

भारत सरकार
Government of India
विद्युत मंत्रालय
Ministry of Power
पूर्वी क्षेत्रीय विद्युत समिति

Eastern Regional Power Committee

14, गोल्फ क्लब रोड, टॉलीगंज, कोलकाता-700033
14 Golf Club Road, Tollygunj, Kolkata-700033



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सं./NO. पू.क्षे.वि.स./PROTECTION/2023/1729

दिनांक /DATE: 29.03.2023

सेवा में / To,

संलग्न सूची के अनुसार / As per list enclosed.

विषय : दिनांक - 17.03.2023 को आयोजित 124 वीं पीसीसी बैठक का कार्यवृत्त।

Sub: Minutes of the 124th PCC meeting held on 17.03.2023

Sir,

17.03.2023 को आयोजित 124 वीं पीसीसी बैठक का कार्यवृत्त पू.क्षे.वि.स. की वेबसाइट (<http://www.erpc.gov.in/>) पर उपलब्ध है। कृपया देखें।

Please find the minutes of the 124th PCC meeting of ERPC held on 17.03.2023 available at ERPC website (<http://www.erpc.gov.in/>).

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

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

भवदीय / Yours faithfully,

for अतीव 29.03.23

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

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Minutes of 124th PCC Meeting

Date: 29/03/2023
Eastern Regional Power Committee
14, Golf Club Road, Tollygunge
Kolkata: 700 033

EASTERN REGIONAL POWER COMMITTEE

MINUTES OF 124th PROTECTION COORDINATION SUB-COMMITTEE MEETING HELD ON 17.03.2023 AT 10:30 HRS THROUGH MS TEAMS PLATFORM

Member Secretary, ERPC chaired the meeting. List of participants who attended the meeting is attached at **Annexure A**.

PART – A

ITEM NO. A.1: Confirmation of Minutes of 123rd Protection Coordination sub-Committee Meeting held on 21st Feb 2023 through MS Teams online platform.

The minutes of 123rd Protection Coordination sub-Committee meeting held on 21.02.2023 was circulated vide letter dated 09.03.2023.

Members may confirm.

Deliberation in the meeting

Members confirmed the minutes of 123rd PCC Meeting.

PART – B

ITEM NO. B.1: Total Power Failure at 220 kV Barauni, Hazipur, Amnour and Mokama S/s on 22.02.2023 at 18:11 Hrs

On 22.02.2023 at 17:57 Hrs, B phase CT of 220/132 kV ATR-3 got burst at Hazipur S/s. At the same time, 220 kV Muzaffarpur-Hazipur D/c and 220 kV Barauni-Hazipur-2 also got tripped. Subsequently, two units of 250 MW each at Barauni along with Mokama, Hajipur and Amnour load got islanded and survived for 13 minutes.

At 18:10 Hrs, due to sudden load throw-off at Amnour, both units got tripped on over-speed protection and total power failure occurred at Barauni, Hazipur, Amnour and Mokama S/s.

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

Load Loss: 255 MW, Gen. Loss: 270 MW
Outage Duration: 00:14 Hrs

BSPTCL, BGCL & NTPC may explain.

Deliberation in the meeting

It was informed that prior to incident 220 kV Begusarai- Barauni D/c was under shutdown for reconductoring work.

At 17:57 Hrs, B phase CT of 220/132 kV ATR-3 got burst at Hazipur S/s. Differential protection of ATR operated and resulted in tripping of ATR instantaneously. At the same time, 220 kV Muzaffarpur-Hazipur D/c and 220 kV Barauni-Hazipur-2 also got tripped from Hazipur end in zone-4(reverse zone) of distance protection.

After tripping of Barauni-Hazipur-2, the loading in parallel circuit increased to great extent. SLDC Bihar informed that to reduce the loading of 220 kV Barauni-Hazipur-1, 220 kV Mokama-Biharsharif was made open. This resulted in islanding operation of Barauni units along with Mokama, Hajipur and Amnour load and islanding mode survived for 13 minutes. However, at 18:10 Hrs, due to sudden load throw-off at Amnour, both units got tripped on over-speed protection and further 220 kV Mokama-Barauni D/c tripped at 18:10:42.888 Hrs due to operation of O/V stage 1 at Mokama and 220 kV Barauni-Hazipur-1 tripped at 18:10:44.001 Hrs on O/V stage 1 at Barauni end. This resulted total power failure at Barauni, Hazipur, Amnour and Mokama S/s.

On enquiry from PCC regarding tripping of 220 kV Muzaffarpur-Hazipur D/c and 220 kV Barauni-Hazipur-2 from Hazipur end instantaneously, BSPTCL representative informed that zone 4 timer setting was set to 250 ms for these lines as per advice from PCC as bus bar protection is not in service for 220 kV Bus at Hazipur. However, timer delay logic setting was not enabled in the relay which resulted in instantaneous tripping of the line.

They further informed that shutdown of the line has been planned for rectification and testing of the relays at Hazipur.

Regarding islanding formation of Barauni units, PCC opined that the event is not desirable from system operation point of view and could have been avoided by SLDC Bihar. It was opined that an SOP may be prepared by SLDC in consultation with ERLDC in case of contingencies in evacuation of generation from Barauni units.

MS ERPC stressed on the fact that due to improper coordination of concerned substations and SLDC Bihar, this event had occurred which further resulted in huge load loss and generation loss which could have been avoided if proper coordination was done by SLDC Bihar and correct information was given to NTPC Barauni on time so that generation could have taken necessary action on time. He further told that this issue need to be highlighted at 49th TCC Meeting so that such type of events should not occur in future.

It was observed that DRs at Hazipur end is not time synchronized accordingly BSPTCL was advised to rectify it at the earliest.

PCC refereed the issue to forthcoming TCC meeting for discussion.

ITEM NO. B.2: Tripping of 400 kV GMR- Meramundali line and Outage of GMR unit 3 on 28.02.2023

On 28.02.2023, at 13:49 hrs, GMR Unit 3 got tripped as power evacuation became zero at Meramundali B end. Detailed report from OPTCL is attached at **Annexure B.2.**

Following events occurred at Meramundali end during the grid disturbance-

1. There was no tripping of 400kV breaker at Meramundali – B end.
2. The Line breaker and tie breaker for Dia – 408 at Mermundali – A end to which Meramundali -B is connected got tripped under SOTF protection.
3. Both 220kV breakers of Goda and Duburi got tripped at Meramundali – B end under Zone – 1 distance protection.
4. Only M2 relay at Meramundali - A end, sensed SOTF protection as fault current sensed in R phase was 2.5kA and 400kV voltage dipped to 366kV.

Since the connectivity between Meramundali – B and Meramundali – A was lost due to opening of 400kV breaker at Meramundali – A end under SOTF protection and also connectivity with 220kV system at Mermundali B end was lost due to opening of 220kV breaker of GODA and Duburi, hence

Unit 3 of GMR got islanded from the Grid subsequently it resulted in tripping of the turbine and hence leads to outage of the unit.

It is requested to take the earliest action in this regard as every outage of the unit results huge start-up cost and high revenue loss. Also as the line is a single circuit, so more focus to be given on its reliability for avoiding unwanted tripping during upcoming monsoon.

To overcome such type of situation in future, it is here with proposed:

1. Relay setting of both M1 and M2 at Meramundali – A end (for GMR – old feeder) to be reviewed, and SOTF setting to be changed.
2. Till the connection of other 400kV feeders at Meramundali – B, it is requested to disconnect 220kV GODA and Duburi feeder from Meramundali B.
3. Other 400kV feeders are to be connected to Meramundali B at the earliest, so that power evacuation problem can be sorted out.

GMR and OPTCL may explain.

Deliberation in the meeting

ERLDC representative informed that earlier, 400kV GMR S/s was connected with 400kV Meramundali A S/s. After LILO of 400kV GMR- Meramundali A at 400kV Meramundali B, 400kV GMR S/s is presently connected with 400kV Meramundali B S/s.

On 28.02.2023, there was fault developed inside 220 kV TSL S/s which is directly connected with 220 kV Meramundali A S/s. There was T connection for 220 kV Meramundali A, 220 kV Meramundali B, 220 kV Goda and 220 kV Duburi line due to which 220 k V Meramundali B- Goda and 220 k V Meramundali B- Duburi line saw the fault at 220 kV TSL S/s in their zone 1 and got tripped from Meramundali A end.

At the same time, 400 kV Meramundali A- Meramundali B tripped from Meramundali A end in SOTF protection.

*Presentation from OPTCL is attached at **Annexure B.2.1**.*

On enquiry from PCC regarding logic set for SOTF protection at Meramundali end, OPTCL representative replied that as per logic, during the incident the current and voltage threshold value for SOTF operation was satisfied and the relay operated. ERLDC intimated that along with current and voltage threshold manual close signal is in AND mode in the relay to which OPTCL replied that in siemens relay no such provision exists.

PCC opined that the logic can be constructed in the relay and advised OPTCL to consult with relay OEM in this regard.

Further it was deliberated that being a extremely shot line, the charging current is very less which is below the threshold setting of 100 A for the line. As a result the relay sensed the line as open when the current value is less than 100 A even if the line is in closed condition. PCC advised OPTCL to consult with rely OEM for further reducing the threshold current value in the SOTF relay.

PCC further observed that being shot line, TOR function may be disabled in the relay for this line and line differential protection may be implemented for reliable protection performance.

OPTCL representative informed that around 200m of underground cable is present for 220 kV Meramundali B- Goda(70 km) and 220 k V Meramundali B- Duburi(95 km) line and enquired about implementation of auto-recloseer in the line. PCC suggested that auto-reclose may be enabled for both lines as cable length is very small as compare to line length. The same may be reviewed in future in case of any discrepancy.

After detail deliberation PCC advised OPTCL following:

- To disable SOTF & TOR in the relay for 400 kV Meramundali-A-Meramundali B line.

- Relay OEM may be contacted for reducing the current threshold value in SOTF setting and for implementation of AND condition with manual closing for triggering of SOTF.
- To remove T-connection for the lines connected among 220 k V Meramundali A/220 kV Meramundali B & 220 kV Goda, 220 kV Duburi at the earliest.
- To implement line differential protection for 400 kV Meramndali A-Meramundali B line.

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

A. Bus tripping occurred in Eastern Region during February 2023

Element Name	Tripping Date	Reason	Utility
132 kV Main Bus-3 at Rangpo	09.02.23 at 19:19 Hrs	DC earth fault in Rongnichu bay	PG ER-2
400 kV Main Bus-2 at Jamshedpur	24.02.23 at 21:50 Hrs	LBB of main bay of 400/220 kV ICT-3 at Jamshedpur operated	PG ER-1

Concerned utilities may explain.

Deliberation in the meeting

- **Tripping of 132 kV Main Bus-3 at Rangpo on 09.02.2023 at 19:19 Hrs**

Powergrid representative informed that during charging of 220 kV Rangpo-Rongnichu line after returning of shutdown, DC earth fault developed in auxiliary contacts of breaker. This initiated tripping of gas density relay of 132 kV Rangpo-Gangtok-2 feeder due to DC leakage in its contactor and it further resulted in tripping of 132 kV Main Bus-3 at Rangpo. He intimated that the issue had already been rectified.

- **Tripping of 400 kV Main Bus-2 at Jamshedpur on 24.02.2023 at 21:50 Hrs**

Powergrid representative informed that 400/220 kV ICT-3 was under shutdown for AMP work during which testing of modification scheme for OSR tripping was also in progress. He intimated that as per their internal guideline on OSR scheme, instead of direct tripping from OSR, the scheme has been modified and interlocked through backup overcurrent/earth fault protection.

During testing of the scheme, current got flowed through LBB relay and at that time already one group relay was in operated condition. This resulted in operation of LBB and subsequent initiation of busbar protection.

He intimated that due to discrepancy during testing, LBB circuit not properly isolated which caused this disturbance.

ITEM NO. B.4: Submission of protection settings for newly charged elements/change in network configuration

The new elements charged in ER Grid during month of Nov 22 and Feb 23 is given at **Annexure B.4.**

In 123rd PCC Meeting, PCC advised all the utilities to intimate any changes in network configuration in their intra state network regularly and review the settings accordingly & upload the relay settings

in PDMS by using DMNS portal or by sending the settings file in desired format to erpc-protection@gov.in.

Deliberation in the meeting

Members noted.

PCC advised all the utilities to upload details of the disturbances such as SOE, DR/ in a timely manner so that analysis of event can be done on time.

On enquiry from ERLDC regarding facility in PDMS to review the settings implemented in the relay, PRDC representative replied that settings can be extracted from PDMS and analysis/review of same can be done by simulation tool of PSCT.

It was decided that the substation-wise review of protection settings may be carried out using PDMS & PSCT for that PRDC was advised to make a presentation in this regard in PCC.

ITEM NO. B.5: Repeated tripping of transmission lines

It has been observed that majority of the repeated tripping is due to non-maintenance of lines/vegetation issues. After detailed analysis it has been found that most of these lines belong to more than one transmission licensee. Lack of coordination between two parties along with non-maintenance of lines are resulting into multiple tripping of same line.

List of repeated tripping of lines is attached as below.

Sl No	Element Name	Utility	2021	2022	Remarks
1	132KV-SULTANGANJ-DEOGHAR-1	BSPTCL/JUSNL	49	29	Fault due to vegetation, non-maintenance
2	220KV-CHANDIL-STPS(WBPDCL)-1	JUSNL/WBSETCL	29	12	Fault due to vegetation around 20 km from Santaldih and around 18 km from Chandil,A/r not functioning properly
3	132KV-RIHAND-GARWAH-1	JUSNL/BSPTCL/UPPTCL	27	31	Radial feeder tripped most of the time from Rihand only. Fault at multiple locations.
4	132KV-KAHALGAON(BSEB)-LALMATIA-1	BSPTCL/JUSNL	25	36	Line charged within an hour in most of the instances. Seems vegetation issue
5	132KV-Nagaruntari-SONENAGAR-1	JUSNL/BSPTCL	23	35	Line charged within an hour in most of the instances. Fault

					at multiple locations
6	132KV-RAXAUL-PARWANIPUR-1	BSPTCL/NEA	19	18	Line charged within an hour in most of the instances.
7	220KV-TENUGHAT-BIHARSARIFF-1	JUSNL/BSPTCL	19	19	Majority of the fault in 2-3 particular location. Seems to be vegetation, Maintenance issue. A/r not functional
8	220KV-JODA-RAMCHANDRAPUR-1	OPTCL/JUSNL	18	18	A/r not functional, most of the fault around 120-125 km from Ramchandrapur
9	132KV-MAITHON-JAMTARA-1	DVC/JUSNL	16	14	Fault around 2-3 km from Maithon for numerous occasions
10	132KV-SONENAGAR-JAPLA-1	BSPTCL/JUSNL	21	24	Maintenance issue, line charged within an hour in most of the instances
11	132KV-RIHAND-Nagaruntari-1	UPPTCL/BSPTCL/JUSNL	14	32	Radial feeder tripped most of the time from Rihand only. Fault at multiple locations.
12	132KV-BANKA (PG)-SULTANGANJ-1	BSPTCL	28	20	Majority of the fault in 15-25 km from Sultanganj
13	132KV-KHSTPP-SABOUR-1	BSPTCL	26	19	Most faults around 11 km from KhSTPP
14	132KV-BANKA (PG)-SULTANGANJ-2	BSPTCL	24	23	Line charged within an hour in most of the instances. Seems vegetation issue
15	400KV-PPSP-BIDHANNAGAR-1	WBSETCL	8	17	Fault in 2-3 particular location. Line charged within half an hour in most of the instances. A/r kept disabled as per OEM advise
16	400KV-PPSP-BIDHANNAGAR-2	WBSETCL	15	11	

17	220KV-DALTONGANJ-CHATRA-1	JUSNL	7	20	A/r functioning properly at Chatra. Faults due to line clearance, vegetation
18	220KV-DALTONGANJ-CHATRA-2	JUSNL	7	23	
19	132KV-LAKHISARAI(PG)-LAKHISARAI(BSEB)-1	BSPTCL	6	13	Majority of faults around 15 km from PG end.

Members may discuss.

Deliberation in the meeting

Regarding tripping of 132kV-Nagaruntari-SONENAGAR-1, JUSNL representative replied that patrolling was done subsequently punctured insulators were found which had been already replaced and single line tripping incidents had been reduced for this line. For 132kV-RIHAND-Nagaruntari-1, he informed that damaged insulators had been replaced however, further tripping incidents had been resulted due to fault near Rihand end.

Regarding tripping of 132kV-Nagaruntari-SONENAGAR-1 and 132KV-SONENAGAR-JAPLA-1, BSPTCL representative informed that only 34 km of line is under their jurisdiction and only single tripping incidence had occurred in their jurisdiction in last 4 months. He further informed that insulator replacement work had been done at 5 locations and recoductoring to HTLS had been also done along with clearance of corridor.

Regarding tripping of 220kV-JODA-RAMCHANDRAPUR-1, JUSNL representative informed that after conducting patrolling of line, punctured insulators were replaced. ERPC representative replied that most of the tripping incidence had caused due to unsuccessful operation of auto- reclose as PLCC coupler is not present.

Regarding tripping of 132kV-SULTANGANJ-DEOGHAR-1, JUSNL representative replied that no issues had been found under their jurisdiction. BSPTCL representative replied that tower top patrolling of line was done on 20/02/2023 during which damaged insulators had been found at 132 no of locations and they are in process to replace it and it is expected that work will be done by one month.

Regarding tripping of 132kV-KAHALGAON(BSEB)-LALMATIA-1, JUSNL representative informed that repeated tripping of line was observed upto July 2022 due to issue in relay settings however after revising relay settings, only 3 tripping had been observed from Aug 22 to Feb 23.

Regarding tripping of 220kV DALTONGANJ-CHATRA-1 and 220kV-DALTONGANJ-CHATRA-2, JUSNL representative informed that auto-reclose of both lines had been restored and rectification of PLCC will be done by March 2023.

Regarding tripping of 220KV-TENUGHAT-BIHARSARIFF-1, BSPTCL representative informed that it is observed that most of tripping had occurred in jurisdiction of Jharkhand for last few months.

PCC referred the issue to forthcoming TCC meeting for discussion.

ITEM NO. B.6: Tripping Incidence in month of February-2023

Single line tripping incidents in the month of February-2023 which needs explanation from constituents of either end is attached.

Deliberation in the meeting

*Explanation from constituents of either end for single line tripping incidents in the month of February-2023 is attached at **Annexure B.6**.*

PART- C :: OTHER ITEMS

ITEM NO. C.1: Implementation of Single-Phase Auto recloser feature in DEF Relays for the 400 kV transmission lines of TPTL-(Agenda by TPTL)

In 108th PCC meeting, the proposal of implementing auto reclosure with DEF protection was discussed and after discussion it was opined that the proposal needs elaborate technical discussion and confirmation from the relay manufacturers regarding provision of the single-phase auto reclosing functionality in DEF relay for which PCC had further advised TPTL to furnish relevant document / information for further discussion in this regard.

Subsequently TPTL had contacted with the relay suppliers of 400 kV D/C Teesta III HEP – Kishanganj transmission line at Teesta III end and Kishanganj end. The supplier of P442 relay at Teesta III HEP end, i.e., M/s GE Renewable Energy has confirmed that single phase tripping and auto reclose is possible in aided DEF protection function in the P442 relay. Further, as per the relay manual of MiCOM P127 relay, supplied by M/s Areva (formerly M/s Schneider) at Teesta III end, auto reclosure feature is available in DEF protection function of the relay. At Kishanganj end it was also confirmed by the relay supplier, i.e., M/s Hitachi Energy (formerly M/s ABB Power Systems India) that single phase auto reclose is available in DEF protection function of REL670 relay.

In view of above, it is proposed to implement Single Phase Auto recloser feature in DEF Relays for the 400 kV transmission lines of TPTL.

Discussion was held in 121st PCC Meeting regarding this agenda and after detailed deliberation, the following way forward was decided:

- ERLDC to coordinate with NERLDC to get feedback regarding reliability and success rate of auto recloser scheme in DEF relay.
- TPTL to make a detailed presentation on proposed scheme & its logic and on implementation of the scheme at relay level along with wiring & communication channel detailing in next PCC meeting.
- All transmission utilities were advised to share comments to ERPC/ERLDC regarding implementation of single-phase auto reclosing feature in DEF relay.

In 122nd PCC Meeting, ERLDC representative informed that as per communication received from NERLDC, single phase auto-recloser scheme in DEF relay had been implemented in 400 kV Silchar- Imphal d/c and 400 kV Silchar- Misa d/c line and it is operating satisfactorily. He further informed that current reversal guard need to be implemented along with auto recloser scheme in DEF relay for its successful operation.

PCC advised TPTL to make a detailed presentation on proposed scheme & its logic and on implementation of the scheme at relay level along with wiring & communication channel detailing in next PCC meeting.

In 123rd PCC Meeting, TPTL representative informed that as per advice of PCC, M/s GE was communicated to submit detailed scheme with regard to implementation of single phase auto-reclose scheme in DEF relay.

He further stated that, as intimated by M/s GE the detail scheme & its implementation will be presented in next PCC Meeting.

M/s GE may present. Members may discuss.

Deliberation in the meeting

Powergrid representative shared case study paper of IIT Mumbai describing about mal operation of DEF protection resulting in spurious tripping of healthy line. He suggested that comments may be shared by utilities before implementing single phase auto recloser feature in DEF Relays for the 400 kV transmission lines of TPTL.

ERLDC informed that spurious tripping of healthy line is even possible if single phase auto recloser feature is disabled in DEF relays however they requested all utilities to share the observation on the proposed scheme.

TPTL representative informed that as per communication made with M/s GE, the detail scheme & its implementation will be presented at the earliest.

ITEM NO. C.2: Follow-up of Decisions of the Previous Protection Sub-Committee Meeting(s)

The decisions of previous PCC meetings are attached.

Members may update the latest status.

Deliberation in the meeting

*Updated status of follow up of decisions of previous PCC meetings are attached at **Annexure C.2.***

ITEM NO. C.3: List of lines having OPGW for 220 kV and above level.

After detailed tripping and protection analysis, it has been observed that majority of discrepancy in protection operation may be attributed to following reasons:

- Tripping of lines without fault.
- Delayed tripping due to Failure of carrier schemes
- Non-operation of Auto reclosure.

Unwanted tripping or non-operation of auto reclose and delayed clearances due to failure of carrier schemes are related to healthiness of communication scheme. To improve this, it is crucial to ensure healthiness of the PLCC and perform regular end-to-end testing during shutdowns. Alternatively, OPGW/DTPC based scheme may be implemented, which will exceptionally improve the reliability and major problems as mentioned above can be resolved. In this regard, all the utilities are requested to provide the following,

- List of 220 kV and above lines where OPGW based communication scheme have already been implemented.
- Upgradation to OPGW has been planned/OPGW work is under progress.
- Further, wherever OPGW have been installed, plan for PLCC replacement with DTPC.

In rest of the lines, OPGW with DTPC may be installed at the earliest to improve reliability and availability of the lines.

In 122nd PCC Meeting, it was informed that as per Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022, it is mandated to implement OPGW based communication scheme in lines above 132 kV. Therefore, all transmission utilities were requested to provide the list of 220 kV and above lines where:

- I. OPGW based communication scheme have already been implemented
- II. Upgradation to OPGW has been planned/OPGW work is under progress.

List of lines with status of OPGW/DTPC received from WBSETCL, DVC, Powergrid and JUSNL is attached at **Annexure C.3**.

Members may update.

Deliberation in the meeting

ERPC representative informed that list of lines with status of OPGW/DTPC had been received from WBSETCL, DVC, Powergrid ER-I and JUSNL.

PCC advised BSPTCL, OPTCL, Powergrid ER-II and Powergrid Odisha to share list at the earliest.

ITEM NO. C.4: New Element Integration

A. FTC of LILO of 400 kV GMR-Meramundali at Meramundali B

As per information received at ERLDC, 400 kV GMR-Meramundali S/c is going to be LILOED at Meramundali B S/s. After LILO, configuration will be as below:

Name	Conductor Type	Length
400 kV GMR-Meramundali B	Twin Moose ACSR	7.3 km
400 kV Meramundali B-Meramundali A	Twin Moose ACSR	1.4 km

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

Reason	Settings to be reviewed	At S/s	Utility	Remarks
FTC of LILO of 400 kV GMR-Meramundali at Meramundali B	400 kV GMR-Meramundali B	GMR, Meramundali B	GMRKEL, OPTCL	Protection coordination to be done for newly connected elements as per ERPC guidelines.
	400 kV Meramundali B-400 kV Meramundali A	Meramundali A, Meramundali B	OPTCL	Protection coordination to be done for newly connected elements as per ERPC guidelines.

- Carrier Scheme healthiness confirmation is required to facilitate FTC of the lines.

- Utilities may confirm if any changes in protection setting required or not. If any changes done, may share the revised protection settings with ERLDC and ERPC at the earliest.

Following points may be noted-

- 400 kV Meramundali S/s is now referred as 400 kV Meramundali A
- Adjacent shortest line for below-mentioned lines at Meramundali S/s will be 400 kV Meramundali B-Meramundali A (1.4 km), which is for records of concerned S/s(remote end) as Zone-2 time delay of these lines will not change (already should be 500 msec):
 - 400 kV TSTPP-Meramundali D/c
 - 400 kV Lapanga-Meramundali D/c
 - 400 kV New Duburi-Meramundali D/c
 - 400 kV Mendhasal-Meramundali D/c
 - 400 kV JSPL-Meramundali D/c

Concerned utilities may update. Members may note.

Deliberation in the meeting

ERLDC representative informed that confirmation had been received from concerned utilities.

Members noted.

पावर सिस्टम ऑपरेशन करपोरेशन लिमिटेड

(भारत सरकार का उद्यम)

POWER SYSTEM OPERATION CORPORATION LIMITED

(A Government of India Enterprise)



Eastern Regional Load Despatch Centre: 14, Golf Club Road, Tollygunge, Kolkata-700 033.

CIN: U40105DL2009GOI188682

फ़ोन: 033- 24235755, 24174049 फ़ैक्स : 033-24235809/5029 Website: www.erldc.org, Email ID- erldc@posoco.in

घटना संख्या: 22-02-2023/1

दिनांक: 09-03-2023

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

Summary of the event (घटना का सारांश):

At 17:57 Hrs, B_ph CT of 220/132 kV ATR-3 burst at Hazipur S/s. At the same time, 220 kV Muzaffarpur-Hazipur D/c and 220 kV Barauni-Hazipur-2 tripped. Subsequently, both units (U#8 & U#9- 250 MW each) at Barauni along with Mokama, Hajipur and Amnour load got islanded and survived for 13 minutes. At 18:10 Hrs, due to sudden load throw-off at Amnour, both units tripped on Over-speed protection and total power supply failed at Barauni, Hazipur, Amnour and Mokama S/s. Around 270 MW generation loss and 255 MW load loss occurred.

- **Date / Time of disturbance:** 22-02-2023 at 18:10 hrs
- **Event type:** GD-1
- **Systems/ Subsystems affected:** 220 kV Barauni TPS, 220/132 kV Hazipur, Amnour, Mokama
- **Load and Generation loss.**
 - 270 MW generation loss occurred during the event at Barauni TPS.
 - Around 255 MW load loss reported during the event at Hazipur, Mokama, Chhapra, Amnour.

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

- 220 kV Barauni-Begusarai D/c under shutdown
- 220 KV Biharsharif-Mokama D/c (opened at 17:56 Hrs)

Major elements tripped (प्रमुख ट्रिपिंग):

At 17:57 Hrs

- 220 kV Muzaffarpur-Hazipur D/c
- 220 kV Barauni-Hazipur-2
- 220/132 kV 200 MVA ATR-3 at Hazipur

At 18:10 Hrs

- U#8, U#9 at Barauni (250 MW each)
- 220 kV Barauni-Mokama D/c
- 220 kV Barauni-Hazipur-1

Network across the affected area (प्रभा वत क्षेत्र का नक्शा)

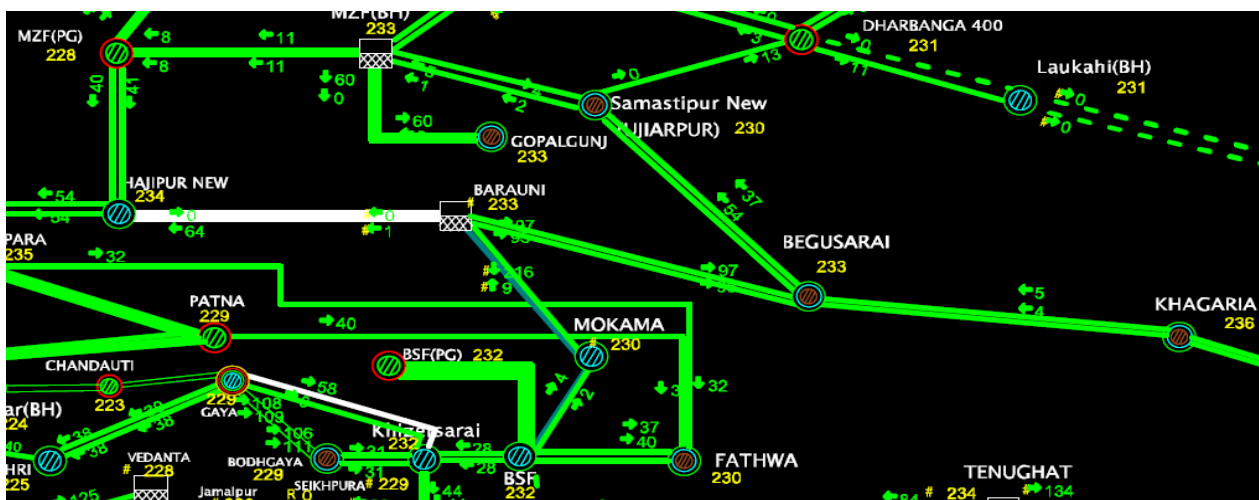


Figure 1: SCADA snapshot of the system

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

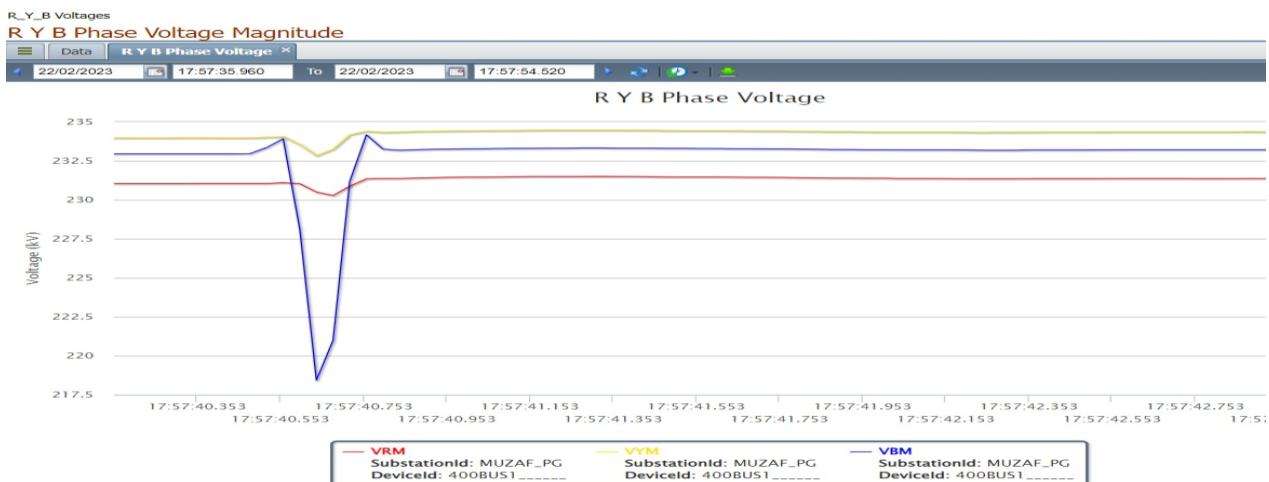


Figure 2: PMU snapshot of 400/220 kV Muzaffarpur S/s

समय	नाम	उप केंद्र 1 रिले संकेत	उप केंद्र 2 रिले संकेत	पीएमयू पर्यवेक्षण
17:57	220/132 kV ATR-3 at Hazipur	Differential Protection		15 kV dip in B_ph at Muzaffarpur
	220KV Muzaffarpur-Hazipur D/c	Muzaffarpur: Didn't trip	-	
	220KV Barauni-Hazipur-2	Barauni: Didn't trip	-	
18:10	Barauni Unit 8 & 9	Overspeed protection		-
	220 kV Barauni-Mokama D/c	Barauni: DT received	Mokama: O/V St.1	
	220 kV Barauni-Hazipur-1	Barauni: O/V st. 1	-	

Restoration (पूर्वावस्था की प्रप्ति)

Transmission/Generation element name	Restoration time
220 kV Muzaffarpur-Hazipur D/c	18:39/18:47
220 kV Barauni-Hazipur D/c	-
Barauni U#8	23:05
Barauni U#9	20:39 (27.02.23)
220 kV Barauni-Mokama D/c	18:34/-

Analysis of the event (घटना का वश्लेषण):

Antecedent Conditions:

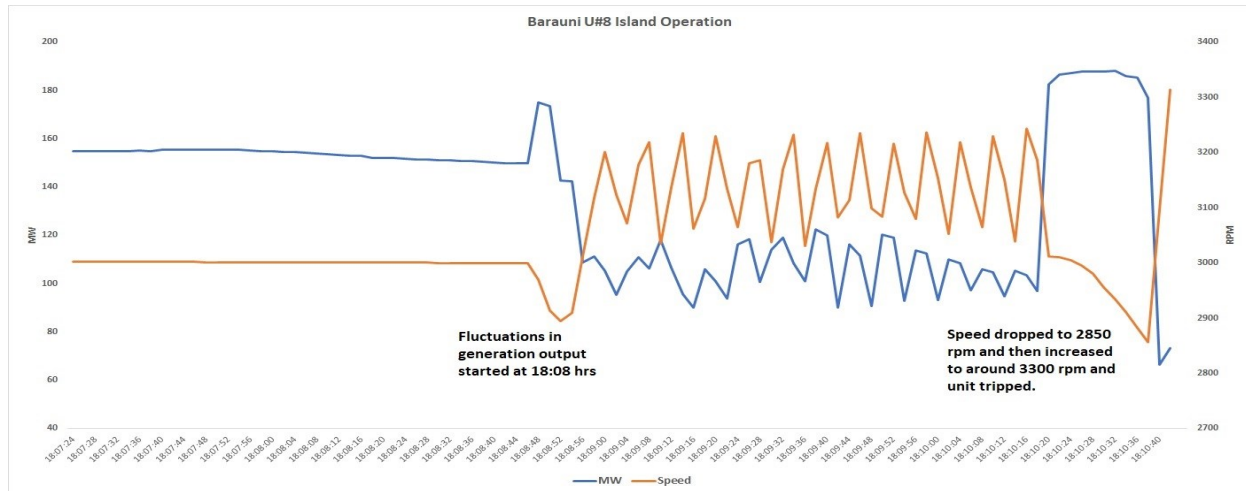
- 220 kV Begusarai-Barauni D/c was under shutdown.
- 220 kV Biharsharif-Mokama D/c was hand-tripped at 17:56 Hrs and Barauni TPS was connected with the grid through 220 kV Barauni-Hazipur-Muzaffarpur link only.

Event Analysis:

- At 17:57 Hrs, B_ph CT of 22/132 kV 220 MVA ATR-3 burst at Hazipur. Differential protection of the autotransformer operated, and it tripped instantaneously. Bus bar protection is not available at Hazipur.
- At the same time, 220 kV Muzaffarpur-Hazipur D/c and 220 kV Barauni-Hazipur-2 tripped from Hazipur. As per DR at Hazipur, Zone-4 picked up in all three lines but line tripped immediately.
- After tripping of abovementioned elements, both units of Barauni along with loads of Hazipur, Mokama, Amnour separated from the grid and started running in islanding mode as 220 kV Biharsharif-Mokama D/c was hand-tripped at 17:56 Hrs.
- This island survived for 13 minutes and at 18:10 hrs both units at Barauni tripped sequentially on overspeed protection due to sudden load throw-off at Amnour.
- U#9 tripped at 18:10:16 Hrs and U#8 tripped at 18:10:42 Hrs.
- 220 kV Mokama-Barauni D/c tripped at 18:10:42.888 Hrs due to operation of O/V st-1 at Mokama and DT received at Barauni.
- 220 kV Barauni-Hazipur-1 tripped at 18:10:44.001 Hrs due to O/V st.1 at Barauni.

Island operation of Barauni TPS:

- As reported, Barauni along with loads of Hazipur, Amnour, Mokama went into island mode at 17:57 hrs after tripping at Hazipur.
- The island operated smoothly till 18:08 Hrs when fluctuations started in both units and subsequently at 18:10 Hrs both units tripped on over-speed protection.



Protection issues (सुरक्षा समस्या):

- Status of Bus Bar implementation at Hazipur may be updated.
- As differential protection of affected transformer operated, no other element should have tripped. BSPTCL may explain why 220 kV Barauni-Hazipur-2 and 220 kV Muzaffarpur-Hazipur D/c tripped from Hazipur.
- Opening of 220 kV Biharsharif-Mokama D/c led to availability of only one grid connectivity to Barauni through 220 kV Barauni-Hazipur-Muzaffarpur link as 220 kV Barauni-Begusarai D/c was under shutdown. **SLDC may explain why 220 kV Biharsharif-Mokama D/c was opened.**
- All DRs at Hazipur are not time synchronized. **BSPTCL may update.**
- O/V settings at Mokama (BGCL) to be reviewed or disabled.

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

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

Status of Reporting (रिपोर्टिंग की स्थिति):

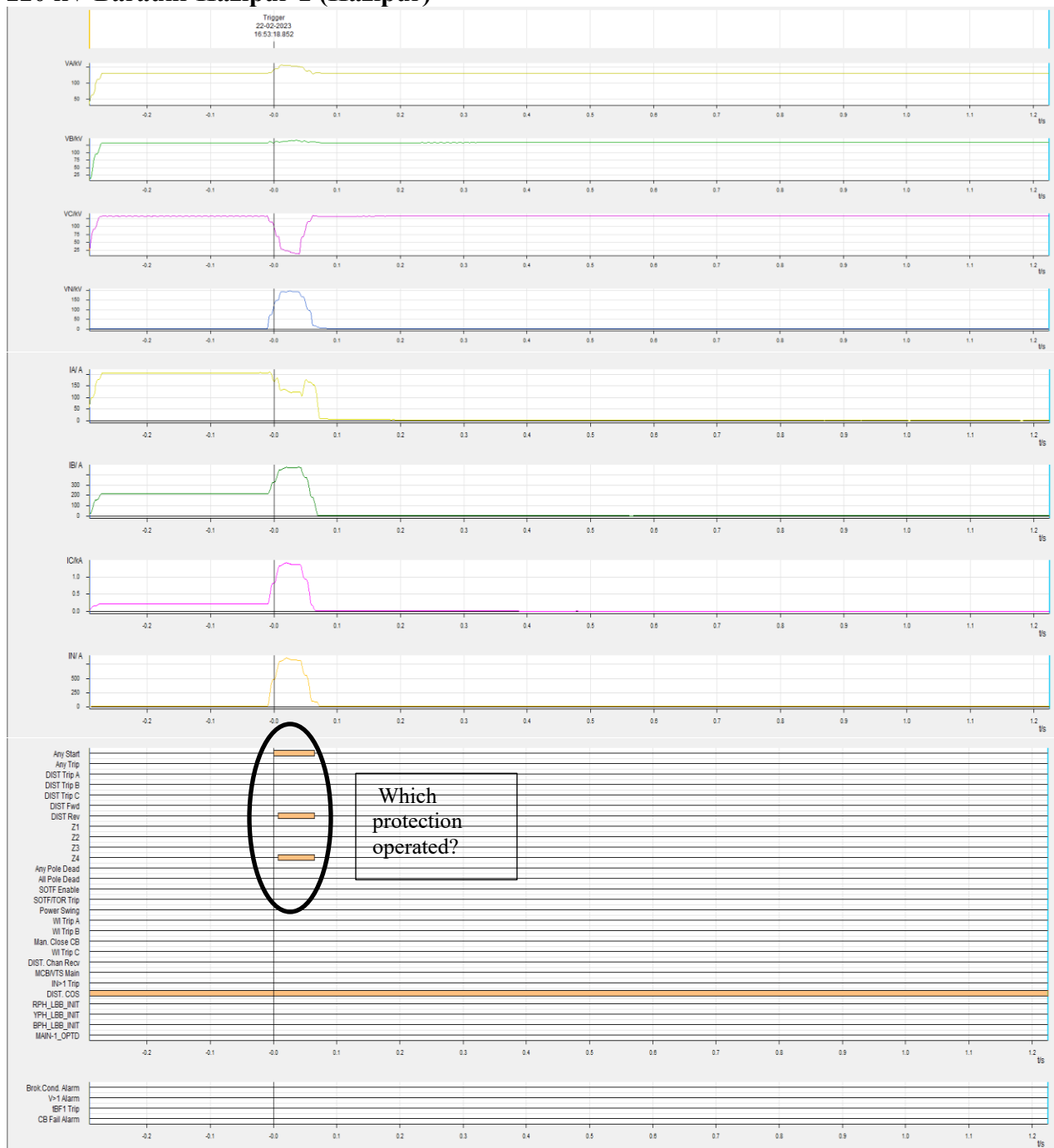
- DR/EL received from BSPTCL, BGCL, BTPS.

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

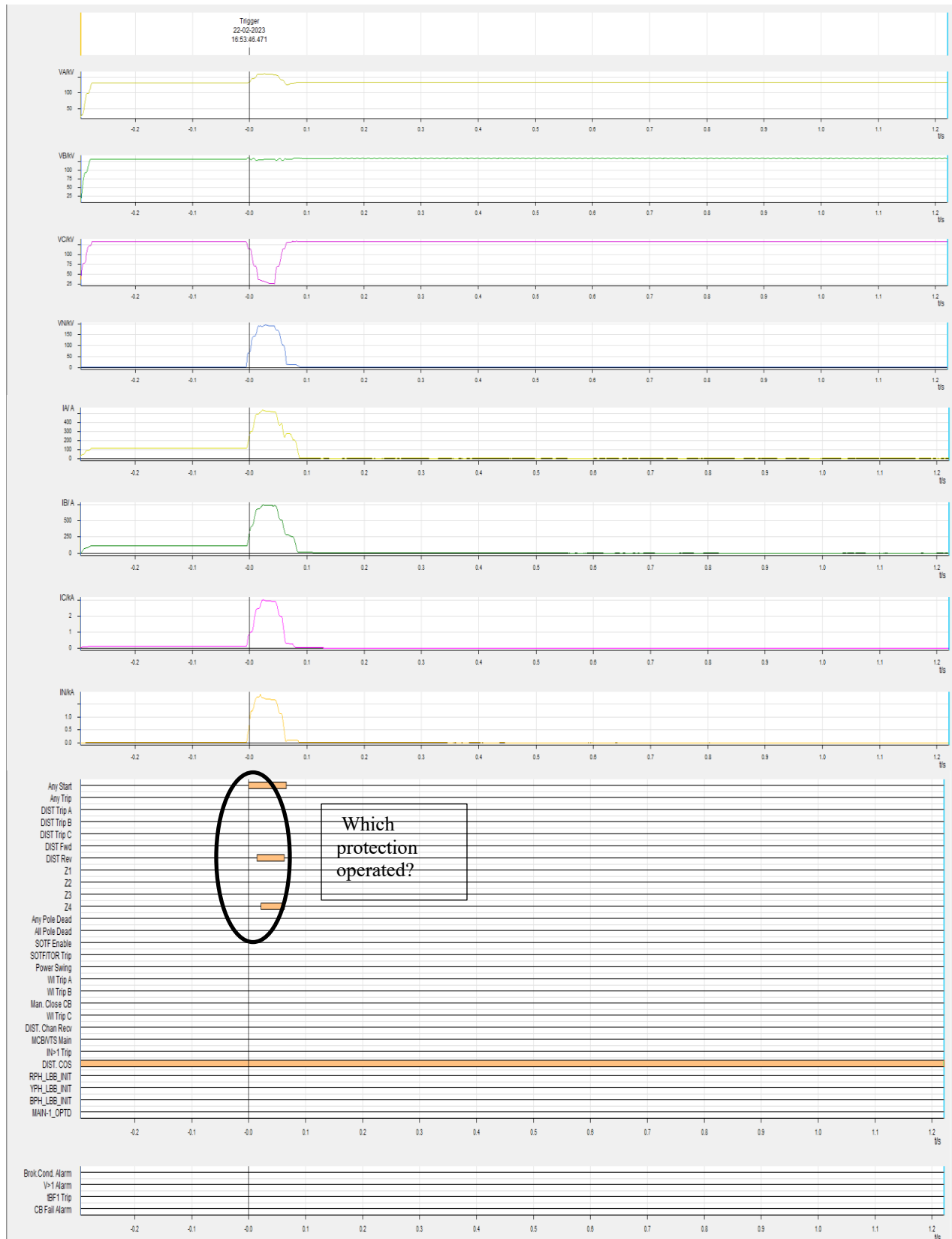
Sequence of event not recorded at time of event.

Annexure 2: DR recorded

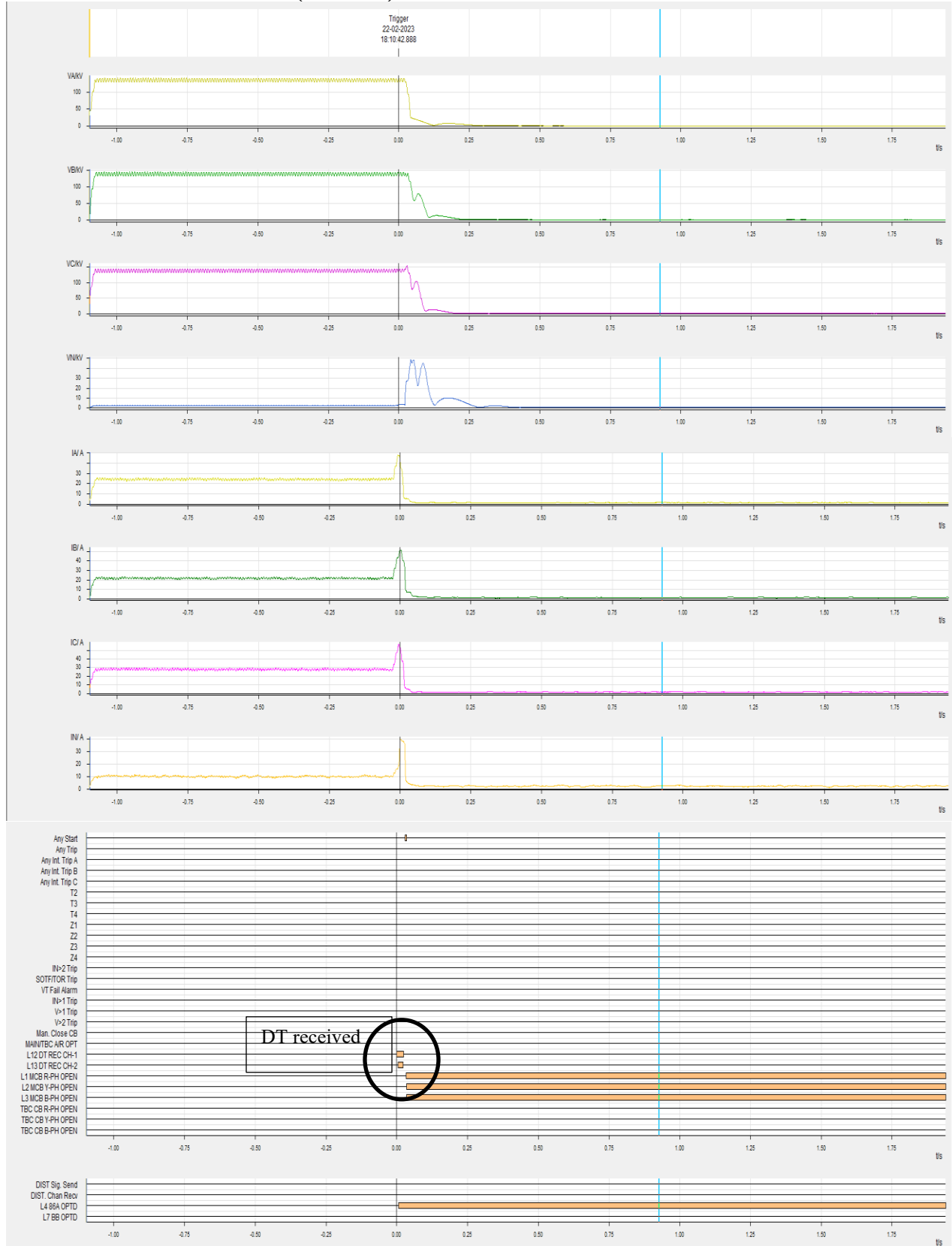
220 kV Barauni-Hazipur-2 (Hazipur)



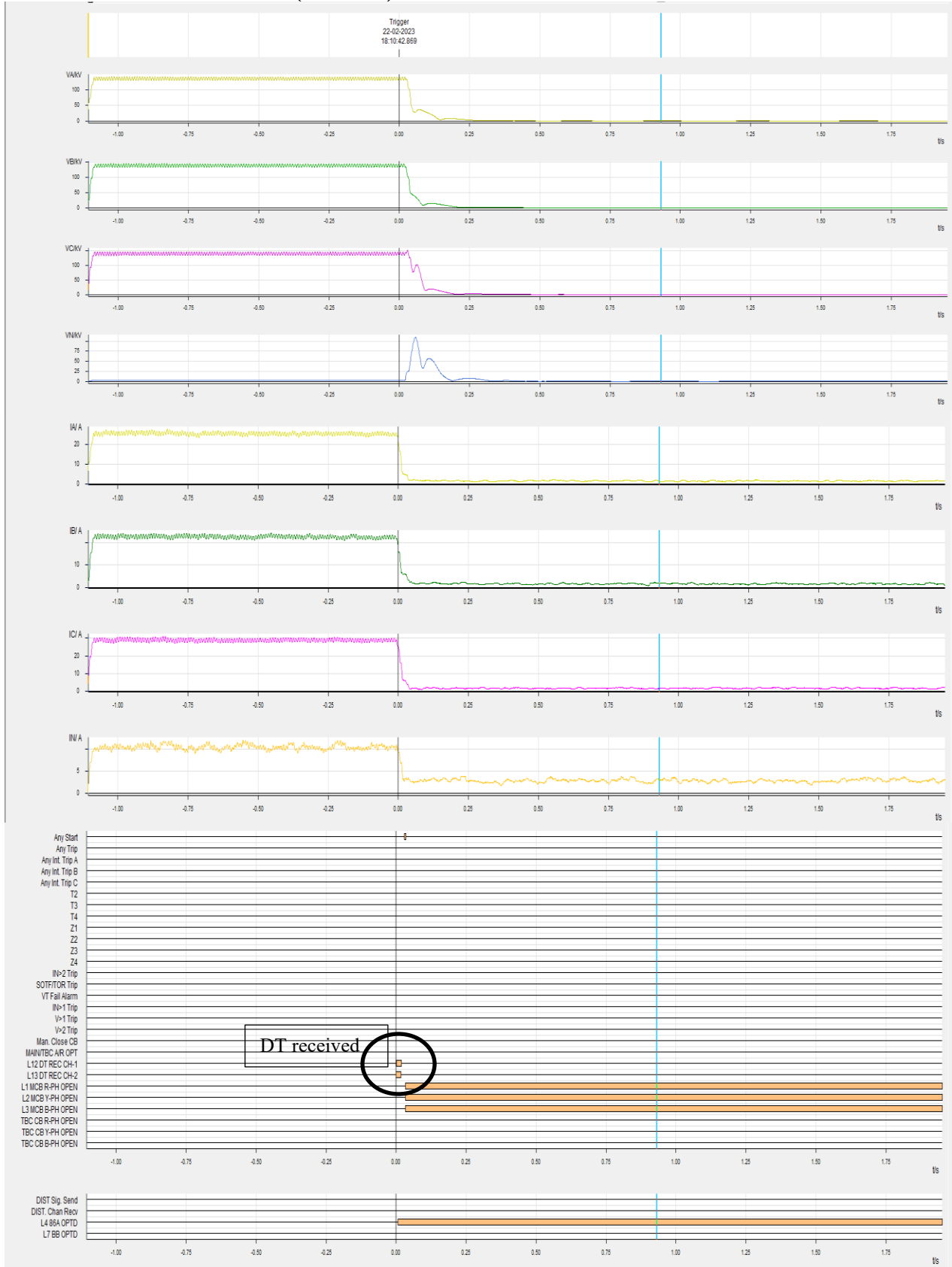
220 kV Muzaffarpur-Hazipur-2 (Hazipur)



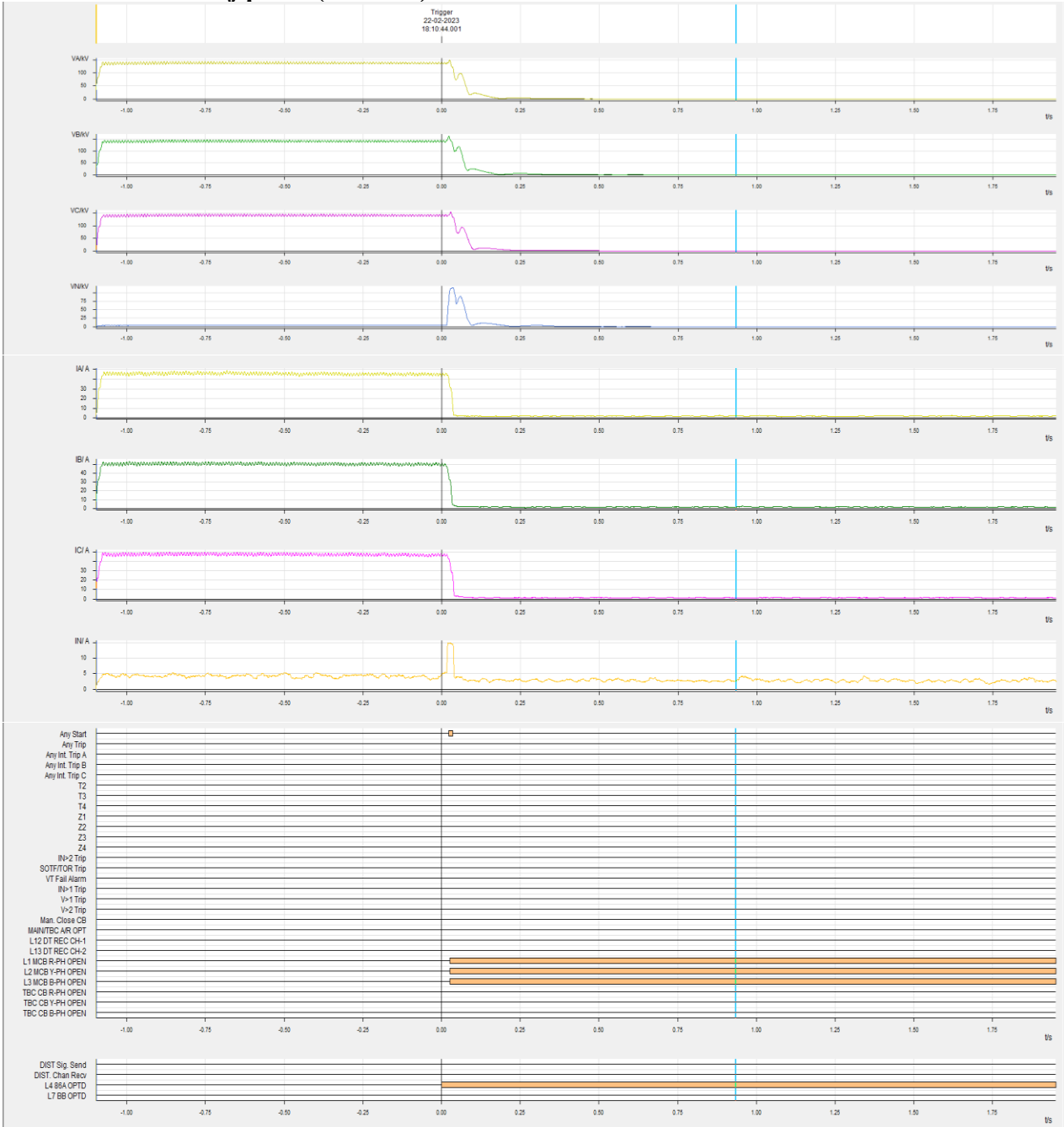
220 kV Barauni-Mokama-1 (Barauni)



220 kV Barauni-Mokama-2 (Barauni)



220 kV Barauni-Hajipur-1 (Barauni)



Annexure B.2

A report on Tripping of GMR – Meramundali 400 kV Line on 28.02.2023 at 13.49Hrs

Earlier scheme:

GMR U#3 was connected dedicatedly to Meramundali Substation – A (scheme attached)

Present Scheme:

GMR U#3 was connected to Meramundali GIS substation – B on 17.02.2023. (scheme attached)

Incident:

On 28.02.2023 , at 13.49 hrs, GMR U#3 tripped due to tripping of turbine as power evacuation became zero. There was no tripping of 400kV breaker at GMR end , while line voltage was zero.

After communication with OPTCL, the following points were observed;

1. There was no tripping of 400kV breaker at Meramundali – B, for the bays B- 401 , B -402 and B -403 to which both GMR and Meramundali line A are connected.
2. The Line breaker and tie breaker for Dia – 408 at Meramundali – A end to which Meramundali -B is connected got tripped under SOTF protection.
3. Both 220kV breakers of Goda and Duburi got tripped at Meramundali – B end under Zone – 1 protection.
4. Only M2 relay at Meramundali - A end, sensed SOTF protection as fault current sensed in R phase was 2.5kA and 400kV voltage dipped to 366kV.

Consequence:

Since the connectivity between Meramundali – B and Meramundali – A was lost due to opening of 400kV breaker at Meramundali – A end under SOTF protection and also connectivity with 220kV system was lost due to opening of 220kV breaker of GODA and Duburi feeder at Meramundali – B end , hence U#3 of GMR that was generating 197 MW , got islanded from the Grid. It resulted in tripping of the turbine and hence leads to outage of the unit.

Remedial action to take:

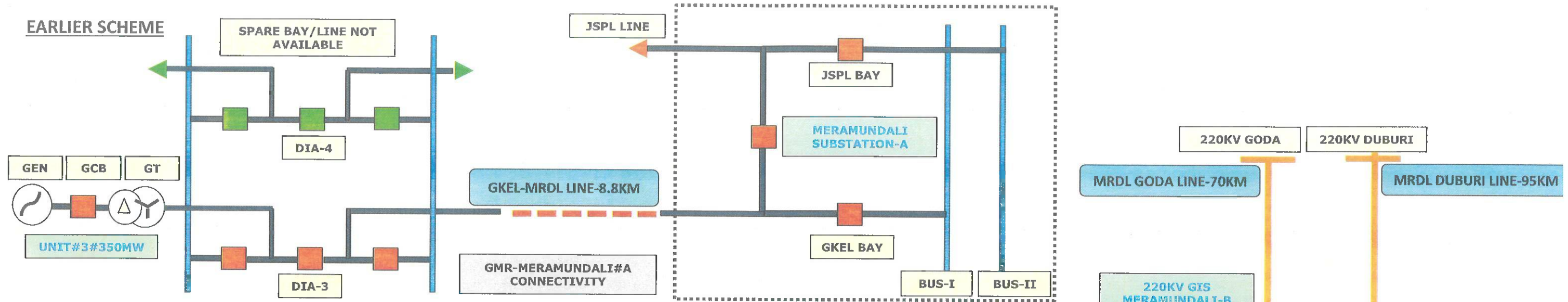
To overcome such type of situation in future it is here with proposed:

1. Relay setting of both M1 and M2 to be reviewed , and SOTF setting to be changed
2. Other 400kV feeders are to be connected to Meramundali B at the earliest, so that power evacuation problem can be sorted out.
3. Till the connection of other 400kV feeder at Meramundali – B , it is requested to disconnect 220kV GODA and Duburi feeder from Meramundali B.

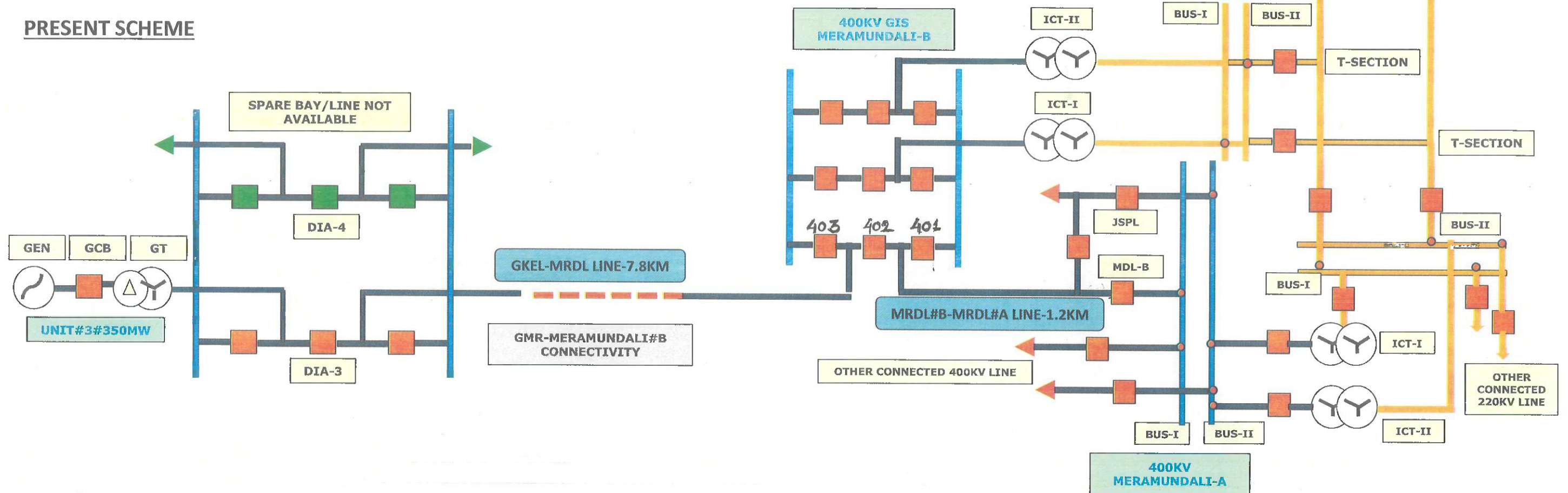


PK Mohanly
01/03/2023

EARLIER SCHEME



PRESENT SCHEME





Disturbance Occurred at Meramundali - A & B GSS On 28.02.2023

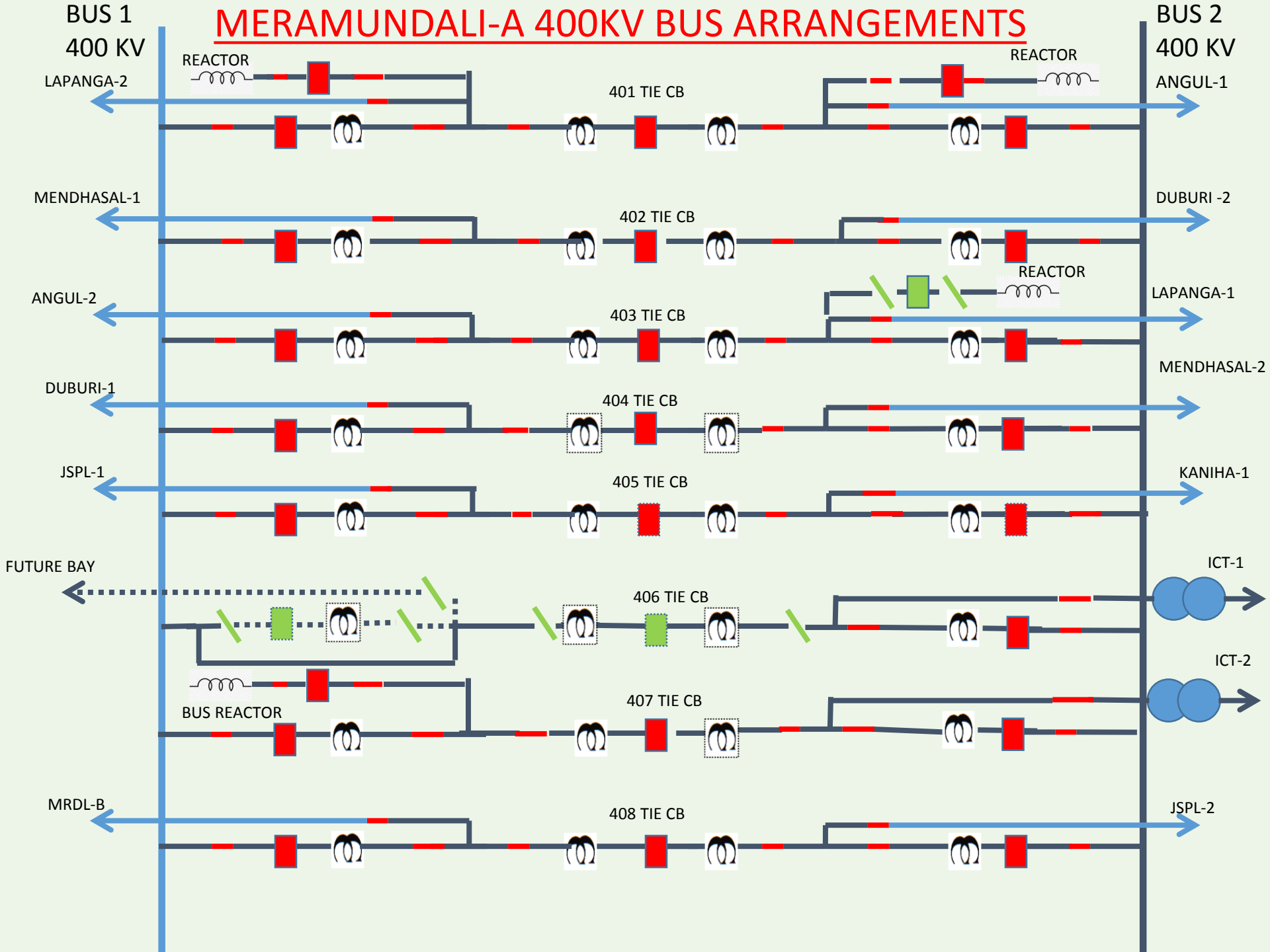
Disturbance occurred at Meramundali(MRDL)-A and B GSS on 28.02.2023.

Date 28.02.2023,Time- 13:50 Hrs.

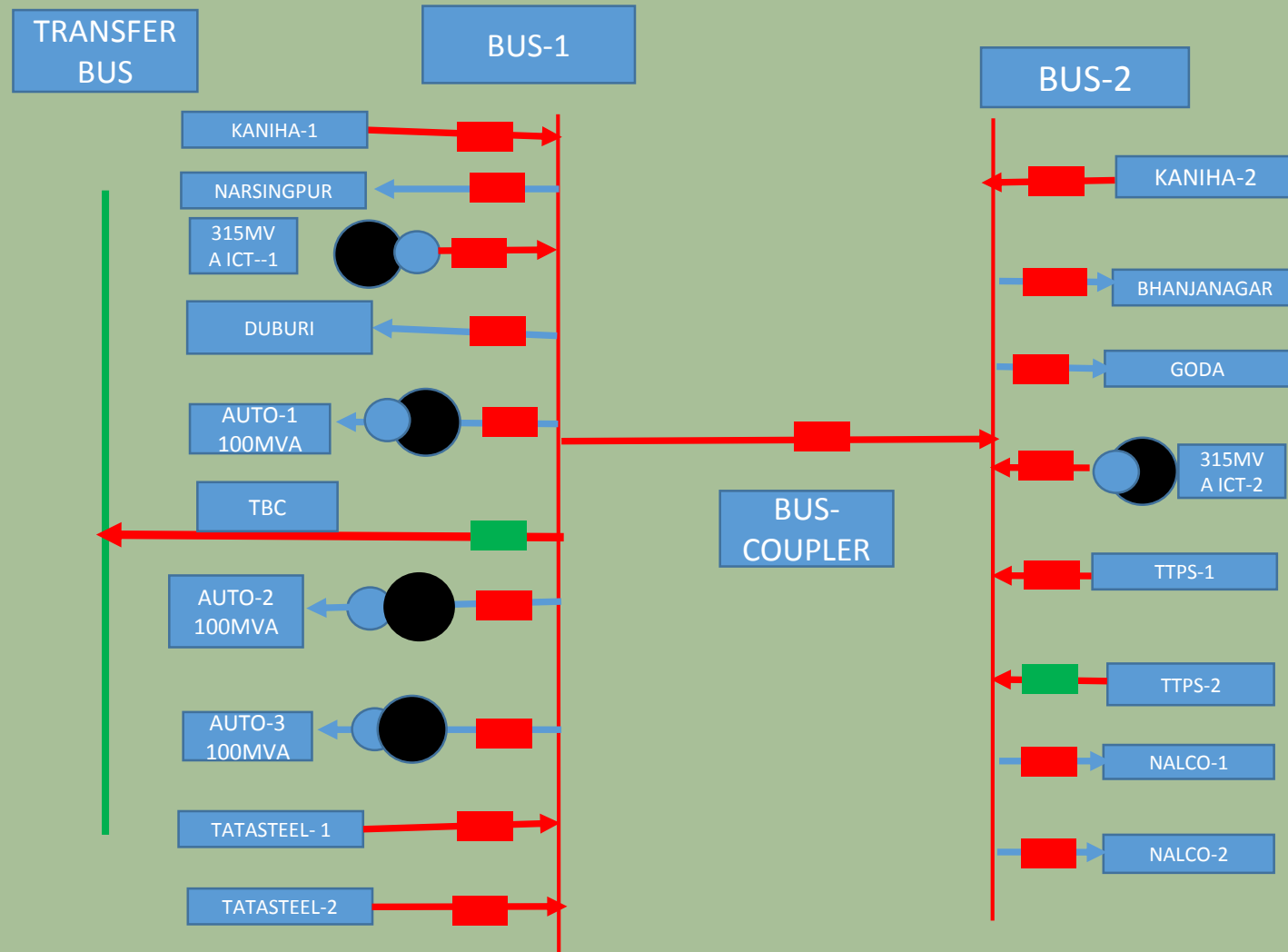
Station : Meramundali-A GSS and Meramundali-B GIS

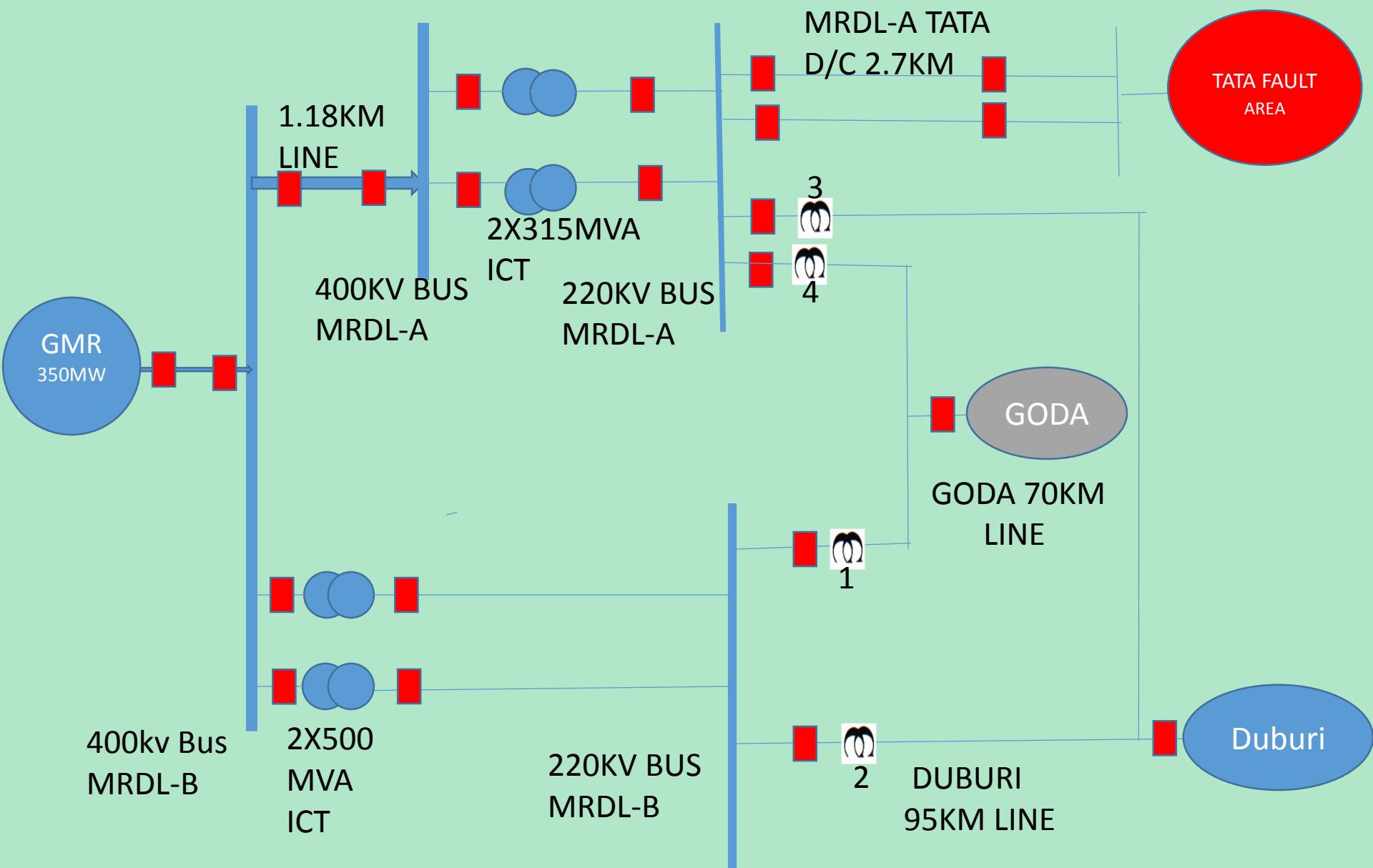
- 1. Both Tata steel-1 & 2 feeders are connected at 220kv Bus of Meramundali-A.**
- 2. Both 220KV MRDL-B to Goda & MRDL-B to Duburi feeders are also connected to 220KV Bus of MRDL-A through 'T' arrangement. These two lines are combination of U/G cable and Over head lines.**
- 3. GMR (350MW Unit-3) is connected to 400KV Bus of MRDL-B and MRDL-B is connected to 400KV Bus of MRDL-A with a line distance of 1.18KM.**
- 4. On 28.02.2023 at 13:50Hrs fault occurred at 220KV TATA Steel end. At the time of fault although 220kv MRDL-B to Goda and Duburi breakers at MRDL-B end tripped in Z-1, power flow to GODA and Duburi continued from MRDL-A, which are connected through 'T'.**
- 5. 400KV MRDL-A to MRDL-B feeder tripped at MRDL-A end only in SOTF as Line closure condition along with SOTF pick up (2.5KA) achieved. So the power from Unit-3 of GMR could not be evacuated and the Generating Unit tripped.**

MERAMUNDALI-A 400KV BUS ARRANGEMENTS



PRE-FAULT CONDITION OF 220KV MRDL-A GSS

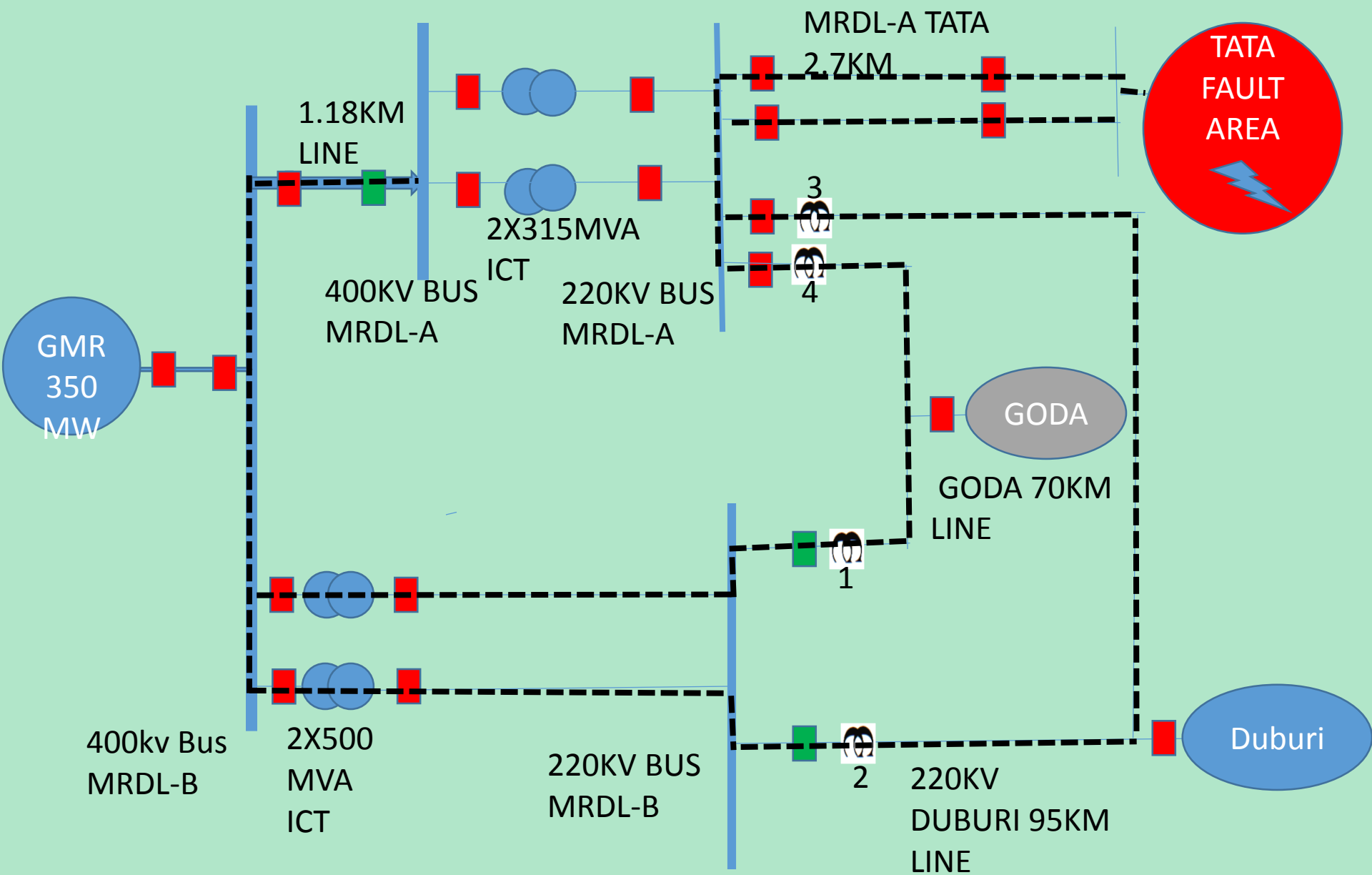




SCHEMATIC DIAGRAM OF MRDL-A AND MRDL-B IN PRE FAULT CONDITION

Load Flow Condition at 13:50 Hrs

Name of the Feeder	Time Stamp	Load in MW	Load in MVar
400KV MRDL-B to GMR	13:50Hrs.	-176.9	5.17
400KV MRDL-B to MRDL-A	13:50 Hrs.	33.88	32.35
220KV MRDL-B to GODA	13:50 Hrs.	70.98	20.49
220KV MRDL-B to DUBURI	13:50 Hrs.	71.03	6.66
220KV MRDL-A TO GODA	13:50Hrs.	27.5	-26.5
220KV MRDL-A to DUBURI	13:50 Hrs.	27.79	-8.79
220KV MRDL-A to TATASTEEL-1	13:50 Hrs.	-46.56	-4.98
220KV MRDL-A to TATASTEEL-2	13:50 Hrs.	-48.78	-4.98



SCHEMATIC DIAGRAM OF MRDL-A AND MRDL-B IN POST FAULT CONDITION

RELAY INDICATIONS

Sl. No.	Line / ATR / Unit	Outage (HH:MIN)	Relay Indications At MRDL end	Other End
1	400 KV MRDL-A TO B	13:50	MRDL-A END:- SOTF TRIPPED.IA=2.65KA,IY=0.98KA,IB=0.9KA.FD=60ms	MRDL-B END:- NO TRIPPING OF BREAKER.
2	400 KV MRDL-B TO GMR	13:50	MRDL-B END:-NO RELAY INDICATION BREAKER DID NOT TRIP.	GMR END:- NO TRIPPING. Generation pulled out as there was no path to evacuate the power.
3	220KV MRDL(A)-MRDL(B)-GODA 'T ' LINE	13:50	MRDL A END:- NO TRIPPING. MRDL-B END:- R-E,Z1,DIST=52.3KM IL1=1.9KA,IL2=0.17KA,IL3=0.57KA, FD=48ms	GODA END:- NO TRIPPING. POWER FLOW TO GODA CONTINUED FROM MRDL-A
4	220KV MRDL(A)-MRDL(B)-DUBURI 'T ' LINE	13:50	MRDL A END:- NO TRIPPING. MRDL-B END:- R-B-E, Z1, DIST=45.3KM IL1=4.17KA,IL2=0.77KA,IL3=0.99KA, FD=35ms	DUBURI END:- NO TRIPPING. POWER FLOW TO DUBURI CONTINUED FROM MRDL-A
5	220KV MRDL-A TO TATA-1	13:50	MRDL-A END:- NO TRIPPING ONLY DIR E/F IDMT PICK UP. IL1=12.5KA,IL2=2.69KA, IL3=2.56KA	TATA END:- NO TRIPPING.POWER FLOW CONTINUED TO TATA.

ANALYSIS OF FAULT

1. On dated 28.2.23 at 13:50Hrs when fault occurred inside Tata Steel plant which is 2.7km from MRDL-A Substation, 220kv Goda and Duburi Breakers at MRDL-B end only tripped in Zone-1 because the CTs of above two feeders at MRDL-B noticed the fault in forward direction and relay settings for these two feeders are 70km and 95km respectively.

2. At the same instance 400KV MRDL-A to MRDL-B line tripped at MRDL-A end only in SOTF as current pick up value and Line closure condition satisfied for the above feeder.

ANALYSIS OF FAULT

Setting of MRDL-A to B Line at MRDL-A end in SIEMENS 7SA52 Relay in Pre fault condition:-

<u>Address</u>	<u>Description</u>	<u>Setting</u>
1130A	Pole open current threshold	100A
1134	Recognition of line closure with	current or voltage or Manual close BI
2404	SOTF O/C Pick Up	2.5KA

Currents at Pre & Post fault conditions in MRDL-A to B Line:-

Current in the above feeders before fault:-

IR=74A, IY=70A, IB=76A.

Current in the above feeders after fault:-

IR=2.65KA, IY=0.98KA, IB=0.9KA.

Request Suggestions by PCC Forum

1. OPTCL requests PCC Forum for suggestions regarding 'T' arrangement for 220 kV MRDL-B to Goda & MRDL-B to Duburi Lines with MRDL-A.
2. Suggestions for modifications in relay settings, if required.

THANK YOU

Annexure B.4

SL NO	MONTH	UTILITY	ELEMENT	DETAILS OF ELEMENT	REMARKS
1	OCC_NOV_2022	NTPC (North Karanpura)	ICT	660MW New Generating Unit charged a Tandwa,Jharkhand	DATA REQUIRED
2	OCC_NOV_2022	NTPC (North Karanpura)	ICT	400KV MAIN BAY OF 400KV/11.50KV 315 MVA ST-3 AT NORTH KARANPURA	DATA REQUIRED
3	OCC_NOV_2022	NTPC (North Karanpura)	GT-1	400KV MAIN BAY OF 400KV/21KV 265 MVA GT-1 AT NORTH KARANPURA	DATA REQUIRED
4	OCC_NOV_2022	NKTL	T/L	400 kV North Karanpura(NTPC)- Chandwa(PG) Transmission Line 1	PDMS AND PSCT DONE AT NORTH KARANPURA END AND DATA REQUIRED CHANDWA END
5	OCC_NOV_2022	NKTL	T/L	400 kV North Karanpura(NTPC)- Chandwa(PG) Transmission Line 2	PDMS AND PSCT DONE AT NORTH KARANPURA END AND DATA REQUIRED CHANDWA END
6	OCC_NOV_2022	JUSNL	T/L	400KV MAIN BAY OF LATEHAR(JUSNL)-1 AT CHANDWA(PG)	PDMS AND PSCT DONE AT CHANDWA END AND DATA REQUIRED AT LATEHAR END
7	OCC_NOV_2022	JUSNL	T/L	400KV MAIN BAY OF LATEHAR(JUSNL)-2 AT CHANDWA(PG)	PDMS AND PSCT DONE AT CHANDWA END AND DATA REQUIRED AT LATEHAR END

SL NO	MONTH	UTILITY	ELEMENT	DETAILS OF ELEMENT	REMARKS
1	OCC_DEC_2022	BGCL	ICT	400KV MAIN BAY OF 400KV/220KV/132kv/33kv 500 MVA ICT 2 AT JAKKANPUR JIS	PDMS AND PSCT DONE
2	OCC_DEC_2022	PGCIL	ICT	400KV MAIN BAY OF 400KV/220KV/33kv 315 MVA ICT 2 AT DURGAPUR SS	DATA REQUIRED

SL NO	MONTH	UTILITY	ELEMENT	DETAILS OF ELEMENT	REMARKS
1	OCC_JAN_2023	JUSNL	T/L	400 kV Chandwa (PG) - Latehar (JUSNL) D/C Line	PDMS AND PSCT DONE AT CHANDWA END
2	OCC_JAN_2023	BSPTCL	T/L	220 kV Patna (PG) - Sipara (BSPTCL) D/C Line after re-conductorin	DATA REQUIRED
3	OCC_JAN_2023	OPTCL	B/R	400 kV 125 MVAR Bus Reactor at Mendhasal GSS	DATA REQUIRED
4	OCC_JAN_2023	NTPC	T/L	Main Bays of 400 kV Gaya D/C Line at NTPC sitchyard	NOT CHARGED
5	OCC_JAN_2023	BSPTCL	T/L	132kV Ganwara-Pandaul line(reconducting)	DATA REQUIRED
6	OCC_JAN_2023	BSPTCL	T/L	132kV Darbhanga-samastipur line(reconducting)	DATA REQUIRED
7	OCC_JAN_2023	PGCIL	T/L	PG-Patna-Gaurichak TL CKT-2(reconducting)	DATA REQUIRED
8	OCC_JAN_2023	PGCIL	T/L	PG-Patna-Gaurichak TL CKT-1(reconducting)	DATA REQUIRED
9	OCC_JAN_2023	BGCL	T/L	220kV JAKKANPUR NEW(BGCL)-KHAGAU(LBSPTCL)	PDMS AND PSCT DONE AT JAKKANPUR END AND DATA REQUIRED KHAGAU END
10	OCC_JAN_2023	BGCL	T/L	220kV JAKKANPUR NEW(BGCL)-SIPARA(BSPTCL)	PDMS AND PSCT DONE AT JAKKANPUR END AND DATA REQUIRED KHAGAU END
11	OCC_JAN_2023	BSPTCL	T/L	132kV Dumraon-Bikramganj line(reconducting)	DATA REQUIRED
12	OCC_JAN_2023	OPTCL	B/R	125kva bus reactorat Mendhasal	PDMS AND PSCT DONE
13	OCC_JAN_2023	OPTCL	ICT	132/33kV 20MVA Power TRF-1 AT Lapanga	PDMS AND PSCT DONE
14	OCC_JAN_2023	OPTCL	ICT	132/33kV 20MVA Power TRF-II ATGIS Hinjili	PDMS AND PSCT DONE

SL NO	MONTH	UTILITY	ELEMENT	DETAILS OF ELEMENT	REMARKS
1	OCC_FEB_2023	PGCIL	T/L	220 kV Pusauli (PG) - Durgauti (IR) D/C Line	Data required in both end
2	OCC_FEB_2023	OPTCL	ICT	132/33kV 20MVA Power TRF-1 AT ASKA NEW	Data required
3	OCC_FEB_2023	OPTCL	ICT	132kV Barbil-Kamanda line	Data required in both end
4	OCC_FEB_2023	OPTCL	T/L	132kV Switching station kutra 132Kv along with LILO of kuchinda rajgangpur s/c line to kutra	Data required
5	OCC_FEB_2023	OPTCL	T/L	132kV Kutra m/s shiva cement s/c line	Data required
6	OCC_FEB_2023	OPTCL	ICT	132/33kV 20MVA Power TRF-1 AT 132/33 kV,GSS,CHANDIPUR	Data required
7	OCC_FEB_2023	OPTCL	T/L	132kV Switching station near M/s Ultrateh Cement Ltd at Khamarnuagaon,Khuntuni,132kV LILO arrangement from Arati steel -TS alloys line	Data required
8	OCC_FEB_2023	OPTCL	T/L	12.5 MW Solar power plant at 33kV Level in 132/33kV witchyard M/S ARBEL having connectivity at 132kV With LILO switching station SAINTALA	Data required
9	OCC_FEB_2023	OPTCL	T/L	220kV Switchyard at 220/132/33kV GSS,BAMRA having LILO connectivity 220kV Budhipadar-Tarkera ckt-II	Data required
10	OCC_FEB_2023	OPTCL	ICT	220/132kV160MVA Power Auto TRF-1 AT 220/132/33 kV,GSS,BAMRA	Data required
11	OCC_FEB_2023	OPTCL	ICT	220/132kV160MVA Power Auto TRF-2 AT 220/132/33 kV,GSS,KURAMUNDA	Data required
12	OCC_FEB_2023	OPTCL	ICT	220/132kV 40MVA Power Auto TRF-1 AT 220/132/33 kV,GSS,KURAMUNDA	Data required

List of important transmission lines in ER which tripped in February-2023

Sl. No.	LINE NAME	TRIP DATE	TRIP TIME	RESTORATION DATE	RESTORATION TIME	Relay Indication LOCAL END	Relay Indication REMOTE END	Reason	Fault Clearance time in msec	Remarks	DR Configuration Discrepancy	DR/EL RECEIVED FROM LOCAL END	DR/EL RECEIVED FROM REMOTE END	UTILITY RESPONSE
1	400 KV MERAMUNDALI-JSPL-2	06/02/2023	14:15	06/02/2023	17:51	Meeramudali: B_N, Zone-1, 14.1 km, 13.00 kA.	JSPL: B_N, Zone-1, 29.89 km, 8.787 kA	B-Earth	100	A/r failed after 400 msec at Meramundali. A/r dead time may be reviewed.		Yes	No	A/r dead time changed to 1 sec
2	400 KV MAITHON-JAMSHEDPUR-1	09/02/2023	17:53	10/02/2023	18:14	Maithon: DT received		No Fault	NA	PG ER-1 may explain		No	No	DC Earth fault in PLCC module at Jamshedpur
3	400 KV DSTPS-JAMSHEDPUR-1	09/02/2023	17:53	10/02/2023	13:24	DSTPS: DT received	Jamshedpur: Didn't trip	No Fault	NA	PG ER-1 may explain		Yes	No	
4	220 KV GAYA-BODHGAYA-1	12/02/2023	12:55	12/02/2023	20:29	Gaya: R_N, Zone-3, 73 km, 2.3 kA		R-Earth	800	Tripped in Zone-3 time from Gaya. Fault in downstream. BSPTCL may explain.		Yes	No	Fault in 220 kV Gaya-Khizersarai-1 and distance protection didn't operate. This line tripped on back-Up O/c. Cable from CT junction to C&R panel of 220 kv Bodhgaya-Khizersarai ckt-1 line was found shorted
5	220 KV GAYA-BODHGAYA-2	12/02/2023	12:55	12/02/2023	13:25	Gaya: R_N, Zone-3, 74 km, 2.3 kA		R-Earth	800	Tripped in Zone-3 time from Gaya. Fault in downstream. BSPTCL may explain.		Yes	No	
6	220 KV GAYA-BODHGAYA-1	13/02/2023	11:41	13/02/2023	12:48	Gaya: R_N, Zone-3		R-Earth	800	Tripped in Zone-3 time from Gaya. Fault in downstream. BSPTCL may explain.		Yes	No	Fault in 220 kV Gaya-Khizersarai-1 and distance protection didn't operate. This line tripped on back-Up O/c. Cable from CT junction to C&R

7	220 KV GAYA-BODHGAYA-2	13/02/2023	11:41	13/02/2023	12:48	Gaya: R_N, Zone-3		R-Earth	800	Tripped in Zone-3 time from Gaya. Fault in downstream. BSPTCL may explain.		Yes	No	panel of 220 kv Bodhgaya-Khizersarai ckt-1 line was found shorted
8	220KV-PUSAULI-DEHRI-1	21/02/2023	16:11	21/02/2023	16:35	Sasaram: B_N, 6.77 km, 9.88 kA	Dehri: Didn't trip	B-Earth	100	Other two phase tripped at Sasaram after 1 second. PG ER-1 may explain.		Yes	No	Continuous initiation in B- N phase receiving to AR relay through initiation contacts of distance/ Aux relay
9	400KV-NEW DUBURI-MERAMUNDALI-2	22/02/2023	16:22	22/02/2023	17:46	New Duburi: DT received	Meeram undali: Didn't trip	No Fault	NA	DT sent to New Duburi due to faulty contact multiplier relay at Meramundali. OPTCL may explain.		No	Yes	Faulty CMR relay at Meramundali
10	400KV-JAMSHEDPUR-ADHUNIK-1	24/02/2023	21:50	25/02/2023	00:19	Jamshedpur: Didn't trip	Adhunik : DT received	No Fault	NA	APNRL/PG ER-1 may explain		NA	No	Status of Tie CB of Jamshedpur is not taken. Any tripping of main bay will send DT to APNRL.

SI No.	Name of the incidence	PCC Recommendation	Latest status
122nd PCC Meeting			
1.	Total Power failure at 220/132 kV Jayanagar (OPTCL) and 220 kV Balimela HEP S/s on 24.12.2022 at 12:05 Hrs	<p>PCC advised OPTCL to test the distance protection relay of 220 kV Jayanagar- Laxmipur circuit-2 at Laxmipur end.</p> <p>PCC advised OPTCL to test DEF relay at Laxmipur end for 220 kV Jayanagar- Laxmipur circuit-1 in coordination with relay OEM and in case the relay is found faulty, the same needs to be replaced at the earliest. Further it was advised to check & ensure zero sequence polarization was set in relay instead of negative sequence polarization.</p> <p>It was recommended to test backup overcurrent relay too at Laxmipur end for 220 kV Jayanagar- Laxmipur D/c.</p> <p>PCC advised OHPC to change non directional E/F protection to directional E/F protection for other feeders also.</p>	OPTCL representative informed that testing of backup overcurrent relay at Laxmipur end for 220 kV Jayanagar- Laxmipur d/c will be done by end of Feb 2023. Further, OPTCL representative confirmed that as per confirmation from OHPC, non-directional E/F had been modified to directional E/F protection for other feeders also.
119th PCC Meeting			
2.	Disturbance at 220 kV Tenughat (TVNL) S/S on 09.09.2022 at 12:55 Hrs	<p>PCC advised JUSNL to rectify all clearance related issues present in 220 kV Tenughat-Govindpur D/C line so that similar type of incidents can be avoided in future.</p> <p>PCC advised JUSNL to share PSL logic of relay to ERPC/ERLDC. It further advised JUSNL to communicate this matter to relay manufacturer for testing and updating firmware in the relay.</p> <p>PCC advised TVNL to review overcurrent settings of unit #2 considering the present transmission network & fault level data at Tenughat. The coordination study may be done considering when one unit in operation & there is a line fault</p>	<p><i>Regarding updating firmware in relay, JUSNL representative informed that it will take 2-3 months more as work is planned to be executed with upgradation of SCADA.</i></p> <p><i>TVNL representaive informed that as per OEM BHEL , it is communicated that relay setings of unit 2 can be reviewed once electromechanical relay is replaced with numerical relay.He further added that status regarding impementation of</i></p>

		in one of the outgoing feeders (worst case scenario). The revised setting may be implemented at Unit end & the same may be intimated to PCC.	<i>numerical relay for unit 2 will be shared to ERPC.</i>
118th PCC Meeting			
3.	Disturbance at 400 kV Dikchu S/s on 10.08.2022 at 11:57 Hrs	<p>PCC advised Dikchu HEP to expedite the visit of relay engineer and resolve the issue by Sep-22.</p> <p>PCC also raised serious concern about long outage of the main bus-2 of Dikchu HEP and advised Dikchu HEP to continuously take up with the vendor for supply of the breaker at the earliest.</p> <p>Further, Dikchu HEP was advised to submit a firm time-line for restoration of the main bus-2 which would be monitored in PCC meeting.</p>	<p>In 120th PCC meeting, Dikchu HEP representative informed that breaker will reach the site by end of Nov 2022.</p> <p>Dikchu HEP representative informed that breaker had been received at site. He further added that shutdown of bus is planned from 21st Jan 2023 and restoration of main bus-2 will be completed by end of Jan 2023 in case service engineer visit is scheduled in January else work will be completed Feb-23.</p> <p><i>ERPC representative informed that as per communication received from Dikchu HEP, restoration work of main bus 2 had been completed.</i></p>

Annexure C.3

Jharkhand

Sl. No.	Element name	Length (in Km)	OPGW Status	Remarks
1	220KV Jasidih-Dumka D/c	75	Non-OPGW (DTPS)	Proposal have been made for laying OPGW under state plan
2	220 KV Garhwa - Daltonganj (PG) D/c	93	Non-OPGW (DTPS)	
3	220KV Itkhorl - Latehar	109	Non-OPGW (DTPS)	
4	220 kV Chandil - STPS S/c	112	Non-OPGW (DTPS)	-
5	220 kV PTPS - TVNL	64	PLCC not available	-
6	220 kV TVNL - Biharsariff	180	PLCC not available	-
7	220 kV Chandil - Ranchi(PG)	78	OPGW work completed	PDH& SDH unit has been installed at both end but not taken in service due to unavailability of protection coupler
8	220 kV Ramchandrapur - Joda	130	OPGW work completed	

West Bengal

SL. NO.	Station Name	Direction	Line Voltage (kV)	DC / SC	Existing Protection Coupler	Direct Link	Remarks
1	Dharampur 220kV	Jeerat	220	DC	Alstom (PLCC) & DPC ABB	YES	
2		Satgachia	220	SC	SIEMENS DPC	NO	
3		Rishra	220	SC	Alstom (PLCC) & DPC ABB	NO	
4	Jeerat 400kV	BKTPP	400	SC	CGL PLCC & DPC ABB	YES	
5		New Chanditala	400	SC	ABB (PLCC)	YES	
6		Barasat	220	DC	DPC ABB	YES	
7		Sagardighi TPS	400		BPL PLCC		
8		Subhasgram (PG)	400	DC	SIEMENS DPC		
9	Kasba 220kV	Barasat 220kv	220	DC	DPC ABB	NO	
10		Subhasgram (WB)	220	DC	CGL PLCC & DPC ABB	YES	
11	KLC 220kV	N.Town - AA III	220	SC	DPC ABB	YES	
12		Subhasgram (PG)	220	SC	DPC ABB	NO	
13	N.Town - AA III	Rajarhat (PG)	220	DC	ZIV PLCC	NO	
14		Subhasgram (PG)	220	SC	ABB ETL & DPC ABB	NO	
15	Subhasgram (WB)	Lakshmikantapur	220	DC	CGL PLCC & DPC ABB	YES	
16		Subhasgram (PG)	220	DC	DPC ABB	YES	
17		Baruipur	220	DC	ABB DPC 2 nos.	YES	
18	Arambag 400kV	BKTPP	400	SC	CGL PLCC & DPC ABB	YES	
19		New PPSP	400	DC	ABB Project (PLCC)	YES	
20		Belmuri	220	SC	SIEMENS DPC	NO	
21	Domjur 220kV	Arambag	220	DC	ABB ETL & DPC ABB	NO	
22	Egra 220kV	Kharagpur 400kV	220	DC	ABB DPC 2 nos.	YES	
23	Foundry Park 220kV	Domjur	220	DC	DPC ABB	YES	
24		New Chanditala	220	DC	DPC ABB	YES	

25	Kharagpur 400kV	KTPP	400	DC	1. BPL V3 2. ABB ETL & DPC ABB	YES	
26		Midnapur (PG)	400	DC		YES	
27		Vidyasagar Park	220	DC	ALSTOM DPC 2 no	NO	
28	KTPP 400kV	Arambag	400	SC	CGL PLCC & DPC ABB	YES	
29		New Chanditala	400	SC	ABB ETL PROJECT	YES	
30		Howrah	220	DC	CGL PLCC & DPC ABB	YES	
31		New Haldia	220	DC	DPC ABB	NO	OPGW Proposed
32	Midnapur 220kV	Arambag	220	DC	DPC ABB	NO	
33		Kharagpur 400kV	220	DC	DPC ABB	YES	
34	New Chanditala 400kV	Arambag	400	SC	Project	YES	
35		Gokarna	400	DC	Projects (PLCC)	YES	
36		Midnapur (PG)	400	DC		YES	
37		Belmuri	220	SC	Projects (PLCC)	NO	
38		Domjur	220	DC	DPC Project	NO	
39		Howrah	220	DC	ABB ETL Project	YES	
40	Rishra 220kV	New Chanditala	220	SC	Projects (PLCC)	NO	OPGW Proposed
41		Satgachia	220	SC	SIEMENS DPC	NO	
42	Satgachia 220kV	BKTPP	220	DC	DPC ABB	NO	OPGW Proposed
43		Krishnanagar	220	DC	ABB ETL & DPC ABB	NO	OPGW Proposed
44	Krishnanagar 220kV	Rejinagar	220	DC	DPC ALSTOM	YES	
45	Gokarna 400kV	New Chanditala	400	DC	PLCC ZIV	YES	
46		Sagardighi TPS	400	DC	ALSTOM PLCC & DPC ABB	YES	
47		New Sagardighi	220	DC	DPC ABB	YES	
48	Gokarna 220KV	Rejinagar	220	DC	DPC Alstom	YES	
49		Sadaipur	220	DC	PLCC ABB	NO	OPGW Available
50	New Sagardighi 220kV	Sagardighi TPS	220	DC	ABB PLCC	YES	
51		BKTPP	220	DC	ABB PLCC	YES	
52	Durgapur 400kV	New Chanditala	400	SC	ABB PLCC & DPC ABB	YES	

53		Parulia (PG)	400	DC	BPL V3 & DPC ABB	NO	
54		PPSP OLD 400	400	DC	ABB PLCC & DPC ABB	YES	
55	Durgapur 220kV	Asansol	220	SC	CGL PLCC & DPC ABB	YES	
56		BKTPP	220	DC	CGL PLCC & DPC ABB	YES	
57		DPL	220	DC		YES	
58		J.K. Nagar	220	SC	ABB	NO	
59		Waria (DVC)	220	DC	ABB	NO	
60	New Bishnupur 220kV	Arambag	220	DC	ABB PLCC & DPC ABB	YES	
61		Hura	220	SC	DPC ABB	NO	
62		STPS	220	SC	DPC ABB	NO	OPGW Proposed
63	STPS 220kV	Asansol	220	SC	DPC ABB	YES	
64		Hura	220	SC	DPC ABB	NO	OPGW Proposed
65		J.K. Nagar	220	SC	ABB	NO	
66	PPSP NEW	PPSP OLD	400	DC	Project Differential	YES	
67		Ranchi	400	DC	PGCIL	NO	
68		TLDP- III	220	SC	ABB PLCC	NO	
69		TLDP- IV	220	DC	BPL PLCC	NO	
70		Alipurduar PG	220	DC	ABB PLCC	NO	OPGW Proposed
71	Gajol 220kV	Dalkhola (PG)	220	DC	PLCC ABB	NO	
72		Maldah (PG)	220	DC	PLCC ABB	NO	

ER ISTS (OPGW installed/Proposed as per ISTS communication plan 2027-28)

Sl. No.	Line Name	Voltage Level	length (km)	Owner
1	BODHGAYA - GAYA I (LILO PORTION)	220kV	12.5	PGCIL
2	DALKHOLA - PURNEA-I	220kV	41	PGCIL
3	PURNEA - NEW PURNEA-I	220kV	1	PGCIL
4	RANCHI - CHANDIL-I (LILO PORTION)	220kV	8	PGCIL
5	BANKA - BIHARSHARIFF-I	400kV	184	PGCIL
6	BARH - MOTIHARI-I	400kV	237	PGCIL
7	BARH - PATNA - III	400kV	93	PGCIL
8	BALIA - BIHARSHARIFF-II	400kV	242	PGCIL
9	BIHARSHARIFF - MUZAFFARPUR-I	400kV	133	PGCIL
10	BIHARSHARIFF - SASARAM-I	400kV	210	PGCIL
11	CHAIBASA - ROURKELA-I	400kV	131	PGCIL
12	CHANDAUTI -NABINAGAR CKT-I	400kV	79.39	PGCIL
13	CHANDWA - GAYA I	400kV	117	PGCIL
14	NEW PURNEA - FARAKKA	400kV	171	PGCIL
15	CHANDAUTI-CHANDAUTI -I	400kV	33	PGCIL
16	JAMSHEDPUR (DVC) - BARIPADA I	400kV	108	PGCIL
17	JAMSHEDPUR - CHAIBASA I	400kV	46	PGCIL
18	KAHALGAON - BANKA I	400kV	54	PGCIL
19	KAHALGAON - BARH-I	400kV	217	PGCIL
20	FARAKKA - KAHALGAON-I	400kV	95	PGCIL
21	KAHLGAON-FARAKKA-III	400kV	95	PGCIL
22	KAHALGAON - LAKHISARAI I	400kV	145	PGCIL
23	KAHALGAON - MAITHON-I	400kV	172	PGCIL
24	KODERMA - BIHARSHARIFF I	400kV	111	PGCIL
25	PATNA - KISHANGANJ I	400kV	421	PGCIL
26	LAKHISARAI - BIHARSHARIFF-II	400kV	89	PGCIL

27	MOTIHARI-GORAKHPUR-II	400kV	190	PGCIL
28	NABINAGAR - SASARAM I	400kV	81.65	PGCIL
29	PATNA - BALIA-I	400kV	195.3	PGCIL
30	PATNA-NABINAGAR CKT-I	400kV	141	PGCIL
31	PATNA-NABINAGAR CKT-II	400kV	141	PGCIL
32	MAITHON - RANCHI-I	400kV	200	PGCIL
33	MAITHON RB - RANCHI I	400kV	188	PGCIL
34	RAGHUNATHPUR - RANCHI	400kV	155.5	PGCIL
35	RANCHI (NEW) - RANCHI I	400kV	79	PGCIL
36	RANCHI - ROURKELA I	400kV	144	PGCIL
37	NEW RANCHI - CHANDWA I	400kV	68	PGCIL
38	SASARAM - ALLAHABAD	400kV	212	PGCIL
39	DALTONGANJ - SASARAM - I	400kV	196	PGCIL
40	SASARAM - SARNATH	400kV	77	PGCIL
41	DHARAMJAIGARH-RANCHI-I	765kV	303	PGCIL
42	GAYA - VARANASI I	765kV	273	PGCIL
43	BISWANATH-AGRA -I	800kV	1800	PGCIL
44	CHANDAUTI-GAYA-I	400kV	17.36	PGCIL
45	CHANDAUTI-NABINAGAR-I	400kV	79.39	PGCIL
46	SAHARSA-KISHENGANJ-I	400kV	183.2	PGCIL
47	SAHARSA-PATNA-I	400kV	238.1	PGCIL
48	SITAMARHI-DARBHANGA-I	400kV	80	PGCIL
49	SITAMARHI-MOTIHARI-I	400kV	80	PGCIL
52	MOTIHARI - BARH I	400 kV	237	PGCIL
53	MOTIHARI - BARH II	400 kV	237	PGCIL
54	MOTIHARI - GORAKHPUR I	400 kV	190	PGCIL
55	MOTIHARI - GORAKHPUR II	400 kV	190	PGCIL
56	MELLI-SILIGURI-I	132kV	90	PGCIL
57	RANGPO-CHUZACHEN-I	132kV	1	PGCIL

58	RANGPO-GANGTOK-I	132kV	26	PGCIL
59	RANGPO-MELLI-I	132kV	17	PGCIL
60	RANGIT-RANGPO-I	132kV	54	PGCIL
61	ALIPURDWAR-SALAKATI-I	220kV	106	PGCIL
62	BIRPARA-ALIPURDWAR-I	220kV	57	PGCIL
63	BIRPARA-BINAGURI-I	220kV	80	PGCIL
64	BINAGURI-SILIGURI-I	220kV	8	PGCIL
65	DALKHOLA-GAZOL-I	220kV	98.3	PGCIL
66	DALKHOLA-KISHENGANJ-I	220kV	31	PGCIL
67	MALDA-GAZOL-I	220kV	18.14	PGCIL
68	RANGPO-NEW MELLI-I	220kV	26	PGCIL
69	ALIPURDWAR-JIGMELING-I	400kV	324	PGCIL
70	ALIPURDWAR-PUNATSANGHCUN-I	400kV	64	PGCIL
71	BINAGURI-KISHENGANJ-I	400kV	98	PGCIL
72	BINAGURI-MALBASE-I	400kV	116	PGCIL
73	BINAGURI-NEW PURNEA-2	400kV	168	PGCIL
74	BONGAIGAON-BINAGURI-I	400kV	104	PGCIL
75	BEHRAMPUR-BHERAMARA-I	400kV	72	PGCIL
76	BEHRAMPUR-FARAKKA-II	400kV	83	PGCIL
77	BEHRAMPUR-SGTPP-II	400kV	26	PGCIL
78	DURGAPUR-FARAKKA-I	400kV	150	PGCIL
79	DURGAPUR-JAMSHEDPUR-I	400kV	177	PGCIL
80	FARAKKA-NEW PURNEA-1	400kV	171	PGCIL
81	FARAKKA-SAGARDIGHI-I	400kV	76	PGCIL
82	FARAKKA-SAGARIGHI-II	400kV	76	PGCIL
83	JEERAT-RAJARHAT-I	400kV	41	PGCIL
84	JEERAT-SAGARDIGHI-I	400kV	197	PGCIL
85	KISHENGANJ-NEW PURNEA-I	400kV	71	PGCIL
86	MAITHAN-DURGAPUR-I	400kV	70.77	PGCIL

87	MAITHAN-MAITHAN-I	400kV	32	PGCIL
88	MALDA-FARAKKA-I	400kV	40	PGCIL
89	MALDA-NEW PURNEA-I	400kV	167	PGCIL
90	NEW PURNEA-GOKARNA-I	400kV	250	PGCIL
91	RANGPO-BINAGURI-I	400kV	110	PGCIL
92	RANGPO-KISHENGANJ-I	400kV	189	PGCIL
93	RANGPO-TEESTAV-I	400kV	11.6	PGCIL
94	RAJARHAT-FARAKKA-I	400kV	312	PGCIL
95	RAJARHAT-GOKARNA-I	400kV	227	PGCIL
96	SAGARDIGHI-SUBHASGRAM-I	400kV	245.6	PGCIL
97	TALA-BINAGURI-I	400kV	98	PGCIL
98	BISWANATHCHAIRALI-AGRA-I	800kV	1690	PGCIL
99	MEDNIPORE-CHANDITALA-I	400kV	96.11	PMJTL
100	MEDNIPORE-KHARAGPUR-I	400kV	115.1	PMJTL
101	NEW JEERAT-JEERAT-I	400kV	25.5	PMJTL
102	MEDNIPORE-NEW JEERAT-I	765kV	169	PMJTL
103	MEDNIPORE-NEW RANCHI-I	765kV	270	PMJTL
104	TEESTA III - KISHANGANJ -II	400kV	215	TPTL
105	JAMSHEDPUR-MAITHON-I	400kV	153	PGCIL
106	MALDA-DALKHOLA-I	220kV	116	PGCIL
107	MUZAFFARPUR-PURNEA-I	400kV	245	PGCIL+ATL
108	MUZAFFARPUR-PURNEA-I	400kV	240	POWERLINKS
109	BIHARSHARIF-PURNEA-I	400kV	231	INDIGRID
110	DHARAMJAIGARH-JHARSUGUDA-I	765kV	151	PGCIL
111	JEYPORE-GAZUWAKA-I	400kV	220	PGCIL
112	JEYPORE-INDRAVATI-I	400kV	72	PGCIL
113	JEYPORE-BOLANGIR-I	400kV	287.7	PGCIL
114	BOLANGIR-MERAMUNDLI-I	400kV	221.4	PGCIL
115	ANGUL-SRIKAKULUM-I	765kV	277	PGCIL

116	MENDHASAL-PANDIABILI-I	400kV	273	PGCIL
117	TALCHER-MERAMUNDALI-I	400kV	88.61	PGCIL
118	ROURKELA-TALCHER-I	400kV	171	PGCIL
119	RENGALI-TALCHER-I	400kV	24	PGCIL
120	ROURKELA-JHARSUGUDA-I	400kV	142	PGCIL
121	DARLIPALLI-JHARSUGUDA-I	765kV	20.54	PGCIL
122	OPGC-JHARSUGUDA-I	400kV	51.3	OGPTL
123	RAIPUR-JHARSUGUDA-I	765kV	305	OGPTL

List of Transmission Lines of ER1 having OPGW without DTPC		
Sl.No	Section Name / Link Name	Line Voltage (KV)
1	Jamshedpur-Chaibasa	400
2	Ranchi 400 - Ranchi 765 D/C	400
3	Ranchi- Chandwa D/C	400
4	Gaya - Chandwa D/C	400
5	Banka-Kahalgaon D/C	400
6	Barh - Kahalgaon D/C	400
7	Biharsharif - Lakhisarai D/C	400
8	Daltonganj - Sasaram D/C	400
9	Biharsharif - Banka D/C	400
10	Hatia - Ranchi D/C	220
11	Koderma- Biharsharif D/C	400
12	Patna-Saharsa D/C	400
13	Barh-Motihari-Gorakhpur D/C	400
14	Allahabad - Sasaram	400

DVC OPGW Links

	FROM	TO	Length (km)	Line No.	Status	Agency
1	Maithon SLDC	Maithon Hydel	1.376	via 66,67	Completed	LS Cable
2	Maithon Hydel	Kalyaneswari	2.205	68	Completed	LS Cable
3	kalyaneswari	Burnpur	18	228, 229	Completed	LS Cable
4	Mejia TPS	DTPS	34.555	221 , 222	Completed	LS Cable
5	DTPS	Parulia	20.652	211 , 212	Completed	LS Cable
6	Parulia(DVC)	Parulia(PG)	0.757	219 , 220	Completed	LS Cable
7	kalyaneswari	CTPS-B	92.351	217, 218	Completed	LS Cable
8	CTPS-B	CTPS-A	2	245 , 246	Completed	LS Cable
9	CTPS-B	BTPS	31.648	205 , 206	Completed	LS Cable
10	BTPS	Konar	23.773	79	Completed	KEC
11	Konar	Barhi	58.455	83	Completed	KEC
12	Barhi	KTPS-220	19.822	43 , 44	Completed	KEC
13	Kalyaneswari	Maithon(PG)	7.113	237, 238	Completed	KEC
14	KTPS 220	Koderma(Old)	17.559	101 , 102	Completed	KEC
15	Kumardhubi	Panchet hydel	6	16,17,70	Completed	KEC
16	RTPS	DSTPS	69.182		Completed	KEC
17	Maithon(PG)	RTPS			Completed	KEC
18	RTPS	Ranchi(PG)			Completed	ZTT
19	Kalyaneswari	Dhanbad			Completed	ZTT
20	Dhanbad	CTPS				ZTT
21	Burnpur	Mejia	38		Completed	ZTT
22	Maithon Hydel	Kumardhubi	8		Completed	ZTT
23	DTPS	ASP	3.636	51 , 52	Completed	ZTT
24	Kalyaneshwari-	Kalipahari	27.909	18 , 19	Completed	KEC
25	Panchet Hydel	Ramkanali	12.508	45 , 46	Completed	ZTT
26	Howrah	Belmuri	49.323	24 , 25	Completed	ZTT
27	Belmuri	Burdwan	49.737	22 , 23	Completed	ZTT
28	Burdwan	DTPS	81.742	75 , 76	Completed	ZTT
29	Howrah	Kolaghat	56.75	26 , 27	Completed	ZTT
30	Kolaghat	Kharagpur	67.108	73 , 74	Completed	ZTT
31	<i>BTPS-B</i>	Ramgarh(220)	<i>54.887</i>	233 , 244	Completed	KEC
32	Ramgarh	Patratu	22.964	77 , 78	Completed	ZTT
33	Ramgarh	Gola	25.542	55 , 56	Completed	ZTT
34	Gola	Chandil	100.919	5	Completed	ZTT
35	Chandil	Jamshedpur	38.325	1	Completed	ZTT
36	Jamshedpur	Mosabani	39.86	2 , 3	Completed	ZTT
37	Kharagpur	Mosabani	96.229	71 , 72	Completed	ZTT
38	Putki	CTPS	26.001		Completed	ZTT
39	CTPS	Purulia	55.364	58 , 59	Completed	ZTT
40	CTPS	Biada	11.882		Completed	ZTT

DTPC available?

YES for 4 lines of CTPS-Putki

41	Patherdih	Putki	20.63	12 , 13	Completed	ZTT
42	Putki	Nimiaghat	42.843	47 , 48	Completed	ZTT
43	Nimiaghat	Giridih	40.368	86 , 87	Completed	ZTT
44	Patratu	North Karanpura	32.101	81 , 82	In Progress	ZTT
45	DTPS	Jamuria	30.392	100	Completed	ZTT
46	Barhi	Hazaribagh	35.293	93 , 94	Completed	ZTT
47	Durgapur (Muchipara)	Parulia	14.791	226 , 227	Completed	ZTT
48	MTPS-A	Barjora	17.245	230 , 231	Completed	ZTT
49	Patherdih	Sindri	4.996	49 , 50	Completed	ZTT
50	Maithon Hydel	Patherdihi	41.654	14 / 66	Completed	ZTT
51	Dhanbad	Giridih220	44.384		Completed	ZTT
52	DTPS	Kalipahari	38.683	20,21	Completed	ZTT
53	Durgapur(DVC)	Mejia	31.37	235-236	Completed	ZTT
54	Jamuria	Ramkanali	53		Completed	Sterlite
55	CTPS	Ramkanali	70		Completed	Sterlite
56	Jamshedpur	Purulia	87		Completed	Sterlite
57	CTPS	Gola	67	6,7	Completed	Sterlite
58	KTPS	Giridih	101		Completed	Sterlite

YES

UGFO LINKS DETAILS

1	Ramgarh (220KV)	Ramgarh(132)	0.75	UGFO	Completed	KEC
2	BTPS-B	BTPS-A	1.36	UGFO	Completed	KEC
3	Mejia-A	Mejia-B	4.65	UGFO	Completed	KEC
4	CTPS220	CTPS132	0.81	UGFO	Completed	KEC
5	KTPS400	KTPS-220	0.635	UGFO	Completed	KEC

Upcoming lines(47th ERPC approved)

1	Bokaro-A-Koderma	105	
2	Dhanbad-Patherdihi	22	
3	CTPS-Kalya LILO at RTPS	125	
4	Parulia-Burdwan	90	
5	DTPS-Parulia LILO at DSTPS	8	
6	BokaroB- Jamshedpur	155	
7	Joda-Jamshedpur	140	
8	Mejia-Ramgarh	155	
9	BTPS-A--BTPS-B (UGFO)	5	