Minutes
of
100th PCC Meeting

Date: 09.04.2021
Eastern Regional Power Committee
14, Golf Club Road, Tollygunge
Kolkata: 700 033

EASTERN REGIONAL POWER COMMITTEE

MINUTES OF 100TH PROTECTION SUB-COMMITTEE MEETING HELD ON 12.03.2021 AT 10:30 HOURS

PART – A

ITEM NO. A.1: Confirmation of minutes of 99th Protection sub-Committee Meeting held on 12th February 2021 through MS Teams.

The minutes of 99th Protection Sub-Committee meeting held on 12.02.2021 circulated vide letter dated 26.02.2021.

Members may confirm the minutes of 99th PCC meeting.

Deliberation in the meeting

Members confirmed the minutes of 99th PCC Meeting.

PART – B

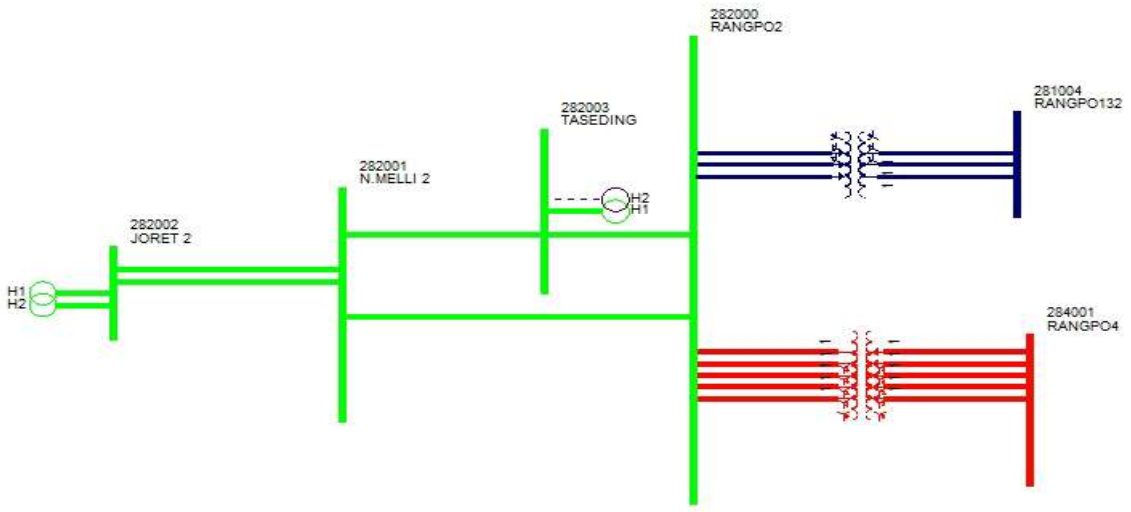
ITEM NO. B.1: Total Power Failure at 220 kV Tashiding HEP

A. On 15-02-2021 at 14:30 hrs.

On 15-02-2021, 220 kV THEP-New Melli S/C was under shutdown and unit-1 of Tashiding HEP was under annual overhauling. Tashiding was connected to rest of the grid via 220 kV THEP – Rangpo S/C.

At 14:30 hrs, 220 kV THEP- Rangpo S/C tripped on B-phase to earth fault resulting in total power failure at THEP.

Relay indication has not been captured in both main 1 and main 2 DR recorded at Tashiding end.



Relay Indications:

Name	End 1	End 2	PMU Observation
220 kV THEP – Rangpo S/C	Tripped	B-N, Zone – 2, 31 km from Rangpo, F/C 1.7 KA	Around 5 kV gradual dip has been observed in B-phase voltage at Rangpo PMU data. The fault clearing time was around 1600 ms.

Gen. Loss : 34 MW

Outage Duration: 1 hr 06 min

Tashiding HEP & Powergrid may explain.

Deliberation in the meeting

Tashiding HEP informed that the weather was rainy and there was heavy thundering at the time of disturbance.

Based on DR analysis, the event was explained with help of a presentation which is attached at ***Annexure B1.***

- *There was a B-phase to earth fault in 220 kV Tashiding-Rangpo line.*
- *At Rangpo end, the main protection relay initially sensed the fault in zone-3, subsequently it was sensed in zone-2 and the line tripped from Rangpo end in zone-2 timing of distance protection.*
- *As per the relay indication of Tashiding end, there was B-phase to earth fault with maximum fault current of 568 A. There was no indication of zone operation for distance protection as well as no tripping at Tashiding end.*
- *The earthfault relay of Generating Transformer at Tashiding end picked up and tripped after around 1.5 sec of the fault inception resulting in total power failure at 220 kV Tashiding S/s.*
- *On analysis of the settings for GT neutral earth-fault relay, it was found that the settings value is not properly coordinated with that of the lines at Tashiding end.*

After detailed deliberation, PCC advised Tashiding HEP to review the settings of earthfault relay and following settings were recommended:

- *For GT: 160 A with TMS= 0.5*
- *For Lines at Tashiding end: 160 A with TMS=0.4*

PCC also advised to disable the high set operation in GT earthfault relay.

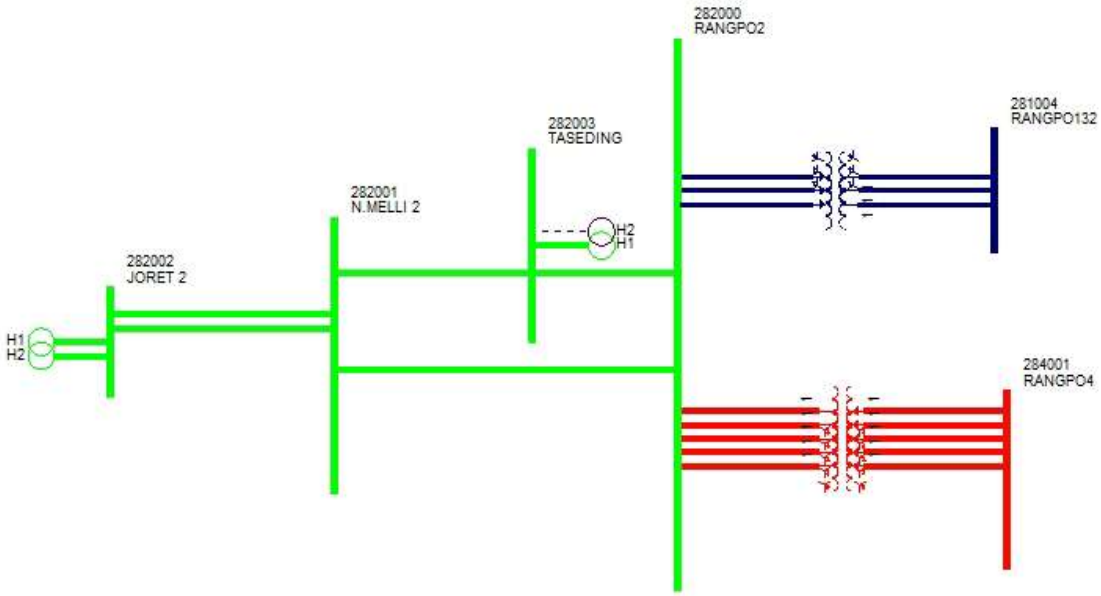
Regarding no indication of zone protection at Tashiding end, it was apprehended that digital indications of DRs at Tashiding end might be configured with relay output signals instead of the direct digital signals. As a result, for time delayed signals like zone-2, zone-3 etc. the digital indication were getting high only after delay time.

PCC advised Tashiding to check and review the configuration of the disturbance recorders.

B. On 17-02-2021 at 19:56 hrs.

On 17-02-2021 at 19:56 hrs, 220 kV THEP – New Melli S/C and 220 kV THEP – Rangpo S/C tripped on R and B phase fault resulting in total generation loss and blackout at 220kV THEP.

Successful auto reclose operation on R phase to earth fault has been observed from DR rerecorded at New Melli end.



Relay Indications :

Name	End 1	End 2	PMU Observation
220 kV THEP – New Melli S/C	Zone – 4, DT sent, 8 km (reverse direction)	R-B, F/C 4.5 kA, 18 km from New Melli.	Around 60 kV dip has been observed in R and B phase voltage at Rangpo PMU data. The fault clearing time was less than 100 ms
220 kV THEP-Rangpo S/C	B-N, Zone – 1, 33 km IR = 2.25 kA, IB = 2.7 kA	R-B, Zone – 2, F/C 4.3 kA,75 km from Rangpo	

Gen. Loss : 48 MW

Outage Duration: 51 min

Tashiding HEP & Powergrid may explain.

Deliberation in the meeting

Tashiding HEP informed that the weather was rainy and there was heavy thundering during the disturbance.

From the analysis of disturbance recorder received from Tashiding HEP & Powergrid, the followings were concluded:

220 kV Tashiding-Rangpo line:

As per relay indications of Main 1 and Main 2 Relay for 220 kV THEP- Rangpo S/C at Tashiding end, B-N fault was observed at 33 km from Tashiding end however high current is observed in R phase also. 220 kV THEP- Rangpo S/C tripped in zone 1 from Tashiding end.

Rangpo end sensed R-B phase to ground fault in zone-2 of distance protection and tripped after receiving carrier from Tashiding end.

Tashiding informed that initially carrier signal was sent to Rangpo end on operation of zone-1 protection and further DT signal was sent to Rangpo end.

220 kV Tashiding-New Melli line:

As per relay indication from Tashiding end, all zones(zone-1 to zone-4) started on R-B phase to ground fault and the line tripped on zone-1 of distance protection.

New Melli end sensed the fault in zone-3 of distance protection but tripped instantaneously after receiving DT from Tashiding end. The autorecloser was attempted from N. Melli end.

Regarding DT sent from Tashiding end to remote end during the disturbance, Tashiding HEP explained that as per the existing PSL setting, DT signal was sent if any trip signal has generated but zone tripping signal is not present.

After detailed deliberation,

PCC opined that there might be simultaneous faults in both 220 kV Tashiding-Rangpo and Tashiding-N.Melli section and advised Tashiding HEP for line patrolling to find out any clearance/sag issues.

PCC also advised Tashiding to submit the PSL settings file of both the lines for further analysis.

PCC advised Powergrid to check the reason for operation of autorecloser relay at New Melli end for a phase to phase fault.

As the Sequence of events for Tashiding HEP have not been recorded/received at ERLDC end, PCC also advised Tashiding HEP to rectify the issue at the earliest.

ITEM NO. B.2: Major grid events other than GD/GI

ITEM NO.B.2.1 : Disturbance at 220/132 kV Chandrapura A TPS on 10-02-2021 at 08:09 hrs

On 10-02-2021 at 08:09 hrs, 220/132 kV ICT 1, 2 & 3 and 132 kV Chandrapura-A TPS tripped resulting in power failure at 132 kV level.

Flash report received from DVC SLDC is attached in the **Annexure B 2.1**.

DVC may explain.

Deliberation in the meeting

DVC informed that the disturbance occurred at 08:09 hrs On 10-02-2021 due to snapping of swing bus of ATR on main bus.

They added that all the 132 kV lines got tripped from remote end on zone-2 of distance protection and all the 220/132 kV ICTs (ICT #1,2,3) tripped from LV side on overcurrent protection. This resulted into total power failure at 132 kV CTPS S/s.

They informed that ICT 1 and 3 were restored at 08:45 hrs.

ITEM NO.B.2.2: Tripping of 400 kV Bus - 1 and 2 at 400/220 kV Jeerat S/s on 17-02-2021 at 13:52 hrs

On 17-02-2021, 400 kV Jeerat-Bakreswar was under shutdown. At 13:52 hrs both 400 kV bus 1 and 2 at Jeerat tripped.

Report received from WBSETCL is enclosed at Annexure B2.2.

WBSETCL may explain.

Deliberation in the meeting

WBSETCL informed that *400 kV bus bar protection was under planned shutdown for integration of CT and SF6 gas tripping logic of new Jeerat 400 kV GIS with existing bus bar protection. The integration work being carried out by OEM i.e. ABB engineers.*

They informed that before testing the logic, the busbar switch for both zones was kept in "out" position and the test links for 96 relays were isolated. However, during testing the SF6 gas logic, all the 96 relays operated and tripped the connected elements.

They further informed that inadvertently tripping logic for bus-2 was simulated first instead of bus-1 and as a result all the elements connected to Bus-2 got tripped. Immediately after that, the OEM engineer simulate the tripping logic for bus-1 and remaining elements connected to bus-1 also got tripped.

On analysis of the disturbance, they found that due to wrong connection in test-links in the busbar panel, the 96 trip realys were never isolated by the test links. As a result both the buses got tripped on external trip function during the testing.

They informed that the wrong connections of test links have been rectified by the OEM.

PCC advised WBSETCL to take proper measures & precautions during testing of the relays to avoid similar type of incidents in future.

ITEM NO.B.2.3.: Tripping of 400 kV Bus-2 at 400/220 kV Baripada S/s on 23-02-2021 at 15:39 hrs

On 23-02-2021 at 13:52 hrs, 400 kV Bus-2 at 400/220 kV Baripada S/s tripped due to mal-operation of Gas density monitor (GDM) relay. 125MVAR bus reactor-1 got tripped during this bus tripping as its tie CB was out for annual maintenance planning of 400/220 kV ICT.

400 kV Bus-2 was later charged at 16:32 hrs and 125 MVAR B/R - 1 charged at 16:35 hrs.

The report received from POWERGRID Odisha is attached in the Annexure B 2.3.

POWERGRID Odisha may explain.

Deliberation in the meeting

*Powergrid explained the event with help of a presentation which is attached at Annexure **B2.3.***

Powergrid explained as follows:

- *On the day of disturbance, main bay & tie bay of ICT-3 was under shutdown.*

- *During checking of body protection of the ICT-3, R & Y phase of GD 36(associated with bus duct of 400 kV Bus-2) got picked up and tripped all the elements connected to main bus-2.*

- *On investigation, it was found that two of the wires emanating from WTI were burnt which resulted in mixing of DC & AC. The same was also confirmed as DC earthfault was appearing in the substation and MCB of AC supply tripped.*

- *They explained that operation of the GD 36 contact multiplication relays is due to capacitive discharging of long cable between GD (in switchyard) & CMR(GIS Hall) during the DC earth fault.*

They further informed that the burnt wires were properly insulated. The wires would be replaced in next available shutdown of ICT-3.

ITEM NO. B.2.4 : Disturbance at Meramundali on 21-02-2021 at 07:23 hrs

On 21-02-2021 at 07:23 hrs,315 MVA 400/220 kV ICT 2 at Meramundali caught fire after bursting of 220 KV B-phase bushing at 400/220 kV ICT 2 at Meramundali. At the same time, 220 KV Meramundali – Talcher STPP - 2 tripped from Talcher STPP end only.

OPTCL & Talcher STPP may explain.

Deliberation in the meeting

OPTCL informed that on 21-02-2021 at 07:23 hrs, 315 MVA 400/220 kV ICT 2 at Meramundali caught fire after bursting of 220 KV side B-phase bushing.

They added that no other disturbance was occurred during this incident. On a query from PCC, OPTCL informed that all the protections of ICT-2 i.e. differential, OTG, WTG, Buccholz operated during the event and 220 kV Meramundali-TSTPP-2 tripped from TSTPP end in zone-1 of distance protection.

TSTPP representative was not present in the meeting.

PCC advised NTPC to submit the details regarding tripping of 220 KV Meramundali – Talcher STPP-2 from Talcher STPP end to ERPC secretariat/ERLDC at the earliest.

ITEM NO. B.2.5.: Tripping of 220 kV Bus-2 at 220/132 kV Budipadar S/S on 27-02-2021 at 17:27 hrs

On 27-02-2021 at 17:27 hrs 220 kV Bus-2 at 220/132 kV Budipadar S/s got tripped due to mal-operation of LBB relay resulting in tripping of following elements connected with the 220 kV bus-2:

- 220 kV bus coupler at Budipadar
- 220 kV Budipadar IBTPS – 2 & 4
- 220 kV BudipadarBasundharaCkt 2
- 220 kV Budipadar VAL 2
- 220 kV Budipadar AAL 2
- 220 kV BudipadarTarkera 1
- 220 kV BudipadarBhusan 1

Bus bar tripping has earlier been occurred at Budipadar S/S on 16th July 2020, 13th March 2020, 08th October 2019 also.

OPTCL may explain.

Deliberation in the meeting

OPTCL informed that during the tripping of 400 kV Meramundali-Lapanga-1 line on Y-B phase to earth fault, the busbar protection of 220 kV Budhipadar main bus-2 operated and tripped all the feeders connected to Bus-2 except 220 kV Budhipadar-Lapanga feeder.

OPTCL explained that on 27-02-2021 at 17:27 hrs 220 kV Bus-2 at 220/132 kV Budipadar S/s got tripped due to mal-operation of LBB relay resulting in tripping of all connected feeder except 220 kV Budipadar- Lapanga circuit-I. They further told that fault was in 400 kV Meramundali - Lapanga-I at that time and bus bar protection bay unit of the line was not in operation. It further told that it was informed to Siemens and bus bar protection bay unit would be restored in two to three weeks.

Powergrid informed that they maintain higher no. of spare bay units for busbar relay of Siemens make because of their high rate of failure.

PCC advised OPTCL following:

I. *To disable the busbar protection until the the faulty bay unit is replaced/restored.*

II. *To reduce the zone-4 time settings in line with the earlier PCC guidelines till the bus-bar is not in operation.*

III. *To maintain the enough spare bay units of busbar protection relay in view of the importance of 220 kV Budhipadar S/s.*

IV. *To take up the issue with OEM for root cause analysis of the failure of bay units of busbar protection.*

ITEM NO. B.3: Repeated tripping of transmission lines connected to 400/220 kV Meramundali S/S

In February 2021, repeated tripping incidents occurred at transmission lines connected to 400/220 kV Meramundali S/S.

Details of tripping incidents are given in the report attached in **Annexure B.3.**

During few incidents, discrepancy in protection system has been observed which are mentioned in below.

Sr. No	Line Name	Trip Date	Trip time	Reason	Discrepancies observed
1	400 kV Meramundali - Bolangir-1	04-02-2021	01:29	B phase to earth fault	Fault was in B phase and B pole breaker tripped but during dead time high voltage in B phase observed at Bolangir due to secondary arcing which lead to O/V stg-2 operation and line tripping.
2	400 kV Meramundali - TSTPP-2	05-02-2021	15:07	B phase to earth fault	B phase fault but all three phase voltage increased to a very high value upto 900 kV at the instant of fault .A/R was unsuccessful .
3	400 kV New Duburi-Meramundali -1	06-02-2021	12:24	NoFault	There was no fault in line. Tripped during A/R of Meramundali - Mendhasal -2.

4	400 kV Meramundali - Mendasal-2	24-02-2021	13:17	R phase to earth fault	At the instance of charging, tripped after 300 ms delay .SOTF function needs to be checked.
5	400 kV Meramundali - Lapanga-1	27-02-2021	17:26	Y and B phase fault	TCB at Lapanga end opened instantly but MCB opened after 200 ms delay which caused fault feeding till 250 ms, although fault was in z-1 .
6	220 kV TSTPP-Meramundali -2	28-02-2021	12:02	R phase to earth fault	From DR it is clear that auto reclose was successful but after 800 ms of successful A/R, line tripped but no fault was noticed .

- OPTCL may share the root cause analysis of the discrepancies mentioned in above table.
- Problem of high voltage at Meramundali during faults has been already pointed out in 98th and 99th PCC meeting. Same has been observed in February also. OPTCL may share plan of action in order to early prevention of this problem.
- DR submitted from Meramundali end is of very less time frame and is not as per ERPC guideline.

OPTCL may explain.

Deliberation in the meeting

Regarding tripping of Meramundali-TSTPP on 05.02.2021, OPTCL informed that there was LA bursting which caused the disturbance.

Regarding tripping of 400 kV New Duburi- Meramundali -1 on 06.02.2021, they informed that the main bay of the circuit was out before the disturbance. Also, the autorecloser relay of tie bay was faulty due to which the A/R was not successful.

Regarding A/R issue in 400 kV Meramundali-Mendhasal line at Meramundali end, PCC advised to test the A/R scheme at the earliest.

Regarding delayed tripping of MCB at Lapanga end for fault in 400 kV Meramundali - Lapanga-1 on 27.02.2021, PCC advised to test the main circuit breaker at Lapanga end for 400 kV Meramundali - Lapanga-1.

Regarding tripping of 220 kV TSTPP- Meramundali -2 on 28.02.2021, OPTCL informed that the tripping was due to bush fire under the line. OPTCL was advised to send the DR file of the backup protection relay for this line.

ITEM NO. B.4: Repeated pole block of HVDC Talcher Kolar

In 2020-21, repeated incidents of pole block of HVDC Talcher Kolar have been observed. Details of all incidents shown in following table:

Element Name	Tripping Date	Tripping Time	Reason 1	Revival Date	Revival Time
HVDC Talcher Kolar pole - 2	16-07-2020	01:58	Tripping of 400kV Bus at Kolar	16-07-2020	03:36
HVDC Talcher Kolar pole - 1	16-07-2020	01:58	Tripping of 400kV Bus at Kolar	16-07-2020	04:48

Element Name	Tripping Date	Tripping Time	Reason 1	Revival Date	Revival Time
HVDC Talcher Kolar pole - 1	19-09-2020	05:02	Problem in smoothing reactor at Talcher end	19-09-2020	19:04
HVDC Talcher Kolar pole - 1	23-10-2020	21:33	Hand tripped due to fire at smoothing reactor at Talcher	01-11-2020	08:15
HVDC Talcher Kolar pole - 1	15-12-2020	16:33	Persistent DC line Fault, 49.7 Km from Talcher	15-12-2020	17:23
HVDC Talcher Kolar pole - 1	20-12-2020	21:24	Inlet temperature high in the valve cooling system	21-12-2020	07:44
HVDC Talcher Kolar pole - 1	26-02-2021	14:20	Hand tripped due to fire at smoothing reactor at Talcher		
HVDC Talcher Kolar pole - 2	26-02-2021	13:10	Hand tripped due to fire at smoothing reactor at Talcher	26-02-2021	14:20

HVDC Talcher Kolar is an important inter-regional link between ER and SR. Reliability of this link is very important with respect to power transmission to Southern Region.

Powergrid Odisha may share

- root cause for repeated fire incident at smoothing reactor at Talcher end.
- action taken in order to reduce the no of pole block of this HVDC link.

Powergrid may explain.

Deliberation in the meeting

Powergrid informed that tripping of HVDC Talcher Kolar-2 on 16-07-2020 was due to overvoltage issue at Kolar end on account of low demand.

They explained that due to aging and high pollution level, repeated fire incident at smoothing reactor at Talcher end were observed.

They informed that one of the smoothing reacator was changed with spare on 19.09.2020 after the disturbance.

The second smoothing reactor was also replaced with a spare reactor recently after repeated fire incidents.

They added that as a preventive measure RTV coating was done in the reactors to minimize pollution effect.

ITEM NO. B.5: Islanding schemes of Eastern Region

1) Chandrapura Islanding Scheme:

The islanding scheme in DVC is under Chandrapura TPS considering unit 1, 2 and 3 having capacity of 3x130 MW (Namely CTPS-A plant) along with connected load of CTPS-A itself. However unit 1 and 2 were decommissioned.

In the OCC meeting, DVC informed that they are planning implement the islanding scheme with the new units (unit 7 and 8) of Chandrapura TPS having capacity of 2 x 250 MW (namely CTPS-B plant).

The detailed plan of islanding scheme is given at **Annexure B5.**

In 98th PCC, DVC explained the Chandrapura islanding scheme in detail with a presentation.

The scheme as explained by DVC in brief as follows:

- *The proposed islanding scheme would be implemented considering 2X 250 MW Generators of CTPS-B generating station along with loads of CTPS-A(120 MVA), Putki (180 MVA), Patherdih (141 MVA) and Nimiaghat (40 MVA).*

- *The islanding relay is to be placed at CTPS-B station with voltage & frequency of 220 kV CTPS-B as reference.*

- *On actuation of islanding relay at 220 kV CTPS-B, the trip commands will be extended further to 220 kV CTPS-A, 132 kV CTPS-A, 132 kV Putki, 132 kV Patherdih, and 132 kV Nimiaghata using OPGW communication network.*

They informed that the timeline for implementation of the islanding scheme would be 18 months from the date of finalization of the scheme.

They added that OPGW network is already present in order to extend trip signal of islanding relay to the related substations.

On a query from PCC regarding healthiness of the breakers at substations associated with this islanding scheme, they informed that circuit breakers are comparatively new in these substations and the breakers are being checked and maintained regularly during annual maintenance program.

During discussion, the frequency settings for islanding operation could not be discussed as representative from CTPS generating station was not present in the meeting.

ERLDC stated that DVC can conduct a dynamic study instead of steady state analysis which might help in finalizing the islanding frequency.

In 99th PCC, ERLDC presented the dynamic study report on CTPS islanding scheme. The report is attached at Annexure B5.1.

The study has been carried out for four different cases based on different scenarios of Generation and Demand. ERLDC informed that stability of islanding schemes was confirmed in each cases. However, over-frequency (upto 53.6 Hz) condition is being observed for cases having minimum demand condition.

They further informed that the over-frequency settings for units at CTPS-B is 52 Hz with 100 sec delay.

PCC opined that over frequency setting of the units need to be discussed/reviewed.

PCC advised ERLDC to share the study report with DVC Planning team and decided to conduct a separate meeting to finalize the scheme.

DVC may update.

Deliberation in the meeting

ERLDC stated that report was already shared to DVC however no response was received from their side.

PCC advised that separate meeting can be conducted among DVC, ERPC and ERLDC in first week of April 2021 for finalizing this islanding scheme.

2) IB-TPS Islanding Scheme:

The islanding scheme was discussed in special meeting held on 12-12-2018

After detailed discussion the following were decided:

- The alarm for islanding scheme shall be initiated at 49.2 Hz at both Budhipadar and IB TPS to alert the operators
- Islanding of one unit (210 MW) of IBTPS with the selected loads of 149 MW connected through 132 kV level at Budhipadar substation will be initiated at 47.8 Hz of grid frequency with 250msec time delay.
- The islanding relay Micom P341 at Budhipadar will give trip command to all 220KV feeders connected to Bus-I and Bus II along with Bus coupler except Auto transformer- I & II and selected islanding IB TPS ckts either (IB -1 & 3) or (IB-2 & 4).
- Give trip command to circuit breakers of 132kV Budhipadar-Lapanga S/c line, 132kV Budhipadar-Jharsuguda D/C line and 132kV Budhipadar-Rajgangpur S/C lines at Budhipadar end.
- It will send carrier command to both Kalunga and Tarkera end to trip 132kV Kalunga-Tarkera S/c line from both the ends to make radial load at Kalunga.
- It will send carrier signal to IB TPS to start ramping and adjust IB TPS (one unit) generation to match the load.

Regarding implementation, OPTCL and OPGC informed the following:

- The islanding relay Micom P341 is already installed at bus coupler panel of 220kV Budhipadar S/s
- OPGW is available for 220 kV lines
- Installation of OPGW is in progress for 132kV lines
  Logic for generation control of islanding after receiving the command from Budhipadar is to be implemented at IB TPS.

In 98th PCC, OPGC informed that as per their recent communication with the OEM i.e. BHEL, high speed governing system is required for operating the unit in islanding mode of operation. As IB-TPS units are around more than 35 years old and having low speed governing system at present, it would be difficult to implement islanding scheme at IB-TPS.

PCC advised OPGC to place final observations from OEM regarding implementation of islanding scheme at IBTPS units in the PCC meeting.

OPGC and OPTCL may update.

Deliberation in the meeting

OPGC was not present in the meeting.

PCC advised that separate meeting can be conducted among OPGC, OPTCL, ERPC and ERLDC in first week of April 2021 for finalizing this islanding scheme.

3) MTPS, Kanti Islanding Scheme:

The islanding scheme was discussed in 68th PCC Meeting held on 18-06-2018.

After detailed deliberation, PCC in principle agreed with the following islanding scheme at Kanti TPS:

· Stage II units (2x195 MW) of Kanti TPS will be islanded with station load of 40 MW and radial load of 150 MW (approx.) of 220kV Kanti TPS-Gopalganj D/C line.
· Once the grid frequency falls to 48.2 Hz, the PLC at Kanti TPS would initiate the islanding process after 500 ms time delay.

In 97th PCC following deliberations were made

KBUNL informed that the islanding scheme would be implemented with Stage II units (2x195 MW) of Kanti TPS. The relevant data related to Stage II units (2x195 MW) of Kanti TPS were already shared to ERLDC. KBUNL added that at present MTPS is having two bus system and they are implementing bus sectionalizer in both the 220 kV buses to isolate the Stage II units (2x195 MW) and 220kV Kanti TPS-Gopalganj D/C lines from rest of the grid.

KBUNL explained that the construction work of relevant bays of bus sectionalizer is pending due to some contractual issues. The work has been awarded to a new contractor and it is expected to be completed by end of 2021.

KBUNL further informed that all the hardware related to islanding schemes have been procured and the islanding scheme is expected to be implemented by December 2021.

PCC opined that implementation of MTPS, Kanti Islanding Scheme is very important for restoration of Bihar system during major grid disturbances. PCC advised KBUNL to expedite the work and implement the islanding scheme by June 2021.

In 98th PCC Meeting, BSPTCL informed that details of the availability of PLCC for the lines associated with KBUNL islanding scheme had already been shared. PCC advised BSPTCL to ensure the healthiness of the PLCC in all the 220kV and 132kV lines connected to the Gopalganj Sub-station within the timeframe of implementation of Islanding scheme at KBUNL.

In 99th PCC, NTPC informed that the out of five no. of bays, work for two no. of bay has been completed. They added that remaining work would be completed by June'2021.

PCC advised BSPTCL & NTPC to complete pending works, if any, related to implementation of KBUNL islanding scheme other than the construction work at KBUNL switchyard, before June'2021 so that the scheme can be implemented at the earliest.

PCC also advised ERLDC to share the detailed action plans and requirements for implementation of the islanding scheme to NTPC & BSPTCL so that the same can be implemented by them within June' 2021.

KBUNL and BSPTCL may update.

Deliberation in the meeting

KBUNL informed that Bay 1 and Bay 2 work has already been completed and Bay 3 work would be completed by March 2021.

PCC advised KBUNL to expedite the work. PCC further decided that the islanding scheme would be discussed in the separate meeting to be convened in first week of April.

4) Review of FSTPS Islanding Scheme

In 175th OCC Meeting, JUSNL informed that 220 kV Lalmatia-Godda line has been charged and the islanding scheme will be reviewed based on this change in network configuration.

OCC advised JUSNL to submit the load details and change in network configuration after commissioning of 220 kV Lalmatia-Godda line to ERLDC at the earliest.

In 99th PCC, it was informed that JUSNL has submitted load details related to Farakka islanding scheme.

PCC advised ERLDC to study and submit revised scheme based on the revised network configuration and load details and advised JUSNL to coordinate with ERLDC in order to finalize the scheme.

JUSNL, NTPC & ERLDC may update.

Deliberation in the meeting

ERLDC informed that additional information related to load details & scheme of Farakka islanding scheme has been sought from JUSNL. However, the same has not been received yet.

PCC advised JUSNL to submit the required information within a week to ERLDC. PCC further decided that the islanding scheme would be discussed in the separate meeting to be convened in first week of April.

ITEM NO. B.6: Islanding Schemes for major cities of Eastern Region

A special Meeting on reviewing of Islanding Schemes was held on 28th Dec 2020 chaired by Hon'ble Minister of state (IC) for Power and New & Renewable Energy.

In this regard a letter from NPC division has been received to discuss the following action points.

a) Islanding schemes must be designed for all major cities and if there is need to establish power plant in / around such city, the proposal may be submitted to Ministry.

b) All strategic and essential loads need to be considered for Islanding Scheme and Ministry of Defence may also be consulted for finalizing strategic loads.

c) Generators which are spatially nearby the strategic and essential load shall be given priority in designing islanding scheme.

d) All concerned utilities to ensure functionality of AUFLS and df/dt relays at all points of time.

99th PCC advised all SLDCs as well as ERLDC to plan for islanding schemes in line with the action points received from NPC division of CEA and submit the proposal in PCC for discussion.

Members may update.

Deliberation in the meeting

After detailed deliberations the followings were emerged:

- *An islanding scheme for Patna, the capital of Bihar can be devised with one unit of Barh STPS of NTPC.*
- *An islanding scheme for Ranchi, the capital of Jharkhand can be devised with Tenughat*

Generating Station as participating generator.

- *It would be difficult to devise islanding scheme for Bhubhaneshwar city, the capital of Odisha because no generators are available in the vicinity of the city.*
- *In respect of Kolkata, the capital of West Bengal, the islanding scheme of CESC os already in operation which caters the strategic and essential loads of the city.*

PCC advised SLDC, Bihar and SLDC, Jharkhand to do preliminary study for islanding schemes at Patna and Ranchi considering strategic and essential loads and future network configuration and submit to ERPC and ERLDC at the earliest.

ITEM NO. B.7: Total Power Failure at 400 kV Motihari Substation on 21.01.2021 at 11:20 hrs

400 kV Motihari-Gorakhpur D/C and 400 kV Motihari Barh-1 were out of service due to tower collapse. Motihari was connected to rest of the grid through 400 kV Barh Motihari - 2.
On 21-01-2021 at 11:20 hrs, a transient Y-phase to earth fault occurred at 400 kV Barh-Motihari - 2. Successful auto reclose operation was occurred at Motihari end.

In 99th PCC, NTPC informed that there was a transient Y-phase to earth fault in 400 kV Barh-Motihari line. The auto reclosure was successful for tie bay at Barh end. However, B-pole breaker of main bay did not reclose during the autorecloser operation. They informed that after opening of the B-phase breaker the compressor air pressure went low due to which autoreclosure got blocked in BCU.

DMTCL informed that autoreclosure was successful from DMTCL end.

Regarding DT send from Barh end, NTPC informed that 50N1 protection of line reactor got picked up during the disturbance and tripped the line reactor after a delay of 1.2 sec. The master trip relay of the line also got operated which send DT signal to Barh end. They added that operation of master trip relay for the line is being investigated.

After detailed deliberation, PCC observed that the as the line reactor is switchable, the protection of line rector should not trip the master trip relay of the line. PCC advised NTPC to check and review the scheme/relay configuration for the line reactor of 400 kV Barh-Motihari-2 line.

NTPC may update.

Deliberation in the meeting

NTPC informed that the scheme/relay configuration for the line reactor of 400 kV Barh-Motihari-2 line is being reviewed by their engineering wing. The same would be shared with ERPC/ERLDC on receipt of the views of their Engineering wing.

ITEM NO. B.8: Repeated tripping of Circuits from NTPC Barh and Associated protection Issues

In January 2021, repeated tripping has been observed for the lines emanating from 400 kV NTPC Barh generating station. During the analysis of the tripping incidents, discrepancies in Auto – reclose operation, protection system operation and extension of the direct trip signal have been observed and the same has been shown in the next table.

In 99th PCC following deliberations were made –

For the event under sl no.1, NTPC informed that 400 kV Barh – Gorakhpur-1 tripped from Barh end due to DT receipt from Gorakhpur end.
Powergrid informed that Gorakpur end tripped due to DT receipt from Barh end.

PCC advised Powergrid to submit DR files of Gorakhpur end for the above line so that tripping can be analysed.

For the event under sl no.2, NTPC informed that relay at their end sensed Y-phase to ground fault in 400 k V Patna – Barh-1 and auto-reclose was successful.

Powergrid informed that both main and backup protection relay for 400 k V Patna – Barh-1 line at Patna end sensed phase to phase fault and tripped in zone-1 of distance protection. Powergrid informed that the autoreclosure for this line was being successful in earlier cases. PCC advised to check the autoreclosure scheme at their end.

For the event under sl no. 3,4 & 5, after detailed deliberation PCC advised to NTPC following:

- Regarding rise in voltage in healthy phases at Patna end, PCC advised to check for CVT earthing issue for the 400 kV Barh-Patna lines.

- Regarding autoreclosure issue under sl no. 3, PCC advised NTPC to do the thorough checking of the A/R scheme, relay configuration & settings and resolve the A/R issue at the earliest.

- During DR analysis, it was observed that there was a delay of more than 100 msec for carrier received at Barh end for 400 kV Barh-Patna lines. PCC advised NTPC & Powergrid to resolve the carrier delay issue at the earliest.

- PCC advised NTPC to submit a detailed report with respect to the above disturbances and action taken thereof to ERLDC/ERPC secretariat at the earliest.

NTPC vide mail dated 26th Feb 2021 updated as follows:

1. M/s Powergrid, Patna has been informed for resolution of carrier signal delay.
2. CVT secondary earthing has been checked at protection panel of Barh -Patna lines. For further detailed checking, shutdown is planned on 02 March 2021. The tripping after auto-reclose is due to TOR(Trip on Re-close) as in DR channel it is configured as SOTF/TOR trip.
3. The AR of both the main and tie breakers will be checked thoroughly during line shutdown.
4. The protection settings and schemes of transmission lines at Barh have been sent to their Engineering team for review and is under process.

NTPC & Powergrid may further update.

Deliberation in the meeting

NTPC Barh informed that the CVT secondary earthing was checked and found healthy.

Regarding A/R & protection scheme, NTPC informed that the scheme has been sent to their engineering wing for review of the same.

Regarding carrier issue for 400 kV Barh –Patna line, Powergrid informed that the same would be checked during shutdown of the line planned in the month of April'2021.

ITEM NO. B.9: Disturbance at 220 k V Hatia Substation on 29.01.2021 at 10:44 hrs

220 kV Ranchi - Hatia - 3 was being shifted from 220 kV bus-1 to 220 kV bus-2 at Hatia. During changeover, sparking was observed in 220 kV bus-2 isolator at Hatia of Ranchi-3 feeder. Bus bar protection was not in service at Hatia at 220 kV voltage level. All 220 kV feeders tripped from remote ends.

In 99th PCC meeting, during analysis the following discrepancies were observed:

i. Non-operation of back up overcurrent protection for 220/132 kV ICTs at Hatia.
ii. Non -operation of backup overcurrent protection at 132 kV level for Hatia-II & Hatia-I S/s.
iii. Tripping of 132 kV Hatia I-Kanke from Kanke end on zone-3 of distance protection.
iv. Tripping of 132 kV Hatia I-PTPS from PTPS end on zone-1 of distance protection.

After detailed deliberation, PCC advised followings to JUSNL:

- To review the backup overcurrent settings of 220/132 kV ICTs at 132 kV Hatia-II S/s immediately.
- To review and submit the line backup overcurrent protection settings for 132 kV Hatia 1-132 kV Hatia II circuits.
- To review the zone settings at 132 kV Kanke end as the line should not have tripped in zone-3 from Kanke end.
- To check healthiness of the relay at PTPS end for 132 kV Hatia-I-PTPS line.
- To configure the disturbance recorders as per the standard finalized in 79th PCC Meeting.

JUSNL may update.

Deliberation in the meeting

JUSNL informed that review of settings for ICTs at Hatia-II end and checking of healthiness of the relay at PTPS end could not be completed due to non-availability of shutdown. They added that same would be done within March-2021.

Regarding DR configuration, they informed that the concerned team had already been communicated to configure the disturbance recorders as per the standard finalized in 79th PCC Meeting and would be completed by two weeks.

ITEM NO. B.10: Grid event at 220/132 kV Lalmatia S/s on 11-01-2021 at 11:57 hrs.

On 11-01-2021 at 11:57 hrs,132 KV KhSTPP - Lalmatia S/C, 132 KV Kahalgaon (Bihar)-Lalmatia S/C, 132 KV Lalmatia – Sahebgunj S/C tripped on R phase to earth fault. As a result, 40 MW load loss occurred. Power was supplied to Sahebgunj and Rajmahal areas through transfer bus at Lalmatia via 132 kV Kahalgaon – Lalmatia – Sahebgunj link. There was no power failure at 220 kV voltage level at Lalmatia.

In 99th PCC, JUSNL informed that both 132 kV Kahalgaon (Bihar)-Lalmatia line and KHSTPP-Lalmatia line are in the same tower. There was an R-phase to ground fault in 132 kV Kahalgaon (Bihar)-Lalmatia line and the line tripped from both the end in zone-1 protection. They added that 132 kV KSTPP-Lalmatia from Lalmatia end and 132 KV Lalmatia-Sahebgunj line from Sahebgunj end also tripped during this disturbance.

JUSNL could not explain the tripping of 132 kV Lalmatia-Sahebgunj line from Sahebgunj end as the line was being radially fed from Lalmatia S/s. PCC advised JUSNL to submit the DR of Sahebgunj end and also to review the protection settings at Sahebgunj end.

On a query from BSPTCL, JUSNL informed that dedicated bay along with protection system for 132 kV Lalmatia-Sahebgunj line at separate transfer bus of Lalmatia S/s have been

commissioned and put into operation. PCC advised JUSNL to submit Substation SLD along with relay settings to ERPC for updation of the same in protection database.

PCC advised BSPTCL to set the relay settings at Kahalgaon(BSPTCL) end considering the line length of 132 kV Kahalgaon – Lalmatia section only.

Regarding frequent tripping of the 132 kV Kahalgaon (Bihar)-Lalmatia line and 132 kV KHSTPP-Lalmatia line, PCC advised JUSNL and BSPTCL to do a joint patrolling of the line and submit a report to PCC.

JUSNL and BSPTCL may update.

Deliberation in the meeting

JUSNL informed that joint patrolling was conducted on 10th March 2021 and clearance issue was observed in the section under jurisdiction of Bihar. The patrolling report is enclosed at Annexure-B.10

PCC advised BSPTCL to submit corrective action plan based on the findings in joint patrolling report within one week.

ITEM NO. B.11: Total Power Failure at 220 /132 k V Dehri Substation on 21.12.2020 at 06:21 hrs

On 21-12-2020 at 06:21 hrs, 220 KV Dehri - Gaya D/C and 220 kV Pusauli - Dehri S/C tripped from Gaya and Pusauli end respectively resulting in total power failure at Dehri end. Existence of Y phase to earth fault has been captured by PMU data as well as DR recorded at Gaya end. The fault clearing time as per Gaya PMU is around 800 ms.

In 98th PCC meeting,

BSPTCL was advised to review the settings of main protection of the 132 kV Dehri-Kochas S/C line and back up protection of all the 220/132 kV ICTs at Dehri immediately.

PCC further advised as follows:

- BSPTCL to review all the relay settings at 132 kV Dehri S/s where new relays have been installed and in case of any change in the settings, the same should be shared with ERPLDC/ERPC for updation in the protection database.
- Powergrid to review zone-3 settings of 220 kV Gaya-Dehri line and 220 kV Pushauli-Dehri line. The same should be coordinated with back up overcurrent protection of 220/132 kV ICTs at Dehri.
- BSPTCL to check the PT connections to the main relay as well as back up protection relay at Dehri end.

In 99th PCC, BSPTCL informed that the settings for new relays have already been shared. They also informed that the PT connections for main as well as backup protection relay were checked and found in order.

Regarding review of ICT overcurrent protection at Dehri end and zone-3 settings at powergrid end, PCC advised BSPTCL to coordinate with Powergerid and revise the settings at the earliest.

BSPTCL and Powergrid may update.

Deliberation in the meeting

Powergrid informed that they had already sent zone 3 settings at their end to BSPTCL. They added that for 220 kV level, they set zone 3 settings to 800 mili-second with 120 percent of line length plus longest line at remote end. They further told that their might be issue in coordination

at BSPTCL end.

BSPTCL informed that ICT overcurrent protection was reviewed at Dehri end and revised settings would be sent to ERPC, ERLDC and Powergrid.

ITEM NO. B.12: Disturbance at 220 kV Meramundali Substation on 01.10.2020 at 04:07 hrs

On 30th September 2020 at 22:36 hrs, 220 kV Meramundali – NALCO - 1 was tripped on overcurrent protection. The line was charged at 00:05 hrs on 01st October 2020. At 01:35 hrs, sparking was noticed on this circuit at Meramundali end switchyard due to which GRIDCO SLDC advised NALCO to reduce the loading of the circuit.

At 04:07 hrs, line side pipe at Meramundali end of the above-mentioned circuit got broken and fell on the ground along with the breaker jumper causing line fault at Meramundali S/s. Bus jumper of 220 kV bus 1 at Meramundali also got damaged at several places which led to bus fault at 220 kV bus 1 at Meramundali. All the elements connected with 220 kV bus 1 along with the bus coupler tripped at Meramundali.

In 97th PCC following deliberations were made

- OPTCL to analyze the reason for rise in healthy phase voltage at Meramundali S/s during single phase to ground fault and send a report to ERPC and ERLDC.
- OPTCL to send latest status of OPGW work and implementation of carrier protection in 220 kV lines to ERPC and ERLDC.

In 98th PCC, SLDC Odisha informed that thorough checking of all earthing points are being carried at out at Meramundali S/s.

In 99th PCC, SLDC Odisha informed that status of OPGW work and implementation of carrier protection in 220 kV lines would be submitted within two weeks.

They further informed that OPTCL has taken up the issue of rise in healthy phase voltage at Meramundali S/s with CPRI. PCC advised to share the progress in this matter to PCC.

OPTCL may update.

Deliberation in the meeting

PCC advised OPTCL to submit the status of OPGW work and implementation of carrier protection in 220 kV lines at the earliest.

ITEM NO. B.13: Backup Overcurrent Relay coordination of Sikkim Complex

In 97th PCC following deliberations were made,

It was informed that IDMT characteristics were implemented at Jorethang and Tashiding.

It was informed that ERPC would share the revised settings as per the study carried out by PRDC to all concerned utilities.

In 99th PCC, PCC advised PRDC to re-send the revised settings to all concerned utilities. It further advised all concerned utilities to go through revised settings and provide their observations within one week.

Members may update.

Deliberation in the meeting

PRDC informed that comments from ERLDC was received and accordingly, revised study had been carried out and further the revised setting was sent to ERLDC for comments, if any.

ERLDC informed that observation would be submitted at the earliest.

ITEM NO. B.14: Resistive reach setting guidelines and model calculation for distance protection--ERLDC

In 98th PCC, ERLDC informed that thermal loading value would be considered based on the design loading value of the individual line. The design loading value (75° or 85°) has been decided during the design phase of the line as per CEA planning criteria.

PRDC informed that in case of short lines, with the proposed guidelines related to resistive reach settings the relay may not be able to clear high resistive fault.

Powergrid informed that they would submit their views with respect to point d) after due consultation from their end.

PCC viewed that these are general guidelines and modification can be done in resistive reach settings as per OEM specifications to solve the issue of clearing highly resistive faults.

In 99th PCC, after detailed deliberation, PCC advised Powergrid, DVC &CESC to give their comments to finalize the guidelines.

The guidelines for resistive reach settings have been finalized based on the comments received from the utilities. It is enclosed at Annexure B.14.

Members may note.

Deliberation in the meeting

Members noted.

ITEM NO. B.15: Protection setting related agenda-ERLDC

B.15.1: Overcurrent Protection and Thermal overload protection for Power Transformer in the Eastern Region to ensure optimum utilization as per relevant CEA standards

All transformers are to be utilized as per their characteristics and design for normal as well as emergency limits defined in the CEA Transmission Planning Criteria. The relevant clause from the CEA Transmission Planning Criteria is provided below:

Quote:

5. Permissible normal and emergency limits:
5.1. *Normal thermal ratings and normal voltage limits represent equipment limits that can be sustained on continuous basis. Emergency thermal ratings and emergency voltage limits represent equipment limits that can be tolerated for a relatively short time which may be one hour to two hours depending on design of the equipment.*

5.2.(c) *The loading limit for an inter-connecting transformer (ICT) shall be its name plate rating. However, during planning, a margin as specified in Paragraph: 13.2 and 13.3 shall be*

kept in the above lines/transformers loading limits (margin of 10% in the thermal loading limits of lines and transformers).

5.2.(d) *The emergency thermal limits for the purpose of planning shall be 110% of the normal thermal limits.*
Unquote:

The protection shall be set considering the normal as well emergency limit as per CEA planning criteria. This is to ensure to utilize the short term capacity of power transformer to avoid unnecessary tripping above name plate rating and provide operator with sufficient time to take action in case of overloading is observed during N-1 contingency of parallel transformer. Thus, the overcurrent and thermal overload protection shall be set as per the IEC and IEEE standard according to which the vendor has specified the design. These standards have defined the overloading limits and their time cycle to which utility should adhere.

During the shutdown of 315 MVA 400/220 kV ICT – 3 at Malda, POWERGRID informed that the overcurrent setting of 315 MVA 400/220 kV ICT – 5 can be set with a maximum time delay of 8 seconds due to limitation in the relay. Because of this limitation, the overcurrent setting of 315 MVA 400/220 kV ICT – 5 was set to 125% current setting with a time delay of 8 seconds. POWERGRID may share the reason for non-ability for the IDMT setting.

In case of any conservative setting which will limit the 100 % normal and 110 % emergency rating of power transformer has been kept, such limitation on protection setting may immediately be provided by Concerned Transmission/Generation utility to ERLDC/ERPC and respective SLDC as these directly affect the long term as well as operational planning including calculation of ATC/TTC limits in line with CERC regulation.

Members may discuss.

Deliberation in the meeting

Powergrid informed that the relay was quite old and for 125% of the setting, max 8 sec can be set for DMT and Max 34 sec can be set in IDMT scheme.

ERLDC informed that the overcurrent and thermal overload protection setting should be implemented with IDMT characteristics for the relay.

PCC advised Powergrid to set the overcurrent relay of the ICT at Malda with IDMT characteristics.

ERLDC further informed that conservative relay settings should be avoided in transformer overcurrent protection and the settings should be done keeping in view the thermal overloading capacity of the transformers as suggested by OEM.

B.15.2: Transformer overcurrent earth fault setting guidelines

In the recent past few uncoordinated tripping of Transformers have been observed where conservative earth fault overcurrent setting is found to be the main reason. One such event is described below.

Name of the event with date and time	PCC in which event was discussed	Observed issue /non-coordinated tripping

Disturbance at 220 kV Darbhanga S/S on 19-09-2020 at 16:37 hrs	95th PCC	400/220 kV ICT at DMTCL Darbhanga tripped in 67N protection, for a line fault at the remote end in 220 kV DMTCL-Darbhanga (BSPTCL). The setting of 67N stage two was 750 Amp. However, the fault current contribution via the ICT neutral was more than 1.5 kA. This shows that there is a lack of coordination.

As presently there are no setting guidelines in the protection philosophy of ERPC on this aspect, there is a need for introducing a general guideline to help utilities avoiding any conservative setting and uncoordinated tripping. One such general guideline for the earth fault overcurrent setting is provided below for discussion.

A. Earth fault overcurrent Stage 1 setting:

The primary requirement for the stage 1 setting should be to detect earth faults at the local bus bar, where the transformer winding is connected. Therefore, a fault calculation should be made as per figure 1. This calculation provides the current fed to the protection i.e. $3I_{0fault1}$. To assure that step 1 calculation to have selectivity for other earth-fault protection in the network, a short delay may be selected. Normally, a delay in the range of 0.3 – 0.4 s is appropriate under such conditions.

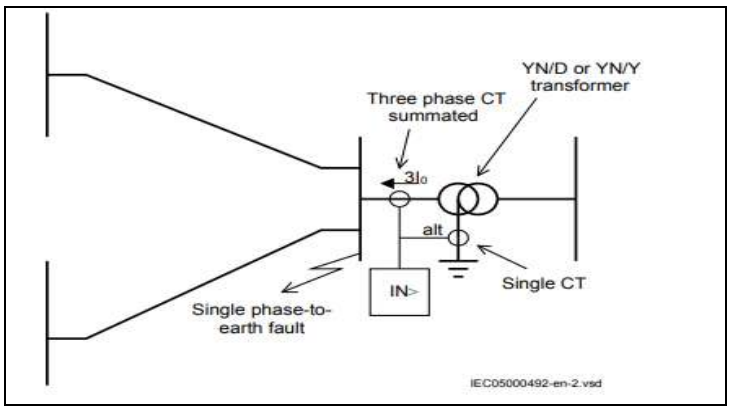


Figure 1: Step 1 fault calculation 1

Further to ensure selectivity to delayed line faults clearance at the local bus (typically distance protection operation in zone 2 in 0.5 sec), the current setting must be set high enough so that these faults do not result in unwanted step 1 trip of transformer on earth fault stage 1 setting.

Therefore, a fault calculation as shown in figure 2 is also required to be done. If the fault is located at the borderline between the instantaneous and delayed operation of the line protection (such as Distance protection or line residual overcurrent protection), the above calculation gives the current fed to the protection i.e. $3I_{0fault2}$ the setting of step 1 can be chosen within the interval shown relation given below for the above calculations.

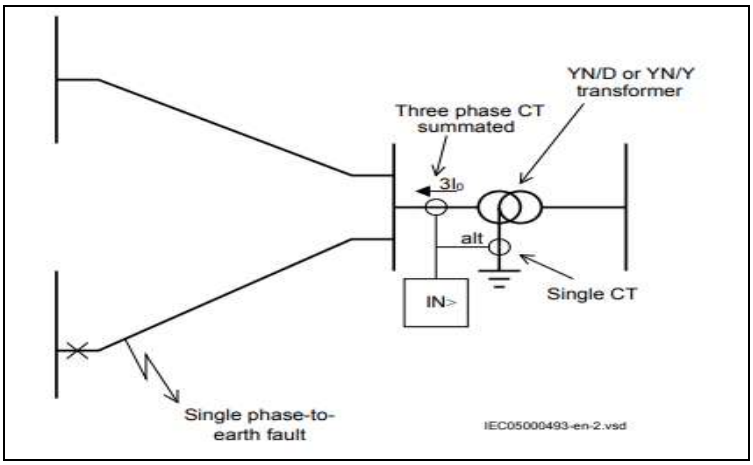


Figure 2: Step 1 fault calculation 1

$$3I_{0fault2} \cdot \text{lowmar} < I_{step1} < 3I_{0fault1} \cdot \text{highmar}$$

Where **lowmar** is a margin to assure selectivity (typical 1.2) and **highmar** is a margin to assure fast fault clearance of busbar fault (typical 1.2)

B. **Earth fault overcurrent Stage 2 setting**:

The setting of the sensitive step-2 is dependent on the chosen time delay therefore often a relatively long definite time delay or inverse time delay is selected. For this, a very low current setting (Minimum setting possible) can be selected as it is required to detect earth faults in the transformer winding, close to the neutral point. However, zero-sequence currents that can occur during normal operation of the power system are also required to be considered while selecting this current value for pickup.

Members may discuss.

Deliberation in the meeting

ERLDC informed that the earth-fault overcurrent relay settings of the ICTs need to coordinated with that of the transmission lines.

PCC advised all the utilities to share their existing practice of setting the E/F overcurrent relays in transformers and also submit their comments regarding the proposed guidelines as above.

B.15.3: Zone-2 and Zone-3 setting when the remote end substation is having non-homogenous conductor type*:*

For zone-2 and zone-3 settings, there is a need for reviewing the adjacent shortest and longest line details for the remote end protection coordination activities as discussed in the previous PCC forum and adopted procedure.

However, if the remote end substation is having non-homogenous conductor types for some lines and if only the line length is considered then the complete coverage of all the transmission lines for zone 2 as well as zone 3 coordination activities may be missed. So, it may be advised that instead of the physical length of the conductor, the impedance value of the lines to be considered at substations where the connected feeders have multiple conductor types.

Members may discuss.

Deliberation in the meeting

PCC advised all the utilities to review the zone-2 & zone-3 settings of the lines for the substations having lines of non-homogeneous conductors.

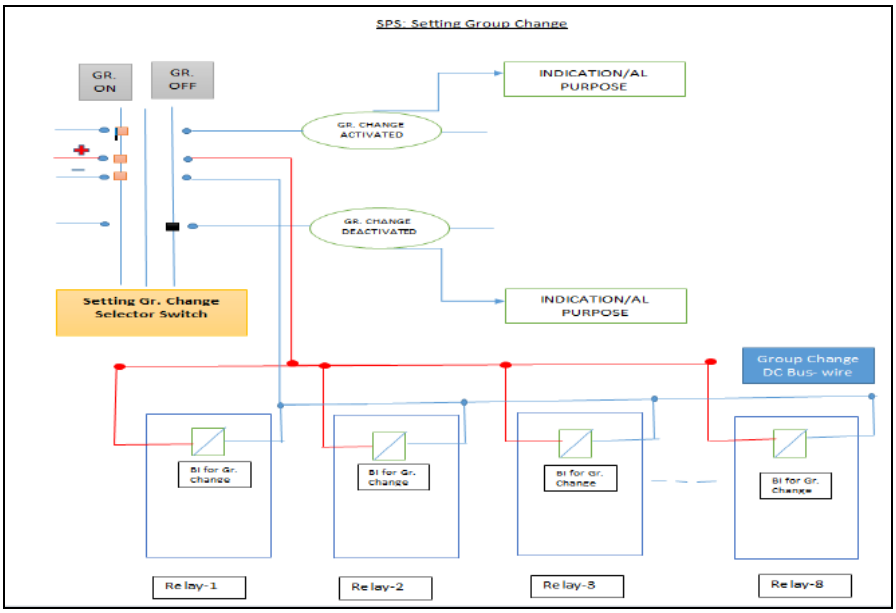
B.15.4: Keeping two sets of protection setting at Substation where bus splitting arrangement is there and at all substations connected to that substation.

In the 93rd PCC meeting, during discussions on operationalizing split bus arrangement at Biharshariff and for any double bus shutdown from one and a half breaker scheme substation, it was proposed to keep two sets of protection settings in all connected substation given the change of longest/shortest line length as per the outage situation and operational philosophy.

In this regards, expert opinions were collected from eastern regional constituents and their response is provided below

- **Odisha:** There is nothing wrong in adopting multiple setting groups in protection IEDs. But this should be handled by expert personnel and group setting should be checked frequently. This reduces a lot of time of relay setting for network change. Only Siemens relay requires Laptop to change the group setting while in almost other relays it is possible by manual group setting in very little time. If CMOS battery of the IED fails, the group setting may revert back to default setting in case of DC fail. In OPTCL, we are using at some places and very careful monitoring is needed while handling the IEDs by expert person only. Risk is high for higher voltage level.

- **CESC:** There is nothing wrong in adopting multiple setting groups in Numerical Relays. But it is better to avoid manual group setting change using HMI or Laptop. My suggestion is that it is better to use digital I/P for this purpose. Some schematic is attached herewith for your reference.



Members may discuss.

Deliberation in the meeting

Based on the observations received from OPTCL & CESC, it was concluded that the changeover between multiple settings group can be done manually through HMI/Laptop or through digital input or automation.

PCC opined that the method for changeover between multiple group settings may be decided by the individual utilities itself based on the facilities available in their substation.

B.15.5: Double-ended fault calculation using IEEE C37.114 guideline for lines with multiple owners

In today's complex power system with multiple asset owners, it is extremely important to determine fault location with high accuracy to avoid any difference in opinion among utilities at the remote ends of the line. In view of this, it is proposed that for lines where multiple owners are involved in those cases "double-ended fault location" may be adopted. IEEE standard "IEEE Std C37.114™-2014 "in this regard may be referred for better understanding and adopting the best international practice.

Recently such calculation has been done for 400 kV Motihari-Barh 2 circuit and results were found to be quite useful to avoid any difference in views of remote end utilities.

Members may discuss.

Deliberation in the meeting

ERLDC informed that double ended fault calculation method is being used for finding the accurate fault location of the line and this method is extremely beneficial for lines where multiple utilities are involved.

They further informed that one calculation was done for an incident in 400 kV Motihari-Barh-2 line and the result was satisfactory.

The analysis & report prepared by ERLDC is attached at Annexure B15.5.

PCC advised all the utilities to go through the above methodology and send their comments in this regard.

ITEM NO. B.16: Submission of TFR of HVDC/STATCOM/TCSC for any AC system fault in the elements of the AC substation where HVDC/STATCOM/TSCS is connected--ERLDC

Complete analysis of any AC system fault in the vicinity of FACTS devices requires analysis of the response of the FACTS devices. So, all the utility may submit the TFR of HVDC/STATCOM/TCSC for any AC fault in the elements connected to the substation where the FACTS are installed.

In 72nd PCC it was decided that the triggering criteria of TFR need to be submitted by all the FACTS asset owners, however only Talcher HVDC has submitted the same. So, others may submit the same on an urgent basis. This may kindly be taken as a standard practice of sharing the dynamic response of such devices to ERLDC to analyze their performance and support provided to the system.

Powergrid may update.

Deliberation in the meeting

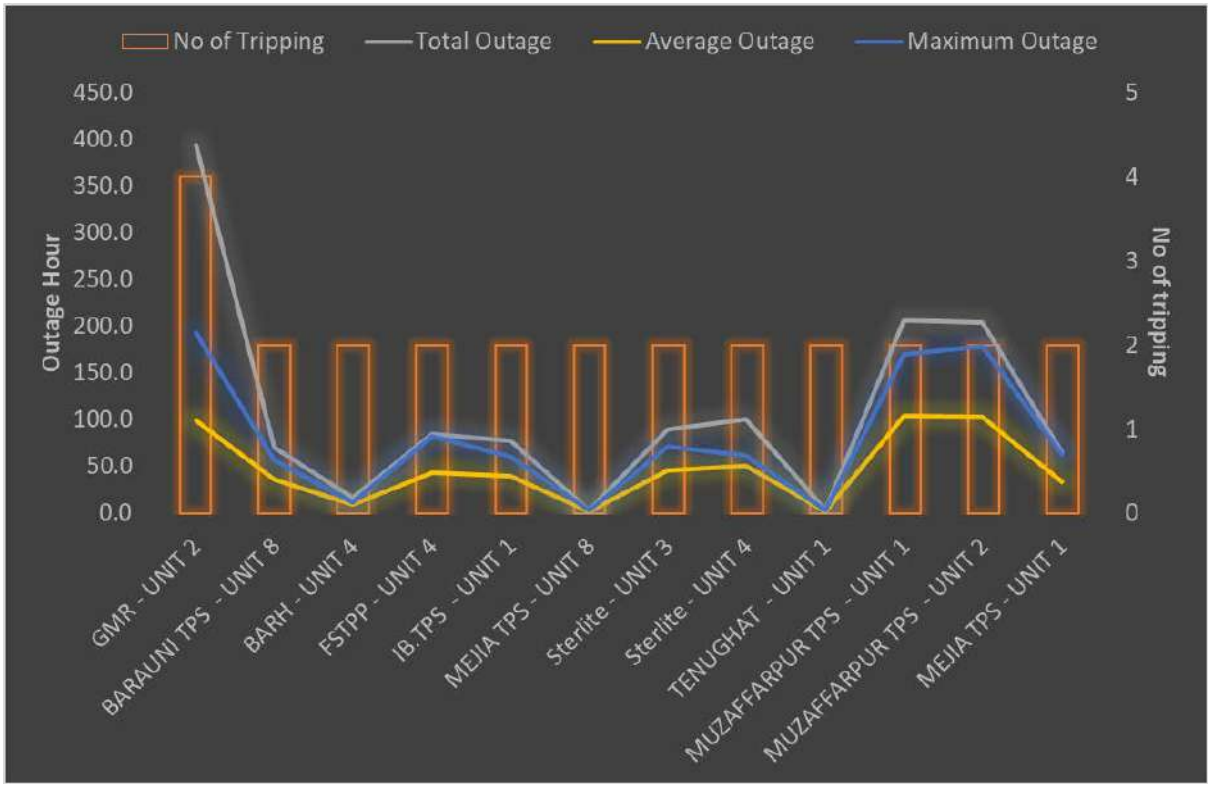
ERLDC informed that triggering criteria of TFR has not been received for HVDC & FACTS devices except Talcher HVDC.

PCC advised Powergrid to share triggering criteria of TFR of remaining HVDC & FACTS elements to ERLDC.

PCC also advised Powergrid to submit the relevant TFR of HVDC/STATCOM/TCSC elements to ERLDC for fault in nearby connected AC system.

ITEM NO. B.17: Repeated tripping of generating units in February 2021

During February 2021, repeated tripping have been observed for a few generating units. A list of such generating units along with the number of tripping and outage duration is shown in the below figure.



Reasons for tripping for units with multiple tripping events in February 2021 is given below:

Name of generating units	Reason for tripping	No of tripping	Utility to respond
GMR TPS Unit 2	Generator Seal oil problem, Primary air fan blade problem	4	GKEL

GKEL may explain.

Deliberation in the meeting

After detailed deliberation, PCC decided that a separate meeting may be convened on quarterly basis with concerned utilities to discuss the issues of multiple tripping/forced outage of the units.

PART- C:: OTHER ITEMS

ITEM NO. C.1: Collection of substation data by PRDC

PRDC is collecting the substation data and maintaining the database for the Eastern Region. The data for following new substations are to be collected:

Sl No	SS Name	Data Collection	Owner	State
1	Bagmundi		WBSETCL	West Bengal
2	Dinahata		WBSETCL	West Bengal
3	Goghat		WBSETCL	West Bengal
4	Saltlake Stadium		WBSETCL	West Bengal
5	Mathabhanga		WBSETCL	West Bengal
6	Kashipur		OPTCL	Odisha
7	Betanati		OPTCL	Odisha
8	Aska New		OPTCL	Odisha
9	Udala		OPTCL	Odisha
10	Narashinghpur		OPTCL	Odisha
11	IBTPS		OPGC	Odisha
12	Mancheswar		OPTCL	Odisha
13	North Karanpura		NTPC	Jharkhand
14	TingTing		….	Sikkim
15	Lethang		….	Sikkim
16	Rongichu		……	Sikkim

In 99th PCC Meeting, it was informed that PRDC personnel would visit physically to new substations mentioned in the list in order to collect substation/relay data for protection database.

PCC advised all concerned utilities to facilitate the visit by PRDC personnel for collection of substation/relay data.

Members may update.

Deliberation in the meeting

PRDC informed that they had visited new substations in West Bengal and collected relevant data. They further informed that they data collection for Odisha substations would be completed by March 2021.

PCC advised all concerned utilities to facilitate the visit by PRDC personnel for collection of substation/relay data.

ITEM NO. C.2: Submission of protection settings in PDMS

Relay settings of many transmission elements are not available in the protection database. The list has been prepared and forwarded to all the concerned utilities.

Relay settings had been received from CESC, Haldia Energy Limited and for few Substations from Powergrid ER-1. OPTCL, WBSETCL, JUSNL, BSPTCL, WBPDCL,Powergrid ER-II ,NTPC and other constituents are required to submit relay settings at earliest.

Concerned utilities are advised to upload the relay settings in PDMS or send the relay settings to erpcprotection@gmail.com.

In 99th PCC , PCC advised all concerned utilities to upload the pending relay settings in PDMS or send the relay settings to erpcprotection@gmail.com.

Members may update.

Deliberation in the meeting

ERPC secretariat informed that an audit by PSDF audit team was carried out for protection Database project on 19.02.2021 and it was noted that around 7 percent of protection settings was not available in PDMS.

PCC advised all concerned utilities to upload the pending relay settings in PDMS or send the relay settings to erpcprotection@gmail.com.

ITEM NO. C.3: Protection coordination of the new transmission elements to be charged in Eastern Region

ITEM NO. C.3.1: LILO of 220 kV Gaya Sonenagar D/C at Chandauti S/S and Charging of 132 kV voltage level at Chandauti

As per information received at ERLDC,220 kV Gaya Sonenagar D/C will be LILOed at Chandauti S/S.

Name	Conductor type	Length
220 kV Gaya Chandauti D/C	Single ACSR Zebra	18 km
220 kV Sonenagar Chandauti D/C	Single ACSR Zebra	76 km

Protection coordination may be required as per the following table.

Reason	S/S may be affected	Remarks	Utility to respond	Response received
LILO of 220 kV Gaya Sonenagar D/C at Chandauti S/S	Chandauti	Protection coordination to be done for all newly connected elements as per ERPC's guidelines	PMTL/ POWERGRID	Protection coordination has been done as per ERPC's guideline
	Gaya	Protection setting may be revised for 220 kV Gaya – Chandauti D/C (Earlier it was 220 kV Gaya Sonenagar D/C). Longest line connected to Gaya S/S (Earlier it was 220 kV Gaya Sonenagar D/C as per details available at ERLDC) may get changed.	POWERGRID ER - 1	**Yet to be received**
	Sonenagar	Protection setting may be revised for 220 kV Sonenagar – Chandauti D/C (Earlier it was 220 kV Gaya Sonenagar D/C).	BSPTCL	**Yet to be received**
	S/S connected to Gaya: Bodgaya, Dehri, Khijesarai	Longest line connected to Gaya S/S (Earlier it was 220 kV Gaya Sonenagar D/C as per details available at ERLDC) may get changed.	BSPTCL	**Yet to be received**

Following Details to be shared:

- POWERGRID ERTS – 1 & BSPTCL may share whether revision of any existing protection setting at above mentioned S/S is required or not. In case of any revision, the revised setting may be shared with ERPC and ERLDC.
- The protection setting at Chandauti may be shared with ERPC and ERLDC.
- Status of carrier protection and PLCC channel in 220 kV Gaya, Chandauti and Sonenagar section may be shared.

Along with above mentioned elements, 132 kV bus and 200 MVA 220/132 kV ICT 1 & 3 at Chandauti will be charged.

PMTL is requested to share protection relay setting of ICT and bus bar protection (In case bus bar protection is not available same may be mentioned).

Powergrid & BSPTCL may update.

Deliberation in the meeting

Powergrid informed that revised protection settings for 220 kV Gaya – Chandauti D/C would be submitted before charging of line.

BSPTCL submitted that revised protection settings for 220 kV Sonenagar – Chandauti D/C and substations connected to Gaya would be sent before 15th March 2021.

ITEM NO. C.3.2: Charging of 220/132 100 MVA ICT - 4 at Rangpo Sub-station

As per the scheme agreed in ER Standing Committee, 220/132 100 MVA ICT - 4 is to be charged at Rangpo S/S. Protection coordination may be required as per the following table.

Reason	S/S may be affected	Remarks	Utility to respond	Response received
Charging of 220/132 100 MVA ICT - 4 at Rangpo Sub-station	Rangpo	Protection coordination to be done for all newly connected elements as per ERPC's guidelines	POWERGRID ER-2	Protection coordination would be done as per ERPC's guideline
	S/S connected to Rangpo: New Melli & Tashiding (at 220 kV level) Gangtok & Chujachen (at 132 kV level)	Protection coordination to be checked for change in impedance due to charging of new ICT	POWERGRID ER – 2, Tashiding HEP and Chujachen HEP	**Yet to be received**

Following may be shared:
- Concerned utilities may share whether revision of any existing protection setting is required or not. In case of any revision, the revised setting may be shared with ERPC and ERLDC.
- POWERGRID ER-2 may share the protection setting at Rangpo for newly charged ICT.

This agenda was placed in 99th PCC meeting however, the response from POWERGRID ER-2, Tashiding and Chujachen HEP is yet to be received.

Powergrid, Tashiding HEP & Chuzachen HEP may update.

Deliberation in the meeting

Powergrid informed that there is no change in protection settings at powergrid end.

PCC advised Chujachen and Tashiding HEP to send revised protection settings to ERPC secretariat/ ERLDC.

ITEM NO. C.3.3: Charging of 220 kV Rangpo – Ronginchu D/C

As per information received at ERLDC, 220 kV bus extension at Rangpo named as bus section 1A & 1B along with bus sectionalizer breaker will be charged along 220 kV Rangpo – Ronginchu D/C.

Details of transmission lines to be charged are as follows:

Name	Conductor type	Length
220 kV Rangpo – Ronginchu D/C	Single ACSR Zebra	7.26 km

Protection coordination may be required before charging at both ends as per following table.

Reason	S/S may be affected	Remarks	Utility to respond	Response received
Charging of 220 kV Rangpo – Ronginchu D/C and bus extension	Rangpo	Newly charged bus extension is covered under bus bar protection	POWERGRID ER- 2/ MBPCL	Yet to be received
	S/S connected to Rangpo: New Melli & Tashiding	Shortest line connected to Rangpo S/S may be checked and protection coordination may be done for feeders connected to Rangpo S/S in case of change in shortest line connected to Rangpo S/S.	POWERGRID ER- 2, Tashiding HEP	

Following may be shared:

- Protective relay setting (both main 1 and main 2) at Rangpo and Ronginchu end for 220 kV Rangpo Ronginchu D/C
- Protective relay setting (both main 1 and main 2) for 220 kV bus at Ronginchu end
- Confirmation of that 220 kV Ronginchu feeders are included in 220 kV bus bar protection at Rangpo
- In case of change in any existing protection relay setting at New Melli and Tashiding, same may be shared with ERPC and ERLDC for update in protection database.

Till the synchronizing of generating units at Ronginchu, week infeed protection (echo and trip) may be enabled at Ronginchu end.

Members may discuss.

Deliberation in the meeting

It was informed that revised settings had already been received.

ITEM NO. C.3.4: LILO of 220 kV Waria TPS-Parulia (DVC) D/C at Durgapur STPS

As per information received at ERLDC, 220 kV Waria TPS - Parulia (DVC) D/C will be LILOed at 400/220 kV Durgapur STPS. Details of the modified line after LILO are as follows:

Name	Conductor type	Length
220 kV Waria TPS- Durgapur STPS D/C	Single AAAC Zebra	11.14 km
220 kV Parulia (DVC)- Durgapur STPS D/C	Single AAAC Zebra	17.34 km

Protection coordination may be required as per the following table.

Reason	S/S may be affected	Remarks	Utility to respond	Response received
LILO of 220 kV Waria TPS - Parulia (DVC) D/C at Durgapur STPS	Durgapur STPS	Protection coordination to be done for all newly connected elements as per ERPC's guidelines	DVC	Protection coordination has been done as per ERPC's guideline
	Waria TPS	Protection setting may be revised for 220 kV Waria TPS - Durgapur STPS D/C (Earlier it was 220 kV Waria TPS - Parulia (DVC) D/C).	DVC	**Yet to be received**
	Parulia (DVC)	Protection setting may be revised for 220 kV Parulia (DVC)- Durgapur STPS D/C (Earlier it was 220 kV Waria TPS - Parulia (DVC) D/C).	DVC	**Yet to be received**
	S/S connected to Parulia (DVC): Tamla, Muchipara, Parulia (PG)	Longest/shortest line connected to Paulia(DVC) (Earlier longest line connected to Parulia (DVC) was 220 kV Waria - Parulia D/C as per ERLDC database) S/S may get changed.	DVC, POWERGRID ER-2	**Yet to be received**
	S/S connected to Waria TPS:Mejia, Bidhannagar	Longest/shortest line connected to Waria TPS S/S may get changed.	DVC, WBSETCL	**Yet to be received**

Following Details to be shared:

- Status of carrier protection and PLCC channel of 220 kV Waria TPS – Durgapur STPS and 220 kV Parulia (DVC)-Durgapur STPS section may be shared.
- In case of revision of existing protection setting at S/S connected to Parulia (DVC) and Waria TPS, revised protective relay setting may be shared.
- Protective relay setting of all newly charged (or to be charged) elements may be shared as per the following table.

Element Name	S/S Name	Utility to respond	Received for S/S
220 kV Waria TPS Durgapur STPS D/C	Waria and Durgapur STPS	DVC	
220 kV Parulia (DVC) Durgapur STPS D/C	Parulia (DVC) and Durgapur STPS	DVC	
Bus bar protection of 220 kV bus 1 & 2	Durgapur STPS	DVC	
400/220 kV ICT at Durgapur STPS	Durgapur STPS	DVC	

DVC may update.

Deliberation in the meeting

It was informed that revised settings had been received.

ITEM NO. C.3.5: Charging of 23.5/765 kV GT-2 at 765 kV Daripalli S/s.

As per information received at ERLDC, 23.5/765 kV GT – 2 will be charged at Daripalli generating stations.

- POWERGRID Odisha may check whether any change in protection relay setting is required at Jharsuguda due to reduction in impedance for charging of GT – 2.
- NTPC may share protection relay setting of GT – 2 at Daripalli for update in ERPC protection database.

NTPC & Powergrid may update.

Deliberation in the meeting

PCC advised concerned utilities to share revised protection settings to ERPC secretariat and ERLDC.

****

Annexure-B1

Tripping Analysis for Multiple Tripping incident at Tashiding

15 Feb 2021
&
17 Feb 2021

INCIDENT OVERVIEW

This report discusses about the details of tripping incidents which occurred at Tashding substation on 15th Feb 2021 around 14:30 Hrs & 17th Feb 2021 at 19:56Hrs.

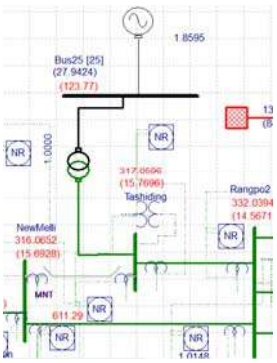
Incident 1: 220 kV Tashiding Rangpo S/C Tripped on BN fault. Prior to the event Tashding and New Meili S/C was under shutdown and Unit 1 is under Annual maintainance.

At the same time Unit 2 GT was tripped on Earth fault.

Affected system Disturbance recorder is analyzed in MiP-PSCT™ software to understand the tripping incident and analyze sequence of events

SLD

- SLD OF affected region



COMTRADE FILE

- Fault as Observed in Comtrade file from Tashiding – Rangpo at Rangpo end Relay

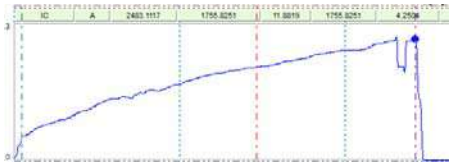


FIG-2: B Phase current of Tashiding Rangpo from DR

- Total fault duration as recorded in comtrade file is around 41mSec.
- Max.fault current observed in Y Phase is 1814A.

COMTRADE FILE

Digital Channel Analysis of **Tashiding – Rangpo at Rangpo end Relay**:

Name	Start Status	End Status	First Change	Last Change
Z3	1	0	14:30:25.110	14:30:25.504
Z2	0	0	14:30:25.304	14:30:25.504
Any Trip	0	0	14:30:25.454	14:30:25.534
L4 GR-A RLY OPTD	0	1	14:30:25.477	
L3 M CB B OPEN	0	1	14:30:25.499	
L1 M CB R OPEN	0	1	14:30:26.832	
Relay 5	0	1	14:30:26.122	

FIG-3: Digital Channel of Rangpo Line Distance relay

- Relay sensed fault in Zone 3 at 14:30:25.110 which later moved into Zone 2 at 14:30:25.304.
- Relay Sent Trip signal at 14:30:25.454 which is almost 300mS from fault initialization.

COMTRADE FILE

- Fault as Observed in Comtrade file from Tashiding – Rangpo at Tashiding end Relay

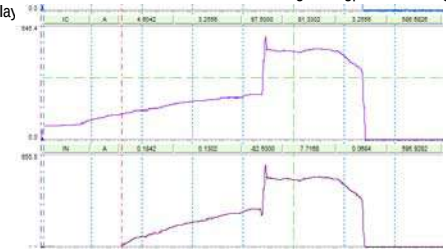


FIG-5: B Phase current of Tashiding Rangpo from TashidingDR

- Total fault duration as recorded in comtrade file is around 1479mSec.
- Max. fault current observed in Y Phase is 586A.

COMTRADE FILE

Digital Channel Analysis of **Tashiding – Rangpo at Tashiding end Relay**:

0	R28 M1 Any Start	0	1	14:30:24.663
0	R29 M1 Any Trip	0	0	
0	L4 M1 AR block	0	0	

FIG-6: Digital Channel of Rangpo Line Distance relay

- Relay sensed fault at 14:30:24.663
- But there is no Trip signal or any Zone operation in relay

DISTANCE RELAY DR ANALYSIS

DR Analysis of **Main 1 Relay at Tashiding end**:

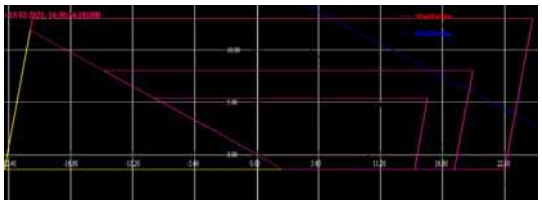


FIG-7: DR Analysis of Rangpo Line Distance relay

- It is clear that Distance relay had seen fault in Zone 2 but for very less time.
- Relay should have been picked up in Zone 2 but may not trip as fault is for very less time.

EARTH FAULT CURVES AT TASHIDING

- Fault as Observed in Comtrade file from Tashiding is 510A and which was feeding by unit 2.

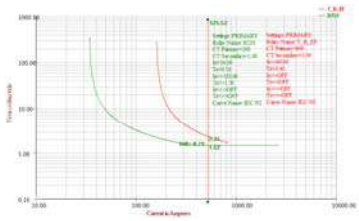


FIG-8: Earthfault curves at Tashiding

- As Main relay had not cleared fault in both distance and backup.
- GT relay had operated and tripped after 1.5Sec which made total power failure at Tashiding.

EARTH FAULT CURVES AT TASHIDING (PROPOSED)

- Fault as Observed in Comtrade file from Tashiding is 510A and which was feeding by unit 2.

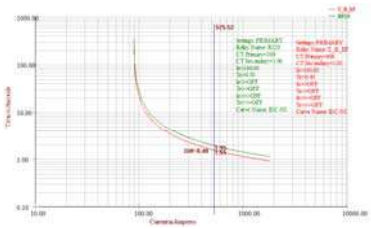


FIG-9: Earthfault curves at Tashiding (Proposed)

- Proposed Settings:
  - ✓ GT – 160A TMS 0.5 and Highset OFF
  - ✓ Line 160A TMS 0.4.

DISTURBANCE RECORDER CONFIGURATION

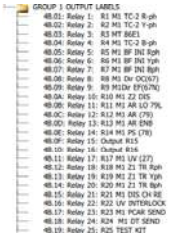


FIG-10: Relay Output Label

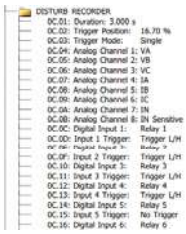


FIG-11: Relay Output Label

- DR was configured from Relay Inputs so it may not get high until Relay input signal was high.
- For time delayed signals DR DI will get high only after delay time.
- Disturbance recorder DI signal has to be configured using direct signals like Zone1, Zone 2 instead of relays

REPORT OF GRID INCIDENT

Date of incident: 17 fEBRUARY 2021

Time of incident: 13:52 hrs.

Location of incident: 220kV bus-1 of Jeerat 400kV Substation

System configuration before the incident:

	Element	Load flow in MW
400kV Bus-1	315MVA, 400/220kV Trf-2 HV	103
	315MVA, 400/220kV Trf-4 HV	108
	400kV Jeerat- New Chanditala Line	-190
400kV Bus-2	315MVA, 400/220kV Trf-1 HV	96
	315MVA, 400/220kV Trf-3 HV	99
	400kV Jeerat- Sagardighi (WBPDCL) Line	-193
	400kV Jeerat- Rajarhat (PGCIL) Line	-20
	63MVAR Bus Reactor	0
	400kV Bus- Coupler	ON
	400kV Bus Transfer	OFF

Description of the incident

400kV bus bar protection was under planned shut down for integration of CT and SF6 gas tripping logic of new Jeerat 400kV GIS with existing bus bar protection (REB 670). This integration work was being done by engineer of ABB.

For the above work, bus bar in- out switch for both zones were kept in “out” position and also test links for 96 relays were isolated.

After completion of wiring, during checking of SF6 bus zone tripping by shorting of relay terminals from New Jeerat GIS , all 96 simultaneously operated.

Analysis of the incident

i) After checking of the bus bar trip circuit, it was found that connection at test links was wrong causing non-isolation of trip relay (96) actually by the link.

ii) During checking ABB engineer instructed to simulate for bus-1 trippng , but inadvertently he did it for bus-2. Immediately he realized the mistake and repeated the same for bus-1 without further instruction. Consequently, both the buses got tripped by external trip function (which remains operational even though bus bar in-out switch is in ‘out’ position)

System affected by the incident:

Due to operation of Bus-bar protection, following elements tripped.

kV	Element name	Relay indication	Load loss	Restoration time
400	315MVA, 400/220kV Trf-2 HV	96, 86	nil	14:17
	315MVA, 400/220kV Trf-4 HV	96, 86	nil	14:32
	400kV Jeerat- New Chanditala Line	96	nil	14:13
	315MVA, 400/220kV Trf-1 HV	96, 86		14:17
	315MVA, 400/220kV Trf-3 HV	96, 86	nil	14:31
	400kV Jeerat- Sagardighi (WBPDCL) Line	96	nil	14:28
	400kV Jeerat- Rajarhat (PGCIL) Line	96	Nil	14:36
	63MVAR Bus Reactor	96	nil	
	400kV Bus- Coupler	96	nil	14:14

Damage of equipment:

No damage of equipment occurred.

Corrective action to be taken:

Wrong connection which was identified shall be corrected shortly.

Annexure B2.1

Flash Report by SLDC/ GENERATOR/ISTS/USER/UTILITY

(As per IEGC section 5.9.5, 5.9.6 (a), (b) & (c))

1. Name of the reporting entity: SLDC, DVC.
2. Date and time of the Incident: 08:05 hrs of dt 10/02/2021
3. Antecedent Conditions (Just Prior to Event):
   a. Frequency: Pre-incidence → 49.99 Hz & Post-incidence → 50.01 Hz.
   b. Demand/Generation Met: Prior to incid → 2950 MW; Post the incid → 2600 MW | Gen → 5420 MW.
   c. Lines/units/elements under shutdown : NIL
   d. Weather condition: Normal.
4. Details of tripping (Along with cause of the event and relay flag, whatever available):

Sl. No.	Area/ Region	Loss of Load(MW)	Loss of Generation(MW)
1	132kV CTPS	350 MW.	NIL.
2			
3			
4			

Transmission/Generation Elements tripped during event:

Sl. No.	Name of the Element	Tripping Time	Restoration Time	Relay Indication (if avbl)
1	ATR#1,2&3 along with 132kV Main bus. (& Swing bus of ATR#2	08:05	08:45.	lock out relay(86) & O/C relay.
2	snapped on Main bus).			
3				
4				
5				
6				
7				

5. Action Taken/Remedial measures taken: After isolating ATR#2; ATR#1&3 normalised.
6. Restoration details: Power restored in 132kV main bus through ATR#1&3 at 08:45 hrs & consequently all 132kV lines connected to that main bus normalised
7. Duration of the disturbance: 40 minutes.
8. Amount of energy unserved ≈ 350 MW.

SCE 10.02.2021

पाली प्रभारी अभियंता
Shift Charge Engineer
एस.एल.डी.सी, दा.घा.नि. हावड़ा
SLDC, DVC Howrah

Copy to: MS, ERPC

POWER GRID CORPORATION OF INDIA LIMITED

LINE/ICT/BUS REACTOR TRIPPING REPORT

(TO BE FILLED BY SHIFT INCHARGE)

Form No: 831302

Region: Odisha Projects

Substation: Baripada Trip Notification No. 109000032303

01	Date and Time of Occurrence: 23/02/2021 at 15:39:28 Hrs.	
02	Date and Time of Restoration: 23/02/2021 at 16:31:55Hrs.	
03	Outage Duration: 0:54:27 Hrs	
04	Particulars of Tripping: 400KV BUSBAR-2 tripped at 15:39:28 Hrs. of 23/02/2021. 401 Bay (Main Bay of 400KV Keonjhar Line) 404 Bay (Main Bay of 400KV Kharagpur line) 409 Bay (Main Bay of 400KV Jamshedpur line) 412 Bay (Main Bay of 400KV TISCO line) 415 Bay (Main Bay of 125MVAR BR-1) 125MVAR BR-1 418 Bay (Main Bay of 125MVAR BR-2)	
05	Connection of line/ICT before Occurrence (Indicate line/ICT Connected to which Bus i.e. Bus No. 1,2 or Transfer Bus)	400 KV Bus-I: 315 MVA ICT-1, 315 MVA ICT-2, Duburi, Pandiabili Line , 500 MVA ICT was in shutdown 400KV Bus-II: Keonjhar, Kharagpur, Jamshedpur, TISCO, 125 MVAR Bus Reactor-1 & 2 220 KV Main Bus-I: Balasore-Line 1, 160 MVA ICT-I 220 KV Main Bus-II: Balasore line-II, 160 MVA ICT-II
06	System Condition Immediately before Occurrence	
	a. Frequency (Hz)	**50.02**
	b. Voltage (400/220/132) KV	**402/228/133**
	c. Load MW & MVAR (on each line/ICT)	

NAME OF LINE /ICT	MW	MVAR
I. 400KV KEONJHAR LINE		
II. 400KV KHARAGPUR LINE		
III. 400KV PANDIABILLI LINE		
IV. 400KV DUBURI LINE		
V. 400KV TISCO LINE		
VI. 400KV JAMSHEDPUR LINE		
VIII. 400/220/33KV,315MVA ICT # I		
IX. 400/220/33KV,315MVA ICT # II		
X. 400/220/33KV ,500MVA ICT # III		
XI. 220/132/33KV ,160MVA ICT # I		
XII. 220/132/33KV ,160MVA ICT # II		
XIII. 220KV BALASORE (OPTCL) LINE-I		
XIV. 220KV BALASORE (OPTCL) LINE-II		
XV. 132KV BARIPADA (OPTCL) LINE		
XVI. 132KV BANGRIPOSI (OPTCL) LINE		
XVII. 132KV JALESWAR (OPTCL) LINE		
XVIII. 132KV BHOGRAI (OPTCL) LINE		

	d. Whether any line / Equipment was under maintenance.	**500MVA ICT-3**
	e. Whether any protection was bypassed/ not available.	**NO**
07	Tripping Sequence (Indicate time of tripping of each feeder): 400KV BUS-2, connected bays of 400KV Bus-2 and 125MVAR BR-1 tripped. (125MVAR BR-1 tripped due to associated Tie Bay was under maintenance shutdown)	
08	Equipment damage ,if any: NIL	
09	Sequence of Normalization: (i) 400KV Bus-2 charged through 404 Main Bay at 16:31:55 hours and subsequently all other bays are taken into service.	
10	Reasons for unsuccessful auto re-closure or auto restart: NA	
11	a. Cause of occurrence: 500MVA ICT-3 and associated Main Bay 413 & Tie Bay 414 were in shutdown. GD36 (R & Y phase Mal opearated & zone trip command initiated and 400 kV Bus-2 was tripped. GD36 belongs to Bus Duct associated with Main GIS 400 kV Bus-2 in which there was no work going on. The reason for initiation of spurious trip command is under analysis.	

24/02/21

	b. Suggestion for improvement: Shall be detailed after analysis and fault finding.
12	Any other relevant information:
13	Review of Protection by T&C Engineer: 1) Checking of GD 36 contacts upto LCC panel to be checked for any abnormality. 2) If everything found normal further checking of complete bus bar protection from GD36 to Bus Bar relays to be done taking 400 kV Bus-2 shut down.

(T&C ENGINEER) 24/2/21 (SHIFT INCHARGE)

Copies: 1..... 2.....

Note: Photocopies of the relevant portion of Disturbance Recorders and Event Logger may be enclosed along with tripping report.

POWER GRID CORPORATION OF INDIA LIMITED

Relay flag details after Line/ICT/Bus reactor tripping.

Form No:831303
Region:Odisha Projects
Substation:Baripada

Sl. No.	Date & Time of Tripping	Name of Line/ICT/ Bus Reactor	Relay Flag Details				Relay Flag Details of other end				LA Count Readir	
			Control Panel	Main-I	Main-II	Other Relays	Control Panel	Main-I	Main-II	Other Relays	Before Tripping	
01.	23/02/2021	BUS 2 TRIPPED	BUSBAR RELAY OPTD OF ALL BUS 2 CONNECTED BAYS									

(Shift Inchar

Report on multiple tripping's from Meramundali substation in the month of February 2021 and Protection violations :

>In the month of February, multiple single line tripping incidents occurred from Meramundali substation, which are mentioned below along with several discrepancy in protection operation are mentioned in Remarks section along with relevant PMU data and DR are attached in Annexure.
>Problem of High voltage during faults has been already pointed out in past which is also observed in some tripping's in February also which is posing threat to equipment's and needs to be resolved as soon as possible.
>Clarification regarding Protection anomaly as mentioned are also required to be submitted and needs to be attended as early as possible. Root cause analysis is also required for such increased number of tripping's from Meramundali substation and proper line maintenance, healthiness of protection needs to be ensured to avoid such tripping's.
>DR submitted from Meramundali end is of very less time frame and is not as per ERPC guideline which is required to be submitted for full time frame as recommended by ERPC guideline so full phenomenon can be captured such as A/R etc and proper analysis can be done.

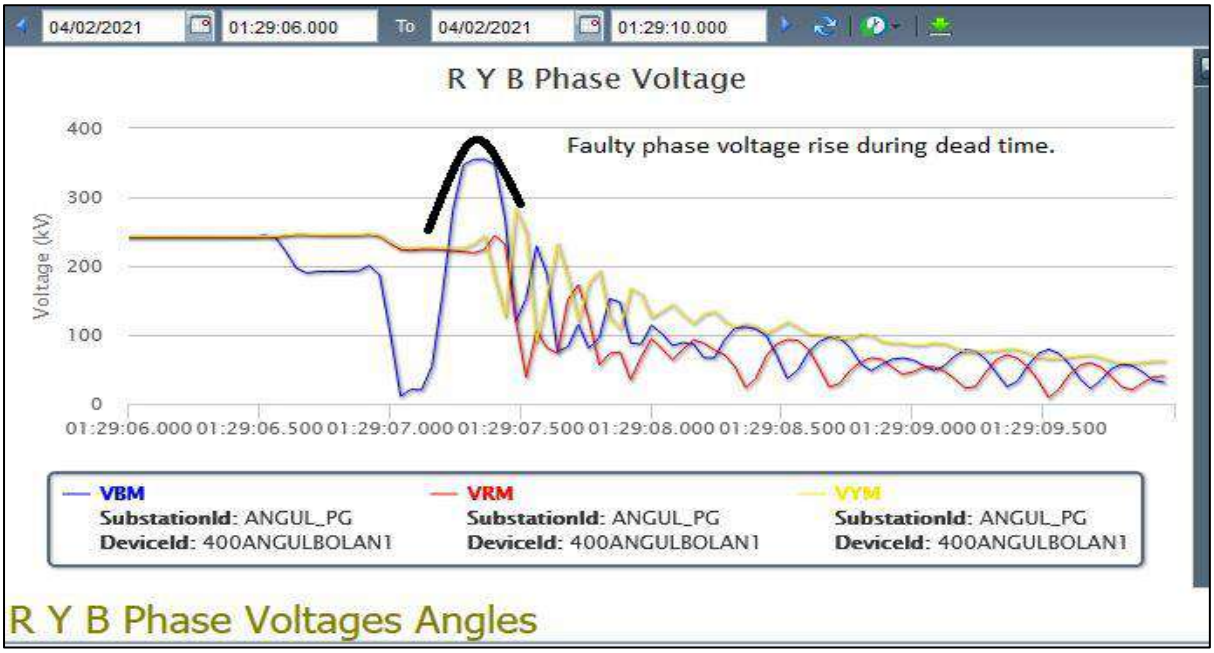
SR. NO	LINE NAME	TRIP DATE	TRIP TIME	Relay Indication LOCAL END	Relay Indication REMOTE END	Reason	Remarks
1	400KV-MEERAMUNDALI-BOLANGIR-1	02-02-2021	15:06	Meeramundali: B-N, 7.56kA, 65.9km	Bolangir: BN, Z2, 1.16KA, 196km	B-Earth	B-phase Fault, A/R operated unsuccessful.
2	400KV-MEERAMUNDALI-BOLANGIR-1	04-02-2021	01:29	BOLANGIR-B-N ,2.09 KA, 58KM ,OVERVOLTAGE STAGE-2,	MEERAUMINDALI : DT RECEIVED	B-Earth	**Fault in b phase and ,B pole breaker tripped but during dead time high voltage in B phase oberved at bolangir due to secondar arcing which lead to o/v stg-2 operation and line tripping. Reactor tripping scheme implemented at Bolangir to avoid such instances further.**
3	400KV-MEERAMUNDALI-TSTPP-2	05-02-2021	15:07	Meramundali-B-N, Ib- 20.6 KA, 12 KM		B-Earth	**B phase fault ,but ALL three phase voltage increased to a very high value upto 900 kv at the instant of fault .A/R was unsuccessful .Sevier high voltage may cause equipment failure .Earthing needs to be checked and rectified soon.**
4	400KV-MEERAMUNDALI-TSTPP-1	05-02-2021	15:46	Meramundali-B-N FC-7.4kA FD-26km		B-Earth	
5	400KV-NEW DUBURI-MEERAMUNDALI-1	06-02-2021	12:24	Tripped from Meeramundali only during A/r of 400 KV Meeramundali-Mendhasal II which is in same dia.		NO FAULT	**There was no fault in line ,tripped during A/R of meramundali-mendhasal -2 ,Line should not have tripped whether main bay was out ?**

6	400KV-MEERAMUNDALI-MENDHASAL-II	13-02-2021	14:09	Meeramundali: R_N, 30.5 KM, 6.62 kA; A/r successful from Mendhasal end		R-Earth	A/R successful from Mendhasal end only ,Why not from Meramundali?
7	400KV-TSTPP-MEERAMUNDALI-1	16-02-2021	12:34	INITIALLY B-ERATH FAULT THEN AT THE INSTANT OF A/R GOT CONVERTED TO Y-B PHASE FAULT AT 42KM FROM MERAMUNDLAI WITH F/C-14.6KA . AT TALCHER ,Y-B , Z-1 , F/C-12.6KA		Y-B	Initially B-Erath fault which got converted to Y-B fault at the time of A/R .
8	220KV-TSTPP-MEERAMUNDALI-2	21-02-2021	07:24	Talcher :- B phase , Z1		B-Earth	
9	400KV-MEERAMUNDALI-MENDHASAL-II	24-02-2021	13:17	Mendhasal:R-N,Z1,FD 36.3km,Ir-5.49 kA		R-Earth	**At the instance of charging tripped after 300 ms ,delayed .SOTF function needs to be checked as tripping should not be delayed while taking charging attempt .**
10	400KV-MERAMUNDALI-LAPANGA-1	27-02-2021	17:26	MERAMUNDALI END :- YB FAULT 2.44KA 191 KM	LAPANGA END :- YB FAULT 3.4KA, 1 KM	Y-B	**TCB at Lapanga end opened instantly but MCB opened after 200 ms delay which caused fault feeding till 250 ms ,although fault was in z-1 .This may please be checked .**
11	220KV-TSTPP-MEERAMUNDALI-2	28-02-2021	12:02	TSTPP: R_N, 35.9 KM, 4 kA		R-Earth	**From DR it is clear that auto reclsoe was successful but after 800 ms of successful A/R , line tripped but no fault was noticed .Reason for tripping may be shared.**

ANNEXURE

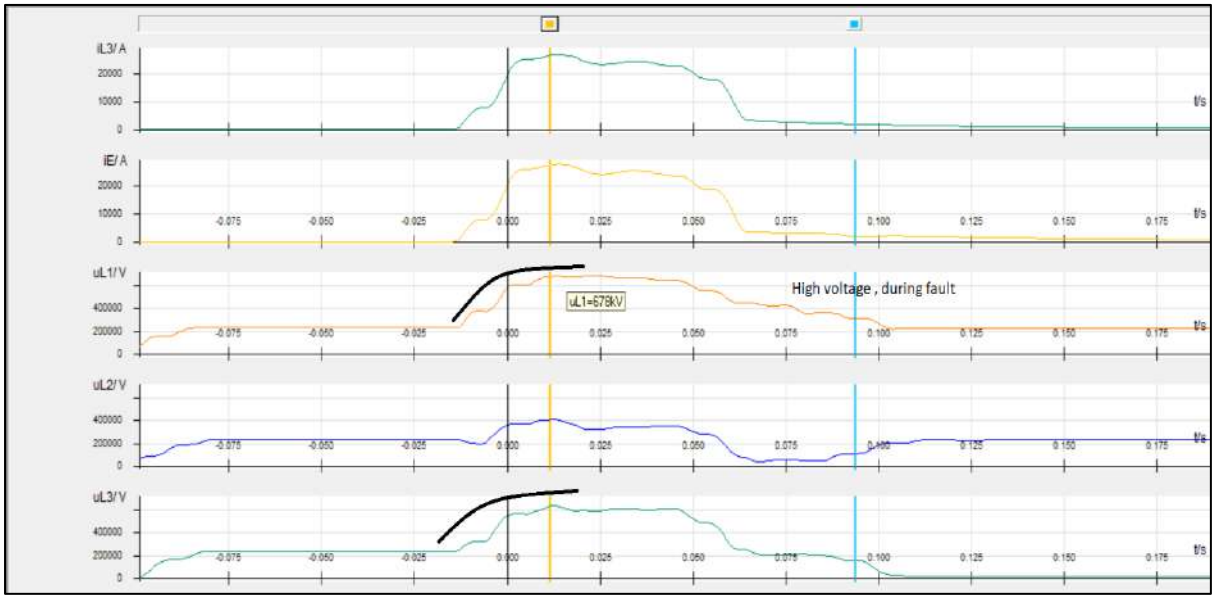
(Sr.No 2) LINE VOLTAGE FROM PMU :

Fault in b phase and ,B pole breaker tripped but during dead time high voltage in B phase observed at bolangir due to secondar arcing which lead to o/v stg-2 operation and line tripping. Reactor tripping scheme implemented at Bolangir to avoid such instances further.



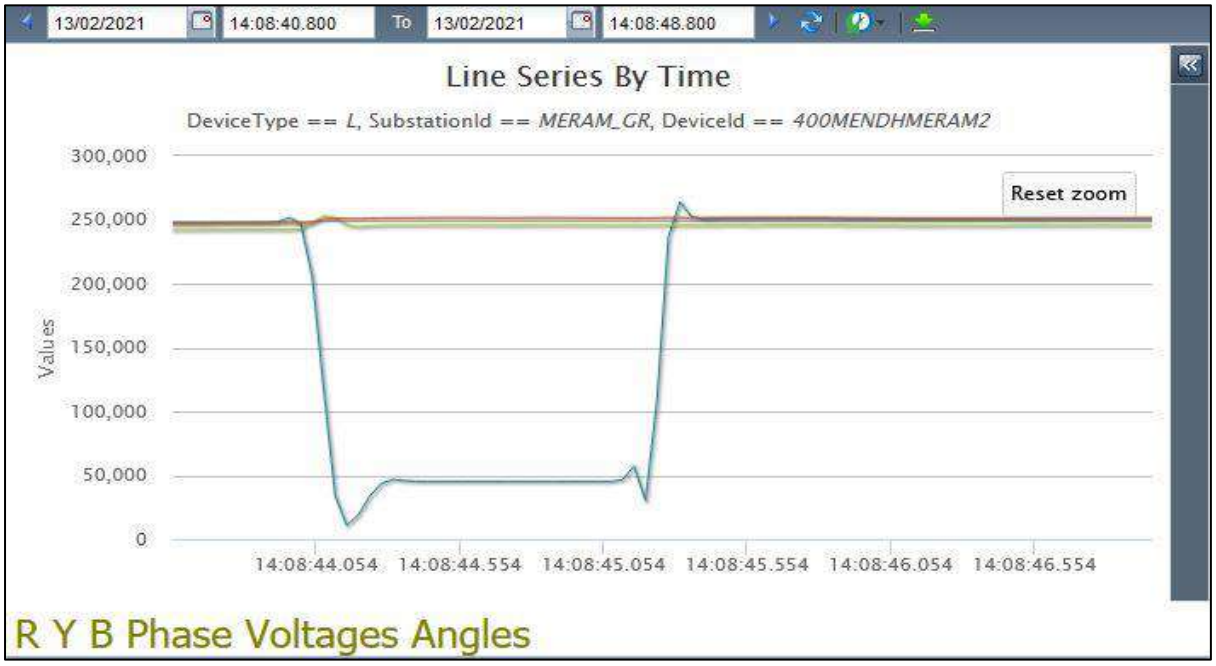
(Sr.No 3) LINE VOLTAGE FROM DR AT MERAMUNDALI END :

B phase fault ,but ALL three phase voltage increased to a very high value upto 900 kv at the instant of fault .A/R was unsuccessful .Sevier high voltage may cause equipment failure .Earthing needs to be checked and rectified soon.



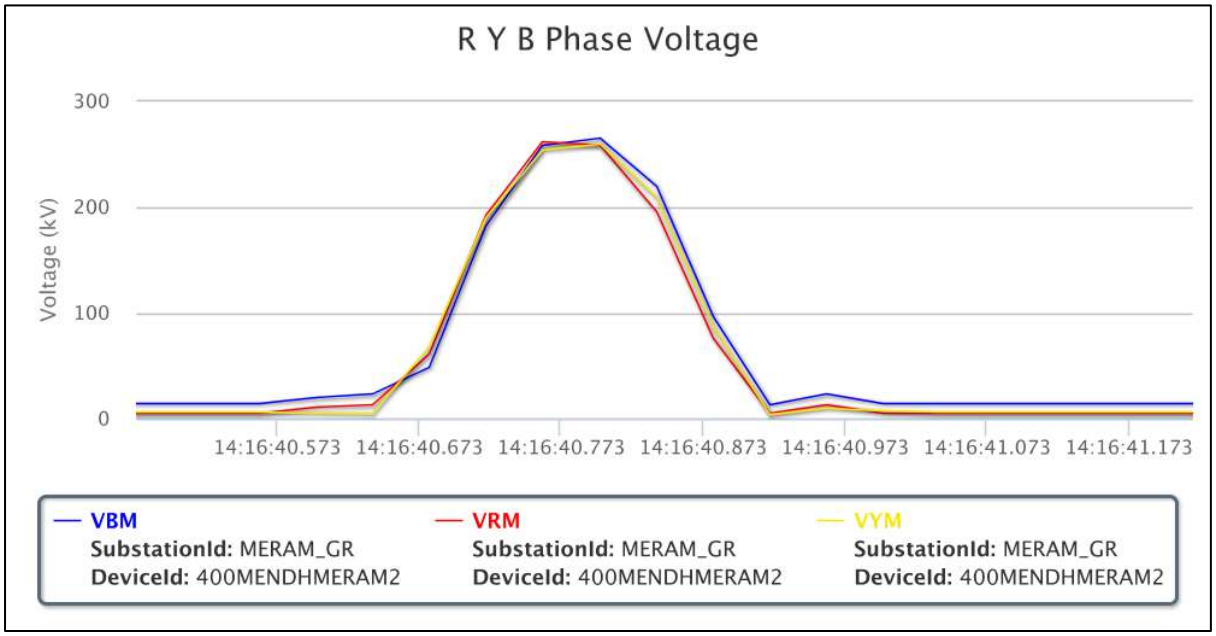
Sr.No (6) Auto reclose successful from Mendhasal end only ,Line voltage from PMU at Meramundali end.

In past also it has been observed that Auto reclose from meramundali is not operating and communication regarding that was already sent in past ,still the same problem is persisting.

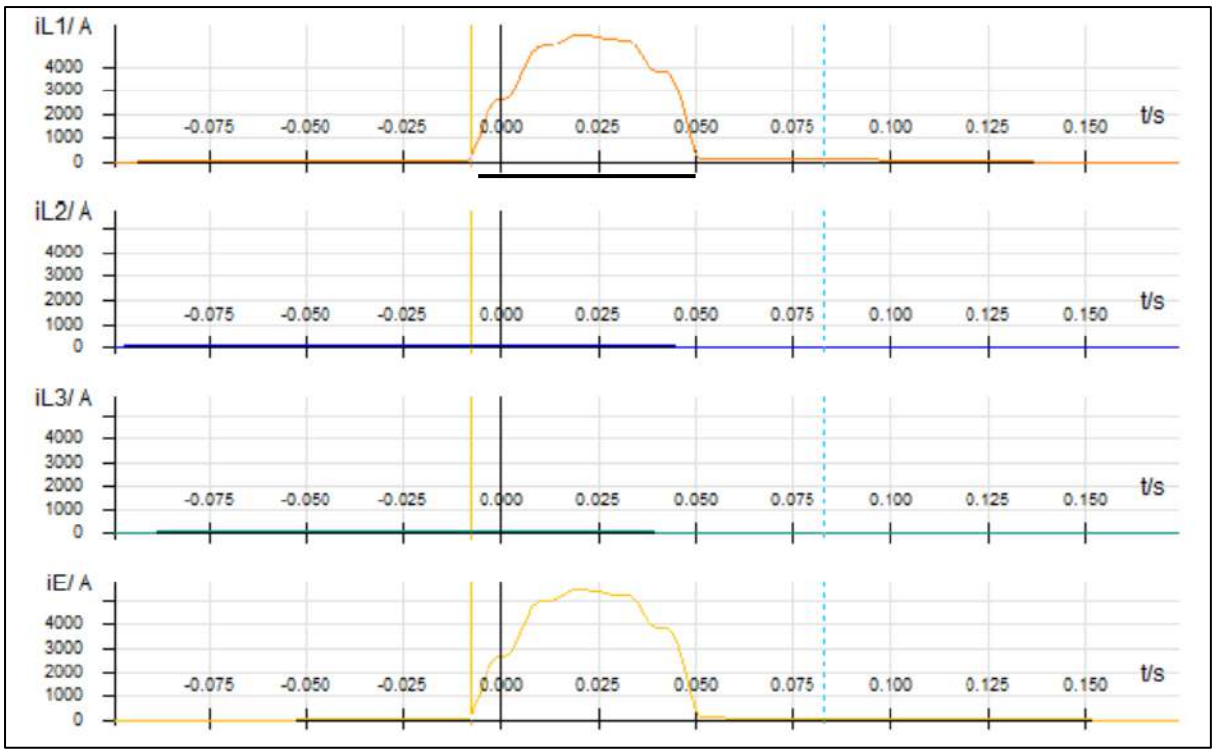


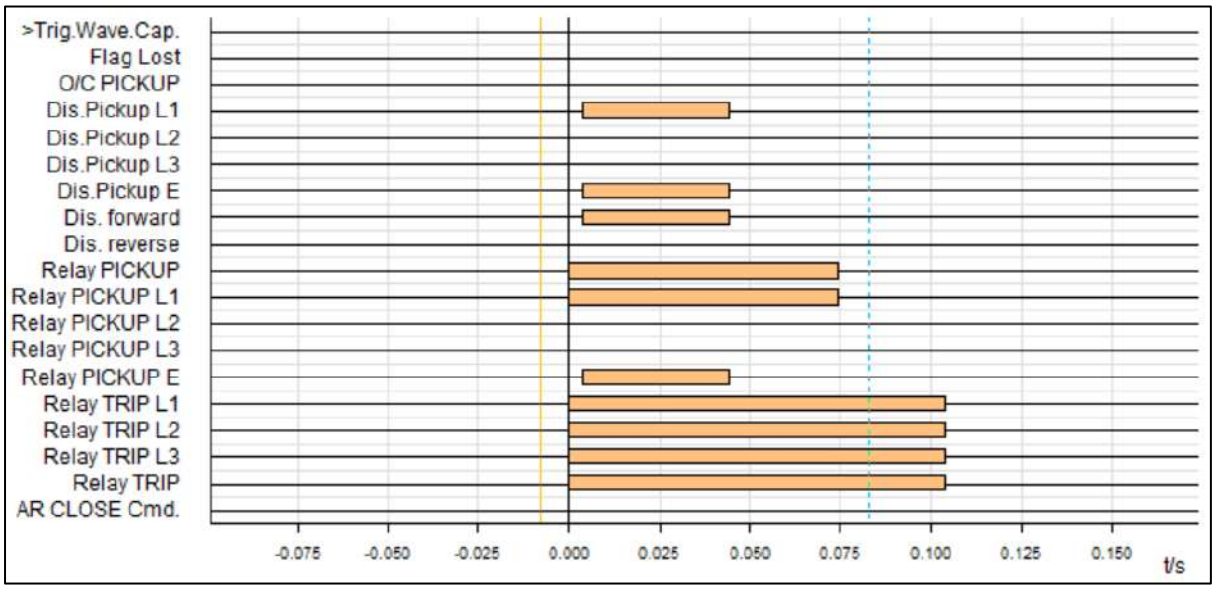
Sr.No (9) At Charging Instance ,Line current from PMU

SOTF protection function needs to be checked as it is not fulfilling the purpose of SOTF protection ,as tripping got delayed at charging instance.



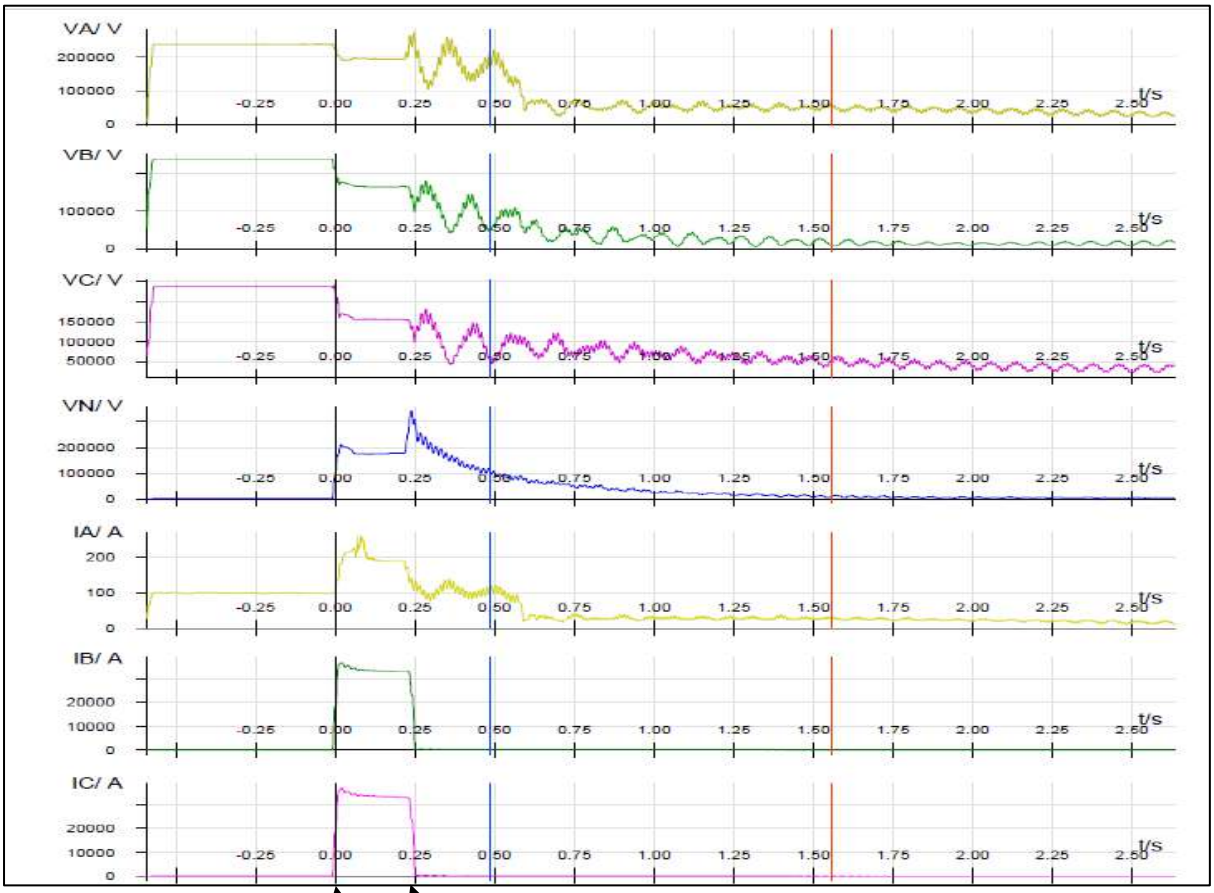
Meramundali end DR :

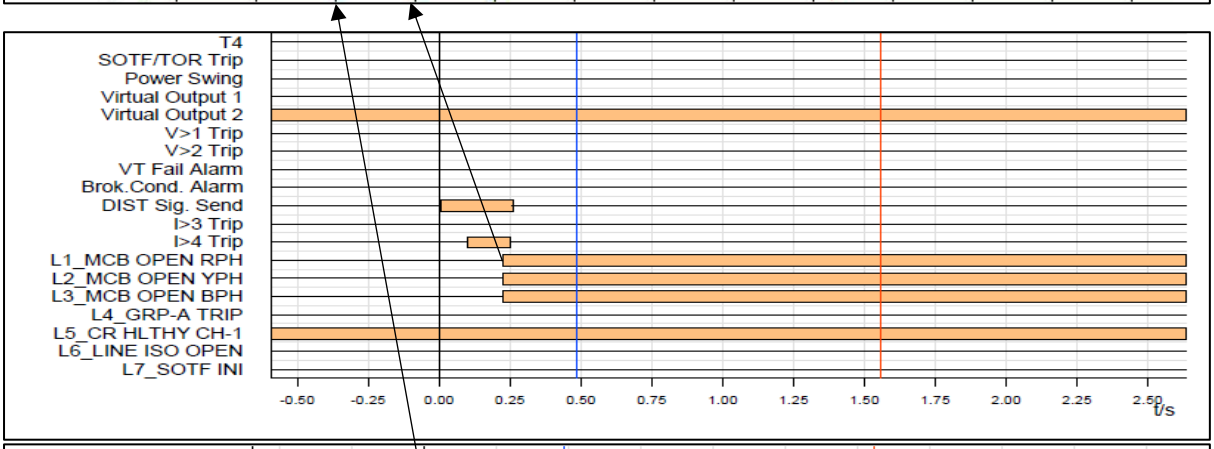


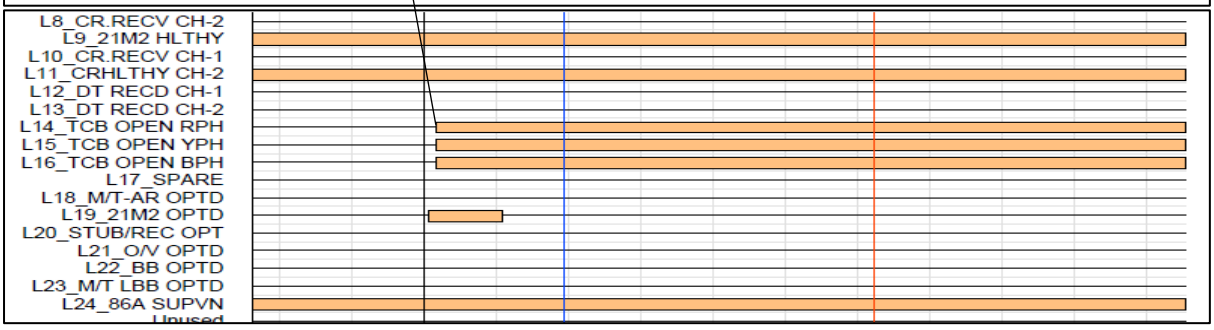


Sr.NO(10)

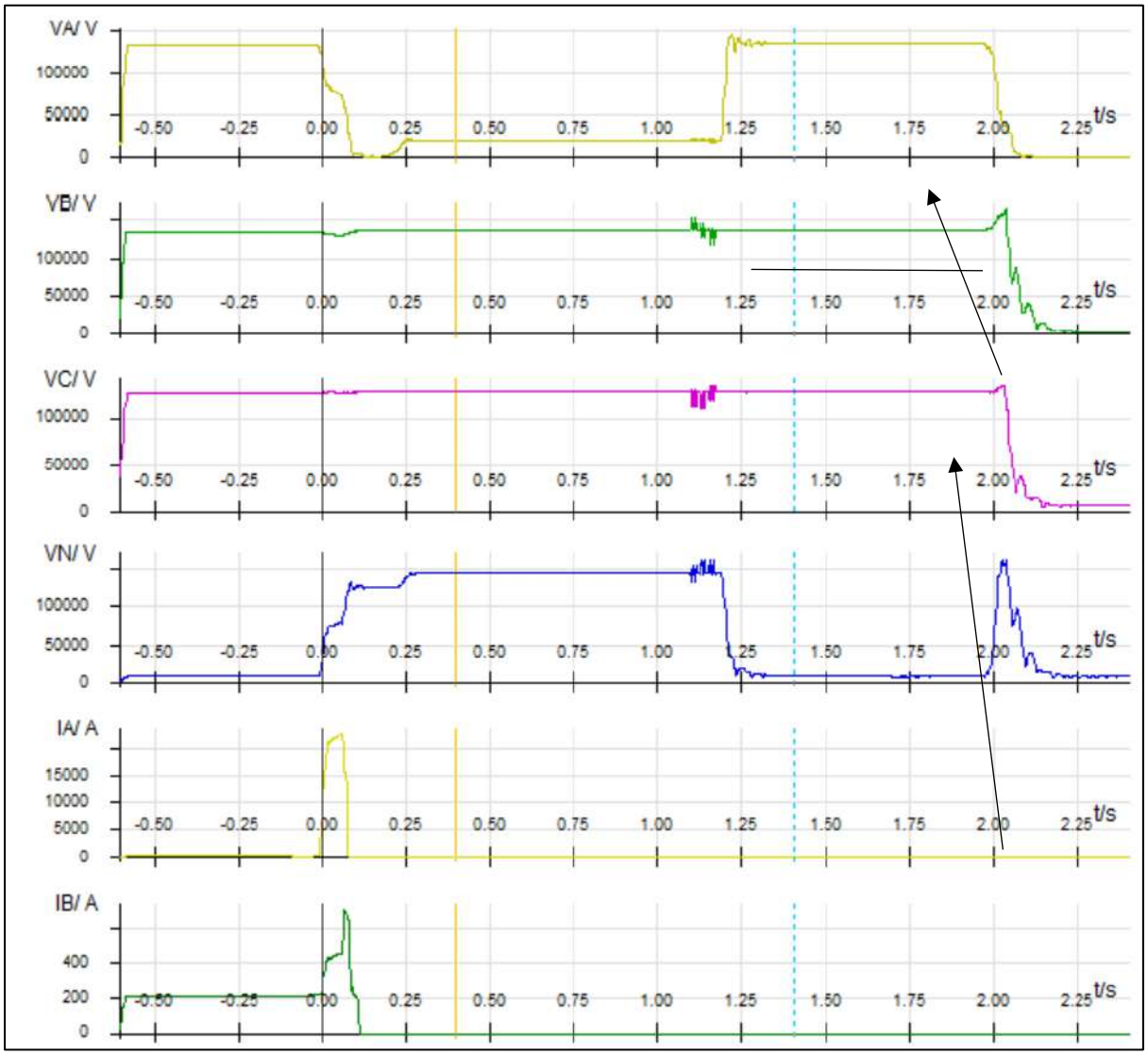
TCB at Lapanga end opened instantly but MCB opened after 200 ms delay which caused fault feeding till 250 ms ,although fault was in z-1 .This may please be checked .







Sr.No(11) From DR it is clear that auto reclose was successful but after 800 ms of successful A/R , line tripped but no fault was noticed .Reason for tripping may be shared.



Philosophy towards formulation and implementation of Grid Islanding Scheme considering 2 x 250 MW units (U # 7 & 8) of Chandrapura TPS, DVC connected to 220KV Grid System

The present islanding scheme in DVC is under service at Chandrapura TPS considering Unit # 1, 2 & 3 having capacity of 3 x 130MW (namely, CTPS – A plant) along with connected load of CTPS – A itself. However, U # 1 & 2 were put out of bar.

Hence, a new suitable venue in DVC is felt to be identified towards formulation and implementation of a new Grid Islanding scheme. Accordingly, U # 7 & 8 of Chandrapura TPS having capacity of 2 x 250MW (namely, CTPS – B plant) has been considered after much thinking and threadbare discussions. These units are connected to 220KV grid. Single line connection diagram (DVC Grid) is shown in Annexure – I.

The Grid islanding scheme is proposed to be implemented in two stages namely,

stage I : Islanding from grid &

stage II : Load – Generation balance through sequential load shedding

considering the 2 x 250MW generators of CTPS – B plant along with connected loads of CTPS – A (120 MVA), BIADA (73 MVA), Putki (180 MVA), Patherdih (141 MVA) & Nimiaghat (40 MVA).

The feasibility of the scheme at this preliminary stage is elaborated as below:-

1. Minimum generation of a unit to be considered as 170MW.
2. Monitoring of Total Generation in MW to be implemented using feed from Ex-Bus MW transducers available at 220kV Switchyard of CTPS – B.
3. The Grid Islanding relay (R1) to be placed at CTPS – B end considering 220KV Bus voltage & frequency of CTPS – B as reference.

   [Note :

   a. The old Islanding panel, placed at CTPS – A, may be used after shifting of the same from CTPS – A to CTPS – B. The OEM of this panel i.e. GE (erstwhile ALSTOM) confirmed that the existing panel could be suitably modified.

   b. Entire scheme design including setting of different relays will be taken care of after freezing of the scheme outline.]

4. After actuation of R1 relay – R2, R3, R4, R5, and R6 Relays which will be connected to IEC-61850 compliant substation bus of CTPS – A (220KV), CTPS – A(132KV), Putki (132KV), Patherdih (132KV) & Nimiaghat (132KV) will get actuated through –

   a. OPGW network with gateway & SDH (synchronous digital hierarchy) to be used for communication of inter-tripping logic through tele-protection GOOSE messaging after creation of VLAN.

   b. Media converter (AC/DC operated) for Gateway-SDH link/connectivity to be incorporated, if required (where length between gateway-SDH is greater than 50mtr.).

   and give trip command (stage – I tripping) as per following –

Substation Bus (IEC - 61850)	Relay	Trip command to -
CTPS_B	R1	CTPS – Dhanbad line (L # 203, 204) CTPS – BTPS line (L # 205, 206)
CTPS_A (220KV)	R2	CTPS – Kalyaneswari line (L # 201, 202) CTPS – BSL line (L # 253 & 254)
CTPS_A (132KV)	R3	CTPS – Gola (L # 6 & 7) CTPS – Purulia (L # 58 & 59) CTPS – Ramkanali/Jamuria (L # 60, 61) CTPS - Rajabera (L # 62, 63)
Patherdih	R5	Patherdih - MHS line (L # 14 & 15) Patherdih - Sindri line (L # 49 & 50) 132/25KV Transformer (Traction Load)
Nimiaghat	R6	Nimiaghat – Giridih line (L # 86 & 87) 132/25KV Transformer (Traction Load)

All Railway feeders/Traction load connected to the above buses to be disconnected during stage 1 operation to avoid unbalance loading.

5. The islanded connection after stage – I tripping is shown in Annexure – II and connected loads (CD in MVA) will be as below having average value of 416 MVA –

CTPS_A	119.90	MVA
BIADA	73.05	MVA
Putki	180.45	MVA
Patherdih	141.40	MVA
Nimiaghat	40.00	MVA
Total Load	554.80	MVA
75% of load	416.10	MVA

Apparently there will be no problem in Load – Generation balance in normal condition –

Generation considered: 225 x 2 MW = 450 MW

Average Load connected: 416 MVA or 400 MW

Considering droop of the TG is 5%,

(450 – 400) MW = 50 MW corresponds to $\frac{5}{450}$ x 50 = 0.56 %

If occurrence freq. is 50 Hz, then it may shoot up to 50 + 50 x 0.56 % = 50.28 Hz.

It will be easily taken care of.

6. However, if

a. Gen.>>Load demand or freq. would exceed a given set point, then one unit (lowest MW) will get tripped and

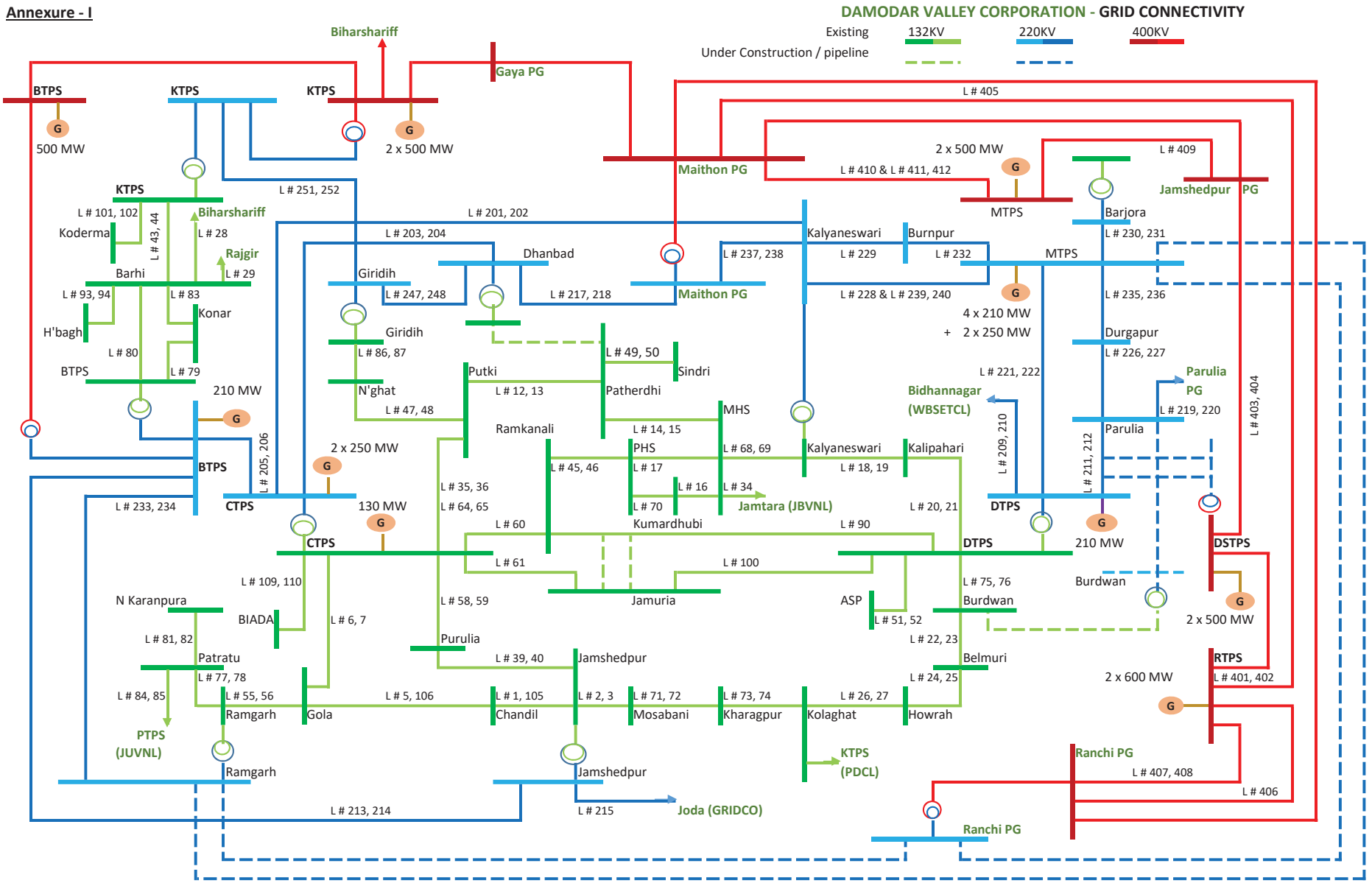
b. Only one unit is in service then

subsequent Load – Generation balancing is to be made by sequential load shedding (stage – II) at different substations as furnished below through protection telemetry (as discussed above) –

Phase - II :: Sequential Load shedding

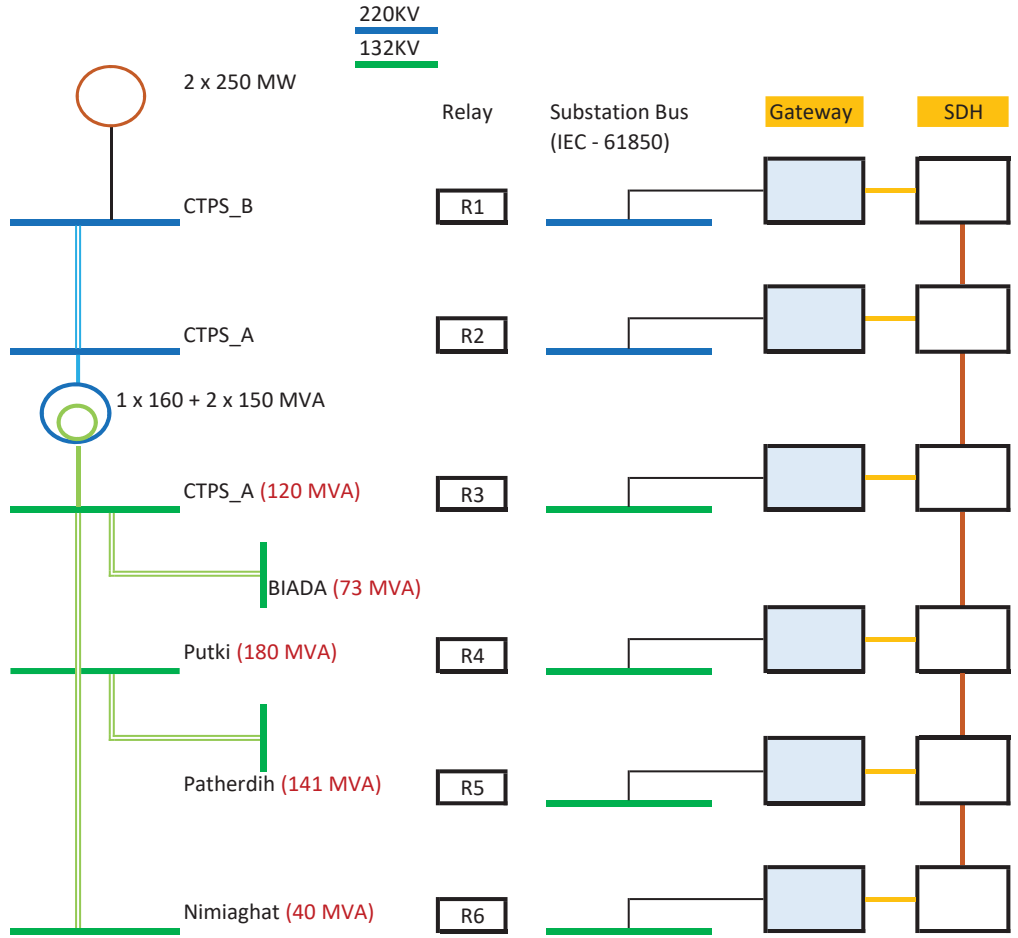
1	JBVNL, Ganeshpur	35.00	Putki
	JBVNL, Digwadih	17.00	Patherdih
		52.00	
2	JUVNL, Godhore	35.00	Putki
	JBVNL, Mukunda	15.00	Patherdih
		50.00	
3	JSEB, Dumri Banaso	40.00	Nimiaghat
4	JBVNL, Dugda	25.00	CTPS
5	JSEB, Jainamore	22.00	CTPS

Annexure - I


DAMODAR VALLEY CORPORATION - GRID CONNECTIVITY
Existing
Under Construction / pipeline
132KV
220KV
400KV
Biharshariff
Gaya PG
BTPS
KTPS
KTPS
500 MW
2 x 500 MW
L # 405
Maithon PG
2 x 500 MW
L # 409
L # 410 & L # 411, 412
MTPS
Jamshedpur PG
KTPS
L # 251, 252
L # 101, 102
Biharshariff
L # 201, 202
Barjora
Koderma
L # 43, 44
L # 28
L # 203, 204
Kalyaneswari
Burnpur
L # 230, 231
Rajgir
Dhanbad
L # 237, 238
L # 229
L # 232
MTPS
Barhi
L # 29
Giridih
L # 247, 248
L # 217, 218
Maithon PG
L # 228 & L # 239, 240
L # 235, 236
L # 93, 94
L # 83
4 x 210 MW
+ 2 x 250 MW
Konar
Giridih
Durgapur
H'bagh
L # 86, 87
L # 226, 227
L # 80
L # 49, 50
Sindri
L # 221, 222
Parulia PG
BTPS
L # 79
Putki
Patherdhi
Bidhannagar (WBSETCL)
210 MW
N'ghat
L # 12, 13
L # 219, 220
L # 47, 48
MHS
Parulia
Ramkanali
L # 14, 15
L # 403, 404
2 x 250 MW
PHS
L # 68, 69
Kalyaneswari
Kalipahari
L # 209, 210
L # 211, 212
L # 205, 206
BTPS
L # 45, 46
L # 17
L # 18, 19
L # 35, 36
L # 64, 65
L # 16
L # 34
Jamtara (JBVNL)
L # 233, 234
CTPS
130 MW
L # 70
L # 20, 21
DTPS
DSTPS
L # 60
Kumardhubi
L # 90
CTPS
DTPS
210 MW
L # 61
L # 100
L # 75, 76
Burdwan
L # 109, 110
Jamuria
ASP
Burdwan
2 x 500 MW
N Karanpura
L # 58, 59
L # 51, 52
BIADA
L # 6, 7
L # 22, 23
L # 81, 82
Purulia
Belmuri
Patratu
L # 39, 40
Jamshedpur
RTPS
L # 77, 78
L # 24, 25
2 x 600 MW
L # 84, 85
L # 55, 56
L # 5, 106
L # 1, 105
L # 2, 3
L # 71, 72
L # 73, 74
L # 26, 27
L # 401, 402
Ramgarh
Gola
Chandil
Mosabani
Kharagpur
Kolaghat
Howrah
PTPS (JUVNL)
KTPS (PDCL)
Ranchi PG
Ramgarh
Jamshedpur
L # 407, 408
L # 406
L # 213, 214
L # 215
Joda (GRIDCO)
Ranchi PG

Islanding Scheme at CTPS

Annexure - II



Phase - I :: Tripping for Islanding

CTPS – Dhanbad line (L # 203, 204)
CTPS – BTPS line (L # 205, 206)

CTPS – Kalyaneswari line (L # 201, 202)
CTPS – BSL line (L # 253 & 254)

CTPS – Gola (L # 6 & 7)
CTPS – Purulia (L # 58 & 59)
CTPS – Ramkanali/Jamuria (L # 60, 61)
CTPS - Rajabera (L # 62, 63)

Patherdih - MHS line (L # 14 & 15)
Patherdih - Sindri line (L # 49 & 50)
132/25KV Transformer (Traction Load)

Nimiaghat – Giridih line (L # 86 & 87)
132/25KV Transformer (Traction Load)

After Phase - I tripping
Load in MVA

CTPS_A	119.90
BIADA	73.05
Putki	180.45
Patherdih	141.40
Nimiaghat	40.00
Total Load	554.80
75% of load	416.10

Phase - II :: Sequential Load shedding

1	JBVNL, Ganeshpur	35.00	Putki
	JBVNL, Digwadih	17.00	Patherdih
		52.00	
2	JUVNL, Godhore	35.00	Putki
	JBVNL, Mukunda	15.00	Patherdih
		50.00	
3	JSEB,Dumri Banaso	40.00	Nimiaghat
4	JBVNL, Dugda	25.00	CTPS
5	JSEB, Jainamore	22.00	CTPS

Annexure-B10

Jharkhand Urja Sancharan Nigam Limited

(CIN: U40108 JH 2013 SGC 001704)
Nigam Office- JUSNL Building, Kusai Colony, Doranda, Ranchi-834002
Office of the Senior Manager, Transmission Division, Lalmatia (Godda) - 814165
Email – [eeetdlalmatiajusnl@gmail.com], Mob. No. - 9939150265

Letter No. 76 **/TD, Lalmatia** **Dated-** 10/03/2021

From,

Senior Manager,
Transmission Division, Lalmatia,

To,

Deputy General Manager
CRITL / Operation Efficiency
JUSNL, Ranchi,

Sub:- Regarding Submission of Joint patrolling report of 132KV Lalmatia-BSPTCL(Kahalgaon) transmission line.

Ref:- (1) Letter No. 11, GM/CRITL(JUSNL), Ranchi, Dated- 22/02/2021.
(2) Memo No. 175/Bhagalpur, Dated- 08/03/2021 of AEE(LM)/TD/Bhagalpur.
(3) This office letter no.51, Dated- 25/02/2021.

Sir,

With refernce to the above subject & reference, I hereby submit Joint patrolling report of 132KV Lalmatia-BSPTCL(Kahalgaon) transmission line for your kind information and needful.

Encl:- As above

Yours Faithfully,

10/03/2021

Senior Manager
Transmission Division, Lalmatia

Copy forwarded to –

1. Manager/ TSD, Lalmatia for kind information & necessary action.
2. DGM,Transmission Circle, Dumka for kind information.
3. G.M./TZ-II, Dumka & GM, CRITL (Operation Efficiency), JUSNL,Ranchi for kind information.

BIHAR STATE POWER TRANSMISSION COMPANY LIMITED
OFFICE OF THE
ELECTRICAL EXECUTIVE ENGINEER
TRANSMISSION DIVISION, BHAGALPUR
E-mail :eeltmsdbhagalpur@gmail.com

Dated:- _____/

Letter No._____/Bhagalpur

From:-

Assistant Executive Engineer
Line Maintenance Trans. Division, Bhagalpur

To,

Electrical Executive Engineer
Transmission Division, Bhagalpur

Sub:- Regarding schedule for joint patrolling of 132 kv Kahalgaon-Lalmatia trans. Line.

Ref:- Letter No. 51 dated:- 25.02.2021 of Senior Manager, Trans. Div. Lalmatia.

Sir,

With reference to above subject it is to say that the joint patrolling of 132 kv Kahalgaon-Lalmatia trans. Line has been scheduled for dated 10.03.2021 after communicating to Jr. Manager & Manager, Trans. Sub-division Lalmatia .

This is for your kind information and necessary action.

Yours faithfully
Sd/-

Assistant Executive Engineer
Line Maintenance Trans. Division, Bhagalpur

Memo No. 175 /Bhagalpur Date :- 08/03/2021

Copy forwarded to Sr. Manager Transmission Division, Lalmatia for kind information and necessary action.

08/03/2021

Assistant Executive Engineer
Line Maintenance Trans. Division, Bhagalpur

MOM held between M/S JUSNL & M/S BSPTCL regarding Joint Patrolling of 132 KV Lalmatia-BSPTCL (Kahalgaon) Transmission Line from Loc. No. 1 (BSPTCL)- Loc. No. 6, Loc. No. 71(LILO Point)- Loc. No. 84 & Loc No-01(Block Chowk) to 123(JUSNL) on Dated 10/03/2021

Members Present

For JUSNL

1. Sri. Prabhuranjan kr. (Manager/TSD/Lalmatia)
2. Sri. Shashikant Verma (Junior Manager/TSD/Lalmatia)

Members Persent

For BSPTCL

1. Smt. Shikha Ranjan (AEE(LM)/TD/Bhagalpur)
2. Sri. Anant kr. Pandit (JEE(LM)/TD/Bhagalpur)

Joint Patrolling of 132 kv Lalmatia-BSPTCL (Kahalgaon) Transmission line from loc. No. 01 to 123 has been completed and found that following points has been observed . Details are given below:-

(1) Tree pruning / Cutting is required at few location such as Loc. No. 3,4,7,8,22 -24,26-28,33-34,50-51, 63-64, & 91-92.Shut down for tree pruning under jurisdiction of BSPTCL has already been applied for dated-16/03/2021 which is also approved in 176th OCC in Sl. No.369 & 370.

(2) Overhead Earth Wire is missing between Loc. No. 34 to 41.

For M/s JUSNL

1. 10/03/2021
Manager/TSD/Lalmatia

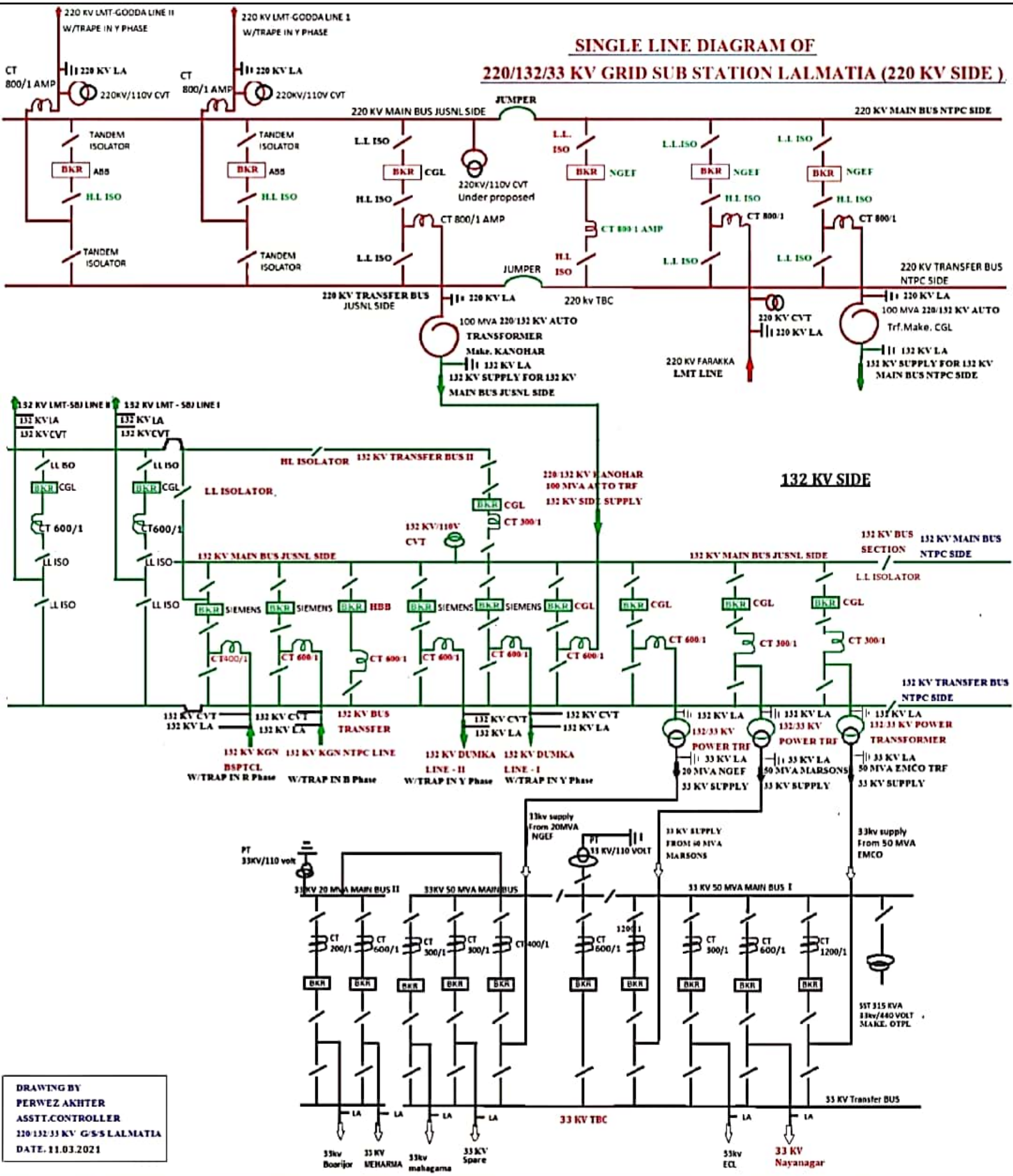
2. Shashikant Verma
10/03/2021
Jr. Manager/TSD/Lalmatia

For M/s BSPTCL

1. Anat kumar Pandit
10/03/21
JEE(LM)/TD/Bhagalpur

2. Shikha
10/09/2021
AEE(LM)/TD/Bhagalpur

SINGLE LINE DIAGRAM OF
220/132/33 KV GRID SUB STATION LALMATIA (220 KV SIDE)



DRAWING BY
PERWEZ AKHTER
ASSTT.CONTROLLER
220/132/33 KV G/S/S LALMATIA
DATE. 11.03.2021

Annexure- B.14

RESISTIVE REACH SETTING GUIDELINES

A. Proposed setting for Phase-earth fault:

a. Calculation of minimum load impedance shall be as per Ramkrishna Committee Recommendation:
   - Maximum load current (Imax) may be considered as 1.5 times the thermal rating of the line or 1.5 times the associated bay equipment current rating (the minimum of the bay equipment individual rating) whichever is lower.
   - Minimum voltage (Vmin) to be considered as 0.85pu (85%).

b. Minimum setting for resistive reach shall be such that it must cover fault resistance, arc resistance and the tower footing resistance.

c. In general, maximum reach setting shall be 80% of the minimum load impedance.

d. Utility should try to set Resistive reach setting < 4.5 times the zone reactive reach setting, however if there is any limitation from relay manufacturer's side then recommendation of OEM may be followed for maximum resistive reach setting.

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

B. Proposed setting for Phase-Phase fault:

a. Calculation of minimum load impedance as per the method mentioned above for phase-earth fault.

b. Minimum setting for resistive reach shall be such that it must cover fault resistance and arc resistance.

c. In general, the resistive reach of zone-3 is set less than 80% of minimum load impedance. For power swing consideration, a margin of DR is given. Therefore, it is essential that load should not encroach this DR. In view of this, R3ph–R4ph may be set 60% of minimum load impedance. R2ph and R1ph may be set 80% of R3ph-R4ph respectively.

d. Utility should try to set Resistive reach setting < 3 times the zone reactive reach setting, however if there is any limitation from relay manufacturer's side then recommendation of OEM may be followed for maximum resistive reach setting.

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

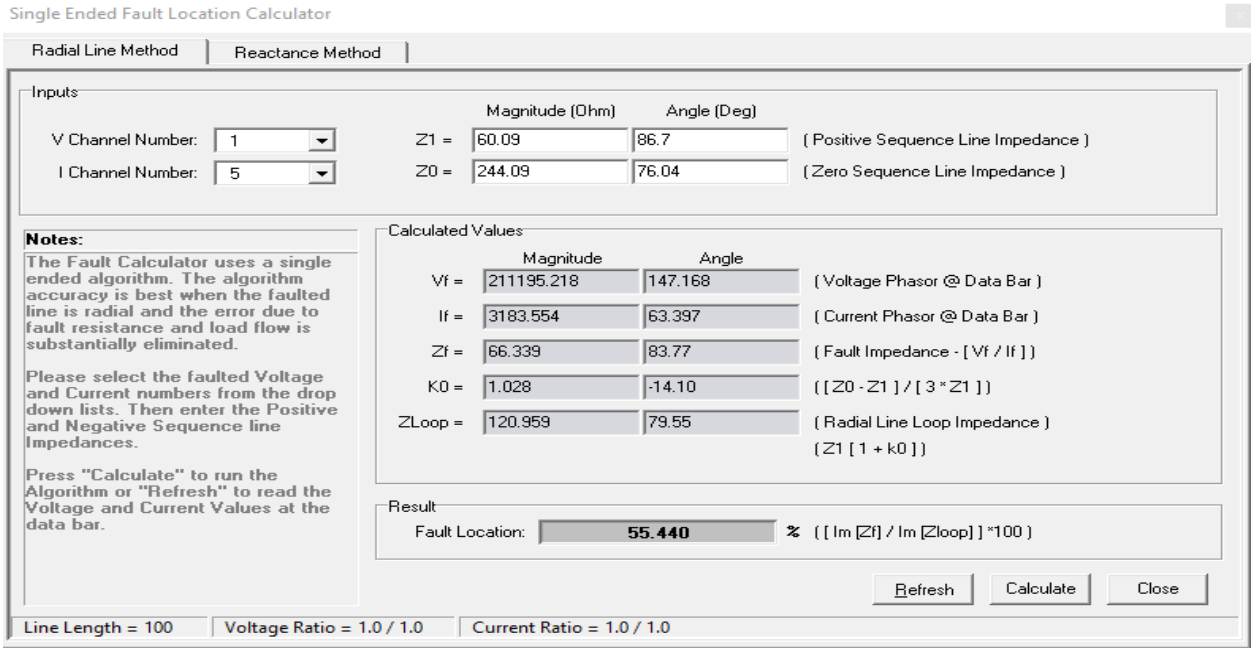
C. For underground cable, as the fault mechanism and earthling resistance of sheath are different from tower footing resistance of overhead lines, the resistive reach setting of cable may be set as per OEM recommendation. However, effort shall be made to keep the setting within the above mentioned range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

Annexure B15.5

Fault location Calculation for 400 kV Barh-Motihari fault on 02/09/2020 at 00:20:29 hrs:

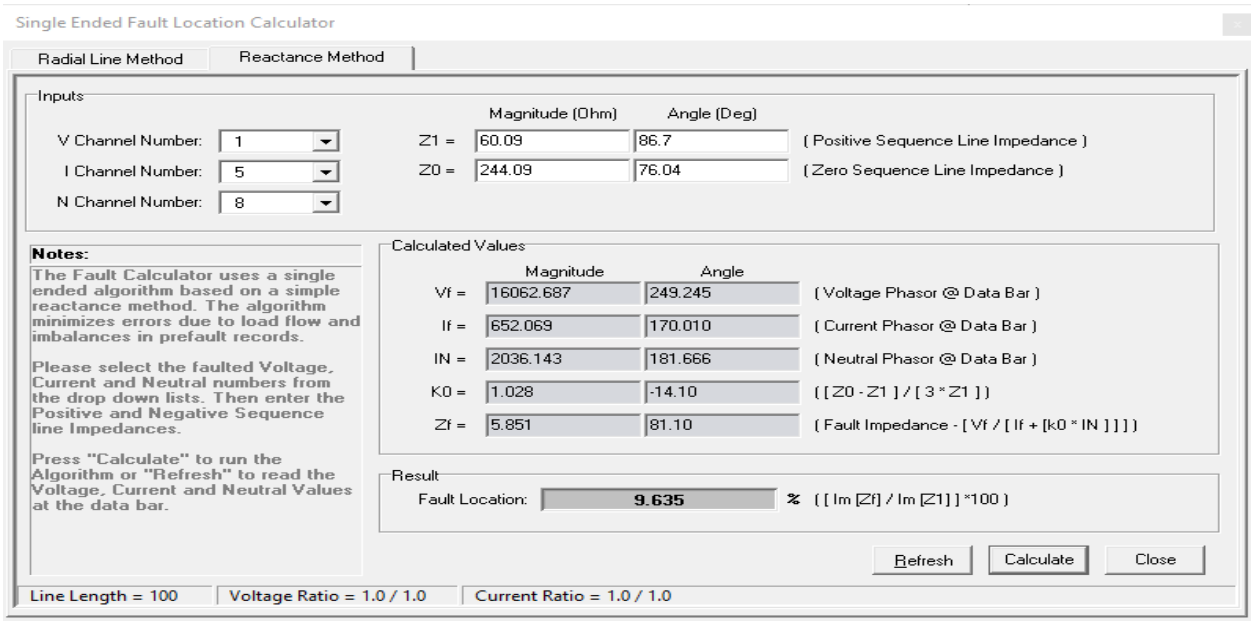
Line length is taken as 237 KM and the impedance is taken as per CEA data for Quad moose D/C line.

a. Single ended Method at Barh end(radial line method):



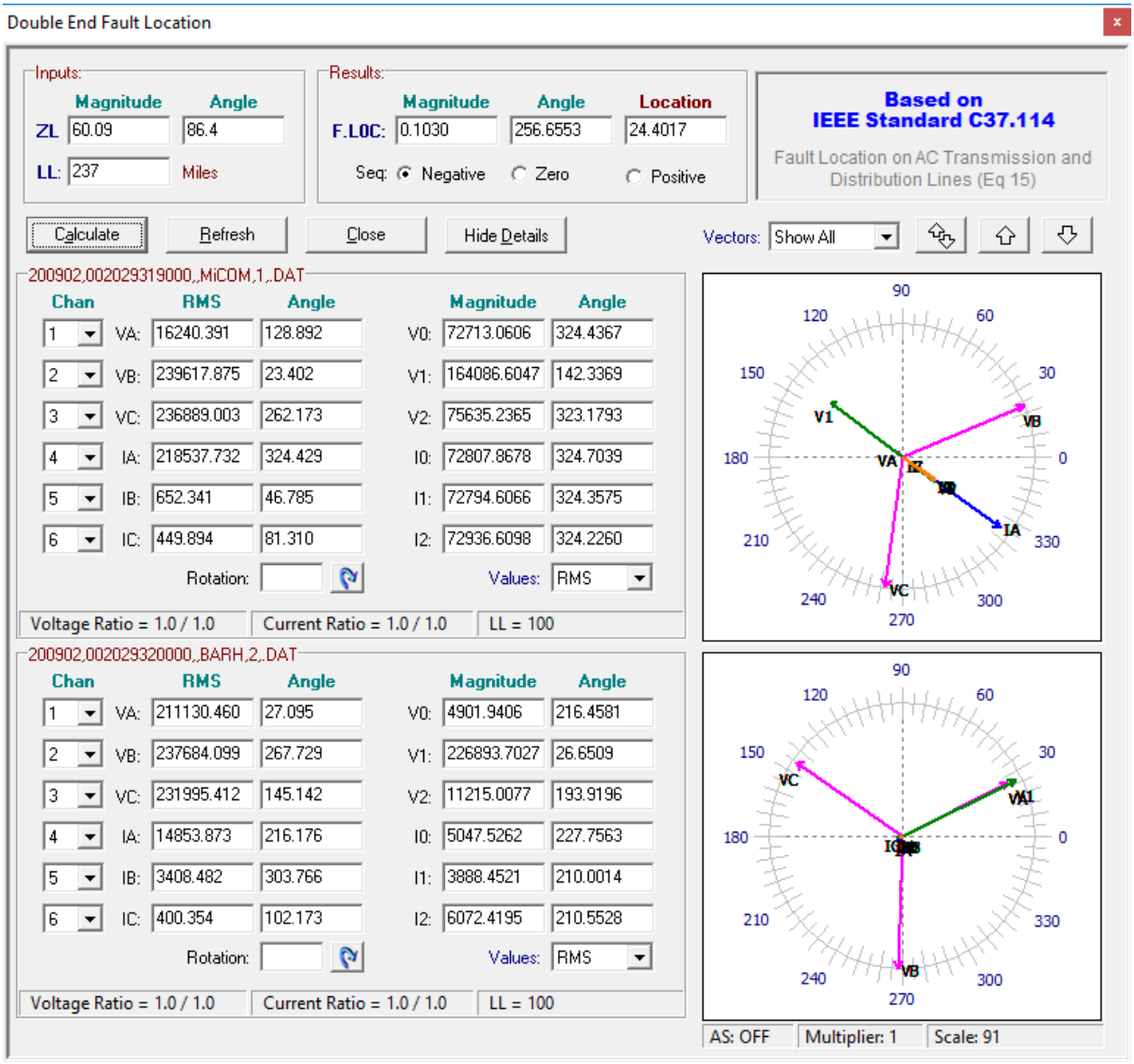
Fault distance =131.39 KM

b. Single ended Method at Motihari end(reactance line method):



Fault distance =22.83 KM

c. Double ended Method at Motihari end(reactance line method):



Fault distance =24.4 KM