Minutes
of
88th PCC Meeting

Date: 05.03.2020
Eastern Regional Power Committee
14, Golf Club Road, Tollygunge
Kolkata: 700 033

EASTERN REGIONAL POWER COMMITTEE

MINUTES OF 88TH PROTECTION SUB-COMMITTEE MEETING HELD AT ERPC, KOLKATA ON 18.02.2020 (TUESDAY) AT 11:00 HOURS

List of participants is at **Annexure-A.**

PART – A

ITEM NO. A.1: Confirmation of minutes of 87th Protection sub-Committee Meeting held on 21st January, 2020 at ERPC, Kolkata.

The minutes of 87th Protection Sub-Committee meeting held on 21.01.2020 circulated vide letter dated 11.02.2020.

Members may confirm the minutes of 87th PCC meeting.

Deliberating in the meeting

Members confirmed the minutes of 87th PCC meeting.

PART – B

ANALYSIS & DISCUSSION ON GRID INCIDENCES OCCURRED IN JANUARY, 2020

ITEM NO. B.1: Disturbance at DSTPS Generating Station on 14.01.2020 at 13:16 Hrs.

400 kV bus II at Durgapur Steel Thermal Power Station was under shutdown.

At 13:16 Hrs, 400 KV Bus-I of DSTPS (Andal) DVC tripped leading to tripping of 2 running units Unit #1 and #2 (500 MW each) and 400 KV DSTPS-RTPS D/C & 400 KV DSTPS-Jamshedpur D/C.

Generation Loss: 700 MW

DVC may explain.

Deliberating in the meeting

*DVC gave a detailed presentation which was given at **Annexure-B1**.*

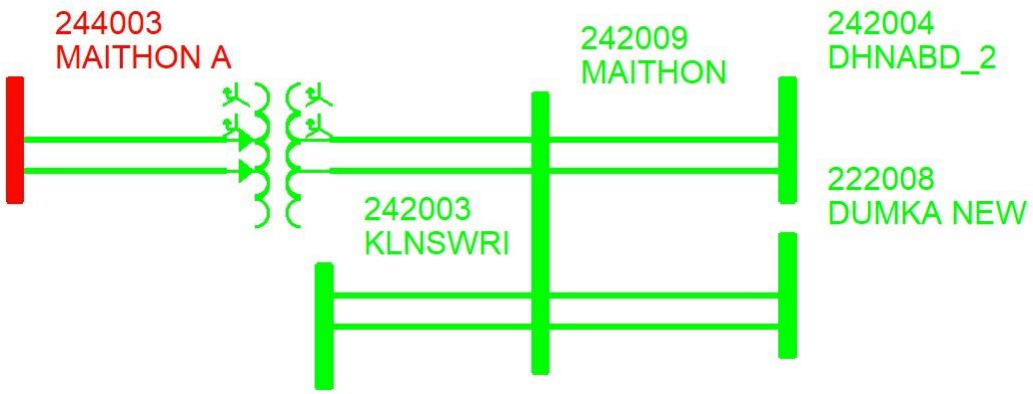
DVC explained that there was no physical fault in the system. During commissioning of Busbar Peripheral Unit of ICT#1 (PU1), testing of same was being done and one "96 Relay" sent DT to bus bar. This initiated tripping of all four 400 kV lines from remote ends leading to tripping of two generators (overvoltage trip) due to loss of evacuation path and total power failure at 400 kV system.

Further, DVC informed that it happened due to operational mistake of M/s GE engineer and they have taken necessary measures so that such type of incidents will not repeat again.

ITEM NO. B.2: Disturbance at 220 kV Maithon(PG) Substation on 25.01.2020 at 15:14 Hrs.

At 15:14 Hrs, LBB operated at 220 kV Bus Coupler bay at Maithon(PG) leading to tripping of 220 kV Bus-1 and 2, 500MVA 400/220kV ICT-1 and 2, 220kV Maithon-Dhanbad Ckt-1 and 2, 220kV Maithon-Kalyaneswari Ckt-1 and 2, 220kV Maithon-Dumka Ckt-1 and 2.

Load loss of around 119 MW in JSEB at Dumka, Pakur and Deoghar area.



Load Loss: 119 MW

JUSNL and Powergrid may explain.

Deliberating in the meeting

Detailed report of above disturbance prepared by ERLDC was given at ***Annexure-B2****.*

Powergrid informed that the trip contact of one current sensing unit (B-phase) became short permanently and extended the trip signal to 220 kV LBB relay. It resulted into tripping of all 220 kV feeders at Maithon station.

Further, Powergrid informed that they have replaced the LBB relay with the spare one and protection has been restored.

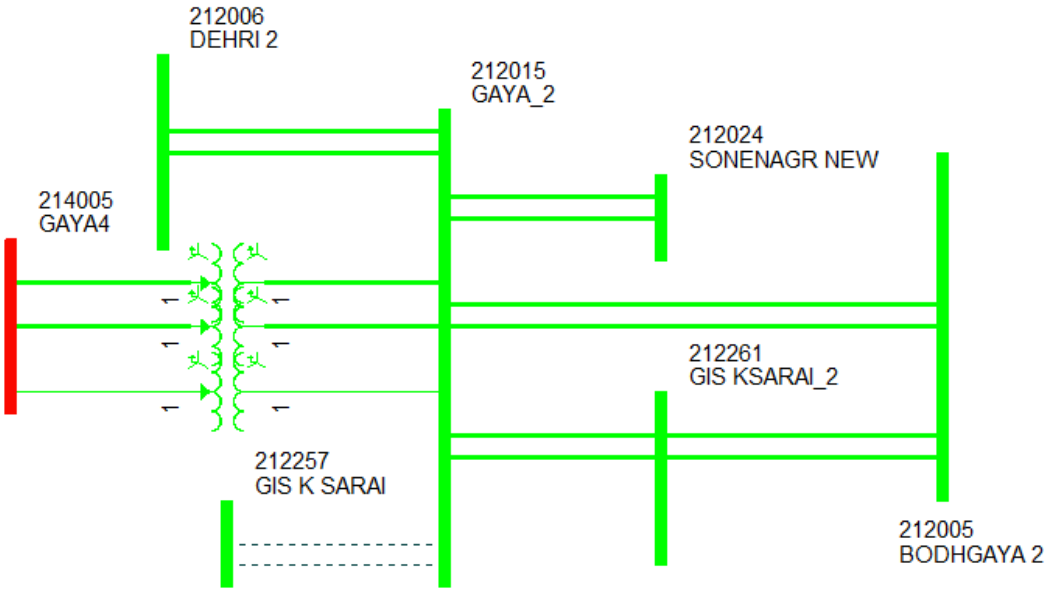
PCC observed that LBB relay installed at Maithon is ABB RAIKA static relay.

PCC advised Powergrid to replace the relay with numerical relay.

ITEM NO. B.3: Tripping of 220 KV Gaya Sonenagar D/C on 13.01.2020 at 00:40 Hrs.

At 00:40 Hrs, 220 KV Gaya-Sonenagar D/C tripped due to B-N Fault, leading to load loss of 130 MW in Aurangabad, Sonenagar, Rafiganj, Japla.

Load Loss: 130 MW



BSPTCL may explain.

Deliberating in the meeting

BSPTCL informed that a Y-phase to ground fault occurred at 12:38 hrs in Gaya-Sonenagar II at 21 km from Sonenagar. At Sonenagar end, it tripped in Zone-1 Distance protection and went for auto-reclose. But, after 600 ms, Sonenagar end tripped as its dead time setting was low (0.5 seconds). BSPTCL informed that they have increased the dead time setting to 1 second. At Gaya end, it tripped in Zone-1 Distance protection and successfully auto-reclosed.

Further, BSPTCL informed that Gaya-Sonenagar I tripped at 12:39 hrs due to E/F.

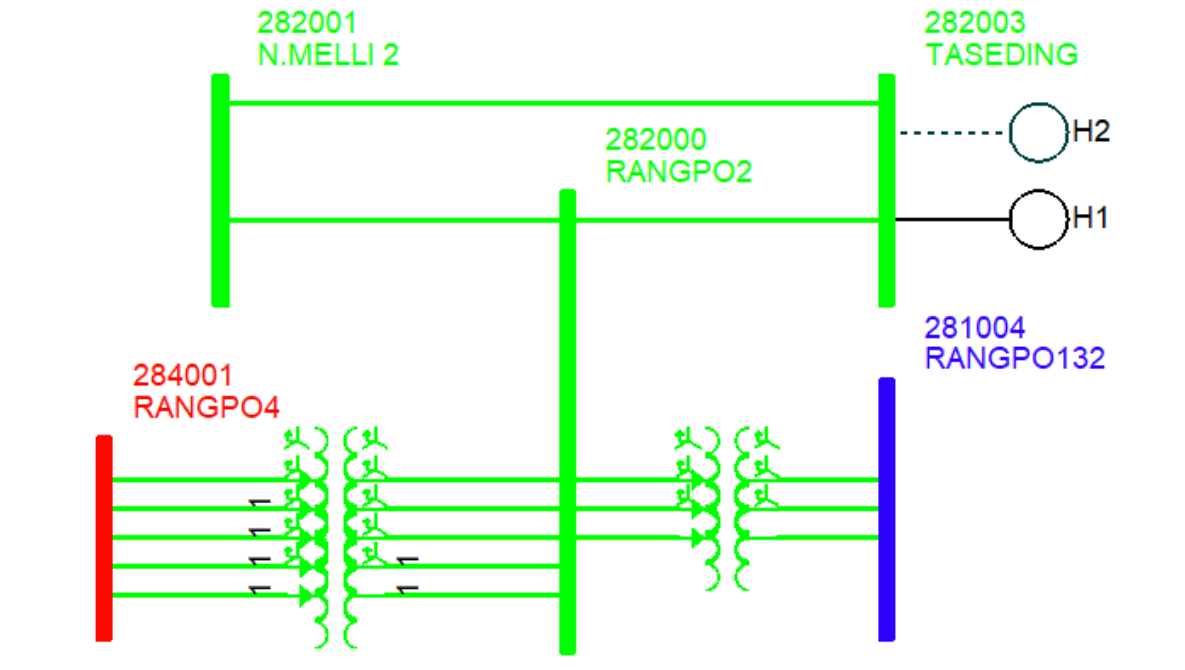
PCC advised BSTPCL take the following corrective actions:

- *Send the PSL logic and relay setting file to ERPC Secretariat.*
- *DR synchronisation need to be reviewed.*

ITEM NO. B.4: Disturbance at 220 kV Rangpo Substation on 11.01.2020 at 11:45 Hrs.

220 kV Bus II at Rangpo was under shutdown. At 11:45 Hrs, 220 KV Bus I at Rangpo became dead due to operation of bus bar protection resulting tripping of all five 315 MVA 400/220 KV ICTs at Rangpo, 220 KV Rangpo-New Melli S/C, 220 KV Rangpo-Tashiding S/C and all 3X100 MVA 220/132 KV ICTs at Rangpo.

Total power failure occured at 220 kV S/S at Tashiding, New Melli and Jorethang S/S. 400 kV bus at Rangpo was in service. Power supply to Gangtok interrupted as it was being fed through 132 KV Rangpo-Gangtok D/c.



No generation loss occurred at Jorethang, Tashiding and Chuzachen as no machine was running.

Load Loss: 45 MW

Powergrid may explain.

Deliberating in the meeting

Powergrid vide mail informed that Madhyabharat Transmission Ltd. was working on Bus II for commissioning of their 220 kV bays at Rangpo. Busbar protection relay got initiated due to malfunction of a contact.

PCC decided to discuss above disturbance in next PCC meeting.

ITEM NO. B.5: Tripping of 400 kV Teesta V – Rangpo D/C on 05.01.2020 at 20:04 Hrs.

Both 400 kV Teesta V – Rangpo D/C tripped from Rangpo end at 20:04 Hrs on Y-N fault. Unit-III was stopped at 20:03 Hrs before the incident. No generation loss occurred as no generation at Teesta V was scheduled.

However, it was observed that SF_6 gas failure of Unit-III GIS circuit breaker alarm was appeared in SOE of Scada at 20:04. On preliminary investigation on the checking of purity of SF_6 gas of Y-Phase detected the presence of SO_2. Both circuits were restored at 22:13hrs & 22:51hrs respectively.

No Load & Generation Loss

NHPC and Powergrid may explain.

Deliberating in the meeting

NHPC informed that Y-phase contact (bus side) of Unit III circuit breaker at Teesta-V did not get closed after the generation was made zero. It failed to close due to leakage of SF_6 as found in preliminary investigation. They have replaced the CB with spare one.

Further, NHPC informed that their bus bar protection did not operated and hence created a bus fault in the system. They informed that a selector switch of bus bar protection was found damaged. The same was not configured in the SCADA system hence the alarm did not get generated in the SCADA system. They have changed the selector switch and configured it in the SCADA system.

400kV Teesta-V – Rangpo line II tripped from both the ends on zone 1. 400kV Teesta-V – Rangpo line I tripped from Teesta V end along with line II on distance protection and sent DT to Rangpo end.

NHPC informed that their bus coupler also operated and tripped due to over current as its time setting was instantaneous. They have reviewed the time settings of bus coupler. Further, NHPC informed that again a fault occurred at Unit III,Teesta-V on 29.01.2020, but this time their bus bar protection operated correctly.

Powergrid informed that Rangpo end breaker got opened for both Teesta-V – Rangpo Ckt I and II.

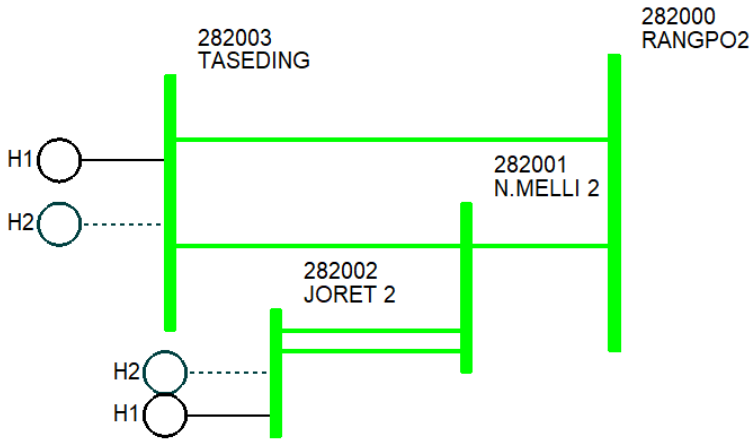
PCC advised NHPC to take following corrective actions:

- *Revise their Zone-4 time settings to 500 ms.*
- *400kV Teesta-V – Rangpo Ckt-I distance protection input needed to be checked.*

ITEM NO. B.6: Total power failure at Tashiding Substation on 16.01.2020 at 15:48 Hrs.

At 15:48 hrs, 220 kV New Melli-Tashiding S/C, 220 kV-Tashiding-Rangpo S/C, 220 kV New Melli-Jorethang-I tripped on Y-N fault resulting total power failure at Tashiding S/S. There was no generation at Tashiding

No Load & Generation Loss



DANS Energy may explain.

Deliberating in the meeting

ERLDC informed that there was a B-N fault in 220kV New Melli-Jorethang line -I and Jorethang end tripped on zone 1. The fault got cleared within 100 ms. Reason for tripping of 220 kV New Melli-Tashiding S/C, 220 kV-Tashiding-Rangpo S/C lines needed explanation.

ERLDC informed that no detailed report had been received from DANS Energy.

DANS Energy representative was not available in the meeting for discussion.

PCC observed that there was uncoordinated tripping at Jorethang & Tashiding due to improper protection relay settings. In earlier PCC Meetings, DANS Energy was advised to review the relay settings. The compliance report is yet to be received from DANS Energy.

It was decided to pursue the issue with DANS Energy.

PCC decided to conduct protection audit at Jorethang, Tashiding and New Melli S/s in the month of March, 2020.

ITEM NO. B.7: Tripping of 400 kV Kishanganj – Darbhanga D/C line on 29.05.2019 at 21:44 Hrs.

400 kV Darbhanga - Kishangunj D/C along with 400 kV bus-2 at Darbhanga tripped at 21:44 hrs. It was intimated by ATL that 400 kV Darbhanga - Kishangunj D/C has tripped due to collapse of Tower No 385 (Loc. 96/0, suspension type) due to high speed wind.

After isolation of these lines, 400 kV Bus 2 was tried to normalize. However, it again tripped. Thereafter, both transmission lines and 400 kV Darbhanga bus-2 were declared under breakdown.

As per PMU data, fault was cleared within 100 ms.

In 80th PCC meeting, KPTL informed that the disturbance occurred due to the tower collapse of 400 kV Darbhanga - Kishanganj D/C line. KPTL explained the sequence of events as follows:

- Initially there was a L-G fault in R-phase of 400 kV Darbhanga – Kishanganj circuit-II. Subsequently R-phase to ground fault was also occurred in circuit I of 400 kV Darbhanga – Kishanganj line.
- Auto-reclosure was successful for both the circuits.
- After some time, fault occurred again in R-phase and subsequently in other two phases and both the circuits got tripped. At the same time, the busbar protection operated for Bus-II at Darbhanga substation and tripped all the connecting elements.
- It was informed that while attempting to charge the line, SOTF protection operated for the

line and subsequently the busbar protection also operated again.

KPTL informed that the PIR of Circuit breaker was found to be damaged and this caused the triggering of busbar protection in both the occasion.

They added that as per their analysis, due to ferro resonance between PIR & shunt reactors at Darbhanga end, the PIR got damaged.

PCC also opined that the shunt reactors shall be tripped whenever the corresponding line trips so that the overcompensation of the line can be reduced thus the ferro resonance effect can be avoided.

Further, this line was again the tripped-on 22nd June, 2019.

Members may discuss.

Deliberating in the meeting

*KPTL gave a detailed presentation which was given at **Annexure-B7**.*

After detailed deliberation, Member Secretary, ERPC formed a technical committee with the following protection engineers:

- *J G Rao, Executive Engineer, ERPC*
- *Chandan Kumar, Manager, ERLDC*
- *Sudipta Maiti, SDE (E), DVC*
- *CH. Mohana Rao, Chief Manager, Powergrid*
- *Alok Prasad, DGM (Quality Assurance & Inspection), ATL*

Scope of the Committee is to decide the following:

- *To assess the reason for damage of PIR during the above disturbance*
- *To assess the reasonable time to restore the transmission line*
- *Remedial measures to be taken*

ITEM NO. B.8: Training on Safe and Secure Power System Operation.

As a part of Capacity Building initiative for the Power Sector engineers of the Eastern Region, a '5 days Training Programme' on "Ensuring Safe and Secure Power System Operation" is being organized by ERPC in association with Asia Institute of Power Management (AIPM), a training arm of CESC Limited at Kolkata from 02.03.2020 to 06.03.2020 (5 days) under PSDF Project. This will be the 4th Training Module for the year 2019 – 20 and ERPC Secretariat had notified to all the Power Utilities of ER on 27.01.2020 seeking nomination for 1 to 2 engineers of each organisation since the batch size is limited to 35 nos. only. Except a few organisation of ER including Bhutan Authorities, the nominations from most of the organizations are still awaited.

The Constituents who are yet to nominate engineers (1 / 2 nos.) for the 4th Module of AIPM Training commencing from 02.03.2020 to 06.03.2020 may please send the nominations to ERPC Secretariat at mserpc-power@nic.in positively by 21.02.2020.

Members may note and send the nomination.

Deliberating in the meeting

Members noted.

ITEM NO. B.9: Tripping Incidences in the month of January, 2020.

Other tripping incidences occurred in the month of January, 2020 which needs explanation from constituents of either of the end is given in Annexure.

In 36th TCC, all the constituents were advised to use the PDMS on-line portal for uploading the single line tripping details along with DR (comtrade files), EL and other relevant files for all trippings of August 2017 onwards. Otherwise, it will be considered as violation of compliance of clause 5.2(r) & 5.9 of IEGC.

In 74th PCC, all the constituents were requested to submit the disturbance report along with DR through the new version of on-line portal which was implemented from 01st Jan. 2019.

Members may discuss.

Deliberating in the meeting

Members explained the tripping incidences. Updated status is enclosed at ***Annexure-B9.***

PART- C:: OTHER ITEMS

ITEM NO. C.1: FOLLOW-UP OF DECISIONS OF THE PREVIOUS PROTECTION SUB-COMMITTEE MEETING(S)

The decisions of previous PCC Meetings are given at Annexure**.**

In 73rd PCC, it was observed that latest status on the implementation of the previous PCC recommendations were not updated by the constituents regularly. All the constituents were advised to update the latest status of the recommendations as per the list.

Members may update the latest status.

Deliberating in the meeting

Members updated the latest status. Updated status is enclosed at ***Annexure-C1.***

ITEM NO. C.2: Status of Third-Party Protection Audit

The compliance status of 1st Third Party Protection Audit observations is as follows:

Name of Constituents	Total Observations	Complied	% of Compliance
Powergrid	54	46	85.19
NTPC	16	14	87.50
NHPC	1	1	100.00
DVC	40	26	65.00
WB	68	49	72.06
Odisha	59	42	71.19
JUSNL	34	25	73.53
BSPTCL	16	5	31.25
IPP (GMR, Sterlite and MPL)	5	5	100.00

** Pending observations of Powergrid are related to PLCC problems at other end.*

The substation wise status of compliance is available at ERPC website (Observations include PLCC rectification/activation which needs a comprehensive plan).

In 77th PCC, BSPTCL has submitted the updated status.

In 79th & 80th PCC, BSPTCL was advised to submit the details of the compliance report.

BSPTCL may update.

Deliberating in the meeting

Members noted.

ITEM NO. C.3: Non-commissioning of PLCC / OPGW and non-implementation of carrier aided tripping in 220kV and above lines.

According to CEA technical standard for construction of electric plants and electric lines -Clause 43(4) (c), transmission line of 220 KV and above should have single-phase auto-reclosing facility for improving the availability of the lines. However, from the tripping details attached June-August, 2016 it is evident that the some of 220kV above Inter & Intra-Regional lines do not having auto-reclose facility either at one end or at both ends. Out of these for some of the lines even PLCC/OPGW is not yet installed and carrier aided protection including Autorecloser facility is not yet implemented. Based on the trippings of June- August, 2016 and PMU analysis a list of such lines has been prepared and as given below:

List of line where auto reclose facility is not available(Information based on PMU data analysis)							
S. No	**Transmission Lines name**	**Date of Tripping**	**Reason of Tripping**	**Owner Detail**		**Present Status**	
				End-1	**End-2**	**OPGW/PLCC Link available**	**AR facility functional**
13	220KV BUDIPADAR-KORBA-II	23.06.16	Y-N FAULT	OPTCL	CSEB	PLCC not available	will be activated in consultation with Korba
17	220 KV TSTPP-RENGALI	17.07.16	EARTH FAULT	NTPC	OPTCL	OPGW replaced PLCC.	by March 2018
18	220KV BUDIPADAR-RAIGARH	21.07.16	EARTH FAULT	OPTCL	PGCIL	PLCC defective.	To be commissioned be Chhatisgarh.
20	220 KV FARAKKA-LALMATIA	03.08.16	B-N FAULT .	NTPC	JUNSL	Yes	Old Relay and not functional. 7-8 months required for auto re-close relay procurement.
23	220 KV MUZAFFARPUR - HAZIPUR - II	10.08.16	B-N FAULT	PGCIL	BSPTCL	PLCC commissioned.	Voice established. For carrier required shutdown
24	220 KV ROURKELA - TARKERA-II	11.08.16	B-N FAULT	PGCIL	OPTCL	OPGW available	DTPC installed. A/R to be commissioned.
27	220 KV BIHARSARIF-TENUGHAT	07.09.16	B-N FAULT	BSPTCL	TVNL		
33	220KV Jamshedpur-Jindal-SC						

34th TCC advised all the respective members to update the above list along with the last tripping status in next PCC meeting.

TCC further advised all the constituents to give the latest status of PLCC of other 220kV and above lines under respective control area.

OPTCL:

1. 220kV Rengali(PG)-Rengali S/Y : *Contract awarded*
2. 220kV Indravati(PG)-Indravati(PH) : *Contract awarded*
3. 132kV Baripada(PG)-Baripada : *OPGW completed*
4. 132kV Baripada(PG)-Rairangpur : *OPGW completed*

BSPTCL:

Sl No.	***Lines***	***Status***
1	*220 kV Purnea(PG)-Madhepura*	*Protection through PLCC is working properly*
2	*220 kV Biharsharif-BTPS new*	*BHEL would complete this work*
3	*220 kV BTPS new- Begusarai*	*BHEL would complete this work*
4	*220 kV Biharshariff-Bodhgaya line LILO at Khizersarai*	*OPGW is present. Protection is done through DPC.*
5	*132 kV MTPS-Motiari line*	*OPGW is installed.*
6	*220KV Madhepura-New Purnea D/C*	*Protection through PLCC is working properly*
7	*220KV Muzaffarpur-Hajipur D/C line*	*Protection through PLCC is working properly*
8	*220KV Patna-Khagaul-SC*	*PLCC Panel working properly.*
9	*220 kV DMTCL(Darbhanga)-Laukhi Circuit-I*	*PLCC Panel working properly*
10	*220 kV Tenughat-Biharsharif S/C*	*PLCC to be commissioned*
11	*220 kV Gaya-Sonenagar New circuit-I*	*Communication through OPGW*
12	*220 kV Pusauli-Dehri S/C*	*PLCC not working. OPGW commissioned at Dehri end.*
13	*220 kV Begusarai-Purnea(PG) D/C*	*PLCC working properly*
14	*220 kV DMTCL-Motipur ckt-II*	*PLCC to be commissioned.*
15	*220 kV Dehri- Gaya D/C*	*PLCC working properly*
16	*220 kV Kishanganj(PG)-Kishanganj(B)-II*	*PLCC working properly*

In 79th PCC, BSPTCL submitted PLCC status of some of the lines. The details have been updated in above table.

In 80th PCC meeting, BSPTCL was advised to rectify the PLCC & Auto reclose issues in coordination with their communication wing.

Members may update.

Deliberating in the meeting

Members noted.

ITEM NO. C.4: Additional Agenda.

1. Implementation of auto reclose in 220kV lines without carrier protection

OPTCL vide letter dated 15th February 2020 informed that they are having auto reclose relays in 220 kV lines but kept out of service due to non-availability of carrier communication.

OPTCL requested to allow for autoreclose operation without carrier communication. Details are enclosed at **Annexure-C4.1**.

Deliberating in the meeting

PCC agreed and advised OPTCL to check the line length as such operation may not be desirable for very long lines.

2. Protection Settings coordination for Bus Split of Bihar Sharif

The Bus Split operation at Bihar Sharif is going to be operationalized shortly. This may change the long and short lines for elements connected on 400 kV Bus-1&2 and also connected to Bus-3&4. Due to this, the lines connected from 400 kV Bihar Sharif Substation may require change in their Zone 2/Zone 3/Zone 4 protection setting from their respective remote ends. Based on the list provided below, PGCIL RTAMC -1(Lakhisarai, Mujaffarpur, New Purnea, Sasaram,Banka) DVC(Koderma) and PGCIL NR-3 (Ballia, Varanasi) have to confirm the readiness with the new protection setting Group at their end for the split bus operation. It is advised to keep two group setting wherever changes are required so that in case of closed bus operation the same can be implemented immediately for operational flexibility.

List of lines (with lengths) connected to each Bus at Bihar Sharif:

Bihar Sharif-A (Bus 1 & Bus 2)		**Bihar sharif-B (Bus 3 & Bus 4)**	
Element Name	**Length (in Km)**	**Element Name**	**Length (in Km)**
400 KV Bihar Sharif-Lakhisarai D/C (Shortest)	89	400 KV Bihar Sharif-Koderma D/C (Shortest)	110.7
400 KV Bihar Sharif-Muzaffarpur D/C	133.3	400 KV Bihar Sharif-Banka D/C	184.5
400 KV Bihar Sharif-New Purnea D/C	231	400 KV Bihar Sharif-Varanasi D/C (Longest)	321
400 KV Bihar Sharif-Balia D/C (Longest)	241.8	400 KV Bihar Sharif-Sasaram-I	195
400 KV Bihar Sharif-Sasaram-II	198.9	400/220 KV ICT II & IV	--
400/220 KV ICT I & III	--		

All utilities are advised to confirm the readiness of protection setting for split bus operation.

Deliberating in the meeting

Powergrid and DVC agreed to make necessary changes wherever required in their protection settings.

3. Protection Settings coordination for 400 KV Angul Bypass

400 KV Meeramundali-Angul-I (25.3 Km) and 400 KV Bolangir-Angul-S/C (196.1 Km) have been bypassed at Angul S/S and made direct circuit 400 KV Meeramundali-Bolangir-SC (221 Km).

Similarly, 400 KV Meeramundali-Angul-II (18.61 Km) and 400 KV Talcher-Angul-S/C (68 km) have been bypassed at Angul S/S and made direct circuit 400 KV Meeramundali-Talcher-II (86 Km).

This may change the long and short lines for elements connected to 400 kV Angul, Bolangir, Jeypore, Rengali, Rourkela, Meeramundali, Mendhasal, Lapanga, New Duburi, Talcher, GMR, JITPL and JSPL S/S. Due to this, these lines will require change in their Zone 2/Zone 3/Zone 4 protection setting from their respective remote ends. PGCIL RTAMC -2, NTPC Talcher, Odisha, GMR and JITPL have to confirm the implementation of new protection setting at their end for the bypass operation.

All utilities are advised to confirm the implementation of new protection setting at their end for the bypass operation.

List of lines (with lengths) before and after bypass operation:

Before Angul Bypass		**After Angul Bypass**	
Element Name	**Length (in Km)**	**Element Name**	**Length (in Km)**
400 KV Angul-Meeramundali-I	25.3	400 KV Meeramundali-Talcher-I	51
400 KV Angul-Meeramundali-II	18.31	400 KV Meeramundali-Talcher -II (Bypassed Ckt)	86
400 KV Angul-Talcher S/C	68	400 KV Meeramundali-Bolangir-I (Bypassed Ckt)	221
400 KV Meeramundali-Talcher S/C	51		
400 KV Angul-Bolangir S/C	196.1		

Deliberating in the meeting

OPTCL confirmed that they have made necessary changes wherever required in their protection settings.

Meeting ended with vote of thanks to the chair

****

Annexure-A

Participants in 88th PROTECTION COORDINATION SUB-COMMITTEE (PCC) Meeting of ERPC

Venue: ERPC Conference Hall, Kolkata Time: 11:00 hrs Date: 18.02.2020 (Tuesday)

Sl No	Name	Designation/ Organization	Contact Number	Email	Signature
1	J. Bandyopadhyay	Member Secretary ERPC	9432326351	mserpc-power@gov.in	
2	D. K. Jain	Executive Director, ERLDC	9910344127	dk.jain@posoco.in	
3	AMARESH MALLICK	CGM	9433027220	amaresh.mallick@posoco.in	
4	J. G. Rao	EE, ERPC	9547891353	ganesh.jada@gov.in	
5	P. N. Sarkar	SE, ERPC	7044126333	pn_sarkar@rediffmail.com	
6	Shivam Asati	AD-II, ERPC	8253035332	shivamasati786@gmail.com	
7	S. P. Datta	AGM, ERPC	94330 67022.	spdutta@rediffmail.com	
8	Rajnath Kumar	AEE T&C DOS	7763817824	rahulraj59132@gmail.com	
9	H. K. SINGH	EE/E/Telecom	9308940668	hkbsptcl@gmail.com	
10	Shivshankar Mandi	Manager, CRITL JUSNL	6202991413	cecritl.jusn@rediffmail.com	
11	JAYANTA KANJILAL	WBSETCL	9434910189	K_JAYANTA12@REDIFFMAIL.COM.	
12	Goutam Dutta.	SLDC, WBSETCL	9434910266	g_dutta1304@rediffmail.com	18/2/20
13	Krishnendu Sanyal	WBSEDCL.	8336908840	K.sanyal01@wbsedcl.co.in	18/02.
14	SOUMYAJIT KONAR	Dy Mgr. CESC Ltd.	8617222676	soumyajit.konar@gmail.com	18/2
15	Md. Ziaul Huda	OPTCL	9438907491	ele.mzhuda@optcl.co.in	18.2
16	Sanjaya Kumar Mishra	SLDC OPTCL	9438907414	ele.skmishra@sldcorissa.org.in	
17	CHANDAN KUMAR	Manager, ERLDC Posoco	9869251460	chandan@posoco.in	
18	S. K. SAHU	DGM, POWERGRID odisha proj. BBSR	9078883643	skSahu@Powergridindia.com	
19	S. MAITI	S.D.E(E), DVC	7545867453	sudiptamaiti@gmail.com	
20	Rahul Anand	Sr. Manager NTPC	9425823430	rahulanand@ntpc.co.in	

"Coming together is a beginning, staying together is progress, and working together is success." –Henry Ford

Participants in 88th PROTECTION COORDINATION SUB-COMMITTEE (PCC) Meeting of ERPC

Venue: ERPC Conference Hall, Kolkata Time: 11:00 hrs Date: 18.02.2020 (Tuesday)

Sl No	Name	Designation/ Organization	Contact Number	Email	Signature
21	MANISH KUMAR	AM(E), NHPC LW Teesta VPS	9800006889	Teestav.maintenance@gmail.c	18/02/20
22	ZAVED KAWSER	CEO - Proj. ATL	8637358714	zaved.kawser@kalpatarupower.com	18/2/20
23	AJAY TRIPATHI	A.V.P.	9821024193	AJAY.TRIPATHI@KALPATARUPOWER.COM	
24	Kumar Manish	Dy. Mgr ATL	9334689726	K.manish@kalpatarupower.com	
25	Alok Prasad	D.G.M.	9425927502	alok.prasad@kalpatarupower	
26	RAJ PRATIM	ERLDC/ DY. Mgr.	9903329591	rajpratim@posoco.in	
27	SAIBAL GHOSH	ERLDC/ Dy. Mgr	8584071079	Saibal@posoco.in	
28	A.K. Basak	Dy. Manager ERLDC, POSOCO	9007059569	akbasak@posoco.in	
29	Madhab Mukherjee	SE PRDC	7797827273	madhab.mukherjee@prdcinfotech.com	
30	Ishani Chowdhury	Engineer, PRDC	9874882962	ishani.c@prdcinfotech.com	
31	Ugyen Tshering	Sr. Manager NLDC Bhutan	975 17613039	Ugyentshering17@bpcbt	
32	Jigme Dorji	Sr. Engineer NLDC-Bhutan	+975-17667748	jigme_dorji@bpc.bt	
33	Lenin.B	EE, ERPC	8335905973	lenin.cea@gov.in	
34	Shri Mohan Jha	Consultant ERPC	6289127726	erpcjha@yahoo.co.in	
35	B. SARKHEL	Consultant ERPC	9433065724	sarkhel.erpc@gmail.com	
36	Kumar Ravi Ranjan	BSPTCL	7033098051	Ranjan80102@gmail.com	
37	RAUSHAN KUMAR	BSPTCL A.Ex.E/SLDC	92964427321	raushanbsptcl@gmail.com	
38	Shivakumar	TCE, Bangalore	8197683334	shivakumar@tce.co.in	
39	ARUN	KPTL	9717322849	arun.d@kalpatarupower.co	
40	Saundarya Ku Pattanayak	SLDC Odisha	9438907245	it.skpattanayak@optcl.co.in	
41	Kumar Satyam	AD(I) ERPC	7355661655	Satyam24365@gmail.co	

"Coming together is a beginning, staying together is progress, and working together is success." –Henry Ford

Annexure-B1

400KV TOTAL POWER FAIL AT DSTPS 14.01.2020

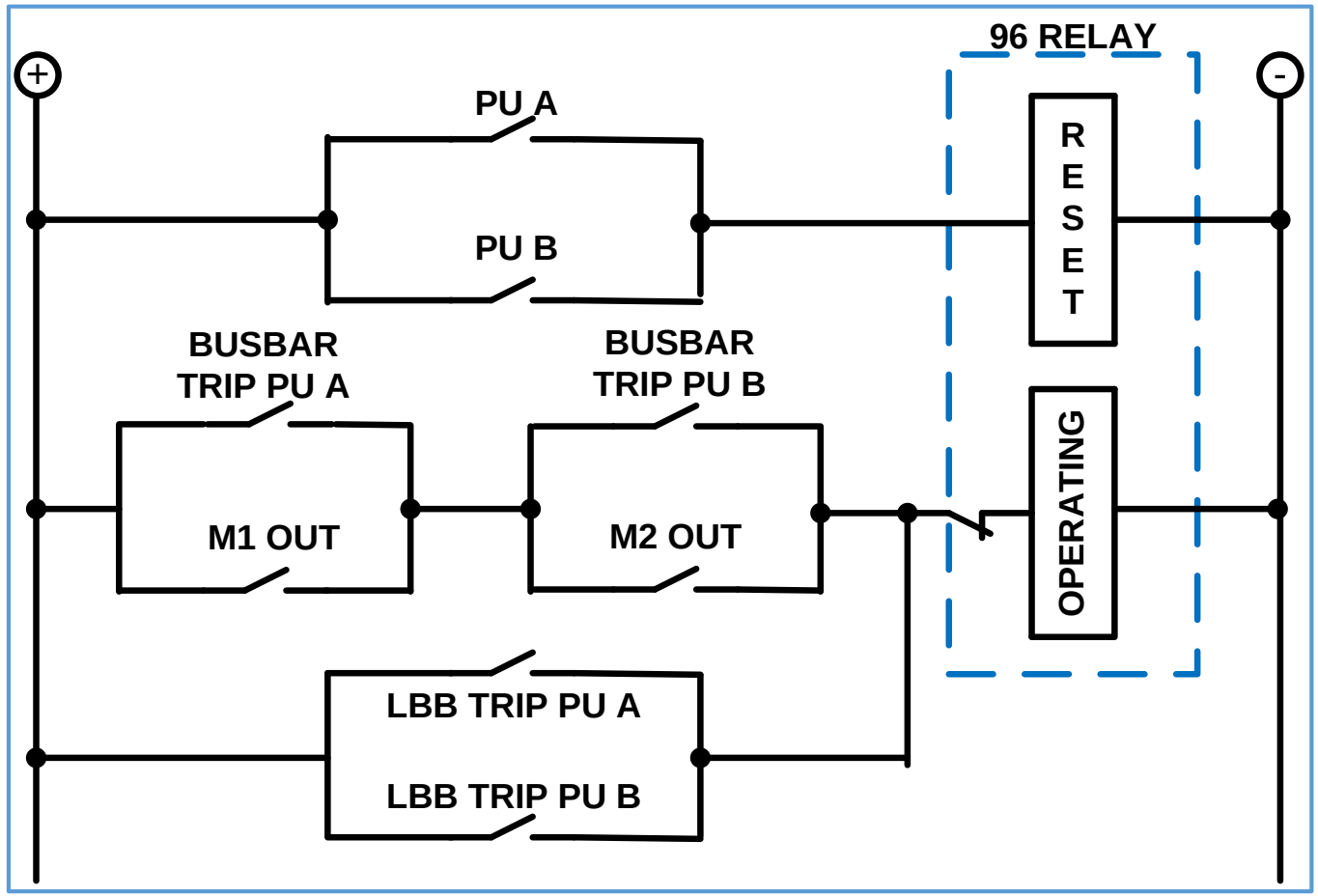
SEQUENCE OF EVENTS

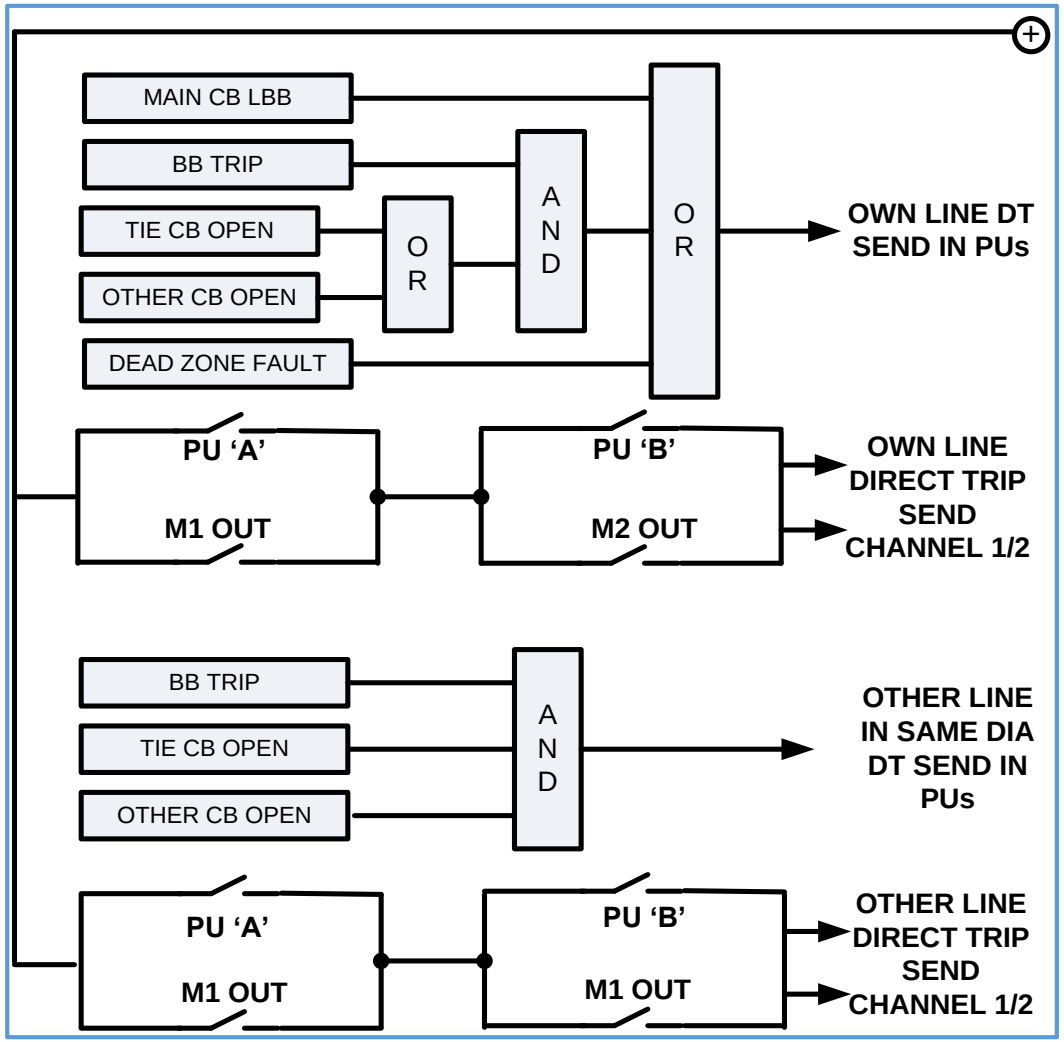
- At around 13:16 Hrs on 14/01/2020, during commissioning of Busbar Peripheral Unit of Bay No. 404 (ICT#1), all four 400 kV lines tripped from remote ends leading to tripping of two generators due to loss of evacuation path and total power failure at 400 kV system.
- MB # 2 S/D taken for checking of PU healthiness of ICT#1 bay with relay interlock protection checking/testing. S/D arranged from 09:45 hrs on 14/01/2020. All bays were in service on MB # 1.
- PRECAUTION: all 96 relays and 86LBB (LBB Retrip) relays drawn out.
- Switch position taken from BB IN to M1 OUT. Operation of M10X relay checked O.K. Then BB OUT. M10X Resets. Checked O.K. Then M2 OUT. M20X operates and M10X remains RESET. All O.K.

SEQUENCE OF EVENTS

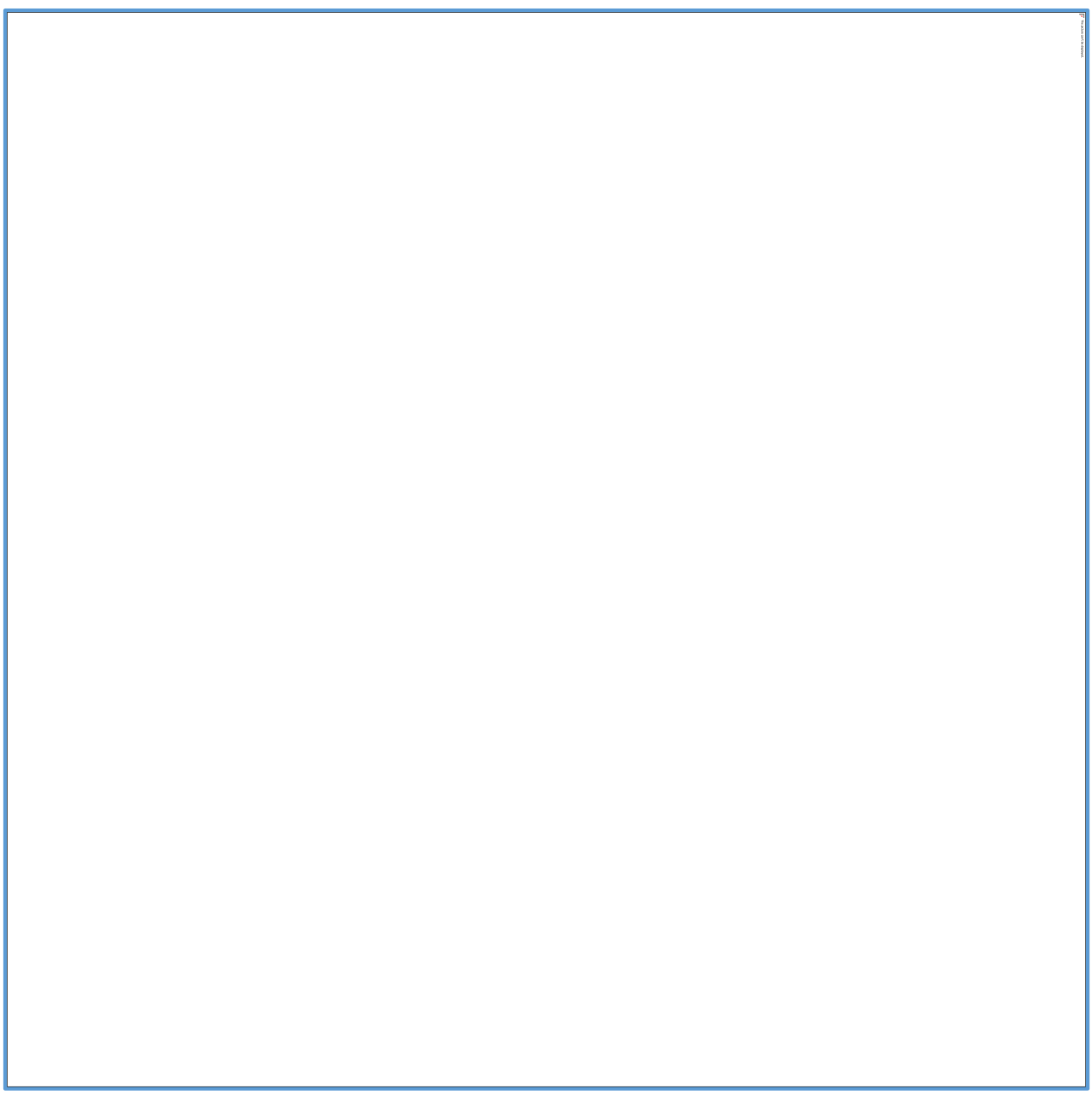
- Tripping of PU1 checked upto 96 relays by keeping CU ‘B’ in OUT position. BB Switch in ‘M2 out’. During testing several times Switch position had been toggled between BB OUT & M2 OUT.
- To check PU ‘B’ operations CU ‘A’ had to be made OUT. BB Sw in ‘M1 OUT’ position.
- This operation was done by GE Engineer at very high speed causing M10 [CU A bypass relay] to operate before M20 [CU B bypass] could RESET.
- In those brief milliseconds both M10 & M20 relays had operated causing all 4 lines to send DT as per scheme.
- After tripping of lines from remote ends both units tripped due to loss of evacuation path. Overvoltage trip.

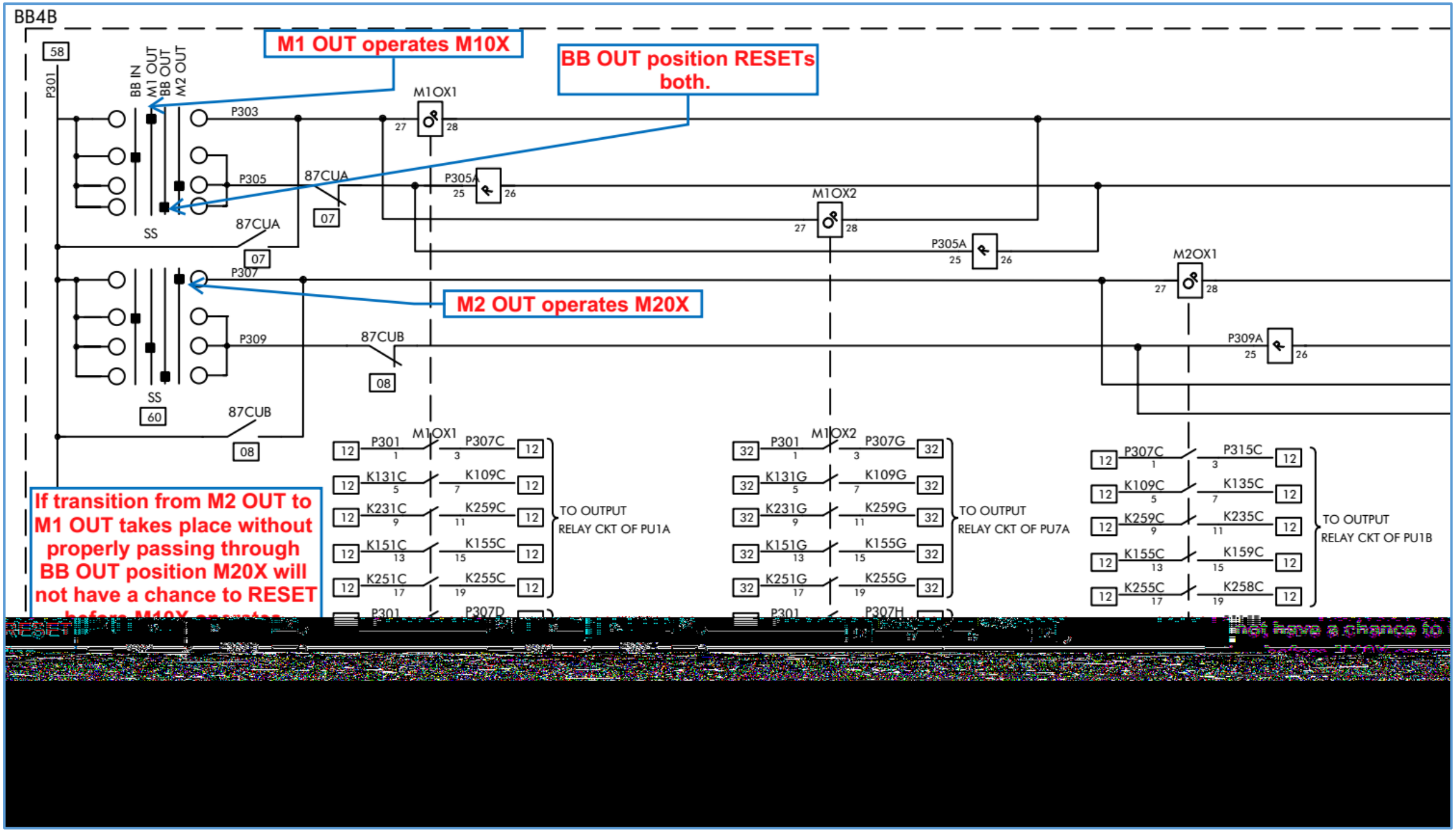
SCHEME OF 96 RELAY AND DT SEND DC CKT



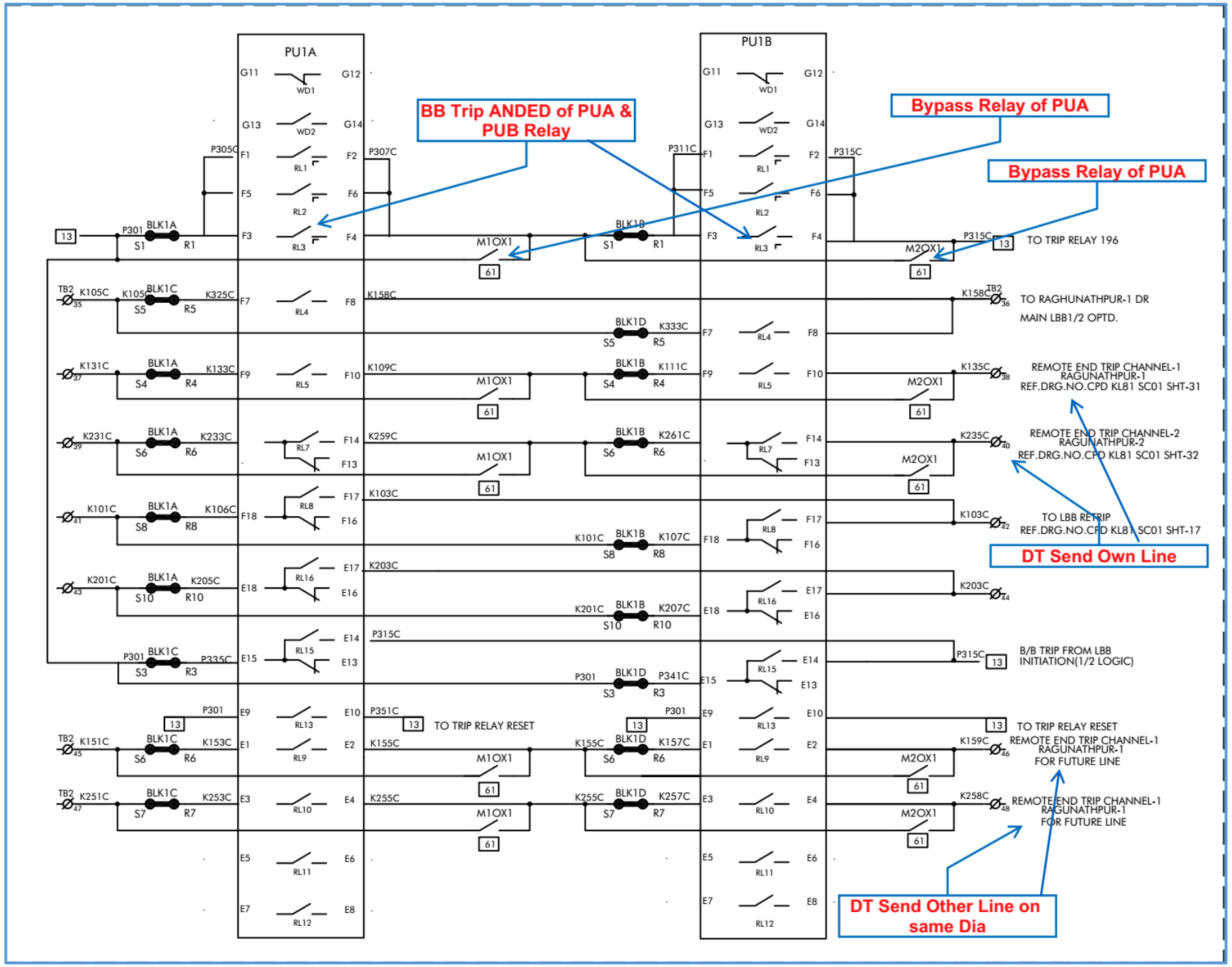


OPERATION OF M1 & M2 OUT AUXILIARY RELAYS




BB4B
M1 OUT operates M10X
BB OUT position RESETs both.
M2 OUT operates M20X
58
P301
BB IN
M1 OUT
BB OUT
M2 OUT
P303
P305
P307
P309
SS
87CUA
87CUB
07
08
60
M1OX1
M1OX2
M2OX1
P305A
P309A
27
28
25
26
TO OUTPUT RELAY CKT OF PU1A
TO OUTPUT RELAY CKT OF PU7A
TO OUTPUT RELAY CKT OF PU1B
If transition from M2 OUT to M1 OUT takes place without properly passing through BB OUT position M20X will not have a chance to RESET

PERIPHERAL UNIT SCHEMATIC



TESTS AND CHECKINGS LATER

- After the event before the first line was charged the switch position was toggled between ‘BB IN’ to ‘M2 OUT’ and back several times and every time the operation of SET / RESET of M10X & M20X relays checked and all found O.K.
- REMEDIAL MEASURES: Henceforth all BB switch position activities to be done after drawing out M10X & M20X both and after that reinserting only the needed relay after making necessary switch transition.

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

Incident No. 25-01-2020/1 **Dtd: 14-02-2020**

Report on the incident in Eastern Region involving JUSNL system

1) **Date / Time of disturbance:** 25-01-2020, 15:14 hrs.
2) **Event type:** GD-I
3) **Systems/ Subsystems affected:** Dumka
4) **Antecedent condition:** Prior to the event, feeder distribution of 220 kV bus at Maithon was as follows:
   220 kV bus 1: 400/220 kV ICT – 2, 220 kV Dhanbad – 2, 220 kV Kalayaneswari – 2, 220 kV Dumaka – 2
   220 kV bus 2: 400/220 kV ICT – 1, 220 kV Dhanbad – 1, 220 kV Kalayaneswari – 1s, 220 kV Dumaka – 1

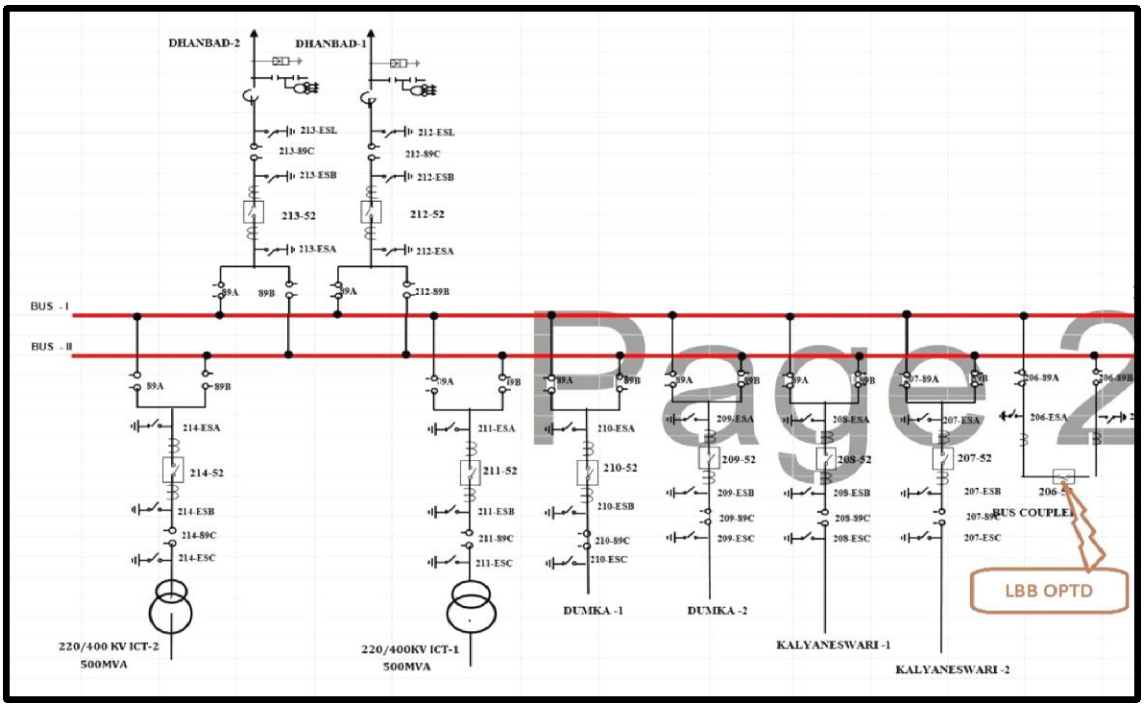


Figure 1: SLDC of 220 kV level of Maithon S/S

5) **Load and Generation loss:** 119 MW load loss at Dumka, Pakur and Deoghar area with no generation loss
6) **Major elements tripped:**
   - 220KV Maithon-Kalyaneswari-D/C
   - 400/220kV ICT-I&II at Maithon
   - 220kV Maithon-Dumka D/C
   - 220kV Maithon-Dhanbad D/C

7) Network across affected area

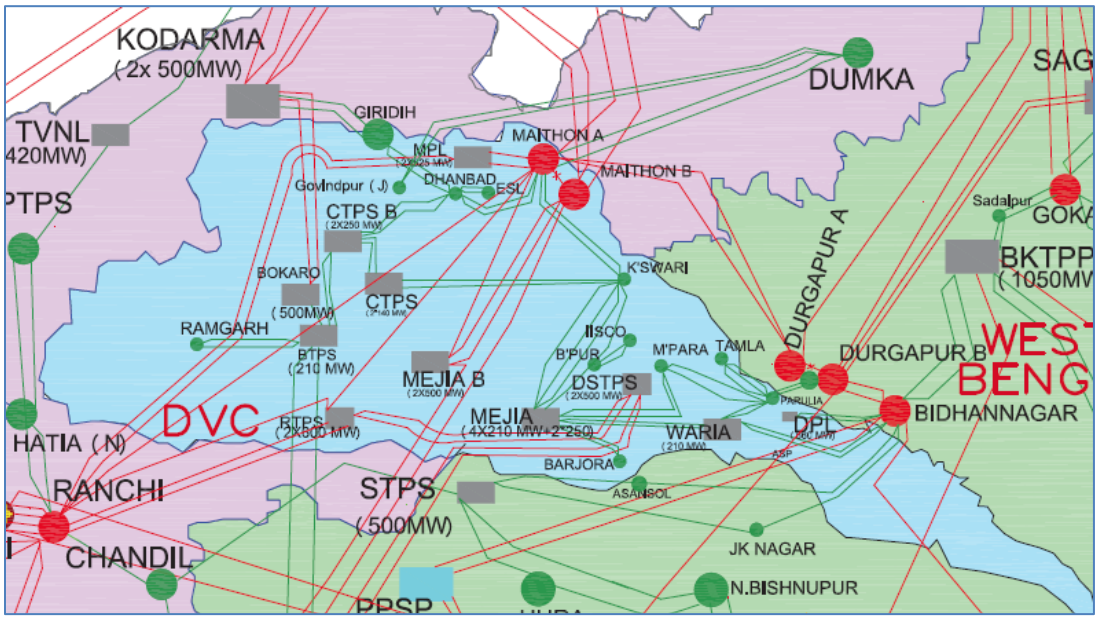


Figure 2: Network across affected area

8) Detailed Analysis:

At 15:14 hrs, of 25th Jan 2020, LBB relay (model: RAICA, make: ABB) of 220KV Bus-coupler trip extended to 220KV Bus-I&II. It resulted into tripping of all 220KV feeders along with 400/220 kV and 220/132 kV ICTs at Maithon station. It observed the trip contact of one current sensing unit (B-phase) became short permanently and extent the trip signal to 220KV Busbar relays. In Durgapur PMU data, no fault was observed. But 400 kV bus voltage became zero at PMU data recorded at Maithon S/S though no tripping of any 400 kV bus was reported by POWERGRID. PG ER-II may check the input of voltage measurement at Maithon S/S.

9) SOE captured during the event:

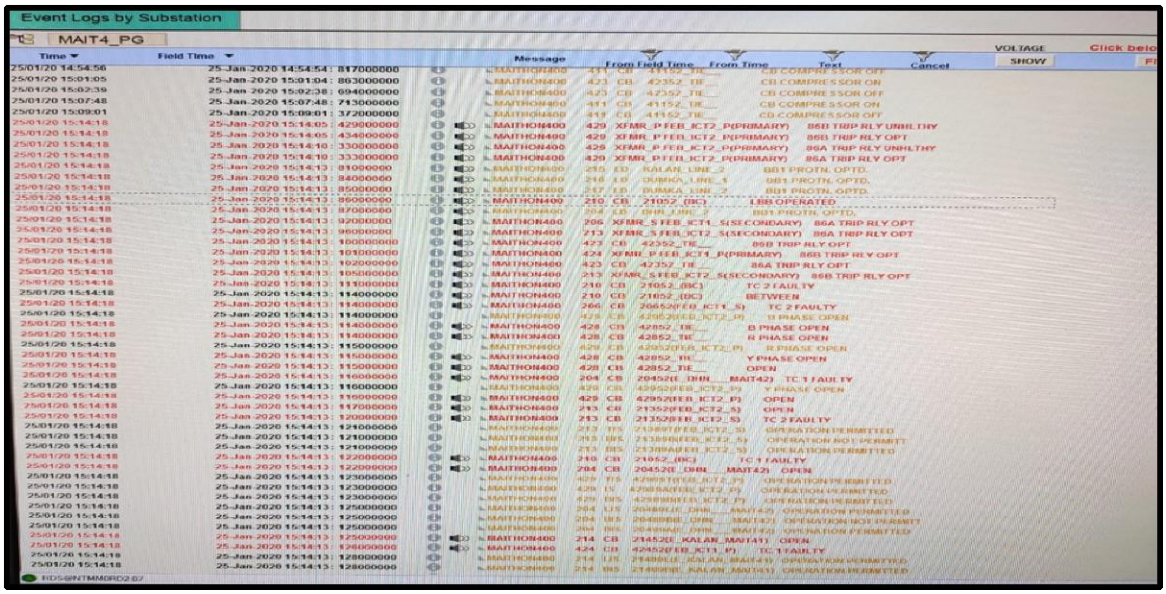


Figure 3: SOE captured during the event

10) PMU & SCADA observation:

In Durgapur PMU data, no fault was observed. But 400 kV bus voltage became zero at PMU data recorded at Maithon S/S.

Figure 4: Three phase voltage captured by Durgapur PMU at the time of disturbance

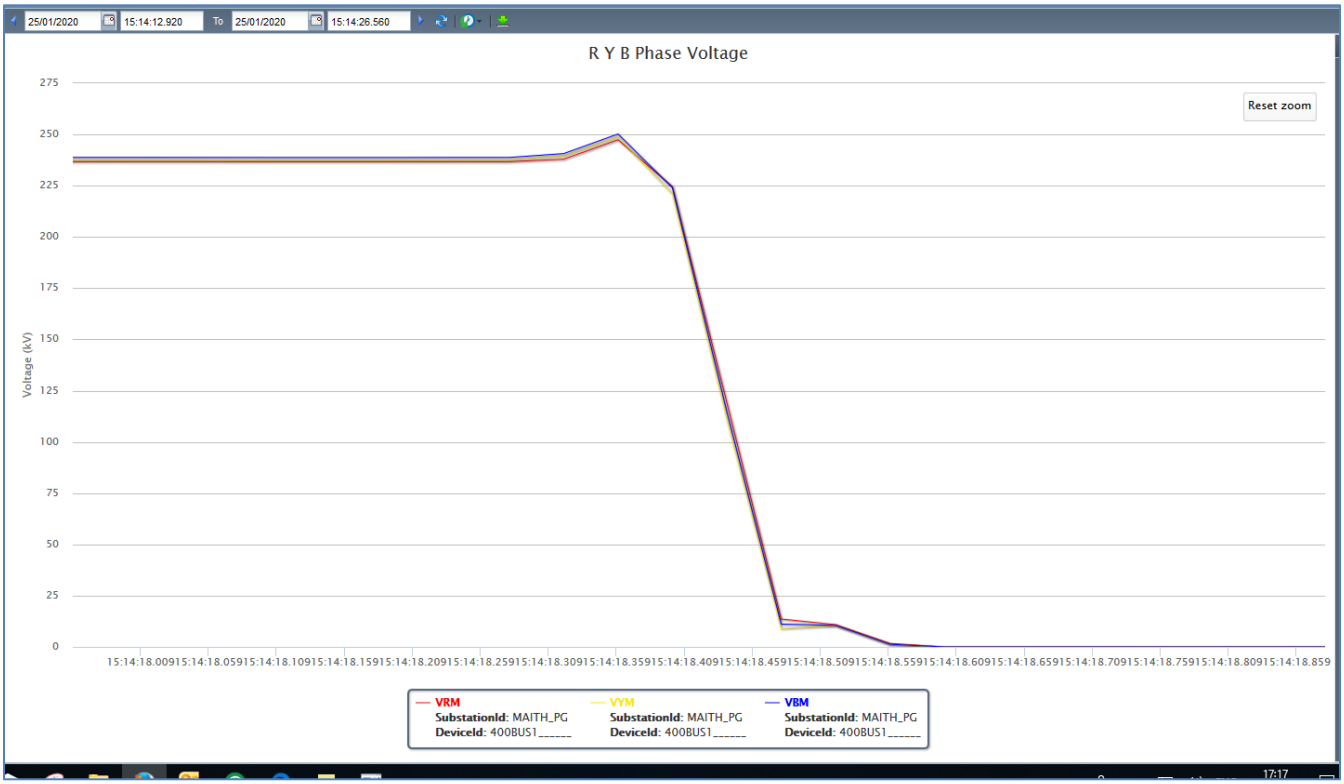


Figure 5: Three phase voltage captured by Maihon PMU at the time of disturbance

11) Restoration:

S. No.	Element Name	Type	Voltage Level	Owner	Time of tripping	Revival Date
1	220KV Bus-II	Bus	220 kV	PGCIL	15:47	25.01.20
2	220KV Bus-I	Bus	220 kV	PGCIL	15:48	25.01.20
3	220KV Kalyaneswari Line-1	Line	220 kV	DVC	15:47	25.01.20
4	220KV Kalyaneswari Line-2	Line	220 kV	DVC	15:48	25.01.20
5	315 MVA ICT 1	ICT	220 kV	PGCIL	15:51	25.01.20
6	315 MVA ICT 2	ICT	220 kV	PGCIL	15:52	25.01.20
7	220KV Dumka Line-1	Line	220 kV	JUSNL	15:57	25.01.20
8	220KV Dumka Line-2	Line	220 kV	JUSNL	15:58	25.01.20
9	220KV Dhanbad Line-1	Line	220 kV	DVC	15:47	25.01.20
10	220KV Dhanbad Line-2	Line	220 kV	DVC	16:01	25.01.20

12) Noncompliance and discrepancies observed:

1. The tripping occurred due to failure of trip contact in one of the current sensing unit (B-phase). Reason for failure may be shared by POWERGRID along with remedial action taken.
2. 400 kV bus voltage became zero at PMU data recorded at Maithon S/S though no tripping of any 400 kV bus was reported by POWERGRID. PG ER-II may check the input of voltage measurement at Maithon S/S.

Issues	Regulation Non-Compliance	Utility
Non-Submission of Details for the tripping which is required for appropriate analysis for GD/GI	1. IEGC 5.2 (r), 5.9.6.c (VI) 2. CEA grid Standard 15.3 3. CEA (Technical standards for connectivity to the Grid) Regulation, 2007-6. 4.d	Jharkhand SLDC
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)	POWERGRID ERTS - II

13) Status of Reporting:

Detail report along with DR/EL is yet to be received from BSPTCL. DR/EL is yet to be received from PG ER-II.

Report received from POWERGRID ERTS - II

1.0 Background

1.1 Multiple tripping occurred at 220 kV Bus-1 & II at Maithon sub-station at 15:14 hrs on dated- 25.01.2020. Trip elements are – 500MVA ICT-I&II, 220KV MTN-Dhanbad Ckt.-I&II, 220KV MTN-Kalyaneswari Ckt.-I&II and 220KV MTN-Dumka Ckt.-I&II.

1.2 All connected feeders are in service and 220KV Bus configuration as follows:

220kV Bus-1	**220kV Bus-2**
1. ICT-2	1. ICT-1
2. Dhanbad-2	2. Dhanbad-1
3. Kalayaneswari-2	3. Kalayaneswari-1
4. Dumka-2	4. Dumka-1

All elements of 220KV system of Maithon substation were in service before the incidence.

2.0 Multiple element tripping at 220kV Maithon station on 25th Jan, 2020 at 15:14 hrs

A. *Event Summary:*

At 15:14 hrs. of 25th Jan 2020, LBB relay (model: RAICA, make: ABB) of 220KV Bus-coupler trip extended to 220KV Bus-I&II. It resulted into tripping of all 220KV feeders at Maithon station.

It observed the trip contact of one current sensing unit (B-phase) became short permanently and extent the trip signal to 220KV Busbar relays. The event sequence attached in annex.-I.

B. *Antecedent Connectivity:*

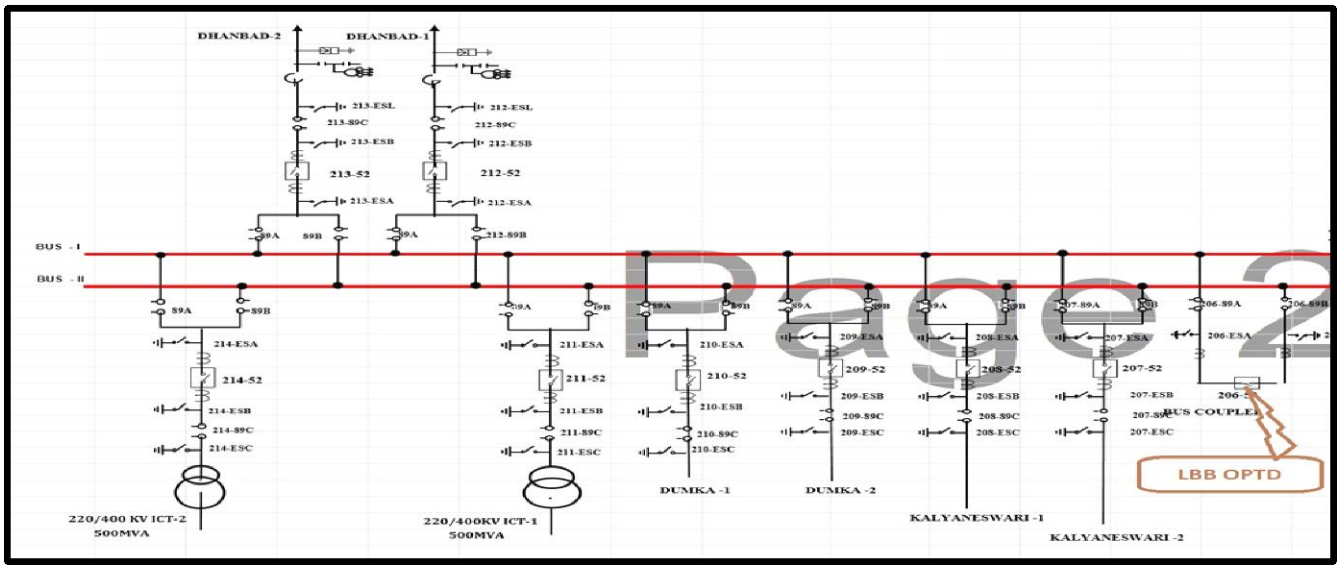


Fig1: 220kV Maithon substation SLD

C. *Load loss:*

Load Loss: Load loss of around 119MW in JSEB at Dumka.

D. *Sequence of Event:*

o.	(in hrs)	ence time n sec)	Description	Remarks
	14:18,860	0	LBB optd in 220KV Buc Coupler	eference time from SOE
	14:18,870	10	220KV BB-1 operated	eference time from SOE
	14:18,870	10	220KV BB-2 operated	eference time from SOE
	14:18,920	60	ICT-1 86T optd.	eference time from SOE
	14:18,960	100	ICT-1 86T optd.	eference time from SOE
	14:18,910	50	220KV Kalyaneswari Line-1&2	eference time from SOE
	14:18,920	60	220KV Dumka Line-1&2	eference time from SOE
	14:18,940	80	220KV Dhanbad Line-1&2	eference time from SOE

E. *Restorations:*

	Name		evel		ipping	te
	s-II		220 kV		:47	.01.20
	s-I		20 kV		48	01.20
	yaneswari Line-1		20 kV		47	01.20
	yaneswari Line-2		20 kV		48	01.20
	CT 1		20 kV		51	01.20
	CT 2		220 kV		52	01.20
	mka Line-1		220 kV		57	01.20
	mka Line-2		220 kV		58	01.20
	anbad Line-1		220 kV		47	01.20
	anbad Line-2		220 kV		01	01.20

A. Observation:

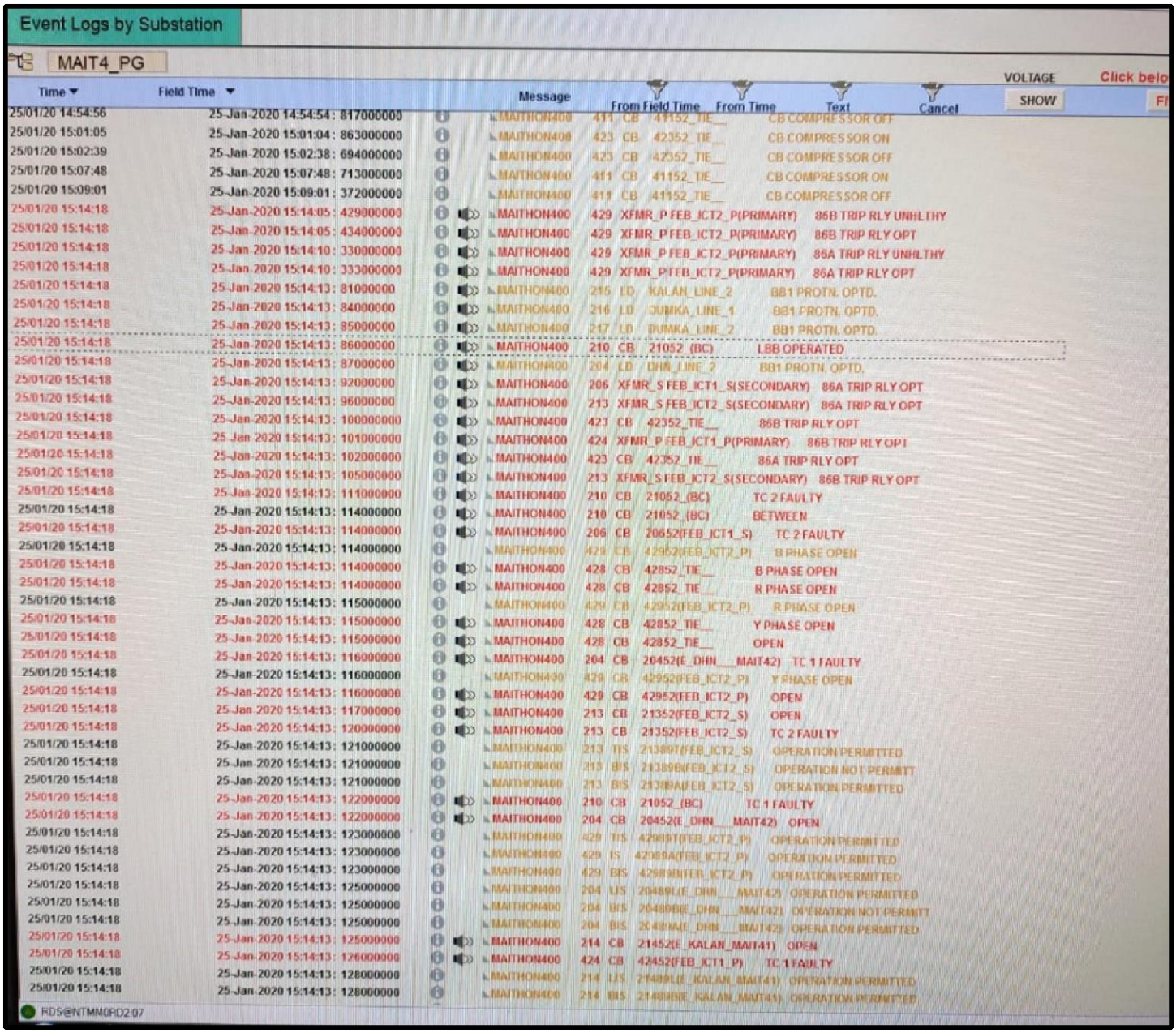
- The tripping occurred due to failure of trip contact in one of the current sensing unit (B-phase).

B. Remedial action already taken:

- The LBB relay (RAICA, ABB) replaced with spare unit and protection restored.

Annex-1

Sequence of Event:



Event Logs by Substation

MAIT4_PG

VOLTAGE SHOW Click belo

Time	Field Time	Message	From Field Time	From Time	Text	Cancel
25/01/20 14:54:56	25-Jan-2020 14:54:54: 817000000	MAITHON400 411 CB 41152_TIE__ CB COMPRESSOR OFF				
25/01/20 15:01:05	25-Jan-2020 15:01:04: 863000000	MAITHON400 423 CB 42352_TIE__ CB COMPRESSOR ON				
25/01/20 15:02:39	25-Jan-2020 15:02:38: 694000000	MAITHON400 423 CB 42352_TIE__ CB COMPRESSOR OFF				
25/01/20 15:07:48	25-Jan-2020 15:07:48: 713000000	MAITHON400 411 CB 41152_TIE__ CB COMPRESSOR ON				
25/01/20 15:09:01	25-Jan-2020 15:09:01: 372000000	MAITHON400 411 CB 41152_TIE__ CB COMPRESSOR OFF				
25/01/20 15:14:18	25-Jan-2020 15:14:05: 429000000	MAITHON400 429 XFMR_P FEB_ICT2_P(PRIMARY) 86B TRIP RLY UNHLTHY				
25/01/20 15:14:18	25-Jan-2020 15:14:05: 434000000	MAITHON400 429 XFMR_P FEB_ICT2_P(PRIMARY) 86B TRIP RLY OPT				
25/01/20 15:14:18	25-Jan-2020 15:14:10: 330000000	MAITHON400 429 XFMR_P FEB_ICT2_P(PRIMARY) 86A TRIP RLY UNHLTHY				
25/01/20 15:14:18	25-Jan-2020 15:14:10: 333000000	MAITHON400 429 XFMR_P FEB_ICT2_P(PRIMARY) 86A TRIP RLY OPT				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 81000000	MAITHON400 215 LD KALAN_LINE_2 BB1 PROTN. OPTD.				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 84000000	MAITHON400 216 LD DUMKA_LINE_1 BB1 PROTN. OPTD.				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 85000000	MAITHON400 217 LD DUMKA_LINE_2 BB1 PROTN. OPTD.				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 86000000	MAITHON400 210 CB 21052_(BC) LBB OPERATED				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 87000000	MAITHON400 204 LD DHN_LINE_2 BB1 PROTN. OPTD.				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 92000000	MAITHON400 206 XFMR_S FEB_ICT1_S(SECONDARY) 86A TRIP RLY OPT				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 96000000	MAITHON400 213 XFMR_S FEB_ICT2_S(SECONDARY) 86A TRIP RLY OPT				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 100000000	MAITHON400 423 CB 42352_TIE__ 86B TRIP RLY OPT				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 101000000	MAITHON400 424 XFMR_P FEB_ICT1_P(PRIMARY) 86B TRIP RLY OPT				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 102000000	MAITHON400 423 CB 42352_TIE__ 86A TRIP RLY OPT				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 105000000	MAITHON400 213 XFMR_S FEB_ICT2_S(SECONDARY) 86B TRIP RLY OPT				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 111000000	MAITHON400 210 CB 21052_(BC) TC 2 FAULTY				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 114000000	MAITHON400 210 CB 21052_(BC) BETWEEN				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 114000000	MAITHON400 206 CB 20652(FEB_ICT1_S) TC 2 FAULTY				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 114000000	MAITHON400 428 CB 42852_TIE__ B PHASE OPEN				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 114000000	MAITHON400 428 CB 42852_TIE__ R PHASE OPEN				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 115000000	MAITHON400 429 CB 42952(FEB_ICT2_P) R PHASE OPEN				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 115000000	MAITHON400 428 CB 42852_TIE__ Y PHASE OPEN				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 115000000	MAITHON400 428 CB 42852_TIE__ OPEN				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 116000000	MAITHON400 204 CB 20452(E_DHN___MAIT42) TC 1 FAULTY				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 116000000	MAITHON400 429 CB 42952(FEB_ICT2_P) Y PHASE OPEN				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 116000000	MAITHON400 429 CB 42952(FEB_ICT2_P) OPEN				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 117000000	MAITHON400 213 CB 21352(FEB_ICT2_S) OPEN				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 120000000	MAITHON400 213 CB 21352(FEB_ICT2_S) TC 2 FAULTY				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 121000000	MAITHON400 213 TIS 21389T(FEB_ICT2_S) OPERATION PERMITTED				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 121000000	MAITHON400 213 BIS 21389B(FEB_ICT2_S) OPERATION NOT PERMITT				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 121000000	MAITHON400 213 BIS 21389A(FEB_ICT2_S) OPERATION PERMITTED				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 122000000	MAITHON400 210 CB 21052_(BC) TC 1 FAULTY				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 122000000	MAITHON400 204 CB 20452(E_DHN___MAIT42) OPEN				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 123000000	MAITHON400 429 TIS 42989T(FEB_ICT2_P) OPERATION PERMITTED				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 123000000	MAITHON400 429 TIS 42989A(FEB_ICT2_P) OPERATION PERMITTED				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 123000000	MAITHON400 429 BIS 42989B(FEB_ICT2_P) OPERATION PERMITTED				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 125000000	MAITHON400 204 LIS 20489LIE_DHN___MAIT42) OPERATION PERMITTED				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 125000000	MAITHON400 204 BIS 20489BIE_DHN___MAIT42) OPERATION NOT PERMITT				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 125000000	MAITHON400 204 BIS 20489AIE_DHN___MAIT42) OPERATION PERMITTED				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 125000000	MAITHON400 214 CB 21452(E_KALAN_MAIT41) OPEN				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 126000000	MAITHON400 424 CB 42452(FEB_ICT1_P) TC 1 FAULTY				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 128000000	MAITHON400 214 LIS 21489LIE_KALAN_MAIT41) OPERATION PERMITTED				
25/01/20 15:14:18	25-Jan-2020 15:14:13: 128000000	MAITHON400 214 BIS 21489BIE_KALAN_MAIT41) OPERATION PERMITTED				

RDS@NTMMDRD2:07

Annexure-B7

"ANALYSIS OF OUTAGE OF DARBHANGA 400kV GIS SUB STATION"

Presentation to the Eastern Regional Power Committee (ERPC)

On February 18, 2020

Presentation by:

Alipurduar Transmission Ltd

TATA Consulting Engineers

ALIPURDUAR TRANSMISSION LIMITED

TATA CONSULTING ENGINEERS LIMITED

CONTENTS

1. Project Details
2. Layout of Darbhanga Substation
3. Instances of Tripping & Restorations
4. Root Cause Analysis
5. Summary
6. Our Prayer to the Committee

PROJECT DETAILS:

Alipurduar Transmission Ltd. (ATL) is a wholly-owned subsidiary of Kalpataru Power Transmission Ltd. (KPTL)

The project comprises of:

- **Element 1 :** 116Km 400 KV D/C transmission Line from Alipurduar (POWERGRID) to Siliguri (POWERGRID)

- **Element 2 :** 209Km 400 KV D/C transmission Line from Kishanganj (Powergrid) -Darbhanga (DMTCL) and fourth diagonal at Darbhanga 400kV GIS substation. The other first three diagonals are owned and operated by DMTCL.

Element 2 was commissioned on 11th March 2019.

DARBHANGA SUBSTATION : 4th DIAGONAL DETAILS

- Two bays are connected to Darbhanga-Kishanganj 209km transmission line circuit-I & II with switchable shunt reactor each of 80MVAr rating.

- The line breakers are provided with series Pre-Insertion Resistor (PIR) of value 425 ohms and the line reactors are provided with Point on Wave (POW) switching devices.

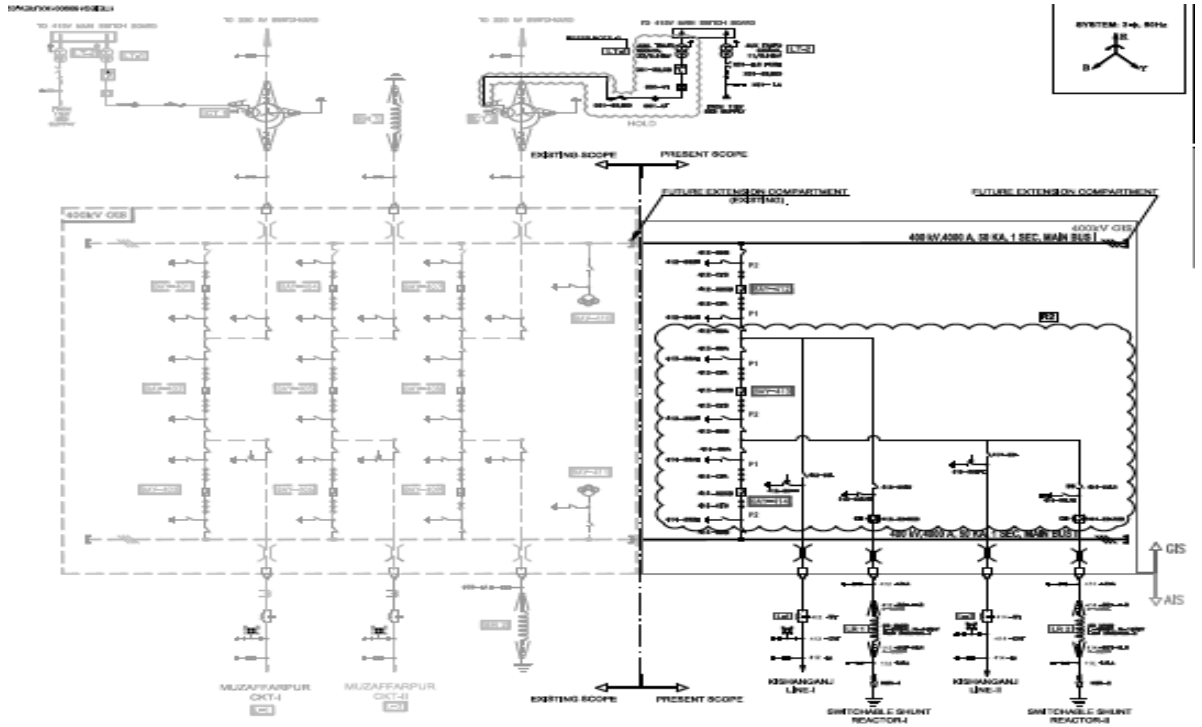


Fig.1: SLD

ALIPURDUAR TRANSMISSION LIMITED

TATA CONSULTING ENGINEERS LIMITED

INCIDENTS OF TRIPPING & RESTORATION (1/2)

- There was a heavy localized storm/high wind speed on 29th May 2019 around 21:30hrs.
- A tripping incident occurred at 21:44hrs due to R-Phase to earth fault in 400kV Kishanganj — Darbhanga Circuit I & II at 21:44hrs at 51Km from Darbhanga S/S end.
- The breakers of line-1 (CB 412) and line-2 (CB 414) performed making and breaking operations due to reclose operation.
- The ground patrolling team found a collapsed tower of type DA+3,No. 96/3 near Koshi river in Sudhpur Village, Supaul Dist.

Fig. 2: Tower Collapse 96/3

INCIDENTS OF TRIPPING & RESTORATION (2/2)

- On 7th June, inspection of the substation was carried and subsequently found that PIR of line-2 CB 414 was damaged.
- Both the lines were charged on 11th June'19 through tie CB 413 and line-1 CB 412 after tower rectification. Line-2 CB 414 was kept open.
- On 22nd June, line-2 tripped through tie CB 413 due to SLG fault while line-1 was still in operation. At 17:30hrs line-2 was re-energized. At 19:00hrs bus bar-1 operated and tripped both the lines. Subsequently, it was found that PIR of line-1 CB 412 was damaged.
- Rectification work was immediately started, line-1 was charged successfully on 23rd July and line-2 on 27th July'19.

Fig.3: Damaged PIR

ROOT CAUSE ANALYSIS

- TATA Consulting Engineers (TCE) were engaged as Independent Subject Matter Experts
- **Events list as per the DR:**

Event-1: SLG fault occurred on Darbhanga-Kishanganj line-II on A-phase at 21.43.57.207hrs.

Event-2: A-phase of 414 Bay opened after 80ms.

Event-3: SLG fault occurred on Darbhanga-Kishanganj line-I on A-phase at 21.43.57.685hrs.

Event-4: A-phase of 412 Bay opened after 80ms.

Event-5: Darbhanga-Kishanganj Line-II reactor is opened at 21.43.58.158hrs.

Event-6: A-phase of 414 Bay breaker recloses on to the fault at 21.43.58.197hrs.

Event-7: All the three phases of 414 bay breaker tripped at 21.43.58.258hrs.

Event-8: A-phase of 412 Bay breaker recloses on to the fault at 21.43.58.681hrs.

Event-9: All the three phases of 412 bay breaker tripped after 100ms.

Event-10: the busbar-2 protection operated and tripped all the 403, 406, 409 breakers connected to it due to heavy fault current in A-phase at 21.44.02.389hrs.

Event-11: D-L line I was closed on to a fault from Darbhanga side through the 412-bay breaker at 22.50.42.569.

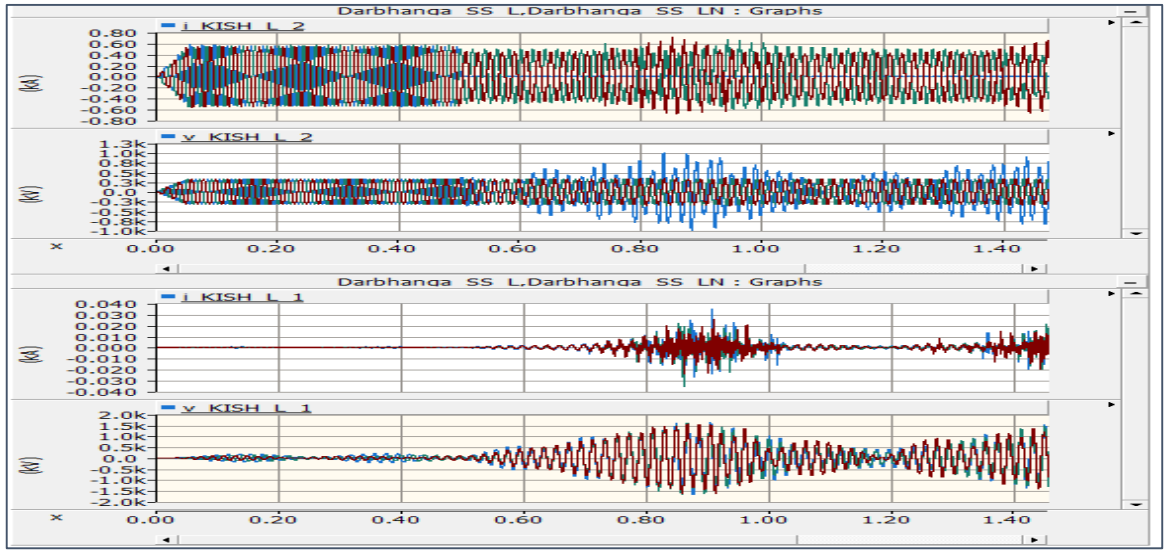
Event-12: Darbhanga-Kishanganj line-II was closed on to a fault from Kishanganj side at 23.00.06.126.

Event-13: The busbar-2 was energized through the breaker 409 from busbar-1 by closing the A-phase of the breaker, the breaker was tripped instantaneously by the bus bar protection at 23.45.57.508.

KEY OBSERVATIONS (1/2)

- RCA based on EMTP simulations considering tower collapse has caused series of ON – OFF operation resulting in severe transient over voltage due to parallel resonance.

- Each line of Darbhanga - Kishanganj generates reactive power of 188 MVAr and is compensated with 160 MVAr line shunt reactors, which is more than 70% of the required shunt compensation



Over voltage up to 1683 KV under Parallel resonance during temporary fault conditions is observed.

KEY OBSERVATIONS (2/2)

- As per the CIGRE WG C4.307: Resonance and Ferro-resonance in power networks, Feb 2014, lines compensated more than 70% are susceptible to parallel resonance at power frequency.

- One of the case studies such as when reactors are left in service condition on an un-energized line results in high over voltages of more than 1500 kV on un-energized line phases and 1000 kV on energized line phase due to parallel resonance between the un-energized Darbhanga - Kishanganj line and their respective line shunt reactors.

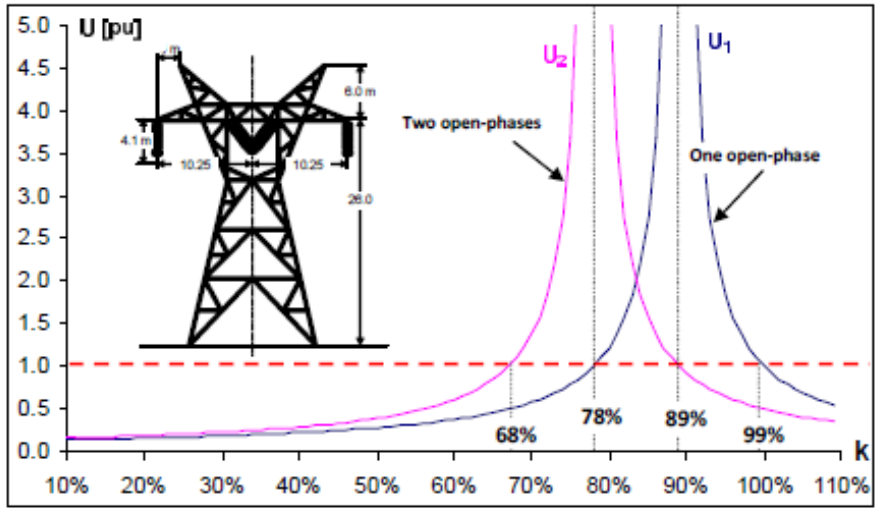


Figure 4-6 Steady-State open-phase voltage (approximate analytical solution) in a 400 kV line as a function of the Shunt Compensation Degree, k.

CIGRE WG C4.307 showing compensation vs over voltage on open phase

SUMMARY

- We can infer that the system is susceptible to and impacted of severe over voltages due to parallel resonance

- These existed during the tower collapse due to multiple switching operation (trip auto-reclose trip) by all the three Circuit Breakers in quick succession developing series of overvoltages.

- The series of overvoltage stress in a very short span of time have impacted the insulation level of PIR and led to the damage.

- These incident appear beyond reasonable control i.e. Force Majeure conditions

OUR PRAYER TO THE EASTERN REGIONAL POWER COMMITTEE (ERPC)

- Considering the merits of the subject, we request the ERPC to treat the incident as beyond the control of ATL

- Significant resources have been deployed to address the failure & restore the line at earliest

- We request that ERPC considers this under provisions of clause 4 & 5 of Procedure for Calculations of Transmission System Availability as events of Deemed availability.

THANK YOU

List of important transmission lines in ER which tripped in January, 2020										Annexure-B9
S.NO	**LINE NAME**	**TRIP DATE**	**TRIP TIME**	**Relay Indication LOCAL END**	**Relay Indication REMOTE END**	**Reason**	**Fault Clearance time in msec**	**DR/EL RECEIVED FROM LOCAL END**	**DR/EL RECEIVED FROM REMOTE END**	**PCC Comments**
1	220KV-PUSAULI-SAHUPURI-1	01-01-2020	16:35	R-Y-B, 127.2 KM, F/C=2 KA IN EACH PHASE	No tripping	R-Y-B Fault	2000 msec	YES	NO	Z-3 at Sasaram, DR not Standardised
2	400KV-BIHARSARIFF(PG)-VARANASI-2	02-01-2020	11:22		DT received at Varanasi.	DT received at Varanasi.	--	NO	NO	Defective wire in DT circuit at Bihar Sharif which has been rectified.
3	400KV-JAMSHEDPUR-ANDAL-2	08-01-2020	08:36	DT received		DT received at Jamshedpur	--	YES	NO	Andal end to confirm about DT sent
4	400KV-MAITHON-KHSTPP-1	11-01-2020	18:41		DT received	DT received at Kahalgaon	--	NO	NO	PGCIL ER-2 and Kahalgaon to send DR
5	220KV-DARBHANGA (DMTCL)-MOTIPUR-2	13-01-2020	21:14	DT received at Motipur		DT received at Motipur	--	NO	NO	BSPTCL and DMTCL to send DR
6	220KV-BOLANGIR(PG)-SADEIPALI-1	16-01-2020	13:34	MASTER TRIP RELAY		MASTER TRIP RELAY	--	NO	NO	DC charger switchover problem at Sadeipalli, rectified
7	220KV-DARBHANGA (DMTCL)-MOTIPUR-2	17-01-2020	08:40	DT RECEIVED		DT RECEIVED AT DMTCL	--	NO	NO	BSPTCL and DMTCL to send DR

S.NO	LINE NAME	TRIP DATE	TRIP TIME	Relay Indication LOCAL END	Relay Indication REMOTE END	Reason	Fault Clearance time in msec	DR/EL RECEIVED FROM LOCAL END	DR/EL RECEIVED FROM REMOTE END	PCC Comments
8	400KV-KODERMA-BIHARSARIFF(PG)-2	17-01-2020	12:22	21.8 km,R-N,Z0	R-N,98.689 km,z-1, 5.495 KA, A/R unsuccessful	R-N Fault	1000 msec	NO	YES	Fault in reclaim time
9	400KV-MEERAMUNDALI-ANGUL-2	21-01-2020	08:25	Triped from Meeramundali end only		Triped from meeramundali end only	--	YES	NO	DT received at Meeramundali, PGCIL to check about DT sent
10	220KV-PATNA-SIPARA-2	24-01-2020	11:50	False tripping			--	NO	NO	BSPTCL to send DR
11	220KV-PATNA-SIPARA-1	24-01-2020	12:34	Mal operation during maintenance		Mal operation during maintenance	--	NO	NO	BSPTCL to send DR
12	220KV-BUDHIPADAR-RAIGARH-1	26-01-2020	01:58		O/V at Raigarh	O/V at Raigarh	--	NO	NO	OK
13	220KV-SILIGURI-KISHANGANJ(PG)-1	12-01-2020	06:39	A/R successful,Y-N, 74.87 km,z1 ,2.223 KA	Y-N,4.34 ka,29.7 km	Y-N Fault	< 100 msec	YES	YES	PD at Kishangunj, Defective BCU has been replaced

S.NO	LINE NAME	TRIP DATE	TRIP TIME	Relay Indication LOCAL END	Relay Indication REMOTE END	Reason	Fault Clearance time in msec	DR/EL RECEIVED FROM LOCAL END	DR/EL RECEIVED FROM REMOTE END	PCC Comments
14	220KV-GAYA-SONENAGAR-2	13-01-2020	00:40	A/R successful at Gaya	B-N, 2.492KA, 22Km	B-N Fault	< 100 msec	YES	YES	Discussed in item no : B3
15	220KV-GAYA-SONENAGAR-1	13-01-2020	00:40	A/R successful at Gaya			< 100 msec	YES	YES	Discussed in item no : B3
16	220KV-BOLANGIR(PG)-SADEIPALI-1	13-01-2020	06:45		Tripped From Sadeipalli end only	Tripped From Sadeipalli end only	500 msec	NO	NO	DC charger switchover problem, rectified
17	220KV-CHANDIL-STPS(WBSEB)-1	14-01-2020	05:32	A/R Successful, R_N, 83 KM, 1.9 kA	R_N, 54 KM, 5.432 kA	R-N Fault	< 100 msec	YES	NO	A/R Lockout at STPS, To be rectified by WBSETCL
18	400KV-ALIPURDUAR (PG)-BINAGURI-3	16-01-2020	15:52	TRIPPED ON ZONE 3 SENSING CKT 4'S FAULT AT BINAGURI			100 msec	NO	NO	PGCIL ER-II to reply
19	220KV-CHANDIL-STPS(WBSEB)-1	20-01-2020	21:22	A/R successful	Y_N, 5.19 kA, 20.30 KM	Y-N Fault	< 100 msec	YES	NO	A/R Lockout at STPS, To be rectified by WBSETCL
20	400KV-RANGPO-TEESTA-V-2	29-01-2020	17:22	Y-N , 14 KM , 2.5 KA		Y-N Fault	< 100 msec	NO	NO	CB fault at Teesta-V

ANNEXURE-C1

Sl No.	Name of the incidence	PCC Recommendation	Latest status
87th PCC Meeting			
1.	Disturbance at CTPS-A 220 kV/132 kV substation on 28.12.2019 at 05:26 Hrs.	PCC advised DVC to take following corrective actions: - • Retrofitting of 220 kV CTPS-A bus bar protection is to be done at the earliest • 220/132kV ATR protection settings to be reviewed • Zone settings of 220 kV CTPS-A-CTPS-B Tie Ckt-1 and 2 to be reviewed. • Relay settings at Unit #8 of CTPS-B plant to be reviewed.	*DVC informed that they there is no plan to retrofit the 220 kV CTPS-A bus bar protection in near future.* *They have reviewed the ATR protection settings.* *They have reviewed zone settings.*
2.	Tripping of 220 KV Darbhanga (DMTCL) – Motipur I on 14.12.2019 at 02:50 Hrs.	PCC advised BSPTCL to take following corrective actions: - • Digital signals configuration of relays at Motipur end need to be checked. • Over voltage settings of relay at Motipur end need to be reviewed.	
3.	Tripping of 132 kV Dumka – Lalmatia D/C on 09.12.2019 at 11:35 hrs	PCC advised JUSNL to collect DRs and discuss above issue with the SLDC and send the details to ERPC/ERLDC. PCC advised NTPC to share the DR at Lalmatia end.	*JUSNL informed that they did not got the reply from SLDC Jharkhand yet.*
4.	CT failure of 220 kV Gokarna – Sadaipur – 2 at Gokarna on 06.12.2019 at 10:58 Hrs	PCC advised WBSETCL to review the 400/220kV ICT protection settings and carry out the protection coordination between 220kV and 400kV system to avoid uncoordinated tripping.	*WBSETCL informed that they have reviewed the settings.*
5.	Disturbance at Liluah substation on 27.11.2019 at 02:36 Hrs	PCC advised WBSETCL to reduce their Zone-2 time setting to 250 ms for the time coordination between line tripping and CESC islanding.	*WBSETCL informed that they would reduce their Zone-2 time setting to 250 ms.*

		PCC also advised CESC to study whether they can increase the SPS time setting from 300 ms for better safety margin between time settings of WBSETCL protection system and CESC islanding scheme.	
83rd PCC Meeting			
7.	Total power failure at 220 kV Darbhanga (BSPTCL) S/s on 16.08.2019 at 22:23 Hrs.	PCC observed that DR configuration at DMTCL end is not in order. PCC advised DMTCL to configure the DR settings as per the standard. In 87th PCC meeting, DMTCL informed that DR would be configured by end of February, 2020.	
81st PCC Meeting			
8.	Disturbance at 400 kV Dikchu S/s on 30.06.2019 at 09:55 Hrs.	The time setting for the DEF relay at Jorethang end was 500 msec. PCC advised Jorethang to review the timer setting of DEF protection at Jorethang end. PCC advised Chuzachen to review the zone settings for 132 kV Chuzachen-Rangpo line. PCC advised TPTL to do line patrolling for 400 kV Rangpo-Dikchu line to find out the cause of such high resistive fault in the line. In 87th PCC meeting, Chuzachen informed that they have asked for information related to Rangpo end from Powergrid and Sikkim. Further, Chuzachen informed that they would send the zone setting file to ERPC/ERLDC at the earliest.	
9.	Disturbance at 220 kV Budhipadar(OPTCL) S/s on 12.06.2019 at 00:37 Hrs.	PCC advised OPTCL to properly configure the DRs for 220 kV Budhipadar – Korba D/C & 220 kV Budhipadar-Raigarh circuit at Budhipadar end and for 220 kV Budhipadar – Lapanga - II at Lapanga end as per the DR	

		standard finalised in 79th PCC Meeting. PCC also advised OPTCL to check the time synchronization. In 3rd TeST meeting, OPTCL informed that they had replaced the old relay at Korba. In 87th PCC meeting, OPTCL informed that DR for Budhipadar – Korba Circuit-I has been configured.	

Annexure-C4.1

ଓଡ଼ିଶା ଶକ୍ତି ସଂଚାରଣ ନିଗମ ଲିଃ.

ODISHA POWER TRANSMISSION CORPORATION LTD.

(A Government of ODISHA under Taking)

Regd. Office: Janpath, Bhubaneswar-751022, Odisha

OFFICE OF THE GENERAL MANAGER (O&M)

BHUBANESWAR ODISHA, PIN-751022

CIN: U40102OR2004SGC007553 GSTN: 21AAACO7873L1Z6

Letter No: TW-GM(O&M),CGM(O&M) 06/2015-271 Dated: 15-02-2020

To,

The Member Secretary ERPC Kolkata.

Sub:- Implementation of Auto Reclose in 220KV lines without Carr. Protection.

Sir,

Many of our 220KV lines do not have Auto Reclose facility due to non commissioning of PLCC/OPGW for some reasons though circuit breakers and relays are ready for Auto Reclose. The issues were being raised in ERPC PCC meeting agenda for years together. We are trying our best to implement Carr.Prot. In the mean time it is suggested to have Auto Reclose provision in 220KV lines without Carr. Protection due to the following reasons

Case-1—During zone-1 fault at both the ends the AR can put the line into service without availability of carrier protection.

Case-2---During zone-1 fault at one end and zone -2 fault at other end, only the side having zone-1 fault will be closed on AR. And other will trip in zone-2 time i.e. 350ms. Thus the only disadvantage is one side will be auto reclose . This will be better than blocking of AR due to carrier failure, saving most of outage.

Therefore necessary deliberation may be made for implementation of Auto Reclose single shot single pole in 220KV lines without Carr.Protection for improvement of availability of the lines.

Yours faithfully

15.02.2020

Md. Ziaul Huda

G.M.(El) O/o CGM (O&M). OPTCL

c.c. CGM (O&M) OPTCL