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

सं./**NO.** पू.क्षे.वि.स./**PROTECTION/2023/** 1286 दिनांक /**DATE:10.01.2023**

सेवा में / To,

संलग्न सूची के अनुसार / As per list enclosed.

विषय : दिनांक - 16.12.2022 को आयोजित 121वीं पीसीसी बैठक का कार्यवृत्त ।

Sub: Minutes of the 121st PCC meeting held on 16.12.2022.

Sir,

16.12.2022 को आयोजित **121वीं** 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 **121st PCC** meeting of ERPC held on **16.12.2022** 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,

10.01.23

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

LIST OF ADDRESSES:

Chief Engineer, Trans (O&M) Bihar State Power Transmission Limited, VidyutBhawan, Bailey Road, Patna-800021	Electrical Supeeerintending Engineer (CRITL) Bihar State Power Transmission Limited, VidyutBhawan,Bailey Road, Patna-800021
Chief Engineer(System Operation), SLDC , BSPTCL, Patna-800021	
Chief Engineer (SLDC) Damodar Valley Corporation, GOMD-I Premises, P.O.- DaneshSeikh Lane, Howrah- 711109	Chief Engineer (CTC) Damodar Valley Corporation, P.O. Maithon Dam, Dist. Dhanbad,Jharkhand-828207
Chief Engineer, (CRITL) Jharkhand UrjaSancharan Nigam Limited Kusai Colony, Doranda, Ranchi-834002	Electrical Superintending Engineer (CLD) Jharkhand UrjaSancharan Nigam Limited, KusaiColony,Doranda, Ranchi-834002
Chief General Manager (O&M), OPTCL, Janpath, Bhubaneswar, Odisha – 751 022. FAX: 0674-2542932 cgm.onm@optcl.co.in	Sr. General Manager (PPA), Technical Wing, OHPCL, Orissa State Police Housing & Welfare Corpn. Bldg. VaniviharChowk, Janpath, Bhubaneswar-752022
Chief Load Dispatcher, SLDC OPTCL, P.O. Mancheswar Rly. Colony Bhubaneswar-751017	Chief Engineer (Testing), WBSETCL Central Testing Laboratory, Abhikshan, Salt Lake, Kolkata-700091 (Fax no. 2367-3578/1235)
Chief Engineer (CLD) WBSETCL, P.O.Danesh Sheikh Lane, AndulRoad, Howrah-711109	Addl. Chief Engineer (ALDC) West Bengal Electricity Distribution Company Ltd VidyutBhavan, 7th Floor, Bidhannagar, Sector-I Salt Lake City, Kolkata-700091(Fax-033-2334-5862)
Dy. Chief Engineer (Testing)/ Sr. Manager (Testing) CESC Ltd.,4, SasiSekhar Bose Road, Kolkata-700025	General Manager (O&M) KhSTPS, NTPC Ltd., P.O.Deepti Nagar, Dist. Bhagalpur, Bihar-813203
General Manager(O&M) FSTPS, NTPC Ltd., P.O. Nabarun, Dist. Murshidabad, West Bengal-742236	Dy. General Manager (Engineering), WBPDCL, OS Dept. Corporate Office, 3/C, LA Block, Salt Lake-III, Kolkata-700098 (Fax-033-23350516)
General Manager (O&M) Barh STPS, NTPC Ltd., P.O. NTPC Barh, Dist. Patna, Bihar-803213	General Manager (OS), ERHQ-II, NTPC Ltd., 3rdflr. OLIC Building, Plot no. N 17/2, Nayapalli, Unit-8 Bhubaneswar- 751012 (Fax No. 0674-2540919)
General Manager(O&M), TSTPS, NTPC Ltd., P.O.Kaniha, Dist. Angul, Orissa-759117	General Manager (AM), POWERGRID, Odisha Projects, Sahid Nagar, Bhubaneswar – 751 007
General Manager (OS), ERHQ-I, NTPC Ltd., LoknayakJaiprakashBhawan, (2nd Floor), DakBunglowChawk, Patna-800001	Manager (Electrical), Adhunik Power & Natural Resources Ltd. "Lansdowne Towers, Kolkata-700020 (Fax No. 033-2289 0285)
Executive Director (O&M) NHPC Ltd., NHPC Office Complex, Sector-33, Faridabad, Haryana-121003 (Fax-01292272413)	Electrical Superintending Engineer, TTPS, TenughatVidyut Nigam Ltd., Lalpania, Dist. Bokaro, Jharkhand-829149
Dy. General Manager (Electrical) IB Thermal Power Station, OPGCL Banhapalli, Dist. Jharsuguda-768234, Orissa	General Manager (AM), ER-I Power Grid Corporation of India Ltd., Alankar Place, Boring Road, Patna-800001
Chief Engineer (Trans.) Power Deptt., Govt. of Sikkim, Gangtok-731010	Sr. Manager (CTMC) Durgapur Projects Limited, Durgapur-713201
Executive Director, ERLDC, POSOCO, Tollygunge, Kolkata-700033	The Head Maithon Power Limited, Maithon Office, MA 5 Gogna, Dist. Dhanbad, Jhankand State, PIN-828207
General Manager (AM), ER-II Power Grid Corporation of India Ltd., J-I-15, Block-EP, Sector-V,Salt Lake,Kolkata-91	Head –Regulatory and contracts, IndiGrid Limited , 247 Embassy, Office No 107, 'B' Wing, Hindustan Co. Bus Stop, Gandhi Nagar, L.B.S. Road, Vikhroli West, Mumbai – 400 079. Ph : +91 845509 96408
General Manager (P&O), PTC Ltd., Kanchanjunga Bldg.,18, Barakhamba Road, New Delhi-110001	
Managing Director, Bhutan Power Corporation Post Box no. 580, Thimpu, Bhutan.	Managing Director, Druk Green Power Corprn. P.O. Box-1351, Thimpu, Bhutan.

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

Minutes
of
121st PCC Meeting

Date:10/01/2023
Eastern Regional Power Committee
14, Golf Club Road, Tollygunge
Kolkata: 700 033

EASTERN REGIONAL POWER COMMITTEE

MINUTES OF 121st PROTECTION COORDINATION SUB-COMMITTEE MEETING HELD ON 16.12.2022 AT 10:30 HOURS THROUGH MS TEAMS ONLINE MEETING PLATFORM

Member Secretary chaired the meeting. List of participants in enclosed at **Annexure A.**

PART – A

ITEM NO. A.1: Confirmation of Minutes of 120th Protection Coordination sub-Committee Meeting held on 16th November 2022 through MS Teams online platform.

The minutes of 120th Protection Coordination sub-Committee meeting held on 16.11.2022 was circulated vide letter dated 02.12.2022.

Members may confirm.

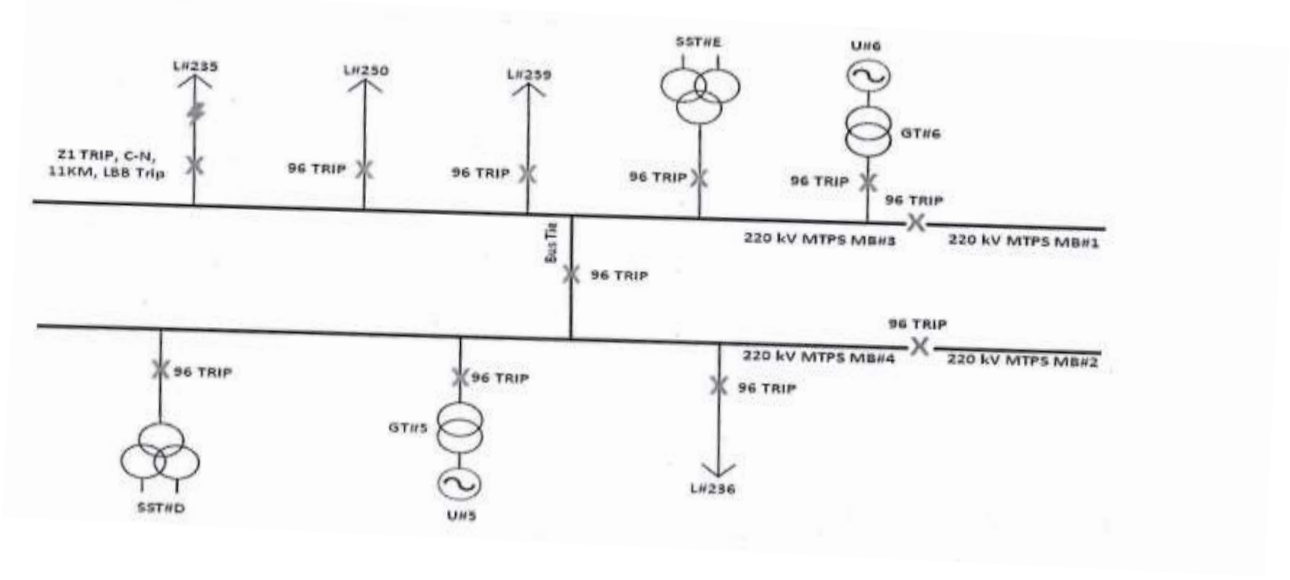
Deliberation in the meeting

Members confirmed the minutes of 120th PCC Meeting.

PART – B

ITEM NO. B.1: Disturbance at 220 kV Mejia (DVC) S/s on 20.11.2022 at 10:40 Hrs

220 kV Mejia-Durgapur (DVC) tripped around 10:40 hrs. from both end due to B phase fault. At the same time due to maloperation of LBB relay of the above line bay at MTPS end, all elements connected to 220 kV Bus-3 also tripped. Further due to defective CT switching relay of SST #D bay, trip command was extended to the elements connected to 220 kV Bus-4 and tripped the connected elements.



Disturbance analysis report from ERLDC is attached at **Annexure B.1.**
Gen. Loss: 366 MW
Outage Duration: 00:35 Hrs

DVC may explain.

Deliberation in the meeting

*The disturbance analysis report submitted by DVC is enclosed at **Annexure B.1.2.***

The event was explained as follows:

- *Prior to the incident, 220 kV Mejia-Durgapur (DVC) line was connected at 220 kV Main Bus-3 at Mejia. At 10:40 Hrs, B phase fault developed in 220 kV Mejia-Durgapur (DVC) line at 11 km from Mejia end. The line got tripped in zone 1 distance protection from both ends.*

- *At the same time, LBB protection of concerned bay mal-operated at Mejia end and resulted in tripping of all bays connected to 220 kV main bus 3 at Mejia. 220 kV main bus-4 at Mejia also got tripped during the event.*

- *The event was investigated and LBB relay of concerned bay was tested by secondary injection method and it was found that whenever LBB initiation was given to relay, relay was issuing CBF trip command instantaneously irrespective of any current in the relay. Subsequently faulty relay was replaced with new one.*

- *Regarding tripping of Main Bus 4 during the event, it was found that reset coil of CT switching relay of station transformer D was defective that resulted in shorting of DC buses of main bus 3 and main bus 4 and subsequently trip command in main Bus 3 was extended to main bus 4 and bus 4 got tripped.*

- *DVC representative informed that fault LBB relay has been replaced with spare relay and the faulty CT switching relay of SST bay has also been replaced with new one.*

Regarding remedial measures he informed that it is planned to replace all old LBB relays with Siemens 7SJ LBB relay at Mejia end at the earliest.

Further they have decided to do manual checking of all contacts and flags of CT switching relay after any bus side isolator operation and once in every shift subsequently status of CT switching relay will be recorded in shift book and in case of any anomaly, maintenance team will be informed to rectify it.

MPL representative stated that in case of numerical bus bar protection, it was easier to track the CT switching relay flag status as blocking feature is also present in numerical bus bar protection.

PCC enquired DVC about status of implementation of numerical bus bar protection at important substations of DVC for which DVC representative replied that already this matter had been taken up with higher authority however there is no further update into it.

Member Secretary ERPC expressed concern upon the fact that due to maloperation of relay, huge quantity of generation and load loss is observed during the event and financial loss to the utility.

He emphasized that proper precautionary measures like periodic testing of relay, replacement of old relay etc. shall be taken in order to avoid such incidents. He further advised DVC to implement numerical bus bar protection in all concerned substations at the earliest.

ITEM NO. B.2: Grid Disturbances at 220 kV Tashiding S/s

A. On 13.11.2022 at 16:34 Hrs

At 16:26 hrs, while desynchronizing Unit #1 at Tashiding, its breaker didn't open. At the same time, 220 kV Tashiding-New Melli-1 connected to same bus got tripped. At 16:34 Hrs, reverse power flow was observed in 220 kV Tashiding-New Melli-2 at Tashiding end and the line was hand-tripped from Tashiding to avoid any issue with generating units.

Load loss & gen loss: Nil
Outage Duration: 01:13 Hrs

Deliberation in the meeting

The detailed report submitted by Tashiding HEP is attached at ***Annexure B.2.1.***

The event was explained as follows:

- *During shutdown of unit-1, the bay circuit breaker of Unit #1 did not open resulting in drawing of reverse power from grid and the machine ran in synchronous motoring mode.*
- *On detection of reverse power by generator protection relay, trip command was issued by the relay however due to faulty bay circuit breaker the breaker did not open and both the trip coil of circuit breaker got burnt*
- *Subsequently busbar protection relay operated and issued trip command to 220 kV Tashiding-New Melli -1. The trip command was not extended to 220 kV Tashiding-N. Melli-2 line.*
- *220 kV Tashiding-New Melli -2 line was hand tripped in order to stop reverse power flow to unit.*

On investigation it was found that due to damage of bearing in unit# 1 bay circuit breaker, it was not opened during the event. Further due to continuous DC extension to trip coil, the coils were burnt. Tashiding HEP representative informed that damaged unit #1 bay breaker had been replaced with new one.

Regarding hand tripping of 220 kV Tashiding-New Melli -2, he informed that trip command from busbar relay did not extend to the line breaker as the isolator status of bus coupler was not available in busbar relay. He added that loose connection was found for bus coupler isolator close status to BB protection relay and the same was tightened.

B. On 28.11.2022 at 14:16 Hrs

During testing of bus bar protection scheme at Tashiding end, tripping command was extended to master trip relay of both outgoing feeders subsequently 220 kV Tashiding-New Melli d/c tripped from Tashding end.

Load loss & gen loss: Nil
Outage Duration: 00:29 Hrs

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

Tashiding HEP may explain.

Deliberation in the meeting

It was informed by Tashidinhg HEP that during live testing of bus bar protection scheme, tripping command was extended to master trip relay of both outgoing feeders and subsequently 220 kV Tashiding-New Melli d/c tripped from Tashding end.

PCC advised Tashiding HEP to take necessary precautions while conducting busbar/LBB test so that these type of spurious tripping incidents can be avoided in future.

ITEM NO. B.3: Total Power failure at 220 kV Chatra(JUSNL) S/s on 18.11.2022 at 01:23 Hrs

220 kV Daltonganj-Chatra-1 tripped due on B_N fault. Subsequently total power failed occurred at Chatra S/s as it is being fed radially through single circuit.

Relay Indications:

Name	End 1	End 2	PMU Observations
220 kV Daltonagnj-Chatra-1	Daltonganj: B_N, 143.5 km, 1.3 kA	Chatra: Didn't trip. 220 kV Bus-2 B_ph PT burst	2 kV dip in B_ph voltage at Biharsharif. Fault clearance time: 350 msec

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

Load Loss: 23 MW
Outage Duration: 01:28 Hrs

JUSNL may explain.

Deliberation in the meeting

JUSNL representative informed that B-phase PT of 220 kV Bus 2 at Chatra S/s got burst which resulted in tripping of 220 kV Daltonganj-Chatra-1 from Daltongunj end in zone-2. No tripping was observed from Chatra end for mentioned line.

PCC opined that as PT was burst for bus-2 during the incident, bus bar protection for bus-2 should have operated at Chatra end. JUSNL representative replied that there was no operation of busbar protection.

PCC advised JUSNL to test the healthiness of bus bar relay at Chatra end for its non-operation during the incident.

On enquiry from PCC regarding status of restoration of 220 kV Daltonganj-Chatra-2, JUSNL representative informed that charging of 220 kV Daltonganj-Chatra-2 had not been done yet due to some pending compliances at SLDC end regarding data reporting for which visit of OEM engineer had been arranged and it is planned to restore line at earliest.

ITEM NO. B.4: Major grid events other than GD/GI

11. **Bus tripping occurred in Eastern Region during November 2022**

During November 2022, following incidents of bus bar tripping have been observed in Eastern Region.

Element Name	Tripping Date	Reason	Utility
220 kV Main Bus-2 at Alipurduar (PG)	18.11.22 at 16:17 Hrs	-	PG ER-2
400 kV Main Bus-1 at Indravati (PG)	23.11.22 at 18:53 Hrs	Bus bar protection operated	PG Odisha
220 kV Main Bus-1 Arambagh	11.11.22 at 13:37 Hrs	-	WBSETCL

Concerned utilities may explain.

Deliberation in the meeting

- **Tripping of 220 kV Main Bus-2 at Alipurduar (PG) on 18.11.22 at 16:17 Hrs**

He informed that on day of incident, shutdown of 220 kV Alipuduar- Salakati -2 was taken and during shutdown line isolator was opened on both ends with earth switch closed on both sides. At 16:17 hrs, a fault was developed at BTPS(NER) due to some equipment damage in BTPS s/s for which fault current was fed by 220 kV Salakati- BTPS line and further by 220 kV Alipuduar- Salakati-1.

He explained that DMT scheme is present at Alipurduar and the CT position is towards line. Since earth switch is closed on both side, fault current was also developed in 220 kV Alipuduar- Salakati -2 due to mutual induction and subsequently SOTF initiated and thereafter LBB operated as fault current was flowing up to 200 ms.

Regarding extension of tripping command to Bus 2, he informed that status of bus isolator was replicated as in closed condition to relay however actually it was open.

To avoid this type of spurious tripping, PCC advised that during shutdown of the line, local earthing on both sides of CT shall be done in case of DMT scheme and where CT position is towards the line to avoid any unwanted tripping in the substation during fault in the other healthy circuit as well as for safety measures.

- **Tripping of 400 kV Main Bus-1 at Indravati (PG) on 23.11.22 at 18:53 Hrs**

Powergrid Odisha representative was not available in the meeting.

- **Tripping of 220 kV Main Bus-1 Arambagh on 11.11.22 at 13:37 Hrs**

WBSETCL representative informed that Y-phase LA of 220 kV Midnapore – Arambagh- 1 got burst subsequently line was tripped in Zone-1 fault form both ends.

At the same time, bus #1 was tripped through Y-phase busbar relay operation. During inspection, it was found that control cable of CT circuit meant for bus zone protection was damaged at cable gland end in busbar panel. He added that insulation of control cable was damaged and caused earthing of CT wire resulting in operation of bus bar relay. He further informed that damaged control cable had been replaced with new one and subsequently bus bar relay was tested and found to be in healthy condition.

ITEM NO. B.5: 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.

TPTL may elaborate. Members may discuss.

Deliberation in the meeting

TPTL representative informed that as per deliberation in 108th PCC Meeting, communication had been made with 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 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 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 that single phase auto reclose is available in DEF protection function of REL670 relay.

He further informed that similar feature has been implemented in North Eastern Region. He requested to provide permission for implementing single phase auto recloser feature in DEF Relays for the 400 kV transmission lines of TPTL.

PCC enquired about relay logic behind single phase auto-recloser scheme and its reliability to which ERLDC representative replied that as per logic provided by relay manufacturer, single phase auto-recloser tripping will occur in case fault is sensed by both ends relay in forward direction for particular phase. So, it is not expected that in case of fault in adjacent or parallel line tripping as per single phase auto-recloser scheme will occur as in that case both ends relay will not see the fault in forward direction so there is not any issue in implementing single phase auto-recloser scheme in concerned lines provided that communication healthiness is ensured at both ends. He further added that this scheme has one limitation that identification of phase for tripping is decided in maximum of 1-2 cycle by relay by checking per phase sudden rise in current or drop in voltage so it may be expected that wrong phase may be identified for tripping. Further 3 phase tripping may occur in case phase identification is not done successfully by relay.

Powergrid representative informed that since single PLCC will be used for carrier at both ends for both distance protection and DEF protection so carrier complexity may arise while issuing and receiving carrier at both ends. He further added that it may affect healthiness of GIS present on either end. So, he requested that further study & discussion need to be carried out before implementing single phase auto-recloser scheme.

ERLDC representative informed that since delayed clearance will be prevented by implementing single phase auto-recloser scheme so it will improve healthiness of GIS.

After detailed deliberation, the following way forward is 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.*

ITEM NO. B.6: Tripping Incidence in month of November-2022

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

Concerned utilities may explain.

Deliberation in the meeting

Members explained the tripping incidences. The updated status is enclosed at ***Annexure B.6.***

PART- C :: OTHER ITEMS

ITEM NO. C.1: DEF protection setting review in Sikkim complex in view of LILO of 400 kV Teesta 3-Kishanganj at Rangpo

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

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

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

The DEF settings based on the revised study is enclosed at **Annexure C.1.**

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

In 119th PCC Meeting, it was informed that Tashiding had revised the DEF settings at their end.

PCC advised concerned utilities to implement the revised DEF settings at their end at the earliest.

Further, NHPC vide email dated 22nd November 2022, TUL vide email dated 01/12/2022, Jorethang vide email dated 01/12/2022 and Dikchu vide email dated 01/12/2022 had confirmed that the revised settings have been implemented at their respective end.

Powergrid and Rongnichu HEP may update.

Deliberation in the meeting

Powergrid ER-II representative informed that proposed DEF setting will be implemented by end of December 2022.

Ronginchu HEP vide email dated 22/12/2022 to ERPC had confirmed that DFE settings had been revised at their end.

PCC advised concerned utilities to implement the revised DEF settings at their end at the earliest and share confirmation to ERPC/ERLDC after implementation.

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 for decisions of previous PCC meetings is given at **Annexure C.2**.*

ITEM NO. C.3: Issue in implementation of differential protection in 220kV Darbhanga (DMTCL) – Darbhanga (BSPTCL) D/C line- (Agenda by DMTCL)

As per deliberation in 45th TCC Meeting, TCC agreed with proposal that differential protection should be implemented for short lines having length < 10 km and cost sharing related to implementation of fiber based differential protection scheme at either end will be borne by bay owner of respective end. It was also clarified that in case different bay owners are present on either side then implementation may be done by single entity and cost can be shared by both utilities.

With reference to this deliberation, BSPTCL vide letter dated 21.07.2022 attached at **Annexure C.3.** had requested DMTCL to implement differential protection in 220kV Darbhanga - Darbhanga D/C as bays at DMTCL end are maintained by DMTCL.

DMTCL vide letter dated 05/12/2022 addressing to ERPC stated that DMTCL being an interstate transmission licensee implemented mentioned ISTS elements under TBCB route. For transmission licensee who are operating under TBCB route, scope of project is considered final as per bid documents and accordingly tariff stream is finalized through regulatory process of tariff adoption by CERC hence any additional requirement imposed on account of change in scope cannot be carried out under existing provisions of transmission service agreement.

In such case DMTCL is unable to implement differential protection in 220kV Darbhanga - Darbhanga D/C however necessary support required can be provided by DMTCL at its bay end.

DMTCL may elaborate. Members may discuss.

Deliberation in the meeting

DMTCL representative informed DMTCL being an interstate transmission licensee had implemented mentioned ISTS elements under TBCB route. For transmission licensee who are operating under TBCB route, scope of project is considered final as per bid documents and accordingly tariff stream is finalized through regulatory process of tariff adoption by CERC hence any additional requirement imposed on account of change in scope cannot be carried out under existing provisions of transmission service agreement. In such case DMTCL is unable to implement differential protection in 220kV Darbhanga - Darbhanga D/C however necessary support required can be provided by DMTCL at its bay end.

On a query from ERPC secretariat regarding methodology of cost sharing for new installation of any equipment at DMTCL end as per grid standards or statutory regulations, for which DMTCL representative replied that if there is necessity of installing any equipment due to guideline/regulations by CEA/CERC then in that case provision for change in law will be considered and accordingly proceedings will be done however installation of differential protection in 220kV Darbhanga - Darbhanga D/C cannot be considered in provision of change in law and it comes under change in scope. They will face difficulty in recovering their incurred cost in case relay is implemented by them at their end.

On enquiry from PCC regarding availability of OPGW in 220kV Darbhanga - Darbhanga D/C BSPTCL representative replied that OPGW is available in 220kV Darbhanga - Darbhanga D/C.

There is no consensus achieved in PCC Meeting subsequently PCC referred this agenda to next TCC Meeting.

ITEM NO. C.4: List of lines having OPGW for 220 kV and above level.

During analysis of protection performance of various utilities of eastern region during the previous PCC meetings, it was observed that one of the main reasons for single line tripping is either due to non-availability of PLCC/auto recloser or spurious DT triggering.

Further, for many of the lines autorecloser scheme has been planned to be implemented after commissioning of OPGW/DTPC in the concerned lines.

In this regard, all the utilities are 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.

Further, wherever OPGW have been installed, PLCC may be replaced with DTPC.

Members may discuss.

Deliberation in the meeting

ERPC secretariat representative informed that as per analysis of performance of protection system of various utilities of eastern region, non-availability of PLCC/auto recloser or spurious DT triggering is observed to be key reason behind large number of single line tripping incident so it is proposed that OPGW based communication scheme may be commissioned in concerned lines along with implementation of DTPC in place of PLCC for reducing number of tripping incidents.

In this regard, he requested all utilities 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.

PCC advised all utilities to share the list of lines as mentioned above to ERPC.

ITEM NO. C.5: Compliance of Third-Party Protection Audit Observations

The compliance status of Third-Party Protection Audit observations is as follows:

Name of Constituent	Total observations	Compiled	% of compliance
Powergrid	7	-	-
NTPC Darlipalli	3	2	66.67
OPTCL	21	7	33.34
OPGC	17	-	-
JUSNL	46	16	34.78
DVC	7	-	-

Status of compliances as per 120th PCC Meeting is attached at **Annexure C.5.**

JUSNL vide email dated 13/12/2022 addressing to ERPC had sent updated status of compliance of protection audit observation which is attached at **Annexure C.5.1.**

Concerned utilities may update.

Deliberation in the meeting

ERPC representative informed that status of compliance of third-party protection audit had been received from OPGC which is attached at ***Annexure C.5.2.***

Powergrid & DVC representative informed that status of compliance of third-party protection audit will be within a week.

****

List of participants in 121st PCC Meeting held on 16.12.2022

Annexure A

Full Name	Join Time	Email
ERPC Kolkata	12/16/2022, 10:11:11 AM	ERPC@KolkataMST.onmicrosoft.com
ABAKASH ADHIKARY	12/16/2022, 10:11:25 AM	abakash.adhikary@dvc.gov.in
SLDC, ODISHA (Guest)	12/16/2022, 10:11:26 AM	
Debdas Mukherjee WBPDCL (Guest)	12/16/2022, 10:12:56 AM	
DGM,JAJPUR_ROAD.OPTCL	12/16/2022, 10:20:08 AM	
NIRMAL MONDAL (WBSETCL) (Guest)	12/16/2022, 10:20:48 AM	
Kumar Satyam, AE, ERPC (Guest)	12/16/2022, 10:22:19 AM	
Alok Pratap Singh	12/16/2022, 10:23:36 AM	apsingh@erldc.onmicrosoft.com
Pallavi Mittal	12/16/2022, 10:25:25 AM	pallavi.k@tvptl.com
Vanrajsinh Dodia	12/16/2022, 10:25:29 AM	Vanrajsinh.Dodia@energy-sel.com
S. K. Bhowmick	12/16/2022, 10:26:17 AM	swapan.b@tvptl.com
Akash Modi, ERLDC	12/16/2022, 10:26:26 AM	
Vijay Chandra -TEESTA III	12/16/2022, 10:26:45 AM	
SMS SAHOO, DGM(ELECT), OPTCL, BHUBANESWAR (Guest)	12/16/2022, 10:26:49 AM	
Nishant Kumar Shankwar	12/16/2022, 10:27:25 AM	Nishant.Kumar@energy-sel.com
B.Pradhan, D.G.M(El.) E&MR Division,Burla (Guest)	12/16/2022, 10:28:05 AM	
Raman Bharmauria	12/16/2022, 10:28:09 AM	raman.bharmauria@opgc.co.in
CRITL BSPTCL (Guest)	12/16/2022, 10:28:18 AM	
Amresh Prusti	12/16/2022, 10:29:24 AM	amresh.prusti@opgc.co.in
RAHUL KUMAR	12/16/2022, 10:30:52 AM	
Prabhat Kumar	12/16/2022, 10:30:58 AM	prabhat@tvptl.com
EEE BSPTCL	12/16/2022, 10:31:07 AM	
Sudeep Kumar, ER1 (Guest)	12/16/2022, 10:31:10 AM	
Sougato Mondal	12/16/2022, 10:31:18 AM	saugato@erldc.onmicrosoft.com
Somnath Chatterjee	12/16/2022, 10:31:33 AM	schatterjee@tatapower.com
Shyamal Konar	12/16/2022, 10:31:46 AM	konar_s@erldc.onmicrosoft.com
MS ERPC (Guest)	12/16/2022, 10:32:40 AM	
VIJAY CHANDRA -TEESTA III HEP (Guest)	12/16/2022, 10:33:00 AM	
Ganesh Korada	12/16/2022, 10:33:52 AM	ganesh.korada@opgc.co.in
Shabari Pramanick	12/16/2022, 10:34:17 AM	shabari.pramanick@erldc.onmicrosoft.com
Arindam bsptcl	12/16/2022, 10:34:26 AM	

Deepak Kumar Singh (Guest)	12/16/2022, 10:35:13 AM	
MITHUN GAYEN	12/16/2022, 10:35:39 AM	mithgyn93@outlook.com
Saurav Kr Sahay	12/16/2022, 10:35:55 AM	saurav.sahay@erldc.onmicrosoft.com
Deepak, EEE, CRITL, BSPTCL	12/16/2022, 10:36:13 AM	
Chandan kumar	12/16/2022, 10:36:56 AM	chandan@erldc.onmicrosoft.com
Brajesh Kumar	12/16/2022, 10:37:23 AM	
Neeraj Kumar Verma	12/16/2022, 10:37:43 AM	Neeraj.Verma@energy-sel.com
Sr. Manager Daltonganj	12/16/2022, 10:38:05 AM	
Sunil Kumar	12/16/2022, 10:38:25 AM	
Deepak	12/16/2022, 10:39:04 AM	
RHEP, Rengali (Guest)	12/16/2022, 10:40:18 AM	
Dilshad Alam BSPTCL	12/16/2022, 10:42:03 AM	
Akash Kumar Modi	12/16/2022, 10:42:04 AM	akmodi@erldc.onmicrosoft.com
Dharm Das Murmu, CRITL, JUSNL (Guest)	12/16/2022, 10:42:33 AM	
gaurav	12/16/2022, 10:45:50 AM	
Pravin Ram	12/16/2022, 10:45:55 AM	
vinod kumar bhoi	12/16/2022, 10:46:13 AM	
Prabhat Kumar,CRITL,JUSNL	12/16/2022, 10:47:34 AM	
"prabhat kumar (TPTL) (Guest)	12/16/2022, 10:48:17 AM	
KUMAR AMRENDRA MADANPURI	12/16/2022, 10:52:40 AM	
Abhilash Hota	12/16/2022, 10:54:16 AM	
Malviya Rakesh	12/16/2022, 10:56:11 AM	Rakesh.Malviya@andritz.com
JAGANATHPANI	12/16/2022, 10:56:26 AM	
AEE Latehar	12/16/2022, 10:57:39 AM	
AEE/CBSA-I (Guest)	12/16/2022, 11:00:29 AM	
Abhilash Hota (Guest)	12/16/2022, 11:04:49 AM	
Sanjay Sharma, Tessta V PS (Guest)	12/16/2022, 11:05:54 AM	
aditya jha	12/16/2022, 11:06:39 AM	
BSPTCL	12/16/2022, 11:07:09 AM	
NILOTPAL CHATTERJEE	12/16/2022, 11:08:41 AM	
Ayyappa Y (Guest)	12/16/2022, 11:12:01 AM	
rajendra prasad (Guest)	12/16/2022, 11:15:22 AM	
Rakesh Bsptcl	12/16/2022, 11:15:39 AM	

Kishore Chandra Bhoi	12/16/2022, 11:19:10 AM	
sk	12/16/2022, 11:26:06 AM	
D.PATEL OPTCL EMR MERAMUNDALI	12/16/2022, 11:29:46 AM	
Ch Mohan Rao,PG-Odisha (Guest)	12/16/2022, 11:45:59 AM	
V Anil Krishna (Guest)	12/16/2022, 11:46:46 AM	
ravi Ranjan	12/16/2022, 12:36:29 PM	
Kurshna samntray	12/16/2022, 12:42:42 PM	krushna.samantray@opgc.co.in

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

घटना संख्या: **20-11-2022/1** दिनांक: **06-12-2022**

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

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

At 10:40 Hrs on 20.11.2022, 220 kV Mejia-Durgapur (DVC) tripped due to B_N fault. At the same time, its LBB relay mal-operated and all elements connected to 220 kV Bus-3 at Mejia tripped. SST#D was connected to 220 kV Bus-4, however, its CT switching relay was defective and isolator status was showing that it was connected to both buses, hence 220 kV Bus-4 at Mejia also tripped. 250 MW U#5, U#6 tripped leading to 366 MW generation loss at Mejia.

- **Date / Time of disturbance:** 20-11-2022 at 10:40 hrs.
- **Event type:** GI- 1
- **Systems/ Subsystems affected:** 220 kV Mejia TPS
- **Load and Generation loss**.
  - 366 MW generation loss reported at Mejia during the event.
  - No load loss occurred during the event

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

- NIL

3. Major elements tripped (प्रमुख ट्रिपिंग)

- 220 kV Mejia-Ranchi-1
- 220 kV Mejia-Ramgarh-1
- 220 kV Mejia-Durgapur D/c
- U#5, U#6 (250 MW each) at Mejia
- SST#D, SST#E

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

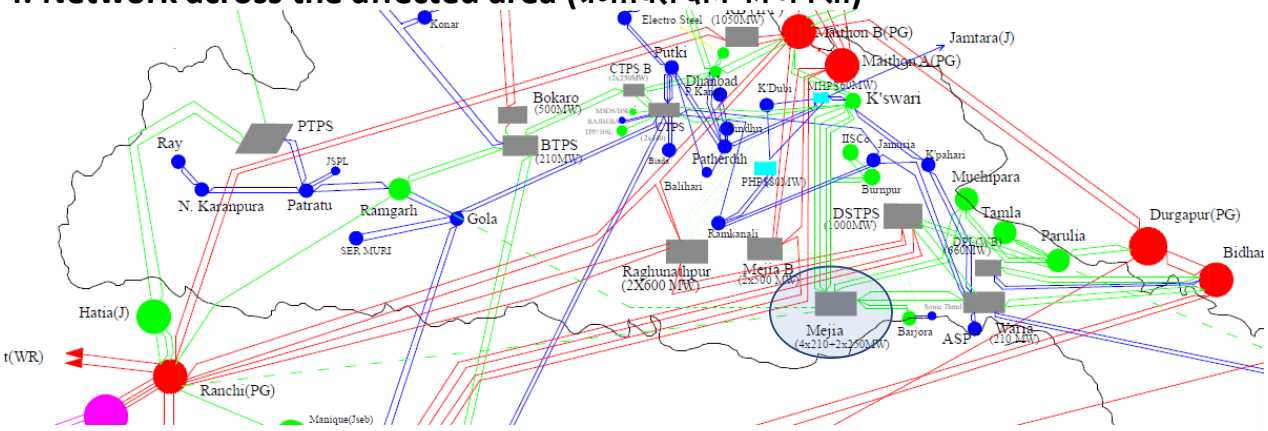


Figure 1: Network across the affected area

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

समय	नाम	उप केंद्र 1 रिले संकेत	उप केंद्र 2 रिले संकेत	पीएमयू पर्यवेक्षण
10:40	220 kV Mejia-Ranchi-1	LBB protection	-	20 kV dip in B_ph voltage at Mejia S/s. Fault clearance Time: 100 msec
	220 kV Mejia-Ramgarh-1		-	
	220 kV Mejia-Durgapur-1		-	
	220 kV Mejia-Durgapur-2	Mejia: B_N, Zone-1, 11 km	-	
	U#5, U#6 at Mejia	LBB protection	-	
	SST#D, SST#E		-	

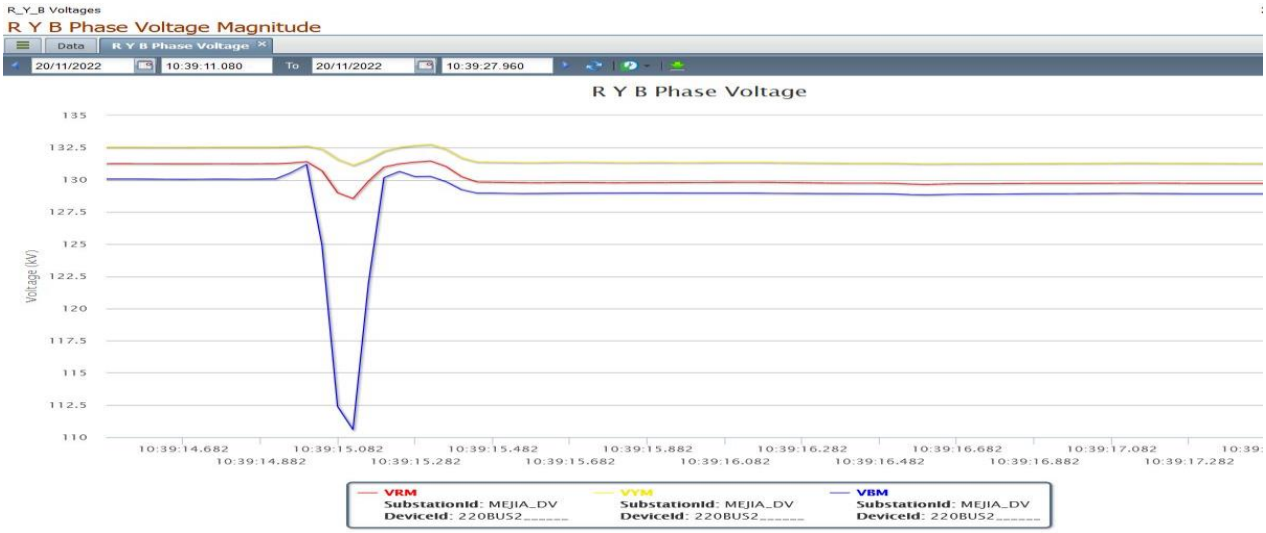


Figure 2: PMU voltage snapshot of 220 kV Mejia S/s

6. Restoration (पूर्वावस्था की प्रप्ति)

Transmission/Generation element name	Restoration time
220 kV Mejia-Ranchi-1	14:00
220 kV Mejia-Ramgarh-1	12:24
220 kV Mejia-Durgapur -1	18:56
220 kV Mejia-Durgapur -2	11:15
U#5, U#6 at Mejia	15:12/18:06
SST#D, SST#E	-

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

- A single-phase fault (B-Earth) struck 220 kV Mejia-Durgapur-1 at 11 km from Mejia which was cleared within 100 msec. However, LBB of this CB operated immediately leading to tripping of all elements connected to 220 kV Bus-3. As reported, LBB relay was found faulty.
- 220 kV Bus-4 also tripped as SST#D which was connected to 220 kV Bus-4 but reset coil of its CT switching relay was faulty and when SST#D was transferred from Bus-3 to Bus-4, its status was not reset properly. Hence, it was showing connected to both buses. Thereby, LBB gave tripping command to all bay connected to 220 kV Bus-4 also.
- Incidents of tripping of both buses due to incorrect isolator status has increased recently. DVC may take necessary steps to avoid such unwanted tripping.
- As reported, CT switching relay of 220 kV Bus coupler was also found faulty.
- Detailed report received from DVC is attached at **Annexure-3.**

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

Issues	Regulation Non-Compliance	Utility
DR/EL not provided within 24 Hours	1. IEGC 5.2 (r) 2. CEA grid Standard 15.3	**DVC**
Incorrect/ mis-operation / unwanted operation of Protection system	1. CEA Technical Standard for Construction of Electrical Plants and Electric Lines: 43.4.A. 2. CEA (Technical standards for connectivity to the Grid) Regulation, 2007: Schedule Part 1. (6.1, 6.2, 6.3)	**DVC**

9. Status of Reporting (रिपोर्टिंग की स्थिति):

DR/EL yet to be received from DVC.

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

SoE data not recorded at the time of events.

Annexure 2: DR recorded

DR/EL yet to be received.

Annexure B.1.2

दामोदर घाटी निगम / DAMODAR VALLEY CORPORATION
अधीक्षण अभियंता कार्यालय / OFFICE OF S.E.(E)
केन्द्रीय रिले एवम् उपकरण परीक्षण प्रयोगशाला / CRITL
डाकघर- मैथन बांध / P.O. MAITHAN DAM,
जिला-धनबाद / DHANBAD, झारखंड / JHARKHAND -828207

पत्र सं° / Letter No.: CRID/MTPS/ 379

दिनांक / Date: 28.11.2022

सेवा में,

श्रीमान् अधीक्षण अभियंता / The Superintending Engineer, (E), MTPS OPH, DVC, MTPS

विषय / Sub: Investigation Report on Tripping of MTPS 220kV Bus # 3 & 4 due to LBB Operation of Line # 235 on 20/11/2022.

प्रिय महोदय / Dear Sir,

Please find the detailed investigation report of Tripping of MTPS 220kV Bus # 3 & 4 due to LBB Operation of Line # 235 on 20/11/2022.

सधन्यवाध / Thanking you,

भवदीय / Yours faithfully,

Dipti Pathi 28/11/22

अधीक्षण अभियंता (वि) /
Superintending Engineer (E)
केन्द्रीय रिले एवम् उपकरण परीक्षण
प्रयोगशाला / CRITL
दाघानि, मैथन / DVC, Maithon

प्रतिलिपि / Copy To:

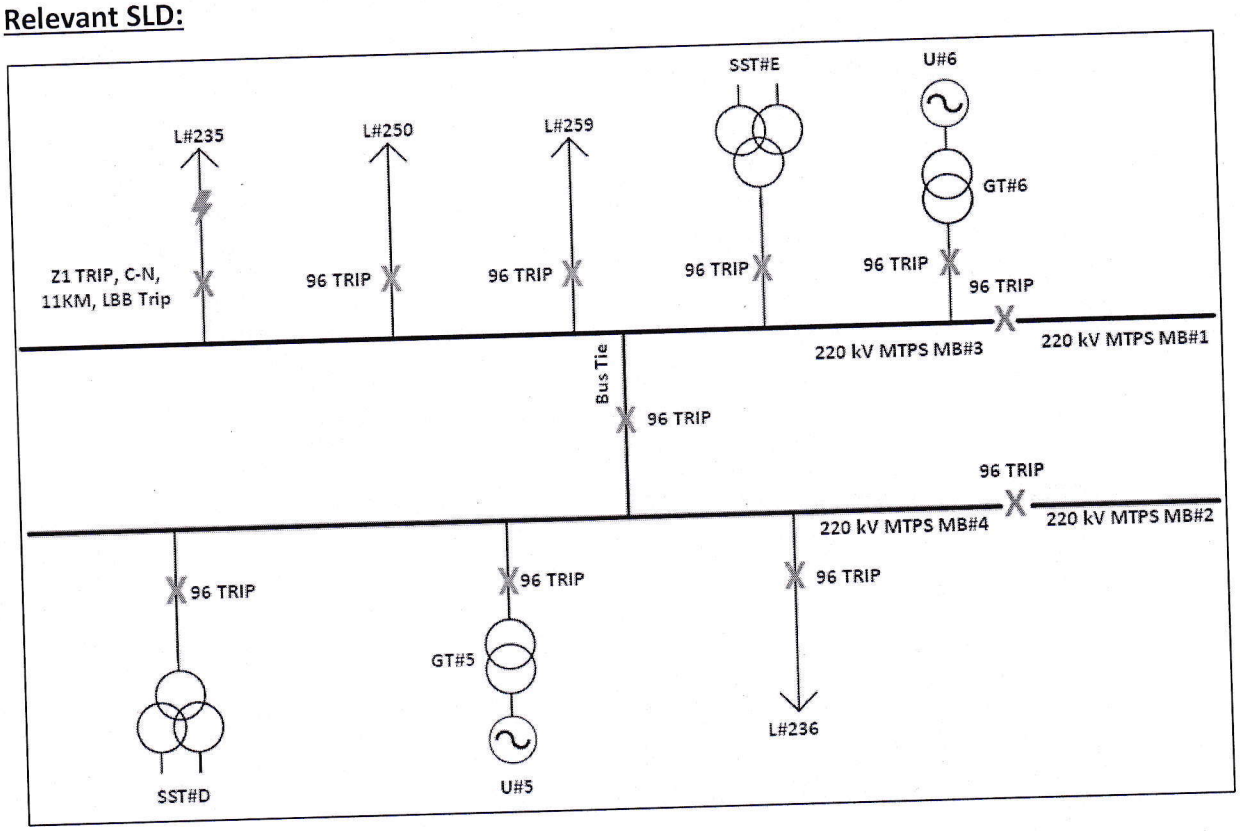
1. श्रीमान् मुख्य अभियंता , दाघानि, MTPS /The Chief Engineer-1 & Proj. Head , MTPS, DVC, MTPS
2. श्रीमान् मुख्य अभियंता- I (ओ°एस° & यू°) दाघानि, कोलकाता / The Chief Engineer-I (OS&U), DVC, Kolkata
3. श्रीमान् मुख्य अभियंता, सी° टी° सी, दाघानि, मैथन/ The Chief Engineer, CTC, DVC, Maithon
4. श्रीमान् एस° ई° एंड° टेक° पा, ईडी (सिस्टम), दाघानि, कोलकाता / The SE & Tech PA, ED (Sys), DVC, Kolkata
5. श्रीमान् अधीक्षक अभियंता (वि.), C.R.I.T.M, दाघानि, मैथन / The SE(E), C.R.I.T.M DVC, Maithon

Investigation Report on Tripping of MTPS 220kV Bus # 3 & 4 due to LBB Operation of Line # 235 on 20/11/2022

Brief History:

It was reported that at around 10:40 Hrs 220kV MTPS-Durgapur L#235 tripped through Z1 distance protection from both ends. The fault occurred in the said line at a distance 11 Km from MTPS end. But along with that LBB protection of the concerned bay operated and tripped all bays connected to 220 kV Main Bus # 3 & 4.

Relevant SLD:



Analysis of the Event:

CRITL team visited MTPS 220kV switchyard on the same day for detailed investigation of the said disturbance. Findings are tabulated as follows:

a) DR of L#235 was extracted and analyzed thoroughly. It was noticed that a L3-E fault occurred in the said line at around 10:40 Hrs on 20/11/2022 and both M1 LPRO and M2 SEL Distance relay issued Z1 trip command instantaneously. After the issuance of Z1 trip command, circuit breaker operated successfully and cleared the fault within 80ms. It may be noted here that L3 fault current was recorded to be around 8.8kA during this fault. DR is attached in Annexure A for reference.

b) Then last fault record of L#235 LBB Relay (ERL ARGUS-1) was noted down from the display panel as DR downloading provision is not available in this relay. It was observed that CB Fail trip command was issued and recorded current values were IA=0.33In, IB=0.45In & IC=10.7In. So, it is evident that, LBB relay logged fault current properly but as this fault current was cleared within 80ms, LBB relay should not have issued any CBF trip command.

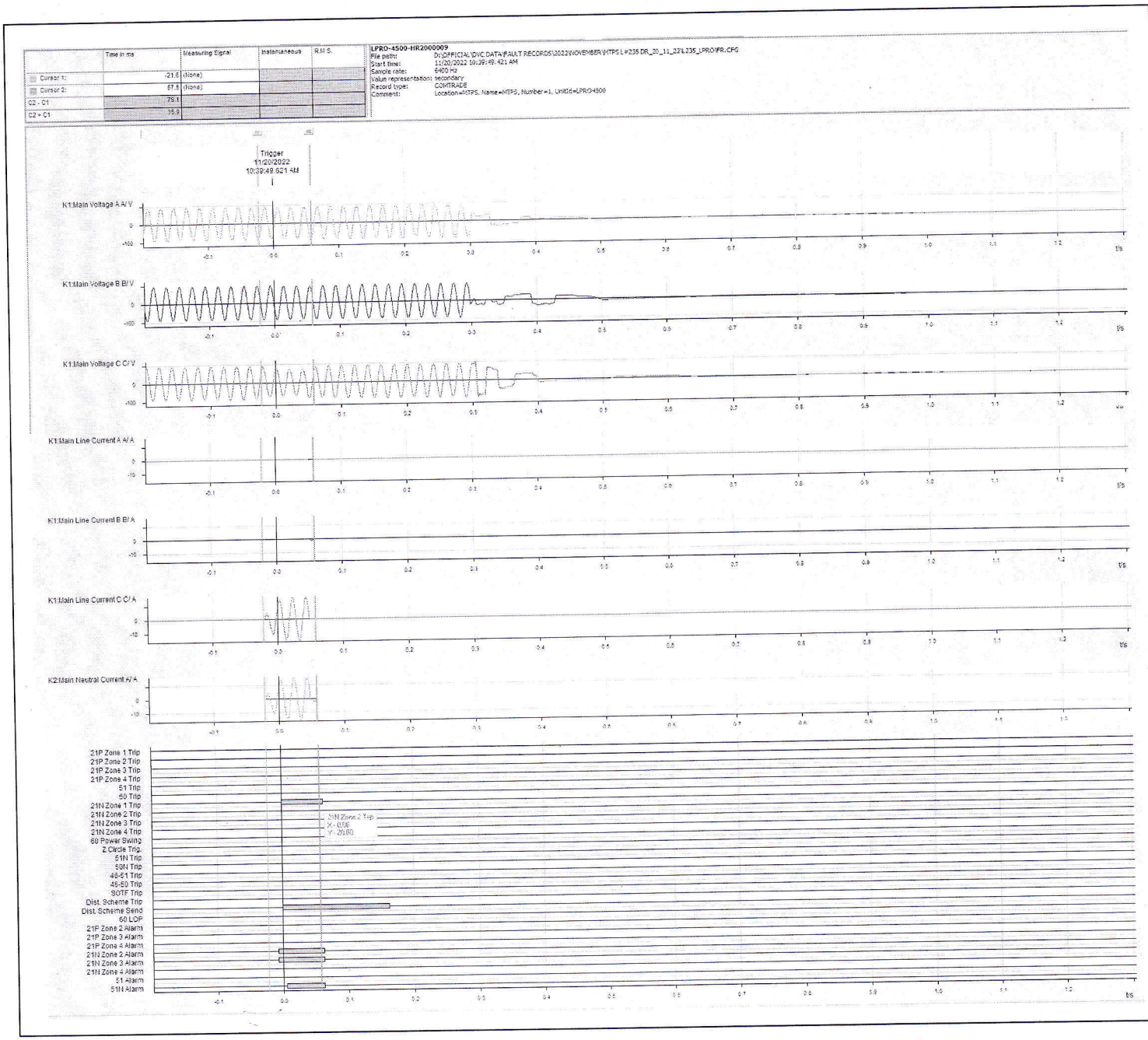
c) All settings of this LBB relay were checked thoroughly and were found to be in order.
d) Then this LBB relay (bearing Sl. No. BR0613291, Type: DCD414B, ARGUS 1) was racked out and tested by secondary injection method. It was found that whenever LBB initiation was given to the relay, relay issued CBF trip command instantaneously irrespective of any current in the relay.
e) Thereafter a healthy relay (bearing Sl. No. BR1601697, Type: DCD414B, ARGUS 1) was configured with the existing relay LBB settings and tested O.K. i.e. the relay was giving the LBB Trip command 200ms (LBB Timer) after LBB initiation only when the current in any phase was above 20% or 200mA (LBB Pick Up current). The faulty LBB relay was replaced by this healthy relay and the line was normalized.
f) So, it was clear that, faulty LBB relay had issued trip command although the circuit breaker of L # 235 fault had cleared the fault correctly. This explained the tripping of all bays connected to MB # 3 (to which L#235 was connected) via operation of 96 relays.
g) The reason of tripping of MB # 4 along with MB # 3 was improper operation of SST # D 89AX CT switching relay which had shorted the DC buses of MB # 3 & MB # 4. The concerned relay was drawn out and tested. On testing, it was found that the reset coil of the said relay was defective. During disturbance, SST # D was connected to MB # 4 and accordingly 89BX CT switching relay was in operated condition. But as 89AX relay did not reset properly due to its faulty resetting coil, both 89AX & 89BX remained in set condition. Thus, appearance of trip command in MB # 3 has resulted in operation of 96 relays of bays connected to MB # 4.
h) In addition to this, 89AX CT switching relay of BC # 4 was also found to be defective during testing.

Recommendations:

a) Malfunction of Easun Reyrolle(ER) make DCD414B relays used for LBB protection at CTPS New 220KV Switchyard had been observed previously too and there the LBB relays in all panels had been replaced by Siemens 7SJ relays. However, at MTPS this was the first occurrence of such mis-operation. Thus, keeping in view of history of malfunction of same make and model relays at CTPS and similar occurrence at MTPS today it has been decided that all existing LBB relays at MTPS Unit # 5 & 6 system are to be replaced by Siemens 7SJ relays in near future.
b) Manual checking of all contacts and flag of CT Switching relays (89AX, 89BX & 89CX) is to be done rigorously after bus side isolator operation and once in every shift. The status of CT switching relay must be recorded in shift book. In case of any anomaly, electrical maintenance should be informed immediately.
c) As a long term measure the existing High Impedance Bus bar & LBB protection scheme needs to be replaced with numerical Low Impedance busbar protection relay with Central & Peripheral unit concept for ensuring reliability.
d) In CU & PU Protection scheme the status of LEDs of Bus Side Isolators in PUs needs to be monitored after every bus side isolator operation and once in every shift and such information should be recorded in shift logbook too.

Patli 28/11/22 Adhikary 28/11/22

Annexure A


Time in ms
Measuring Signal
Instantaneous
R.M.S.
Cursor 1: -21.6 (None)
Cursor 2: 57.5 (None)
C2 - C1 79.1
C2 + C1 35.9
LPRO-4500-HR2000009
File path: Dr:\OFFICIAL\DVC DATA\FAULT RECORDS\2022\NOVEMBER\HTPS L=235 DR_20_11_22\L235_LPRO\FR.CFG
Start time: 11/20/2022 10:39:49.421 AM
Sample rate: 6400 Hz
Value representation: secondary
Record type: COMTRADE
Comment: Location=HTPS, Name=HTPS, Number=1, UnitId=LPRO4500
Trigger
11/20/2022
10:39:49.621 AM
K1:Main Voltage A A/ V
K1:Main Voltage B B/ V
K1:Main Voltage C C/ V
K1:Main Line Current A A/ A
K1:Main Line Current B B/ A
K1:Main Line Current C C/ A
K2:Main Neutral Current A/ A
21P Zone 1 Trip
21P Zone 2 Trip
21P Zone 3 Trip
21P Zone 4 Trip
51 Trip
50 Trip
21N Zone 1 Trip
21N Zone 2 Trip
21N Zone 3 Trip
21N Zone 4 Trip
68 Power Swing
Z Circle Trip
51N Trip
50N Trip
46-51 Trip
46-50 Trip
SOTF Trip
Dist. Scheme Trip
Dist. Scheme Send
50 LOP
21F Zone 2 Alarm
21F Zone 3 Alarm
21F Zone 4 Alarm
21N Zone 2 Alarm
21N Zone 3 Alarm
21N Zone 4 Alarm
51 Alarm
51N Alarm
21N Zone 2 Trip
X= 0.00
Y= 25.60
t/s

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

दिनांक: **06-12-2022**

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

Summary of the events (घटनाओं का सारांश):

Event 1: At 16:26 Hrs on 13.11.2022, while de-synchronizing U#1 at Tashiding, its breaker did not open. LBB operated and 220 kV Tashiding-New Melli-1 tripped. Tashiding has single bus with sectionalizer scheme. As breaker remained still stuck, reverse power flow started as unit want into motoring mode. At 16:34 Hrs, 220 kV Tashiding-New Melli-2 was manually hand-tripped from Tashiding. No generation loss or load loss occurred.

- **Date / Time of disturbance:** 13-11-2022 at 16:26 hrs.
- **Event type:** GD - 1
- **Systems/ Subsystems affected:** 220 kV Tashiding S/s
- **Load and Generation loss**.
  - No generation loss occurred during the event.
  - No load loss occurred during the event.

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

- NIL

Major elements tripped (प्रमुख ट्रिपिंग)

- 220 kV Tashiding-New Melli D/c

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

समय	नाम	उप केंद्र 1 रिले संकेत	उप केंद्र 2 रिले संकेत	पीएमयू पर्यवेक्षण
16:26	220 kV Tashiding-New Melli-1	Tashiding: LBB operated	New Melli: Didn't trip	1 kV dip in each phase at Rangpo at 16:26 Hrs and 1 kV dip in each phase at 16:34 Hrs
16:34	220 kV Tashiding-New Melli-2	Handtripped from Tashiding	New Melli: Didn't trip	

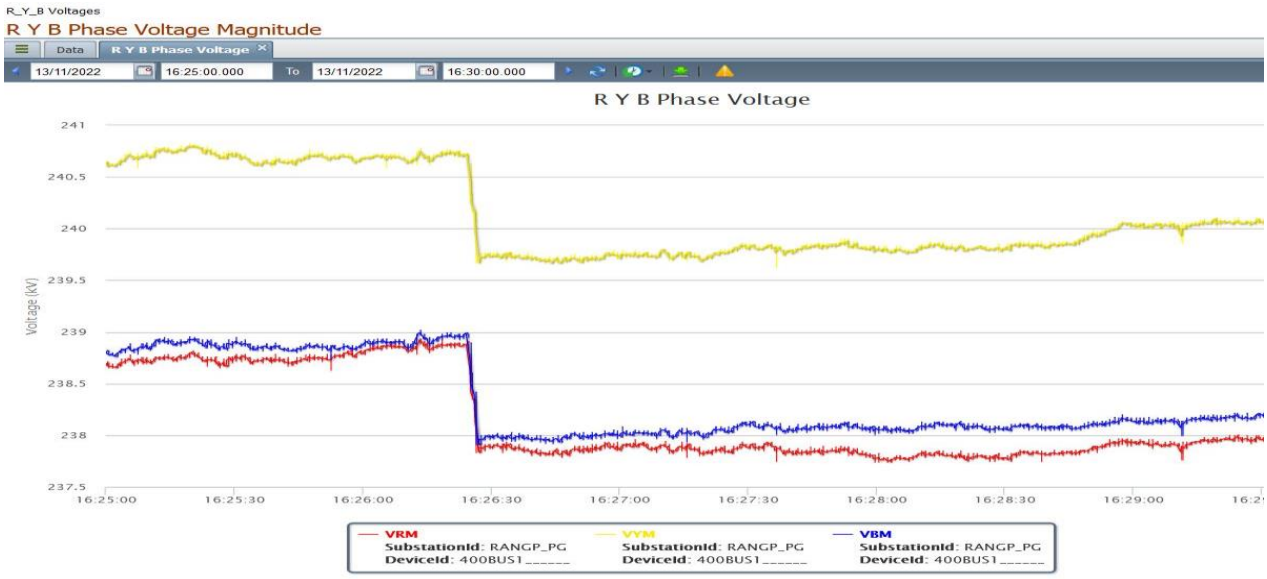


Figure 1: PMU Voltage snapshot of 400/220 kV Rangpo S/s at 16:26 Hrs

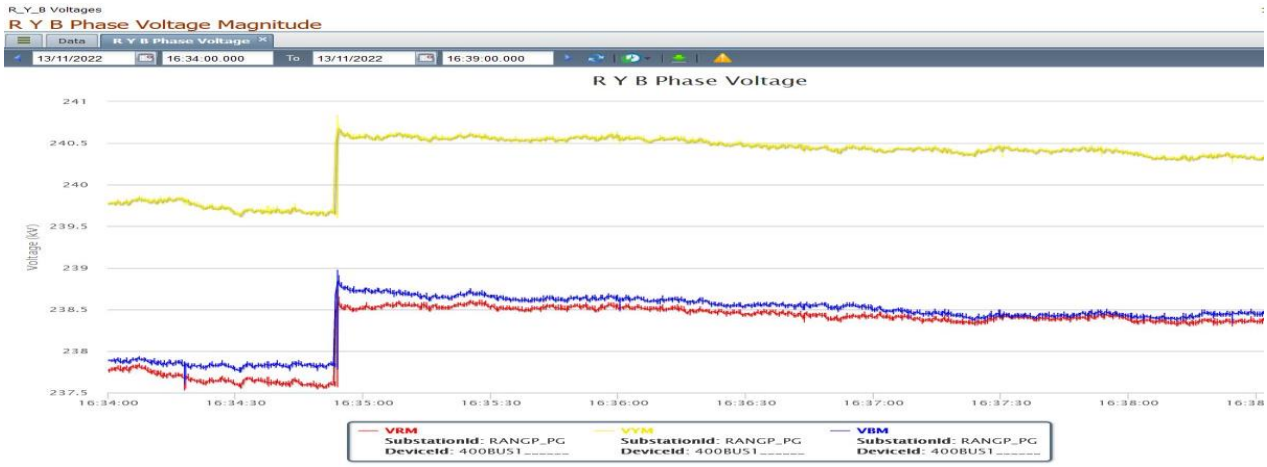


Figure 2: PMU Voltage snapshot of 400/220 kV Rangpo S/s at 16:34 Hrs

Restoration (पूर्वावस्था की प्रप्ति)

Transmission/Generation element name	Restoration time
220 kV Tashiding-New Melli-1	17:47
220 kV Tashiding-New Melli-2	17:47

Event 2: At 14:16 Hrs on 28.11.2022, while testing bus bar protection scheme at Tashiding, tripping command extended to 220 kV Tashiding-New Melli D/c and total power failure occurred at Tashiding. No generation loss or load loss occurred.

- **Date / Time of disturbance:** 28-11-2022 at 14:16 hrs.
- **Event type:** GD - 1
- **Systems/ Subsystems affected:** 220 kV Tashiding S/s
- **Load and Generation loss**.
  - No generation loss occurred during the event.
  - No load loss occurred during the event.

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

- NIL

Major elements tripped (प्रमुख ट्रिपिंग)

- 220 kV Tashiding-New Melli D/c

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

समय	नाम	उप केंद्र 1 रिले संकेत	उप केंद्र 2 रिले संकेत	पीएमयू पर्यवेक्षण
14:16	220 kV Tashiding-New Melli-1	Tashiding: Master trip operated	New Melli: Didn't trip	No fault observed from PMU data
	220 kV Tashiding-New Melli-2		New Melli: Didn't trip	

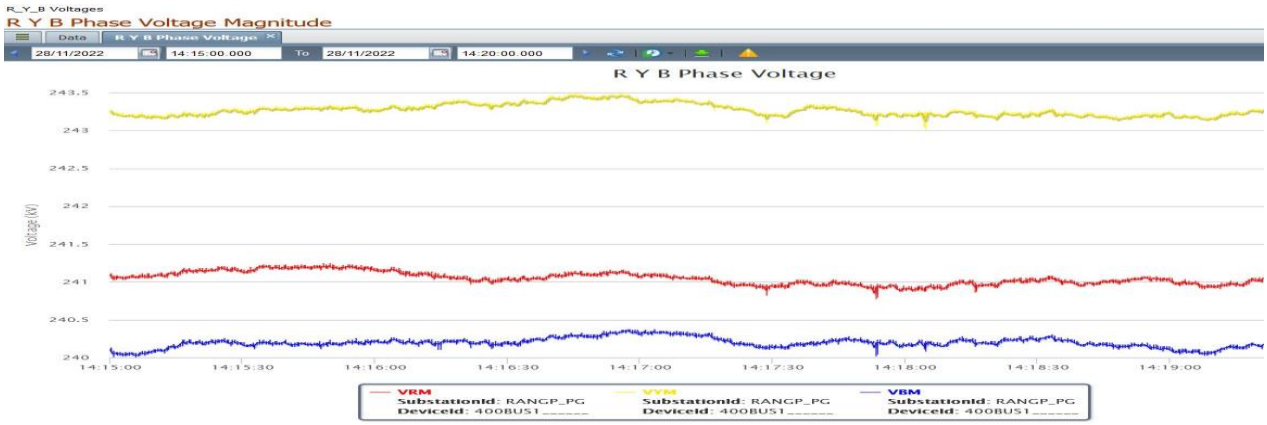


Figure 2: PMU Voltage snapshot of 400/220 kV Rangpo S/s

Restoration (पूर्वावस्था की प्राप्ति)

Transmission/Generation element name	Restoration time
220 kV Tashiding-New Melli-1	14:55
220 kV Tashiding-New Melli-2	14:45

Analysis of the events & Protection issue (घटनाओं का विश्लेषण और सुरक्षा समस्या):

Event 1:

- While de-synchronizing Tashiding U#1, its breaker did not open thereby, LBB operated, and 220 kV Tashiding-New Melli-1 tripped.
- Tashiding has single bus scheme with bus sectionalizer with one unit and one feeder on each side.
- LBB should have given tripping command to both feeders, but it was found that due to loose wiring, bus sectionalizer status was not available and it was considered equivalent to OPEN state.
- As Ckt-2 was still available and breaker of U#1 main bay was still stuck, Unit went into motoring mode and reverse power flow started.
- Generator protection sensed reverse power flow and again gave tripping command to its main bay, however, due to mechanical failure in CB, it did not open. Trip coils were also found to be in burnt condition later as continuous tripping command triggered for opening the breaker.
- At 16:34 Hrs, 220 kV Tashiding-New Melli-2 was manually hand-tripped from Tashiding to avoid any damage to U#1.
- Detailed report received from Tashiding is attached at Annexure-3.

Event 2:

- At 14:16 Hrs, while verifying wiring scheme for bus bar protection scheme, tripping simulation was tried. However, master trip circuits through bus bar protection were not isolated. ERLDC to be informed while doing any testing online or offline and proper precaution should be taken before any testing is done. **Tashiding may explain.**

In both events lines did not trip from New Melli.

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

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

Status of Reporting (रिपोर्टिंग की स्थिति):

- DR/EL yet to be received from Tashiding.

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

Sequence of Events not recorded at the time of event.

Annexure 2: DR recorded

DR not received yet.

Annexure B.2.1

SHIGA ENERGY PRIVATE LIMITED

2 X 48.5 TASHIDING HYDRO ELECTRIC PROJECT

Date: 30-11-22

Summary of the Events:

On 13th Nov-22 at 16:24 hrs; Unit-1 was in Generation at 42 MW while Unit-2 was at standstill (as per schedule) and all other components were in healthy condition. At about 16:26 hrs, normal shutdown (NSD) command was given to Unit-1from CCR (Central Control Room). But due to non-Opening of Unit-1 bay Circuit breaker; QSD (Quick Shutdown) sequence started and turbine wicket gate along with MIV got closed. Due to this, grid connected Unit-1(CB not opened) started to draw reverse power from Grid and continued to run in synchronous motoring mode. Power drawn in motoring mode was about 5.80 MW. On detection of reverse power by Generator protection relays (Micom P 343); trip commands were issued by these protection relays too, but due to non-opening of unit-1 bay Circuit Breaker, both the trip coil of Circuit breaker burnt.

Further Unit-1 bay CB failure causes BB protection relay to operate and issued trip command to Tashiding-New Melli CKT-I only; while no trip command was issued to Tashiding-New Melli CKT-II, hence TNM CKT-II did not trip and continued to feed unit-1. Therefore TNM CKT-II's CB was OPENED manually from CR-SCADA.

Date and time of the Incident: 13th November 2022 at 16:26 Hrs.

Antecedent Conditions (Just Prior to Event):

a. Frequency: 49.97 Hrs
b. Demand/Generation Met: 42.60 MW (Generation)
c. Lines/units/elements under shutdown: Unit 2 was under shutdown .
d. Major Elements Tripped: 220 KV TNM CKT-I & 220 KV TNM CKT-II(CB opening done manually)
e. Weather condition: Sunny weather & Clear Sky.

Load / Generation Loss: 0.0 MW at the time; Incidence took place during NSD of the machine (as per generation schedule). **However total generation loss till Unit-1 bay readiness was about 92.00 MWh.**

Restoration:

1. 220 KV Tashding-New Melli CKT-I & CKT-II Charged at 17:47 hrs
2. Unit-2 was ready to be synchronized with grid as per schedule.
3. Unit-1 bay became ready on 15th Nov-2022 by the evening.

Events Analysis:

1. SCADA Events:

From the SCADA events, it was found that Unit-1 NSD command was issued from CR-SCADA and NSD sequence execution started as per SFC (Sequential Flow Chart); generation from the unit was reduced gradually to a level required to OPEN GCB. But SEQ 5- STEP 3(dedicated to Unit Circuit Breaker Remote OPEN) was not "Validated"; because CB did not OPENED; although CB Open CMD was issued by the controller.

Further due to delay in sequence execution (NSD: SEQ 5- STEP 3); Sequence TLTE TRP detected and consequent to this machine went into QSD and Turbine wicket gate and MIV got closed; creating a situation of prime mover failure, while Unit was still connected to Grid due CB fail to open.

Since conditions required for synchronous motoring were fulfilled, it started to operate in motoring mode and started to draw power from the grid (about 5.80 MW). Generator protection relays detected reverse power (32R) and issued trip command to CB and initiation of CB fail to BB protection relay.

Unit-1 bay CB failure initiation causes BB protection relay to operate and issued trip command to Tashiding-New Melli CKT-I only; while no trip command was issued to Tashiding-New Melli CKT-II, hence TNM CKT-II did not trip and continued to feed unit-1. Therefore TNM CKT-II's CB was OPENED manually from CR-SCADA.

2. Non-Opening of Unit-1 Bay Circuit Breaker:

- Unit-1 bay CBs mechanism box was inspected. It was found that Closing Spring's roller bearing was damaged; causing improper spring charging and hindrance in the mechanical movement of the other parts. Consequent to this, on getting opening command from controller, CB could not open.
- Moreover during inspection, it was also found that both the Trip coil of the CB were damaged. On analysis of the tripping circuits; it was inferred that when Generator protection relays (Micom P343) detected reverse power (32R) and issued trip command

to Unit-1 Bay CB via master trip relay; due to non-opening of CB's auxiliary contact (52a), short time rated trip coils (on full voltage) were remained energized continuously and consequent to this, heavy heat generated in the coils and burnt both the trip coils.

3. Non-Issuance of Trip command by BB Protection Relay to Unit-2 bay CB & TNM CKT-II CB:

- Bus bar Protection relay's events, DR and PSL were analyzed. It was noticed in the events that B/C section ISO status to BB protection relay was always in OFF state.
- At Tashiding HEP, there is Single Bus bar arrangement with Sectionalizer (B/C Isolator). Unit-1 and TNM CKT-I is on section-1 and Unit-2 and TNM CKT-II is at section-2. Accordingly, there are two zones of Bus Bar Protection- Zone-1 & Zone-2. For tripping of all the CBs in both zones; B/C Isolator close status to BB protection relay was required.
- Since B/C Isolator's close status was not available to BB protection relay and it was equivalent to isolator open state; BB protection relay did not issued trip command to Zone-2 CBs (TNM CKT-II & Unit-2 Bay CB) and consequent to this TNM CKT-II CB did not tripped and bus bar was remained charged through TNM CKT-II. Hence Unit-1 connected to live bus (due to CB fail to Open), continued to run in synchronous motoring mode.

Remedial Action Taken:

- Unit-1's faulty Gang Operated CB operating mechanism box was replaced with new spare.
- Bus Bar Protection relay's wiring was cross checked (B/C Isolator's O/C status to BB protection relay- Micom P746) with the drawing. Loose connection found (of B/C isolators close status) to BB protection relay was tightened. Moreover operation of the BB protection relay with CB Fail I/P simulation was done and found working as per PSL of the BB protection scheme.

DEEPAK KUMAR SINGH
Contact No. 9609442862

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

घटना संख्या: **18-11-2022/1** दिनांक: **01-12-2022**

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

Summary of the event (घटना का सारांश):

At 01:23 Hrs on 18.11.2022, 220 kV Daltonganj-Chatra-1 tripped due to B_N fault. Total power failed at Chatra S/s as it is being fed radially through only one circuit. 220 kV Daltonganj-Chatra-2 is LILOed at Latehar, however, 220 kV Latehar-Chatra is not charged yet. 23 MW load loss reported at Chatra by Jharkhand SLDC.

- **Date / Time of disturbance:** 18-11-2022 at 01:23 hrs
- **Event type:** GD-1
- **Systems/ Subsystems affected:** 220/132 kV Chatra
- **Load and Generation loss**.
    - No generation loss was reported during the event.
    - Around 23 MW load loss reported during the event at Chatra by Jharkhand SLDC.

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

- 220 kV Latehar-Chatra (part section of LILO of 220 kV Daltonganj-Chatra-2 at Latehar)

Major elements tripped (प्रमुख ट्रिपिंग):

- 220 kV Daltonganj-Chatra-1

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

समय	नाम	उप केंद्र 1 रिले संकेत	उप केंद्र 2 रिले संकेत	पीएमयू पर्यवेक्षण
01:23	220 kV Daltonagnj-Chatra-1	Daltonganj: B_N, 143.5 km, 1.3 kA	Chatra: Didn't trip. 220 kV Bus-2 B_ph PT burst	2 kV dip in B_ph voltage at Biharsharif. Fault clearance time: 350 msec

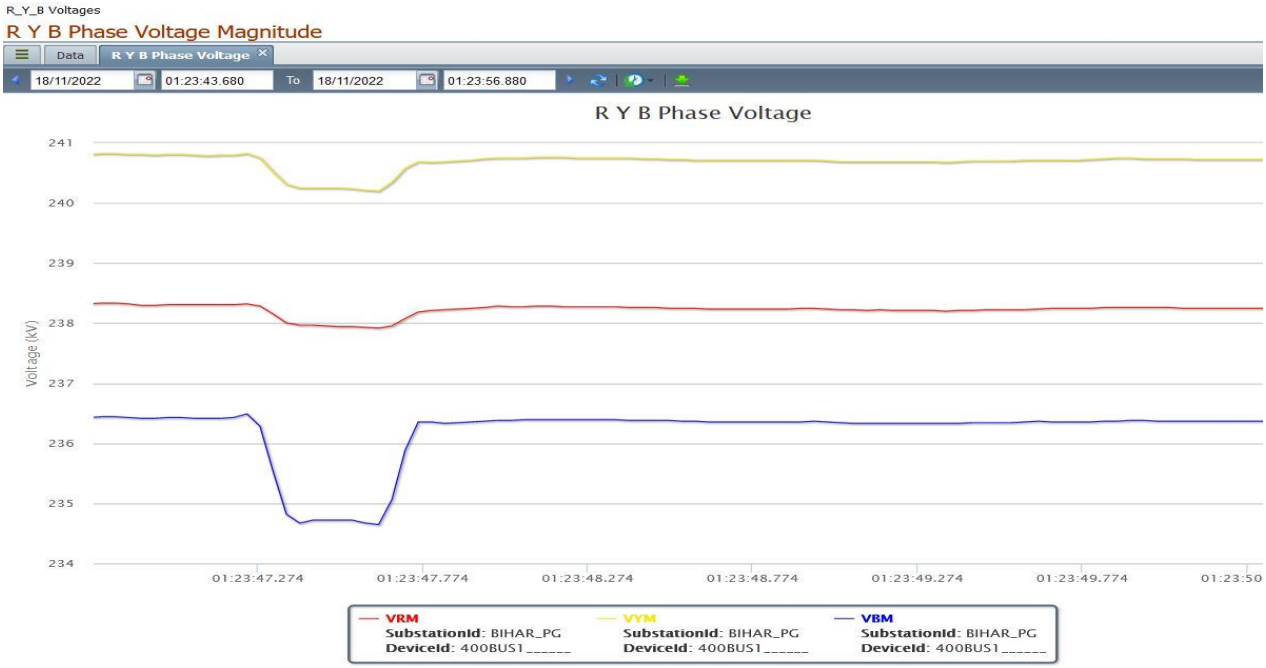


Figure 1: PMU snapshot of 400/220 kV Biharsharif S/s

Restoration (पूर्वावस्था की प्रप्ति)

Transmission/Generation element name	Restoration time
220 kV Daltonganj-Chatra-1	02:51

Network across the affected area (प्रभावित क्षेत्र का नक्शा)

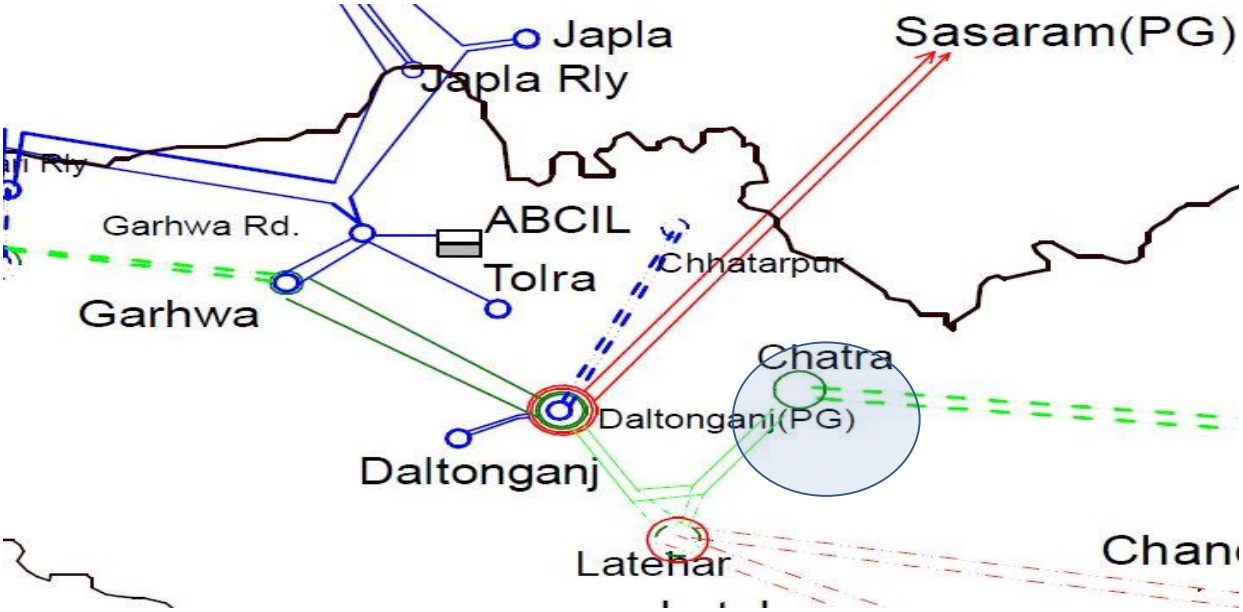


Figure 4: Network across the affected area

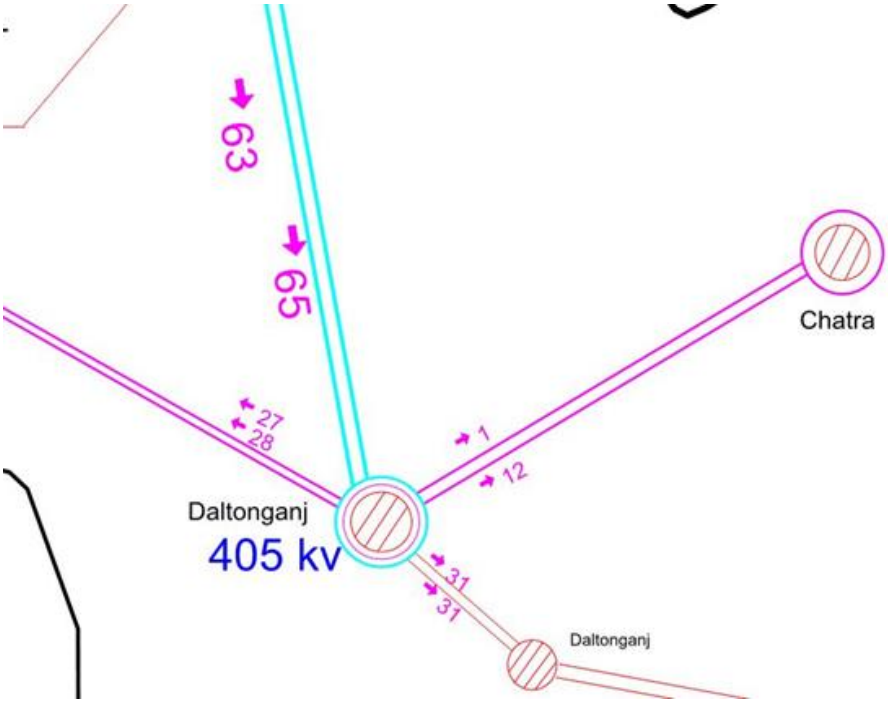


Figure 5: SCADA snapshot of the system

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

- B_ph PT of 220 kV Bus-2 at Chatra burst. This fault was seen in Zone-2 from Daltonganj and was cleared after 350 msec. Line did not trip from Chatra.

- LILO portions of 220 kV Daltonganj-Chatra-2 at Latehar has not been charged yet, hence affecting reliability of power supply at Chatra. **JUSNL to update status of the line.**

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

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

Status of Reporting (रिपोर्टिंग की स्थिति):

- DR yet to be received from PG ER-1.

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

SoE data not recorded at the time of events.

Annexure 2: DR recorded

DR/EL yet to be received.

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

Sl. No.	LINE NAME	TRIP DATE	TRIP TIME	RESTORATION DATE	RESTORATION TIME	Relay Indication LOCAL END	Relay Indication REMOTE END	Reason	Fault Clearance time in msec	Remarks	DR Configuration Discrepancy	DR/EL RECEIVED FROM LOCAL END	DR/EL RECEIVED FROM REMOTE END	UTILITY RESPONSE
1	220 KV NEW PURNEA-MADHEPURA-1	02-11-2022	09:50	02-11-2022	12:00	New Purnea: Didn't trip	Madhepura: Master trip operated	No fault	NA	BSPTCL may explain		NA	No	Spurious DT singal initiated at Madhepura PLCC due to loose connection.
2	220 KV CHAIBASA-CHAIBASA-1	03-11-2022	20:08	03-11-2022	21:03	Chaibasa (PG): Y_N, 0.8 km, 5.6 kA		No fault	NA	Y_ph CT of 220 kV Chaibasa(JUSNL)-Railway TSS-2 burst at TSS end. JUSNL may		No	No	220 kV Chaibasa (JUSNL)-RTSS-2 failed to trip in Zone-2 from JUSNL end. Zone-2 settings to be reviewed

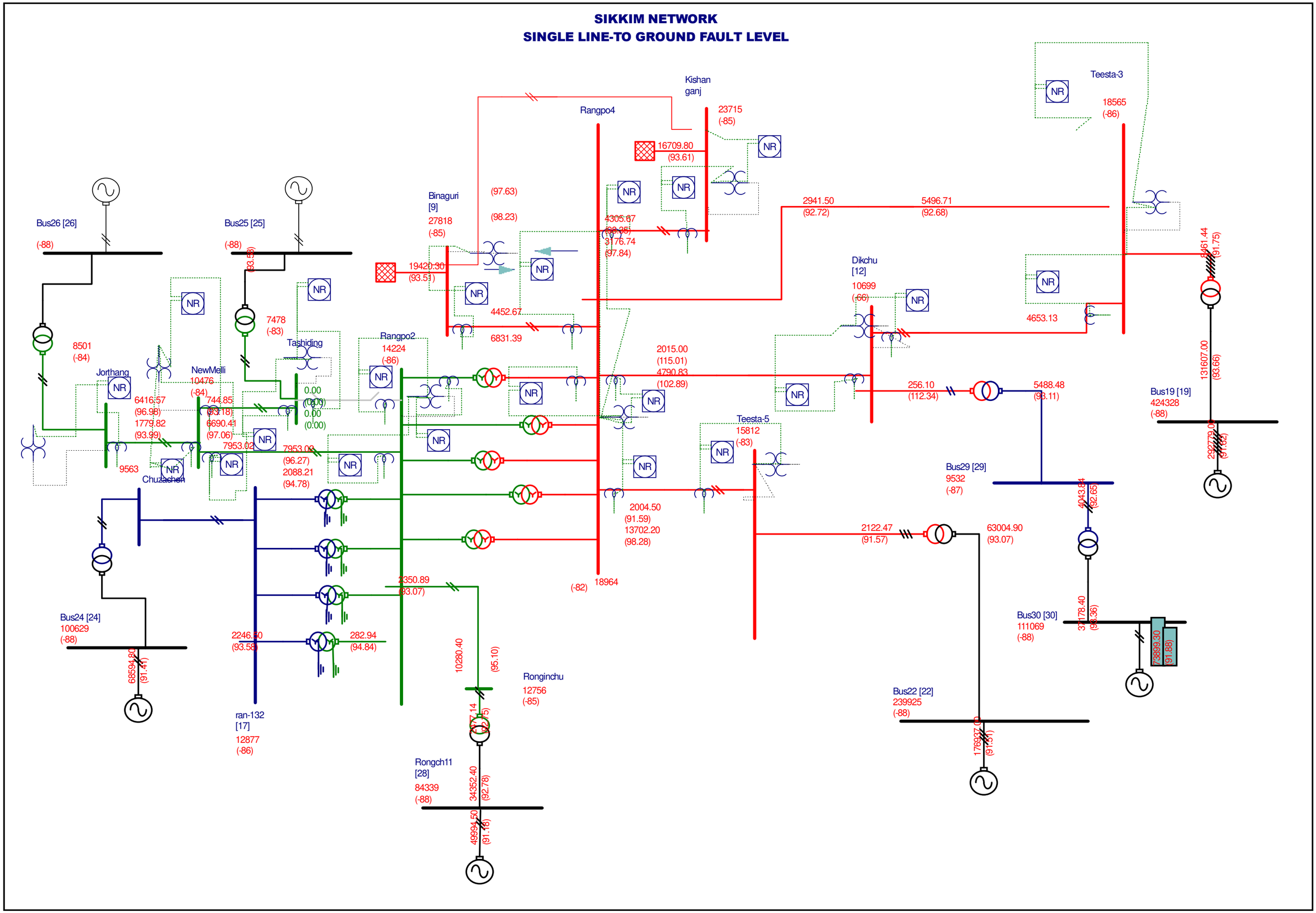
									explain. Both lines tripped in Zone-3 after 1 sec				
3	220 KV CHAIBASA-CHAIBASA-2	03-11-2022	20:08	03-11-2022	21:04	Chaibasa (PG): Y_N, 0.8 km, 3 kA		No fault	NA		No	No	
4	400 KV MERAMUNDALI-LAPANGA-1	04-11-2022	08:28	04-11-2022	10:32	Meramundali: Didn't trip	Lapanga: Y_ph & B_ph CVT fuse failed. Zone-4 appeared and tripped after 500 msec	No fault	NA	Line shouldn't trip due to CVT fuse failure. OPTCL may explain		No	Yes	Issue in D60 relay. Will be checked during shutdown
5	220 KV NEW PURNEA-MADHEPURA-2	09-11-2022	15:58	09-11-2022	21:36	New Purnea: Didn't trip	Madhepura: Master trip operated	No fault	NA	BSPTCL may explain		NA	No	Spurious DT singal initiated at Madhepura PLCC due to loose connction.
6	400 KV FARAKKA-RAJARHAT-1	15-11-2022	09:52	15-11-2022	10:18	FSTPP: DT received		No fault	NA	PG may explain		No	No	PLCC frequency matching with 400 kV Gokrna-New Chanditala line.

7	220 KV CHAIBASA-CHAIBASA-1	16-11-2022	08:58	16-11-2022	12:11	Chaibasa(PG): Didn't trip	Chaibasa (JUSNL) : Tripped due to B_ph CT gas pressure low	No fault	NA	JUSNL may explain		No	No	Unable to locate gas leakage in CT. To be referred to OEM
8	220 KV ALIPURDUAR-ALIPURDUAR(WB)-2	18-11-2022	16:17	18-11-2022	18:18	220 kV Bus-2 at Alipurduar (PG) tripped	Alipurduar (WB): DT received	No fault	NA	B_ph CB of 220 kV Salakati-BTPS-2 burst (line in NER adjacent to Alipurduar-Salakati). PG may explain the tripping event		No	Yes	Line side CT sensed current, which actuated LBB. Tripping command to other bus elements due to faulty isolator status
9	220 KV ALIPURDUAR-BIRPARA-2	18-11-2022	16:17	18-11-2022	18:28	221 kV Bus-2 at Alipurduar (PG) tripped		No fault	NA			No	No	
10	220 KV MAITHON-DHANBAD-2	26-11-2022	09:34	26-11-2022	10:39	Maithon: Didn't trip	Dhanbad: Line side isolator opened due to control circuit problem	No fault	NA	DVC may explain		NA	No	Line isolator opened bypassing interlock scheme due to issue in control circuit

11	220 KV RANCHI-CHANDIL-1	26-11-2022	19:19	26-11-2022	20:08	Ranchi: Didn' trip	Chandil: Master trip operated	No fault	NA	JUSNL may explain		NA	No	Tripped commnad extended during installation of LBB relay

SIKKIM NETWORK

SINGLE LINE-TO GROUND FAULT LEVEL



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

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

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

Sl No.	Name of the incidence	PCC Recommendation	Latest status
120th PCC Meeting			
1.	Tripping of 220 kV Bus-1 at Ramchandrapur on 04/10/2022 at 21:30 Hrs	PCC advised JUSNL that knee-point test may be carried out for the associated CTs in order to find out the CT saturation issue and the observation may be shared with ERPC/ERLDC.	*JUSNL representative informed that knee point test for associated CTs was not carried out due to non availiability of shutdown however shutdown is planned on 31st Dec 22 in order to complete the task. He further added that oil leakage in CT had been observed so it is planned to replace these faulty CT with new one.*
2.	Tripping of 220 kV Bus-2 at Rengali(PH) on 07/10/2022 at 13:42 Hrs	PCC advised OHPC/SLDC Odisha to submit the DR/EL of the event immediately and also submit a report w.r.t. the above disturbance.	*ERPC representative informed that DR/EL and report had been received from OHPC. The disurbance report is enclosed at* ***Annexure C.2.2.***
3.	Repeated Tripping of 132 kV Sonenagar-Nagaruntari	PCC advised JUSNL and BSPTCL to rectify all clearance issues present in line and replace all faulty insulators at the earliest.	*BSPTCL representative informed that all clearance issues had been rectified and all faulty insulators had been replaced.*
119th PCC Meeting			
4.	Disturbance at 220 kV Tenughat (TVNL) S/S on 09.09.2022 at 12:55 Hrs	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. 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. PCC advised TVNL to review overcurrent settings of unit #2 considering the present transmission	Regarding updating firmware in relay, JUSNL representative informed that site visit of relay engineer has been scheduled in last week of Nov-22. TVNL representative informed that they are in communication with PRDC in order to review overcurrent settings of unit

		network & fault level data at Tenughat. The coordination study may be done considering when one unit in operation & there is a line fault in one of the outgoing feeders (worst case scenario). The revised setting may be implemented at Unit end & the same may be intimated to PCC.	#2. He further added that as per M/s BHEL has also been communicated with regard to the review of the settings in Unit #2. *Regarding updating firmware in relay, JUSNL representative informed that it will take 2-3 months more as work is planned to be executed with upgrdation of SCADA.*
5.	Repeated Disturbances at 220 kV Ratu(JUSNL) S/s	PCC opined that all utilities may share the best practices adopted in their system to avoid such type of maloperation of Transformers/Reactors so that a common best practice may be compiled and shared for benefit of all.	MPL has shared the practices adopted by them in order to avoid spurious tripping of the transformers. The report is enclosed at **Annexure C.2.5.** *Members noted.*
118th PCC Meeting			
6.	Disturbance at 400 kV Dikchu S/s on 10.08.2022 at 11:57 Hrs	PCC advised Dikchu HEP to expedite the visit of relay engineer and resolve the issue by Sep-22. PCC also raised serious concern about long outage of the main bus-2 of Dikchu HEP and advised DIkchu HEP to continuously take up with the vendor for supply of the breaker at the earliest. Further, Dikchu HEP was advised to submit a firm time-line for restoration of the main bus-2 which would be monitored in PCC meeting.	In 120th PCC meeting, Dikchu HEP representative informed that breaker will reach the site by end of Nov 2022. Regarding autorecloser issue, he informed that testing of wiring in relay is in progress and final report will be shared with ERPC/ERLDC.

Analysis on System Disturbance at RHEP on Dt-07/10/2022

Pre fault conditions:

220KV Bus A: Unit-1, Unit-4, TTPS feeder, RS/Y-I feeder
220KV Bus-B: Unit-2, Unit-5, SST feeder, Kaniha feeder, RS/Y-2 feeder
Buscoupler in closed condition.

At 13.42Hr:

Y phase jumper between Line isolator & transmission line of 220KV kaniha feeder was snapped for which Busbar protection Zone-B operated at Bus-coupler panel. Then all the units and feeders connected in Bus –B were autotripped on Bus-bar protection operated at respective panels and all the breakers were completely in opened condition. However, as per the Busbar protection scheme of RHEP, the busbar protection relay triggered LBB relays of respective feeders and units as secondary protection.

For Bus-bar differential protection, High impedance Differential Relay (187A-Zone-A; 287B-Zone-B; 387-Zone-C), Make-Universal Electric, Type-ARE 2D, Tap setting- 25 to 175V (set at-75V) is used.

For Over-current & E/F protection (51A/51C/51N), Make-Universal Electric, Type- IOC, Model-R118, Rating-1A is used. Applied setting- 0.75A for 51A/51C with TMS-0.1 & 0.15A for 51N with TMS-0.3.

For Back-up Over-current & E/F protection (51BIA/51CBI/51BIN), Make-Universal Electric, Type- IOC, Model-SPL 500, Rating-1A is used. Applied setting- 2A for 51BIA/51BIC with TMS-0.1 & 0.4A for 51BIN with TMS-0.3.

So far as the LBB settings of the all the 220KV feeders are concerned, it is set at 0.5A, 0.5secs. Numerical relays Micom P444 are used in all the 220KVfeeders.

MPL
MAITHON POWER LIMITED

TATA
TATA POWER

PREVENTION OF SPURIOUS TRIPS IN TRANSFORMER

SOMNATH CHATTERJEE

Lighting up Lives!

(1)THE BOX

TRIGGER

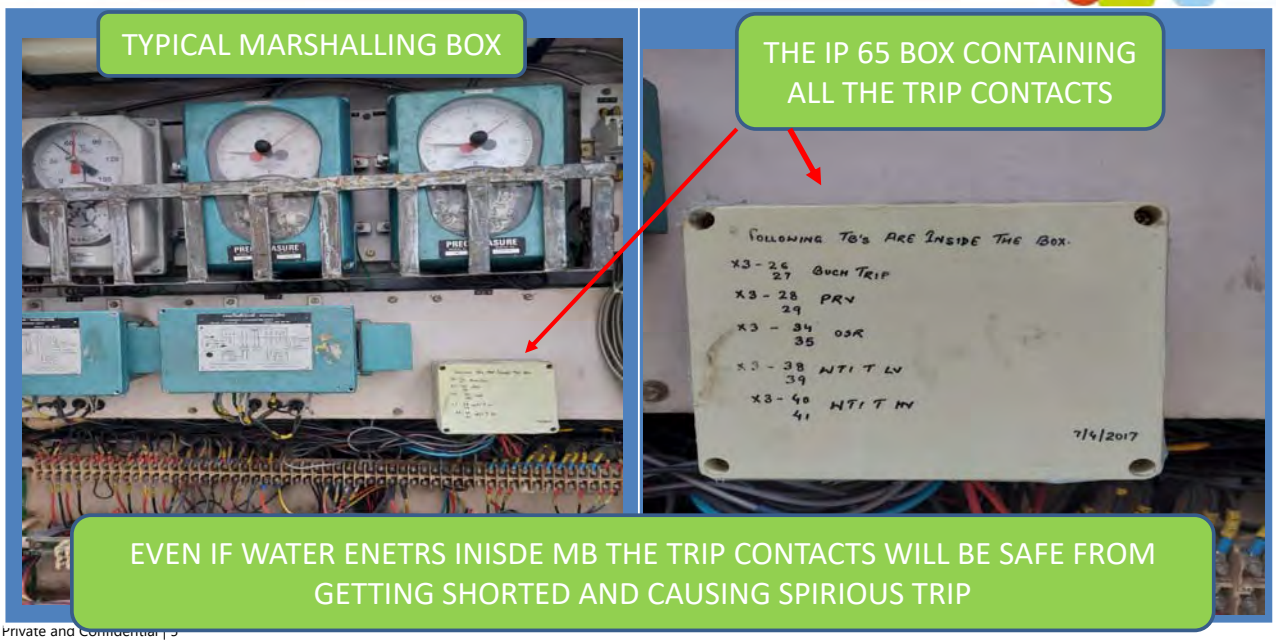
- Almost every substation has faced spurious trips of transformer due to moisture ingress in Marshalling Box.
- Most of the transformers have a single Marshalling box where OTI and WTI are present along with the alarm and trip terminal blocks of transformer mechanical devices.
- It's a general practice prior to monsoon to cover marshaling boxes with plastic.
- However, the marshalling boxes are needed to be opened periodically for noting Oil and Winding temperatures when OTI and WTI readings are not available in remote and are not clearly visible form outside the MB.
- Also due to negligence or gasket problem, the door's in MB doesn't close properly
- So always there remain a chance of moisture entering the marshalling box leading to spurious trip of transformer.

SOLUTION

THINK OUT OF THE BOX

BOX INSIDE BOX

SOLUTION: BOX INSIDE BOX



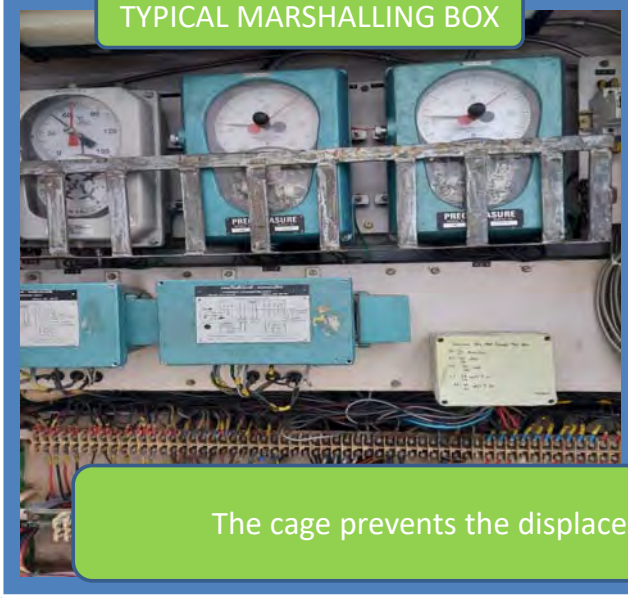
(2)THE CAGE

TRIGGER

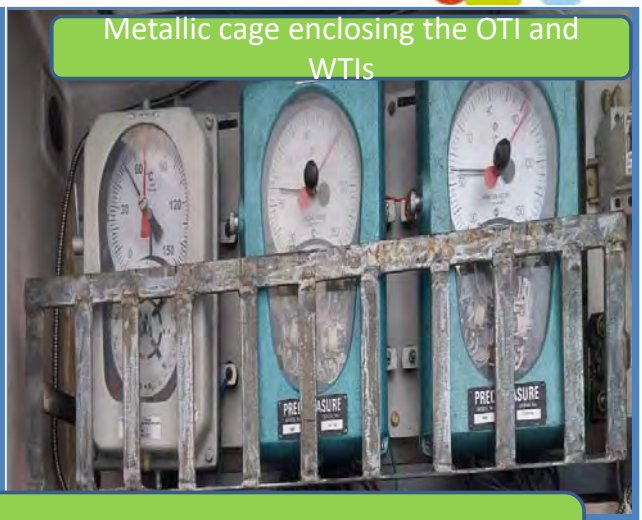
- In one of the generating station of TATA POWER there had been a bizarre instance of unit trip due to falling of WTI. The vibrating pads of the WTI gave away due to ageing and the WTI got dislocated leading to movement of mercury and making of trip contact.
- Apart from timely replacement of the vibrating pads one of the CAPA point of the trip was fixing of a cage around OTI/WTI. So there is no movement of the WTI/OTI even when vibrating pads are not supporting them.

SOLUTION: CAGE

TYPICAL MARSHALLING BOX



Metallic cage enclosing the OTI and WTIs



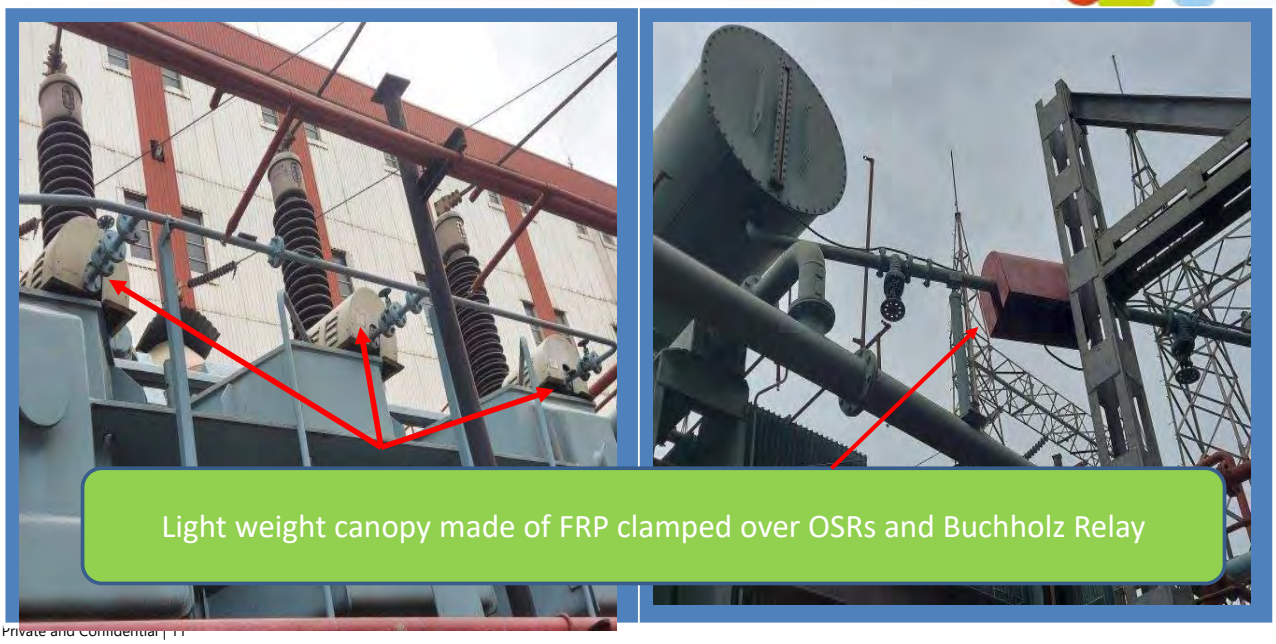
The cage prevents the displacement of mercury based OTI/WTIs

(3)THE CANOPY

TRIGGER

- The most vulnerable portion of moisture ingress are the terminal boxes of transformer mechanical devices. Exposed to the atmosphere, there always remains a chance of moisture/water ingress during rain or accidental operation of deluge system.

SOULTION: CANOPY



Light weight canopy made of FRP clamped over OSRs and Buchholz Relay

(4)THE RTXV

TRIGGER

MAITHON POWER

- In recent past one of our UAT auxiliary transformer tripped on Buchholz trip protection leading to unit outage.
- No gas found in Buchholz, no other transformer protection relay operated.
- No moisture ingress in MB, also the trip contacts are safely located in trip box.
- DR showed no abnormality in current waveform at the time of Bz trigger.
- The DR showed that the Bz trip signal came for mere 25msec

The above observation lead us to conclude that it was a spurious trip.

The probable reason for the same are:

- Internal mechanism of Bz device itself has become faulty. Corrective Action: Bz relay replaced with spare one.
- The cable carrying the core of Bz trip has got punctured and momentarily the contact have got short. Corrective Action: Old cables from Relay panel to MB and from Devices to MB replaced with new cables.
- Due to induced voltage the auxiliary low impedance RSF relay had picked up momentarily: Corrective Action: Introduction of RTXV.

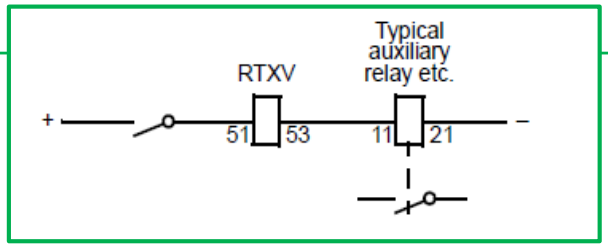
SOLUTION: THE RTXV

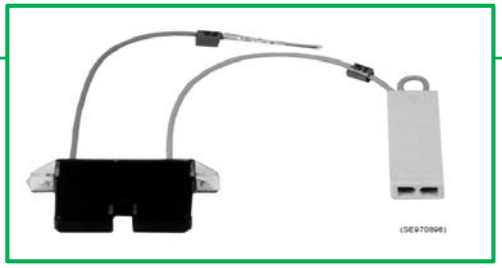
MAITHON POWER

In place of replacing all low impedance auxiliary relay with high impedance relay a new device has been explored with ABB team which can avoid false pickup of auxiliary relay due to induced voltage, RTXV.

RTXV:

To avoid the risk of false pickup of auxiliary relays a control unit (RTXV) is to be used in series with the relay coil. The control unit connects the applied voltage to the relay only if the voltage is large than 60-80% of the rated voltage of the unit. The voltage drop in the control unit is about 2 V.





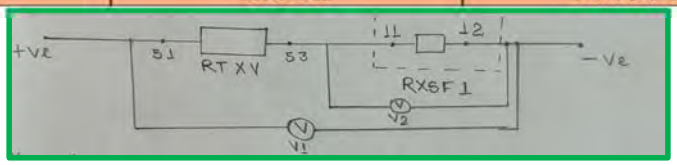
EXPERIMENT

MAITHON POWER

MPL

RTXV in Series with RXSF1 relay

V1 (Measured) (V DC) Total Voltage applied	V2 (Measured) (V DC) Voltage across Coil	Calculated V3 (V DC) Voltage across RTXV	Status of RXSF1
5.6	0.115	5.485	Not Picked-up
20.98	0.429	20.551	
80.6	1.645	78.955	
143.6	2.934	140.666	
168.1	5.843	162.257	
173.4	10.76	162.64	
176.6	13.86	162.74	
177.4	175.6	1.8	Pick-up
168.8	167.6	1.2	Picked up State
157.8	156.2	1.6	
107	105.6	1.4	
92	90.7	1.3	
79.5	1.632	77.868	Drop-up



CONCLUSION

MAITHON POWER

MPL

By putting RTXV in series with RXSF1 relay coil, the pick up voltage increase to 80% of rated voltage (220V DC) thus preventing and spurious pick up due to stray voltages.

	Without RTXV	With RTXV in Series	Remark
Pick up Voltage	116 V	**177 V**	Pick up increase by 28% to 80% of rated voltage of 220V DC

Actual connection photograph

Thank You!

Website: www.tatapower.com

Email Id: schatterjee@tatapower.com

Annexure C.3

BIHAR STATE POWER TRANSMISSION COMPANY LTD., PATNA

(A subsidiary company of Bihar State Power (Holding) Company Ltd., Patna)
CIN – U74110BR2012SGC018889
Head Office, Vidyut Bhawan, Bailey Road, Patna – 800021
E-mail address – cetransom1.bsptcl@gmail.com, Website– www.bsptcl.in

Letter No...../ Patna **Dated ...../**
CE./Trans.(O&M)/Misc- 38 /2022

From,

S.N. Kumar,
Chief Engineer (O&M)

To,

CEO, DMTCL,
M/s Sekura Energy Limited
504 & 505, 5th Floor,Windsor,
Off CST Road, Kalina, Santacruz (East),
Mumbai - 400 098

Sub: Regarding implementation of line differential protection in short lines

Ref: 45th TCC Meeting, dated 25.03.2022 at Rajgir, Bihar

Sir,

With reference to above, please find enclosed herewith the Minutes of 45th TCC Meeting held on 25th March 2022 at Rajgir. In this meeting, it was directed to implement line differential protection in 220KV and above voltage level of short lines having length less than 10km.

Therefore, in compliance to 45th TCC meeting of ERPC, line differential protection is to be implemented in 220KV Darbhanga –Darbhanga (DMTCL) ckt-I&II T/L as the line bays at DMTCL end are being maintained by DMTCL.

Therefore, it is requested to please implement line differential protection in aforesaid line so that action plan may be communicated to ERPC in next meeting.

Encl: As above

Yours' faithfully,

sd/-
(S.N. Kumar)
Chief Engineer, Trans. (O&M)

Memo No ...../ **Dated...../**

Copy forwarded to Sri Nishant Kumar, M/s Darbhanga Motihari Transmission Co. Ltd., 400/220KV GIS Substation, near Kunwar Eit udyog, Dekuli, Chandan Patti,Darbhanga-846002 for kind information and necessary action.

sd/-
(S.N. Kumar)
Chief Engineer, Trans. (O&M)

Memo No ...../ **Dated...../**

Copy forwarded to Chief Engineer (System Operation)/CE (CRITL), BSPTCL, Patna for kind information.

sd/-
(S.N. Kumar)
Chief Engineer, Trans. (O&M)

P.T.O.

Memo No .....456...../ Dated.....21/07/2022...../

Copy forwarded to Director (Operation), BSPTCL, Patna for kind information.

(S.N. Kumar)
Chief Engineer, Trans. (O&M)

Protection audit recommendations for substations audited by protection team of ERPC

Annexure C.5

Sl No.	Name of Substation	Owner	Date of Audit	Remarks/Recommendation	Compliance Status
1	765/400 kV Sundergarh S/s	Powergrid	25.04.2022	1.Switchyard equipments are in good and healthy condition. Switchyard area as well as overall station is well maintained.	
				2.Provision for nameplate with bay/line name may be done in front of SPR(Kiosk) in switchyard for easy identification.	
				1.Event logger is not available for 220 kV System. The same shall be provided.	220 KV EVENT LOGGING INTEGRATED WITH 400 KV SAS EVENT LOGGER .
				2.Time synchronising equipment is not available for 220 kV system.	TIME SYNCH TO BE DONE WITH EXISITNG 400 KV TIME SYNCH AS NO 220 KV TIME SYNCH IS AVAILABLE.
				3.Busbar/LBB protection is not available for 220 kV system . The same shall be commissioned at the earliest.	UNDER PROCESS.
				4.Autorecloser is implemented without PLCC for all the 220 kV feeders. It was informed that OPGW for these lines are under commissioning.	done

2	400/220/132 kV Lapanga(OPTCL) S/s	OPTCL	26.04.2022	5.OPGW/DTPC commissioning may be expedited and thereafter carrier based autorecloser as well as intertripping scheme may be implemented for 220 kV lines.	UNDER PROCESS.
				6.For 220 kV control room housing the relay panels, air conditioning shall be provided for proper functioning of protection system panels & to prevent failure of numerical protection systems.	TO BE DONE.
				7.Zone settings(zone-2, zone-3 & zone-4) in distance protection relay may be reviewed for all the 400 & 220 kV lines in line with the ERPC Protection philosophy.	ALL SETTINGS ARE UPDATED AS PER ERPC GUIDELINE.
				8.Group protection for 400 kV Lapanga-Meramundali line may be enabled and two group settings may be kept in the relay. One group considering 400 kV M'mundali-Bolangir in service and another group setting when 400 kV M'mundali-Bolangir is not in service. Group to be selected as per the actual configuration.	SETTING FILES PREPARED .WILL BE DONE ACCORDINGLY.

				9.Autorecloser in 400 kV Lapanga-Meramundali line is having some issue. The same may be rectified.	Intimated to OEM for corrections in BCU logic .
				10.Power swing blocking enabled for all zones. It may reviewed and blocking may be done all the zones except zone-1.	To be done.
				11.Grading in terms of time/voltage setting shall be done in Overvoltage settings of 400 kV lines.	Grading done and Implemented in relays.
				1. Time synchronising equipment in substation control room is not working. The same may be rectified & put into service.	It is presently working but synchronization with some of the Relays to be done.
				2.Main-I relay of 220 kV Budhipadar-Lapanga-I feeder and main-2 relay of 220 kV Budhipadar-SMC feeder was found to be defective and not in operation. Defective relay shall be changed with spare/new relay immediately.	New relay(Siemens, 7SA522) commissioned for Main-1 of Lapanga-1. Main-2 D.P Relay of SMC feeder to be replaced.

3.Main-1 relay of following fedders are of static type. 220 kV Budhipadar-IB TPS line, 220 kV Budhipadar-Tarkera D/c line, 220 kV Budhipadar-Raigarh PG. All Electro Static Relays may be replaced with latest version of Numerical relays for quick and accurate analysis of Trippings.	Budhipadar-Tarker-1 and 2 , Budhipadar-IBTPS-1 and 2 replaced by numerical relay.
4.DC earth leakage were found in both DC-I & II sources. The same may be attended. Continous monitoring of dc earth leakage measurements to be done.	Very old single strand cables are to be replaced. Checking is under progress.However, the D.C Fault will be rectified during Automation of the S/S which is under progress.
5.PLCC is not in service for most of the lines. Autorecloser w/o PLCC is implemented for some of the feeders like 220 kV Tarkara D/C, 220 kV Lapanga D/C feeder. For rest of the feeders auto recloser was not in service.	In addition to Tarkera & Lapanga, A/R scheme without PLCC implemented for 220KV Korba-1, Raigarh P.G & Lephripada feeder. OPGW available for IBTPS-3 & IBTPS-4.

				It was informed that OPGW for these lines are under commissioning. OPGW/DTPC commissioning may be expedited and thereafter carrier based autorecloser as well as intertripping scheme shall be implemented for 220 kV lines.	
3	220/132 kV Budhipadar(OPTCL) S/s	OPTCL	26.04.2022	6.For 220 kV Budhipadar-Korba-1 &2, the PLCC is not working and found to be out of service since long. Being inter-regional line, matter may be taken up with appropriate authority for restoring the PLCC communication in the line. Alternatively, It is suggested that carrier communication through OPGW network may be planned & implemented.	To be discussed with Korba.
				7.Zone settings for all 220 kV lines need to be reviewed in line ith ERPC Protection Philosophy & considering the present network configuration at the remote end substations.	Zone settings are updated as per ERPC Guideline

8.Busbar protection is available for a single bus only. For other bus, it is out of service due to defective bay units. It is advised to restore the busbar protection for the second bus at the earliest. Similarily zone-4 settings of feeders corresponding to the bus for which busbar is out of service may be reduced to 250 msec.	All defective BU s of 220 KV Bus bar Proction are rectified and presently Bus bar Proction is in Healthy and Active condition . Zone-4 setting revised to 500ms.
9. Oil leakages was observed in 220/132 kV Auto-I. Action may be taken to address the same.	Oil leakage through Breather arrested .
10.Vegetation shall be cleared & proper PCC and gravelling should be done in the switchyard.	Vegetation is being cleard from corridor during S/D of the feeder. Regarding PCC and gravelling matter to be discussed with higher Authority.
General:	
1. Uniform protection philosophy shall be adopted across OPTCL network in line with ERPC Protection philosophy.	

				2. Protection co-ordination to be done as and when there is change in network configuration or commissioning of new lines.	
				3. Voltage/time gradation to be done in overvoltage setting for S/s level.	
				4. Review of implemented protection settings need to be carried out periodically for OPTCL system..	
				1. Event logger is not available for 220 kV system. The same shall be provided.	
				2. Zone-2 tmer setting may be reviewed considering the shortest line at remote end(budhipadar) for all 220 kV lines	
				3. Zone-4 reach and time delay may be reviewed for all 220 kV lines	
				4. Zone-3 time delay may be reviewed as it is encroaching next voltage level (220 kV Lines)	

4	220 kV IB TPS	OPGC	27.04.2022	5. PLCC not operational for all four 220 kV feeders. It was informed that OPGW/DTPC based communication system will be commissioned in near future.	
				6. OPGW/DTPC commissioning may be expedited and thereafter carrier based autorecloser as well as intertripping scheme may be implemented for 220 kV lines.	
				7. Busbar relay is of static type. It was informed that renovation & upgradation of 220 kV switchyard is under proposal stage.	
				8. Overvoltage setting enabled for all the lines with same voltage & time setting. Grading in terms of time/voltage setting shall be done in Overvoltage settings of 220 kV lines	

5	400 kV OPGC S/s	OPGC	27.04.2022	1. At 400 kV level, it was found the both main-1 & main-2 relays of outgoing transmission lines are of same make & model employing different characteristic. It is recommended that different make & model for main-1 &2 relay is preferable and same may be implemented.	
				2. Overvoltage setting for the lines need to be reviewed. Time grading / voltage grading may be done in the overvoltage settings for different lines/for overall substation	
				3. DR time window may be increased. DR configuration may be done in line with guidelines approved in ERPC PCC meeting.	
				4. Overcurrent protection in 400 kV lines may be disabled.	
				5. Provision for sending DT signal to other end during operation of DEF protection may be implemented.	

				6. Line length for 400 kV OPGC-Lapanga line may be verfied in consultation with OPTCL.	
				7. Zone-2 & Zone-3 settings of all 400 kV lines need to be reviewed and set as per the ERPC Protection philosophy.	
				8. Adjacent shortest and longest line length maybe verified and zone settings maybe implemented accordingly	
				9. Power swing block enabled for all zones. May be reviewed	
6	765 kV Darlipali(NTPC) S/s	NTPC	28.04.2022	1. Time grading to be done in stage-I overvoltage settings for 765 kV Darlipalli-Jharsuguda D/c line.	completed.
				2. Power Swing blocking enabled for all zones. May be reviewed.	
				3. Relay setting data is not available in Protection database of ERPC. The same may be updated at the earliest.	completed.

Sl No.	Name of Substation	Owner	Date of Audit	Remarks/Recommendation	Status
1	400/220 kV Jamshedpur S/s	Powergrid	20.07.2022	1.Time synchronization for some of the relays are not as per the GPS clock. The same may be rectified.	
				2.Zone-2 timer setting for all 400 kV lines is set to 500 msec. The same may be reviewed in line with ERPC Protection guidelines.	
				3. TMS value of backup overcurrent IDMT relay is different for three ICTs whereas the pickup value is same for all the ICTs. Similarly TMS of backup earthfault relay for ICT-1 & ICT-2 is different than ICT-3. It is recommended to set TMS value for overcurrent relay as well as backup E/F relays uniform among all three ICTs.	
				1.Switchyard equipments are in good and healthy condition. Switchyard area as well as overall station is well maintained.	

2	400/220 kV Chaibasa S/s	Powergrid	21.07.2022	2.Though Overvoltage stage 1 settings are graded in time or voltage magnitude between the two ckts of Rourkella or Chaibasa or jamshedpur ,they are not so clearly graded as whole(Rourkella 1 and Jamshedpur 1 having identical settings).This part may be reviewed and the shorter line may be made to have higher magnitude or time value relative to the longer lines. No two 400 KV line should have exactly same settings in voltage triggering value or time delay.	
				General:	
				1. Uniform protection philosophy shall be adopted across JUSNL network in line with ERPC Protection philosophy.	
				2. Protection co-ordination to be done as and when there is change in network configuration or commissioning of new lines.	
				3. Review of implemented protection settings need to be carried out periodically for JUSNL system..	
				4.Measures shall be taken to ensure healthiness of busbar/LBB protection relay & PLCC system in the substation.	
				1. Time synchronising equipment in substation is not available.	

				2.For 220 kV Ranchi Feeder, only main-I protection relay is present along with separate back-up overcurrent relay. Main-2 protection relay shall be installed for this line.	
				3. Peak load served by the station is 240 MVA,however three out of four 100 MVA 220/132 KV ATR are functional. 4th ATR is out since 30.4.2020 and replacement status is not available.N-1 relibility criteria is being not satisfied during peak condition. Steps may be taken at the earliest to bring 4th ATR into service.	
				4.Oil leakage found in ATR-1. However due to high demand, the shutdown is not being allowed and the issue can not be attended. The same may be looked into urgently.	
				5.220 kV is having sing main & transfer bus scheme. As intimated by S/s incharge, proposal for bus sectionalizer in 220 kV bus is under consideration.	
				6.Busbar/LBB protection is not available.	
				7.Zone 4 delay time for all 220 kV lines is 300 ms.it may be made 250 ms as Bus bar protection is not commissioned.	done
				8.Disturbance recorders shall be configured as per the DR standard guidelines of ERPC.	

3	220/132 kV Chandil(JUSNL) S/s	JUSNL	20.07.2022	9. For Santaldih ckt, zone 2 reach has been setting has been done as 18.97 Ω which seems to be on the higher as it is appearing to be 120% of line length + 50% of Shortest adjacent line. As per ERPC guideline, the same for 220 KV line should be either 120% of line length or (100% of length+ 50% of shortest adjacent line).	Revised
				10.For Ramchandrapur line, zone 3 value is 23.87 Ω. However, this value is encroaching the 2x150 MVA 220/132 KV ATR impedance in Ramchandrapur as seen from chandil,so the time delay of zone 3 may be suitably reviewed and coordinated with fault clearing time of the said ATR.	For Ramchandrapur line, Zone-3 time is coordinated with fault clearing time of ATR at Ramchndrapur. 23 time delay kept on 1 sec.
				11.Only one DC battery source is found in service while other is in spare and not in service simultaneously. For 220 KV, Two separate Dc sources are recommended feeding to main 1 and main 2 relays with separate trip coils as per CEA construction standards.	
				12.Power swing block is enabled for all the zones in 220 kV lines. It is recommended to block zone 2 and above with unblocking time of 2 seconds	done
				13.REF protection for ATRs is not available in all but one. For one ATR, though REF protection is avaialble, REF has been kept disabled after it maloperated during through faults. It is advised to implement REF protection for all the transformers.	

				14.DC earth leakage was found. Battery connectors were found to have oxidized etching marks. Action may be taken to rectify the above issue.	
				15.PLCC channels are not healthy for Ranchi line.For Sanataldih circuit, the autorecloser dead time setting may be checked and set to 1 sec.	At present PLCC channels are healthy for Ranchi line. AR setting is reviewed for 220 kV lines and set dead time- 10 sec and reclaim time- 25 s.
				16.Bus CVT is being used for distance protection relay of 220 kV feeders. Provision for line CVT in 220 kV Feeders may be envisaged and implemented.	
				17.PCC & Gravelling may be done for complete area of 220 kV Switchyard.	
				18.LA counter is missing in ATR-2. The same may be provided.	
				19.Zone settings for all 220 kV lines need to be reviewed in line ith ERPC Protection Philosophy & considering the present network configuration at the remote end substations.	done
				1. Bus 2 PT is not in service. Only bus 1 PT is present and it is being used in distance relay for covering short line section between the 220 KV side 400/220 KV Jamshedpur ICT terminals to 220 KV Ramchandrapur bus .Bus-2 PT may be replaced at the earliest.	

				2.Requirement of distance protection on RCP end for the line section of 220 kV RCP-Jamshedpur(PG) may be reviewed. In case distance protection remain in operation, provision for line CVT may be envisaged where distance protection is in service.	
				3.Only one DC battery source is found in service while other is in spare and not in service simultaneously. For 220 KV level, Two separate Dc sources are recommended feeding to main 1 and main 2 relays with separate trip coils as per CEA construction standards. Necessary action may be taken to operate two sources in parallel.	
				4.DR is not GPS time synchronised. The same may be rectified.	
				5. DR time window may be increased. DR configuration may be done in line with guidelines approved in ERPC PCC meeting.	DR time window has been increased for all elements. (DR length-3.0 sec and pre-fault time-0.50 sec).
				6.Busbar relay panel is placed in old control room without Air Conditioning.Action may be taken to place the busbar panel in a AC room.	
				7.Zone settings for chandil line shall be reviewed in line with ERPC protection philosophy.	done.

4	220 kV Ramchandrapur	JUSNL	21.07.2022	8. Zone-2 & zone-3 reach setting may be reviewed for Chaibasa fedder	done.
				9.Zone-3 setting may be reviewed for 220 kV RCP-Joda feeder.	done.
				10. LBB relays are not for individual bay as a result LBB protection is not functional although busbar protection is in service. As per CEA grid connectivity regulation, LBB is mandatory for 220 kV S/s. Action may be taken to implement the same.	
				11.Power swing block is enabled for all the zones in 220 kV lines. It is recommended to block zone 2 and above with unblocking time of 2 seconds	Power swing is blocked for Z2 and Higher Zone.
				12.Autoreclose scheme is implemented without PLCC . Dead time is seen to be 1.2 sec ,while recommendation is 1 sec. Reclaim time is 3 seconds while recommendation is 25 seconds.Above settings may be reviewed.	AR setting is reviewed for 220 kV lines and set dead time-1.0 sec and reclaim time- 25s.
				13.PLCC is healthy only for 220 kV Chaibasa lines. For rest 220 kV feeders, steps may be taken to address the PLCC issue and put into service at the earliest.	

				14.N-1 relaibility criteria is not being satisfied for 200/132 kV ATRs in both peak & off-peak period.Out of 3 ATRs available, one is out of service due to bushing failure since long wheras another transformer is being operated in very critical condition having heavy oil leakge. As per the reports submitted in S/s, the parametes w.r.t. transformer oil and bushing is not as per the standard. It is recommended that complete overhauling/replacement of ATR-2 may be done at the earliest. SImilarly action may be taken for bushing replacement for ATR-1 which is out of service since long.	
				15.PCC & Gravelling may be done for transformer bays in 220 kV Switchyard.	
				16.REF protection is not in service for both the 220/132kV transformers. The same may be implemented.	
				1. Disturbance recorders are not time synchronised.	
				2. DR time window may be increased. DR configuration may be done in line with guidelines approved in ERPC PCC meeting.	DR time window has been increased for all elements. (DR length - 3.0 sec and pre-fault time-0.50 sec).
				3. Zone-2 reach setting & zone-3 timer setting for Ramchandrapur feeder shall be reviewed in line with ERPC protection philosophy.	done

				4. Overvoltage protection was seen to be enabled with stage 1 at 110%,5 sec delay. The same may be disabled or set to a higher value(greater than 112 %).	
				5.For Ramchandrapur feeders, autorecloser is not in service for both the circuits due to issue in BCU panel. The issue may be looked into at the earliest.	
				6. Zone-3 & Zone-4 reach setting to be reviewed for 220 kV Chaibasa-Chaibasa(PG) line.	done
5	220 kV Chaibasa S/s	JUSNL	21.07.2022	7. In 150 MVA 220/132 KV ATR, low set current pickup setting in backup O/C relay is 1048 A ,which is 260% of transformer rated current. This current pick up setting may be reviewed.	done.
				8.The bus bar protection relay is not functional due to fibre communication error as shown in relay display. Being a imporatant protection in the substation, immediate measure shall be taken to rectify the issue and bring the busbar relay into service.	
				9. Air conditioning is not working in the kiosks housing the relay panel for different bays. AC shall be provided for proper functioning of protection system panels & to prevent failure of numerical protection systems.	

				10.It is seen in the switchyard that both bus side isolators of 220 KV Chaibasa Chaibasa ckt 2 and 220 KV Chaibasa Ramchandrapur ckt 1 are in closed condition. This may be immediately changed to a single bus only as whenever there is a bus fault in either of 220 KV bus,both lines will trip during fault clearance. Necessary modification may be made in wiring of bus bar relay and Peripheral units.	
				11.DC earth leakage was observed in one of the DC sources. The same may be attended.	
				1.PLCC is not working for 220 kV JSD-Jindal line. Therefore autorecloser scheme is kept disabled for the line. PLCC panel is present at Jamshedpur end however there is no information of PLCC at JSPL end. The matter may be taken up with appropriate authority for commissioning PLCC in the line.	
				2. Disturbance recorder configuration to be done as per DR standard guidelines by ERPC. CB close status(CB open shall be configured in DR instead of CB Close) to be rectified and DR window size to be increased in DR.	
				3. Time synchronising equipment in substation control room is not working. The same may be rectified & put into service.	

6	220 kV Jamshedpur S/s	DVC	22.07.2022	4.DC earth leakage were found in both DC-I & II sources. The same may be attended. Continous monitoring of dc earth leakage measurements to be done.	
				5.For JSPL circuit, Zone 2 reach is encroaching half of next shortest adjacent line,so time delay is seen to be 500 ms. Alternatively,reach may be reduced from 120% of length to line length plus 50% of SAL ,while time delay can be maintained at 350 msec. To be reviewed.	
				6. Zone-2 reach setting for Bokaro line may be reviewed considering the shortest adjacent line as 220 kV BTPS-CTPS.	
				7.As informed by S/s Incharge, in the LBB protection there is no provision of sending DT signal to other end of the line. The scheme may be reviewed and transmitting DT signal to other end in LBB protection may be incorporated.	

Annexure C.5.2

400KV OPGC SUBSTATION

SL.No	Audit Report Observation	OPGC Reply
1	At 400 kV level, it was found the both main-1 & main-2 relays of outgoing transmission lines are of same make & model employing different characteristic. It is recommended that different make & model for main-1 &2 relay is preferable and same may be implemented.	We are in process for approval of different make relay and after getting clearance same will be implemented
2	Overvoltage setting for the lines need to be reviewed. Time grading / voltage grading may be done in the overvoltage settings for different lines/for overall substation	Implemented
3	DR time window may be increased. DR configuration may be done in line with guidelines approved in ERPC PCC meeting.	Implemented
4	4. Overcurrent protection in 400kV lines may be disabled.	Implemented
5	Line length for 400 kV OPGCLapanga line may be verfied in consultation with OPTCL.	Same was confirmed and implemented
6	Zone-2 & Zone-3 settings of all 400 kV lines need to be reviewed and set as per the ERPC Protection philosophy.	We have taken approval from M/s OPTCL and same shall be implement after internal approval
7	Adjacent shortest and longest line length maybe verified and zone settings maybe implemented accordingly	We have taken approval from M/s OPTCL and same shall be implement after internal approval
8	Power swing block enabled for all zones. May be reviewed	We have in discussion with OPTCL for unblocking modification in zone-1 and same will be implemented after OPTCL reply.

IB-LAPANGA LINE SETTING

Line setting in Main 1 & 2 of D60 relay used in IB-Lapanga circuit-1 & 2 used below protection philosophy and raw data inputs from adjacent substation

Sl.	Zone	Direction	Protected Line Reach Settings	Time Settings (in Seconds)	Remark
1	Zone1	Forward	80% of Protection line length	0 Sec	
2	Zone2	Forward	100% of protection line + 50% of shortest line	0.5	
3	Zone3	Forward	100% of protection line + 100% of Longest line	1.0 Sec	
4	Zone4	Reverse	20% of Protected line	0.5 Sec	

1. 400KV IB thermal substation to OPTCL Load pooling station Lapanga with double circuit twin moose AAAC conductor
   Positive Seq. impedance in primary - 0.0297 + j 0.332 Ohm/KM
   Zero Seq. Impedance in primary - 0.161 + j 1.240 Ohm/KM

2. Protection length -22 Km

3. Shortest line – 40Km, Positive Seq. impedance in primary - 0.0297 + j 0.332 Ohm/KM

4. Longest Length- 220Km , Positive Seq. impedance in primary -0.0297 + j 0.332 Ohm/KM

5. CTR-2000/1 and VTR 400/0.110

Zone setting with previous data

Zone-1	3.32 Ohm	84.88 Deg	0 Sec
Zone-2	7.813 Ohm	84.88 Deg	0.5 Sec
Zone-3	44.44 Ohm	84.88 Deg	1 Sec
Zone-4	0.83 Ohm	84.88 Deg	0.5 Sec

As per present data input and present CEA protection philosophy , following correction need to done in line setting in Main 1 & 2 of D60 relay used in IB-Lapanga circuit-1 & 2 as per below line data inputs

1. 400KV IB thermal substation to OPTCL Load pooling station Lapanga with double circuit twin moose AAAC conductor
   Positive Seq. impedance in primary - 0.0297 + j 0.332 Ohm/KM
   Zero Seq. Impedance in primary - 0.161 + j 1.240 Ohm/KM

2. Protection length -24.45 Km,
3. Shortest line – 17Km, Positive Seq. impedance in primary - 0.0297 + j 0.332 Ohm/KM

4. Longest Length- 211Km , Positive Seq. impedance in primary -0.0297 + j 0.332 Ohm/KM

5. CTR-2000/1 and VTR 400/0.110

As per CEA protection philosophy setting calculation for double circuit transmission line

Sl.	Zone	Direction	Protected Line Reach Settings	Time Settings (in Seconds)	Remark
1	Zone1	Forward	80% of Protection line length	0 Sec	As per CEA
2	Zone2	Forward	For single ckt- 120 % of the protected line **For double ckt- 150 % of the protected line**	0.5 to 0.6 - if Z2 reach overreaches the 50% of the shortest line ; 0.35- otherwise	As per CEA
3	Zone3	Forward	120 % of the (Protected line + Next longest line)	0.8 - 1.0 Sec	As per CEA
4	Zone4	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 Sec	As per CEA

Revised Zone setting

Zone-1	**3.586 Ohm**	**84.88 Deg**	**0 Sec**
Zone-2	**6.724 Ohm**	**84.88 Deg**	**0.5 Sec**
Zone-3	**51.80 Ohm**	**84.88 Deg**	**1 Sec**
Zone-4	**0.8956 Ohm**	**84.88 Deg**	**0.5 Sec**

Over Voltage setting

Transmission line	OVER VOLTAGE SETTING					
	First stage U> Pick up	Existing time delay	Revised Time delay	Second stage U>> Pick up	Existing time delay	Revised Time delay
IB-LAPANGA-CKT1 (M1 & M2)	110 %	5 Sec	5Sec	140%	1 Sec	**0.1Sec**
IB-LAPANGA-CKT2 (M1 & M2)	110 %	5 Sec	**5.5 Sec**	140%	1 Sec	**0.1Sec**

Note:-

Case-1 Zone-2 impedance setting as per 150 % of the protection line is 6.724 < 84.88 deg

Case-2 Zone-2 impedance setting Total protection line + 50 % of shortest line is 6.041 < 84.88 Deg

As per above case-1 calculated impedance over reaching case 2 calculated impedance value so,zone-2 delay kept remain same as 0.5 sec

OPGC-SUNDERGARH LINE SETTING

Line setting in Main 1 & 2 of D60 relay used in IB-Sundergarh circuit-1 & 2 used below protection philosophy and raw data inputs from adjacent substation

Sl.	Zone	Direction	Protected Line Reach Settings	Time Settings (in Seconds)	Remark
1	Zone1	Forward	80% of Protection line length	0 Sec	
2	Zone2	Forward	100% of protection line + 50% of shortest line	0.5	
3	Zone3	Forward	100% of protection line + 100% of Longest line	1.0 Sec	
4	Zone4	Reverse	20% of Protected line	0.5 Sec	

1. 400KV IB thermal substation to PGCIL Load pooling station Sundergarh with triple snow bird conductor
   Positive Seq. impedance in primary - 0.0239 + j 0.2563 Ohm/KM
   Zero Seq. Impedance in primary - 0.2564 + j 0.9833 Ohm/KM

2. Protection length -53 Km.
3. Shortest line – 53 Km, Positive Seq. impedance in primary - 0.0239 + j 0.2563 Ohm/KM

4. Longest Length- 145.315 Km , Positive Seq. impedance in primary -0.0288 + j 0.307 Ohm/KM

5. CTR-2000/1 and VTR 400/0.110

Zone setting with previous data

Zone-1	6.11 Ohm	84.88 Deg	0 Sec
Zone-2	11.46 Ohm	84.88 Deg	0.5 Sec
Zone-3	32.37Ohm	84.88 Deg	1 Sec
Zone-4	1.5 Ohm	84.88 Deg	0.5 Sec

As per present data input and present CEA protection philosophy , following correction need to done in line setting in Main 1 & 2 of D60 relay used in IB-Sundergarh circuit-1 & 2

1. 400KV IB thermal substation to PGCIL Load pooling station Sundergarh with triple snow bird conductor

   Positive Seq. impedance in primary - 0.0239 + j 0.2563 Ohm/KM
   Zero Seq. Impedance in primary - 0.2564 + j 0.9833 Ohm/KM

2. Protection length -51.35 Km,
3. Shortest line – 51.35Km, Positive Seq. impedance in primary - 0.0239 + j 0.2563 Ohm/KM

4. Longest Length- 152.3Km , Positive Seq. impedance in primary -0.0288 + j 0.307 Ohm/KM

5. CTR-2000/1 and VTR 400/0.110

As per CEA protection philosophy setting calculation for double circuit transmission line

Sl.	Zone	Direction	Protected Line Reach Settings	Time Settings (in Seconds)	Remark
1	Zone1	Forward	80% of Protection line length	0 Sec	As per CEA
2	Zone2	Forward	For single ckt- 120 % of the protected line **For double ckt- 150 % of the protected line**	0.5 to 0.6 - if Z2 reach overreaches the 50% of the shortest line ; 0.35- otherwise	As per CEA
3	Zone3	Forward	120 % of the (Protected line + Next longest line)	0.8 - 1.0 Sec	As per CEA
4	Zone4	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 Sec	As per CEA

Revised Zone setting

Zone-1	**5.816 Ohm**	**84.67 Deg**	**0 Sec**
Zone-2	**10.904 Ohm**	**84.67 Deg**	**0.5 Sec**
Zone-3	**39.77 Ohm**	**84.67 Deg**	**1 Sec**
Zone-4	**1.454 Ohm**	**84.67 Deg**	**0.5 Sec**

Over Voltage setting

Transmission line	OVER VOLTAGE SETTING					
	First stage U> Pick up	Existing time delay	Revised Time delay	Second stage U>> Pick up	Existing time delay	Revised Time delay
IB-SUNDERGARH-CKT1 (M1 & M2)	110 %	5 Sec	5Sec	140%	0.1 Sec	0.1Sec
IB-SUNDERGARH-CKT2 (M1 & M2)	110 %	5 Sec	**5.5 Sec**	140%	0.1 Sec	0.1Sec