



# Agenda for 93<sup>rd</sup> PCC Meeting

**Date: 17.08.2020**  
**Eastern Regional Power Committee**  
**14, Golf Club Road, Tollygunge**  
**Kolkata: 700 033**

## **EASTERN REGIONAL POWER COMMITTEE**

### **AGENDA FOR 93<sup>RD</sup> PROTECTION SUB-COMMITTEE MEETING TO BE HELD ON 17.08.2020 AT 10:30 HOURS**

#### **PART – A**

##### **ITEM NO. A.1: Confirmation of minutes of 92<sup>nd</sup> Protection sub-Committee Meeting held on 22<sup>nd</sup> July 2020 at ERPC, Kolkata.**

The minutes of 92<sup>nd</sup> Protection Sub-Committee meeting held on 22.07.2020 circulated vide letter dated 07.08.2020.

**Members may confirm the minutes of 92<sup>nd</sup> PCC meeting.**

#### **PART – B**

##### **ITEM NO. B.1: Total power failure at 220 k V Darbhanga Substation on 20.07.2020 at 07:06 hrs**

At 07:06 hrs. B phase to earth fault occurred at 400 kV Muzaffarpur-Gorakhpur – 2. B pole of tie breaker at Muzaffarpur end got did not open. Due to delay in LBB operation, fault was getting fed and to clear the fault, 400 kV Muzaffarpur-Gorakhpur – 1, 400 kV Muzaffarpur-New Purnea-2, 400 kV Muzaffarpur-Biharshariff D/C and 220 kV Muzaffarpur – Hajipur D/C tripped. Fault clearing time was around 500 ms. Tripping of 220 kV Muzaffarpur – Hajipur D/C resulted total power failure at Hajipur and chapra.

At 07:08 hrs, 220 kV Darbhanga (DMTCL) – Darbhanga D/C, 220 kV Darbhanga (DMTCL) – Motipur D/C, 220 kV Darbhanga (DMTCL) – Laukahi - 1, 220 kV Darbhanga (DMTCL) – Samastipur S/C tripped due to overvoltage problem resulting total power failure at Darbhanga and its nearby areas.

**Load Loss : 300 MW**

**Powegrid , BSPTCL and DMTCL may explain**

##### **ITEM NO. B.2: Disturbance at 220 k V Darbhanga Substation on 22.07.2020 at 12:15 hrs**

220 kV Darbhanga (BSPTCL) to Mushahari – 2 was idle charged from Mushahari end. At 12:15 hrs 220 kV Darbhanga (DMTCL) – Darbhanga (BSPTCL) D/C tripped from DMTCL end only. At same time 220 kV Darbhanga (BSPTCL) to Mushahari – 1 also tripped. Later it was reported that Y – Phase Bushing to Gantry tower conductor of 220 kV Darbhanga (DMTCL) – Darbhanga (BSPTCL) – 2 was melted and fault occurred.

Detail report for any event occurred at Bihar STU network is yet to be received from Bihar SLDC in spite of repeated reminders.

##### **Relay Indications:**

<b>Element Name</b>	<b>End 1</b>	<b>End 2</b>	<b>PMU observation</b>
220 kV Darbhanga (DMTCL)-Darbhanga (Bihar)-2	Yet to be received	Did not trip	Around 15 kV dip has been observed in B and Y phase voltage at Muzaffarpur PMU. Initially there was a B phase to earth fault.
220 kV Darbhanga (DMTCL)-Darbhanga (Bihar)-1	Yet to be received	Did not trip	

220 kV Darbhanga (Bihar) – Mushahari - 1	Yet to be received	Yet to be received	Around 1000 ms later, another Y phase to earth fault occurred. Fault clearing time was 1300 ms for B phase to earth fault and 300 ms for Y phase to earth fault.
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**Load Loss : 250 MW**

**Powegrid , BSPTCL and DMTCL may explain**

**ITEM NO. B.3: Disturbance at 220 k V Darbhanga S/S on 10.06.2020 at 10:54 hrs.**

On 10<sup>th</sup> June 2020, at 10:54 Hrs, 220 kV Darbhanga (DMTCL)-Darbhanga (BSPTCL) D/C tripped from BSPTCL end. At the same time 220 kV Darbhanga (BSPTCL) – Mushahari – 1 and 220 kV Darbhanga (DMTCL) – Motipur – 1 also tripped resulting in load loss at Darbhanga, Madhubani and Pandaul.

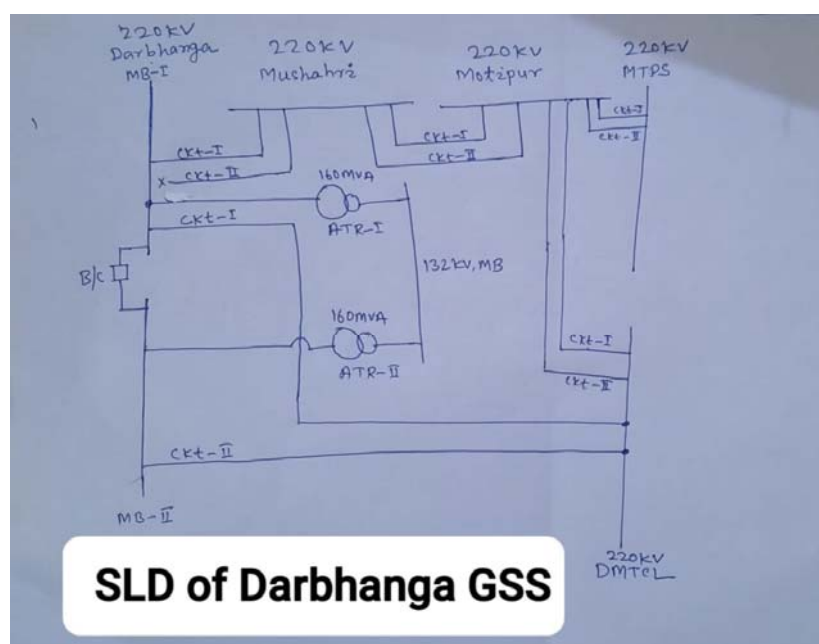
Load Loss: 135 MW

*In 92<sup>nd</sup> PCC, BSPTCL explained that fault was in 220 k V Darbhanga(DMTCL) – Motipur -1 line, the line got tripped in zone 1 and the auto-reclose was successful at Motipur end.*

*DMTCL informed that auto-reclose was unsuccessful at Darbhanga(DMTCL) end.*

*BSPTCL informed that 220 kV Darbhanga (DMTCL)-Darbhanga (BSPTCL) circuit 2 got tripped from BSPTCL end on directional earth fault. Thereafter LBB protection at Darbhanga (BSPTCL) was operated due to loose connection and tripped 160 MVA ATR-2 which was connected to Bus II. As a result, 160 MVA ATR-I and 220 kV Darbhanga (BSPTCL) – Mushahari – 1 also got tripped due to overload.*

*ERLDC pointed out that when system remains on both buses (MB-1 & MB-2) through bus coupler then the current values are unsymmetrical resulting in abnormal neutral current. But when the system is put on the single bus the currents are in symmetrical.*



*After detailed deliberation, PCC advised DMTCL to check the reason for non-operation of auto-reclose of 220 kV Darbhanga(DMTCL) – Motipur -1 line from DMTCL end.*

*PCC advised BSPTCL to take the following corrective actions:*

- *Test the breakers at 220/132 KV GSS Darbhanga (BSPTCL)*
- *Test the healthiness of LBB protection at Darbhanga (BSPTCL)*
- *Find out the reason for occurrence of unsymmetrical current at Darbhanga (BSPTCL) and resolve the issue.*

**BSPTCL may update.**

**ITEM NO. B.4: Disturbance at 400 kV Motihari Substation on 08.07.2020 at 02:19 hrs.**

400/132 kV Motihari substation is connected to rest of the grid via 400 kV Barh – Motihari – 2 (Others lines are under breakdown due to tower-collapse) and its radial load of 132 KV Betiya, 132 KV Motihari (Bihar) and 132 KV Raxaul are being supplied through 400/132 kV ICT – 2 at Motihari.

At 02:19 hrs 400 kV Barh – Motihari – 2 tripped due to B phase to earth fault. The tripping has led to loss of supply to Betiah/Raxaul/Motihari as being the single source of supply causing Grid Disturbance 1 (GD-1) category event.

Due to tower collapse of other lines(i.e. 400 kV Barh – Motihari – 1 and 400 kV Motihari Gorakhpur D/C) in the months of August and September 2019, 400/132 kV Motihari S/S is connected to rest of the grid through only 400 kV Barh – Motihari S/C line. Therefore, fault level of 400/132 kV Motihari S/S is reduced to very low as around 3000 MW. 400 kV Barh – Motihari – 2 is restored with the help of emergency restoration towers (ERS). Power is transferred though only single AAAC moose conductor in ERS section. As a precautionary measure, maximum power transfer limit via this line is set as 200 MW. Due to power transfer limitation, some load at Motihari and its surrounding areas are to be supplied from other source. Earliest restoration of all the connected lines at 400/132 kV Motihari S/S may increase the reliability of load served in the above-mentioned areas. No SOE has been recorded in ERLDC SCADA data at the time of the event. NTPC Barh, BSPTCL and DMTCL are requested to check this issue.

**Relay Indications:**

Element Name	Motihari End	Barh End	PMU observation
400 kV Barh Motihari - 2	B-N, F/C 2.59 kA, 189.8 km from Barh	B-N, F/C 0.36 kA, 8 km from Motihari	Unsuccessful auto-reclose operation for persistent B phase to earth fault has been found in Barh PMU data. Fault clearing time was less than 100 ms. Voltage dip was around 25 kV in B phase.

**Load Loss: 248 MW**

**Powergrid, NTPC Barh, BSPTCL and DMTCL may explain.**

**ITEM NO. B.5: Total Power failure at 220/132 kV Chaibasa Substation on 06.05.2020 at 01:19 hrs.**

*In 92<sup>nd</sup> PCC, JUSNL was advised to take the following corrective actions:*

- *CB of Chaibasa(JUSNL) end of 220 kV Chaibasa – Ramchandrapur circuit 1 to be tested*
- *Protection system of 220/132 kV ATRs to be tested along with healthiness of DC and the respective CT, PT connections to be checked*

**JUSNL may update.**

**ITEM NO. B.6: Total Power failure at 220/132 k V Hatia Substation on 14.05.2020 at 15:33 hrs**

In 92<sup>nd</sup> PCC, JUSNL explained that backup overcurrent protection settings of 220 kV Hatia(II) – Ranchi (PG) circuit 3 was kept at non-directional with definite time setting of 250 ms. JUSNL informed that the same was corrected to directional with the time setting of 1.25 sec definite time.

JUSNL further informed that overvoltage setting of 220 kV Hatia(II) – Ranchi (PG) circuit 1 and 220 kV Patratu-Hatia D/C at Hatia was 110 % and pickup to drop off ratio was changed from 0.98 to 0.9.

ERLDC advised JUSNL to increase pickup to drop off ratio to 0.99.

PCC opined that over voltage may appear due to improper earthing of the substation. PCC advised JUSNL to take the following actions and submit a report to ERPC and ERLDC

- Verify the reason for non-operation of autorecloser and carrier inter tripping of 220 kV Hatia(II) – Ranchi (PG) circuit 2 from Hatia end
- Checking of earthing at 220kV Hatia II and Patratu S/s.
- Backup overcurrent protection time settings must be IDMT instead of definite time. It has to be rectified with proper time setting in consultation with ERPC and PRDC.

**JUSNL may update.**

**ITEM NO. B.7: Tripping of both running units at BRBCL on 01.07.2020 at 05:50 hrs**

BRBCL, a 4 x 250 MW thermal power plant is connected to rest of the grid via 400 kV BRBCL – Sasaram D/C. 400 kV BRBCL – Sasaram – 2 was under break down due to rectification of tower bending. Unit 1 and 2 were in running condition at BRBCL. At 05:50 hrs., 400kV Sasaram-BRBCL #1 tripped on R and Y phase fault. Both the units got tripped due to loss of evacuation path. Heavy rain, thundering and lightning was reported at the time of the event.

BRBCL is connected to rest of the grid through only one circuit i.e. 400 kV BRBCL – Sasaram – 1. Tripping of this circuit may cause repeated GDs in BRBCL. POWERGRID ERTS – 1 is requested to maintain the healthiness of this line properly so that repeated outage can be avoided. This line tripped again on same fault at 21:53 hrs on 29th June 2020 resulting GD at BRBCL. Rectification work of tower bending may be expedited so that 400 kV BRBCL – Sasaram – 2 can be restored at the earliest. No SOE recorded at Sasaram the time of the event. POWERGRID ERTS – 1 is requested to check this issue.

**Relay Indications :**

Time	Element Name	End 1	End 2	PMU observation
05:50 Hrs.	400 kV BRBCL – Sasaram – 1	Yet to be received	R-Y, 18.2 km from Sasaram, IR 8.2 kA, IY 8.3 kA	Around 80 kV voltage dip has been observed in R and Y phase.
05:50 Hrs.	Unit 1 and 2 at BRBCL	Due to loss of evacuation path		05:50 Fault was cleared within 100 ms

**Gen Loss: 410 MW**

**BRBCL , Powergrid may explain**

**ITEM NO. B.8: Tripping of both units at BRBCL on 07.07.2020 at 23:58 hrs.**

BRBCL, a 4 x 250 MW thermal power plant is connected to rest of the grid via 400 kV BRBCL – Sasaram D/C. 400 kV BRBCL – Sasaram – 1 was charged from Sasaram end. During

synchronizing this line from BRBCL end, 400 kV bus 1 at Sasaram got tripped resulting in tripping of 400 kV BRBCL – Sasaram – 2, 765/400 kV ICT at Sasaram. Unit 2 and 3 were in running condition at BRBCL prior to the event. Both the units tripped due to loss of evacuation path.

400 kV BRBCL – Sasaram – 1 was charged from Sasaram end. Before its synchronization from BRBCL end, one R phase to earth fault occurred in this circuit. Sasaram end relay detected the fault in zone – 1 and tripped this circuit from Sasaram end to isolate the fault. Sasaram end Main 1 relay of 400 kV BRBCL – Sasaram – 2 sensed the fault in Zone – 4. Around 1.5kA current was recorded in R phase. Other phase currents were low. But Sasaram end Main 2 relay of 400 kV BRBCL – Sasaram – 2 sensed the fault in Zone – 1. Around 11kA current was recorded in Y phase. It is suspected main 2 relay sensed the fault in Zone – 1 in Y phase and tripped the line. Carrier was sent to BRBCL end also. • In PMU data, existence of R phase to earth fault has been observed at the time of the event. BRBCL end of 400 kV BRBCL – Sasaram – 2 and main 1 relay at Sasaram end of 400 kV BRBCL – Sasaram – 2 sensed the fault in Y phase. POWERGRID ERTS – 1 may investigate the reason for recording of such a high fault current in Y phase by main 2 relay at Sasaram end. At same time, LBB operated for 400 kV BRBCL – 2 bay at Sasaram end. As per DR, around 16 kA current has been observed in Y phase. Reason for such a high current in Y phase in LBB DR may be investigated by POWERGRID ERTS – 1. No fault was observed in Y phase voltage at PMU data at the time of the event. Reason for LBB operation may also be shared. As per PMU and DR data, fault was cleared within 100 ms. It is suspected due to LBB operation 400 kV BRBCL – 2 bay at Sasaram end, 765/400 kV ICT – 1 and 400 kV bus 1 at Sasaram tripped.

Reason for LBB operation of 400 kV BRBCL – 2 bay at Sasaram end may be shared. Reason for tripping of 765/400 kV ICT – 1 at Sasaram, 400 kV Sasaram – BRBCL - 2 and 400 kV Sasaram bus 1 may be also be shared • Reason for recording of such a high fault current in Y phase by main 2 relay at Sasaram end may be investigated by POWERGRID ERTS – 1.

#### Relay Indications :

Time	Element Name	End 1	End 2	PMU observation
23:58 Hrs.	400 kV BRBCL – Sasaram – 1	Line was not charged	R-N, Zone – 1, IR=13.6kA, IY=0.2kA, IB=2.9kA,	Around 100 kV voltage dip has been observed in R phase voltage measured by Sasaram PMU. At same time around 40 kV rise in Y phase and around 30 kV dip in B phase has been observed in Sasaram PMU data. Fault in R phase was cleared within 100 ms. But around 250 ms was taken to clear the voltage dip in B phase.
23:58 Hrs.	400 kV BRBCL – Sasaram – 2	R-N, 123 km from BRBCL, F/C 2 kA	R-N, Zone – 4, IR=1.5kA, IY=0.3kA, IB=0.6kA,	
23:58 Hrs.	765/400 kV ICT – at Sasaram	Did not trip from 765 kV side	Yet to be received	
23:58 Hrs.	400 kV bus 1 at Sasaram	Yet to be received		
23:58 Hrs.	Unit 2 and 3 at BRBCL	Loss of evacuation path		

**Gen. Loss : 425 MW**

**BRBCL , Powergrid may explain.**

**ITEM NO. B.9: Disturbance at 220 kV Joda Substation on 04.07.2020 at 13:19 hrs**

At 12:47 hrs 220 kV Joda – TTPS - 1 tripped on Y and B phase to earth fault. Fault clearing time was less than 100 ms. At 13:00 hrs it was charged from Joda end successfully. But while charging this circuit from TTPS end at 13:01 hrs, it tripped on B phase to earth fault from TTPS end. In PMU data at Jamshedpur end, no fault has been observed. Line was in charged condition at TTPS end at the time of the tripping. At 13:06 hrs 220 kV Joda – TTPS – 2 tripped from both ends on R phase to earth fault. Fault clearing time was less than 100 ms. As per DR recorded at Joda end, around 511 kV phase to neutral Voltage has been observed in R phase at Joda. Around 1.4 kA current has been observed in R phase. At 13:19 hrs 220 kV Joda – Ramchandrapur end tripped from both ends on Y phase to earth fault. It tripped from Joda end in zone – 1. In Ramchandrapur end back up O/C protection operated to trip the line. As per PMU data, fault duration was around 500 ms. As per DR recorded at Ramchandrapur end, Zone – 3 relay sensed the fault. But before tripping in Zone – 3, it tripped in back up O/C protection. As per SCADA data recorded at ERLDC, prior to the tripping, power flow of 220 kV Ramchandrapur – Joda S/C was around 150 MW. At same time, power flow through 220 kV Jamshedpur – JSPL – Joda was 18 MW. After the tripping of 220 kV Ramchandrapur – Joda S/C, 220 kV Jamshedpur – JSPL – Joda S/C tripped on O/C protection from Jamshedpur end. As per relay current data, three phase current was around 0.45 – 0.48 kA (Equivalent to 170-180 MW)

Similar type of event occurred at 11:57 hrs on 23rd June 2020. 220 kV Ramchandrapur – Joda S/C and 220 kV Jamshedpur (DVC) – Jindal S/C tripped on overload after tripping of 220 kV Joda – TTPS D/C at 11:41 hrs on B phase to earth fault. During this event three faults have been observed in the span of 30 min duration. As a result, all the four lines connected to Joda tripped. OPTCL is requested to maintain healthiness of the lines to reduce the repeated faults in same lines.

JUSNL may share the reason for operation of back up overcurrent protection at Ramchandrapur end within 500 ms. It has operated before operation of zone – 3 protection. Reach of distance protection at Ramchandrapur end may also be reviewed. Reason for non-picking of zone – 2 distance protection at Ramchandrapur end may be shared. Reason for tripping of 220 kV TTPS – Joda end at TTPS end at 13:01 hrs may be shared by OPTCL. Whether it was remained charged from Joda end during the event, may also be shared by OPTCL. Reason for high voltage in R phase at Joda end DR output recorded at the time of tripping of 220 kV Joda – TTPS – 2 may be investigated by OPTCL. DR for 220 kV Joda – TTPS – 2 at Joda end may be standardized as per PCC's recommendation.

**Relay Indications :**

Time	Element Name	End 1	End 2	PMU observation
12:47 Hrs.	220 kV Joda – TTPS - 1	Y-B, Zone -1, 98 km from Joda, IR = 0.23 kA; IY = 1.89 kA; IB = 2.1 kA, IN = 0.007 kA	R-Y-B, Zone -1, 55 km from TTPS, IR = 2.39 kA; IY = 4.36 kA; IB = 4.02 kA	Around 2 – 3 kV dip has been observed in Y and B phase voltage captured by PMU at Jamshedpur. Fault clearing time was less than 100 ms.
13:01 Hrs.	220 kV Joda – TTPS - 1	Did not trip (Line was being charged again)	B-N, Zone -1, 74 km from TTPS, IR = 0.060 kA; IY = 0.050 kA; IB = 1.8 kA,	No fault has been observed in PMU data recorded at Jamshedpur
13:06 Hrs.	220 kV Joda – TTPS - 2	B/U relay operated. IR = 0.98 kA; IY = 0.3 kA; IB = 0.3 kA,	R-N, Zone -1, 81 km from TTPS, IR = 1.8 kA; IY = 0.3 kA; IB = 0.3	Around 2 kV dip has been observed in R phase voltage

			kA. VRN = 511 kV	captured by PMU at Jamshedpur. Fault clearing time was less than 100 ms.
13:19 Hrs	220 kV Joda - Ramchandrapur S/C	Y-N, Zone -1, 38 km from Joda, IR = 0.59 kA; IY = 0.95 kA; IB = 0.43 kA, IN =1.6 kA	B/U O/C. IR = 0.91 kA; IY = 1.77 kA; IB = 0.4 kA,	Around 4 kV dip has been observed in Y phase voltage captured by PMU at Jamshedpur.
13:19 Hrs	220 kV JodaJSPL Jamshedpur S/C	Did not trip at JSPL and Joda end	Directional O/C, IR = 0.47 kA; IY = 0.48 kA; IB = 0.45 kA, IN =0.010 kA	Fault clearing time was less than 450 ms. Voltage got improved by around 1 kV after tripping of 220 kV Joda - Ramchandrapur S/C from Joda end in Zone -1.

**Load Loss: 110 MW**

**OPTCL , JUSNL and DVC may explain.**

**ITEM NO. B.10: Disturbance at 220 kV Joda Substation on 23.06.2020 at 11:58 hrs**

At 11:41 hrs 220 kV Joda – TTPS D/C tripped on B phase to earth fault. At 11:57 hrs, 220 kV Ramchandrapur – Joda S/C tripped on overload. Prior to the tripping, power flow was 160 MW. At same time 220 kV Joda JSPL (Jindal) – Jamshedpur S/C tripped at same time from Ramchandrapur and Jamshedpur end respectively in overcurrent protection.

At 11:41 hrs 220 kV Joda – TTPS D/C tripped on B phase to earth fault. Fault clearing time was less than 100 ms. As per relay indication received, 220 kV Joda – TTPS – 1 tripped from TTPS end in zone -1. So, it is suspected fault was at this line. 220 kV Joda TTPS – 2 tripped at same time from Joda end only. Details of protection operated at Joda end for both 220 kV TTPS feeders are not mentioned in OPTCL report. OPTCL informed current was around 0.4, 0.2 and 0.6 kA in R, Y and B phases respectively at Joda end for 220 kV TTPS - 2 feeder. Neutral current was around 0.6 kA at Joda end of 220 kV Joda – TTPS feeder. OPTCL may share the reason for 220 kV Joda – TTPS - 2 at Joda end. After tripping of 220 kV Joda – TTPS D/C, power flow through 220 kV Ramchandrapur Joda S/C increased to 160 MW from 60 MW and power flow through 220 kV JSPL – Joda S/C decreased from around 90 MW to 30 MW. MW power flow through 220 kV Jamshedpur - JSPL- Joda shows that power flow reversed after the tripping of 220 kV Joda - TTPS - S/C at 11:41 hrs. Earlier around 60 MW power was flowing towards Jamshedpur. After the tripping, around 30 MW power was flowing from Jamshedpur to Jindal (around 30 MW was power was flowing towards Jindal from Joda at this time). At 11:57 hrs, 220 kV Ramchandrapur – Joda S/C and 220 kV Joda – JSPL - Jamshedpur S/C tripped from remote end on O/C protection. Prior to the tripping power flow through 220 kV Ramchandrapur – Joda S/C and 220 kV Joda – JSPL S/C was 160 MW (as per DR recorded at Ramchandrapur end current in 3 phases was around 440 A) and 30 MW respectively Joda end as per ERLDC SCADA data. Around 30 MW power was flowing from Jamshedpur (DVC) to Jindal prior to the tripping. As per relay indication, current in all three phases of 220 kV Joda – JSPL – Jamshedpur S/C at Jamshedpur end was less than 0.5 kA prior to the tripping. Current in 220 kV Joda – Ramchandrapur S/C was around 0.1, 0.4 and 1.1 kA at Ramchandrapur end in R, Y and B phases respectively. No voltage dip has been observed at Jamshedpur PMU at this time. JUSNL and DVC may share DR recorded at Ramchandrapur and Jamshedpur end along with reason of 220 kV Ramchandrapur – Joda and 220 kV Jamshedpur – JSPL – Joda from Jamshedpur end.



No SOE recorded at the time of the event. GRIDCO SLDC/OPTCL are requested to check this issue

OPTCL may share the reason for 220 kV Joda – TTPS - 2 at Joda end. JUSNL and DVC may share DR recorded at Ramchandrapur and Jamshedpur end along with reason for tripping of 220 kV Ramchandrapur – Joda and 220 kV Jamshedpur – JSPL – Joda from Jamshedpur end

#### Relay Indications :

Time	Element Name	End 1	End 2	PMU observation
11:41 Hrs.	220 kV Joda – TTPS - 1	B-N, F/C 1.16 kA	B-N, Zone -1, F/C 1.8 kA, 69 km from TTPS	Around 2 kV voltage dip observed in B phase at Jamshedpur PMU at the time of tripping of 220 kV Joda – TTPS D/C.
11:41 Hrs.	220 kV Joda – TTPS - 2	B-N, IR = 0.4kA, IY = 0.2kA, IB = 0.6kA, IN = 0.6kA	Did not trip	Voltage dip in R and Y phase was around 0.5 kV at Jamshedpur PMU. Fault clearing time was less than 100 ms. During the tripping at 11:57 hrs, no significant voltage dip has been observed in Jamshedpur PMU data
11:57 Hrs.	220 kV Joda - Ramchandrapur S/C	Did not trip	O/C, Zone-3, 241km IR = 0.1kA, IY = 0.5kA, IB = 1.1 kA, B-N fault	
11:57 Hrs.	220 kV Joda- JSPL Jamshedpur S/C	Did not trip	Directional O/C, IR = 0.5kA, IY = 0.5kA, IB = 0.5kA, IN = 0.01kA	

Load Loss: 160 MW

*In 92<sup>nd</sup> PCC, OPTCL explained that R-N fault occurred in 220 kV Joda – TTPS – 1 at 69 km from TTPS end and TTPS end got tripped on zone 1. OPTCL explained that due to high arc resistance, the fault was seen in zone 3 from Joda end, in the meantime backup overcurrent Earth fault was operated within 800 ms and tripped the line from Joda end. However, backup overcurrent protection of 220 kV Joda – TTPS – 2 at Joda end was also operated inadvertently and tripped the line from Joda end. OPTCL explained that there was a problem in PT circuit of the said relay therefore the relay was operated in non-directional mode. OPTCL added that the relay has been replaced after the disturbance.*

*DVC informed that 220 kV Joda- JSPL-Jamshedpur S/C was tripped from Jamshedpur end on backup directional overcurrent protection due to low pickup setting. DVC added that the pickup value has been reviewed from 500 to 800 A.*

*JUSNL informed that there was no fault in 220 kV Joda - Ramchandrapur S/C, the line got tripped from Ramchandrapur end on operation of backup overcurrent protection due to overload. JUSNL added that EM type relay is installed for this line therefore they could not get the DR.*

*ERLDC pointed out that 220 kV Joda - Ramchandrapur S/C line was charged through bus*

*coupler.*

*JUSNL informed that the line protection relay got hanged hence they charged the line through bus coupler.*

*PCC advised JUSNL to give a detailed report to ERLDC for charging of bay at Ramchandrapur through bus coupler.*

**OPTCL, JUSNL and DVC may update.**

**ITEM NO. B.11: Disturbance at 400 k V Talcher – Kolar HVDC on 16.07.2020 at 01:58 hrs.**

At 01:58hrs. both poles of Talcher-Kolar HVDC tripped due to un-availability of 400kV bus voltage at Kolar end. Before tripping flow was 500MW. SPS acted and generation reduction happened at JITPL(150MW) and GMR (269MW). No generation reduction in Talcher Stg-2.

**Gen Loss: 419 MW**

**OPTCL and Powergrid may explain.**

**ITEM NO. B.12: Disturbance at 400 k V Arambag S/S on 10.07.2020 at 08:45 hrs.**

At 08:45 hrs, 400 kV Arambag – New Chanditala S/C, 400 kV Arambag – Bakreswar S/C, 400 kV Arambag Kolaghat S/C and 400/220 kV ICT – 1, 2, 3 and 4 at Arambag tripped. At same time, all 220 KV lines connected to Arambag s/s and some 132 kV lines also tripped during this event. Flash over was reported at B phase pole of 220 kV side breaker of 315 MVA 400/220 kV ICT – 4 at Arambag.

Flash over at B phase pole of 220 kV side breaker of 315 MVA 400/220 kV ICT – 4 at Arambag resulted B phase to earth fault at 220 kV bus at Arambag. Fault was sensed by Directional E/F protection from 400 kV ICT – 4. Remote ends of 220 kV feeders sensed the fault in Zone – 2. Due to delay in clearance of fault, 220 kV Arambag – Midnapore D/C, 220 kV Arambag – New Bishnupur D/C, 220 kV Arambag – Domjur – 1 and 220 kV Arambag Howrah S/C tripped from remote end in Zone -2. 220 kV Arambag – Rishra S/C tripped from Arambag end Zone -2. Reason for tripping of 220 kV Arambag – Rishra S/C from Arambag end may be investigated by WBSETCL as fault was in reverse direction. Remote ends of 400 kV Arambag – New Chanditala S/C, 400 kV Arambag – Bakreswar S/C, 400 kV Arambag Kolaghat S/C sensed the fault and tripped in zone – 3 after non-clearance of fault in zone -3 timing. For 400 kV Arambag – New Chanditala S/C and 400 kV Arambag Kolaghat S/C, direct trip signal was received at Arambag end and Arambag end breakers got opened. Criteria for sending DT signal to remote ends may be reviewed by WBPDCCL and WBSETCL. 132 kV Arambag Tarakeswar D/C, 132 kV Arambag – Raina D/C, 132 kV Arambag – Brisingha 2 tripped from remote end in back up E/F protection. • 400/220 kV ICT 1, 2, 3 and 4 at Arambag tripped in directional E/F from 400 kV side (ICT - 4 tripped from 220 kV side also). Fault clearing time was around 1100 ms.

Delayed fault clearance has been observed. Due to fault clearing time of around 1100 ms, 400, 220 and 132 kV feeders tripped from remote ends in Zone -2, Zone -3, back up E/F protection. WBSETCL may investigate and share the reason for delayed clearance of this fault. It has been learnt 220 kV bus bar protection was not in service at Arambag end. Reason for tripping of 220 kV Arambag – Rishra S/C from Arambag end may be shared by WBSETCL.

**Relay Indications:**

Element Name	End 1	End 2	PMU observation
400 kV Arambag – New Chanditala S/C	DT received	B-N, Zone – 3, 133 km, F/C 3.2 kA	Around 140 kV dip has been observed in B phase at Arambag PMU. Current in 400
400 kV Arambag – Bakreswar S/C	Did not trip	B-N, Zone – 3, 300 km	

400 kV Arambag Kolaghat S/C	DT received	B-N, Zone – 3, 180 km, F/C 2 kA	kV Arambag – New PPSP – 1 and Arambag – Bakreswar S/C increased to 1.4 kA during the event. As per PMU data, fault clearing time was around 1100 ms.
400/220 kV ICT – 1, 2, 3 and 4 at Arambag	ICT 1, 2, 3: Directional E/F from HV side ICT 4: Directional E/F from HV and LV side		
220 kV Arambag – Midnapore D/C	Did not trip	Zone – 2 protection	
220 kV Arambag – New Bishnupur D/C,	Did not trip	Zone – 2 protection	
220 kV Arambag – Domjur – 1,	Did not trip	Zone – 2 protection	
220 kV Arambag Howrah S/C	Did not trip	Zone – 2 protection	
220 kV Arambag – Rishra S/C	Zone – 2	Did not trip	
132 kV Arambag Tarakeswar D/C	Did not trip	Back up E/F	
132 kV Arambag – Raina D/C	Did not trip	Back up E/F	
132 kV Arambag – Brisingha 2	Did not trip	Back up E/F	

**Load Loss : 61 MW**

**WBSETCL may explain.**

#### **ITEM NO. B.13: Repeated Disturbances at 400 k V Alipurduar Substation**

##### **1. Disturbance at 400 k V Alipurduar Substation on 19.07.2020 at 23:18 hrs**

At 23:18 Hrs, 400 KV Alipurduar-Jigmelling D/c tripped on spurious DT receive at Alipurduar end resulting in tripping of Mangdechu units #1 and #2 due to loss of evacuation path. Generation loss at Mangdechu was 777 MW. No generation or load loss was reported in Indian grid during this event.

**No load loss and gen loss**

**Powergrid may explain.**

##### **2. Disturbance at 400 k V Alipurduar Substation on 22.07.2020 at 01:32 hrs**

At 01:32 hrs 400 kV Alipurduar Jigmelling D/C tripped due to R & B phase fault. Prior to the tripping, schedule to Mangdechu generating units were 762 MW. There was no load or generation loss reported in Indian grid at the time of the event.

**No load loss and gen loss**

**Powergrid may explain.**

#### **ITEM NO. B.14: Tripping of both units at Jorethang on 04.07.2020 at 14:24 hrs**

At 14:24 hrs 400 kV Rangpo – Kishangunj S/C tripped from both ends. Directional Earth fault protection operated at Rangpo and DT was received at Kishangunj. At same time, 220 kV JLHEP – New Melli D/C and 220 kV Tashiding Rangpo S/C tripped on earth fault protection at Jorethang and Tashiding end respectively. As a result both the running units at Jorethang tripped due to loss of evacuation path.

At around 14:24:21.100 hrs one high resistance B phase fault occurred at 400 kV Rangpo

Kishangunj S/C. This fault was sensed by B phase directional Over Current relay at Rangpo end of 220 kV Rangpo – Tashiding S/C and Earth Fault relay at Jorethang end of 220 kV Jorethang – New Melli D/C. round 15 kV dip has been observed at around 14:24: 21.100 hrs. in B phase at Rangpo PMU. At around 14:24:21:900 hrs 220 kV Tashiding – Rangpo S/C tripped from Tashiding end on B phase directional O/C and 220 kV Jorethang – New Melli D/C tripped from Jorethang end on E/F protection. After tripping 220 kV JLHEP – New Melli D/C and 220 kV Tashiding New Melli S/C, it increased to 1 kA before tripping. At 14:24:22.302 hrs, 400 kV Rangpo – Kishangunj S/C tripped from Rangpo end due to operation of Directional Earth fault protection. Though B phase current at Rangpo end was 5.3 kA, no significant amount dip in B phase voltage (Phase voltage was 223 kV prior to the tripping) has not been observed in DR recorded at Rangpo end. Start time of DEF at Rangpo end of 400 kV Rangpo – Kishangunj S/C is not recorded in DR. POWERGRID ERTS – II is requested to event logger output recorded at Rangpo end. 400 kV Rangpo Kishangunj S/C tripped from Kishangunj end after DT receipt at Kishangunj end. As per PMU data, B phase current at Kishangunj end decreased at starting of the fault. After tripping of 220 kV JLHEP – New Melli D/C and 220 kV Tashiding New Melli S/C, it increased to 1 kA before tripping. After tripping of 400 kV Rangpo Kishangunj S/C, SPS signal was sent to hydro generating stations in Sikkim areas. Jorethang HEP, Tashiding HEP and Chujachen HEP have confirmed the receipt of SPS signal. As SPS was disabled at generating stations, no unit tripped due to receipt of SPS signal. As per information received from POWERGRID ERTS – II, SPS for 400kV Rangpo-Kishanganj line (installed at Rangpo) has been disabled at 10:00 Hrs of 05th July 2020 after the incident.

During 161st OCC meeting, it was decided that POWERGRID will keep this SPS in standby mode. But during the event, SPS signal was received by JLHEP, THEP and Chujachen HEP. POWERGRID informed same has been disabled after the event. 400 kV Rangpo Kishangunj S/C tripped on 27th June 2020 due to B phase to earth fault. TVPTL is requested to maintain the healthiness of 400 kV Rangpo – Kishangunj S/C.

Reason for tripping of 220 kV Jorethang – New Melli D/C and 220 kV Tashiding – Rangpo S/C before tripping of 400 kV Rangpo – Kishangunj S/C may be shared. POWERGRID ERTS – II may share the time when DEF relay picked up at Rangpo end.

#### Relay Indications :

Time	Line name	End 1	End 2	PMU observation
14:24 Hrs	220 kV Jorethang - New Melli -1	DEF, IR = 0.08 kA; IY = 0.08 kA; IB = 0.22 kA, IN = 0.169 kA Fault clearing time: 800 ms	Did not trip	Around 15 kV dip has been observed at around 14:24: 21.100 hrs. in B phase at Rangpo PMU. Initially current of 400 kV Kishangunj – Rangpo S/C reduced in B phase at Rangpo end. But after tripping 220 kV JLHEP – New Melli D/C and 220 kV Tashiding New Melli S/C, it increased to 1 kA before tripping
14:24 Hrs	220 kV Jorethang - New Melli -2	DEF, IR = 0.08 kA; IY = 0.08 kA; IB = 0.22 kA, IN = 0.173 kA Fault clearing time: 800 ms	Did not trip	
14:24 Hrs	220 kV Tashiding - Rangpo S/C	DEF, IR = 0.17 kA; IY = 0.17 kA; IB = 0.37 kA, IN = 0.25 kA Fault clearing time: 800 ms	Did not trip	
14:24 Hrs	400 kV Rangpo – Kishangunj S/C	DEF, IR = 0.66 kA; IY = 0.48 kA; IB = 5.3 kA, IN = 5.1 kA VCN = 223 kV	DT received at Kishangunj end	

14:24 Hrs	Unit 1 and 2 at JLHEP	Due to loss of evacuation Path	
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**Gen Loss : 180 MW**

**DANS Energy , Dikchu , Jorethang and Powergrid may explain.**

**ITEM NO. B.15: Disturbance at 220 k V Jorethang and 220 k V Tashiding Substation on 27.05.2020 at 04:28 hrs.**

In 92<sup>nd</sup> PCC, DANS Energy informed that the revised settings received from PRDC had been implemented at Jorethang and Tashiding ends thereafter no unwanted tripping was observed for the connected lines.

ERLDC pointed out that 220kV Tashiding – Rangpo S/C line tripped from Tashiding end is not in order, the polarity of the distance protection relay at Tashiding end of 220 kV Tashiding – Rangpo S/C is to be verified.

DANS Energy informed that they also observed that polarity of main I protection of 220kV Tashiding – Rangpo S/C line at Tashiding is not proper and the polarity would be corrected by taking shutdown.

PCC advised DANS Energy to check the CT star point, relay configuration settings etc. to find out the issue and accordingly correct the polarity at the earliest. PCC advised DANS ENERGY to disable the relay till the correction of polarity to avoid maloperation of the relay.

PCC also advised DANS ENERGY to explore implementation of Differential protection for the lines connected to Jorethang and Tashiding.

DANS Energy informed that OPGW implementation is in progress and the differential protection would be implemented once OPGW work would be completed.

ERLDC pointed out that relay coordination of backup overcurrent protection of transmission lines is required for different hydro generation in Sikkim.

PCC decided to discuss this issue in a separate meeting with the concerned utilities.

**Members may decide.**

**ITEM NO. B.16: Disturbance at 400 k V Teesta III and Dikchu S/S on 16.07.2020 at 16:27 hrs**

400 KV Teesta III Kishanganj S/C was taken under shutdown on emergency basis at 15:49 hrs for gas density monitor replacement work at Kishanganj end. To ensure maximum power evacuation, 400 kV buses at Rangpo were split. Teesta III and Dikchu were connected to 400 kV bus 1 at Rangpo through 400 kV Dikchu – Rangpo S/C. their generation was evacuated through 400 kV Rangpo Kishanganj S/C. All other elements at Rangpo S/S were connected to 400 kV bus 2. Generation at Teesta V, Jorethang, Tashiding, Chujachen HEP was being evacuated through 400 kV Rangpo – Binaguri D/C. At 16:27 hrs, 400 KV Teesta III – Dikchu S/C, 400 KV Rangpo-Dikchu S/C, 400 KV Rangpo-Kishanganj S/C tripped resulting total power failure at Teesta III and Dikchu HEP.

It is suspected there was a high resistance B phase to earth fault. The location of the fault is yet to be known. Teesta III end of 400 kV Teesta III – Dikchu S/C, Dikchu end of 400 kV Dikchu – Rangpo S/C and Rangpo end of 400 kV Rangpo Kishanganj S/C sensed the fault in Directional Earth Fault zone and tripped the lines. Though the other end of the above-mentioned lines tripped due to DT receipt, E/F relay also picked up at Dikchu end of 400 kV Teesta III – Dikchu S/C, Rangpo end of 400 kV Dikchu – Rangpo S/C also. Based on the direction earth fault pickup,

it is suspected that fault was on 400 kV Rangpo-Kishanganj circuit however the delay in clearance of fault has been sensed by other circuits in upstream which also gave direction earth fault trip from the respective source ends. After tripping of 400 kV Teesta III – Dikchu S/C, Dikchu – Rangpo S/C and 400 kV Rangpo Kishanganj S/C, all the running units at Teesta III and Dikchu got tripped due to loss of evacuation path. In this case, as the 400 kV Teesta 3-Dikchu-Rangpo-Kishanganj system was in Radial mode with Teesta 3 as source and Kishanganj as sink due to the outage of Teesta 3-Kishanganj Circuit. The correct operation of DEF on suspected 400 kV Rangpo-Kishanganj circuit should have ensured the isolation of fault however even though due to radial nature the generation would have been lost irrespective of other line tripping or not.

It is suspected the same fault was sensed by Rangpo, Dikchu and Teesta III end. Location and reason of fault may be shared. Delayed clearing of the fault has been observed during this event. The fault indicates the very need to coordinate the directional earth fault protection at all substations. The fault level calculation and setting criteria for DEF used should be uniform for all power plants and stations in Sikkim Complex to ensure there is no such tripping. This will ensure that the line on which fault is there will be tripping first.

#### Relay Indications:

Line name	End 1	End 2	PMU observation
400 KV Teesta III – Dikchu S/C	Directional O/C and E/F trip, IR = 1.7kA, IY = 1.4 kA, IB = 3.5 kA, IN = 2.7 kA	DT received; E/F relay picked up, IR = 1.7kA, IY = 1.4 kA, IB = 3.5 kA, IN = 2.7 kA	High Resistance B phase to earth fault has been observed in PMU data. Fault clearing time was around 1600 ms. Frequency dropped from 49.99 Hz to 49.86 Hz at nadir point in 16 seconds Later it stabilized at 49.91 Hz
400 KV Rangpo-Dikchu S/C	E/F start, DT received, IR = 1.7kA, IY = 1.5 kA, IB = 3.6 kA, IN = 2.7 kA	E/F start, IR = 1.7kA, IY = 1.6 kA, IB = 3.4 kA, IN = 2.3 kA	
400 KV Rangpo-Kishanganj S/C	Dir. E/F trip, IR = 1.6kA, IY = 1.3 kA, IB = 3.5 kA, IN = 2.8 kA	DT received.	

**Gen Loss: 1390 MW**

**DANS Energy , Teesta , Dikchu and Powergrid may explain.**

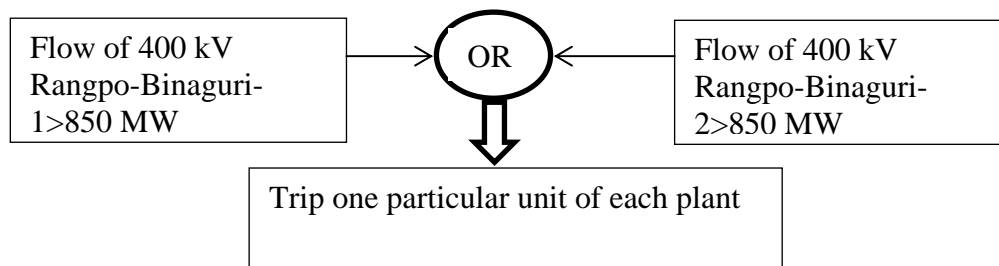
#### **ITEM NO. B.17: SPS for taking care of N-2 Contingency of 400 kV outgoing lines from Sikkim Complex--ERLDC**

As per the decision taken in 161 OCC meeting no SPS is required when all the four 400 kV evacuating lines are in service. However, based on the study following proposal are made for the consideration of the forum:

1. When all 4 lines are in service only N-1 contingency of 400 kV Rangpo-Dikchu is critical due to cable portion of Teesta III- Kishanganj section. That part is taken care of by Teesta III local SPS.
2. When all 4 lines in service, following N-2 contingencies are critical
  - a. 400 kV Rangpo-Kishanganj & 400 kV Teesta-III-Kishanganj
  - b. 400 kV Rangpo-Kishanganj& 400 kV Rangpo-Binaguri one ckt
  - c. 400 kVTeesta-III-Kishanganj& 400 kV Rangpo-Binaguri one ckt

From the past experience and due to sharing some common corridor N-2 contingency of 400 kV Rangpo-Kishanganj & 400 kV Teesta-III-Kishanganj is a credible contingency. Following SPS logic may be implemented for ensuring reliability during the above mentioned three critical N-2 contingency:

**SPS:**



In 168<sup>th</sup> OCC meeting ERLDC informed that the SPS is required till completion of reconductoring work of 400kV Rangpo-Binaguri D/C lines for safe evacuation of hydro generation in Sikkim during any contingency.

In 169<sup>th</sup> OCC, it was decided to discuss the issue along with the protection coordination issues in Sikkim in a separate meeting with the concerned utilities.

**Members may discuss.**

**ITEM NO. B.18: Tripping Incidences in month of July 2020**

Other tripping incidences occurred in the month of July 2020 which needs explanation from constituents of either of the end is given in **Annexure-B18**.

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

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

**Members may discuss.**

**PART- C:: OTHER ITEMS**

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

The decisions of previous PCC Meetings are given at **Annexure-C1**.

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

**Members may update the latest status.**

## **ITEM NO. C.2: Protection Coordination for New Lines/ICTs Before First Time Charging-- ERLDC**

Several new elements are being added in the Eastern region System in every month. The addition of new elements changes the network configuration and thus impact the protection setting of existing elements in the grid. It has been observed on various occasions when a new element is added (like Transmission line/ICT) which directly impacts the Remote end Protection setting of transmission lines connected from that substation, the protection coordination activity is lacking and is being done later on leading to risk to reliability and security of the system during any event. Thus, it is utmost desired that such protection coordination has to be completed beforehand for the charging of new elements. In the month of July' 2020, few lines/ICT has been charged for the first time which are as mentioned below and these require protection coordination along with their adjacent substation:

<b>400/220 kV 500 MVA ICT-3 AT Maithon(PG)</b>	Substation: Maithon (PGCIL ERTS 2),
<b>Lilo of 220 Kv Purnea – Begusarai D/C at Khagaria S/s</b>	Adjacent Substation: Purnea(PGCIL ERTS1), Begusarai (BSPTCL)
<b>220 Kv Bolangir PG – New Bolangir -II</b>	Adjacent Substation: Bolangir(PGCIL ERTS3), Bolangir New (OPTCL)

**PGCIL ERTS 1,PGCIL ERTS 2, PGCIL ERTS 3 , BASPTCL and OPTCL may kindly confirm the following:**

1. Share the Main 1 and Main2 relay settings for these lines from respective ends (PDF format).
2. Whether with these line/ICTs commissioning, is there any change in long and short lines at these substations which require protection coordination.
3. List of lines/ICTs for which protection setting has been revised to be intimated to ERLDC/ERPC
4. In case long lines and the short line has changed from any of the substations whether Remote End Substations have been informed and their protection setting has been revised by remote end utilities or not to be confirmed by respective substation Owners.

**In addition to this, all utilities as well as SLDCs thus are hereby reminded the decision taken for protection coordination of new elements in 78<sup>th</sup> PCC meeting of Eastern Region :**

1. The utility which is going to charge any new elements shall inform the remote end utility in advance of 30 days regarding the details of element and relevant parameters along with the charging date.
2. If the new element which is being integrated is an ICT or a line whose length is more than the existing longest line or less than the existing shortest line from the substation, remote end confirmation is mandatory before charging the line/ICT.



3. The remote end utility should review their settings and confirm the main utility within 15 days of receiving the details.

**Members may update.**

**ITEM NO. C.3: Tripping of 400 kV Farakka –Behrampur D/C on 19/07/2020 at 17:04 Hrs.**

It was observed during the event that for a single-phase Y-N fault in Circuit -2, Farakka end relay has sensed the fault in zone-2 and carrier aided tripping was not observed hence fault clearance time was 500 ms. The same fault was also sensed by CKT-1 and instantaneous 3 phase tripping occurred at Behrampur end. The following observations may need detailed discussion for the analysis of the event :

1. It was seen from line currents at Behrampur end that Healthy phase currents which were present up to Zone-2 time in circuit-2 were highly distorted and peaks of waveforms were clipped off, whether it was due to CT saturation or any other reason may please be explained.
2. After 3 phase pole opening at Berhampur end in ckt-1, line currents were present with highly distorted(High 3 & 5 harmonics) value up to Zone-2 time till when the ckt-2 got opened from Farakka end. At Farakka end, no such current distortion observed for lines 1& 2.
3. The impact of HVDC also needs to be assessed during the event to identify the root cause of such distortion observed. Any past event may also kindly be analyzed in this regard. (NTPC Farakka,
4. Whether extended A/R time feature can be utilized for Auto reclose for such lines also need to be explored.

**Members may discuss.**

**ITEM NO. C.4: Observation of Reactor Ringdown or LC Oscillation in Voltage after 3 phase poles opening.--ERLDC**

During the month of July'2020, few tripping incidents were reported where after 3 phase pole opening line voltages were present for a long duration due to resonance between the shunt reactors and the shunt capacitance of the line and sometimes high voltages are even observed where the frequency of oscillation of line voltage matches with resonance voltage. Concern regarding Distance protection mal-operation due to the use of memory voltage for polarisation also mentioned in the attachment. The list of lines where these are observed in July/2020 are mentioned below.

Sl. No.	LINE NAME	TRIP DATE	TRIP TIME	Relay Indication	Remarks
1	400KV-PATNA-BARH-2	01-07-20	16:06	PLCC maloperation at Patna	Reactor ring down was observed due to LC resonance. Line voltage was present even after 3

					phase poles opening .
2	400KV-BIHARSARIFF(PG)-VARANASI-2	04-07-20	15:12	DT Received	Calculated Resonance frequency = 27 Hz , voltage oscillation of 28-29 hz observed. Max voltage went up to 580 kV.
3	400KV-MAITHON-KHSTPP-2	07-07-20	15:23	KHSTPP: R-PH, FD: 80 km, FC 5.14 kA	R phase MCB A/R failed at Maithon end even after 1 second of that R phase TCB reclosed which should not occur .Line voltage available after 3 poles opening. <b>(35 Hz) oscillation observed close to Resonance frequency which is 36 Hz due to which high voltages up to 800 kv observed.</b>
4	400KV-BIHARSARIFF(PG)-BANKA(PG)-2	08-07-20	13:42	Banka: 104 m,14.1 kA, B-N, Zone 1 LA blast severe lightning	3 phase line voltage present up to 5 seconds even after 3 phase poles opening. calculated Resonance frequency = <b>35 Hz</b> , voltage oscillation of <b>32</b> hz observed .Max voltage went up to <b>525 kV</b> .
5	400KV-KISHANGANJ-TEESTA-III-1	14-07-20	12:52	Kishanganj-Gas density monitor malfunction. No fault also observed in PMU	Reactor ringdown observed ,even after 3 phase poles opening ,3 phase line voltage persisted up to few seconds . calculated Resonance frequency= <b>33 Hz</b> , voltage oscillation of <b>30 Hz</b> observed .Max voltage went up to <b>550 kV</b> .
6	400KV-KHSTPP-LAKHISARAI-1	23-07-20	22:59	Y_N,z1,30km,11.18kA at Kahalgaon end	Unsuccessful Auto reclose . 3 phase line voltage present even after 3 phase breakers opening. calculated Resonance frequency= <b>39 Hz</b> , voltage oscillation of <b>37 Hz</b> observed .Max voltage went up to <b>500 kV</b> .
7	400KV-BINAGURI-TALA-2	26-07-20	23:13	Z2,Y-N FAULT,FD 130.2KM,FC 2.729KA BINAGURI	A/R unsuccessful ,reactor ringdown observed as line voltage was present even after 3 phase poles opening . Calculated Resonance frequency = <b>43 Hz</b> , voltage oscillation of <b>40</b> hz observed .Max voltage went up to <b>450 kV</b> .

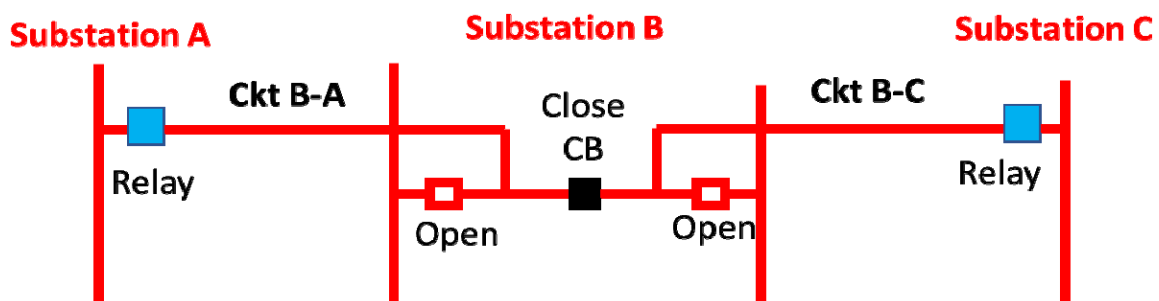
8	400KV-KISHANGANJ-TEESTA-III-1	27-07-20	23:35	R-B FAULT,FD 127.1KM,FC IR 3.55KA,IB 4.129KA@TEES TA 3	Reactor ringdown observed ,even after 3 phase pole opening ,3 phase line voltage persisted up to few seconds . calculated Resonance frequency= <b>33 Hz</b> , voltage oscillation of <b>30</b> Hz observed .Max voltage went up to <b>520 kV</b> .
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Detailed report and analysis for above mentioned tripping citing the issue of Reactor Ringdown attached for reference in the **Annexure-C4**.

**Members may discuss.**

**ITEM NO. C.5: Additional Protection Readiness for lines from One and Half substation configuration for condition of substation bypass through Tie CB.---ERLDC**

Many a times in one and half breaker substation due some issues like breaker issue, double bus shutdown or any large contingency event leading to tripping of both Main buses CB, the elements in the same diameter are in charge condition through tie CB. This results in one aspect of protection issue as now the long and short lines for remote end will change and will become the same line. However, it is observed that neither ends have any ready relay group setting for such eventuality (although rare but has happened) to ensure protection coordination. This was also faced during recent shutdown of 400 kV Bus 3 & 4 at Kahalgoan NTPC substation on 12<sup>th</sup> Aug 2020 and at the end all lines were made out which itself impact the system reliability. Thus, in view of taking full advantage of one and half breaker scheme substation and ensuring reliability for such eventuality, all Transmission and generation owner of Eastern region may also prepare such group setting by confirming regarding the element in their diameter at remote end one and half substation to ensure proper operation. Below figure is provided to elaborate the issue.



**Members may discuss.**

**ITEM NO. C.6: Protection Setting Confirmation for 400 kV Bihar Sharif Bus Split Operation.--ERLDC**

400 kV Bihar Sharif Bus split has been planned in the past in standing committee of eastern region and is now ready for operationalisation for reduction in fault level. In 169<sup>th</sup> OCC, Approval 93<sup>rd</sup> PCC Agenda

has been provided for operationalisation of both 400 kV Jhasurguda and 400 kV Bihar Sharif bus split operation by readying the group setting for Bus split mode (New setting) and Bus Close mode (existing setting). 400 kV Bus split operation at Jhasurguda was completed with coordination from PGCIL Orissa, OPGC, Sterlite and PGCIL WR-1. However, for the Bihar Sharif, similar coordination activities are desired from PGCIL Norther Region (Ballia, Varanasi), DVC (Koderma TPS) and 220 kV Bihar Sharif (BSPTCL). In View of this, PGCIL ERTS 1 is advised to coordinate and confirm the readiness of group setting for slit/close mode at the remote end substation so that the split mode can be operationalised.

**Members may Discuss.**

#### **ITEM NO. C.7: Standardization of event logger recorder output--ERLDC**

It has been observed that in case of wide area events involving a number of substations, the analyzing multiple DRs and preparing sequence of event becomes a tremendous challenging job. To ease out these, the event logger comes into picture which helps in making a correct sequence of event. The transmission element event logger is in general having all the inputs from DR however these input from DR need some standardisation in naming. Further, the station event logger should have all primary information from each bay (Which relay operated, CB open, close, Isolator status and other relevant details as per substation alarm list).

Thus, there is a need of element as well station event logger to at least have some basic input for event information and analysis. Thus, some standardisation is required to be adopted to ensure all major events are integrated in the event logger as per the need.

**Members may discuss.**

#### **ITEM NO. C.8: Online training program conducting by PRDC**

PRDC is conducting the training on PDMS and protection study using PSCT in different states through online. The training has been completed in West Bengal and Jharkhand. The schedule of the training is given below:

**Online Training Program**

SI No.	Date	State	Topic	Person Attended
1	29.06.2020	West bengal	PDMS	-
2	30.06.2020	West bengal	Protection Study	-
3	20.07.2020	Jharkhand	PDMS	34
4	21.07.2020	Jharkhand	Protection Study	34
5	24.08.2020	Odisha	PDMS	
6	25.08.2020	Odisha	Protection Study	
7	21.09.2020	Bihar	PDMS	
8	22.09.2020	Bihar	Protection Study	

Odisha and Bihar may note and attend the training program.

**Members may note.**

**ITEM NO. C.9: 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**

SI No	SS Name	Data Collection	Owner	State
1	Bagmundi		WBSETCL	West Bengal
2	Gajole	Collected	WBSETCL	West Bengal
3	Dinahata		WBSETCL	West Bengal
4	Rejinagar		WBSETCL	West Bengal
5	Jhalda		WBSETCL	West Bengal
6	Goghat		WBSETCL	West Bengal
7	Saltlake Stadium		WBSETCL	West Bengal
8	Kashipur		OPTCL	Odisha
9	Betanati		OPTCL	Odisha
10	Aska New		OPTCL	Odisha
11	Udala		OPTCL	Odisha
12	Narashinghpur		OPTCL	Odisha
13	IBTPS		OPGC	Odisha
14	Mancheswar		OPTCL	Odisha
15	Govindpur	Collected	JUSNL	Jharkhand
16	North Karanpura		NTPC	Jharkhand
17	Mangdhechu		MHPA	Sikkim
18	TingTing		....	Sikkim
19	Lethang		....	Sikkim
20	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.

**Members may note.**

**ITEM NO. C.10: Any additional agenda – with permission of the Chair.**

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## Repeated tripping of transmission lines during the month of July 2020

During the month of July 2020, repeated tripping (tripping incidents reported more than 2 times) has been observed for 9 transmission lines (220 kV and above voltage level) as shown below:

Element Name	No of Tripping	Total Outage duration (Hour)	Average Outage duration (Hour)	Utility to respond
220KV-BEGUSARAI-NEW PURNEA-1	5	49.5	9.9	BSPTCL
400KV-ALIPURDUAR (PG)-JIGMELLING-2	3	5.1	1.7	PG ER – II & Bhutan
400KV-PPSP-BIDHANNAGAR-2	3	1.5	0.5	WBSETCL
220KV-NEW PURNEA-MADHEPURA-1	3	3.4	1.1	BSPTCL
220KV-JODA-RAMCHANDRAPUR-1	3	2.3	0.8	OPTCL & JUSNL
220KV-DARBHANGA (DMTCL)-DARBHANGA-1	3	2.2	0.7	DMTCL & BSPTCL
220KV-CHANDIL-STPS(WBPDCL)-1	3	4.3	1.4	WBSETCL/ WBPDCL & JUSNL
220KV-DARBHANGA (DMTCL)-MOTIPUR-1	3	18.0	6.0	DMTCL & BSPTCL
220KV-BUDHIPADAR-KORBA-2	3	4.2	1.4	OPTCL (for ER Part)

Utilities are requested to share the action taken to reduce the no of above mentioned lines.

Details of these tripping is given in Annexure A.

## Repeated tripping of units during the month of July 2020

During the month of July 2020, repeated tripping (tripping incidents reported more than 1 time) has been observed for 9 transmission lines (220 kV and above voltage level) as shown below:

Unit Name	No of Tripping	Total Outage Duration (Hour)	Average Outage Duration (Hour)	Utility to respond
BARH - UNIT 4	7	154.2	22.0	NTPC
BARAUNI TPS - UNIT 8	3	111.4	55.7	Bihar SLDC
SAGARDIGHI - UNIT 3	3	42.4	14.1	WBPDCL/WB SLDC
Sterlite - UNIT 4	3	118.8	39.6	GRIDCO SLDC/ SEL
BAKRESHWAR - UNIT 2	2	258.0	129.0	WBPDCL/WB SLDC
JITPL - UNIT 1	2	1.5	1.5	JITPL
KHSTPP - UNIT 6	2	366.9	183.4	NTPC
KODERMA - UNIT 1	2	268.2	268.2	DVC
MEJIA TPS - UNIT 3	2	63.5	31.8	DVC
RENGALI HPS - UNIT 3	2	328.2	164.1	GRIDCO SLDC/ OHPC

At 23:59 hrs on 31<sup>st</sup> July 2020, Koderma unit 1, Barauni unit 8 and JITPL unit 1 were out of service. Hence their last outage was not considered in calculation of Total and average outage duration. Utilities are requested to share the action taken to reduce the no of above mentioned units. Details of these tripping is given in Annexure B.

## Annexure A: Details of tripping of transmission lines which tripped repeatedly in the month of July 2020

Element Name	Tripping Date	Tripping Time	Reason 1	Revival Date	Revival Time
400KV-ALIPURDUAR (PG)-JIGMELLING-2	01-07-2020	23:15	APD-Z1 R-N FD-46km FC-6kA	01-07-2020	23:52
400KV-PPSP-BIDHANNAGAR-2	09-07-2020	16:31	BIDHANNAGAR: Y-N, Z-1, FD=47.6 km, FC=1 kA.	09-07-2020	17:09
400KV-ALIPURDUAR (PG)-JIGMELLING-2	19-07-2020	23:18	DT RECEIVED AT APD END	20-07-2020	01:09
400KV-ALIPURDUAR (PG)-JIGMELLING-2	22-07-2020	01:32	For ckt-II Ir= 2.055 KA , Ib= 2.317 KA , 233 Km from Alipurduar	22-07-2020	04:10
400KV-PPSP-BIDHANNAGAR-2	28-07-2020	12:36	DGP END: Z1, Y PH E/F, DIS. 105KM, 2.795kA	28-07-2020	12:55
400KV-PPSP-BIDHANNAGAR-2	30-07-2020	08:23	PPSP end RX1, RX2, 86A, 86B.	30-07-2020	08:59
220KV-NEW PURNEA-MADHEPURA-1	01-07-2020	12:36	PURNEA:Z1, Y-B, 43KM, IY-4.5KA, IB-4.4KA	01-07-2020	13:18
220KV-NEW PURNEA-MADHEPURA-1	02-07-2020	13:02	from Madhepura end , Relay operated R-N pickup, carrier receive, Z1B trip, IL1- 1.26 KA & dist- 83.5 km	02-07-2020	13:22
220KV-JODA-RAMCHANDRAPUR-1	04-07-2020	13:20	Joda-Z1 Y-N FC-Iy-950A FD-37.72km	04-07-2020	14:02
220KV-DARBHANGA (DMTCL)-DARBHANGA-1	05-07-2020	23:37	back up IDMT O/C & E/F AT DARBHANGA (BSEB)	06-07-2020	00:37
220KV-NEW PURNEA-MADHEPURA-1	08-07-2020	17:39	2.7 km B-N,5.828 KM Z1,A/R SUCCESSFUL /LATER HAND TRIPPED	08-07-2020	20:02
220KV-CHANDIL-STPS(WBPDCL)-1	13-07-2020	17:09	Spurious tripping	13-07-2020	20:35
220KV-DARBHANGA (DMTCL)-MOTIPUR-1	13-07-2020	22:20	B-N, Zone-1, 5.12 KA, 24 KM from DMTCL, Suspected jumper snapped	14-07-2020	14:59
220KV-BUDHIPADAR-KORBA-2	16-07-2020	12:06	z2 210 km 0.5 ka at korba end	16-07-2020	14:15
220KV-BUDHIPADAR-KORBA-2	18-07-2020	11:58	Z1 B-N,118 KM ,1.38 KA FROM BUDHIPADAR	18-07-2020	12:40
220KV-BEGUSARAI-NEW PURNEA-1	19-07-2020	08:45	R_N, 63.94 KM, 2.32 kA (Begusarai)	21-07-2020	06:15
220KV-DARBHANGA (DMTCL)-MOTIPUR-1	19-07-2020	11:04	E/F at DMTCL end,I(Y)=4.71KA,28.2km from DMTCL end,Z1	19-07-2020	11:44
220KV-DARBHANGA (DMTCL)-MOTIPUR-1	20-07-2020	07:06	O/V OPERATED AT DARBHANGA	20-07-2020	07:45

Element Name	Tripping Date	Tripping Time	Reason 1	Revival Date	Revival Time
220KV-DARBHANGA (DMTCL)-DARBHANGA-1	20-07-2020	07:06	OVERVOLTAGE STAGE-I	20-07-2020	07:47
220KV-BEGUSARAI-NEW PURNEA-1	21-07-2020	08:15	B_N, 1.113 kA, 200 KM (New Purnea)	21-07-2020	10:09
220KV-DARBHANGA (DMTCL)-DARBHANGA-1	22-07-2020	12:17	E/F	22-07-2020	12:48
220KV-BEGUSARAI-NEW PURNEA-1	23-07-2020	23:46	B_N,70.8km from New Purnea,1.86kA	24-07-2020	00:55
220KV-CHANDIL-STPS(WBPDCL)-1	26-07-2020	11:25	B-N,Z-1 45.3 km,2.87 KA	26-07-2020	11:52
220KV-BEGUSARAI-NEW PURNEA-1	27-07-2020	22:31	NEW PURNEA: R-N, 2.2KA, 80.9KM	27-07-2020	22:57
220KV-JODA-RAMCHANDRAPUR-1	28-07-2020	08:32	Joda-Z1 Y-N FD-14.934km FC-Iy-3.393kA	28-07-2020	09:28
220KV-CHANDIL-STPS(WBPDCL)-1	29-07-2020	12:13	R_N fault,Ia:- 116.6 A,fault distance:- 56.37 km, Zone-1	29-07-2020	12:41
220KV-JODA-RAMCHANDRAPUR-1	29-07-2020	12:31	Y_N fault,1.266kA	29-07-2020	13:11
220KV-BUDHIPADAR-KORBA-2	31-07-2020	14:08	B-N , 118 KM , 1.40 KA@BUDHIPADAR	31-07-2020	15:30
220KV-BEGUSARAI-NEW PURNEA-1	31-07-2020	16:16	B-N,71.4KM,FC 1.95@N PURNEA	31-07-2020	16:45



## Annexure B: Details of tripping of units which tripped repeatedly in the month of July 2020

Unit Name	Tripping Date	Tripping Time	Reason 1	Revival Date	Revival Time
NABINAGAR(BRBCL) - UNIT 2	01-07-2020	05:51	LOSS OF EVACUATION PATH	05-07-2020	07:49
NABINAGAR(BRBCL) - UNIT 3	01-07-2020	22:42	Excitation system channel I, II failure	02-07-2020	03:16
BARH - UNIT 4	02-07-2020	09:35	BOILER TUBE LEAKAGE	03-07-2020	19:38
BARH - UNIT 4	03-07-2020	23:12	ELECTRICAL FAULT	04-07-2020	17:20
SAGARDIGHI - UNIT 3	04-07-2020	02:38	MDBFP Leakage rectification	05-07-2020	17:52
JITPL - UNIT 1	04-07-2020	08:27	PA FAN TRIPPED	04-07-2020	09:59
BARAUNI TPS - UNIT 8	04-07-2020	12:00	BOILER TUBE LEAKAGE	07-07-2020	06:03
JITPL - UNIT 1	05-07-2020	04:52	PA FAN PROBLEM		
SAGARDIGHI - UNIT 3	05-07-2020	19:08	LOW DRUM LEVEL	05-07-2020	20:50
NABINAGAR(NPGC) - UNIT 1	06-07-2020	14:08	GENERATOR ROTOR EARTH FAULT	06-07-2020	19:23
RENGALI HPS - UNIT 3	06-07-2020	17:08	WATER LEAKAGE IN TURBINE PIT	07-07-2020	12:40
BARH - UNIT 4	06-07-2020	23:33	BOILER TUBE LEAKAGE	08-07-2020	16:30
NABINAGAR(BRBCL) - UNIT 3	07-07-2020	23:58	LOSS OF EVACUATION PATH	08-07-2020	10:08
NABINAGAR(BRBCL) - UNIT 2	07-07-2020	23:58	LOSS OF EVACUATION PATH	09-07-2020	02:16
KODERMA - UNIT 1	08-07-2020	01:09	BOILER TUBE LEAKAGE	19-07-2020	05:19
BARH - UNIT 4	09-07-2020	13:41	BOILER TUBE LEAKAGE	10-07-2020	09:42
RENGALI HPS - UNIT 3	09-07-2020	17:30	SHAFT VIBRATION HIGH	22-07-2020	14:08
BAKRESHWAR - UNIT 2	11-07-2020	08:41	HIGH PRESSURE BY-PASS VALVE OF BOILER IN-OPERATIVE	21-07-2020	01:24
DPL - UNIT 7	11-07-2020	17:19	RSD/LOW SYSTEM DEMAND	15-07-2020	13:36
Sterlite - UNIT 4	12-07-2020	18:10	Problem in Ash handling plant	14-07-2020	02:45
NABINAGAR(NPGC) - UNIT 1	15-07-2020	13:01	LOSS OF FUEL	15-07-2020	18:36
KHSTPP - UNIT 6	15-07-2020	16:22	BOILER TUBE LEAKAGE	17-07-2020	15:17
Sterlite - UNIT 4	17-07-2020	16:16	HYDRAULIC GOVERNOR SYSTEM PROBLEM	17-07-2020	17:52
KHSTPP - UNIT 6	18-07-2020	09:58	Turbine protection	31-07-2020	17:54

Unit Name	Tripping Date	Tripping Time	Reason 1	Revival Date	Revival Time
			operated		
Sterlite - UNIT 4	18-07-2020	17:10	BOTTOM ASH PROBLEM	22-07-2020	05:45
SAGARDIGHI - UNIT 3	20-07-2020	03:46	FLAME FAILURE	20-07-2020	05:13
BAKRESHWAR - UNIT 2	21-07-2020	09:40	GENERATOR ROTOR EARTH FAULT	22-07-2020	10:58
BARH - UNIT 4	22-07-2020	16:41	boiler feed pump tripped	22-07-2020	20:29
DPL - UNIT 7	23-07-2020	09:02	RSD/LOW SYSTEM DEMAND	29-07-2020	03:13
BARH - UNIT 4	24-07-2020	08:12	BOILER TUBE LEAKAGE	25-07-2020	18:38
MEJIA TPS - UNIT 3	25-07-2020	01:19	RSD/LOW SYSTEM DEMAND	27-07-2020	14:35
BARH - UNIT 4	25-07-2020	18:50	Generator protection operated	25-07-2020	21:41
KODERMA - UNIT 1	27-07-2020	12:39	BOILER TUBE LEAKAGE		
BARAUNI TPS - UNIT 8	27-07-2020	18:40	boiler protection trip	29-07-2020	16:02
MEJIA TPS - UNIT 3	31-07-2020	07:14	FLAME FAILURE	31-07-2020	09:30
BARAUNI TPS - UNIT 8	31-07-2020	16:15	DUE TO TRIPPING OF UAT		

# Annexure-2

List of important transmission lines in ER which tripped in JULY-2020

S.NO	LINE NAME	TRIP DATE	TRIP TIME	Relay Indication LOCAL END	Relay Indication REMOTE END	Reason	Fault Clearance time in msec	Remarks	PMU Location	DR CONFIGURATION DESCREPANCY	DR/EL RECEIVED FROM LOCAL END	DR/EL RECEIVED FROM REMOTE END	Utility to update
1	400KV-ALIPURDUAR (PG)-JIGMELLING-2	01-07-2020	23:15	APD-Z1 R-N FD-46km FC 6kA	Jig-DT received	R-N FAULT.	<100		BINAGURI		YES	NO	BHUTAN
2	400KV-PATNA-BARH-2	01-07-2020	16:06	PLCC MALOPERATION AT PATNA		NO FAULT IN PMU	NA	Reson of Mal-operation may be shared .Reactor ring down observed due to lc resonance line voltage present even after 3 phase breaker opening .	PATNA		NO	NO	NTPC BARH , PG-ER-1
3	220KV-NEW PURNEA-MADHEPURA-1	01-07-2020	12:36	PURNEA:Z1, Y-B, 43KM, IY-4.5KA, IB-4.4KA	MADHEPURA: Z1, Y-B, 50KM, IY-2.7KA, IB-2.8KA	Y-B FAULT.	<160	OK.	PURNEA	Individual pole opening status may be checked at Madhepura end as it is not showing pole opening status.Individual pole opening status may be configured at Purnea end .	YES	YES	BSPTCL
4	400KV-PUSAULI(PG)-NABINAGAR(BRBCL)-1	01-07-2020	05:51	Sasaram: R-Y,18.25 km, Ir 8.197 kA, Iy 8.33 kA	Nabinagar: R-Y	R-Y FAULT.	<100	OK.	SASARAM		YES	NO	
5	220KV-NEW PURNEA-MADHEPURA-1	02-07-2020	13:02	from Madhepura end , Relay operated R-N pickup, carrier recive, Z1B trip, IL1- 1.26 KA & dist- 83.5 km	7.8 KM ,IR=10.08 KA,R-N Z1 FROM NEW PURNEA	R-N FAULT.	<160	Why A/R not attempted from any end .Communication chanel status?as 3 phase opening not occued even after DT sent . When did all 3 pole opened ?	PURNEA	Individual pole opening status may be configured at Purnea end .	YES	YES	BSPTCL
6	400KV-FSTPP-KHSTPP-2	03-07-2020	13:01	R_N, 62.9 KM, 5.39 kA,AR successfult rom KHSTPP end only	R_N, Z1, 22 KM (FSTPP)	R-N FAULT.	<100.	Why A/R not attempted from FARAKKA?	FARAKKA	DR time frame not suffiecient for A/R observation	NO	YES	NTPC FARAKKA
7	400KV-MAITHON-KHSTPP-1	04-07-2020	16:41	KHG-Z! B-N FC-2.74kA FD-137.1km	Maithon AR succesful	B-N FAULT	<100.	Why A/R not attempted from Kahalgaon end.Was it enabled or not and if disabled then it should sent DT to other end .	MAITHON	Individual pole opening status may be checked at Maithon end as status did not changed.	YES	YES	PG-ER-1
8	400KV-BIHARSARIEFF(PG)-VARANASI-2	04-07-2020	15:12	DT Received	REACTOR REF OPERATED AT VNS	NO FAULT	<100.	Was any fault found in reactor ? Line voltage present due to reactor ringdown even after 3 phase opening .	BIHARSHARIEFF		YES	NO	PG-ER-1
9	220KV-BIRPARA-MALBASE-1	04-07-2020	14:51	BINAGURI : B-N Z2 40.74 KM 1.33 KA	MALBASE: NO TRIPPING	B-N FAULT	500		BINAGURI		YES	NO	
10	220KV-TASHIDING-RANGPO-1	04-07-2020	14:24	Tashi-EF		B-N FAULT	<100.	High resistive fault as seen by DR , Directional Over current setting may be checked .	BINAGURI		YES	NO	TASHDING
11	400KV-KISHANGANJ(PG)-RANGPO-1	04-07-2020	14:24	DT receipt	DEF	B-N FAULT	1000	Why Distance protection did not pickup at rangpo end fault current was more than 5 ka for 700 ms as seen from rangpo DR.High resistive fault turning to flashover at v peak as seen from kishanganh DR.Z-2&Z-3 started at Kishanganj end .	BINAGURI		YES	YES	PG-ER-2
12	220KV-FSTPP-LALMATIA-1	04-07-2020	10:27	MASTER TRIP AT LALMATIA		NO FAULT IN PMU	NA	Reason of master trip may be explaine.	FARAKKA		NO	NO	NTPC FARAKKA,JUS NL

13	220KV-DARBHANGA (DMTCL)-DARBHANGA-1	05-07-2020	23:37	back up IDMT O/C & E/F AT DARBHANGA (BSEB)		B-N FAULT	600		MUZZAFFERPUR		NO	NO	DMTCL , BSPHCL
14	220KV-RANCHI-HATIA-3	05-07-2020	16:40	Ranchi: B-N, 3.720KA, 27.823Km	Hatia: B-N, 32.4Km	B-N FAULT	<100.		RANCHI	DR not opening..Send proper file at hatia end .	NO	YES	JUSNL
15	220KV-RANCHI-HATIA-1	05-07-2020	16:40	Ranchi: B-N, 28.320Km, 4.974KA	Hatia: B-N, 2.20KA, 32.7Km	B-N FAULT	<100.		RANCHI	DR not opening..Send proper file at hatia end .	NO	YES	JUSNL
16	220KV-CHANDIL-RANCHI-1	05-07-2020	15:35	Ranchi: R_B_N, 17.8 KM, 9.387 KA	Chandil: R_B_N, 77.82 KM, Ir: 2.118 kA, Ib: 2.913 kA	R-B FAULT	<100.		RANCHI		NO	NO	JUSNL
17	400KV-ALIPURDUAR (PG)-BONGAIGAON-2	06-07-2020	10:27	Bong-Z1 R-N FC-4.234kA FD-44.56km	APD-R-N FC-4.3kA FD-75km	R-N FAULT.	<100	Tripped in reclaim time .	ALIPURDUAR	Individual pole opening status may be configured at APD end .	YES	NO	
18	400KV-MAITHON-KHSTPP-2	07-07-2020	15:23	KHSTPP: R-PH,FD 80KM,FC 5.14KA	MAITHON:R-N,74KM,3.95KA	R-N FAULT.	<100	R phase MCB A/R failed at Maithon end even after 1 second of that R phase TCB reclosed which should not occur .Line voltage available after 3 pole opening.	KAHALGAON	DR time frame is not capturing full event A/R etc it is of very short duration at Kahalgaon end .	YES	YES	PG-ER-2
19	400KV-PATNA-BALIA-2	07-07-2020	20:48	B_N, 89.9 KM, 4.24 kA, A/r successful from Patna end only		B-N FAULT	<100	Why A/R at Balia end did not operated?	PATNA		YES	NO	PG-ER-1 , NR
20	220KV-NEW PURNEA-MADHEPURA-1	08-07-2020	17:39	2.7 km B-N,5.828 KM Z1,A/R SUCCESSFUL /LATER HAND TRIPPED	B-N pickup, carrier receive, Z1B trip, IL3- 1.75 KA & dist- 80.0 km relay from both end. T	B-N FAULT	<100	A/R at Madhepura did not operated.	PURNEA	DR time frame not sufficient to observe A/R .	YES	YES	BSPTCL
21	400KV-MOTIHARI-BARH-2	08-07-2020	02:19	B_N, 0.36 kA, 8 KM (Motihari)	B_N, 2.59 kA, 189.8 KM (Barh), tower bend	B-N FAULT	<100	A/R unsuccessful but even after 3 pole opening REACTOR RINGDOWN observed and line voltage buildup started and high resonance over voltages were observed.	BARH		YES	YES	NTPC BARH , MOTIHARI
22	400KV-BIHARSARIEFF(PG)-BANKA(PG)-2	08-07-2020	13:42	banka: 104 m,14.1 KA,B-N,z1 LA blast severe lightning	biharshariff: 184.5 km,1.67 KA,B-N,z1b,LA FAILED	B-N FAULT	200	3 phase line voltage present upto 5 seconds even after 3 phase breaker opening due to reactor ringdown and exchange of energy between L/R & Line capacitance .	BIHARSARIEFF		YES	YES	PG-ER-1
23	400KV-PPSP-BIDHANNAGAR-2	09-07-2020	16:31	BIDHANNAGAR: Y-N, Z-1, FD=47.6 KM, FC=1 kA.	PPSP: Y-N, Z1	Y-N FAULT	<100	NO A/R at PPSP end .	DURGAPUR		YES	NO	
24	400KV-KHSTPP-BARH-1	09-07-2020	13:41	TEED PROTECTION OPERATED AT BARH	Charged through tie bay at Barh	TEED	<100	There was current in secondary of B-phase main bay CT even the line was out of service. This was forcing the TEED protection to operate. Line has been charged through tie CB. . At the same time 400kV Patna-NPGC ckt#2 A/R successful on B-N	BARH		NO	NO	NTPC KAHALGAON , NTPC BARH
25	400KV-PATNA-KISHANGANJ-1	11-07-2020	05:02	TRIPPED ON OVERVOLTAGE WHILE WAS ANTI THEFT CHARGED FROM KISHANGUNJ END		O/V-STG-I	<100	What was the relay setting of O/V stg-1&2	KISHANGANJ		NO	NO	PG-ER-1

26	400KV-PATNA-KISHANGANJ-2	11-07-2020	05:02	TRIPPED ON OVERVOLTAGE WHILE WAS ANTI THEFT CHARGED FROM KISHANGANJ END		O/V-STG-I	<100	What was the relay setting of O/V stg-1&2	KISHANGANJ		NO	NO	PG-ER-1
27	220KV-SUBHASGRAM(PG)-NEW TOWN-1	12-07-2020	23:47	Z1, RN 0.9 Km from Shubhasgram, 17.23 KA.	a/r successful at new town z1 R-N, 7.45 KA, 17.97 km	R-N FAULT.	<100	Whether A/R attempted from Subhasgram Pg end ,DR may plz be shared.	DURGAPUR		NO	NO	PG-ER-2
28	220KV-DARBHANGA (DMTCL)-MOTIPUR-1	13-07-2020	22:20	B-N, Zone-1, 5.12 KA, 24 KM from DMTCL, Suspected jumper snapped		B-N FAULT	<100	A/R successful from motipur end .Why A/R did not occurred at DMTCL end .			NO	YES	DMTCL
29	220KV-CHANDIL-STPS(WBPDCL)-1	13-07-2020	17:09	no trip at chandil		NO FAULT IN PMU	NA				NO	NO	WB , JUSNL
30	400KV-RAJARHAT-FSTPP-1	13-07-2020	18:22	Rajarhat: A/R successful, Z1, Y-N, 135Km, 2.65KA	FSTPP: Y-N, 2.8KA, 184.1KM	Y-N FAULT	<100	Secondary Arching issue observed during dead time voltage was present .Why A/R not operated at Farkka may be explained .	DURGAPUR		YES	NO	PG-ER-2,NTPC-FARAKKA
31	400KV-RAJARHAT-FSTPP-1	13-07-2020	15:39	DT sent to FSTPP while switching off Tie bay at Rajarhat		NO FAULT	NA	Reason for DT ?	DURGAPUR		NO	NO	PG-ER-2,NTPC-FARAKKA
32	400KV-KISHANGANJ-TEESTA-III-1	14-07-2020	12:52	Kishanganj-Gas density monitor malfunction. No fault also observed in PMU	Tessta III-DT received	NO FAULT	NA	Reactor ringdown observed ,even after 3 pole opening ,3 phase line voltage persisted upto few seconds .	BINAGURI		YES	NO	PG-ER-1 , TUL
33	220KV-PATNA-FATUHA-1	15-07-2020	13:12	PATNA: B-N, 20.32 KM, 5.18 KA,	FATUHA: Z-1, 9.11 KM, IB=5.548 kA,	B-N FAULT	350	From PMU it seems there is no A/R and carrier aided tripping as one end cleared fault in z-2.	PATNA		YES	NO	PG-ER-1
34	400 KV MERAMUNDALI - MENDHASAL -1	17-07-2020	16:43	B-N , 3.5KA , 81KM FROM MERAMUNDALI	B-N	B-N FAULT	<100	B PHASE LA BLASTED.Whether A/R operated or not?	MERAMUNDALI	DR frame not sufficient .	YES	NO	OPTCL
35	220KV-PATNA-KHAGAUL-2	17-07-2020	18:09	SPURIOUS LBB TRIPPING		NO FAULT IN PMU.	NA	Reason for lbb may plz be shared.	PATNA		NO	NO	PG-ER-1
36	220KV-BUDHIPADAR-KORBA-2	18-07-2020	11:58	Z1 B-N,118 KM ,1.38 KA FROM BUDHIPADAR	z1 B-N 41.17 km,3.5 KA	B-N FAULT	<100	NO A/R at Budipadar end .	BUDIPADAR		YES	NO	
37	400KV-ALIPURDUAR (PG)-JIGMELLING-1	19-07-2020	23:18	DT RECEIVED AT APD END		O/V STG-1	NA	seeing the line voltage at apd end it seems voltage went more than 450 kv for 100 ms only so o/v setting at jigmelling end may be checked .	ALIPURDUAR		YES	NO	
38	400KV-ALIPURDUAR (PG)-JIGMELLING-2	19-07-2020	23:18	DT RECEIVED AT APD END		O/V STG-1	NA	seeing the line voltage at apd end it seems voltage went more than 450 kv for 100 ms only so o/v setting at jigmelling end may be checked .	ALIPURDUAR		YES	NO	
39	220KV-ARRAH-NADHOKHAR-1	19-07-2020	12:34	R_Y_N, 8.89 KM, Ir: 6.6 kA, Iy: 6.57 kA (Arrah)		R-Y FAULT.	<100		SASARAM		NO	NO	PG-ER-1 , BSPTCL

40	400KV-FSTPP-BAHARAMPUR-1	19-07-2020	17:04	did not trip from farakka		Y-N FAULT.	500	3 PHASE opening from Behrampur end as Y & B both phase current increased so Y-B-N fault detected ,which zone picked up not shown in DR may kindly explain and share the details .It seems Behrampur sensed the fault in zone-4 reverse direction .	FARAKKA		NO	YES	NTPC FARAKA
41	400KV-FSTPP-BAHARAMPUR-2	19-07-2020	17:04	At Farakka:y-n,Z-2,	At Behrampur: A/r successful, y-n,11.6 km, 16.53 ka	Y-N FAULT.	500	A/R successful from Behrampur end and carrier sent still from Frakka end line opened after z-2 time this may plz be explained ?Whether carrier recived or not ?High 3rd & 5th harmonics upto 30 % observed in R and B phases till zone 2 time untill braker from Farakka not opened .Reason may be expalined plz?	FARAKKA		NO	YES	NTPC FARAKA,PG-ER-2
42	220KV-TENUGHAT-BIHARSARIFF-1	19-07-2020	13:42	Y_N, 6.085 KM, 2.4 kA (Biharsharif)		Y-N FAULT.	<100	No A/R operation .	BIHARSHARIFF	R phase cb status at bsf end showing wrong status.Individual pole opening status may be configured at TTPS end .	YES	YES	
43	220KV-BEGUSARAI-NEW PURNEA-1	19-07-2020	08:45	R_N, 63.94 KM, 2.32 kA (Begusarai)	R_N, 132 KM, 1.6 kA	R-N FAULT.	900	VT FUSE FAILURE	PURNEA		NO	NO	BSPTCL
44	220KV-DARBHANGA (DMTCL)-MOTIPUR-1	19-07-2020	11:04	E/F at DMTCL end,I(Y)=4.71 KA,28.2km from DMTCL end,Z1		Y-N FAULT.	<100	No A/R operation .	MUZZAFFERPUR		NO	NO	DMTCL
45	220KV-BEGUSARAI-NEW PURNEA-1	21-07-2020	08:15	B_N, 1.113 kA, 200 KM (New Purnea)	Didn't trip from Begusarai	B-N FAULT	350	Reason for delayed clearance may be explained	PURNEA		NO	NO	BSPTCL
46	400KV-JHARSUGUDA-RAIGARH-1	22-07-2020	20:27	Y_N, 78.776 KM, 4.792 kA (Jharsuguda)	Y_N, 25.74 KM, 7.76 kA (Raigarh)	Y-N FAULT.	<100	Tripped in reclaim,Y phase conductor snapped.	JHARSUGUDA		NO	NO	PG ER-3
47	220KV-DARBHANGA (DMTCL)-DARBHANGA-1	22-07-2020	12:17	Y PHASE E/F		Y-N FAULT	<100	Y PHASE CONDUCTOR SNAPPED.No Auto reclose.	PURNEA		NO	NO	DMTCL,BSPTCL
48	400KV-ALIPURDUAR (PG)-JIGMELLING-1	22-07-2020	01:32	R-B fault. For ckt-1 Ir= 2.608 KA, Ib = 1.895 KA. DLdiatance 220 Km from Alipurduar		R-B FAULT.	<100.		ALIPURDUAR		YES	NO	
49	400KV-ALIPURDUAR (PG)-JIGMELLING-2	22-07-2020	01:32	For ckt-II Ir= 2.055 KA , Ib= 2.317 KA , 233 Km from Alipurduar		R-B FAULT.	<100.		ALIPURDUAR		YES	NO	
50	220KV-BEGUSARAI-NEW PURNEA-1	23-07-2020	23:46	B_N,70.8km from New Purnea,1.86kA	B_N,Z2,1.15A(Begusarai)	B-N FAULT	350	No A/R operation whether carrier aided protection is there or not as one end opened in z-1 & other in z-2?	PURNEA		NO	NO	BSPTCL
51	400KV-KHSTPP-LAKHISARAI-1	23-07-2020	22:59	Y_N,z1,30km,11.18kA at Kahalgaon end	Y_N,117.6km,3.712kA at Lakhisarai end	Y-N FAULT.	<100.	Unsuccessful Auto reclose .3 phase line voltage present even after 3 phase breaker opening	KAHALGAON		YES	YES	PG-ER-1 , NTPC KAHALGAON
52	400KV-JHARSUGUDA-RAIGARH-1	23-07-2020	21:36	Y_N, 48.04 kA, 0.032 KM (Jharsuguda)		Y-N FAULT.	<100.	Y PHASE LA failed.A/R unsuccessful	JHARSUGUDA		NO	NO	PG-ER-3
53	400KV-RANGPO-TEESTA-V-1	23-07-2020	20:12	DT received at Teesta-V from Rangpo	Didn't trip	NO FAULT IN PMU	NA	Reason of DT may be explained .	BINAGURI		NO	NO	PG-ER-2
54	220KV-DARBHANGA(DMTCL)-LAUKAHI-1	23-07-2020	12:28	B PH O/V RELAY OPERATED	TRIPPED FROM LAUKAHI(BSEB) END ONLY	O/V STG-1	NA				NO	NO	DMTCL

55	400KV-KHARAGPUR-KOLAGHAT-1	25-07-2020	14:01	KOLAGHAT: R-N, Z1, 65KM, 9KA	KHARAGPUR: R-N, Z-1, 3KM, 11KA	R-N FAULT.	<100	A/r attempted but unsuccessful.	JAMSHEDPUR		NO	NO	WB
56	400KV-BINAGURI-TALA-2	26-07-2020	23:13	Z2,Y-N FAULT,FD 130.2KM,FC 2.729KA BINAGURI	Y-N,7.5KA,21.1KM@TAL A	Y-N FAULT	<100	A/R unsuccessful ,reactor ringdown observed as line voltage was present even aftrter 3 pole opening .	BINAGURI		YES	NO	PG-ER-2
57	220KV-TSTPP-MEERAMUNDALI-1	26-07-2020	20:16	R-Y Z1 15.58 KM IR 13.16 KA 9.61	Y-PHASE ZONE-1 32.8KM FROM TSTPP	R-N FAULT.	<100		TALCHER		NO	NO	OPTCL
58	220KV-ARRAH-KHAGAIL-2	26-07-2020	04:49	B-N, FC- 3.419 KA, 35.069 KM FROM ARRAH		B-N FAULT	<160	A/r was successful from Arrah END ,When did 3 phase breaker opened fom Khagail end ?No A/R at khagail end.	PATNA		YES	NO	BSPTCL
59	400KV-MAITHON-GAYA-1	26-07-2020	11:43	R-N 1.9 KA 338.2(main 1) 238 km(main2)km,z2 at maithon	R-N,59.3 km,4.4 KA z1 at gaya	R-N FAULT.	<100	SEVERE HIGH VOLTAGE IN Y PHASE APPEARED AFTER A/R.At gaya end at the instant of failed A/R 3 phase breaker did not opened only faulty phase opened this (this may please be checked )lead to O/V and and o/v-stg-2 picked.	GAYA	Breaker opening status may be configured.	YES	YES	PG ER-1 , PG-ER-2
60	220KV-CHANDIL-STPS(WBPDCL)-1	26-07-2020	11:25	B-N,Z-1 45.3 km,2.87 KA		B-N FAULT	1000	At STPS end 3 phase breaker opening occurred at the instant of fault .	JAMSHEDPUR		YES	YES	WB
61	400KV-KISHANGANJ-TEESTA-III-1	27-07-2020	23:35	R-B FAULT,FD 127.1KM,FC IR 3.55KA,IB 4.129KA@TEESTA 3	Z1,R-B,91.3KM,IR6.8KA,IB 6.2KA@KISHANGANG	R-B FAULT	<100	Reactor ringdown observed.	BINAGURI		NO.	YES.	PG-ER-1 , TUL
62	220KV-BEGUSARAI-NEW PURNEA-1	27-07-2020	22:31	NEW PURNEA: R-N, 2.2KA, 80.9KM	O/c&e/f relay Ia 976.5A,Ib 315.7A,Ic 437.9A@Begusarai	R-N FAULT.	900		PURNEA		NO.	NO.	BSPTCL
63	220KV-BUDHIPADAR-RAIGARH-1	27-07-2020	12:30	B_N Fault, 2.05 kA, 65.5 KM (Budhipadar)	B_N, 3.38 kA, 18.8 KM (Raigarh)	B-N FAULT	500		BUDIPADAR		NO	NO	OPTCL
64	220KV-CHANDIL-RANCHI-1	28-07-2020	17:49	Chandil Zone1, O/C, E/F , Ia=4.963 KA, Ib=237.5 A, Ic= 68.22 A, Fault location-16.09 KM.	Ranchi R-N, 84.2 KM 1.89 KA	R-N FAULT.	500	Reason for delayed clearance may be explained	RANCHI		YES	NO	JUSNL
65	400KV-PPSP-BIDHANNAGAR-2	28-07-2020	12:36	DGP END: Z1, Y PH E/F, DIS. 105KM, 2.795kA	O.PPSP END: Z1, DIS. 38.9KM.	Y-N FAULT.	<100	No auto reclose at PPSP end .	DURGAPUR		NO	NO	WB
66	220KV-JODA-RAMCHANDRAPUR-1	28-07-2020	08:32	Joda-Z1 Y-N FD-14.934km FC-Iy-3.393kA	Zone-3, Ia=485.4 A, Ib=1.519 kA, Ic=241.6 A Fault location=176.4 km	Y-N FAULT.	400	Seems RCP end opened after Z-2 time .No A/r	JAMSHEDPUR	Individual pole opening status may be configured at Chandil end .	YES	NO	JUSNL
67	220KV-JODA-RAMCHANDRAPUR-1	29-07-2020	12:31	Y_N fault,1.266kA		Y-N FAULT.	500	RCP end breaker opened after z-2 time while Joda end opened after 250 ms seems no carrier aided protection. Reason of delay may be explained ?	JAMSHEDPUR	Individual pole opening status may be configured at Chandil end .	YES	NO	JUSNL , OPTCL
68	220KV-CHANDIL-STPS(WBPDCL)-1	29-07-2020	12:13	R_N fault,Ia:- 116.6 A,fault distance:- 56.37 km, Zone-1		R-N FAULT.	<160	No A/R operation observed ,Other two phases were closed in DR frame till 3 seconds when did they got opened ?	RANCHI	Individual pole opening status may be configured at Chandil end .	YES	NO	JUSNL
69	400KV-MEERAMUNDALI-MENDHASAL-II	30-07-2020	12:13	Mendhasal Z1 R-N FC-3.67KA Dist-49.91Km		R-N FAULT.	<100	A/r unsuccessful	MERAMUNDALI		YES	YES	OPTCL

70	400KV-PPSP-BIDHANNAGAR-2	30-07-2020	08:23	PPSP end RX1, RX2, 86A, 86B.	DGP end: Over Voltage Stage-I (59R), 86B	0/V-STG-I	NA		DURGAPUR		NO	NO	WB
71	220KV-NEW PURNEA-MADHEPURA-2	30-07-2020	00:55	R phase, 1.5 KA, 73 km from madhepura end	R-N, 8.2 km, 9.22 KA, z1, a/r successful at new purnea	R-N FAULT.	<160	A/R successful at purnea end.	PURNEA	Breaker opening status AT PURNEA END MAY BE CHECKED.	YES	NO	BSPTCL
72	220KV-BEGUSARAI-NEW PURNEA-1	31-07-2020	16:16	B-N, 71.4KM, FC 1.95@N PURNEA	B-N, 136.68KM, FC 1.113KA @BEGUSARAI	B-N FAULT	500		PURNEA		NO	NO	BSPTCL
73	400KV-MEERAMUNDALI-MENDHASAL-II	31-07-2020	13:11	R-N, FD 46 KM, 4KA@MNDS	R-N, FD 66.7KM, 4.62KA@MRMD	R-N FAULT.	<100	Fault was in ckt-2, why both lines tripped at the same time? .From PMU it seems that Fault was in R phase of ckt-2 only.	MERAMUNDALI	Send DR of both ends.	YES	NO	OPTCL
74	400KV-MEERAMUNDALI-MENDHASAL-1	31-07-2020	13:11	R-N, FC 1KA		R-N FAULT.	<100	Fault was in ckt-2, why both lines tripped at the same time? .From PMU it seems that Fault was in R phase of ckt-2 only.	MERAMUNDALI	Dr time frame not sufficient.	NO	NO	OPTCL
75	400KV-MERAMUNDALI-LAPANGA-1	31-07-2020	12:30	Y-N, Z2 FD 111.7KM, FC 4.55KA@MRMDL	Y-N, Z1, FD 99KM, FC 3.17KA@LAPANGA	Y-N FAULT.	<100	A/r unsuccessful	MERAMUNDALI		YES	NO	OPTCL
76	220KV-BUDHIPADAR-KORBA-2	31-07-2020	14:08	B-N, 118 KM, 1.40 KA@BUDHIPADAR	KORBA: B-N, 3.5KA, 41.8KM	B-N FAULT	<160		BUDIPADAR		NO	NO	OPTCL
77	400KV-MUZAFFARPUR-GORAKHPUR-2	31-07-2020	10:11	B-N, FD 118.80, FC 4.17KA@MZP	B-N, FD 164.8KM, FC 5.11KA@GORAKHPUR	B-N FAULT	<100		MUZAFFARPUR		NO	NO	PG-ER-1



## List of important transmission lines in ER which tripped in JUNE-2020

S.NO	LINE NAME	TRIP DATE	TRIP TIME	Relay Indication LOCAL END	Relay Indication REMOTE END	Reason	Fault Clearance time in msec	Remarks	PMU Location	DR/EL RECEIVED FROM LOCAL END	DR/EL RECEIVED FROM REMOTE END	Utility to update
1	400KV-FSTPP-MALDA(PG)-1	01-06-2020	00:57	Y-N FAULT,Z2,43.39 KM,4.7KA	FSTPP: Y-N,Z1,FD 0.2 KM,44KA	Y-N fault .	<100	Line tripped in reclaim time .DR pole status showing all 3 phase breaker opened during dead time but it is not the case as rest 2 phase R&B were intact .	Farakka	NO	YES	PG ER-II
2	400KV-MAITHON-KHSTPP-2	05-06-2020	16:08	DT RECEIVED AT MAITHON		O/V STAGE -2	<100	At the same time A/R was successful in Y phase kahalgaoon -farakka IV ,line which caused severe O/V in Khstpp-Maithon -2	KAHALGAON	YES	YES	NTPC KAHALGAON
3	400KV-ALIPURDUAR (PG)-BONGAIGAON-2	09-06-2020	14:43	APL 95.5 KM, R_N, Z2, 1.864 KA	BNG R_N, 53.5 KM, 5.04 KA, Z1	R-N fault .	600	Reason for delayed tripping may be explained .Pmu shows 600 ms fault clearance time .	ALIPURDUAR	NO	NO	PG , ER-II
4	400KV-ALIPURDUAR (PG)-BONGAIGAON-2	11-06-2020	06:33	R-N,z2,carrier received,2.166 KA ,95.6 km, from alipurduar	R-N,z1,40.3km,5.4 KA at bongaigaon	R-N fault .	500 ms	Delayed clearance observed ,.Fault was in z-2 of APD although carrier received but3-pole tripping occurred and line opened after z-2 time. Unsuccessful A/R observed at Bonagigaon end.	SILIGURI	YES	NO	PG ER-2
5	400KV-RANCHI-MAITHON RB-1	27-06-2020	12:49	Y_N, 110 KM, 2.35 kA (Maithon RB)		Y-N FAULT.	<100	A/R successful from Ranchi end only ,Why A/R not occurred at MPL end .Secondary arching issue observed even after opening of Y phase breaker ,Y phase voltage went upto more than 600 Kv.	RANCHI	YES	NO	MPL,ER-1 PG

SI No.	Name of the incidence	PCC Recommendation	Latest status
<b>90<sup>th</sup> PCC Meeting</b>			
1.	Tripping of both running units at 220 k V TTPS on 15.03.2020 at 16:12 hrs.	<p>PCC advised JUSNL to take the following measures to avoid the unwanted tripping of transmission lines:</p> <ul style="list-style-type: none"> <li>• Check any fault was appeared in downstream network of Patratu PTPS S/s</li> <li>• Send the relevant DR of zone 4 tripping of 220 kV TTPS – PTPS S/C line at PTPS end</li> <li>• Check the zone 4 reach and time settings of 220 kV TTPS – PTPS S/C line at PTPS end as the line should not trip within 100 ms.</li> <li>• Test the protection relays of 132kV and 220 kV system at PTPS including 220/132kV ATRs</li> </ul>	<p>JUSNL updated following points –</p> <ol style="list-style-type: none"> <li>a) No fault found at downstream network of PTPS according to grid official. Relevant DR was already submitted.</li> <li>b) Z4 reach and time delay of 220 kV PTPS – TTPS was reviewed and found as per ERPC Philosophy.</li> <li>c) Line patrolling and Tree cutting have been done (report enclosed).</li> <li>d) Relay setting was already submitted by mail on 13.05.2020.</li> </ol>
2.	Black out at 220 k V Tenughat Substation on 14.04.2020 at 12:47 hrs	<p>After detailed deliberation. PCC opined that tripping of 220 kV TTPS – PTPS S/C line not clear, PCC advised JUSNL to collect the details and submit to ERPC and ERLDC.</p> <p>PCC advised BSPTCL, JUSNL and TVNL to take following corrective measures to avoid frequent tripping of the lines:</p> <ul style="list-style-type: none"> <li>• 220 kV TenughatBiharshariff S/C tripped 7 times in the months of March and April, 2020. 220 KV TTPS PTPS line also tripped several times in March and April 2020. JUSNL and BSPTCL were advised to carry out the line patrolling and ensure healthiness of these line.</li> <li>• TVNL was advised to review the O/C, E/F protection settings of 220 kV TenughatBiharshariff S/C , O/C ,</li> </ul>	<p>JUSNL updated following points –</p> <ol style="list-style-type: none"> <li>a) No fault found at downstream network of PTPS according to grid official. Relevant DR was already submitted.</li> <li>b) Z4 reach and time delay of 220 kV PTPS – TTPS was reviewed and found as per ERPC Philosophy.</li> <li>c) Line patrolling and Tree cutting have been done (report enclosed).</li> <li><b>d)</b> Relay setting was already submitted by mail on 13.05.2020</li> </ol>

		E/F protection settings of PTPS unit so that high resistance faults could be identified reliably.	
3.	Disturbance at 220 k V Tenughat Substation on 28.04.2020 at 06:29 hrs.	PCC advised TVNL to replace the EM type Busbar protection with numerical relay.	
4.	Disturbance at 220 k V Chandil Substation on 29.03.2020 at 19:21 hrs.	<p>PCC observed the following discrepancies and advised JUSNL and WBPDCCL to take appropriate action:</p> <ul style="list-style-type: none"> <li>• 220kV Chandil-Ramchandrapur S/C line got tripped within 100 ms. (Relay fault pickup details are not available due to incorrect DR configuration) JUSNL may check timing of distance protection at Ramchandrapur.</li> <li>• Disturbance recorders of all the substations of JUSNL involved in this disturbance are to be configured as per the ERPC guidelines.</li> <li>• STPS end DR of 220kV Chandil-STPS line is to be configured as per the ERPC guidelines</li> <li>• Protection system of 220/132kV ATRs to be tested and the settings are to be coordinated with 220kV and 132 kV protection relays.</li> <li>• Busbar protection for all 220kV substations are to be installed to minimize the fault clearing time.</li> <li>• As 220kV Chandil S/s has single bus and transfer scheme, option for sectionalizer may be explored.</li> <li>• Healthiness of carrier signal of 220kV Chandil-STPS line is to be checked.</li> <li>• STPS end DR of 220kV Chandil-STPS line is to be configured as per the ERPC guidelines</li> </ul>	<p>JUSNL updated following points:</p> <ol style="list-style-type: none"> <li>a) Timing of distance protection at Ramchandrapur end was reviewed and found as per ERPC Philosophy.</li> <li>b) Old electromechanical relays are to be replaced under PSDF upgradation (In progress).</li> <li>c) Proposal for bus sectionaliser has been sent by Chandil.</li> <li>d) Current PLCC healthiness status report is enclosed.</li> <li>e) Z4 reach and time delay of 220 kV Chandil – STPS line at Chandil end was reviewed and found as per ERPC Philosophy.</li> </ol>

5.	Total Power failure at 220 k V Chandil Substation on 15.04.2020 at 17:20 hrs	<p>PCC observed the following discrepancies and advised JUSNL to take appropriate action:</p> <ul style="list-style-type: none"> <li>• Disturbance recorders of all the substations involved in this disturbance are to be configured as per the ERPC guidelines.</li> <li>• CB of 220kV STPS-Chandil line at Chandil end is to be tested</li> <li>• Protection system of 220/132kV ATRs to be tested and the settings are to be coordinated with 220kV and 132 kV protection relays.</li> <li>• Busbar protection for all 220kV substations are to be installed to minimize the fault clearing time.</li> </ul>	<p>JUSNL updated following points:</p> <ol style="list-style-type: none"> <li>a) Timing of distance protection at Ramchandrapur end was reviewed and found as per ERPC Philosophy.</li> <li>b) Old electromechanical relays are to be replaced under PSDF upgradation (In progress).</li> <li>c) Proposal for bus sectionaliser has been sent by Chandil.</li> <li>d) Current PLCC healthiness status report is enclosed.</li> <li>e) Z4 reach and time delay of 220 kV Chandil – STPS line at Chandil end was reviewed and found as per ERPC Philosophy.</li> </ol>
6.	Total Power failure at 220 k V Chandil Substation on 30.04.2020 at 19:37 hrs	<p>PCC observed the following discrepancies and advised JUSNL to take appropriate action:</p> <ul style="list-style-type: none"> <li>• Disturbance recorders of all the substations involved in this disturbance are to be configured as per the ERPC guidelines.</li> <li>• The reach and time settings of distance protection of 220kV STPS-Chandil line at Chandil end are to be reviewed.</li> <li>• Protection system of 220/132kV ATRs to be tested and the settings are to be coordinated with 220kV and 132 kV protection relays.</li> </ul>	<p>JUSNL updated following points:</p> <ol style="list-style-type: none"> <li>a) Timing of distance protection at Ramchandrapur end was reviewed and found as per ERPC Philosophy.</li> <li>b) Old electromechanical relays are to be replaced under PSDF upgradation (In progress).</li> <li>c) Proposal for bus sectionaliser has been sent by Chandil.</li> <li>d) Current PLCC healthiness status report is enclosed.</li> <li>e) Z4 reach and time delay of 220 kV Chandil – STPS line at Chandil end was reviewed and found as per ERPC Philosophy.</li> </ol>

7.	Tripping of Unit 1 of JITPL on 05.03.2020 at 19:27 hrs	<p>PCC advised JITPL take following corrective actions:</p> <ul style="list-style-type: none"> <li>• Reduce zone 4 time setting of transmission lines to 0.5 second.</li> <li>• Bay CT could be taken in reactor differential protection.</li> <li>• As a temporary measure, set reactor bays backup impedance tripping time to 200-300 milisecond instead of 0 second to avoid maloperation.</li> </ul>	<p>JITPL : At presently Rector Bay -1 &amp;2 Back up Impedance Tripping time set at relay 100 milli sec .</p> <p>For Appropriate differential Scheme adaptation in both reactors bay we are called consultant(TCE), OEM (Siemens) and Relay testing Engineer ,it is in process of P.O placed .</p> <p>After completion, it will be shared with ERPC and ERLDC separately in future.</p>
8.	Tripping of both units of JITPL on 21.04.2020 at 18:29 hrs	<p>PCC advised JITPL to take following action:</p> <ol style="list-style-type: none"> <li>1) Tripping of both units at JITPL for bus bar protection operation of any bus may be reviewed.</li> <li>2) Units shall be connected to grid through remaining healthy bus</li> </ol>	<p>As per BHEL tripping scheme any one of the bus trip both generators will be tripped. During Visiting of Consultant (TCE), OEM(SIEMNS), Relay Testing Engineer the bus bar tripping scheme will be reviewed .</p> <p>After completion, it will be shared with ERPC and ERLDC separately in future.</p>
<b>89<sup>th</sup> PCC Meeting</b>			
1.	Disturbance at 220 kV Bidhannagar Substation on 01.02.2020 at 21:05 Hrs.	<p>PCC suggested WBSETCL to take the following remedial measures:</p> <ul style="list-style-type: none"> <li>• Submit the last test report of the CT which was failed during the disturbance</li> <li>• Carry out the testing of other CTs at Bidhanagar S/s</li> <li>• Avoid uneven distribution of lines between the Buses</li> <li>• WBSETCL along with SLDC, WB should explore to change the network configuration to reduce the fault current level at Bidhanagar</li> </ul>	

2.	Tripping of 220 kV Muzaffarpur-Hajipur D/C on 09.02.2020 at 12:53 Hrs and Tripping of 220 kV Hajipur-Amnour D/C on 10.02.2020 at 17:32 Hrs.	<p>PCC advised BSPTCL to take the following actions:</p> <ul style="list-style-type: none"> <li>• Check the past trippings for successful/unsuccessful operation of LBB and Bus Bar protection</li> <li>• Test LBB protection and Bus bar protection.</li> </ul> <p>PCC also advised SLDC Bihar and Powergrid to check reason for voltage unbalance at Muzaffarpur Substation.</p>	
<b>88th PCC Meeting</b>			
1.	Disturbance at 220 kV Maithon(PG) Substation on 25.01.2020 at 15:14 Hrs.	PCC advised Powergrid to replace the relay with numerical relay.	
2.	Tripping of 220 KV Gaya SonenagarD/Con 13.01.2020 at 00:40 Hrs.	<p>PCC advised BSTPCL take the following corrective actions:</p> <ul style="list-style-type: none"> <li>• Send the PSL logic and relay setting file to ERPC Secretariat.</li> <li>• DR synchronisation need to be reviewed.</li> </ul>	<p>PSL logic was also checked by BSPTCL and was shared with ERPC.</p> <p>There is no GPS available at the Sonenagar end and is being done manually.</p>
3.	Tripping of 400 kV Teesta V – Rangpo D/Con 05.01.2020 at 20:04 Hrs.	<p>PCC advised NHPC to take following corrective actions:</p> <ul style="list-style-type: none"> <li>• Revise their Zone-4 time settings to 500 ms.</li> <li>• 400kV Teesta-V – Rangpo Ckt-I distance protection input needed to be checked.</li> </ul>	

<b>87<sup>th</sup>PCC Meeting</b>			
1.	Tripping of 132 kV Dumka – Lalmatia D/C on 09.12.2019 at 11:35 hrs	<p>PCC advised JUSNL to collect DRs and discuss above issue with the SLDC and send the details to ERPC/ERLDC.</p> <p>PCC advised NTPC to share the DR at Lalmatia end. In 88<sup>th</sup> PCC meeting JUSNL informed that they did not get the reply from SLDC Jharkhand yet</p>	

### Reactor Ring down or Lc oscillation voltage after 3 pole opening

When a single- or double-line-to-ground fault occurs and a transmission line experiences a three-pole trip, the healthy phase(s) will experience resonance between the shunt reactors and the shunt capacitance of the line. Plot of the line voltages for a fault on the power system, we can see, once the line is isolated, the voltages on the unfaulted phases begin to oscillate and ring down.

The energy trapped in the shunt reactor and capacitor results in a voltage that has a frequency of resonance oscillation as mentioned below .  $x_l/x_c=K$  Degree of compensation .As the Mvar generation by line varies and similarly reactor output also depends on voltage ,hence frequency of oscillation may also vary but when its near to as below mentioned frequency ,resonance voltages will be high .

$$f = F\left(\frac{x_l}{x_c}\right)^{1/2}$$

**Concern:** (1) Whenever this frequency of voltage oscillations, after 3 pole opening is near to natural frequency of oscillation high voltages may be observed

(2)Where the distance elements are polarized using memory voltage and the potential transformers (PTs) are located on the line. Under these conditions, the memory voltage logic may memorize the ring down voltage and use this when the line is re-energized. From Fig. 3, we see that once the line is isolated, the energy trapped in the shunt reactor and capacitor results in a voltage that has a frequency of approximately 40 Hz.

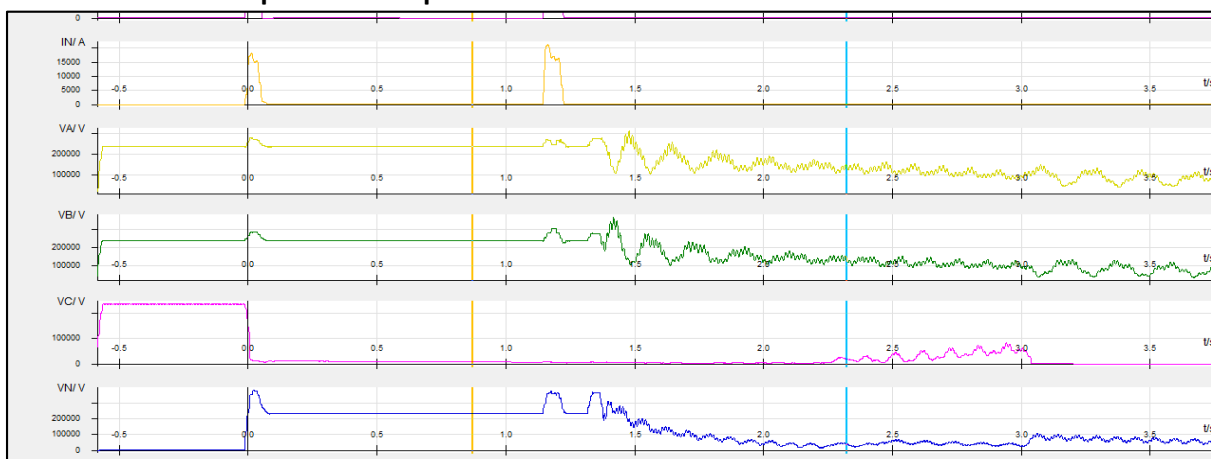
**The reason for this is that the relay is sampling this voltage at an integer value of 50 Hz when the system is in fact at 40 Hz, which is why the magnitude calculation is oscillating.**

The problem is that the relay memorizes the voltage at a frequency of 40 Hz and the relay uses that voltage once the line is re-energized, which can lead to a mis-operation of the distance elements.

**Suggestion:** To prevent such a situation, distance relays need to be equipped with ring down detection logic to flush the memory voltage (set memory voltage to zero), so when the line is re-energized, the distance elements will be momentarily blocked (0.5 to 0.75 cycle) while the memory voltage is recharged. If a relay does not have ring down logic to clear the memory voltage as described, then we extend the reclosing open interval delay beyond the relay memory action.

e.g **SOTF DLD**(Dead line detection) where 3 Phase V & I are if below a preset value ( $I < 20\%$  AND  $V < 40\%$ ) dead line is detected and SOTF enabled but due to above phenomenon it may cause maloperation of the same.

**Above are the mentioned concern and suggestions regarding this problem, all utilities are requested to go through the above and adopt if no such provision.**



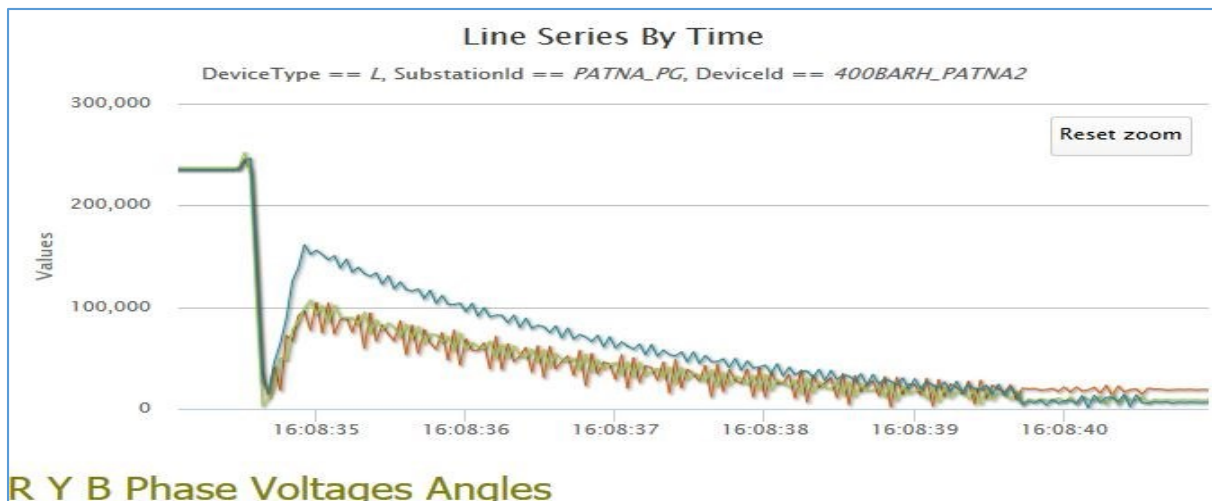
Figure(3)Rms voltage as seen by Relay



**CASES where in the month of July it has been observed is mentioned below :**

S.N O	LINE NAME	TRIP DATE	TRIP TIME	Relay Indication LOCAL END	Remarks
1	400KV-PATNA-BARH-2	01-07-20	16:06	PLCC MALOPERATION AT PATNA	Reactor ring down observed due to lc resonance line voltage present even after 3 phase breaker opening .
2	400KV-BIHARSARIFF(PG)- VARANASI-2	04-07-20	15:12	DT Received	calculated Resonance frequency= <b>27 Hz</b> , voltage oscillation of <b>28-29</b> hz observed .Max voltage went upto <b>580 Kv</b> .
3	400KV-MAITHON-KHSTPP-2	07-07-20	15:23	KHSTPP: R-PH,FD 80KM,FC 5.14KA	R phase MCB A/R failed at Maithon end even after 1 second of that R phase TCB reclosed which should not occur .Line voltage available after 3 pole opening. <b>(35 Hz) oscillation observed close to Resonance frequency which is 36 Hz due to which high voltages upto 800 kv observed.</b>
4	400KV-BIHARSARIFF(PG)- BANKA(PG)-2	08-07-20	13:42	banka: 104 m,14.1 KA,B- N,z1 LA blast severe lightning	3 phase line voltage present upto 5 seconds even after 3 phase breaker opening. calculated Resonance frequency= <b>35 Hz</b> , voltage oscillation of <b>32</b> hz observed .Max voltage went upto <b>525 Kv</b> .
5	400KV-KISHANGANJ-TEESTA- III-1	14-07-20	12:52	Kishanganj-Gas density monitor malfunction. No fault also observed in PMU	Reactor ringdown observed ,even after 3 pole opening ,3 phase line voltage persisted upto few seconds . calculated Resonance frequency= <b>33 Hz</b> , voltage oscillation of <b>30</b> hz observed .Max voltage went upto <b>550 Kv</b> .
6	400KV-KHSTPP-LAKHISARAI- 1	23-07-20	22:59	Y_N,z1,30km,11. 18kA at Kahalgaoon end	Unsuccessful Auto reclose .3 phase line voltage present even after 3 phase breaker opening. calculated Resonance frequency= <b>39 Hz</b> , voltage oscillation of <b>37</b> hz observed .Max voltage went upto <b>500 Kv</b> .
7	400KV-BINAGURI-TALA-2	26-07-20	23:13	Z2,Y-N FAULT,FD 130.2KM,FC 2.729KA BINAGURI	A/R unsuccessful ,reactor ringdown observed as line voltage was present even after 3 pole opening . . calculated Resonance frequency= <b>43 Hz</b> , voltage oscillation of <b>40</b> hz observed .Max voltage went upto <b>450 Kv</b> .
8	400KV-KISHANGANJ-TEESTA- III-1	27-07-20	23:35	R-B FAULT,FD 127.1KM,FCIR 3.55KA,IB 4.129KA@TEEST A 3	Reactor ringdown observed ,even after 3 pole opening ,3 phase line voltage persisted upto few seconds . calculated Resonance frequency= <b>33 Hz</b> , voltage oscillation of <b>30</b> hz observed .Max voltage went upto <b>520 Kv</b> .

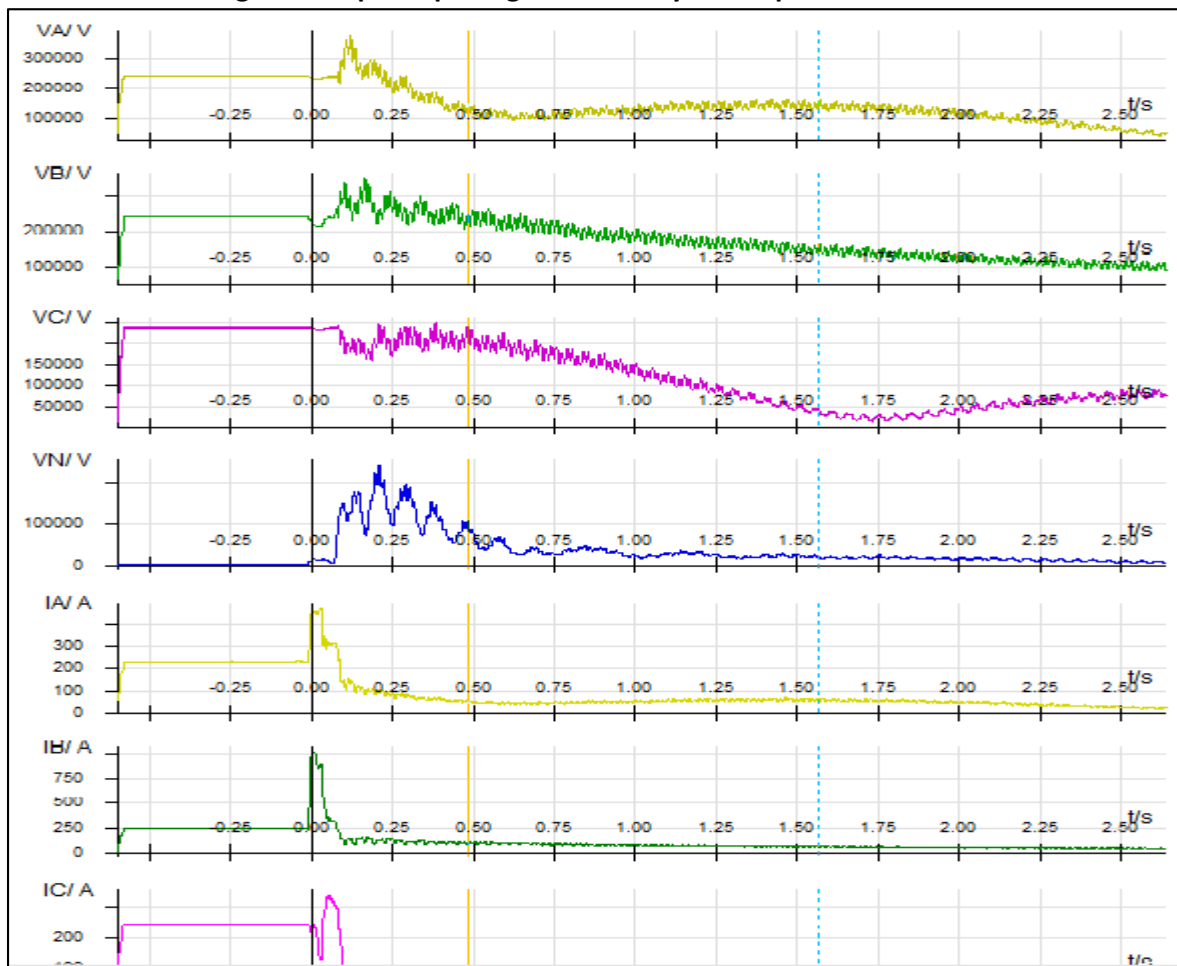
(1)PATNA – BARH –II : No DR received so PMU plot is attached for reference .

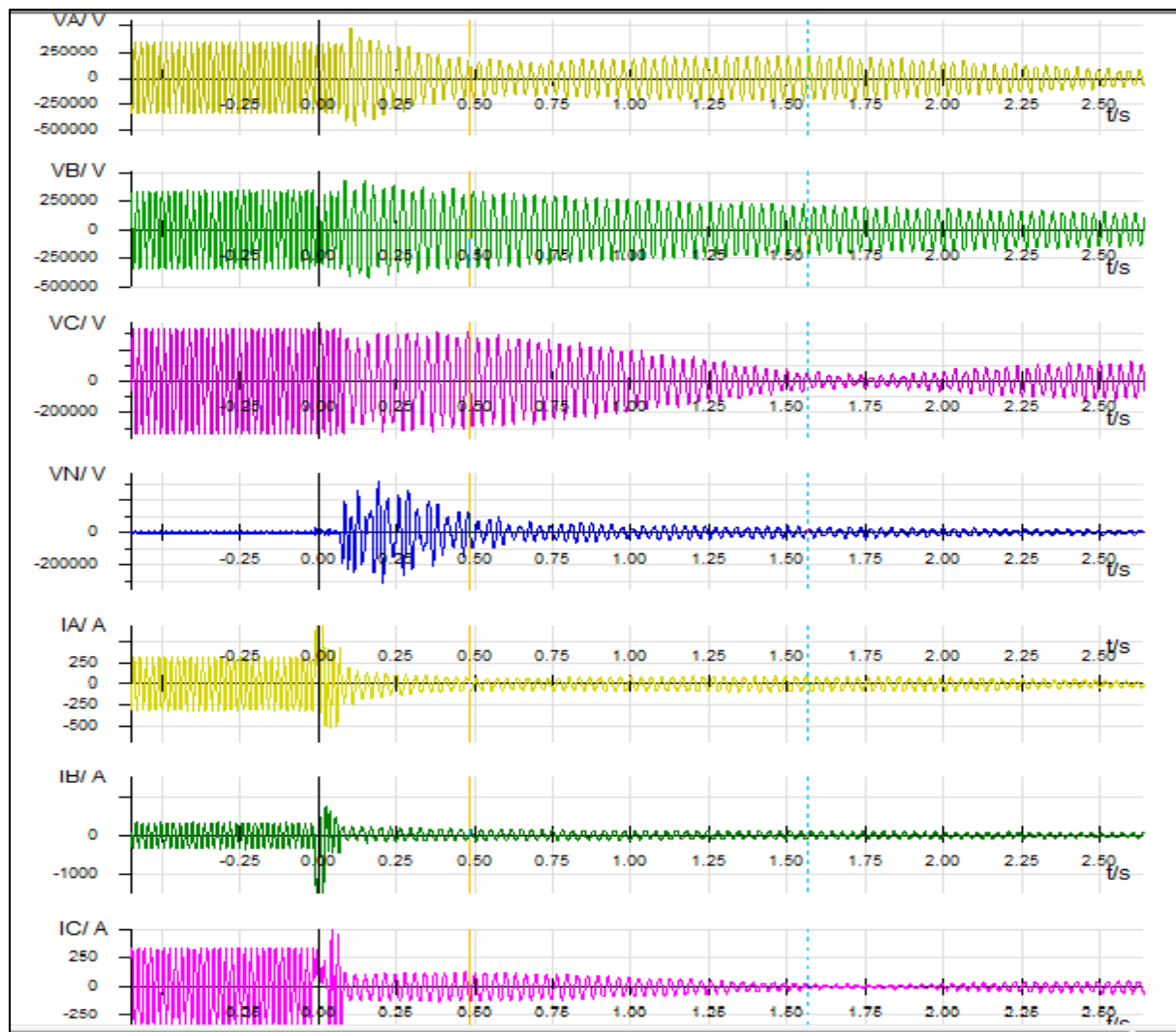


(2)Tripping of BIHARSHARIFF – VARANASI -2 on 04/07/2020 :Reactor Ringdown observed : Whether Reactor was tripped due to REF operation or was intact as after 3 pole opening resonating 3 phase line voltage of 28-29 Hz was present .

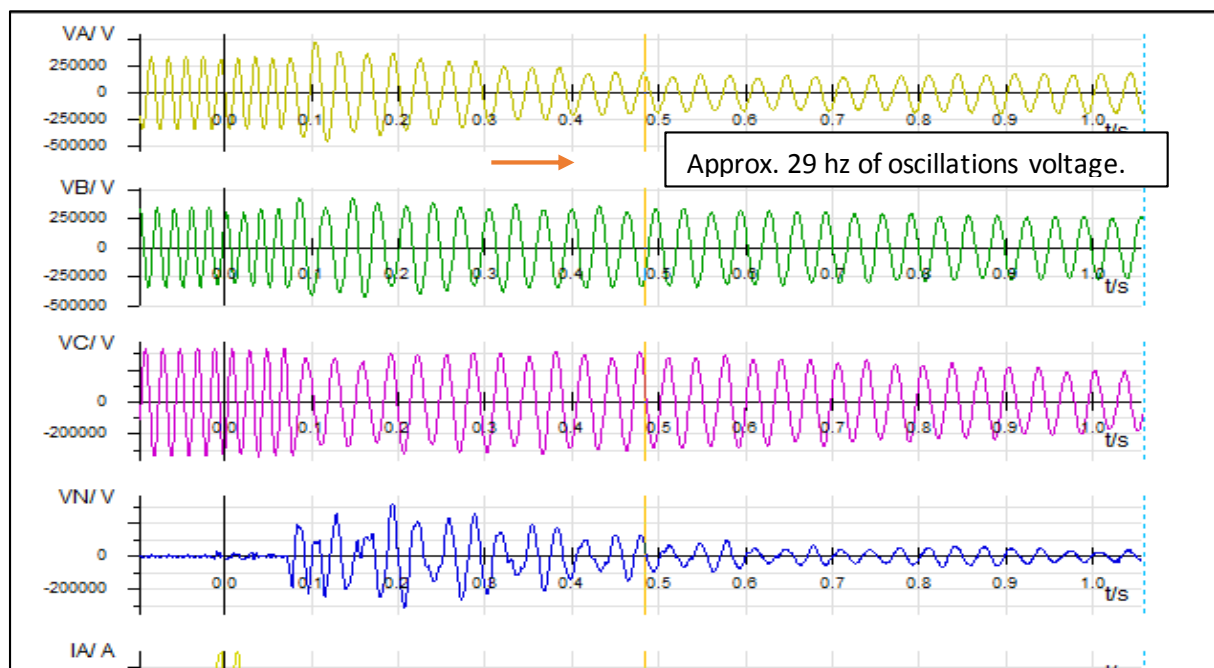
Line is having 321 Km long twin moose with 50 Mvar L/R at Biharshariff end . Charging MVAR generated by line is  $321 \times 0.55 = 176 \text{ Mvar}$  ,  $K = 50/176 = 0.284$  ,  $(K)^{0.5} = 0.534$  ,  $F_{osc} = F \times (K)^{0.5} = 0.534 \times 50 = 27 \text{ Hz}$  .

**RMS VALUE : Voltage after 3 pole opening momentarily went upto 600 kv.**

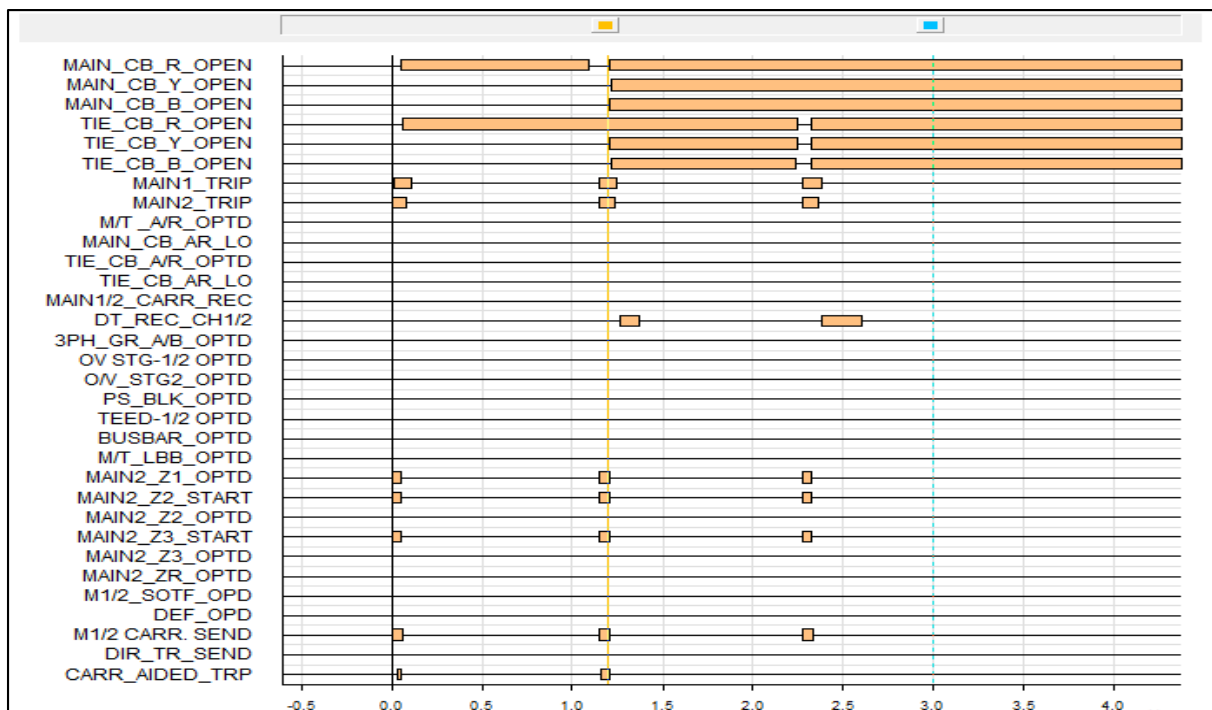
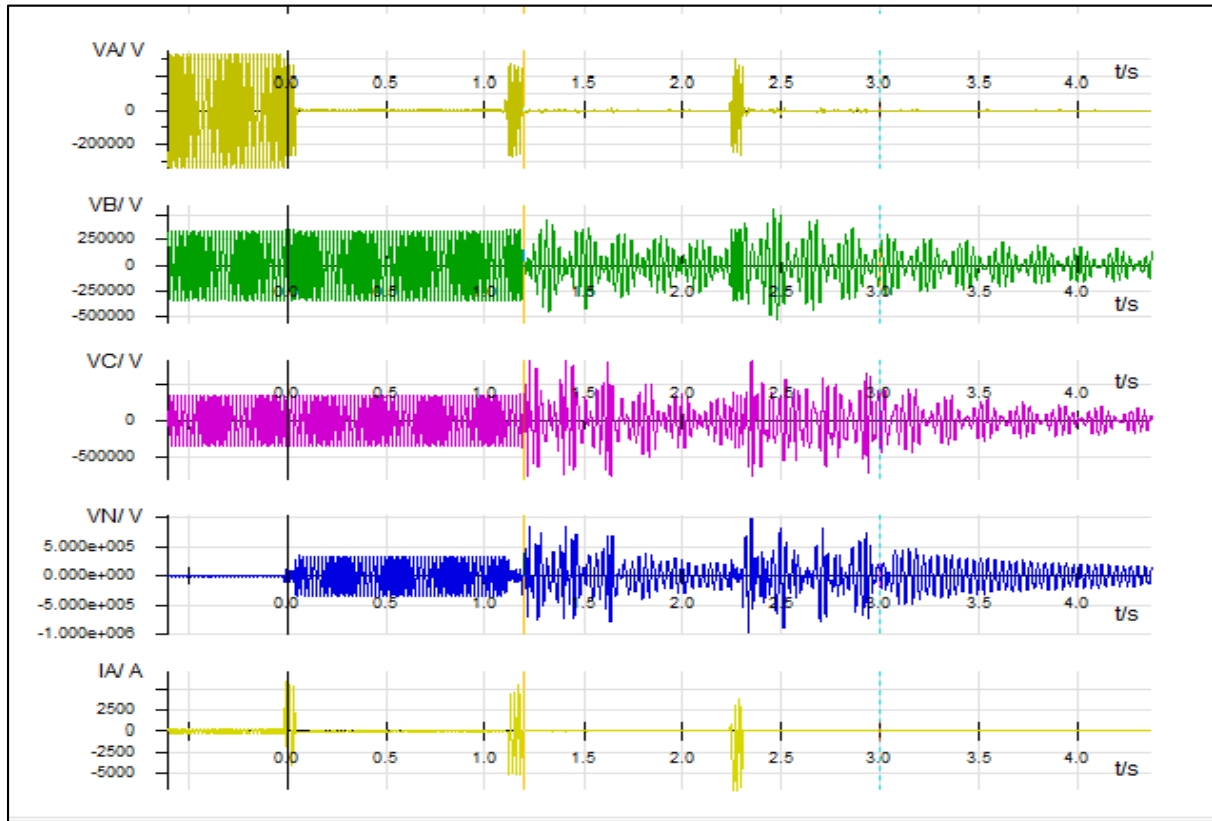




Zoomplot:



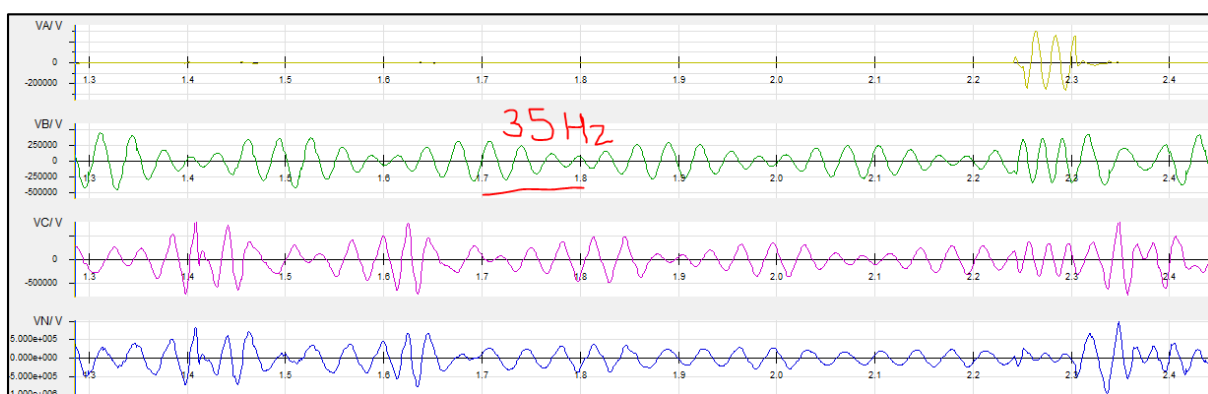
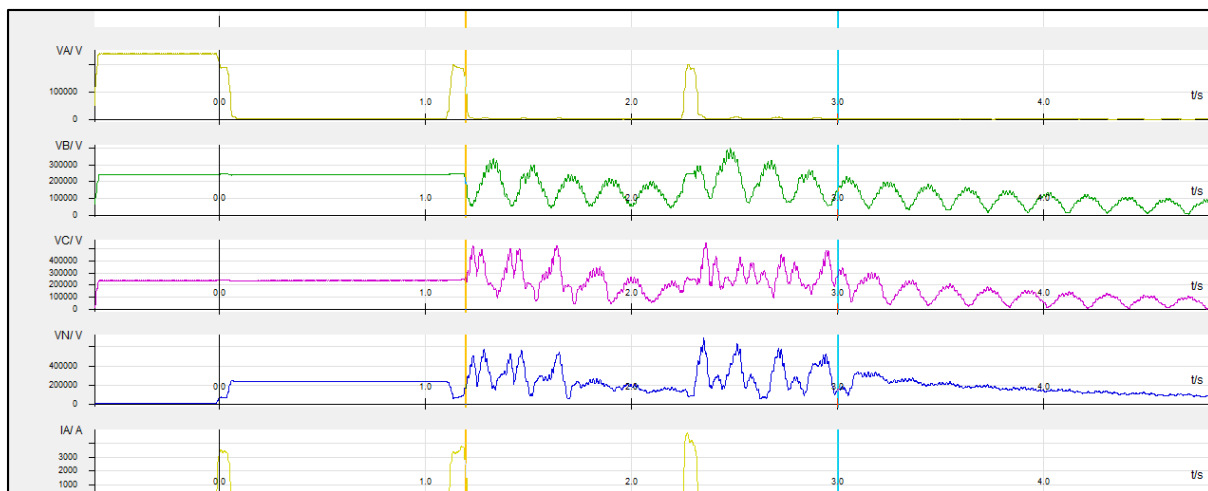
### (3)TRIPPING OF MAITHON KAHALGON II AT 07/07/2020



R phase MCB failed even after than R phase TCB reclosed after 1 second .

In the month of JUNE also same thing observed for the same line .

**Reactor Ring down phenomenon:** Due to Energy exchange between reactor and line capacitance, Electrostatic and electromagnetic energy exchange .

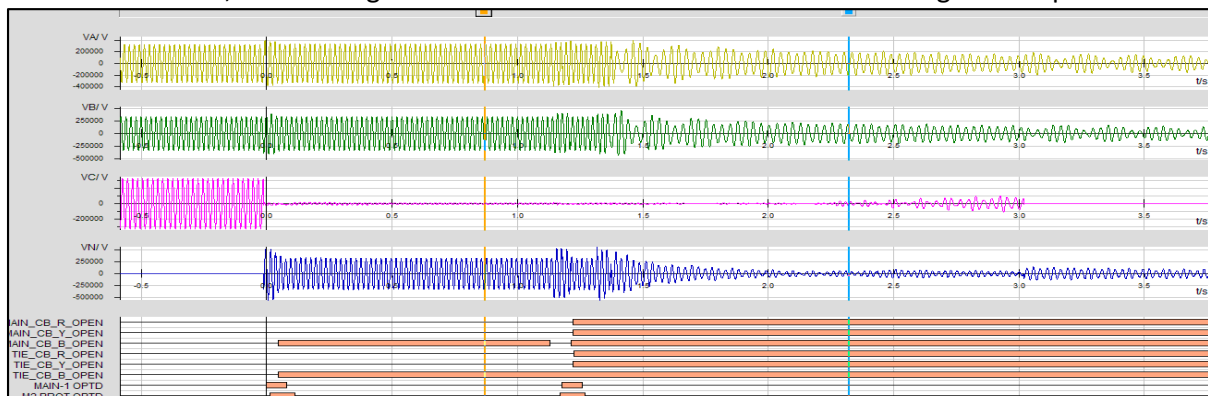


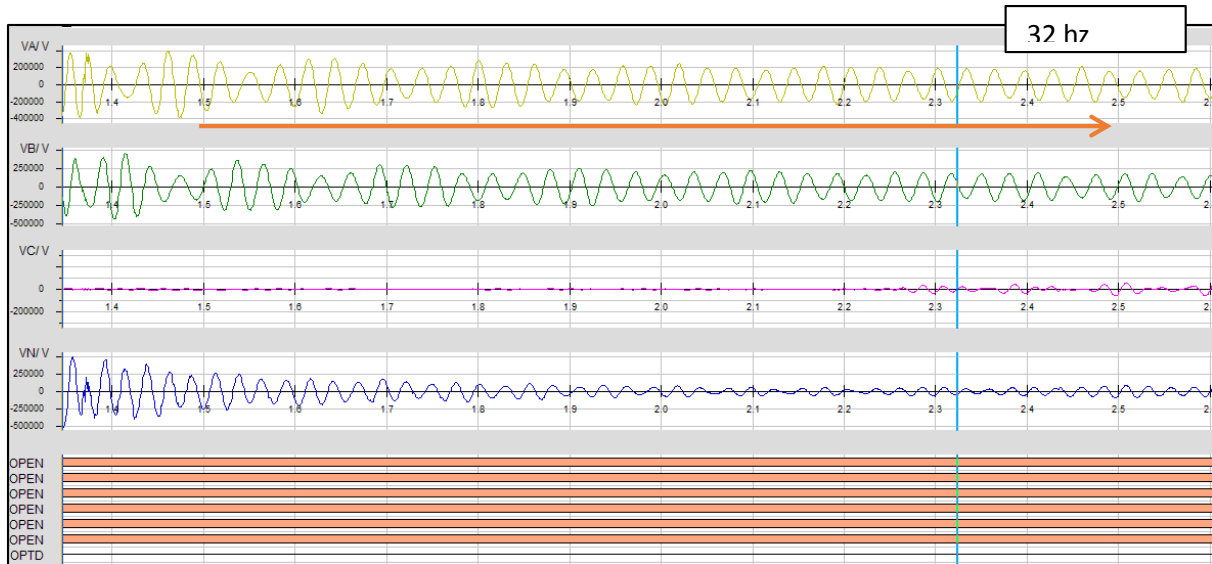
#### SEVERE HIGH VOLTAGE AFTER 3 POLE OPENING UPTO 800 KV .

**Reactor ringdown:** At maithon end even after breaker opening line voltage was there for few seconds due to LC oscillations due to 50 Mvar line reactor at maithon end .Line is 172 km twin moose line so charging mvar will be  $172 \times 0.55 = 94$  mvar and .Degree of compensation with 50 Mvar reactor at maithon end comes to  $50/94 = 54\%$ . Hence LC oscillation frequency will be **36 Hz** . With Dr at maithon end LC Oscillation frequency is shown below which is around 35 HZ almost same as calculated above so it can be inferred that these Line voltage with are present due to LC oscillations between reactor and line capacitance. **High voltages due to oscillation frequency close to resonance frequency .**

#### (4)400KV-BIHARSARIFF(PG)-BANKA(PG)-2 ON 08-07-20

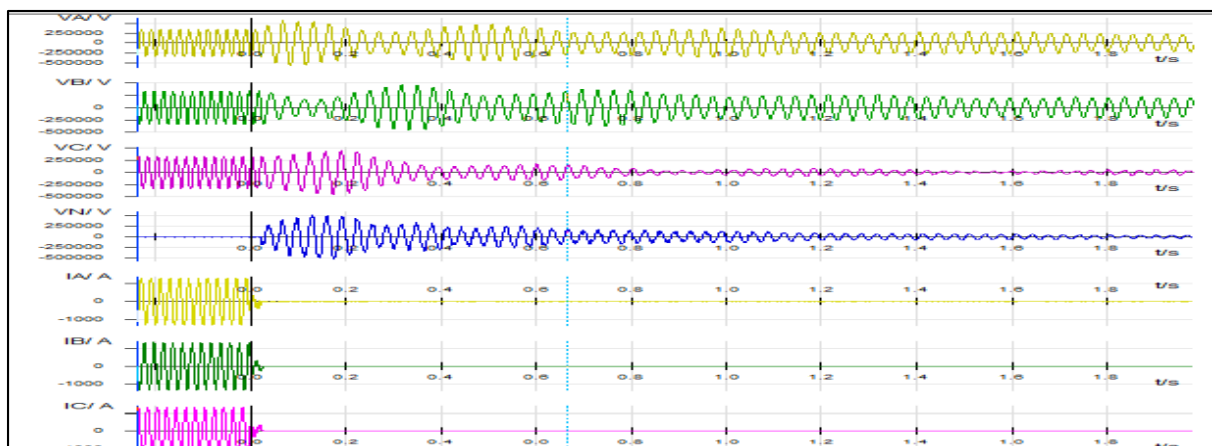
184 Km twin moose line with 50 Mvar Line reactor at Banka end .Degree of compensation  $k = 50\%$  Fosc-**35 Hz** ,Reactor ringdown of **32 hz** observed in this case .Max voltage went upto **525 kv** .



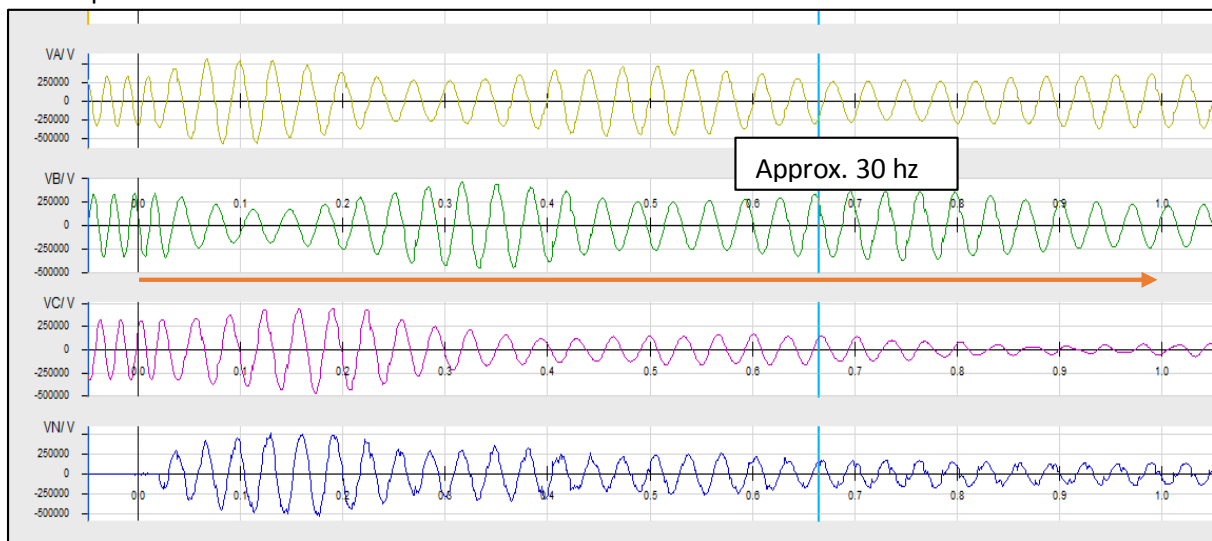


#### (5)400KV-KISHANGANJ-TEESTA-III-1 FOR 14 & 27 JULY

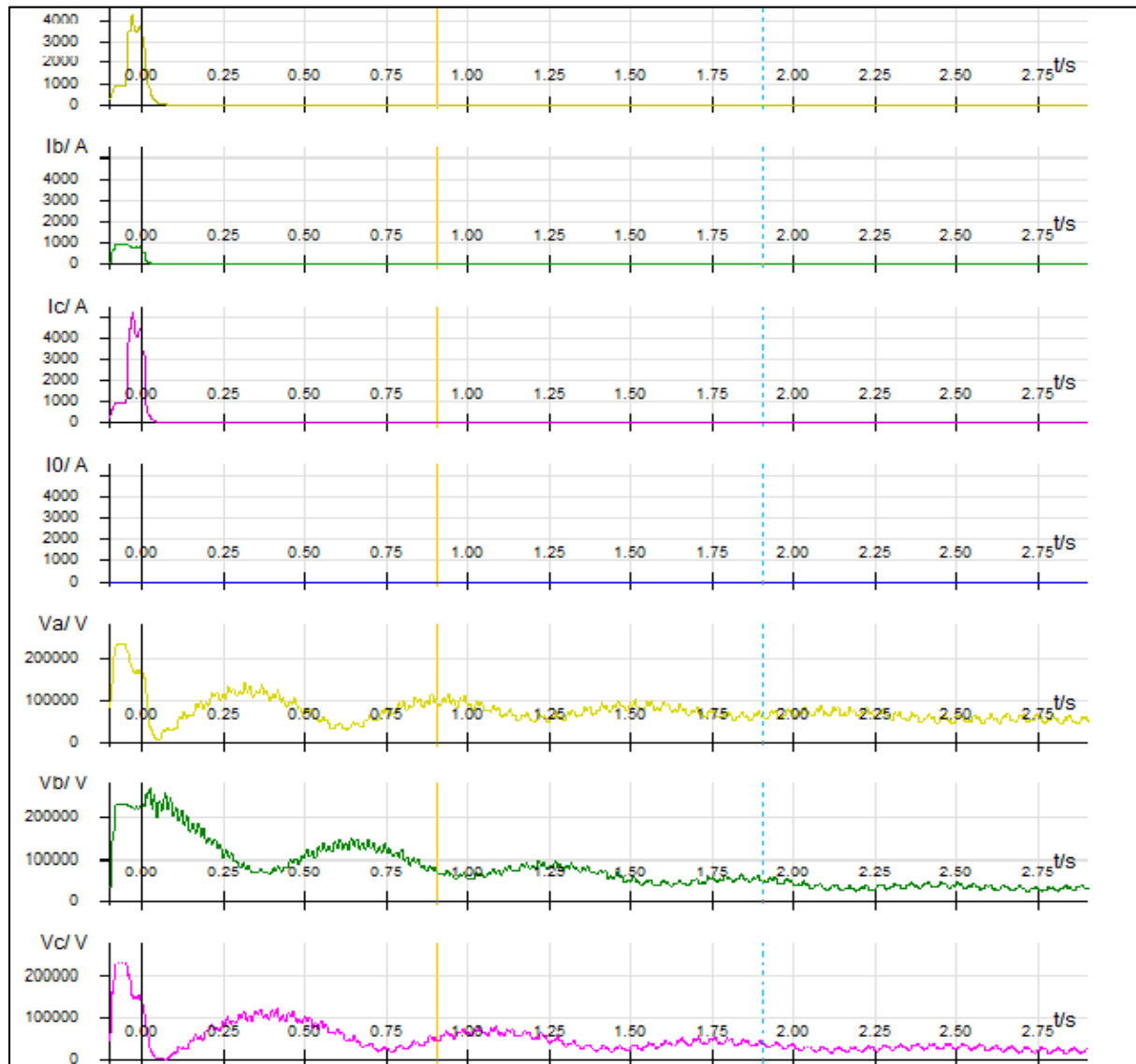
**DR for 14<sup>th</sup>** : 215 KM HTLS, line with 63 Mvar L/R at Kishanganj end . K=44% , Fosc=33 hz, Line voltage after 3 phase opening reached upto 550 kv .



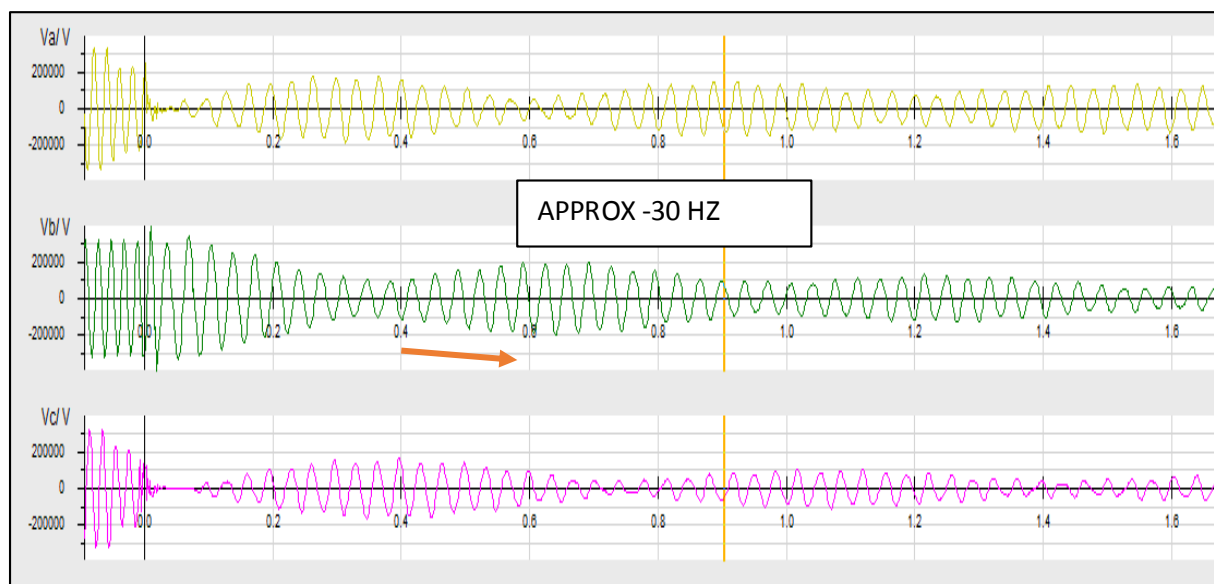
**ZOOM plot:**



DR FOR 27<sup>TH</sup> :



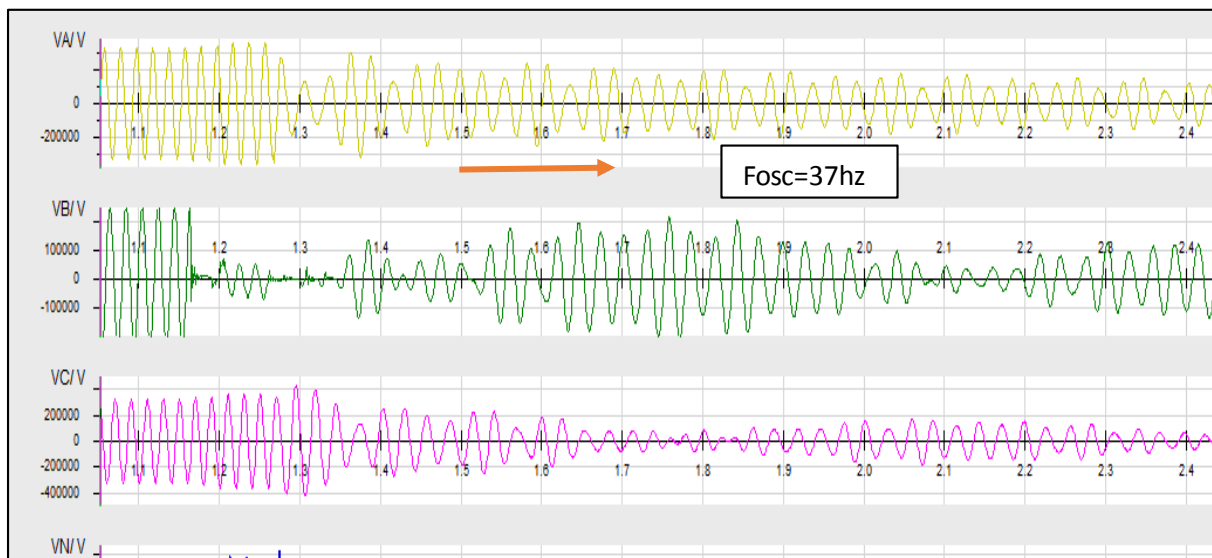
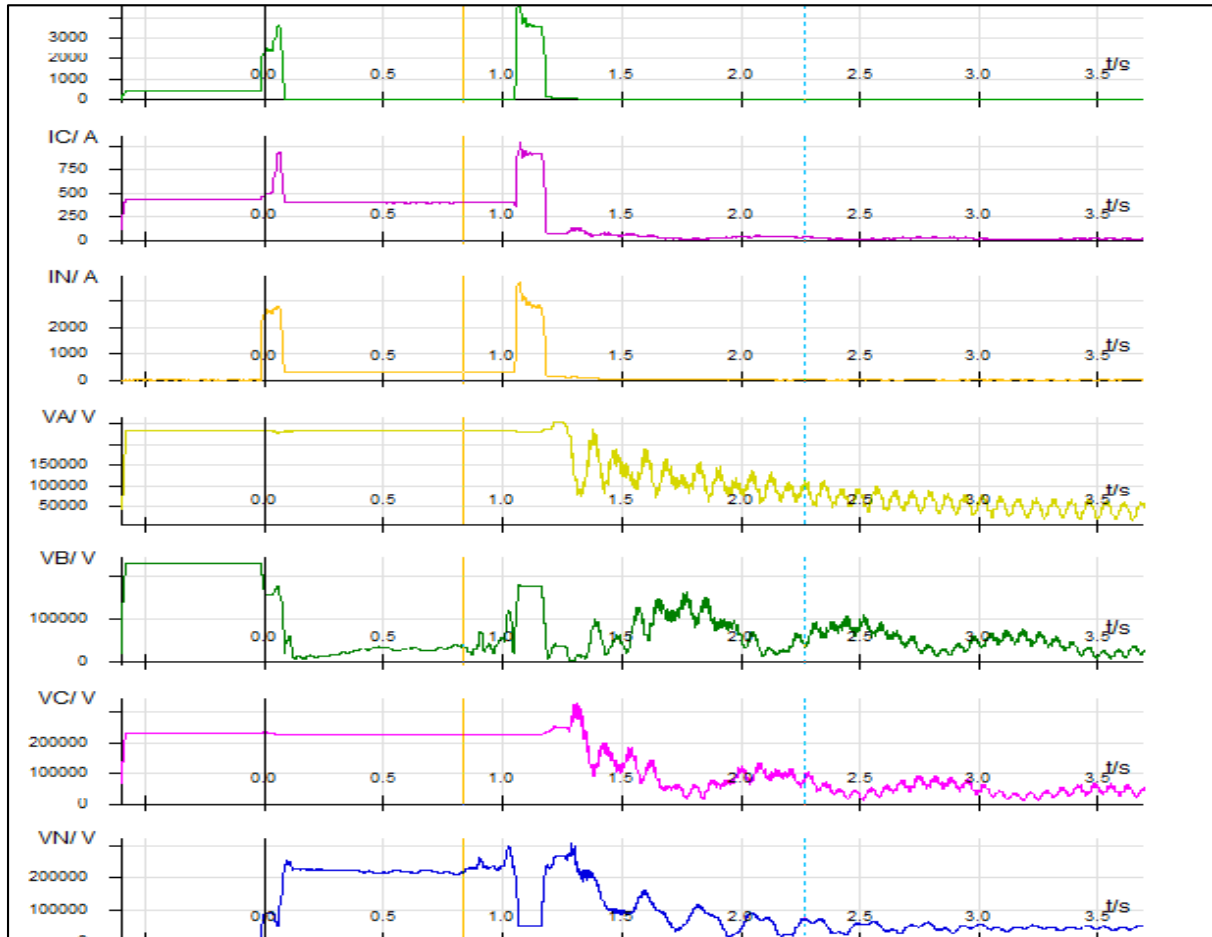
ZOOM PLOT:



**(6)400KV-KHSTPP-LAKHISARAI-1 ON 23<sup>RD</sup> JULY:**

Line is 145 km long twin moose with 50 mvar L/R at lakhisarai end .Line charging mvar=80 ,  
K=50/80 ,SO Fosc =39 Hz. Maximum voltage went upto 500 Kv .

**DR PLOT RMS VALUE:**



From zoomed plot approx. -37 Hz of oscillating voltage was noticed.



### (7)TRIPPING OF 400KV-BINAGURI-TALA-2 ON 26<sup>TH</sup> JULY:

Degree of compensation is 76% so  $f_{osc} = 43$  Hz. Dr plot voltage after 3 pole opening as shown below observed 40 HZ . Maximum voltage went upto 450 kv .

