Minutes
of
98th PCC Meeting

Date: 28.01.2021
Eastern Regional Power Committee
14, Golf Club Road, Tollygunge
Kolkata: 700 033

EASTERN REGIONAL POWER COMMITTEE

MINUTES OF 98TH PROTECTION SUB-COMMITTEE MEETING HELD ON 13.01.2021 AT 10:30 HOURS

The 98th PCC meeting was chaired by Member Secretary, ERPC. Meeting was conducted through Microsoft Teams online platform. List of participants is enclosed at Annexure A.

PART – A

ITEM NO. A.1: Confirmation of minutes of 97th Protection sub-Committee Meeting held on 14th December 2020 through MS Teams.

The minutes of 97th Protection Sub-Committee meeting held on 14.12.2020 circulated vide letter dated 04.01.2021.

Members may confirm the minutes of 97th PCC meeting.

Deliberation in the meeting

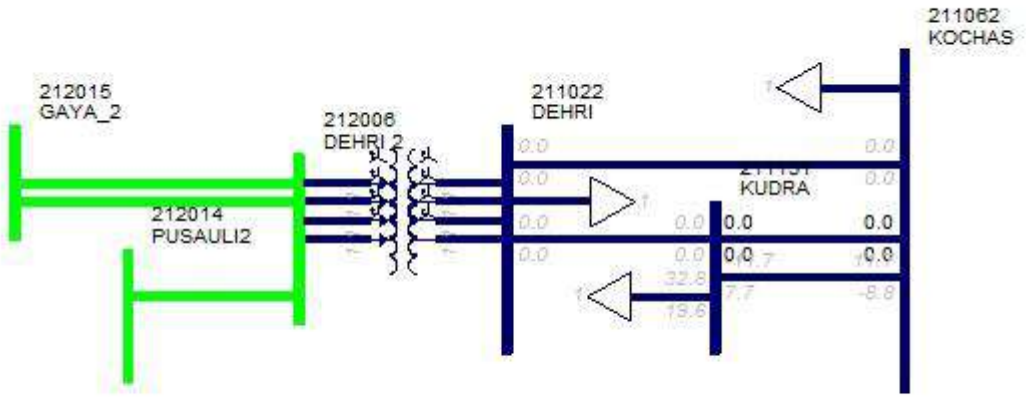
Members confirmed the minutes of 97th PCC Meeting.

PART – B

ITEM NO. B.1: 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.

BSPTCL informed that the fault was in 132 kV Dehri-Kochas line.



Load Loss: 184 MW

BSPTCL and Powergrid may explain.

Deliberation in the meeting

BSPTCL explained the following:

- *The disturbance was due to a transient fault in 132 kV Dehri-Kochas S/C Line.*
- *At Kochas end, main protection picked up and circuit breaker operated to clear the fault.*
- *At Dehri end, only backup overcurrent relay picked up the fault. However the circuit breaker of the line failed to operate due to problem in contactor.*
- *The 220/132 kV ICTS at Dehri Substation also failed to pick up the fault. As a result the fault got propagated to upstream network. The fault finally got cleared from 220 kV Pushauli and 220 kV Gaya end in zone-3 of distance protection.*
- *They explained that the distance relay at Dehri end was recently replaced by new relay so there might be some setting issue in the relay as a result the relay did not pick up the fault.*
- *Regarding 220/132 kV ICTs they informed that HV side backup overcurrent settings of ICTs was in IDMT characteristics however relay did not pick up during the fault.*

They informed that the contactor problem of circuit breaker was resolved in Dehri side and its operation was checked and put into service.

ERLDC informed that during analysis of DR of 132 kV Dehri-Kochas line at Dehri end, it was observed that the voltage values of all three phases are close to zero even during the pre-fault period.

PCC felt that the tripping of 220 kV lines from Gaya and Pushauli end for a transient fault in 132 kV Dehri-Kochas line is not desirable and advised BSPTCL 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 advised BSPTCL to do the periodic checking of the CBs and also to share the last test report of the same to ERPC and ERLDC.

Thus, 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.*

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

ITEM NO. B.2.1: Multiple cases of 315 MVA ICT 2 and 3 trippings at 400/220 kV Bihar Sharif during any close-in fault on 400 kV Transmission lines from Biharsharif

On multiple occasions in the last year, 400/220 kV 315 MVA ICTs 2 and 3 of Biharsharif got tripped during all the close-in fault on 400 kV Transmission lines from Biharsharif. The issue was discussed in the 94th and 95th PCC and BSPTCL was advised to review the ICT backup overcurrent protection relay settings in coordination with Powergrid.

However the issue is still not rectified as observed from the recent event on 01-01-2021 where the ICTs tripped during a fault on 400 kV-Bihar Sharif- Mujaffarpur 2 circuit (LA failure at Biharsharif end). The detailed list of past tripping is provided below :

Sr No	Element Name	Tripping Date	Tripping Time	Reason 1	Reason 2	ICT Tripping on External fault
1	400KV-BIHARSARIFF(PG)-MUZAFFARPUR(PG)-2	01-01-2021	17:31	B'SARIFF: R-N,FD 0.02KM,FC 29KA	MZP: R-N,FD 132KM,FC 3.9KA	ICT Tripped due to fault in 400 BSF-MZF-2 although fault cleared within 100 ms still Ict tripped .
2	400KV/220KV 315 MVA ICT 2 AT BIHARSARIFF	01-01-2021	17:31	TRIPPED DUE TO DIRECTIONAL O/C		
3	400KV/220KV 315 MVA ICT 3 AT BIHARSARIFF	01-01-2021	17:31	TRIPPED DUE TO DIRECTIONAL O/C.TRIPPED FROM BSEB END ONLY		
4	400KV-BIHARSARIFF(PG)-MUZAFFARPUR(PG)-1	23-09-2020	19:16	BSF: B-N,28.1KA,1.1Km	MFR: B-N,3.9KA, 132Km	ICT Tripped due to fault in 400 BSF-MZF-I although fault cleared within 100 ms still Ict tripped .
5	400KV/220KV 315 MVA ICT 2 AT BIHARSARIFF	23-09-2020	19:16	Backup O/C trip		
6	400KV/220KV 315 MVA ICT 3 AT BIHARSARIFF	23-09-2020	18:19	Backup O/C trip		ICT Tripped due to fault in 400 Kv BSF-varanasi-2 although fault cleared within 100 ms still Icttripped .
7	400KV/220KV 315 MVA ICT 2 AT BIHARSARIFF	23-09-2020	18:19	Backup O/C trip		
8	400KV-BIHARSARIFF(PG)-VARANASI-2	23-09-2020	18:19	B_N, 2.8 KM, 27.6 kA		
9	400KV/220KV 315 MVA ICT 3 AT BIHARSARIFF	14-08-2020	20:23	NO TRIP AT PG SIDE	MASTER TRIP RELAY AT BSEB	ICT Tripped due to fault in 220 Kv BSF-Tenughat although fault cleared within 100 ms still Icttripped .
10	400KV/220KV 315 MVA ICT 2 AT BIHARSARIFF	14-08-2020	20:23	inter trip received at HV pg side	MASTER TRIP RELAY AT BSEB	

Sr No	Element Name	Tripping Date	Tripping Time	Reason 1	Reason 2	ICT Tripping on External fault
11	220KV-TENUGHAT-BIHARSARIFF-1	14-08-2020	20:23	Y-N Fault, Zone 2, location - 184.8 KM from TTSP, Ir- 782 A, Iy- 1.342 KA, Ib- 382 A, Fault Resistance -15.8 ohm	Y-N,o/c e/f 27.15 kA in iY at biharshariff	
12	400KV/220KV 315 MVA ICT 2 AT BIHARSARIFF	19-07-2020	05:47	MASTER TRIP RELAY 86 (INTER TRIP) OPERATED		--
13	220KV/132KV 150 MVA ICT 2 AT BIHARSARIFF	19-07-2020	05:50	master trip relay 86(inter tripping)		
14	400KV/220KV 315 MVA ICT 3 AT BIHARSARIFF	05-06-2020	20:14	Back Up O/C. From BSPTCL end		ICT Tripped due to fault in 400 Kv BSF-varanasi-2 although fault cleared within 100 ms still Icttripped .
15	400KV/220KV 315 MVA ICT 2 AT BIHARSARIFF	05-06-2020	20:14	Back Up O/C		
16	400KV-BIHARSARIFF(PG)-VARANASI-2	05-06-2020	20:14	B_N Fault, 3.64 KM, 23.21 kA (Biharsharif)		
17	400KV/220KV 315 MVA ICT 1 AT BIHARSARIFF	26-06-2020	14:26	Due to intertrip received from BSPTCL end		**--**
18	400KV/220KV 315 MVA ICT 1 AT BIHARSARIFF	28-06-2020	09:07	DT received at PG end		**--**

BSPTCL and Powergrid may explain.

Deliberation in the meeting

*BSPTCL explained the issue with a presentation which is enclosed at **Annexure B2.1***

BSPTCL explained that the cause of frequent trippings of ICTs were investigated at 220 kV Biharsharif substation in coordination with Powergrid.

They informed that as per their observation the spurious tripping commands might be getting generated from old busbar-LBB panel. The old Bus-bar panel was out of service, however the cables for LBB protection were having potential, which may have caused spurious tripping of ICTs.

They also found severe DC leakage issue in the substation.

Regarding rectification of the issues, they informed that the cable from old busbar panel have already been removed. The new busbar panel is available at site and would get commissioned soon.

The unbalanced DC voltage issue has been rectified. They added that new cables for control and protection circuit are being laid out in substation under winter maintenance program.

ERLDC advised BSPTCL to complete the work of SPS implementation during this period, so that Bus splitting scheme can be implemented.

It was further informed that relays at LV side of back up overcurrent protection of ICT I & IIhas been changed to numerical types from existing electromechanical type.

PCC advised BSPTCL to complete the commissioning work of new Bus bar panel at the earliest.

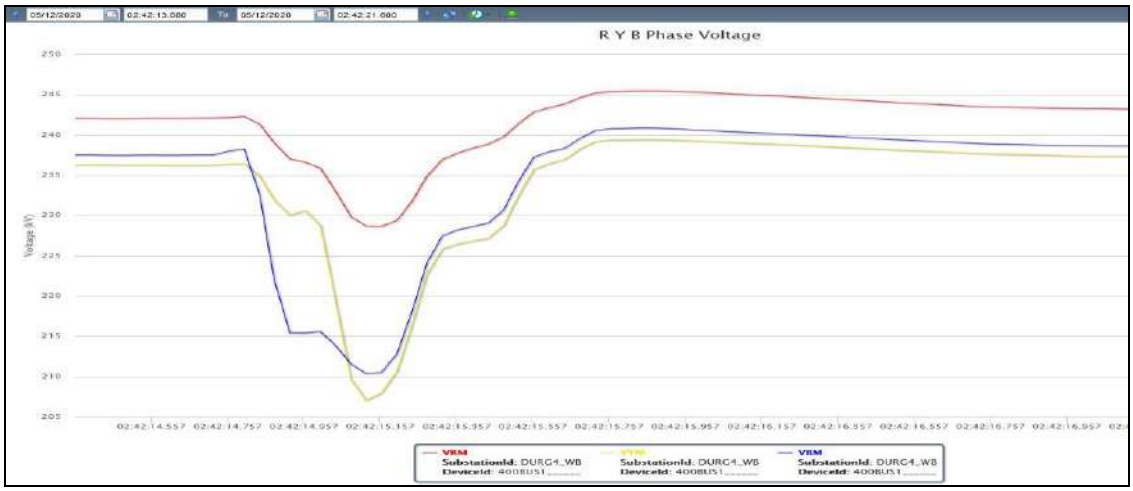
BSPTCL also submitted the oil test report of 220/132 kV ICT I & 2 at 220 kV Biharsharif S/s, and stated that, in ICT 2 no violation was observed but some violation was there in ICT I, which is due to ageing of the transformer having make of year 1985 and its last overhauling was done in the year 2010.

PCC advised BSPTCL to do the Oil filtration immediately for ICT 1, and subsequently to make a plan regarding replacing the old ICT with new one. BSPTCL was also advised to check the Oil of the ICT I periodically after oil filtration so that any unwanted eventuality could be avoided.

ITEM NO.B.2.2: Grid event at 400/220/132 kV Gokarna S/S on 05 – 12 – 2020 at 02:42 hrs

On 05-12-2020 at 02:42 hrs, B phase PT of 220 kV Main Bus-1 at Gokarna got burst resulting in 220 kV Bus 1 fault at Gokarna. As there was no Bus-Bar Protection at 220 kV bus at Gokarna, the fault was cleared by tripping of 220 kV feeders, 315 MVA 400/220 kV ICT, 160 MVA 220/132 kV ICTs & 220KV Bus-Coupler on backup protection/remote end protection as mentioned in below table.

Serial No	Name of Bay	Connected to Bus	Relay indication at Gokarna end	Relay indication at Remote end
1	220KV Sadaipur#1	Bus-1	Y-B-N, Z4	No Trip
2	220KV Sadaipur#2	Bus-2	Y-B-N, Z4	No Trip
3	220KV Rejinagar#1	Bus-1		Tripped with Z2
4	220KV Rejinagar#2	Bus-2	B-N, Z4	
5	220KV Sagardighi#1	Bus-1		Tripped with Z2
6	220KV Sagardighi#2	Bus-2	Y-B-N, Z4	
7	315 MVA 400/220 kV ICT - 1	Bus-1	B/U O/C&E/F(HV)	
8	160 MVA 220/132 kV ICT - 1	Bus-1	B/U O/C&E/F(HV)	
9	160 MVA 220/132 kV ICT - 2	Bus-2	B/U O/C&E/F(LV)	
10	160 MVA 220/132 kV ICT - 3	Bus-1	B/U O/C&E/F(LV)	
11	220KV B/C		O/C&E/F	



As per Durapur PMU, fault was in R, Y and B phase at 02:42 hrs. Around 30 kV dip has been observed in Y and B phase voltage while 12 kV dip in R phase is recorded in the PMU. The fault clearing time was around 800 ms.

Report received from WBSETCL is attached in the **Annexure B2.2.**

WBSETCL may explain.

Deliberation in the meeting

WBSETCL informed that the disturbance occurred due to bursting of Blue phase PT of 220 kV Bus-I at Gokrna S/s.

WBSETCL explained the following:

- *As bus bar protection at 220 kV Gokarna S/s was not in service the fault was cleared by tripping of 220KV Lines, 315 MVA 400/220 kV ICTs, 160 MVA 220/132 kV ICTs & 220KV Bus-Coupler. The details of the tripping is given in the report.*

- *The protection operation of 220KV lines connected to Bus-2 & 220KV Bus- Coupler were in order.*
- *The zone 4 protection of 220KV Lines connected to Bus-1 didn't pick up during the fault due to failure of Blue phase PT and the respective lines tripped from remote end in zone 2. However, the 220KV Gokarna – Sadaipur circuit 1 which was connected to Bus-1, tripped in zone 4, as it has line CVT.*

- *Protection operation of 315 MVA Transformer, 160 MVA Transformer connected to 220KV Bus-1 were in order except 160 MVA ICT1 which tripped in HV O/C & E/F relay.*

- *160 MVA ICT 2 as connected to Bus-2, it was tripped due to wrong overcurrent setting enabled in the relay. The same has been rectified after this incident.*

Regarding tripping of 160 MVA ICT-1 they informed that the relay could have maloperated due to failure of PT. The DR from the relay could not be extracted due to communication problem.
They further informed that Blue phase PT was already replaced with new PT. The HV O/C relay of 160 MVA ICT1 was also replaced.

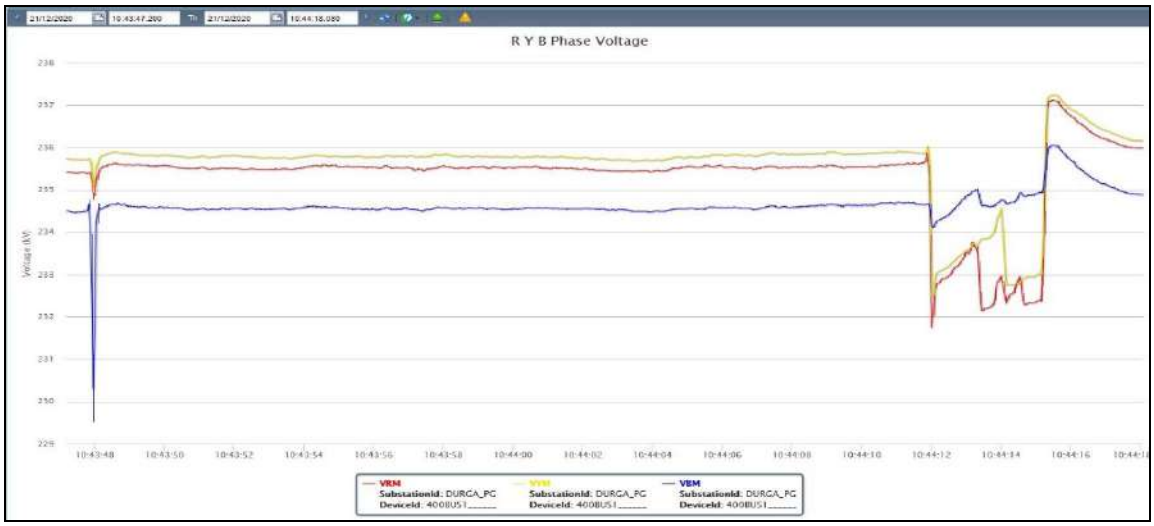
On a query from PCC, WBSETCL informed that implementation of bus bar protection system had been awarded to M/S ABB and the same will be implemented by Januart'2021.

ITEM NO. B.2.3 : Grid event at 220/132 kV Waria TPS on 21 – 12 – 2020 at 10:45 hrs

Before the event, 132 kV Waria TPS-Burdwan S/C was diverted through Bus Coupler and 132 kV Waria TPS-Jamuria S/C was under shutdown for CT replacement at Jamuria end.

On 21-12-2020 at 10:45 hrs, there was a fault at 132 kV Waria TPS-Kaliphari S/C due to snapping of R-phase jumpers at few locations. Subsequently total power failure occurred at 132 kV voltage level at Waria TPS as the 86 lockout relay failed to trip the circuit breaker at Waria end.

As per PMU at Durgapur, there was a fault in R, Y and B phases at 10:44 hrs. Around 5 kV dip has been observed in Y and R phase and around 0.5 kV dip has been observed in the B phase at the same time. The fault clearing time was around 3200 ms.



The report received from DVC SLDC is attached in **Annexure B2.3.**

DVC may explain.

Deliberation in the meeting

DVC informed that there were two faults occurred which lead to this disturbance.

The first fault occurred in 132 kV DTPS – Kalipahari circuit-1 due to jumper snapping at a location 12.8 km (approx..) away from DTPS end & distance relays of both Kalipahari and DTPS end tripped from Z1 Distance Protection and cleared the fault.

Then after 24 sec from the occurrence of 1st fault, the second fault of L-L-G nature occurred in 132 k V DTPS – Kalipahari circuit-2 at a location 1.3 km (approx..) away from Kalipahari end. Distance relay at Kalipahari end issued trip command in Z1 protection and subsequently breaker tripped isolating the fault from Kalipahari end. However, distance relay at DTPS end sensed the fault in Z2 and issued trip command but the breaker did not trip.

They added that as the fault was not cleared from 132 kV DTPS end, all three 220/132 kV ATRs of DTPS tripped from Back Up HV O/C protection and vvarious 132 kV DTPS lines tripped from remote ends through directional earth fault protection.

It was further informed that after patrolling, Insulator crack in B phase in Location 93 (Around 12 km from DTPS end) and Jumper snap in Location 88 (Around 14 km from DTPS end) was found

in 132 k V DTPS – Kalipahari circuit-1 and Jumper snap in A-phase was found in various locations in 132 k V DTPS – Kalipahari circuit-2 .

DVC informed that the breakers at 132 kV DTPS S/s are quite old. PCC advised DVC to plan for phase wise replacement of old circuit breaker at their old Power stations CTPS, BTPS & DTPS S/s and to take up the issue with their higher authority.

It was informed that the substation equipments of generating stations (CTPS, BTPS, DTPS) are under the control of respective generating stations and as such the maintenance is being carried out by the generators.

PCC advised DVC Transmission to coordinate with Generating stations and maintain the healthiness of circuit breakers in order to avoid such type of incidents in future

ITEM NO. B.3: .Islanding schemes of Eastern Region

1) 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.

PCC advised Bihar to check the availability of UFRs at 132kV lines and also to check the availability of PLCC system in 220kV Kanti TPS-Gopalganj D/C lines & 132kV lines connected at Goplaganj and submit the details to ERPC and ERLDC immediately.

KBUNL and BSPTCL may update.

Deliberation in the meeting

BSPTCL informed that details of the availability of PLCC for the lines associated with KBUNL islanding scheme had already been shared. The same is enclosed at Annexure B3.1.

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.

PCC opined that additional UFRs also need to be ensured as a redundancy measure so that, if communication network fails, the trip command from UFRs can be extended to the circuit breakers during the islanding operation.

On a query from BSPTCL regarding enabling the inbuilt UFR facility within the main and backup protection relays, PCC advised that use of UFR function within main protection relays shall be avoided. The UFR facility in back up protection relay or a dedicated UFR relay can be used for implementation of the UFRs in islanding network.

Regarding status of construction work at KBUNL end, the status could not be updated as KBUNL representative was not present in the meeting.

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 97th PCC following deliberations were made

SLDC Odisha informed that report related to latest status of IB-TPS Islanding scheme would be provided within a week to ERPC and ERLDC.

OPGC and OPTCL may update.

Deliberation in the meeting

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.

3) 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 B3.3**

In 97th PCC following deliberations were made:

DVC informed that concerned representative could not attend the meeting due to Covid-19.

PCC advised to discuss the Chandrapura islanding scheme in a separate meeting between DVC, ERPC and ERLDC.

Members may discuss.

Deliberation in the meeting

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.

PCC advised DVC to conduct a dynamic study in coordination with ERLDC by January' 2021. PCC decided that a separate meeting to be conducted between DVC, ERPC and ERLDC to finalize the islanding scheme.

ITEM NO. B.4: Total Power Failure at 220 / 132 kV Hatia Substation on 13.11.2020 at 14:36 hrs

On 13th November 2020 at 14:36 hrs, B phase CT at Hatia end of 220 kV Ranchi Hatia – 3 was busted causing bus fault at 220 kV Hatia bus of 220/132 kV Hatia Substation. The following elements got tripped:

- 220 kV Ranchi Hatia – 1 and 2 tripped from Ranchi end
- 220 kV Patratu – Hatia D/C tripped from Patratu end
- 220/132 kV 150 MVA ICT – 3 Hatia also tripped

Thereafter, 220/132 kV ICT – 1 & 2 and 220 kV Ranchi – Hatia – 1 & 2 were hand tripped from Hatia end. As a result total power failure occurred at 220/132 kV Hatia S/S.

In 97th PCC Meeting, PCC observed that the fault in 220kV bus at Hatia was not cleared from 220/132kV ICT 2 and ICT 3, as a result the 132kV lines got tripped.

PCC advised JUSNL to take the following corrective measures:

a) *The busbar protection of 220kV Hatia should be put in service at the earliest after necessary rectification work.*
b) *zone 4 time settings must be reduced to 250-300 ms till the bus bar protection is not operational.*
c) *Primary and backup protection system of 220/132kV ICT 1, 2 and 3 is to be tested and settings needed to be reviewed for proper coordination with transmission line protection. Tripping of circuit breaker should be checked by giving a trip command from the relay.*
d) *Check the configuration of PLCC signals of 220 kV Hatia – Ranchi circuit 2 and 3 at Hatia end as Powergrid received carrier signal for both circuit 2 and circuit 3 from Hatia end.*
e) *Verify reason of tripping of 132 kV PTPS – Hatia circuit from Patratu end in zone 1 as it should not detect the fault in zone1 .*
f) *Detail of all CTs installed at Hatia along with testing report to be submitted to ERPC and ERLDC.*

JUSNL may update.

Deliberation in the meeting

JUSNL updated the status as follows.

a) *Installation of busbar protection of 220kV Hatia is in progress. The rectification work was already completed and relay would be installed by February' 2021.*

b) Zone 4 settings was already reduced to 250-300 ms

c) Shutdown has been scheduled from 27th Jan 2021 onwards for testing of primary and backup protection system of 220/132kV ICT 1, 2 and 3. They further added that tripping of circuit breakers also be checked during the ICT shutdown.

d) Configuration of PLCC signals of 220 kV Hatia – Ranchi circuit 2 and 3 at Hatia end would be checked during shutdown scheduled from 27th Jan 2021 onwards.

e) DR was already submitted to ERPC and ERLDC, however it is difficult to identify the root cause of tripping of 132 kV PTPS – Hatia circuit from Patratu end in zone 1 from DR/EL. They further informed that relay settings were being checked and study is being carried out to find out the root cause of tripping of 132 kV PTPS – Hatia circuit from Patratu end in zone 1.

f) List of details of all CTs installed at Hatia would be shared to ERPC and ERLDC by tomorrow. It further informed that testing of some of CTs is already completed and shutdown would be taken for testing of remaining CTs.

PCC advised JUSNL to avail the shutdown in winter season in order to test the CTs and circuit breakers. PCC also advised JUSNL to restore the zone 4 settings to its original value as per protection philosophy once bus bar protection comes into service.

ITEM NO. B.5: Tripping of 400 kV Bus bar – 2 at 400/220 kV Jeerat S/S on 12 – 11– 2020 at 12:10 hrs.

400 kV bus bar – 2 at 400/220 kV Jeerat S/S tripped on 12 – 11– 2020 at 12:10 hrs due to Y phase to earth fault resulting in tripping of following elements:

- 400 kV Rajarhat – Jeerat S/C
- 400 kV Jeerat – Bakreswar S/C
- 400/220 kV 315 MVA ICT – 2 & 4 at Jeerat

Around 130 kV dip has been observed at Y phase bus voltage at Jeerat.

In 97th PCC following deliberations were made

WBSETCL informed that 400 kV bus bar – 2 at 400/220 kV Jeerat S/S was tripped due to Y phase to earth fault. Bus bar protection operated and tripped of all connected elements with Bus 2. WBSETCL added that no physical fault was found within the substation and it might be a transient fault.

ERLDC enquired about any load trimming scheme implemented at Jeerat.

PCC advised WBSETCL to share the load trimming scheme to ERPC and ERLDC.

WBSETCL may update.

Deliberation in the meeting

WBSETCL informed that the load trimming scheme has been submitted to ERLDC.

ITEM NO. B.6: 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 updated the following:

- *Bus Bar Protection at 220kV level of Meramundali S/s was not in service due to problem in BCU. Defective BCU has been sent to OEM Siemens.*
- *Zone 4 time settings of all 220 kV elements have been reduced and the same would be continued till restoration of the Busbar protection at 220 kV Meramundali.*
- *It was informed that overcurrent E/F protection at TTPS end of 220 kV Meramundali-TTPS D/C line has pick up the fault.*
- *220 kV Meramundali-Tata Steel D/C line tripped from Tata Steel on backup O/C, E/F protection. Since the line is 3 km long so they are in process of implementing differential protection for this line. The islanding scheme of Tata Steel was successfully operated and survived.*

After detailed deliberation PCC advised the following:

- *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.*
- *OPTCL and TTPS to analyze the reason for non-operation of distance protection at TTPS end of 220 kV Meramundali – TTPS D/C line.*

OPTCL may update.

Deliberation in the meeting

Regarding rise in healthy phase voltage at Meramundali S/s, SLDC Odisha informed that thorough checking of all earthing points are being carried at out at Meramundali S/s.

They further informed that the status of OPGW work and implementation of carrier protection in 220 kV lines would be submitted within a week.

TTPS informed that distance protection relay for 220 kV TTPS-Meramundali line was checked and found healthy and they could not find the cause for non-operation of distance protection at TTPS end during this incidence.

PCC advised OPTCL to check the healthiness of old equipment at Meramundali S/s and replace them if required in order to avoid repetition of such events.

ITEM NO. B.7: 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.

Members may discuss

Deliberation in the meeting

PCC advised all concerned utilities to go through revised settings as per the study carried out by PRDC and provide their observations within one week.

ITEM NO. B.8: Resistive reach setting guidelines and model calculation for distance protection--ERLDC

1. Proposed Criteria for Phase-earth fault:

a. Calculation of minimum load impedance should 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 should be such that it must cover fault resistance, arc resistance and the tower footing resistance.
c. Generally Maximum reach setting should be 80% of the minimum load impedance.
d. Resistive reach setting < 4.5 times the zone reactive reach setting.

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

2. Proposed Criteria for Phase-Phase fault:

a. Calculation of minimum load impedance as per the same method mentioned above.
b. Minimum setting for resistive reach should be such that it must cover fault resistance and arc resistance.
c. Generally, 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 is set 60% of minimum load impedance. R2ph and R1ph are set 80% of R3ph-R4ph respectively.
d. Resistive reach setting < 3 times the zone reactive reach setting.

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

Another important point is consideration of remote end in feed for zone-2 and 3 reach calculations.

In 96th PCC, Powergrid informed that the specifications in point d) may change with the OEM therefore this condition may not be applicable for all manufacturers.

DVC informed that consideration of thermal loading value (75° or 85°) for the settings to be discussed and finalized.

In 97th PCC meeting, PCC advised all the constituents to go through the guidelines and submit their comments to ERPC and ERLDC.

Members may discuss.

Deliberation in the meeting

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.

Powergrid informed that the specifications in point d) may change with the OEM therefore this condition may be modified accordingly.

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.

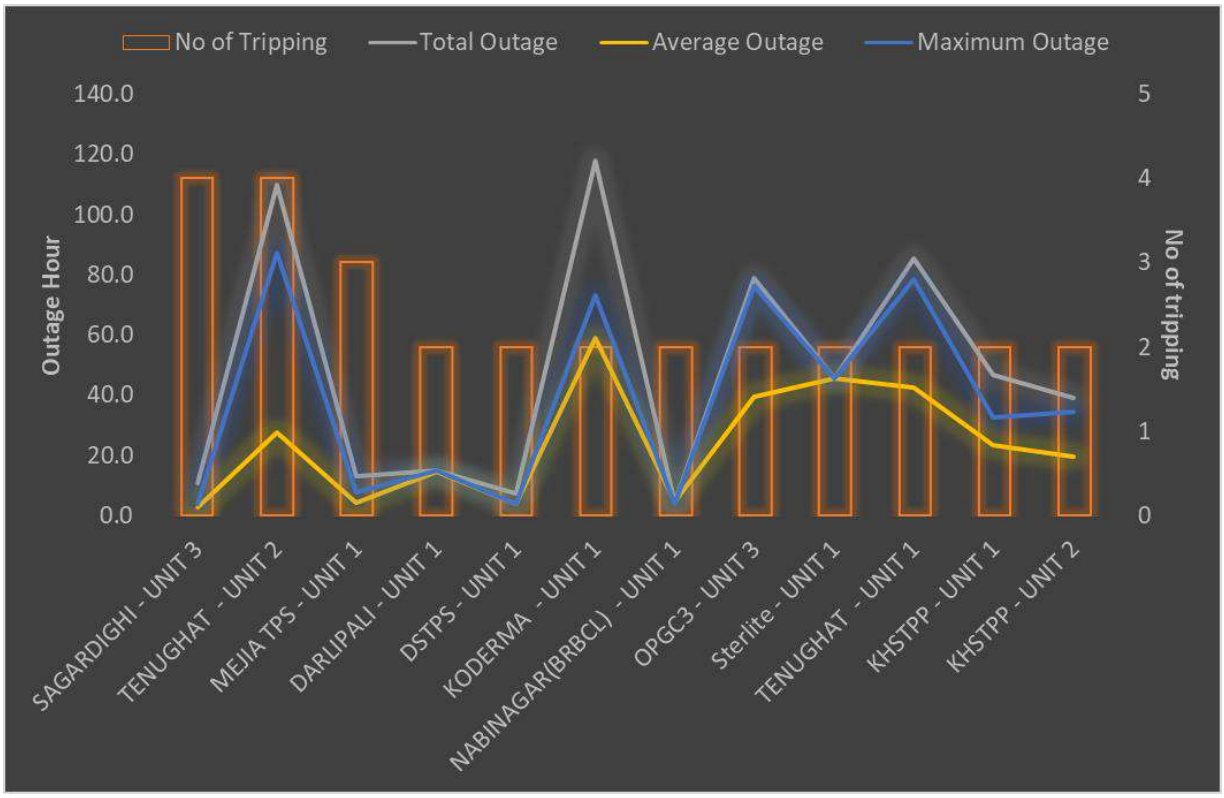
Powergrid informed that they would submit their views with respect to point d) after due consultation from their end.

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.

It was decided that the guidelines would be finalized after receiving the comments from Powergrid.

ITEM NO. B.9: Repeated tripping of generating units in December 2020

During December 2020, repeated tripping has 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 Dec 2020 is given below

Name of generating units	Reason for tripping	No of tripping	Utility to respond
Sagardighi TPS Unit 3	DC Earth Fault, Flame failure, Drum level low, High turbine shaft vibration	4	WBPDCL, WBSLDC
Tenughat TPS unit 2	Boiler leakage problem; turbine problem	4	Jharkhand SLDC, TTPS
Mejia TPS unit 1	Low furnace pressure, Electrical reserve board failure	3	DVC SLDC

WBPDCL, Tenughat , Jharkhand SLDC & DVC may explain.

Deliberation in the meeting

WBPDCL informed that due to spurious pickup in LBB relay, LBB protection mal operated and unit got tripped. The issue is being investigated by their testing team.
Regarding shaft vibration problem, they informed that the issue is being analyzed by the OEM i.e. BHEL.

SLDC DVC informed that as per the information received to them, there was a fault in ash pond pump feeder which did not get cleared and got extended to Electrical reserve board and subsequently the unit got tripped. They informed that detail report from Mejia TPS has not been received yet.

PCC viewed that multiple tripping of generating units is serious concern and need to be reduced for improving reliability of eastern regional grid.

PCC advised respective generators to attend the PCC meeting and to submit a detailed report regarding the frequent tripping of the units during the month along with the actions taken to address the issues.

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:

New Substation List

Sl No	SS Name	Data Collection	Owner	State
1	Saltlake Stadium		WBSETCL	West Bengal
2	Kashipur		OPTCL	Odisha
3	Betanati		OPTCL	Odisha
4	Aska New		OPTCL	Odisha
5	Udala		OPTCL	Odisha
6	Narshinghpur		OPTCL	Odisha
7	Mancheswar		OPTCL	Odisha
8	North Karanpura		NTPC	Jharkhand
9	Mangdhechu		MHPA	Sikkim
10	TingTing		….	Sikkim
11	Lethang		….	Sikkim
12	Rongichu		….	Sikkim

In view of COVID-19 pandemic the data is being collected through online. All the constituents may note and submit the relevant data to PRDC for maintaining the database.

In 93rd PCC, all the concerned utilities were advised to submit the relevant data to PRDC for maintaining the database.

In 97th PCC , PCC advised all concerned utilities to submit the relevant data to PRDC for maintaining the database.

Members may note and comply.

Deliberation in the meeting

PCC advised all concerned utilities to submit the relevant data to PRDC for maintaining the database.

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 97th 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 note and comply.

Deliberation in the meeting

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

1. Charging of 400 kV New Purnea Farakka S/C and 400 kV New Purnea Gokarna S/C

To avoid tower collapse situation because of encroachment of Ganga river, some portion of 400 kV New Purnea Farakka S/C and 400 kV New Purnea Gokarna S/C were charged as 400 kV Farakka Gokarna S/C since 08th September 2020. Subsequently, the tower near the river collapsed however the above arrangement survived due to the action taken. To restore the original circuit through the ERS tower arrangement, 400 kV Farakka Gokarna S/C was switched off and 400 kV New Purnea Farakka S/C and 400 kV New Purnea-Gokarna S/C were restored on 27th December 2020 and 26th December 2020.

As per information available at ERLDC, protection coordination may be required as per the following table.

Reason	S/S may be affected	Remarks	Utility to respond	Response received
Restoration of 400 kV New Purnea Farakka S/C and 400 kV New Purnea	New Purnea	Protection coordination to be done for all newly connected elements as per ERPC's guidelines. **Some portion was antitheft charged from New Purnea end.** Protection setting may be modified for that portion	POWERGRID ER- 1	Protection setting has been revised. Revised setting is shared with ERPC.
	Farakka	Protection coordination to be	NTPC	Protection

Gokarna S/C		done for all newly connected elements as per ERPC's guidelines. **Protection setting may be revised from the setting configured for 400 kV Farakka Gokarna S/C**	Farakka	setting has been revised. Revised setting is shared with ERPC.
	Gokarna	Protection coordination to be done for all newly connected elements as per ERPC's guidelines. **Protection setting may be revised from the setting configured for 400 kV Farakka Gokarna S/C**	WBSETCL	Protection setting has been revised.
	S/S connected to New Purnea: Biharshariff, Kishangunj, Muzaffarpur, Farakka, Malda, Binaguri	Longest line connected to New Purnea S/S may be changed to 400 kV New Purnea Gokarna. **POWERGRID ER-1 may share whether any change in longest or shortest line connected to New Purnea S/S.**	POWERGRID ER – 1 & 2, NTPC Farakka	Confirmation of protection coordination has been received from POWERGRID ER – 1 & 2 and NTPC Farakka.
	S/S connected to Farakka: Kahalgaon, Sagardighi, Parulia, Malda, Berhampur, Rajarhat	**NTPC Farakka may share whether any change in longest or shortest line connected to Farakka S/S.**	NTPC Kahalgaon, WBPDCL, POWERGRID ERTS - 2	NTPC Farakka informed there is no change in longest and shortest line due to restoration of this circuit.
	S/S connected to Gokarna: Rajarhat Sagardighi	Longest and shortest line connected to Gokarna S/S may be changed to 400 kV New Purnea Gokarna S/C and 400 kV Gokarna Sagardighi S/C	POWERGRID ERTS – 2, WBPDCL	Confirmation of protection coordination has been received from POWERGRID ER – 1 & 2.

WBPDCL 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-II intimated that PLCC channel could not be established due to problem found in the co-axial cable and in the signal generator card at Farakka end. Further they have set the zone-2 time settings of the above line at 200 msec from both end with autoreclosure enabled mode to avoid relay racing.

Members may discuss.

Deliberation in the meeting

ERLDC informed that protection coordination was already completed by all concerned utilities.
PCC advised concerned utilities to send protection settings to ERPC for maintaining protection database.

2. First time charging of 765 kV Ranchi Medinipur D/C, 765 kV main bus 1 & 2 at Medinipur along with 2 x 330 MVAr Bus reactor at Medinipur

As per information received at ERLDC following elements will be charged in near future:

- 765 kV Ranchi Medinipur D/C
    - **Line length 269.04 km; Conductor type: Hexa ACSR Zebra**
    - 3 x 80 MVAr line reactor will be charged at Medinipur for each circuit
    - 3 x 80 MVAr line reactor are already charged at Ranchi for each circuit
- 765 kV Main Bus 1 & 2 at Medinipur
    - Type of Conductor- QUAD AAC Bull
- 765 kV 3x 110 MVAr Bus reactor 1 & 2 at Medinipur

As per information available at ERLDC, protection coordination may be required as per the following table.

Reason	**S/S may be affected**	**Remarks**	**Utility to respond**	**Response received**
Charging of 765 kV Ranchi Medinipur D/C	Medinipur (New)	Protection coordination to be done for all new connected elements as per ERPC's guidelines	POWERGRID/ PMJTL	Protection coordination has been done as per ERPC's guideline
	Ranchi	Protection relay setting is to be revised from idle charging setting. Protection setting may be configured as per ERPC's guidelines.	POWERGRID ER - 1	
	S/S connected to Ranchi: Dharamjaigarh	Protection relay setting may be coordinated as per new charging line.	WRLDC/ POWERGRID	

Protection relay setting at Medinipur and Ranchi for all newly charged elements may be shared with ERLDC and ERPC for updating in ERPC protection database.

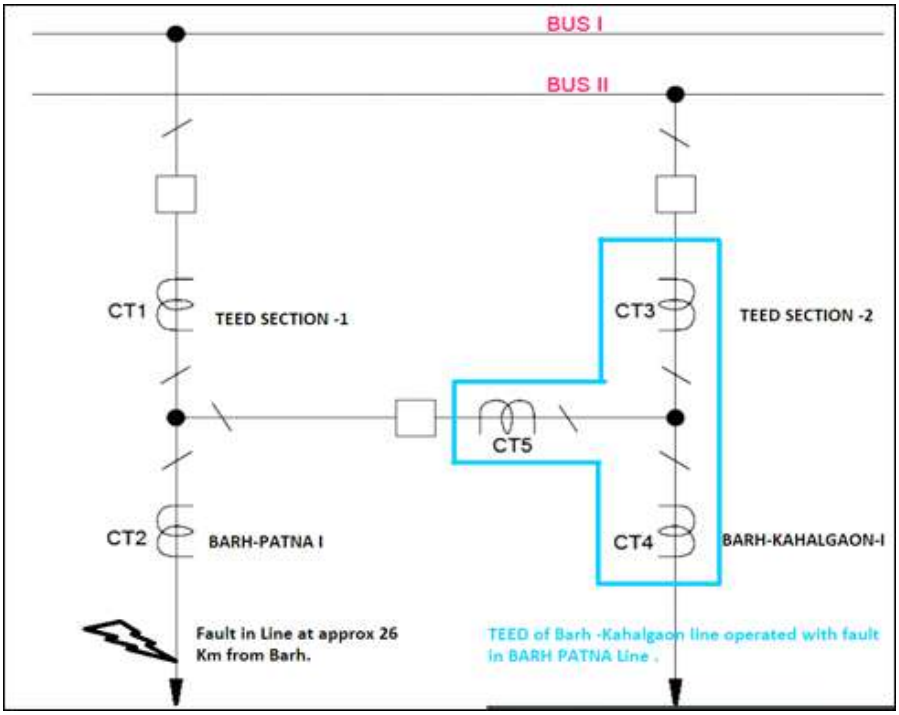
Powergrid may update.

Deliberation in the meeting

ERLDC informed that confirmation of protection coordination at Ranchi and Dharmjaygarh end has already been received.

ITEM NO. C.4: Tripping of 400 kV Barh- Kahalgaon line at Barh end on 22.12.2020.

On 22 December 06:09 Hrs ,400 Kv Barh -Patna-I line tripped at Barh end due to Y phase fault and at the same time 400 kV Barh -Kahalgaon-I which is in same dia also tripped with the operation of TEED protection associated with the line.



ERLDC informed that on 09th July 2020 at 13:40 Hrs, Teed protection has also operated for section associated with BARH-Kahalgaon-I for through fault in 400 kV Patna -NPGC line. A report by ERLDC in this regard is enclosed at Annexure C.4.1.

Deliberation in the meeting

NTPC representative was not present in the meeting.

PCC advised NTPC to submit a report regarding the disturbance to ERLDC/ERPC secretariat at the earliest.

Meeting ended with vote of thanks to the chair

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Annexure A

S.No.	Name	Designation	Organisation	Contact No.	Email Id
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14.	Pallavi Kansal		TVTPL	9898596883	pallavi.k@tvptl.com
15.	Rajdeep Bhattacharje e		BSPHCL		
16.	Pankaj Mishra		BSPTCL , CRITL		
17.	S M S SAHOO	AGM	Meramundul i, OPTCL		
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19.	Dilshad Alam	AEE	BSPTCL	7763818081	
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22.	Yallaji Reddy R				

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27.	Rahul Anand	Senior Manager (O & M)	NTPC	9425823430	rahulanand@ntpc.co.in
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35.	Alok Pratap Singh		ERLDC		
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42.	Sourav Biswas	Dy. Manager	ERLDC		
43.	Gagan Kumar		Bihar SLDC		

Annexure B2.1

There has been tripping incidents of ICT in Biharsharif. There are 04 incoming 220 kV lines from ICTs LV SIDE of PG BIHARSHARIF, directly to 220 kV bus of Biharsharif GSS. Out of these four, there are protection panel having Back up protection and Master trip Circuit in ICT 1&2 at Biharsharif GSS side. In The other two, ICT 3&4 at Biharsharif GSS end only intertrip command is recieved and no protection is there, it is in PG side. Also, bay maintenance of LINE 1&2 is done by GSS biharsharif BSPTCL and that of LINE 3&4 done by PGCIL.

The spurious tripping of ICT LV, in case of Fault in upper voltage level or in other bay, is suspected to be due to command from old BUS bar- LBB panel at our end. Or, un-balnced DC voltage may also be triggering such faults.

In this regard we would like to share some steps taken from our side.

1. Rectification of DC EARTH FAULT:

We have taken up rectification work of DC VOLTAGE during ongoing winter maintenance works in GSS Biharsharif. One by one DC EARTH FAULT in each bay are being identified and new healthy cables are being laid out for control and protection circuit. Till date, We managed to achieve balance DC VOLTAGE in system, and further this work is to be continued in all other bays respectively as per schedule of winter maintenance (Report enclosed)
At present (11.01.2021) DC VOLTAGE is perfectly balanced

Source 1
+Ve to E 112v
-Ve to E 115v
+Ve to -Ve 227

Source 2
+Ve to E 117 v
-ve to E 113 v
+Ve to -Ve 230 v

2. Identification of faulty cables from Old bus bar panel:
We are identifying and removing cables from old bus bar panel which is not in service. Also, CT CORE used for bus bar and LBB is shorted. It is suspected that spurious Tripping command is being generated by LBB relay.
Commissioning of New bar panel is under process.

3. Installation of numerical Back up relay in ICT 1 &2.:
Electromechanical relay installed as back up protection in ICT 1 & 2 at Biharsharif gss end is being replaced by numerical relay(on 11th and 12th January) in consultation with PGCIL enginners. This will help in analysing fault data and take appropriate action.

We are hopeful that with these works, we will be able to avoid such tripping incidents in future and stable operation in Biharsharif will be achieved.

Report of incidence on 05-12-2020 at Gokarna 220KV Sub-station.

1. **Date & Time of occurrence:** 05-12-2020, 02-42 hr.
2. **Name of Sub-Station:**Gokarna 220KV S/S.WBSETCL
3. **Location & nature of Fault:**220 KV Main Bus-I, Blue phase PT bursts out.
   Defective PT Particulars:Make-CGL ; Type-VEOT, Year- 1997; Sl.No.9880.
   List of Lines & Units tripped during the event:

Serial No	Name of Bay	Connected to Bus	Relay indication at Gokarna end	Relay indication at Remote end
1	220KV Sadaipur#1	Bus-I	B-C-N, Z4	No Trip
2	220KV Sadaipur#2	Bus-II	B-C-N, Z4	No Trip
3	220KV Rejinagar#1	Bus-I		Tripped with Z2
4	220KV Rejinagar#2	Bus-II	C-N, Z4	
5	220KV Sagardighi#1	Bus-I		Tripped with Z2
6	220KV Sagardighi#2	Bus-II	B-C-N, Z4	
7	315 MVA TR#1 LV	Bus-I	B/U O/C&E/F(HV)	
8	160 MVA TR#1 HV	Bus-I	B/U O/C&E/F(HV)	
9	160 MVA TR#2 HV	Bus-II	B/U O/C&E/F(LV)	
10	160 MVA TR#3 HV	Bus-I	B/U O/C&E/F(LV)	
11	220KV B/C		O/C&E/F	

4. **Antecedent condition prior to the Event:**Incident report of Site attached herewith.
5. **List of elements (which have influence on the event) which were under outage prior to the event**: Nil
6. **Amount of load and generation loss in MW:**No Load Loss occurred.
7. **Amount of energy unserved in MU to consumer/customer:**Not Applicable.
8. **Catering load from alternate source (if done after the event):**Not Required.
9. **Root cause for tripping of lines (Source of fault if any; Malfunction of protection system if any):** 220KV Main Bus-I, Blue phase PT bursts out. As there is no Bus-Bar Protection at present in 220KV system, the fault was cleared by tripping of 220KV Lines, 315 MVA Transformers, 160 MVA transformers & 220KV Bus-Coupler as mentioned in above shown table.
   Protection operation of 220KV lines connected to Bus-2 & 220KV Bus- Coupler are in order.
   Protection (Zone4) of 220KV Lines connected to Bus-1 didn't pick up at that instant due to failure of Blue phase PT and tripped from far end with Z2 time.
   Though 220KV Sadaipur#1 was connected to Bus-1, but it is tripped with Z4, as the same has line CVT.
   Protection operation of 315 MVA Transformer, 160 MVA Transformer connected t 220KV Bus-1 is in order except 160 MVA TR#1

160 MVA TR#1 tripped with HV O/C & E/F relay (Aegis) which may mal-operate in reverse direction due to failure of PT. DR couldn't be extracted due to communication problem.

Though 160 MVA Tr#2 was connected to Bus-2, it was tripped due to wrong o/c setting enabled in the differential relay apart from our standard setting.

10. **Remedial action taken (if any):**
    - **a)** Blue phase PT replaced on the next day.
    - **b)** HV O/C relay(Aegis) of 160 MVA TR#1 has been replaced by P141.
    - **c)** Wrong O/C setting in differential relay of 160 MVA TR#2 has been corrected.
    - **d)** For incorporation of 220 KV Bus Bar, M/S ABB has been engaged.

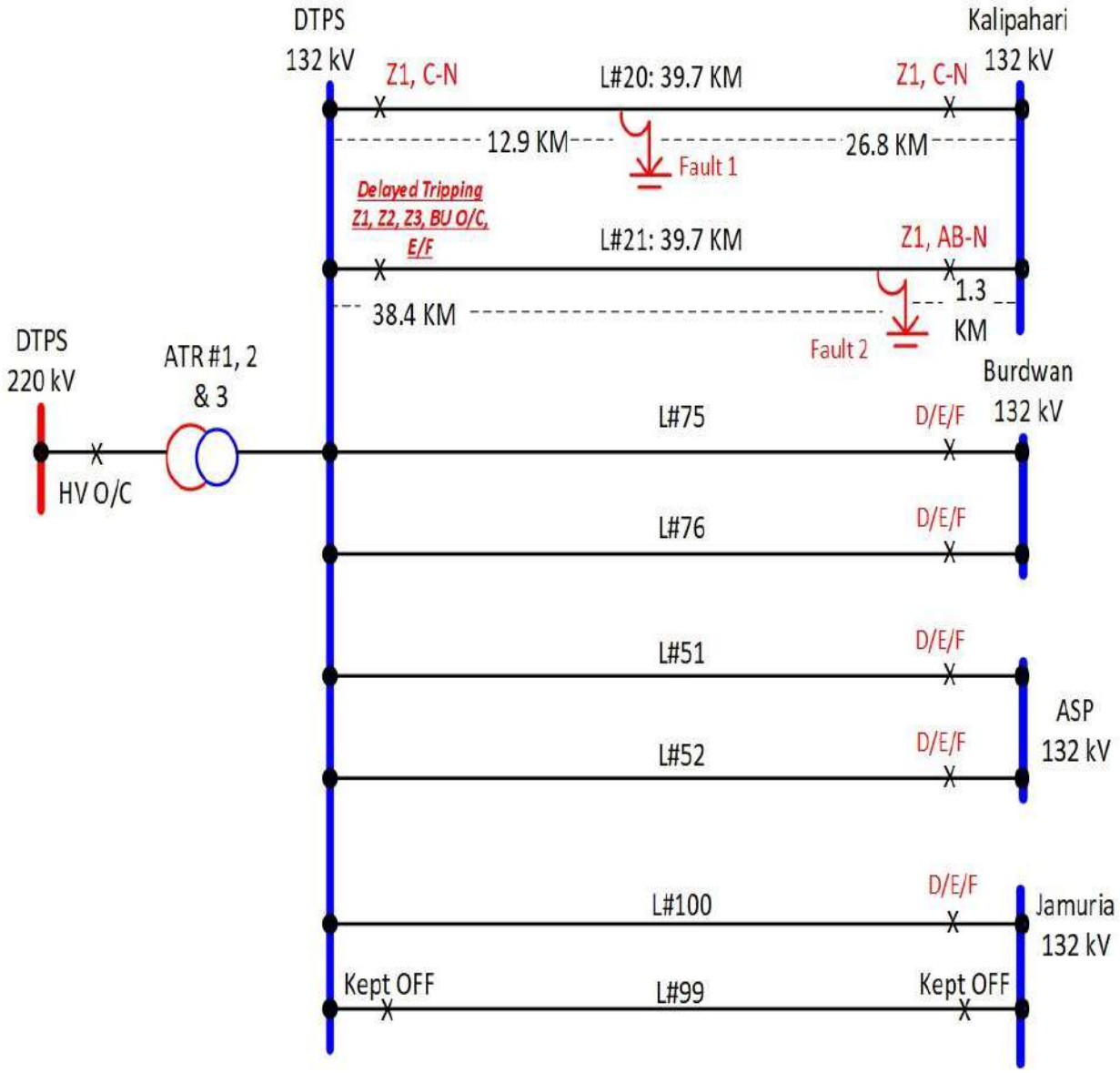
11. **Restoration of elements:**Incident report of site attached.

Annexure B2.3

INVESTIGATION REPORT OF TOTAL POWER FAILURE AT 132 KV DTPS ON 21.12.20

BRIEF HISTORY: On 21st December 2020 at about 10:30 hrs, total power failed in DTPS 132KV Bus due to tripping of all three ATRs and all lines from remote end. As per message received from DTPS Personnel, L#21 (DTPS-Kalipahari) breaker at DTPS end tripped from Z1 Distance Protection while L#20 breaker at DTPS end did not trip although Main Distance Relay (P442) of L#20 at DTPS end operated in Z1 Distance Protection. It was also reported that no lockout relay appeared for L#20 breaker at DTPS End.

RELEVANT SLD:



TRIPPING DETAILS:

LINE NO.	TIME OF FAULT	RELAY INDICATIONS	
		DTPS END	OTHER END
20 (Kalipahari)	10:27:36.081	Z1, 94	Z1
21 (Kalipahari)	10:27:59.923	Z1, Z2, Z3, BU O/C, D/E/F, 86	Z1
75 (Burdwan)		No Tripping	D/E/F
76 (Burdwan)		No Tripping	D/E/F
100 (Jamuria)		No Tripping	D/E/F
99 (Jamuria)		Kept Off	Kept Off
51 (ASP)		No Tripping	D/E/F
52 (ASP)		No Tripping	D/E/F
ATR#1, 2 &3		HV O/C	----

Note: The time has been taken as the time of fault pickup by P442 Distance Relay at DTPS end of L#21

TRIPPING ANALYSIS:

1. From the downloaded fault records of the numerical relays at DTPS end and information gathered from various substations, the following chronology of faults and subsequent line tripping could be established.
2. The first fault occurred at L#20 at a location roughly 12.8 KM away from DTPS. Both distance relays of L#20 at Kalipahari end and DTPS end tripped from Z1 Distance Protection and cleared the fault within 90ms from the time of fault initiation. 94 lockout relay operated at DTPS end of L#20. Breaker at DTPS end reclosed from Auto Recloser operation. That's why DTPS personnel have found L#20 breaker in closed condition after normalisation of the disturbance. Meanwhile breaker at Kalipahari end did not reclose and remained in tripped condition.
3. After around 24 seconds of this fault, a second phase-phase-ground (AB-N) fault developed at L#21 at a location roughly 1.3 KM away from Kalipahari end. Distance relay of L#21 at Kalipahari end issued trip command in Z1 protection and subsequently breaker tripped isolating the fault from Kalipahari end. Distance relay of L#21 at DTPS end sensed the fault in Z2 and issued trip command after expiry of carrier coordination time delay (Tp = 80ms). Although 86 lockout relay operated, the breaker did not trip. As the fault was not cleared, subsequently Z2 Trip, BU O/C Trip, Z3 Trip, BU E/F trip commands were issued from the relay but the breaker did not trip.

   Due to feeding of this uncleared fault, all three ATRs of DTPS tripped from Back Up HV O/C protection and Various 132 kV DTPS lines tripped from remote ends through D/E/F Protection.

   From DR of L#21 at DTPS end it was observed that the fault had continued for almost 4 seconds.

4. TPF occurred at Jamuria S/S as during the occurrence of this disturbance, L#99 was kept off due to CT replacement work as L#61 was isolated from Jamuria end as per instruction of CLD. L#100 tripped at Jamuria end on D/E/F Protection.
5. TPF occurred at ASP S/S as L#51 & 52 tripped on D/E/F protection.
6. After patrolling of L#20 & 21 by GOMD, the following primary circuit faults were detected:
   a) L#20: Insulator crack in B phase in Location 93 (Around 12 km from DTPS end), Jumper snap in Location 88 (Around 14 km from DTPS end).
   b) L#21: Jumper snap in A Ph in Location 5, 55, 60 (Around 1.5km and 18 km from Kalipahari end)

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

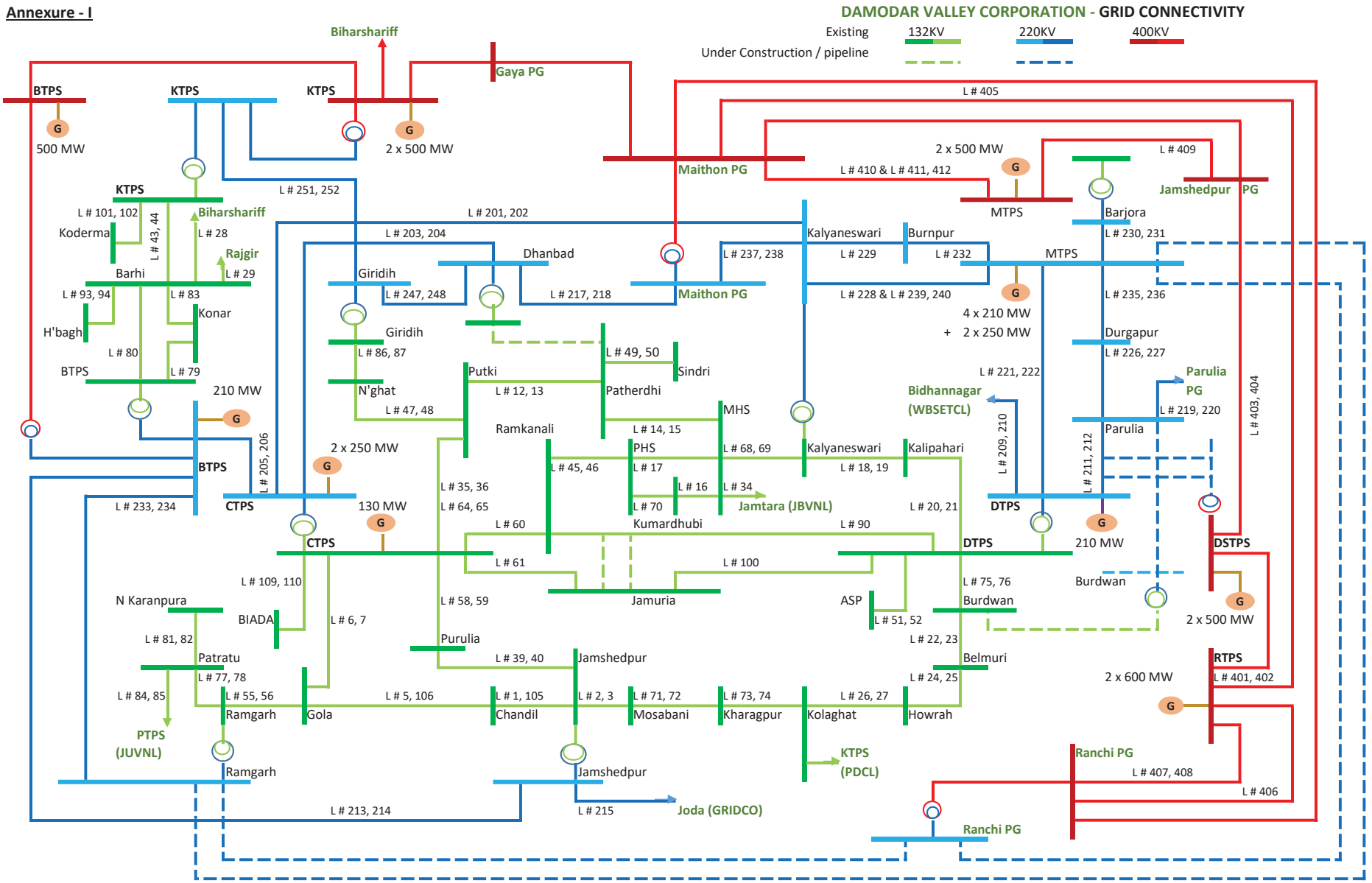
b. Only one unit is in service then

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

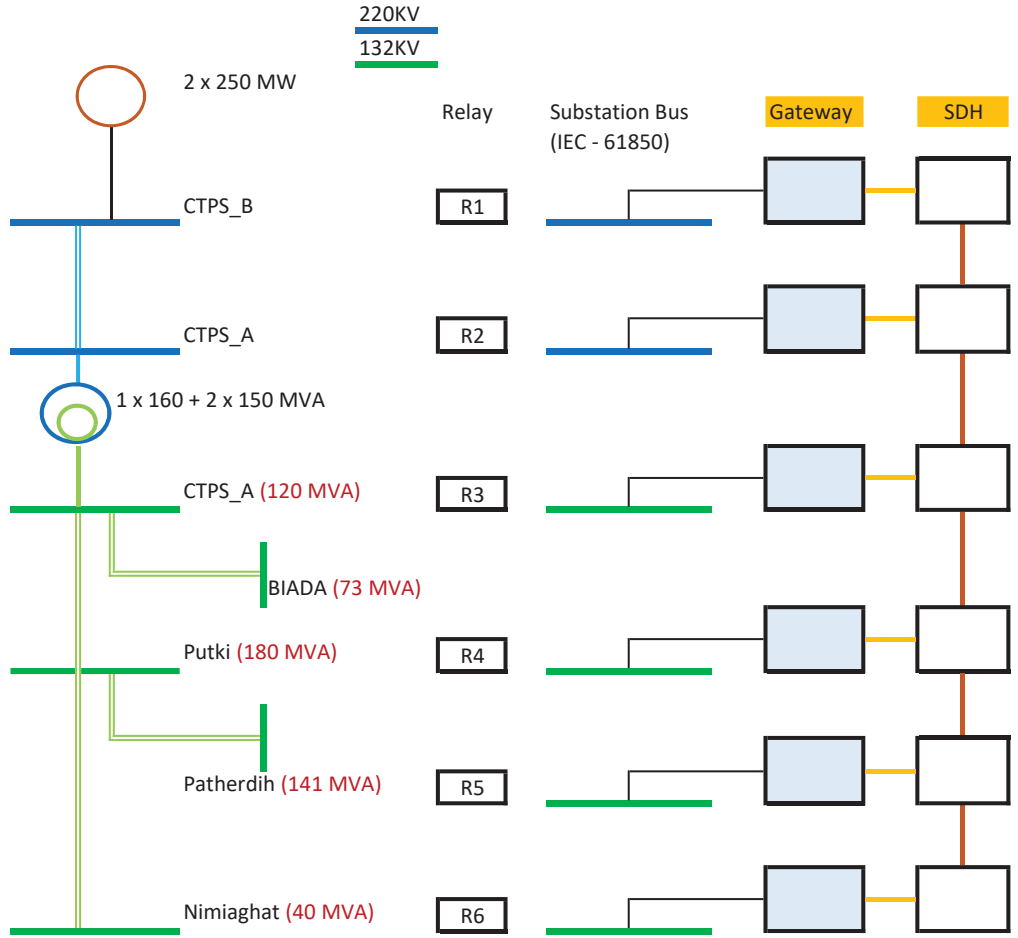
1	JBVNL, Ganeshpur	35.00	Putki
	JBVNL, Digwadih	17.00	Patherdih
		52.00	
2	JUVNL, Godhore	35.00	Putki
	JBVNL, Mukunda	15.00	Patherdih
		50.00	
3	JSEB, Dumri Banaso	40.00	Nimiaghat
4	JBVNL, Dugda	25.00	CTPS
5	JSEB, Jainamore	22.00	CTPS

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

BIHAR STATE POWER TRANSMISSION Co. LTD.

A Subsidiary company of Bihar State Power (Holding) company ltd., Patna

CIN – U40102B2012SC0 18889

(Department of System Operation)

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Annexure B3.1

BUFF-SHEET

U.O.I No. 08
Tele/PLCC/04/2019

Date. 08.01.2021

Chief Engineer (O&M)
BSPTCL,Patna.

Subject: - Regarding Compliance of agenda items of 97th PCC meeting held on dt.14.12.2020

Ref:- (i) *U.O.I. No. 05 dt.06.01.2021*
(ii) *SLDC mail dt. 05.01.2020*

As required, the availability of PLCC system in the following lines is detailed below:

1. **220kV MTPS – Gopalganj D/C** : PLCC System (make-ABB-ETI-12), for voice & data is operational in one ckt of 220kV MTPS –Gopalganj T/L. However, data of Gopalganj is being reported to SLDC through OPGW link of Gopalganj- Bettiah. Also, Installation of OPGW in 220kVMTPS – Gopalganj D/C is in progress and will be commissioned by end of Jan'2021.
2. **Connectivity of GSS Gopalganj with 132kV Transmission Lines:**
   a. 132kV Gopalganj – Areraj : PLCC System(Make-GE) is available and operational for voice, data and carrier-protection.
   b. 132kV Gopalganj – Hatuha : PLCC System(Make-GE) is available and operational for voice, data and carrier-protection.
   c. 132kv Gopalganj – Masrakh: PLCC System(Make-CGL) is available and operational for voice, data and carrier-protection.
   d. 132kV Gopalganj – Bettiah: PLCC system is not available. However, OPGW link is present. Also 132kV power is fed to Sidhwalia sugar Mill thorough tapping arrangement.

(A.K. Choudhary)
Chief Engineer (System Operation)

C.C.:- ESE,SLDC, Patna

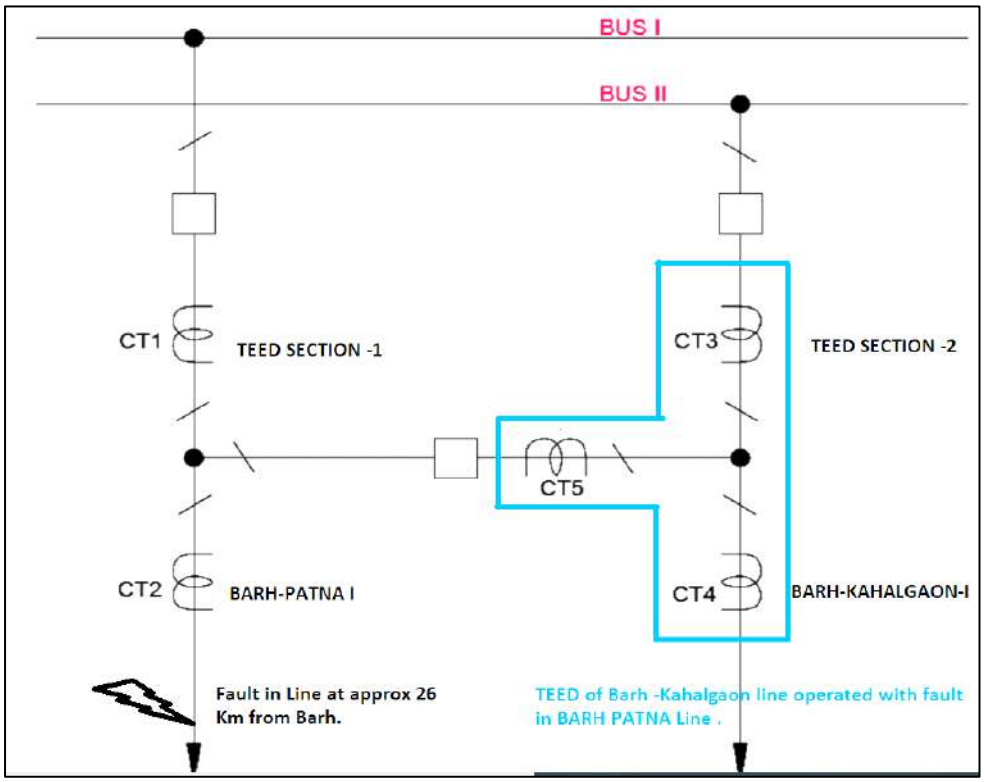
Tripping of 400 Kv Barh -Kahalgaon -I due to TEED operation

On 22 December 06:09 Hrs , 400 Kv Barh -Patna line tripped due to Y phase fault and at the same time 400 Kv Barh -Kahalgaon-I which is in same dia also tripped with the operation of TEED protection associated with the line as shown in below figure .

TEED protection is a differential protection which is used to take care of the faults in teed section only. Teed relay for section 2 has operated in this case for a through fault which should have not operated Summation of currents of CT3+CT4+CT5 under normal operating condition will be zero and in case of fault only in teed section, current will appear which will cause operation of teed protection.

In the past also on 09th July 2020 at 13:40 Hrs, Teed protection has operated for section associated with BARH-Kahalgaon I for through fault of Patna -NPGC .

Possible Cause for this may be the , incorrect polarity wiring of CT involved in TEED protection.
Replication of inaccurate current due to CT saturation or other issues which is causing sufficient differential current even in through faults.
Stability test would reveal incorrect wiring of CT. Primary injection could be used for injecting current into bus-bars, and the actual current in relays and its direction could be verified.
Above things may please be checked for identifying root cause and avoiding such instances in future.



From the Past event of July it was observed that there was some problem in Main bay CT of Kahalgaon line even after outage of line, CT was having current which was causing TEED operation so line was charged only through Tie bay . What Problem was found and was rectification done at that time may also be shared .

Non operation of A/R at Barh end for Barh-Patna I tripping at Barh end :

In the above mentioned tripping of 400 Kv Barh -Patna I for single phase Y -earth fault 3 phase tripping occurred at Barh End .

As seen below MCB of all 3 phase was showing already opened prior to fault and as the fault detected all 3 phase TCB also opened .Whether MCB was already opened ? Reason for 3 phase tripping ? DR AT BARH END shown below :