KV Y-PH CT i.r.o.220KV KLC-NAA-III Ckt
(xii)	Estimate of time to return to service	At 17:47 HRS on 01.04.24 entire system was normalized after replacement of CT.

(xiii)	Recommendation for Future Improvement/Repeat Incident	Carrier scheme check at KLC-NTAA3 CKT
(xiv)	Analysis of the event	<ol style="list-style-type: none"> <li>1) 220 KV KLC- NTAA3 feeder tripped with Y-Phase, Zone-1 fault at KLC end. A/R initiates and A/R close. As fault persists , A/R L/O operates. <b>Y-Phase 220 KV CT of NTAA3 circuit burst-out.</b>Carrier channel was healthy as per both end DR.Carrier was sent from KLC end but it was not received to New town end.We have to check carrier panel to find out the issue.</li> <li>2) During dead time KLC end CT was seeing current after Y phase CB pole open.Busbar should have to operate at KLC end but Busbar relay was faulty which was intimated earlier and Z4 time was reduced to 250 ms. <b>As the KLC substation is the vicinity of tannery, severe chemical contamination is a common phenomenon which causes frequent faulty of numerical relays, puncture of Terminal blocks etc.</b></li> <li>3) Dead time on KLC-NTAA3 ckt at KLC end was found 500 relay, which is rectified .</li> <li>4) 220 KV NTAA3-KLC feeder tripped with Zone-2 relay indication from Newtown end.</li> <li>5) 220 KV KLC- Subhasgram PG circuit tripped with Zone-1 relay indication from PG end only. No tripping at KLC end. KLC end found zone-4 start. It seems that during A/R close at KLC-NTAA3 circuit , PG—KLC feeds the fault current and PG circuit trips on Zone-1(suspected maltripping), causing no power at KLC.</li> </ol>

### List of important transmission lines in ER which tripped in March-2024

Sl. No.	LINE NAME	TRIP DATE	TRIP TIME	RESTORATION DATE	RESTORATION TIME	Relay Indication LOCAL END	Relay Indication REMOTE END	Reason	Fault Clearance time in msec	Remarks	DR Configuration Discrepancy	DR/EL RECEIVED FROM LOCAL END	DR/EL RECEIVED FROM REMOTE END
1	400KV-RANCHI-SIPAT-2	01-03-2024	11:41	01-03-2024	12:51	Ranchi Y-N, 179.13 km, 1.617 kA	-	Y-Earth	100	A/r successful after 1 second. Tripped again within reclaim time		Yes	NA
2	220KV-KHAGARIA-NEW PURNEA-2	01-03-2024	12:25	01-03-2024	16:37	Khagaria Y-B, Iy=1.713 kA, Ib=1.656kA, 88.89 km	New Purnea Y-B 7.8 km, Iy=11.48 kA, Ib=11.46 kA.	Y-B	350	Tripped in Zone-2 time from Khagaria. No carrier received.		Yes	No
3	400KV-IBEUL-OPGC-1	01-03-2024	16:04	01-03-2024	17:08	IBEUL: Didn't trip	OPGC: DT received	No fault	NA	OPGC may explain. DT not sent from IBEUL		NA	No

4	400KV- ALIPURDUAR (PG)- BONGAIGAON-1	02-03-2024	16:05	02-03-2024	17:05	Alipurduar: Didn't trip			No fault	NA	No fault observed from PMU. PG ER-2 may explain.		No	NA
5	400KV- MUZAFFARPUR- GORAKHPUR-2	03-03-2024	20:47	04-03-2024	02:18	Muzaffarpur: DT received	Due to earth fault in DC source-2 at Gorakhpur.		No fault	NA	DT received at Muzaffarpur. DC earth fault at Gorakhpur end. No fault in line.		Yes	NA
6	220 KV CHANDIL- SANTALDIH-1	04-03-2024	05:49	04-03-2024	23:26	Chandil: B_N, 89.5 km, 2.04 kA	Santaldih: B_N, 12.1 km, 6.5 kA		B-Earth	350	Tripped in Zone-2 time from Chandil. A/r failed after 1 second from Santaldih. Carrier signal was sent from Santaldih, still line tripped in Zone-2 from Chandil. JUSNL may explain.		Yes	Yes
7	400KV- BIDHANNAGAR- NEW CHANDITALA-1	04-03-2024	12:01	04-03-2024	12:40	Bidhannagar: R_N, 86.7 km	New Chanditala: R_N, 86 km, 3.66 kA		R-Earth	100	A/r successful after 1 second. Line tripped again within reclaim time.		Yes	Yes
8	400KV- BIDHANNAGAR- NEW CHANDITALA-1	04-03-2024	13:08	04-03-2024	18:25	nagar: R_N, 80 km,	New Chanditala: R_N, 86 km, 3.80 kA		R-Earth	100	A/r failed after 1 second		Yes	Yes

9	400 KV DSTPS-RAGHUNATHPU R-1	04-03-2024	16:26	04-03-2024	21:25	S: B_N, 70.63 km, 4	RTPS: B_N, 16.3 km, 10.58 kA	B-Earth	100	A/r successful after 800 msec. Tripped again within reclaim time.	No	Yes
10	400KV-PPSP-BIDHANNAGAR-2	04-03-2024	16:54	04-03-2024	17:57	PPSP: R-N	Bidhannagar: R-N, 4.03 kA, 46 km	R-Earth	100	A/r kept disabled as per OEM advise.	No	Yes
11	400KV-KHSTPP-BARH-1	04-03-2024	17:24	04-03-2024	18:07	Barh: DT received	KHSTPP: Didn't trip	No fault	NA	Tripped on DT received at Barh. No fault in line. NTPC may explain.	No	Yes
12	220KV-NEW MELLI-TASHIDING-1	06-03-2024	11:34	06-03-2024	15:20	New Melli: Y-B , 7.8 km, Iy- 0.014 kA, Ib-0.734 kA	Tashiding: Y-B , 13.24 km, Iy-0.93 kA Ib- 0.833 kA	Y-B-Earth	300	Resistive fault in R_ph evolved to phase to phase fault. DT sent from Tashiding. Reason for the same may be explained.	Yes	Yes
13	220KV-SUBHASGRAM(PG)-BANTALA-1	08-03-2024	08:39	08-03-2024	08:56	Subhashgram: Didn't trip		No fault	NA	WBSETCL may explain. No fault observed from PMU.	No	No



14	400KV-KHSTPP-BARH-1	09-03-2024	16:18	09-03-2024	16:57	KhSTPP: Didn't trip	Barh: DT received	No fault	NA	NTPC Kahalgaon may explain.	No	Yes
15	400KV-RAJARHAT-GOKARNA-1	10-03-2024	15:32	10-03-2024	19:38	Rajarhat: B_N, 2.67 kA	Gokarna: B_N, 15.8 km, 12 kA	B-Earth	100	A/r failed after 1 second. DT received at both ends during A/r attempt . WBSETCL/PG ER-2 may explain	Yes	Yes
16	220KV-KHAGARIA-NEW PURNEA-2	11-03-2024	12:34	11-03-2024	17:08	Khagaria : Y-B, 70.97 km, Iy- 2.329 kA, Ib- 2.257 kA	New Purnea: Y_B, Iy- 7.107 kA, Ib- 7.107 kA, 25.67 km	Y-B	100	Phase to phase fault	Yes	Yes
17	400KV-DURGAPUR-BIDHANNAGAR-1	12-03-2024	06:59	12-03-2024	08:03	Durgapur: Didn't trip	Bidhannagar: Tripped on Pole Discrepancy.	No fault	NA	R_ph opened from Bidhannagar without any fault. Other two phase tripped on PD after 1.6 seconds. WBSETCL may explain.	No	No

18	220KV- CHANDAUTI (PMTL)- SONENAGAR-1	12-03-2024	13:48	12-03-2024	14:50		Sonenagar - Y_B , Iy- 1.370 kA , Ib-1.447 kA, 58.61 km	Y-B- Earth	1100	Resistive fault evolved to phase to phase fault		Yes	Yes
19	400KV-RANCHI- RAGHUNATHPU R-2	13-03-2024	01:25	13-03-2024	02:35	Ranchi: R_N, 38.434 km, 10.965 kA, A/r successful	Raghunathpur: R_N, 155 km, 2.335 kA	R-Earth	500	Tripped in Zone- 2 time from Raghunathpur despite carrier sent from Ranchi. DVC may explain.		Yes	Yes
20	400KV- ARAMBAGH- BAKRESWAR-1	13-03-2024	06:03	13-03-2024	16:19	Arambagh: Y_N, 92 km, 4.65 kA	Bakreshwar : Y_N, 47 km, 4.29 kA	Y-Earth	100	Whether A/r attempt was successful at Arambagh? After 1.25 seconds, DT received at Arambagh. WBSETCL/WB PDCL may explain.		Yes	No
21	400KV- MEERAMUNDAL I-MENDHASAL-1	13-03-2024	08:56	13-03-2024	09:09	Tripped during taking s/d of A/r	Mendhasal: DT received	No fault	NA	400 kV Meramundali- Mendhasal-1 and 400 kV		Yes	Yes

22	400KV- MEERAMUNDAL I-NEW DUBURI-2	13-03-2024	08:56	13-03-2024	09:13	Tripped during taking s/d of A/r	New Duburi: DT received	No fault	NA	400 KV Meramundali- New Duburi-2 are in one dia at Meramundali. While availing A/r shutdown of Mendhasal-1, LBB of tie bay operated at Meramundali and DT sent to		Yes	Yes
23	400KV- MEERAMUNDAL I-MENDHASAL-1	13-03-2024	09:13	13-03-2024	09:36	Tripped during Charging of Tie Bay	Mendhasal: DT received	No fault	NA	While charging the tie bay at Meramundali, LBB operated again and DT sent to remote ends. OPTCL may explain.		Yes	Yes
24	400KV- MEERAMUNDAL I-NEW DUBURI-2	13-03-2024	09:13	13-03-2024	09:34	Tripped during Charging of Tie Bay	New Duburi: DT received	No fault	NA			Yes	No
25	765KV-NEW RANCHI- MEDINIPUR-2	13-03-2024	17:06	14-03-2024	05:23	New Ranchi - Y_N , FD - 275 km , FC - 3.69 kA	Due to Y-Phase bus pipe connector broken between line Isolator to BPI (towards line side) at Medinipur End.	Y-Earth	500	Tripped in Zone- 2 from New Ranchi. PG ER-2 may explain the event.		Yes	Yes

26	220KV-PUSAULI(PG)-DURGAUTI-1	14-03-2024	12:31	14-03-2024	17:42	Pusaui : Y_B_N, 3.7 km, 13.29 kA		Y-B-Earth	100	Phase to phase fault		Yes	No
27	220KV-PARULIA-PARULIA(PG)-1	14-03-2024	13:42	14-03-2024	15:50	DVC: Broken conductor trip	Parulia(PG): Didn't trip	No fault	NA	DVC may explain		No	No
28	220KV-PARULIA-PARULIA(PG)-2	14-03-2024	13:42	14-03-2024	15:50	DVC: Broken conductor trip	Parulia(PG): Didn't trip	No fault	NA	DVC may explain		No	No
29	400KV-NEW PPSP-ARAMBAGH-1	14-03-2024	20:32	14-03-2024	20:56	NEW PPSP: B_N, 86 km, 3.5 kA	Arambagh: B_N, 105 km, 3.3 kA	B-Earth	100	A/r failed after 1 second		Yes	Yes
30	220KV-MAITHON-DUMKA-1	15-03-2024	13:34	15-03-2024	14:22	Maithon: B-N, Zone 1, 1.98 kA, 13 km	Dumka: B_N, 46.04 km	B-Earth	1600	Resistive Fault. Three phase tripping from Maithon when it came in Zone 1		Yes	Yes
31	400KV-JEERAT-SAGARDIGHI-2	15-03-2024	11:57	15-03-2024	23:11	Jeerat: Z1, B-N, 75.406 km, 3.5 kA	Sagardighi: Z1, B-N, 113 km	B-Earth	100	A/r attempted from Sagardighi after 700 msec and failed. From Jeerat, A/r		Yes	No

32	220KV-RANCHI-MTPS(DVC)-1	16-03-2024	15:43	16-03-2024	16:26	Ranchi: R_N, 10.5 kA, A/r successful	Mejia: R_N, 1.11 kA. Line taken in service at MTPS end through Bus Coupler bay due to issue in Main CB	R-Earth	100	A/r kept disabled at Mejia	DR length less at Mejia	Yes	Yes
33	400KV-JAMSHEDPUR-MEJIA-1	16-03-2024	17:36	16-03-2024	18:33	Jamshedpur: B_N, 7.15 km, 16.83 kA, A/r successful	Mejia: B_N, Zone-2, 166.3 km, 2.402 kA	B-Earth	100	Other two phase at Mejia opened after 1.5 seconds. No A/r attempted. DVC may explain		Yes	Yes
34	400KV-DHANBAD-MAITHON RB-2	16-03-2024	18:31	16-03-2024	20:56	Dhanbad: Y_N, A/r successful	MPL: Y_N, 9.68 kA	Y-Earth	100	BCU defective at MPL, hence A/r was not in service. However, only faulty phase tripped during fault other two phase opened on pole discrepancy after 3 seconds instead of three phase tripping. A/r successful from Dhanbad		No	No

35	400KV-NEW PPSP- ARAMBAGH-1	16-03-2024	18:32	16-03-2024	18:52	New PPSP end- B Ph, Z-1, 90.2 km. 3.4 kA	Arambagh end- B Ph, Z- 1, 108.6 km, 3.0 kA	B-Earth	100	A/r failed after 1 second		Yes	Yes
36	220KV-PARULIA- PARULIA(PG)-1	16-03-2024	18:58	16-03-2024	19:35	DVC: Broken conductor trip	Parulia(PG): Didn't trip	No fault	NA	DVC may explain		No	NA
37	220KV-PARULIA- PARULIA(PG)-2	16-03-2024	18:58	16-03-2024	19:35	DVC: Broken conductor trip	Parulia(PG): Didn't trip	No fault	NA	DVC may explain		No	NA
38	400KV-NEW PPSP- ARAMBAGH-1	16-03-2024	19:37	16-03-2024	19:51	New PPSP end - B Ph, Z-1, 86.4 km. 3.4 KA.	Arambagh end- B Ph, Z- 1, 117 km, 3.21 kA	B-Earth	100	A/r failed after 1 second		Yes	Yes
39	400KV-JEERAT- SAGARDIGHI-1	16-03-2024	20:48	16-03-2024	21:18	Jeerat: Y-N, Z1, 132KM, 2.6 KA	Sagardighi: Z1, Y-N, 89KM, Y-ph, 1.4KA (A/R successful)	Y-Earth	100	A/r successful from Sagardighi only. Other two phase at Jeerat tripped after 2.2 seconds. WBSETCL may explain.		Yes	No

40	765KV- DHARAMJAIGARH-JHARSUGUDA-1	16-03-2024	23:27	17-03-2024	21:17	Dharamjaigarh:-Y-N, 6.329 kA, 91.962km (60.700%)	Jharsugudada:-Z-1, Y-N, 11.9kA, 50km, DT receipt.	Y-Earth	100	A/r successful from Jharsuguda after 1.5 seconds. Tripped again within reclaim time. Later DT also received at Jharsuguda. Reason for DT receipt may be clarified.		NA	Yes
41	220KV- DARBHANGA(DMTCL)-LAUKAHI-1	17-03-2024	12:42	17-03-2024	17:46	Darbhangha: Y_B, Iy-10.78kA, Ib-10.69kA, 9.7km, Z-I	Laukahi: Y_B, zone - 2, 76.47 km, Iy-1.783 kA, Ib-1.883 kA	Y-B	100	Phase to phase fault		No	No
42	400KV- BINAGURI-MALBASE-3	17-03-2024	17:58	17-03-2024	19:02		Binaguri : Y-N, Z-2, 3.175 kA, 113.2 km	Y-Earth	500	Tripped in Zone-2 time from Binaguri. No carrier received.		Yes	Yes
43	220KV- DARBHANGA(DMTCL)-LAUKAHI-1	17-03-2024	18:30	17-03-2024	21:49		Laukahi: Bus bar protection operated to Y_ph CT blast of Darbhanga-Laukahi-2 at Laukahi end	B-Earth	100	Bus bar protection operated at Laukahi. BSPTCL may explain.		No	Yes

44	220KV-DARBHANGA(DMTCL)-LAUKAHI-2	17-03-2024	18:30	20-03-2024	17:56		Laukahi: Bus bar protection operated to Y_ph CT blast of Darbhanga-Laukahi-2 at Laukahi end	B-Earth	100	Bus bar protection operated at Laukahi. BSPTCL may explain.		No	Yes
45	765KV-NEW RANCHI-DHARAMJAIGARH-1	17-03-2024	23:20	18-03-2024	00:32	New Ranchi: R-N, 4.17 kA, 120 km;	Dharamjaigarh: R-N, 3.6 kA, 190 km	R-Earth	100	A/r attempt failed		Yes	NA
46	765KV-JHARSUGUDA-RAIPUR PS (DURG)-1	18-03-2024	00:48	18-03-2024	10:22	Jharsuguda:- Direction: E/F, Ib-1.1 kA	Raipur: Bus-2 out due to CT blast at Raipur	B-Earth	1500	DEF operated at Jharsuguda		Yes	NA
47	220KV-BUDHIPADAR-RAIGARH-1	18-03-2024	01:40	18-03-2024	02:25	Budhipadar: A/r successful	RAIGARH:-R-N, 2.78 kA, 83.8 km	R-Earth	100	A/r successful from Budhipadar only. As per PMU data, R & B_ph both opened during fault at Budhipadar and A/r operated successfully after 1 second.		No	NA
48	220KV-DALTONGANJ-CHATRA-1	18-03-2024	12:16	18-03-2024	20:46	Daltonganj: Y_B, FD-3.39 km, Iy-4.68 kA, Ib 4.62 kA, Z-1		Y-B	100	Phase to phase fault		Yes	Yes
49	220KV-RANCHI-MTPS(DVC)-1	18-03-2024	16:24	18-03-2024	17:38	Ranchi - R_N, 15.12 km, 9.05 kA, A/r successful	Mejia: R_N, 210.92 km, 914.03 A	R-Earth	100	A/r kept disabled at Mejia		Yes	Yes



50	220KV- BUDHIPADAR- KORBA-2	18-03-2024	19:15	03-04-2024	17:49	Budhipadar: Didn't trip	Tripped from Korba only on Earth fault. R_ph current became zero.	No fault	NA			No	NA
51	400KV- JHARSUGUDA- RAIGARH-3	18-03-2024	21:39	19-03-2024	00:00	Jharsuguda: DT received		No fault	NA	DT received at Jharsuguda. PG Odisha may explain.		Yes	NA
52	400KV-NEW PPSP- ARAMBAGH-1	18-03-2024	23:37	18-03-2024	23:59	New PPSP: B_N, Zone-1, 86.8 km, 3.39 KA	Arambag : B-N, Z1, 109.4 km, 3.363 kA, SOTF	B-Earth	100	A/r failed after 1 second		Yes	Yes
53	400KV-NEW PPSP- ARAMBAGH-1	19-03-2024	18:14	19-03-2024	18:31	Arambagh: B-N, Z1, 110.9 km, 2.97 KA	New PPSP : B_N, Z1, 86 km, 3.47 KA	B-Earth	100	A/r failed after 1 second		No	Yes
54	400KV-KHSTPP- LAKHISARAI-1	20-03-2024	00:28	20-03-2024	21:31	Kahalgaon: R_B, IR-3.901 KA, IB-4.337 KA, Z2, FD-126.2 km	Lakhisarai: R_N, 7.700 kA, 16.043 km	R-Earth	100	Fault struck R_ph first and A/r was successful. During reclaim time, a phase to phase fault struck the line.		No	Yes
55	220KV-RANCHI- MTPS(DVC)-1	20-03-2024	18:55	20-03-2024	20:02	Ranchi: R_N, A/r successful	MTPS: R_N, Zone-1, 177.91 km, 1.045 kA	R-Earth	100	A/r kept disabled at Mejia	time synchronized at Mejia and DR	Yes	Yes

56	400KV-TSTPP-RENGALI-1	21-03-2024	13:53	21-03-2024	14:37	Tripped on zone 1 R-ph distance 8.8kms from Talcher end only	Rengali: Didn't trip	No fault	NA	R_N fault struck 400 kV Talcher-Rourkela-1 at this instance which was cleared within 100 msec and A/r was also successful. NTPC may explain the reason of tripping of these lines.	DR length less at TSTPP	Yes	No
57	400KV-TSTPP-RENGALI-2	21-03-2024	13:53	21-03-2024	14:52	Tripped on zone 1 R-ph distance 8.8kms from Talcher end only	Rengali: Didn't trip	No fault	NA		DR length less at TSTPP	Yes	No
58	220KV-SUBHASGRAM(PG)-BANTALA-1	21-03-2024	15:26	22-03-2024	20:52	Subhasgram: R-N, Z1, 14.6 km, 8.8 kA	Bantala:R-N, Z1, 2.25 km, 7.8 kA	R-Earth	100	Three phase tripping at Bantala. Carrier fail signal high in DR		Yes	Yes

59	400KV- SUBHASHGRAM(P G)-RAJARHAT-1	21-03-2024	15:37	21-03-2024	15:52	Subhasgram: B-N, Z1, 11.5 kA, 8.6 km	Rajarhat: B-N, Z1, 6.8 kA, 18.9 km (A/R successful)	B-Earth	100	A/r lockout appeared at Subhashgram during the fault. Still only faulty pahse opened. Other two phase of main CB opened after 1.6 second and of tie CB oepened after 2.3 second. PG ER-2 may explain.		Yes	Yes
60	220KV- DALTONGUNJ- GARWAH (NEW)- 2	23-03-2024	12:26	23-03-2024	13:30	Daltonganj: B_N, 2.9 kA		B-Earth	100	A/r successful. Tripped again in reclaim time		Yes	Yes
61	220KV- DALTONGANJ- CHATRA-1	23-03-2024	13:32	23-03-2024	14:05	Daltonganj: Y_B, Iy: 5.57 kA, Ib: 5.52 kA		Y-B	100	Phase to phase fault		Yes	No
62	220KV- DALTONGUNJ- GARWAH (NEW)- 2	23-03-2024	14:09	23-03-2024	19:03	Daltonganj:B-N, Ib= 3.57 KA, 22.85 km	Garhwa : Z-1.72.28 km,Ib-0 kA	B-Earth	100	DR of another instance uploaded. Whether A/r attempted or not from both ends. PG ER-1/JUSNL may confirm		No	Yes

63	400KV-BARH-PATNA-3	24-03-2024	10:55	24-03-2024	12:04	Barh: B_N, Z-1, 2.94 km, 26.37 kA	Patna: B_N, 59.42 km, 8.57 kA, A/R successful	B-Earth	100	A/r successful from Patna only. Other two phase at Barh tripped after 2.2 seconds. NTPC may explain.	DR length less at Barh	Yes	Yes
64	220KV-DALTONGUNJ-GARWAH (NEW)-2	24-03-2024	12:47	24-03-2024	13:21	DALTONGANJ: B-N, 23.512 Km, 3.286 KA	Garhwa: B_N, 2.2 kA	B-Earth	100	A/r failed after 1 second	DR not time synchronized at Garhwa	Yes	Yes
65	400KV-KHARAGPUR-CHAIBASA-1	24-03-2024	13:59	24-03-2024	14:57	Kharagpur: Z-1, Y_N, 62.19 km, 3.22 kA	Chaibasa: Y_N, 135.33 km, 2.99 kA	Y-Earth	100	A/r successful. Tripped again within reclaim time		Yes	Yes
66	400KV-KOLAGHAT-KHARAGPUR-2	25-03-2024	18:28	25-03-2024	19:23	KTPP: B_N, Z1, 33.43 Km, 7.819 KA	Kharagpur: B_N, Zone-1, 58.73 Km, 4.562 KA	B-Earth	100	A/r successful. Tripped again within reclaim time		No	Yes
67	400KV-ARAMBAGH-NEW CHANDITALA-1	25-03-2024	18:45	25-03-2024	19:21	Arambagh: R-Y-N, Z1, 28.62 km, Ir=7.507 kA, Ib=7.458 kA	New Chanditala : R-Y-N, Z1, 23.5 km, Ir=11.08 kA, Iy=11.17 kA	R-Y	100	Phase to phase fault. DT sent from New Chanditala. WBSETCL may explain.		No	Yes
68	400KV-NEW JEERAT-SUBHASGRAM(PG)-1	25-03-2024	19:52	25-03-2024	21:33	New Jeerat: R-B, IR=9 KA IB=10.3 KA, 39 Km	Subhashgram: R-B, IR=5.2 KA IB=5.5 KA, 67 Km	R-B-Earth	100	Phase to phase fault		Yes	Yes
69	220KV-BOLANGIR (PG)-KESINGA-1	26-03-2024	14:26	26-03-2024	14:56	Bolangir- R_N, FD - 80.59 Km, FC - 1.723 KA	Kesinga: R_N, 6.2 km, 2.7 kA	R-Earth	200	Resistive fault. A/r failed after 1 second		Yes	No

70	400KV-BARIPADA-TISCO-1	27-03-2024	13:24	27-03-2024	14:17	Baripada: Didn't trip	Direct trip signal received at TISCO end.	No fault	NA	DT sent from Baripada. PG Odisha may explain.		No	No
71	400KV-KODERMA-BOKARO-1	31-03-2024	00:22	31-03-2024	03:40	Koderma: B_N, 15.65 km, 9.6 kA	Bokaro: B_N, A/r successful	B-Earth	100	A/r not attempted at Koderma. Other two phase tripped on PD	DR not time synchronized and DR length less at Koderma	Yes	No
72	220KV-TENUGHAT-BIHARSARIFF-1	31-03-2024	00:35	31-03-2024	00:54			Zone 1, Ib: 310.9 A	3500	Highly resistive fault.		No	No
73	220KV-MAITHON-DUMKA-1	31-03-2024	02:17	31-03-2024	03:37	Maithon: B_N, 6.33 kA	Dumka : B_N, 46.39 km, 2.139 kA	B-Earth	100	Three phase tripping at both ends. PG ER-2/JUSNL may explain		Yes	Yes
74	400KV-PPSP-BIDHANNAGAR-1	31-03-2024	02:20	31-03-2024	02:44	PPSP: Y_N, Z1, 124 Km	Bidhannagar: Y_N, Z1, 43.53 Km, 6.123 KA	Y-Earth	100	A/r kept disabled as per OEM advise.		No	Yes

75	400KV- DARBHANGA (DMTCL)- MUZAFFARPUR- 1	31-03-2024	13:46	31-03-2024	14:06	Darbhanga: B- N, Z-2, 4.2 kA, 64 km	Muzaffarpur:B-N, Z1, 10.7 KA, 17 km	B-Earth	100	Three phase tripping at Darbhanga. A/r successful at Muzaffapur. DMTCL may explain.		Yes	Yes
76	400KV- ALIPURDUAR (PG)- BONGAIGAON-2	31-03-2024	15:48	31-03-2024	17:50	Alipurduar: Y-N, Z- 1, 13 KA, 1 km	Bongaigaon: Y-N , Z-2, 4.93 KA, 105.7 Km	Y-Earth	100	Three phase tripping for single phase fault		Yes	NA
77	220KV- DALTONGANJ- CHATRA-1	31-03-2024	18:42	31-03-2024	19:46	Daltonganj : B- N,12.45 Km,4.4 kA	Chatara:Ia-42A, Ib-99.6 A, Ic-127. 2 A, Distance protection operated, Z-1.	B-Earth	100	A/r successful. Tripped again within reclaim time		Yes	Yes

**EASTERN REGIONAL POWER COMMITTEE**  
**KOLKATA**

**PROTECTION PROTOCOL OF EASTERN REGION**

Prepared in Compliance to

Clause 12(2) and Clause 13 of Central Electricity Regulatory  
Commission Indian Electricity Grid Code Regulations, 2023

# Contents

- 1. Background**
- 2. Applicability**
- 3. Definitions**
- 4. General Philosophy of Protection System**
- 5. Protection Schemes**
- 6. Protection Settings & Coordination**
- 7. Disturbance Monitoring, Analysis and Reporting**
- 8. Protection Audit Plan**
- 9. Performance Monitoring of the Protection Systems**
- 10. Compliance Monitoring**



# **PROTECTION PROTOCOL OF EASTERN REGION**

## **1. Background**

1.1. The Protection Protocol of Eastern region is prepared in accordance with Clauses 12(2) & 13 of the Indian Electricity Grid Code, 2023 (IEGC 2023) notified by the Central Electricity Regulatory Commission.

### **1.1.1. The clause 12(2) of the IEGC 2023:**

*“There shall be a uniform protection protocol for the users of the grid:*

- a) for proper co-ordination of protection system in order to protect the equipment/system from abnormal operating conditions, isolate the faulty equipment and avoid unintended operation of protection system;*
- b) to have a repository of protection system, settings and events at regional level;*
- c) specifying timelines for submission of data;*
- d) to ensure healthiness of recording equipment including triggering criteria and time synchronization; and*
- e) to provide for periodic audit of protection system.”*

### **1.1.2. The clause 13 of the IEGC 2023:**

#### ***“13. Protection protocol***

- (1) All users connected to the integrated grid shall provide and maintain effective protection system having reliability, selectivity, speed and sensitivity to isolate faulty section and protect element(s) as per the CEA Technical Standards for Construction, the CEA Technical Standards for Connectivity, the CEA (Grid Standards) Regulations, 2010, the CEA Technical Standards for Communication and any other applicable CEA Standards specified from time to time.*
- (2) Back-up protection system shall be provided to protect an element in the event of failure of the primary protection system.*
- (3) RPC shall develop the protection protocol and revise the same, after review from time to time, in consultation with the stakeholders in the concerned region, and in doing so shall be guided by the principle that minimum electrical protection functions for equipment connected with the grid shall be provided as per the CEA Technical Standards for Construction, the CEA Technical Standards for Connectivity, the CEA Technical Standards for Communication, the CEA (Grid Standards) Regulations, 2010, the CEA (Measures relating to Safety and Electric Supply)*

*Regulations, 2010, and any other CEA standards specified from time to time.*

- (4) The protection protocol in a particular system may vary depending upon operational experience. Changes in protection protocol, as and when required, shall be carried out after deliberation and approval of the concerned RPC.*
- (5) Violation of the protection protocol of the region shall be brought to the notice of concerned RPC by the concerned RLDC or SLDC, as the case may be.”*

1.2. The Protection Protocol of Eastern Region stipulates General Protection Philosophy of Protection System, Protection Schemes for Generators & various Transmission Elements in Power System, Protection Settings & their Coordination among entities, Disturbance Monitoring, Analysis and Reporting, Time Synchronization of Protection Systems, Protection Audit Plan, Performance of Protection Systems & Compliance Monitoring.

## **2. Applicability**

The Protection Protocol of Eastern Region shall be applicable to all Eastern Regional entities, State/Central/Private Generating Companies/ Generating Stations including REGs, RHGS, integrated RE with Pumped Storage Plant (PSP), SLDCs, ERLDC, CTU, STUs, Transmission Licensees and ERPC.

## **3. Definitions**

Words and expressions used in this Protection Protocol are defined in the Act or any other regulations specified by the Central Commission or Central Electricity Authority shall, unless the context otherwise requires, have the meanings assigned to them under the Act or other regulations specified by the Central Commission, as the case may be.

## **4. General Philosophy of Protection System**

4.1. Protection philosophy shall be in accordance with below mentioned objectives, design criteria and other details. However, protection design in a particular system may vary depending upon judgment and experience in the broad contours of the protection philosophy. Consideration must also be given to the type of equipment to be protected as well as the importance of this equipment to the system. Further, protection must not be defeated by the failure of a single component.

### **4.1.1. Objectives:**

The basic objectives of any protection schemes should be to:

- (i) Automatically isolate the faulty element.
- (ii) Mitigate the effect of short circuit and other abnormal conditions in minimum possible time and area.
- (iii) Indicate the location and type of fault and

- (iv) Provide effective tools to analyses the fault and decide remedial measures.

#### 4.1.2. **Design Criteria:**

To accomplish the above objectives, the four design criteria for protection that should be considered are:

- (i) fault clearance time/speed;
- (ii) selectivity;
- (iii) sensitivity and
- (iv) reliability (dependability and security)

4.1.2.1.**Fault clearance time/speed:** To minimize the effect on customers and maintain system stability, Fault clearance time shall be as per CEA Grid Standard Regulations 2010, as amended to date.

4.1.2.2.**Selectivity:** To ensure Selectivity, coordination shall be ensured with the adjacent protection schemes including breaker failure, transformer downstream relays, generator protection and station auxiliary protection.

4.1.2.3.**Sensitivity:** To ensure Sensitivity, the settings must be investigated to determine that they will perform correctly for the minimum fault current envisaged in the system, yet remain stable during transients and power swings from which the system can recover.

4.1.2.4.**Reliability:** To ensure Reliability, two independent auxiliary direct current-supplies shall be provided for Main-I and Main-II relays. The Main-I and Main-II relays should be from two different makes or operating with different algorithm. The CB's shall have two independent trip coils and two independent trip circuits. Each protection device should trip at least one of them by independent auxiliary DC- supplies.

4.1.2.5.**Security:** To ensure Security, the protection shouldn't limit the maximum transmission capacity of the element. Distance protection in particular could cause spurious tripping due to specific grid conditions, in case of high load operation. Therefore, any special topologies must be known and considered for protection parameterization. For parallel Over Head Lines it is necessary to consider the rapid increase of load current in the healthy line when the faulty line trips and the protection operation must allow such conditions The load encroachment detection function of the relays must be used, when the highest distance zone resistance reach conflicts with the maximum transmitted load on the protected element.

4.2. All generating units shall have standard protection system to protect the units not only from faults within the units and within the Station but also from faults in sub-stations and transmission lines.

4.3. The generator, generator transformer, unit auxiliary transformer shall be provided with protection systems connected to two independent channels or groups, such that one

channel or group shall always be available for any type of fault in the generator and these transformers;

- 4.4. Protection relays shall be configured in such a way that digital input points shall not pick up due to stray voltages.
- 4.5. Protective relays shall be used to detect electrical faults, to activate the alarms and disconnect or shut down the faulted apparatus to provide for safety of personnel, equipment and system.
- 4.6. Electrical faults shall be detected by the protective relays arranged in overlapping zones of protection.
- 4.7. The protection relays for the generators, motors, transformers and the transmission lines shall generally be of numerical type.
- 4.8. All relays used shall be suitable for operation with CTs secondary rated for one ampere or five amperes as per relevant Indian Standards or International Electrotechnical Commission or Institute of Electrical and Electronics Engineers standards.
- 4.9. Relevant Indian Standards or International Electrotechnical Commission or Institute of Electrical and Electronics Engineers standards shall be applied for protection of generators, transformers and motors.

## **5. Protection Schemes**

The electrical protection functions for equipment connected with the grid shall be provided as per the Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022 amended to date, the CEA (Technical Standards for connectivity to the Grid) Regulations 2007 amended to date, the CEA (Technical Standards for Communication System in Power System Operation) Regulations 2020 amended to date, the CEA (Grid Standards) Regulations 2010 amended to date, the CEA (Measures relating to Safety and Electric Supply) Regulations 2023 amended to date, and any other CEA standards specified from time to time.

### **5.1. Thermal Generating Units**

The electrical protection functions for generator, generator transformer, unit auxiliary transformer and station transformer shall be provided in accordance with but not limited to the list given in **SCHEDULE-I** of CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022 amended to date.

### **5.2. Hydro Generating Units**

- 5.2.1. For the generating units with a rating of more than one hundred megawatt, protection system shall be configured into two independent sets of protection (Group A and B) acting on two independent sets of trip coil fed from independent DC supplies, using separate sets of instrument transformers, and segregated cables of current transformers and voltage transformers.

5.2.2. The protection functions for Generator, Excitation Transformer, Generator Transformer, Generator and Generator Transformer, Unit Auxiliary Transformer, and Station Auxiliary Transformer shall be provided in accordance with but not limited to the list given in SCHEDULE-IV of CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022 amended to date except for variable speed units which will have specialized protection functions.

### 5.3. REGs/RHGS/BESS

Protection Schemes for Renewable Energy (RE) Power Plants of Solar power generation, Wind power generation, Battery Energy Storage System (BESS) and Hybrid of these connected with grid at voltage level above 650 volts shall be in accordance with the Central Electricity Authority (Technical Standards for Construction of Renewable Energy Power Plants) Regulations, 2023 from the date as & when these regulations are notified (Presently the finalization of these Standards by CEA is under progress).

### 5.4. Substations & Transmission System Elements

5.4.1. All major protection relays for the Voltage levels 66 kV and above shall be of numerical type and communication protocol shall be as per IEC-61850.

5.4.2. Grouping of Protection systems for the voltage level 66 kV and above:

- i. The protection circuits and relays shall be electrically and physically segregated into two groups each being independent and capable of providing uninterrupted protection even in the event of one of the protection group fails or taken out for maintenance.
- ii. Interconnection between these two groups shall not generally be attempted. However, such interconnection shall be kept to the bare minimum, if found absolutely necessary.

5.4.3. The protections required in respect of transmission lines, transformers, reactors and bus bars but not limited to shall be in accordance with **SCHEDULE-V** of CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022 amended to date.

#### 5.4.4. **Bus Bar Protection and Local Breaker Backup Protection (breaker failure protection):**

- i) Bus bar protection and local breaker backup protection shall be provided in 220 kV and higher voltage interconnecting sub- stations as well as in all generating station switchyards.
- ii) Duplication of bus bar protection shall be done for all main buses of 400kV and above voltage class.
- iii) The bus bar protection scheme shall be centralized or distributed type and have provision for planned future expansion.

## 5.5. HVDC Terminals/ Stations

### 5.5.1. Classical HVDC Terminals/ Stations

- i) HVDC system protection shall consist of two parts:

**(A) AC side protection:**

AC side protection function shall cover the zone for converter transformer, AC filters, shunt capacitors, shunt reactors, and bus bars. These protections shall generally follow the same philosophy as in a typical substation i.e. detection of fault by relay and tripping of circuit breaker.

**(B) DC side protection:**

DC side protection shall cover the zones consisting of the valve hall, DC switchyard including smoothing reactor and DC filters, DC line, DMR line / electrode line and ground electrode. The protection equipment shall be designed to be fail safe and shall ensure high security to avoid mal-operation/ unwanted shutdown due to protection equipment failures.

- ii) Following a DC Line fault, the HVDC System shall have the facility to restart, one or more times, the faulted pole at a variable pre-selected DC voltage level(s), not below 80% of the nominal voltage rating. The DC transmission system shall be capable of recovery in a controlled and stable manner without commutation failures during recovery following ac and dc system faults. The post fault power order shall be equal to the pre-fault power order unless AC/ DC systems dictate otherwise.
- iii) Protection system required in respect of Classical HVDC Terminals/ Stations but not limited to shall be in accordance with 13 (b) of Part A of **SCHEDULE-VI** of CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022 amended to date.
- iv) Software based controls and protection shall be used to permit flexibility in effecting modifications. Protection and controls shall be duplicated for reliability. The control & protection shall provide fast controllability of the HVDC system.

### 5.5.2. Voltage Source Converter (VSC) based HVDC Terminals/Stations

- i) The protection equipment shall be designed to be fail-safe and shall ensure high security to avoid mal-operation/ unwanted shutdown due to protection equipment failures.
- ii) Protection system required in respect of Voltage Source Converter (VSC) based HVDC Terminals/ Stations but not limited to shall be in accordance with 8 (b) of Part B of **SCHEDULE-VI** of CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022 amended to date.
- iii) Software based controls and protection shall be used to permit flexibility in effecting modifications. Protection and controls shall be duplicated for

reliability. Protection shall be provided by numerical relays to suit the requirement of the HVDC system.

### 5.6. Philosophy of Transmission Line Protection

#### 5.6.1.

Sl. No.	Zone	Direction	Protected Line Reach Settings	Time Settings (in Seconds)	Remarks
1	Zone-1	Forward	80%	Instantaneous (0)	As per CEA
2a	Zone-2	Forward	For single ckt- 120 % of the protected line	0.5 to 0.6 - if Z2 reach overreaches the 50% of the next shortest line ; 0.35- otherwise	As per CEA
			For double ckt- 150 % of the protected line		As per CEA
2b	Zone-2 (for 220 kV and below voltage Transmission lines of utilities)	Forward	120 % of the protected line, or 100% of the protected line + 50% of the adjacent shortest line	0.35	As per CEA with minor changes
3	Zone-3	Forward	120 % of the (Protected line + Next longest line)	0.8 - 1.0	As per CEA
4	Zone-4	Reverse	10%- for long lines (for line length of 100 km and above) 20%- for shot lines (for line length of less than 100 km)	0.5 (Where Busbar Protection is not available: 0.25)	As per CEA

Note:

- 1) Zone-2:- Z2 Reach should not encroach the next lower voltage level.
- 2) Zone-3:- If Z3 reach encroaches in next voltage level (after considering “in-feed”), then Z3 time must be coordinated with the fault clearing time of remote end transformer.
- 3) Zone-4:- If utility uses carrier blocking scheme, then the Z4 reach may be increased as per the requirement. It should cover the LBB of local bus bar and should be coordinated with Z2 time of the all other lines.
- 4) The above settings are recommended primarily (exclusively) for uncompensated lines.

#### 5.6.2.

<p><b>Lines with Series and other compensations in the vicinity of Substation</b></p>	<ul style="list-style-type: none"> <li>• Zone-1: 80% of the protected line with 100ms-time delay. POR Communication scheme logic is modified such that relay trips instantaneously in Zone-1 on carrier receive.</li> <li>• Zone-2: 120 % of uncompensated line impedance for single circuit line. For Double circuit line, settings</li> </ul>
---	---

	<p>may be decided on basis of dynamic study in view of zero sequence mutual coupling.</p> <ul style="list-style-type: none"> <li>Phase locked voltage memory is used to cope with the voltage inversion. Alternatively, an intentional time delay may be applied to overcome directionality problems related to voltage inversion.</li> <li>over-voltage stage-I setting for series compensated double circuit lines may be kept higher than 113%.</li> </ul>
--	---

5.6.3.

	Power Swing Blocking	<p>For all lines, block tripping in all zones except zone-1.</p> <p>Out of Step tripping to be applied on all inter regional tie lines. Deblock time delay = 2s</p>
	Protection for broken conductor	<p>Negative Sequence current to Positive Sequence current ratio more than 0.2 (i.e. <math>I_2/I_1 \geq 0.2</math>)</p> <p>Only for alarm: Time delay = 3-5 sec</p>
	Switch on to fault (SOTF)	<p>Switch on to fault (SOTF) function to be provided in distance relay to take care of line energization on fault</p>
	VT fuse fail detection function	<p>VT fuse fail detection function shall be correctly set to block the distance function operation on VT fuse failure.</p>
	Carrier Protection	<p>To be applied on all 220kV and above lines with the only exception of radial feeders.</p>
	Back up Protection	<p>On 220kV and above lines with 2 Main Protections:</p> <ul style="list-style-type: none"> <li>Back up Earth Fault protections alone to be provided.</li> <li>No Over current protection to be applied.</li> </ul>



		At 132kV and below lines with only one Main protection:  <ul style="list-style-type: none"> <li>• Back up protection by IDMT O/C and E/F to be applied.</li> </ul>

5.6.4. Overvoltage Protection:

FOR 765kV LINES:	Low set stage (Stage-I): 106% - 109% (typically 108%) with a time delay of 5 seconds. High set stage (Stage-II): 140% - 150% with a time delay of 100 milliseconds.
400kV LINES/CABLE:	Low set stage (Stage-I): 110% - 112% (typically 110%) with a time delay of 5 seconds. High set stage (Stage-II): 140% - 150% with a time delay of 100 milliseconds.
FOR 220 KV LINES:	No over-voltage protection shall be used in general.  If necessary, may be enabled on case-to-case basis after due approval from SLDC/ERLDC.
FOR 220 KV CABLE:	Low set stage (Stage-I): 110% - 112% (typically 110%) with a time delay of 5 seconds. High set stage (Stage-II): 140% - 150% with a time delay of 100 milliseconds.

- The lines emanating from same substation shall be provided with pick-up as well as time grading to avoid concurrent trippings. Grading to be done in such a way that inter-regional lines and lines with generation evacuation should trip last, as far as practicable.
- The overvoltage relay shall have better than 98% drop-off to pick-up ratio.
- To achieve required discrimination for OVR grading on account of limitation imposed by voltage resolution of the relay, Ph-to-Ph voltage to be used for Over Voltage detection.

### **5.6.5. Resistive Reach Setting**

#### Setting for Phase-earth fault:

- a. Calculation of minimum load impedance shall be as per Ramkrishna Committee Recommendations.
- b. Maximum load current ( $I_{max}$ ) may be considered as 1.5 times the thermal rating of the line or 1.5 times the associated bay equipment current rating (the minimum of the bay equipment individual rating) whichever is lower. Minimum voltage ( $V_{min}$ ) to be considered as 0.85pu (85%).
- c. Minimum setting for resistive reach shall be such that it must cover fault resistance, arc resistance and the tower footing resistance.
- d. In general, maximum reach setting shall be 80% of the minimum load impedance.
- e. Utility should try to set Resistive reach setting  $< 4.5$  times the zone reactive reach setting, however if there is any limitation from relay manufacturer's side then recommendation of OEM may be followed for maximum resistive reach setting.

Resistive reach shall be the maximum of the value determined by the above rules.

#### Setting for Phase-Phase fault:

- a. Calculation of minimum load impedance as per the method mentioned above for phase earth fault.
- b. Minimum setting for resistive reach shall be such that it must cover fault resistance and arc resistance.
- c. In general, the resistive reach of zone-3 is set less than 80% of minimum load impedance. For power swing consideration, a margin of DR is given. Therefore, it is essential that load should not encroach this DR. In view of this, R3ph-R4ph may be set 60% of minimum load impedance. R2ph and R1ph may be set 80% of R3ph-R4ph respectively.
- d. Utility should try to set Resistive reach setting  $< 3$  times the zone reactive reach setting, however if there is any limitation from relay manufacturer's side then recommendation of OEM may be followed for maximum resistive reach setting.

Resistive reach shall be the maximum of the value determined by the above rules.

- e. For underground cable, as the fault mechanism and earthing resistance of sheath are different from tower footing resistance of overhead lines, the resistive reach setting of cable may be set as per OEM recommendation. However, effort shall be made to keep the setting within the above-mentioned range as far as possible honoring OEM guidelines.

### 5.6.6. Auto Reclosing:

The single-phase high-speed auto-reclosure (HSAR) at 220 kV level and above (except for the composite feeders: overhead plus underground) shall be implemented, including on lines emanating from generating stations. If 3-phase auto reclosure is adopted in the application of the same on lines emanating from generating stations should be studied and decision to be taken on case to case basis.

#### i) Scheme Special Requirements:

- a) Modern numerical relays (IEDs) have AR function as built-in feature. However, standalone AR relay or AR function of Bay control unit (BCU) for 220kV and above voltage lines may be used. For 132kV/110kV lines, AR functions built-in Main distance relay IED can be used.
- b) Fast simultaneous tripping of the breakers at both ends of a faulty line is essential for successful auto-reclosing. Therefore, availability of protection signalling equipment is a pre-requisite.
- c) Starting and Blocking of Auto-reclose Relays:

Some protections start auto-reclosing and others block. Protections which start A/R are Main-I and Main-II line protections. Protections which block A/R are:

- i. Breaker Fail Relay
- ii. Line Reactor Protections
- iii. O/V Protection
- iv. Received Direct Transfer trip signals
- v. Busbar Protection
- vi. Zone 2/3 of Distance Protection
- vii. Carrier Fail Conditions
- viii. Circuit Breaker Problems.
- ix. Phase to Phase Distance Trip
- x. AR selection switch in OFF position
- xi. Logic AR OFF in SAS
- xii. Phase Distance Start (when Auto reclosure is in progress)

When a reclosing relay receives start and block A/R impulse simultaneously, block signal dominates. Similarly, if it receives 'start' for 1-phase fault immediately followed by multi-phase fault the later one dominates over the previous one.

ii) **Requirement for Multi breaker Arrangement:**

Following schemes shall be adhered to multi-breaker arrangements of one and half breaker or double breaker arrangement:

- a) In a multi-Circuit Breaker (C.B.) arrangement one C.B. can be taken out of operation and the line still be kept in service. After a line fault only those CBs which were closed before the fault shall be reclosed.
- b) In multi-C.B. arrangement it is desirable to have a priority arrangement so as to avoid closing of both the breakers in case of a permanent fault.
- c) A natural priority is that the C.B. near the busbar is reclosed first. In case of faults on two lines on both sides of a tie C.B. the tie C.B. is reclosed after the outer C.Bs. The outer C.Bs. do not need a prioritizing with respect to each other.

iii) **Setting Criteria:**

- a) Auto reclosing requires a dead time which exceeds the de-ionising time. The circuit voltage is the factor having the predominating influence on the de-ionising time. Single phase dead time of 1.0 sec. is recommended for 765 kV, 400 kV and 220 kV system. For the lines emanating from generating stations single-phase dead time upto 1.5 sec may be adopted.
- b) According to IEC 62271-101, a breaker must be capable of withstanding the following operating cycle with full rated breaking current:

O - 0.3 s - CO - 3 min - CO

O stands for Open

CO stands for Close-Open

The rated operating cycle of the circuit breaker consisting of an opening, a holding time of 0.3 seconds, a CO cycle, a 3-minute wait, and another CO cycle.

The recommended operating cycle at 765kV, 400 kV and 220 kV is as per the IEC standard. Therefore, reclaim time of 25 Sec. is recommended.

### 5.7. Transmission Relay Loadability

Transmission Relay Loadability means the loading permitted in the transmission line by the relay including a security margin. The relay loadability is to be arrived in such a way as far as possible not to interfere with system operator actions, while allowing for short-term overloads, with sufficient margin to allow for inaccuracies in the relays and instrument transformers. Transmission relay do not prematurely trip the transmission elements out-of-service and allow the system operators from taking controlled actions consciously to alleviate the overload.

#### 5.7.1. Protective relay settings shall

- i) Not limit transmission loadability;

- ii) Not interfere with system operators' ability to take remedial action to protect system reliability and;
  - iii) Be set to reliably detect all fault conditions and protect the electrical network from the faults.
- 5.7.2. The protective functions which could trip with or without time delay, on load current i.e. load responsive phase protection systems including but not limited to:
- i) Phase distance.
  - ii) Out-of-step tripping.
  - iii) Switch-on-to-fault.
  - iv) Overcurrent relays.
  - v) Communications aided protection schemes including but not limited to:
    - Permissive overreach transfer trip (POTT).
    - Permissive under-reach transfer trip (PUTT).
    - Directional comparison blocking (DCB).
    - Directional comparison unblocking (DCUB).
  - vi) Phase overcurrent supervisory elements (i.e., phase fault detectors) associated with current based, communication-assisted schemes (i.e., pilot wire, phase comparison, and line current differential) where the scheme is capable of tripping for loss of communications.
- 5.7.3. Each Transmission Licensee and Generating Company shall use any one of the following criteria for any specific circuit terminal to prevent its phase protective relay settings from limiting transmission system loadability while maintaining reliable protection of the Grid for all fault conditions. Relay loadability at 0.85 per unit voltage and a power factor angle of 30 degrees shall be evaluated.
- i) For Distance protection relays of transmission lines, the Zone-3 shall prevent load encroachment, considering the following criteria:
    - a) Maximum load current ( $I_{max}$ ) may be considered as 1.5 times the thermal rating of the line or 1.5 times the associated bay equipment current rating (the Minimum of the bay equipment individual rating) whichever is lower.
 

(The rating considered is approximately 15 minutes rating of the Transmission facility).
    - b) For setting angle for load blinder, a value of 30 degree may be adequate in most cases.
    - c) The Distance protection relays shall have provision for load blinder characteristic or load encroachment detection.
  - ii) For Directional Overcurrent relays, wherever used in a transmission line (132/110 kV level), the following shall be adopted:

- a) An overload alarm shall be set at 110% of the thermal rating of the line with sufficient delay. This alarm shall allow the operator to take corrective action.
- b) The Directional Overcurrent relay shall allow the line to carry 1.2 times of the thermal rating of the associated line or bay equipment (whichever is lower) at least 10 minutes.
- iii) For transformer protection relays the following shall be adopted:
  - Set the definite time transformer overload relay at 105% of the transformer ratings with sufficient delay. It shall be wired for alarm purpose only to allow the operator to take corrective action. No tripping shall be issued from this relay.
    - The back-up overcurrent relays shall use IDMT characteristics and be suitably coordinated with the upstream transmission network.
    - Install supervision for the transformer using either a top oil or simulated winding hot spot temperature element. The alarm and trip settings for these relays shall be set by individual entities based on the manufacturer's recommendation.

Thermal ratings as specified in the prevailing CEA's Manual on Transmission Planning Criterion shall be used for above requirement.

## **6. Protection Settings & Coordination**

The purpose is to ensure system protection is coordinated among the grid connected entities. The Protection systems coordination comprises the following:

- i) Each Transmission Licensee, Load Dispatch Centre (LDC) and Generating Company shall keep themselves familiarized with the purpose and limitations of Protection System schemes applied in its area of control.
- ii) Each Transmission licensee shall coordinate its Protection System schemes with concerned transmission system, sub-transmission system and generators.
- iii) Each Generating Company shall coordinate its Protection System schemes with concerned transmission system and station auxiliaries.
- iv) Each Transmission Licensee and Generation Company shall be responsible for settings calculations for protection of elements under its ownership. It shall be the responsibility of the respective asset owner to obtain the inputs (adjacent line settings, infeed values etc.) from STU/Generating Company/ Transmission Licensee necessary for calculation of the settings.
- v) STU/Generating Company/Transmission Licensee shall provide the infeed values/latest network model to the requesting entity, within 15 days of receipt of such a request from the entity.
- vi) Each Generating Company and Transmission Licensee, for voltage levels 400kV and above and interstate lines, shall submit the protection settings as per the format

prescribed, along with the calculation sheets, co-ordination study reports and input data, in advance, to ERPC/ERLDC for every new element to be commissioned. The mentioned information shall be submitted to the ERPC/ERLDC two months in advance for all the elements proposed to be commissioned. ERPC shall furnish the approved settings within forty days from the date of submission of the settings by the entity.

- vii) The PCC of ERPC shall review the settings to ensure that they are properly coordinated with adjacent system and comply with the existing guidelines. The onus to prove the correctness of the calculated settings shall lie with the respective Transmission licensee/Generation Company. In case, the PCC feels that the adjacent transmission system settings need to be changed, in view of the new element, it shall inform the concerned entity for revision of the existing settings.
- viii) The PCC of ERPC shall review and approve the settings based on the inputs /report submitted by the entities.
- ix) The approved settings shall be implemented by the entity and proper record of the implemented settings shall be kept. The modern numerical relays have several settings for various features available in the relay. It shall be ensured that only the approved features and settings are enabled in the relay. No additional protection/setting shall be enabled without the prior approval of ERPC.
- x) Each Transmission licensee and Generating Company shall co-ordinate the protection of its station auxiliaries to ensure that the auxiliaries are not interrupted during transient voltage decay.
- xi) Any change in the existing protection settings, for voltage levels 400kV and above & interstate lines, shall be carried out only after prior approval from the ERPC. The owner entity shall inform all the adjacent entities about the change being carried out.
- xii) In case of failure of a protective relay or equipment failure, the Generating Company and Transmission Licensee shall inform appropriate SLDC/ERLDC/ERPC. The Generating Company and Transmission Licensee shall take corrective action as soon as possible.
- xiii) Each Transmission Licensee shall coordinate Protection Systems on major transmission lines and interconnections with neighbouring Generating Company, Transmission Licensee and appropriate LDC.
- xiv) ERPC in consultation with the ERLDC & Eastern Regional entities shall undertake review of the protection settings, assess the requirement of revisions in protection settings and revise protection settings, from time to time and at least once in a year. The necessary studies in this regard shall be carried out by the ERPC. The modifications/changes, if any, in protection settings shall be advised to the respective users and STUs.
- xv) ERPC shall maintain a centralized database and update the same on periodic basis in respect of their respective region containing details of relay settings for grid elements connected to 220 kV and above. ERLDC also shall maintain such database.

Respective Transmission licensee/Generating Company/Entities are responsible for ensuring to make available the implemented protection settings in the centralized database within fifteen days from the date of commissioning.

- xvi) If System Protection Schemes (SPS) is recommended to be implemented by the appropriate forum/Sub-Committee of ERPC on account of operational & system constraints, the same shall be implemented by the concerned Transmission licensee/Generating Company/Entities within the specified timelines.

## **7. Disturbance Monitoring, Analysis and Reporting**

The Purpose is to ensure that adequate disturbance data is available to facilitate Grid event analysis. The analysis of power system disturbances is an important function that monitors the performance of protection system, which can provide information related to correct behavior of the system, adoption of safe operating limits, isolation of incipient faults,

### **7.1. The Disturbance Monitoring Requirements include the following:**

- i) Each Transmission Licensee and Generating Company shall provide Sequence of Event (SOE) recording capability by installing Sequence of Event recorders or as part of another device, such as a Supervisory Control and Data Acquisition (SCADA) Remote Terminal Unit (RTU), a generator plants Digital (or Distributed) Control System (DCS) or part of Fault recording equipment.

This capability shall be provided at all substations and at locations to record all the events in accordance with CEA Grid Standard Regulations, 2010 amended to date. The following shall also be monitored at each location:

- a) Transmission and Generator circuit breaker positions
  - b) Protective Relay tripping for all Protection Groups that operate to trip circuit breakers identified in (a) above.
  - c) Tele protection keying and receive
- ii) In either case, a separate work station PC shall be identified to function as the event logger front end. The event logger work-station PC should be connected to UPS (Uninterrupted Power Supply).

The event logger signals shall include but not limited to

- All Circuit Breaker and isolator switching Operations
- Auxiliary supply (AC, DC and DG) supervision alarms
- Auxiliary supply switching signals
- Fire-fighting system operation alarms
- Operation signals (Alarm/Trip from all the protection relays.)
- Communication Channel Supervision Signals.
- Intertrip signals receipt and send.
- Global Positioning System (GPS) Clock healthiness.



- Control Switching Device healthiness (if applicable).
  - RTU/Gateway PC healthiness
  - All Circuit Breaker Supervision Signals.
  - Trip Circuit Supervision Signals.
- iii) Each Transmission Licensee/Generating Company/Users shall provide Disturbance recording capability for the following Elements at facilities:
- All transmission lines (Each line shall be provided with facility for distance to fault locator)
  - Autotransformers or phase-shifters connected to busses.
  - Shunt capacitors, shunt reactors.
  - Individual generator line interconnections.
  - Dynamic VAR Devices.
  - HVDC terminals.
  - Bus Bars
- iv) The Disturbance recording feature shall be enabled and configured in all the numerical relays installed. Disturbance recording system shall have minimum recording time of 3 seconds (0.5 seconds for pre-fault and 2.5 seconds for post fault).
- v) Each Generating Company shall provide Disturbance recording capability for Generating Plants in accordance with Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022 amended to date, the CEA (Technical Standards for connectivity to the Grid) Regulations 2007 amended to date.
- vi) Each Transmission Licensee and Generating Company shall record for Faults, sufficient electrical quantities for each monitored Element to determine the following:
- Three phase-to-neutral voltages. (Common bus-side/line side voltages may be used for lines.)
  - Three phase currents and neutral currents.
  - Polarizing currents and voltages, if used (As applicable).
  - Frequency (As applicable).
  - Real and reactive power (As applicable).

The Minimum parameters to be monitored in the Fault record is given at Annexure.

- vii) Each Transmission Licensee and Generating Company shall provide Disturbance recording with the following capabilities:
- The Disturbance recorders shall have time synchronization and a standard format for recording analogue and digital signals (DR labels to be standardized

as per the Report of FOLD Working Group - 3 on DR Parameter Standardization). The data files shall be capable of being viewed, read, and analyzed with a generic COMTRADE analysis tool as per the latest revision of IEEE Standard C37.111.

- Each Fault record duration and the trigger timing shall be settable and set for a minimum 3 second duration including 0.5 seconds for pre-fault and 2.5 seconds for post fault
  - Each Fault recorder shall have sampling frequency of 1 kHz or better.
  - Each Fault recorder shall be set to trigger for at least the following:  
Internal protection trip signals, external trigger input and additional triggers may be assigned as necessary.
- viii) Each Transmission Licensee and Generating Company shall keep the recording instruments (disturbance recorder and event logger) in proper working condition and shall establish a maintenance and testing program for Disturbance Recorder (DR) that includes
- Maintenance and testing intervals and their basis.
  - Summary of maintenance and testing procedures.
  - Monthly verification of communication channels used for accessing records remotely (if the entity relies on remote access and the channel is not monitored to a control centre staffed around the clock, 24 hours a day, 7 days a week (24/7)).
  - Monthly verification of time synchronization (if the loss of time synchronization is not monitored to a 24/7 control centre).
  - Monthly verification of active analog quantities.
  - A requirement to return failed units to service within 90 days. If a Disturbance Recorder (DR) will be out of service for greater than 90 days, the Transmission Licensee and Generating Company shall keep a record of efforts aimed at restoring the DR to service.
- ix) The time synchronization of the disturbance recorders shall be corroborated with the PMU data or SCADA event loggers by ERLDC. ERLDC shall list out for Disturbance recorders which are non-compliant for discussion in PCC meetings of ERPC.
- x) Each Transmission Licensee and Generating Company shall submit the data files to the ERLDC conforming to the following format requirements:
- The data files shall be submitted in COMTRADE and PDF format.
  - File shall have contained the name of the Relay, name of the Bay, station name, date, time resolved to milliseconds, event point name, status.

The DR archives shall be retained for a period of three years.

xi) A separate work-station PC, powered through UPS (Uninterrupted Power Supply) shall be identified with access to all the relays for extraction of DR. Auto-Download facility shall be established for automatic extraction of the DR files to a location on the work- station PC.

xii) **Time Synchronization Equipment**

- a) Time Synchronizing Equipment complete with antenna, all cables and processing equipment shall be provided to receive synchronizing pulse through Global Positioning System or Indian Regional Navigation Satellite System Navic compatible for synchronization of event logger, disturbance recorder, Phasor Measurement Units, and Supervisory Control and Data Acquisition System or Substation Automation System.
- b) Each substation shall have time synch equipment to synchronize all the numerical relays installed. Before any extension work, the capability of the existing Time-sync equipment shall be reviewed to ensure the synchronization of upcoming numerical relays.
- c) The status of healthiness of the time-sync device shall be wired as “Alarm” to SCADA and as an “Event” to Event Logger.
- d) The time synch status of all the installed numerical relays and event logger shall be monitored monthly and recorded. The Monthly records for relays not in time-sync shall be reported to ERLDC and ERPC. This record shall be archived for a period of three years by each concerned agency.
- e) Remedial action shall be taken by the concerned substation/ Protection department immediately to make the relays in time synchronization with reference to external time source.
- f) All the new Grid elements/Bay extension shall have accurate and precise Time synchronization equipment.

**7.2. Disturbance Analysis and Reporting**

- i) Immediately following an event (grid disturbance or grid incidence as defined in the CEA Grid Standards) in the system, the concerned user or SLDC shall inform ERLDC through voice message.
- ii) Written flash report shall be submitted to ERLDC and appropriate SLDC by the concerned Transmission Licensee/Generating Company/User within eight (8) hours from Grid event.
- iii) Disturbance Recorder (DR), station Event Logger (EL), Data Acquisition System (DAS) shall be submitted by the respective Transmission licensee and Generating Company within twenty-four (24) hours from Grid event. These records shall be uploaded by the respective Transmission licensee and Generating Company in the Web Based Tripping Portal of ERLDC.
- iv) ERLDC shall classify the grid incidents and grid disturbances according to CEA (Grid Standards) Regulations, amended to date. ERLDC shall report the event (grid

disturbance or grid incidence) to CEA, ERPC and all regional entities within twenty-four (24) hours of receipt of the flash report.

- v) After a complete analysis of the event, the Transmission licensee and Generating Company/User shall submit a detailed report in the case of grid disturbance or grid incidence within one (1) week of the occurrence of event to ERLDC and ERPC.
- vi) ERLDC shall prepare a draft report of each grid disturbance or grid incidence including simulation results and analysis which shall be discussed and finalized in the PCC meetings of ERPC as per the timeline specified in Table below.

Sl. No	Grid Event (GD/GI Classification as per the CEA Grid Standards)	Flash report submission deadline (Users/ SLDC)	Disturbance record and station event log submission deadline by Users/ SLDC)	Detailed report and data submission deadline by Users/ SLDC)	Draft report submission deadline by ERLDC	Discussion in PCC and final report submission deadline by ERPC
1	GI-1/GI-2	8 hours	24 hours	+7 days	+7 days	+60 days
2	Near miss event	8 hours	24 hours	+7 days	+7 days	+60 days
3	GD-1	8 hours	24 hours	+7 days	+7 days	+60 days
4	GD-2/GD-3	8 hours	24 hours	+7 days	+21 days	+60 days
5	GD-4/GD-5	8 hours	24 hours	+7 days	+30 days	+60 days

vii) The analysis reports submitted by ERLDC shall be discussed in the Protection Coordination Sub-Committee (PCC) meetings of the ERPC. The PCC shall identify the lessons learnt during the events being discussed. The PCC shall scrutinize the correctness of operation of subject protection systems put in place by the concerned Constituents and the final analysis report along with the recommendations shall be concluded. It shall also recommend the appropriate remedial measures for system improvement.

viii) The implementation of the recommendations of the final report shall be monitored by the PCC of ERPC.

ix) Any additional data such as

- Single line diagram (SLD)
- Protection relay settings,
- HVDC transient fault record,
- Location of fault with distance
- Fault details with type & relay indications
- CT/PT/CVT rating details with location
- Bus-bar arrangement/ Configuration of feeders
- CB positions (OPEN/ CLOSE) at the time of fault

- Isolator & Earth-switch positions (OPEN/CLOSE)
- Voltage, frequency & power flows with direction at the time of fault
- DR&EL records
- switchyard equipment

and any other relevant station data required for carrying out analysis of an event by ERPC, ERLDC and concerned SLDC shall be furnished by the Users including ERLDC and respective SLDC, as the case may be, within forty- eight (48) hours of the request. All Users shall also furnish high-resolution analog data from various instruments including power electronic devices like HVDC, FACTS, renewable generation (inverter level or WTG level) on the request of ERPCs, NLDC, ERLDCs or SLDCs.

- x) Triggering of STATCOM, TCSC, HVDC run-back, HVDC power oscillation damping, generating station power system stabilizer and any other controller system during any event in the grid shall be reported to the ERLDC and ERPC if connected to ISTS and to the concerned SLDC if connected to an intra-state system. The transient fault records and event logger data shall be submitted to the ERLDC or concerned SLDC within 24 hours of the occurrence of the incident. Generating stations shall submit 1 second resolution active power and reactive power data recorded during oscillations to ERLDC or concerned SLDC within 24 hours of the occurrence of the oscillations.
- xi) A monthly report on events of unintended operation or non-operation of the protection system shall be prepared and submitted by each user/owner of important elements in the regional grid, as identified by the appropriate forum of ERPC including those in the State grids that are critical for regional grid operation to ERPC and ERLDC within the first week of the subsequent month.
- xii) The detailed analysis reports shall be archived periodically. The archive shall be retained for a period of three years by each concerned agency.

## **8. Protection Audit Plan**

- i) All Users/Entities connected at 220 kV and above, shall conduct internal audit, as per the prescribed audit checklist, of their protection systems annually, and any shortcomings identified shall be rectified and informed to ERPC. The audit report along with action plan for rectification of deficiencies detected, if any, shall be shared with ERPC.
- ii) All Users /Entities shall also conduct third party protection audit of each sub-station at 220 kV and above once in five years.
- iii) After analysis of any event, PCC of ERPC may identify a list of substations / and generating stations where third-party protection audit is required to be carried out and accordingly advise the respective users to complete third party audit within three months.
- iv) The third party audit report shall contain all the information as in *Annexure-1(Third*

*Party Protection System Checking & Validation Template for a Substation) of CERC (Indian Electricity Grid Code), Regulations 2023*). The protection audit reports, along with action plan for rectification of deficiencies detected, if any, shall be submitted to the respective ERPC and ERLDC or respective SLDC, as the case may be, within a month of submission of third party audit report. The necessary compliance to such protection audit report shall be followed up regularly in the PCC meetings of ERPC.

- v) ERPC shall keep all compliance monitoring reports/audit reports at least for five years.
- vi) Annual audit plan for the next financial year shall be submitted by the Users/entities to ERPC by 31<sup>st</sup> October of every year. The users shall adhere to the annual audit plan and report compliance of the same to ERPC.

## **9. Performance Monitoring of the Protection Systems**

9.1. Users/Entities shall submit the following protection performance indices of previous month to ERPC and ERLDC on monthly basis for 220 kV and above by 15<sup>th</sup> of the subsequent month and the same shall be reviewed in the ensuing PCC meeting of ERPC.

- a) The Dependability Index defined as  $D = N_c / (N_c + N_f)$

Where,  $N_c$  is the number of correct operations at internal power system faults and  $N_f$  is the number of failures to operate at internal power system faults.

- b) The Security Index defined as  $S = N_c / (N_c + N_u)$

Where,  $N_c$  is the number of correct operations at internal power system faults and  $N_u$  is the number of unwanted operations.

- c) The Reliability Index defined as

$$R = N_c / (N_c + N_i)$$

Where,  $N_c$  is the number of correct operations at internal power system faults and  $N_i$  is the number of incorrect operations and is the sum of  $N_f$  and  $N_u$

9.2. Users/Entities shall furnish the reasons for performance indices less than unity of individual element wise protection system to the ERPC and action plan for corrective measures. The action plan will be followed up regularly in the PCC Meetings.

## **10. Compliance Monitoring**

10.1. The Protection Protocol of ER shall be reviewed as and when required, in consultation with the stakeholders of the Eastern Region.

10.2. Violation of the Protection Protocol of the Eastern Region shall be brought to the notice of ERPC by the ERLDC or concerned SLDC, as the case may be.

10.3. In case any User/Entity fails to comply with the Protection Protocol or fails to undertake remedial action identified by the PCC of ERPC within the specified timelines, the ERPC would approach the Commission with all relevant details for suitable directions.

\*\*\*

Protection Performance Indices for the month of March '24 (In compliance of Clause 15(6) of IEGC 2023)																	
NAME OF STATION:			NTPC NORTH KARANPURA SUPER THERMAL POWER PROJECT (3 X 660MW)														
S. No.	Name of the element	Tripping Date	Tripping Time	Restoration Date	Restoration Time	Reason (Relay)		Nc		Nu		Nf		Dependability index (Nc/(Nc+Nf))	Security Index (Nc/(Nc+Nu))	Reliability Index (Nc/(Nc+Nu+Nf))	Remarks (Reason for performance indices less than 1)
						End A	End B	End A	End B	End A	End B	End A	End B				
1	Unit-2	20.03.2024	10:03 Hrs	20.03.2024	21:23:00 Hrs	64RUT2A	NA	1	NA	1	NA	0	NA	1	1	1	Unit-2 tripped on Electrical Protection (UT-2A Restricted E/F) in month of March 2024



**Protection Performance Indices for the month of March'24 (In compliance of Clause 15(6) of IEGC 2023)**

Sl. No.	Name of the element	Tripping Date	Tripping Time	Restoration Date	Restoration Time	Reason (Relay indication)		Nc		Nu		Nf		Dependability index (Nc/(Nc+Nf))	Security Index (Nc/(Nc+Nu))	Reliability Index (Nc/(Nc+Nu+Nf))	Remarks (Reason for performance indices less than 1)	Analysis of the event
						End A	End B	End A	End B	End A	End B	End A	End B					
1	New Chanditala-Durgapur 400 KV #1	04.03.24	12:01:00	04.03.24	12:40:00	R-phase, Zone-1, A/r optd., A/R L/O	R-phase, Zone-1, A/r optd., A/R L/O	1	1	0	0	0	0	1	1	1		A/R L/O operate due to persistent of fault.
2	New Chanditala-Durgapur 400 KV #1	04.03.24	13:08:00	04.03.24	18:25:00	R-phase, Zone-1, A/r optd., A/R L/O	R-phase, Zone-1, A/r optd., A/R L/O	1	1	0	0	0	0	1	1	1		Tree fault found around dist. 80 Km. from Durgapur and clear the same
3	Durgapur- PPSP 400 KV # 2	04.03.24	16:54:00	04.03.24	17:47:00	R-phase, Zone-1, CS,CR, 3-Phase trip		1		0		0		1	1	1		A/R switch kept OFF as recommendation of OEM of PPSP GIS
4	Kolkata Leather Complex-Subhasgram PG	08.03.24	08:39:00	08.03.24	08:57:00	No relay indication		0		1		0		0	**	**	burn of Contrl switch contact	No fault at the Line. CB Control switch contact found damage and remote trip send from this path.Rectify the same.
5	Gokarna-Rajarhat 400 KV #1	10.03.24	15:32:00	10.03.24	19:38:00	B-phase, Zone-1, A/r optd., A/R L/O		1		0		0		1	1	1		Earth wire snapped.
6	Durgapur-Durgapur PG #2	12.03.24	06:59:00	12.03.24	07:59:00	Tripped with pole discrepancy.		0		1		0		0	**	**	PD timer Relay replaced	Pole discrepancy timer relay found burnt .Replace the same on date
7	Arambag- BKTPP	13.03.24	06:03:00	13.03.24	16:19:00	Y-phase, Zone-1, A/r optd., A/R L/O		1		0		0		1	1	1		Y-phase Suspension disc failure around 66 Km from Arambag.
8	Arambag- New-PPSP #1	14.03.24	20:32:00	14.03.24	20:56:00	B-phase, Zone-1, A/r optd., A/R L/O		1		0		0		1	1	1		A/R L/O operate due to persistent of fault.
9	Jeerat -sagardighi #2(GIS)	15.03.24	11:57:00	15.03.24	23:08:00	B-phase, Zone-1, A/r optd., A/R L/O		1		0		0		1	1	1		A/R L/O operate due to persistent of fault.
10	Arambag-NEW-PPSP#1	16.03.24	18:32:00	18.03.24	18:49	B-phase, Zone-1, A/r optd., A/R L/O	B-phase, Zone-1, A/r optd., A/R L/O	1		0		0		1	1	1		A/R L/O operate due to persistent of fault.

11	Jeerat -sagardighi #1(AIS)	16.03.24	20:48:00	16.03.24	20:48:00	Y-phase, Zone-1		0	0	1	**	0	**	NO A/R OPERATED AT JEERAT	AS the Bays are the control of Powergrid ,the matter is discussed with PG and they are taking care about the matter.
12	Arambag 315 MVA -ICT-4	16.03.24	20:12:00	16.03.24	22:39:00	Flashing observed at HV side R-phase isolator and manual		0	1	0	**	**	**	tripping of the CB due to flashing of 400 KV	Due to sudden heavy storm, R-phase HV isolator of ICT-4 dislocated and heavy flashing observed. Rectified the same and put into service at 22:39
13	Arambag-NEW-PPSP#1	18.03.24	18:48:00	18.03.24	19:15:00	B-phase, Zone-1, A/r optd., A/R L/O	B-phase, Zone-1, A/r optd., A/R L/O	1	0	0	1	1	1		A/R L/O operate due to pesistent of fault.
14	Arambag-NEW-PPSP#1	18.03.24	23:37:00	18.03.24	23:59:00	B-phase, Zone-1, A/r optd., A/R L/O	B-phase, Zone-1, A/r optd., A/R L/O	1	0	0	1	1	1		A/R L/O operate due to pesistent of fault.
15	Arambag- New-PPSP #1	19.03.24	18:14:00	19.03.24	18:31:00	B-phase, Zone-1, A/r optd., A/R L/O		1	0	0	1	1	1		During patrolling of line it is found that due to the eccessive sag of OPGW earthwire between TL no. 255 to 258 , it touches the phase conductor due to wind. (O&M)
16	KLC-Subhasgram PGCIL	21.03.24	15:26:00	22.03.24	19:36	R-phase, Zone-1, Carrier Fail		1	0	0	1	1	1		phase and at the same time cross arm of Y-phase and B-phase broken. Replaced the same and normalise at 00:00 on 22.03.24 . SDH panel of KLC found defective
17	Kharagpur- Chaibasa#1	24.03.24	13:59:00	24.03.24	14:57:00	Y-phase, Zone-1, A/r optd., A/R L/O		1	0	0	1	1	1		
18	Kharagpur- KTPP #1	25.03.24	18:28:00	25.03.24	19:23:00	B-phase, Zone-1, A/r optd., A/R L/O		1	0	0	1	1	1		
19	Arambag-New-Chanditala#1	25.03.24	18:45:00	25.03.24	19:21:00	R-phase, Y-phase, Zone-1, A/R L/O	R-phase, Y-phase, Zone-1, A/R L/O	1	0	0	1	1	1		
20	Durgapur-PPSP #1	31.03.24	02:20:00	31.03.24	02:24:00	Y-phase, Zone-1, A/R L/O		1	0	0	1	1	1		
21	KLC-Subhasgram PGCIL	31.03.24	21:49:00	31.03.24	22:22:00	No Tripping at KLC End									
22	KLC-NT AA3	31.03.24	21:49:00	01.04.24	17:47:00	Y-phase, Zone-1, A/r optd., A/R L/O	Y-phase, Zone-2, A/R L/O	1	0	0	1	1	1		Y-phase 220 KV CT burst out at KLC which causes tripping of NT-KLC in Zone-2 from NT end and PG end tripped in Zone-1(Not desirable).

SI No.	Name of the incidence	PCC Recommendation	Latest status
<b>133rd PCC Meeting</b>			
1.	Status of Busbar Protection at 220 kV Substations-reg	PCC advised state transmission utilities to share the present status of bus bar protection at 220 kV and above substations to ERPC as per the format.	
2.	Review of SPS at Sterlite (Vedanta)	SLDC Odisha representative informed that the meeting to discuss the modalities of implementation of proposed SPS scheme will be convened within a week.	
<b>132nd PCC Meeting</b>			
3.	Disturbance at 220 kV Biharsharif S/s on 14.01.2024	<ul style="list-style-type: none"> <li>➤ PCC advised Powergrid and BSPTCL to jointly review the highset overcurrent protection considering the present network configuration and fault level.</li> <li>➤ PCC advised BSPTCL to review E/F setting of the ICTs as well as lines at 220 kV Biharsharif S/s</li> <li>➤ DR configuration to be done by BSPTCL for the relays of ICT-1 &amp; 2 and relays of Mokama lines.</li> </ul>	<p><i>In 133<sup>rd</sup> PCC, BSPTCL representative informed that Powergrid had been already communicated to revise overcurrent settings at their end and settings at their end will be revised consequently. He further informed that shutdown of ICT 1 and 2 is applied for 18<sup>th</sup> March 2024 in order to rectify DR and other issues.</i></p> <p><i>Powergrid representative replied that settings will be reviewed shortly.</i></p>
<b>130<sup>th</sup> PCC Meeting</b>			
4.	Tripping of 220 kV Main Bus-2 at Budhipadar on 06.10.23 at 16:14 Hrs	<p>PCC advised to replace the defective bay unit at the earliest and restore the busbar protection for bus-2 thereafter.</p> <p><i>In 132<sup>nd</sup> PCC Meeting, OPTCL representative informed that OEM M/s Siemens had been communicated for this issue. He</i></p>	<p><i>In 133<sup>rd</sup> PCC, OPTCL representative informed that M/s Siemens had been communicated to submit estimate for procurement of new relay.</i></p>

		<i>further informed that bus bar protection for bus 2 is in off condition and for bus 1 is in service at present.</i>	
<b>125<sup>th</sup> PCC Meeting</b>			
<b>5.</b>	Repeated Line tripping of 220 kV Ramchandrapur - Joda in April 2023	<p>Regarding status of commissioning of DTPC in the line, PCC advised the matter may be taken with their telecom wing for early commissioning of the same.</p> <p><i>In 132<sup>nd</sup> PCC Meeting, JUSNL representtative informed that the tendering for procurement of DTPC is in process.</i></p>	