107 वीं पीसीसी बैठक
हेतु
कार्यसूची

Agenda
for
107th PCC Meeting

दिनांक: 22.10.2021

Date: 22.10.2021

पूर्वी क्षेत्रीय विद्युत समिति

Eastern Regional Power Committee

14, गोल्फ क्लब रोड, टॉलीगंज, कोलकाता: 700 033

14, Golf Club Road, Tollygunge, Kolkata: 700 033

EASTERN REGIONAL POWER COMMITTEE

AGENDA FOR 107th PROTECTION COORDINATION SUB-COMMITTEE MEETINGTO BE HELD ON 22.10.2021 AT 10:30 HOURS

PART – A

ITEM NO. A.1: Confirmation of minutes of 106th Protection Coordination sub-Committee Meeting held on16rd Sep 2021 through MS Teams.

The minutes of 106th Protection Coordination sub-Committee meeting held on 16.09.2021 was circulated vide letter dated 13.10.2021.

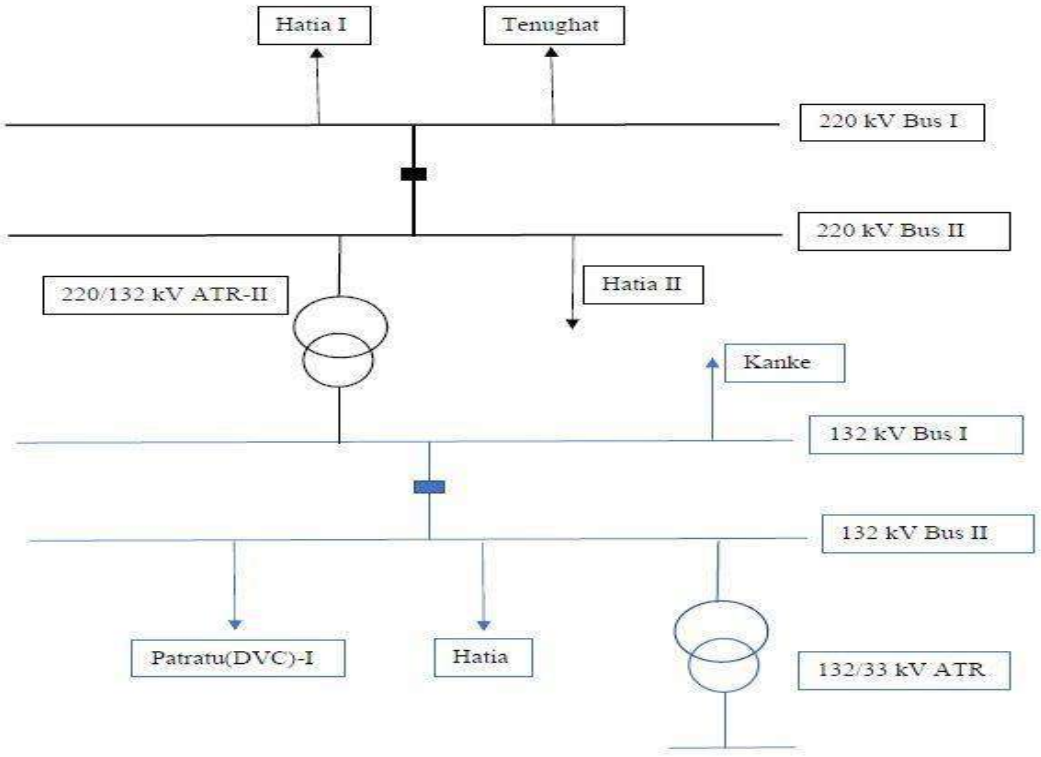
Members may confirm.

PART – B

ITEM NO. B.1: Disturbance at 220/132 kV Patratu(JUSNL) S/S on 12.09.2021 at 16:01Hrs

At 16:01 hrs, all 132 kV lines at 220/132 kV Patratu S/s tripped to clear fault in 132 kV Patratu-Patratu (DVC) line. At 16:32 Hrs, 132/33 kV ATR tripped leading to 15 MW load loss at Patratu.

During restoration, while charging 132 kV Patratu-Patratu (DVC) line at 18:43 Hrs, total power failure occurred and 220 kV side also became dead at Patratu.



SLD of 220/132 kV Patratu S/s

Relay Indications:

Time	Name	End 1	End 2	PMU Observation
16:01 Hrs	220 kV Patratu-Hatia-2	Y_B fault		6 kV dip in Y-ph and B-ph at Ranchi. Fault clearance time: 1.3 seconds
	132 kV Patratu-Kanke	Y_B, Z I, Iy:1.337 kA, Ib: 1.388 kA		
	132 kV Patratu-Hatia	Y_B, Iy:2.11 kA, Ib: 2.16 kA		
	132 kV Patratu-Patratu (DVC)-1	Only B_ph tripped		
18:43 Hrs	220 kV Bus-1 & 2 at Patratu			7 kV Dip in Y-ph at Ranchi. Fault clearance time: 1.3 seconds
	220 kV Patratu-Hatia D/c	Didn't trip	Ckt II tripped on O/c	
	220 kV Patratu-Tenughat	Didn't trip	E/F O/C, Iy: 1.003 kA	
	150 MVA 220/132 kV ICT-2 at Patratu	O/C		
	132 kV Patratu-Hatia	B_N, Z I		
	132 kV Patratu-Kanke	B_N, Z I		
	132 kV Patratu-Patratu (DVC)-(Idle charged)			

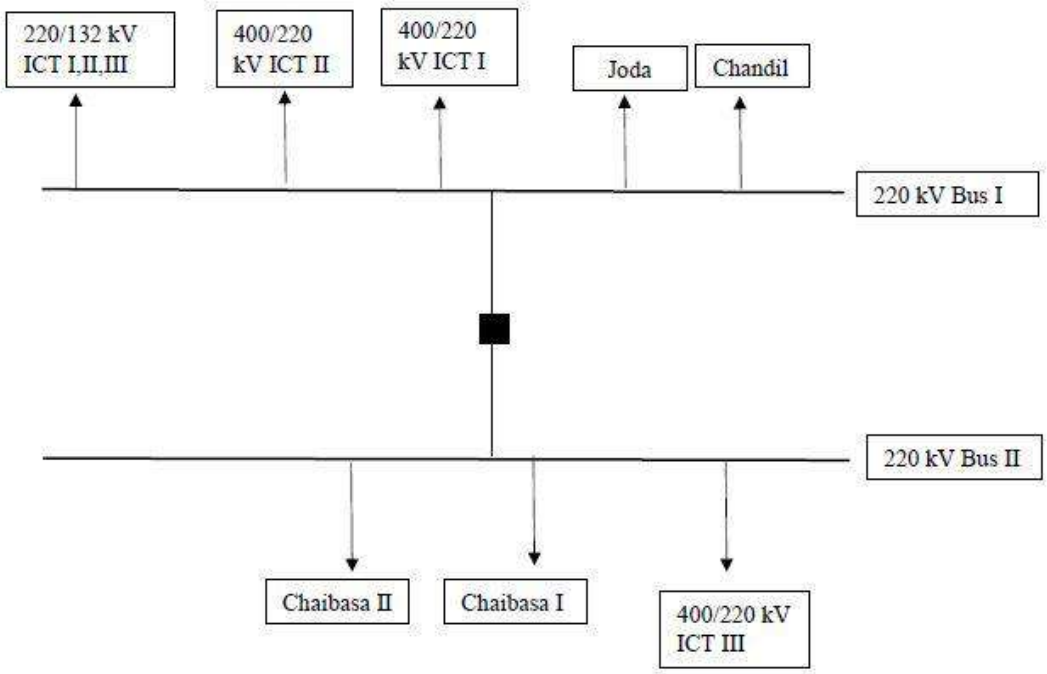
Detailed report from ERLDC is attached at **Annexure B.1.**

Load Loss: 15 MW
Outage Duration: 03:26 Hrs.

DVC & JUSNL may explain.

ITEM NO. B.2: Total Power Failure at 220 kV Ramchandrapur S/S on 03.09.2021 at 21:52Hrs

At 21:52 hrs, Bus PT of 220 kV Bus-2 at Ramchandrapur got burst leading to tripping of both 220 kV buses. This resulted in total power failure at Ramchandrapur S/s.



220/132 kV Ramchandrapur Schematic Bus diagram

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

Load Loss: 200 MW
Outage Duration: 00:15 Hrs

JUSNL may explain.

ITEM NO. B.3: Total Power Failure at 220 kV Garwah S/S on 26.09.2021 at 15:31Hrs

At 15:31 Hrs, 220 kV Daltonganj-Garhwa (New) D/C tripped on B-phase to earth fault leading to total power at 220/132 kV Garhwa S/s.

Relay Indications:

Time	Name	End 1	End 2	PMU Observation
15:31Hrs	220 kV Bus-1, Bus 2 at Garhwa (New)			Around 52 kV dip in B_ph at Daltonganj. A/r failed
	220 kV Daltonagnj-Garhwa(New)-1	B_N, FC-1.7 kA, FD- 56 km	B-N, FC-1.4kA, FD- 59 km	
	220 kV Daltonagnj-Garhwa(New)-2	Didn't trip	B-N, FC-1.4Ka, FD- 65 km	

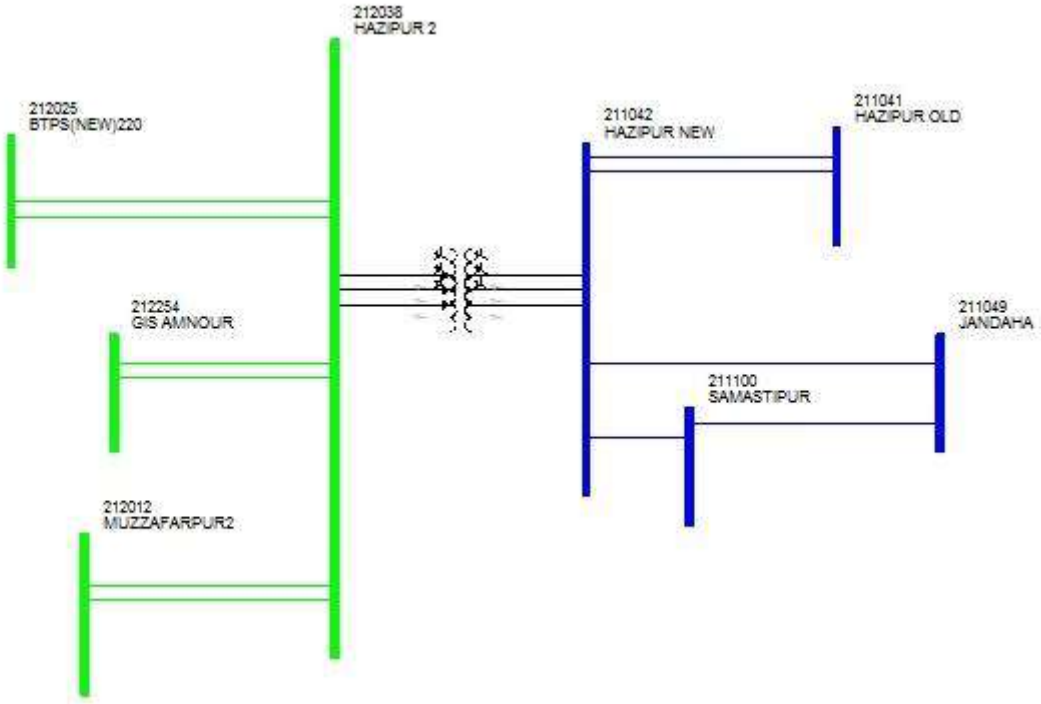
Disturbance report is attached at **Annexure B.3.**

Load Loss: 34 MW
Outage Duration: 00:55 Hrs

JUSNL may explain.

ITEM NO. B.4: Disturbance at 220 kV Hajipur S/S on 28.09.2021 at 17:18Hrs

Both 220 kV Buses at Hazipur tripped due to operation of LBB of 220 kV Hazipur-Amnour-II line which lead to total power failure at Hazipur and Amnour.



Relay Indications:

Time	Name	End 1	End 2	PMU Observation
17:18 Hrs	220 kV Bus-I, Bus II at Hazipur	Z-1 in Amnour-2 circuit but breaker did not open. Subsequently LBB operated which caused tripping of all ckts from Hazipur end.		23 kV dip in R phase with fault clearance time of 250ms.
	220 kV Hazipur-Muzaffarpur-I		Didn't trip	
	220 kV Hazipur-Muzaffarpur-II			
	220 kV Hazipur-Amnour I			
	220 kV Hazipur-Amnour II			
	220 kV Hazipur-Barauni (BTPS)-II		Didn't trip	

	2*100 MVA 220/132 kV ICTs at Hazipur			

Disturbance report is attached at **Annexure B.4.**

Load Loss: 230 MW
Outage Duration: 00:12 Hrs

BSPTCL may explain.

ITEM NO. B.5: Total Power Failure at 220 kV Amnour S/S on 29.09.2021 at 11:28Hrs

220 kV Hazipur-Amnour-2 was out of service prior to the disturbance. At 11:28 hrs, 220 kV Hazipur-Amnour-1 tripped due to operation of bus bar protection at Hazipur leading to total power failure at Amnour S/s.

As reported, during testing of 220 kV Hazipur-Amnour II (which was under breakdown), bus bar protection of 220 kV Bus I at Hazipur had operated.

Relay Indications:

Time	Name	End 1	End 2	PMU Observation
11:28 Hrs	220 kV Bus-I at Hazipur	Bus bar protection operated at Hazipur		No fault observed in PMU
	220 kV Hazipur-Muzaffarpur-I		Didn't trip	
	220 kV Hazipur-Barauni (BTPS)-II			
	220 kV Hazipur-Amnour I			
	220 kV Bus-I,II at Amnour	Loss of power suppply		

Detailed report from ERLDC is attached at **Annexure B.5.**
Load Loss: 140 MW
Outage Duration: 00:27 Hrs

BSPTCL may explain.

ITEM NO. B.6: Total Power Failure at 220 kV Ramgarh S/S on 29.09.2021 at 01:24Hrs

At 01:24 hrs, total power failure occurred at 220/132 kV Ramgarh, 132 kV Patratu S/s and 132 kV North Karnpura S/s.

Load Loss: 150 MW
Outage Duration: 00:06 Hrs

DVC may explain.

ITEM NO. B.7: Disturbance at 220 kV Upper Kolab S/S on 18.09.2021 at 17:59Hrs

While synchronizing U#2 at UpperKolab, all three circuits emanating from 220 kV UpperKolab HEP tripped and 220 kV bus became dead.

Relay Indications:

Time	Name	End 1	End 2	PMU Observation
17:59 Hrs	220 kV Bus-I, Bus II at UpperKolab	U#2 LBB operated		No fault observed in PMU
	220 kV UpperKolab-Jaynagar-1			
	220 kV UpperKolab-Jaynagar-2			
	220 kV Upper Kolab-Therubali			
	80 MW U#1 at UpperKolab			

Disturbance report is attached at **Annexure B.7.**

Gen. Loss: 73 MW
Outage Duration: 00:58 Hrs

OHPC/OPTCL may explain.

ITEM NO. B.8: Major grid events other than GD/GI

B.8.1: Islanding Performance and Observations during recent Islanding incidents in CESC system.

CESC islanding performance and frequency variation for past few Islanding events were checked for Island stability. Based on the analysis by ERLDC, possible challenges for island survival are listed below.

- Oscillating Variation of frequency after island formation in Budge-budge frequency is observed up to (0.5-1 Hz) and was varying continuously till it got synchronized with grid at Howrah point.
- In event 3, Budge-Budge Unit generation was also oscillating and its root cause needs to be looked into which is ultimately driving the frequency of island.
- Any cyclic load changes or other behavior within the island need thorough analysis as these may also be the source of observed variation. Variation of traction and Metro load may also be studied within the island as it impacts on overall frequency stability within the islanded system.
- Under frequency load shedding setting as shared within the island starts from 49.4 Hz and may cause operation of UFR relay in some cases inside the island. This would be

detrimental for island survival as observed for 2 events, Frequency dipped up to 49.5 & 49.6 Hz due to these variations.

- Above observation and frequency variation pattern was also observed during event of 28thApril 2020.

Following root cause analysis is required to be carried out by CESC:

1. Analysis of oscillatory variation in frequency during island mode.
2. Reason for Budge Budge unit generation oscillation during event 3.
3. Budge Budge units Governor and PSS behavior in islanded mode, issues and its tuning performance during islanded mode.
4. Load behavior within island including cyclic, metro rail/traction and its impact on island system
5. UFR system and its possible operation and impact during such variation in the island.

Detailed report from ERLDC is attached at **Annexure B.8.1.**

CESC may explain.

B.8.2: Low Frequency Oscillation of local mode in CESC system due to Budge-Budge Plant on 20th Sept 2021

Low Frequency Oscillation of 0.875 Hz was observed between 03:53 Hrs to 03:57 Hrs on 20th sept 2021 near Subhasgram area. The magnitude of oscillation was maximum near Subhasgram and started reducing on moving away from Subhasgram. Observed LFO was of Local mode which indicates that the oscillation initiated with hunting of any nearby unit.

It was observed that maximum variation in MW oscillation was observed for Budge-budge units, which appears to be the source of oscillation. It was also observed that as MW of units reduced at Budge Budge units, this oscillation also damped.

Detailed report from ERLDC is attached at **Annexure B.8.2.**

CESC may explain. Members may discuss.

B.8.3: Bus tripping occurred in Eastern Region during September 2021

During September 2021, following incidents of bus bar tripping have been observed in Eastern Region.

Element Name	Tripping Date	Reason	Utility
220 kV Main bus - 1 at Rangpo	11-09-2021 at 16:37 Hrs.	Mal-Operation	PGCIL ERTS 2
400 kV MAIN BUS - 2 AT FSTPP	08/09/2021 at 15:05 Hrs.	Tripped due to mal-operation of LBB relay contacts in 400 kV Malda-2 line and Bus-2 CB	Farakka NTPC

Powergrid and NTPC Farakka may explain.

B.8.4: Event of Smelter Load tripping at Sterlite CPP on 20th & 28th September 2021.

Smelter load tripping of 400 kV Sterlite CPP was observed on two occasions i.e., on 20 & 28th September 2021 due to electrical disturbance in the downstream side which resulted into Smelter load reduction/tripping of more than 1000 MW.

- This has caused under drawl of Odisha by more than 1000 MW, with SPS action at Sterlite injection to grid was limited upto 800 MW.
- Intimation of such events is necessary in real time as this change the grid flow pattern and also such huge load tripping /change is important for Frequency response assessment purpose.

Detailed Report as received from Sterlite is attached at **Annexure B.8.4.**

SLDC Odisha & Sterlite may explain.

ITEM NO. B.9: Repeated Tripping of Transmission Lines and associated issues

B.9.1: Repeated Tripping of 400 kV FSTPP-KHSTPP -4.

400 kV Farakka-Kahalgaon -4 had tripped four times in the month of Sep-21 due to DT receipt at Kahalgaon end. Details of such events are provided below.

	Element Name	Tripping Date	Tripping Time	Reason	Remarks	Revival Date	Revival Time
›	400KV-FSTPP-KHSTPP-4	24/09/2021	16:10	TRIPPED FROM FARAKKA END ONLY		24/09/2021	18:23
›	400KV-FSTPP-KHSTPP-4	24/09/2021	11:53	FSTPP: DT received from KHSTPP		24/09/2021	12:55
›	400KV-FSTPP-KHSTPP-4	09/09/2021	11:43	DT received at Farakka Not tripped at KHSTPP		09/09/2021	12:37
›	400KV-FSTPP-KHSTPP-4	06/10/2021	07:21	DT Received at Kahalgaon End; Tripped from Kahalgaon end only.		06/10/2021	08:52

NTPC may explain.

B.9.2: Repeated Tripping of 220KV Tie Lines of Jharkhand (JUSNL)

(A) Tripping of DALTONGANJ – GARWA D/C lines.

Following trippings were occurred during month of September.

Sr No	Element Name	Tripping Date	Tripping Time	Reason
1	220KV-DALTONGUNJ-GARWAH (NEW)-2	03-09-2021	12:22	GARWAH: Z1, YB, Iy-518A, Ib-555A, 49.59km DALTONGUNJ: YB, Iy-2.8kA, Ib-2.9kA, 27.6km
2	220KV-DALTONGUNJ-GARWAH (NEW)-2	06-09-2021	09:16	Garwah B-N, 479.9 A 60.5 km
3	220KV-DALTONGUNJ-GARWAH (NEW)-2	07-09-2021	14:43	DALTONGUNJ: - R-Y, 64.4KM, Ir=Iy=1.8KA, Z-2 GARWAH: - Z-1, 25.2KM, R-Y, Ir=Ib=1.1KA

4	220KV-DALTONGUNJ-GARWAH (NEW)-2	13-09-2021	18:38	Daltongunj: A/R successful,137.7Km,0.978Ka,b-n Garwa New: Z-I, 18.07 kM,Ia=165.9A, Ib=219.3A, Ic=916.2A
5	220KV-DALTONGUNJ-GARWAH (NEW)-2	17-09-2021	11:23	A/R SUCCESSFUL FROM DALTONGANJ; GARHWA: Z-1, B-N, Fc= 0.88 kA, Fd= 54.25km
6	220KV-DALTONGUNJ-GARWAH (NEW)-2	26-09-2021	15:31	Garwah: B-N,1.4kA, 65Km, Daltongunj- did not trip

- **Fault Nature, Sag and Clearance Issue**

It was observed from DR plots that B phase current started rising slowly and then got converted to perfect phase to phase fault (as phase currents of Y and B are 180 degrees apart) due to arc over at voltage peak instance. B phase was involved in each fault.

Same phenomenon is observed in almost all cases, which indicates that the fault is occurring due to sag and clearance issues, hence proper line patrolling and healthiness of line should be maintained.

- **Non-Operation of Auto Reclose:**

In some of the incidents, it was observed that during B-phase to ground fault, B phase opening is occurring at Garwa end but after dead time A/R is not occurring and B phase kept opened until pole discrepancy rely got operated and caused tripping of line. For all these instances A/R was successful from Daltonganj end and proper A/R operation at Garwa end could have avoided the line tripping.

Detailed report is attached at **Annexure B.9.2.A.**

JUSNL may explain.

(B) Repeated tripping of 220 kV Chandil –Santaldih S/C line

Details of tripping are mentioned below along with issues identified.

- Most of the Faults are R-Earth Fault.
- 3 phase tripping had occurred for single phase fault due to Non operation of A/R at Chandil end**.**
- Delayed tripping is observed for z-2 faults due to non-availability of PLCC

S.NO	LINE NAME	TRIP DATE	TRIP TIME	Relay Indication LOCAL END	Relay Indication REMOTE END	Remarks
1	220KV CHANDIL-SANTALDIH(STPS)-1	03-09-2021	13:54	Chandil: R_N, Z I, 1.75 kA, 101.1 km	Santaldih: R_N, 17.9 km, 4.007 kA	Three phase tripping at Chandil for single phase fault.
2	220KV CHANDIL-SANTALDIH(STPS)-1	03-09-2021	17:50	Chandil: R_N, Z I, 2.61 kA, 30.07 km	Santaldih: R_N, Z II, 93.282	Three phase tripping at Chandil for single

					km, 9.230 kA	phase fault after Zone-2
3	220KV CHANDIL-SANTALDIH(STPS)-1	04-09-2021	09:50		Santaldih: R_N, 18 km, 4.69 kA	3 phase tripping from chandil end for single phase fault
4	220KV CHANDIL-SANTALDIH(STPS)-1	04-09-2021	11:49	Chandil: B_N, 50.1 km, 1.5 kA	Santaldih: AR successful	3 Phase tripping from ChnadilEND, A/R successful from STPS end.
5	220KV SANTALDIH (STPS)-CHANDIL-1	17-09-2021	10:35	Santaldih: R_N, Z II, 101 km, 1.33 kA	Chandil: R_N, Z I, 24 km, 2.12 kA	Three phase tripping at Chandil for single phase fault.STPStripping after Zone-2
6	220KV CHANDIL-SANTALDIH(STPS)-1	18-09-2021	14:50	Chandil: R_N, 2.77 kA, 43 km		Three phase tripping at Chandil for single phase fault.

JUSNL & WBSETCL/WBPDCL may explain.

(C) Repeated Tripping of 220 kV Joda- Ramchandrapur

Details of tripping are mentioned below along with issues identified

- 3 phase tripping had occurred for single phase fault and Non operation of A/R at Ramchandrapur end**.**
- Delayed tripping for z-2 faults is observed due to non-availability of PLCC

S.NO	LINE NAME	TRIP DATE	TRIP TIME	Relay Indication LOCAL END	Relay Indication REMOTE END	Fault Clearance time in msec	Remarks
1	220KV JODA-RAMCHANDRAPUR-1	01-09-2021	11:20	Joda: Y_N, 1.55 kA	Ramchandrapur: 4.4 km, 0.75 kA	700	Tripped on DEF protection from Joda in 700 msec F/c was 1.6ka why Distance did not picked at Jodaend . Single phase tripping within 100 msec from Ramchandrapur
2	220KV JODA-RAMCHANDRAPUR-1	02-09-2021	10:20	Joda: 41 km, 0.5 kA	Ramchandrapur: 97.4 km, 1.9 kA	100	R_ph opened from Joda within 100 msec, rest two phase opened after 500 msec.

3	220KV JODA-RAMCHANDRAPUR-1	03-09-2021	10:24	Joda: R_N, Z I, 42.37 km, 1.377 kA	Ramchandrapur: R_N, 98.4 km, 1.89 kA	150	Three phase tripping for single phjasefault.PLCC seems unhealthy.
4	220KV JODA-RAMCHANDRAPUR-1	17-09-2021	11:13	Joda: A/r successful	Ramchandrapur: R_N, Z I, 16 km, 2.28 kA	100	A/r from Joda end only. PD time at Ramchandrapur end may be checked. Other two phase didn't open even after 2.5 seconds
5	220KV JODA-RAMCHANDRAPUR-1	25-09-2021	18:42	Joda: B_N, Z II, 128 km, 1.28 kA	Ramchandrapur: B_N, 9.6 km, 10 kA	400	Three phase tripping for single phjase fault after z-2 time from joda end as no carrier received .PLCC seems unhealthy.
6	220KV JODA-RAMCHANDRAPUR-1	30-09-2021	04:45	Joda: B_N, Z I, 47.4 km, 2.6 kA		100	A/r attempt from Joda end failed after 1 sec

JUSNL may explain.

(D) Repeated Tripping of Daltonganj-Chatra D/C Line:

Details of line tripping is given below:

	Element Name	Tripping Date	Tripping Time	Reason	Remarks
>	220KV-DALTONGANJ-CHATRA-1	22/09/2021	12:09	Daltonganj: Y-B Fault, FD: 31.49km, FC: Iy = 3.204 kA Ib = 3.207 kA	
>	220KV-DALTONGANJ-CHATRA-1	21/09/2021	09:03	Daltongunj: DT received. Chatra:mistake by operator .	
>	220KV-DALTONGANJ-CHATRA-1	14/09/2021	22:57	Daltonganj: YB, 31.55km, Iy-3.1kA, Ib-3.1kA Chatra: Not tripped	
>	220KV-DALTONGANJ-CHATRA-2	15/09/2021	12:30	Bus bar protection operated at Chatra.Dal=Z-3,239kM,R-N fault.0.96kA	
>	220KV-DALTONGANJ-CHATRA-2	13/09/2021	16:09	Daltongunj=Z-1,81.62KM,IR=57.01A,IY=1.98KA,IB=1.967KA	FTC of the line done
>	220KV-DALTONGANJ-CHATRA-2	10/09/2021	11:58	DIRECTIONAL EARTH FAULT RELAY OPERATED - B PH - 217 AMP , R , Y PH - 52 AMP	
>	220KV-DALTONGANJ-CHATRA-1	05/09/2021	02:15	DALTONGANJ: R_N, Z-1, FD-57.44 KM, FC-4.149 KA,	Anti theft charge from Daltonganj end.

JUSNL may explain.

ITEM NO. B.10: Implementation of Islanding Schemes in Eastern Region

1. Patna Islanding Scheme

In 106th PCC Meeting, ERLDC informed that they had received requisite information from SLDC Bihar &Nabinagar TPP. They intimated that they would require two-week time to complete the study.

In order to expedite the simulation study, it was suggested for carrying out dynamic study for Patna Islanding scheme by M/s PRDC.

PCC agreed for the same and advised PRDC to complete the simulation study by September'21.The required data would be provided by ERLDC.

MS, ERPC advised BSPTCL to prepare the DPR for implementation of Patna islanding scheme and submit it to PSDF nodal agency within 15 days.

In 44th TCC meeting, BSPTCL updated that preparation of DPR for PSDF funding is under process and the same would be completed within 15 days.

TCC stressed on the fact that this issue is being regularly monitored by MoP and advised BSPTCL for timely implementation of the Islanding Scheme.

SLDC Bihar may update.

2. Ranchi Islanding Scheme

In 106th PCC Meeting, ERLDC informed that they had received requisite details from JUSNL and simulation study is being carried out by them and the same would be completed within a week.

MS, ERPC advised JUSNL to prepare the DPR for implementation of Ranchi islanding scheme and submit it to PSDF nodal agency within 15 days.

ERLDC submitted the preliminary islanding study report for Ranchi Islanding Scheme. The report is enclosed at **Annexure B.10.2.**

In 44th TCC Meeting, JUSNL updated that preparation of DPR for PSDF funding is under process and the same would be completed within 15 days.

TCC stressed on the fact that this issue is being regularly monitored by MoP and advised JUSNL for timely implementation of the Islanding Scheme.

SLDC Jharkhand & TVNL may update.

ITEM NO. B.11: Tripping Incidence in month of September 2021

Tripping incidents in the month of September 2021 which needs explanation from constituents of either of the end is attached at **Annexure B.11.**

Concerned utilities may explain.

PART- C::OTHER ITEMS

ITEM NO. C.1: Schedule of Training Program on PSCT and PDMS by PRDC

As part of 4th year support period, PRDC has conducted online training program on PDMS &PSCT at Bihar &West Bengal. In continuation to same PRDC is going to conduct online training program for Jharkhand, Odisha and Sikkim as per the following schedule.

Sl No.	Date	State
1	27.09.2021-28.09.2021	Jharkhand
3	04.10.2021-05.10.2021	Odisha
5	25.10.2021-26.10.2021	Sikkim

Members may note.

ITEM NO. C.2: Requirement of additional MiP-PSCT License key with Laptop

44th TCC advised all the utilities of ER including JUSNL to furnish their requirement, if any, for additional MiP-PSCT license to ERPC Secretariat citing proper justification.

Further in 44th ERPC meeting, ERPC advised all the utilities to submit their requirement, if any, by 15th October'2021. ERPC further advised ERPC Secretariat to prepare and submit a DPR for additional MiP-PSCT licenses required for ER utilities for PSDF funding.

Concerned utilities may update.

ITEM NO. C.3: Review of guideline for over voltage setting for anti-theft charging of 765 kV, 400 kV and 220 kV Lines --ERLDC

In 67thPCC meeting,Relay settings were finalized for anti -theft charging of lines where over voltage setting was finalized as mentioned below:

- Over voltage Stage-I - Overvoltage pick up should be minimum of all the lines connected from the charging substation with minimum grading and minimum time delay corresponding to other lines which are in service.
- Further, it was informed to utilities to keep it above 105 % but it should also be lower than any of the other lines over voltage setting.

However, many utilities keep it at 105 % itself which is leading to tripping of line during charging itself. These can be due to operational regime voltage of substation being around 416-420 kV and during charging the over voltage criteria of 105 % is already reached.

In 106th PCC Meeting,

ERLDC explained the issue they are observing with regard to overvoltage settings of anti-theft charged lines and proposed certain modification w.r.t. to the guidelines for overvoltage settings of anti-theft charge lines.

Based on the discussion in the meeting, the following guidelines are suggested.

For anti-theft charging of 765 & 400 kV lines at charging station end:

- *Overvoltage pick up should be below the minimum over voltage setting of all lines from that charging substation.*
- *The settings shall be more than 105% and preferably just below(say 1 or 2 % below) the minimum over voltage setting of all lines from that substation.*

Overvoltage settings for remote end (open end) substation for anti-theft charged lines:

- *The utility may in its discretion keep overvoltage settings at remote end of line and a trip commend may be sent to charging station in order to avoid voltage stress on the equipment (LA, CVT etc.) during overvoltage condition. In such case, the settings shall be greater than the rated voltage of equipment e.g.: for 400 and 765 kV lines it should not be less than 110% and for 220 kV it should be at least 112%.*
- *In case high voltage is observed at remote end of the line, the affected utility may request respective SLDC or ERLDC to open the circuit for safety of theequipment.*

For anti-theft charging of 220 kV lines, the similar guidelines as given above may be followed.

PCC advised all the utilities to submit their comments on the above guidelines for overvoltage settings for anti-theft charging of transmission lines.

Members may discuss.

ITEM NO. C.4: Follow-up of Decisions of the Previous Protection Sub-Committee Meeting(s)

The decisions of previous PCC meetings are given at **Annexure C.4.**

Members may update the latest status.

ITEM NO. C.5: Protection coordination of the New Transmission elements to be charged in Eastern Region

C.5.1: FTC for LILO of 220 kV Purnea-Begusarai-I at Khagaria

220 kV New Purnea (PG)-Begusarai-I is being LILOed at Khagaria. After LILO, lines will be as below:

Name	Conductor type	Length
220 kV New Purnea (PG)-Khagaria-I	ACSR Triple Zebra	102 km
220 kV Begusarai-Khagaria-I	ACSR Triple Zebra	98 km

Protection coordination may be required as per the following table:

Reason	S/S may be affected	Remarks	Utility to respond
FTC OF 220 kV New Purnea (PG)-Khagaria I & 220 kV Khagaria-Begusarai I (LILO of 220 kV New Purnea (PG)-Begusarai I at Khagaria)	Khagaria	Protection coordination to be done for all newly connected elements as per ERPC's guidelines. Busbar protection to be ensured. Adjacent longest line for existing lines at Khagaria was previously 220 kV New Purnea (PG)-Begusarai. Now it will change. Hence, Zone-3 settings for existing lines at Khagaria may be reviewed keeping in view it should not encroach next voltage level.	BSPTCL. Received
	New Purnea (PG)	Protection coordination to be done for all newly connected elements as per ERPC's guidelines.	PG ER-I, Received
	Begusarai	Protection coordination to be done for all newly connected elements as per ERPC's guidelines.	BSPTCL,Received
	S/S connected to New Purnea(PG): Purnea(PG), Madhepura	Adjacent longest line will be now 220 kV New Purnea(PG)-Khagaria,(102 km). Hence Zone-3 settings at Purnea(PG) and Madhepura end may be reviewed keeping in view it should not encroach next voltage level. Kindly check and confirm any setting revision if any change in adjacent short and long line.	BSPTCL, PG ER-I Received
	S/s connected to Begusarai: Samastipur, Barauni (BTPS)	Adjacent longest line for Samastipur, Barauni (BTPS) will be now 220 kV Begusarai-Khagaria (98 km). Hence Zone-3 settings at Samastipur, Barauni (BTPS) end may be reviewed keeping in view it should not encroach next voltage level. Kindly check and confirm any setting revision if any	BSPTCL

		change in adjacent short and long line.	

Following details needs to be shared:

- Respective Utilities may share whether revision of any existing protection setting at above mentioned S/S is required or not. In case of any revision, the revised setting may be shared with ERPC and ERLDC.
- Status of carrier protection and PLCC channel in the all above mentioned section may be shared.
- Utilities should ensure that proper protection coordination are in place after charging of these lines/elements.

Concerned Utilities may update.

C.5.2: FTC for LILO of 132kV Madhepura -Sonbarsa at Saharsa (PMJTL)

As per information received, 132 kV Madhepura -Sonbarsa will be liloed at 132 kV Saharsa (PMJTL). Details of the line

Name	Conductor type	Length
132 kV Madepura – Saharsa New	ACSR Twin Moose	37.56 km
132 kV Saharsa New - Sonbarsa	ACSR Twin Moose	52.36 km

Protection coordination may be required as per the following table.

Reason	S/S may be affected	Remarks	Utility to respond	Response received
Lilo of 132 kV Madhepura -Sonbarsa	Madhepura	Protection coordination to be done for all newly connected elements as per ERPC's guidelines. Longest/Shortest line may change.	BSPTCL	Received
	Sonbarsa	Protection coordination to be done for all newly connected elements as per ERPC's guidelines. Longest/Shortest line may change.	BSPTCL	Received
	Saharsa New	Protection coordination to be done for all newly connected elements as per ERPC's guidelines.	PMJTL	Received

	S/S connected to Supaul ,Sahrsa ,Kusheswar,SimriBhaktiyarpur	Kindly check and confirm any setting revision for change in adjacent short line.	BSPTCL	Received

Following Details needs to be shared:

- PMJTL/BSPTCL may share whether revision of any existing protection setting at above mentioned S/S is required or not. In case of any revision, the revised setting may be shared with ERPC and ERLDC.
- The protection setting at Madhepura/Sahrsa New /Sonbarsa may be shared with ERPC and ERLDC.

Status of carrier protection and PLCC channel in the all above mentioned section may be shared.

Concerned Utilities may update.

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(A Government of India Enterprise)
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घटना संख्या: **12-09-2021/1** दिनांक: **07-10-2021**

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

Summary of the event (घटना का सारांश):

At 16:01 hrs, all lines at 132 kV level of 220/132 kV Patratu S/s tripped except 220/132 kV ICT 2, 132/33 kV ICT to clear fault in 132 kV Patratu-Patratu(DVC)(idle charged line). At 16:32 Hrs, 132/33 kV ATR tripped leading to 15 MW load loss at Patratu. During restoration, while charging 132 kV Patratu-Patratu (DVC) line at 18:43 Hrs, total power failure occurred and 220 kV side also became dead at Patratu.

Date / Time of disturbance: Event 1: 12-09-2021 at 16:01 hrs
Event 2: 12-09-2021 at 18:43 hrs

- **Event type: Event 2:** GD-1
- **Systems/ Subsystems affected:** 220/132 kV Patratu (PTPS)
- **Load and Generation loss**.
    - No generation loss was reported during the event.
    - Around 15 MW load loss reported at Patratu by SLDC Jharkhand

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

Nil

Major elements tripped (प्रमुख ट्रिपिंग):

Event 1

- 220 kV Patratu-Hatia-2
- 132 kV Patratu-Kanke
- 132 kV Patratu-Hatia
- 132 kV Patratu-Patratu (DVC)-1 (Idle-charged)

Event 2

- 220 kV Main Bus 1 & 2 at Patratu
- 220 KV Patratu-Tenughat
- 220 kV Patratu-Hatia D/c
- 150 MVA 220/132 kV ICT 2 at Patratu
- 132 kV Patratu-Hatia
- 132 kV Patratu-Kanke
- 132 kV Patratu-Patratu (DVC)-I-(idle charged)

Network across the affected area (प्रभावित क्षेत्र का नक्शा)

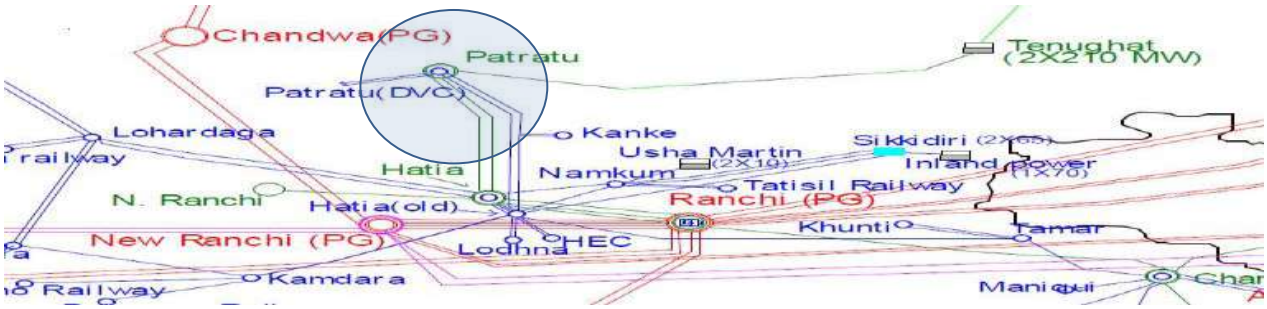


Figure 1: Network across the affected area

Figure 2: SCADA snapshot of the system

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

समय	नाम	उप केंद्र 1 रिले संकेत	उप केंद्र 2 रिले संकेत	पीएमयू पर्यवेक्षण
16:01	220 kV Patratu-Hatia-2	Y_B fault	-	6 kV dip in Y-ph and B-ph at Ranchi. Fault clearance time: 1.3 seconds
	132 kV Patratu-Kanke	Y_B, Z I, Iy:1.337 kA, Ib: 1.388 kA	-	
	132 kV Patratu-Hatia	Y_B, Iy:2.11 kA, Ib: 2.16 kA	-	
	132 kV Patratu-Patratu (DVC)-1 (Idle charged)	Only B_ph tripped	-	
18:43	220 kV Bus-1 & 2 at Patratu	-	-	7 kV Dip in Y-ph at Ranchi. Fault clearance time: 1.3 seconds
	220 kV Patratu-Hatia D/c	Didn't trip	Ckt II tripped on O/c	
	220 kV Patratu-Tenughat	Didn't trip	E/F O/C, Iy: 1.003 kA	
	150 MVA 220/132 kV ICT-2 at Patratu	O/C		
	132 kV Patratu-Hatia	B_N, Z I		
	132 kV Patratu-Kanke	B_N, Z I	-	
	132 kV Patratu-Patratu (DVC)-(Idle charged)	-	-	

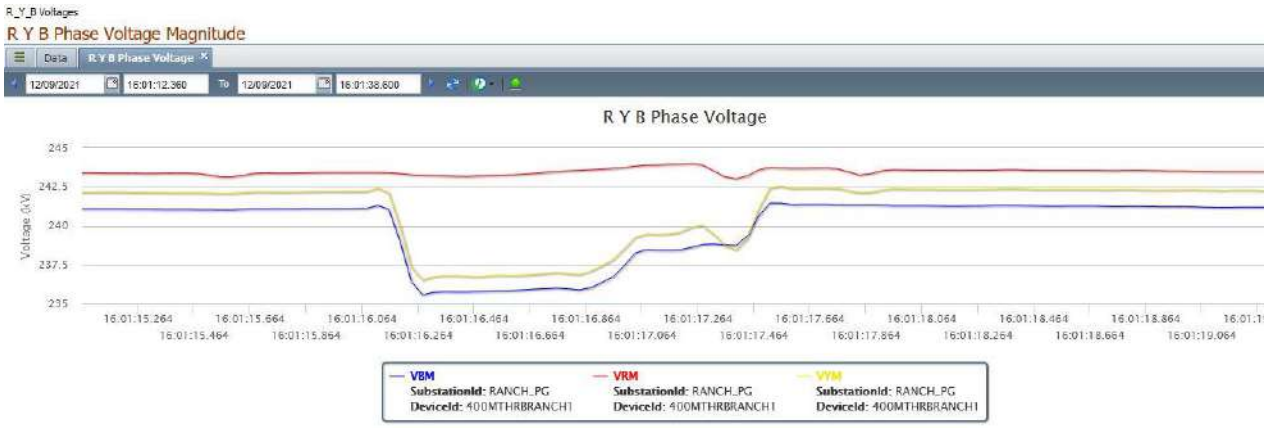


Figure 3: PMU snapshot of 400/220 kV Ranchi S/s (16:01 Hrs)

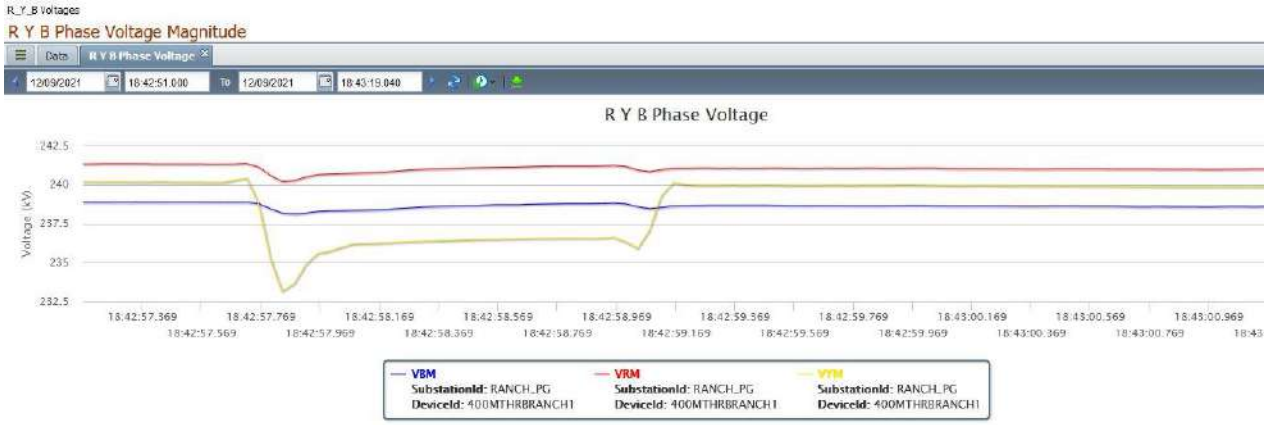
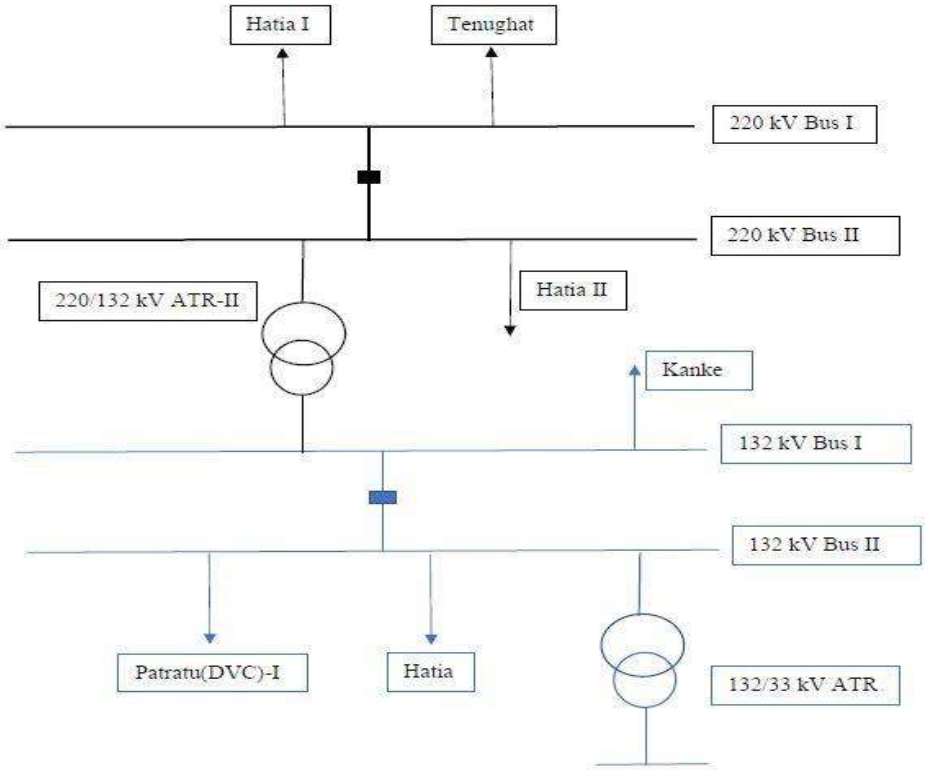


Figure 4: PMU snapshot of 400/220 kV Ranchi S/s (18:42 Hrs)

Restoration (पूर्वावस्था की प्रप्ति)

Transmission/Generation element name	Restoration time
220 kV Bus 1& Bus 2 at Patratu	19:27
220 kV Patratu-Tenughat	19:49
220 kV Patratu-Hatia-1	19:39
220 kV Patratu-Hatia-2	16:50/19:27
150 MVA 220/132 kV ICT 2 at Patratu	19:46
132 kV Patratu-Hatia-1	16:37/19:51
132 kV Patratu-Hatia-2	16:37/20:00
132 kV Patratu-Kanke	16:38/19:50
132 kV Patratu-Patratu(DVC)-1	-

Analysis of the event (घटना का विश्लेषण):



SLD of 220/132 kV Patratu S/s

Event 1 (16:01 Hrs):

- Y-ph jumper of 132 kV Patratu-Patratu (DVC)-1 (Idle charged) snapped and touched B-ph of the line, creating a phase-to-phase fault.
- DR of Patratu-Patratu(DVC) line shows tripping command triggered, though breaker didn't open of any phase. LBB also didn't operate. Fault was sensed in Z-4 which should not occur.
- After 1.2 seconds, fault came in Zone I and then line tripped.
- 132 kV Patratu-Hatia & 132 kV Patratu-Kanke tripped after 800 msec on distance protection.
- 220 kV Patratu-Hatia-2 also tripped. Reason for tripping of line may be shared.
- 220/132 kV ICT-2 & 132/33 kV ICT didn't trip and Namkum load was being fed.

At 16:32 Hrs, 132/33 kV ICT tripped. Reason may be shared.

Event 2 (18:43 Hrs):

- When breaker of 132 Kv Patratu -Patratu line closed, SOTF triggered but breaker again didn't open.
- 132 kV Patratu-Hatia and 132 kV Patratu-Kanke tripped within 150 msec on distance protection. Both lines shouldn't trip immediately as fault was in reverse direction.
- 220 kV Patratu-Hatia-2 tripped on O/c within 300 msec.
- 220 kV Patratu-Tenughat tripped after 1.3 seconds.
- 220/132 kV ICT 2 tripped on O/c after 1.3 seconds.

Protection issue (सुरक्षा समस्या):

- Breaker of 132 kV Patratu-Patratu didn't open during both instances despite tripping command triggered. LBB also didn't operate.
- B_ph breaker of Patratu-Patratu opened after 1.3 seconds on Zone-4 for a forward fault.
- 132 kV Patratu-Hatia and Patratu-Kanke tripped in Zone-1 for a reverse fault.
- Relay PT inputs for R_ph and Y_ph for all 132 kV elements seem swapped. That's why a fault in forward direction in 132 kV Patratu-Patratu is seen in Zone-4 and for other lines fault is coming in Zone-1. This aspect may be checked.
- 220 kV Patratu-Hatia 2 tripped on O/c within 300 msec for a downstream fault. Reason maybe checked.
- Reason for tripping of 220 kV Patratu-Hatia 1 in 2nd instance may be shared.
- Reason for tripping of 132/33 kV ICT at 16:32 Hrs maybe shared
- Detailed report for the event is awaited from JUSNL.

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

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

Status of Reporting (रिपोर्टिंग की स्थिति):

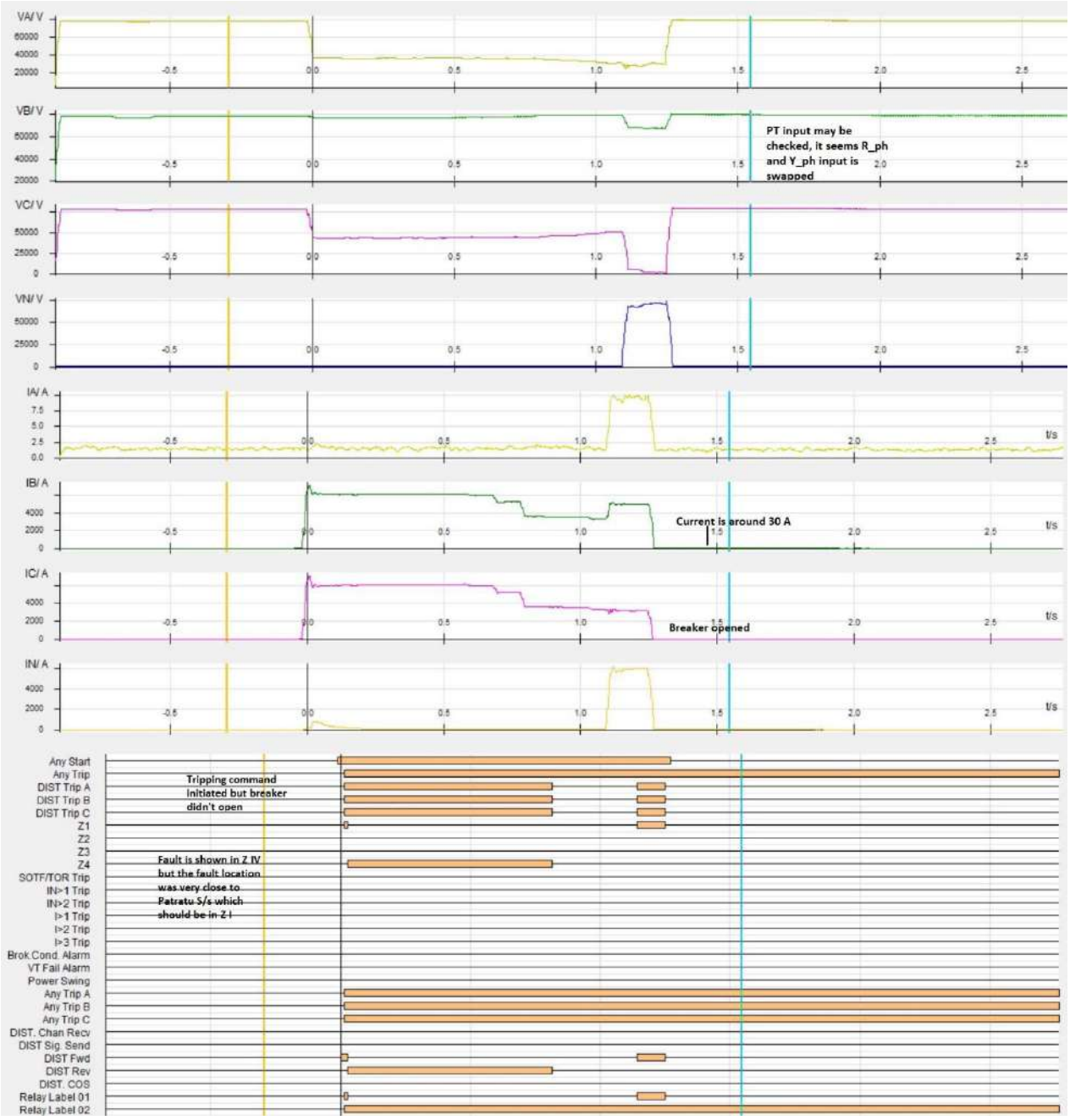
- Complete DR/EL yet to be received from JUSNL

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

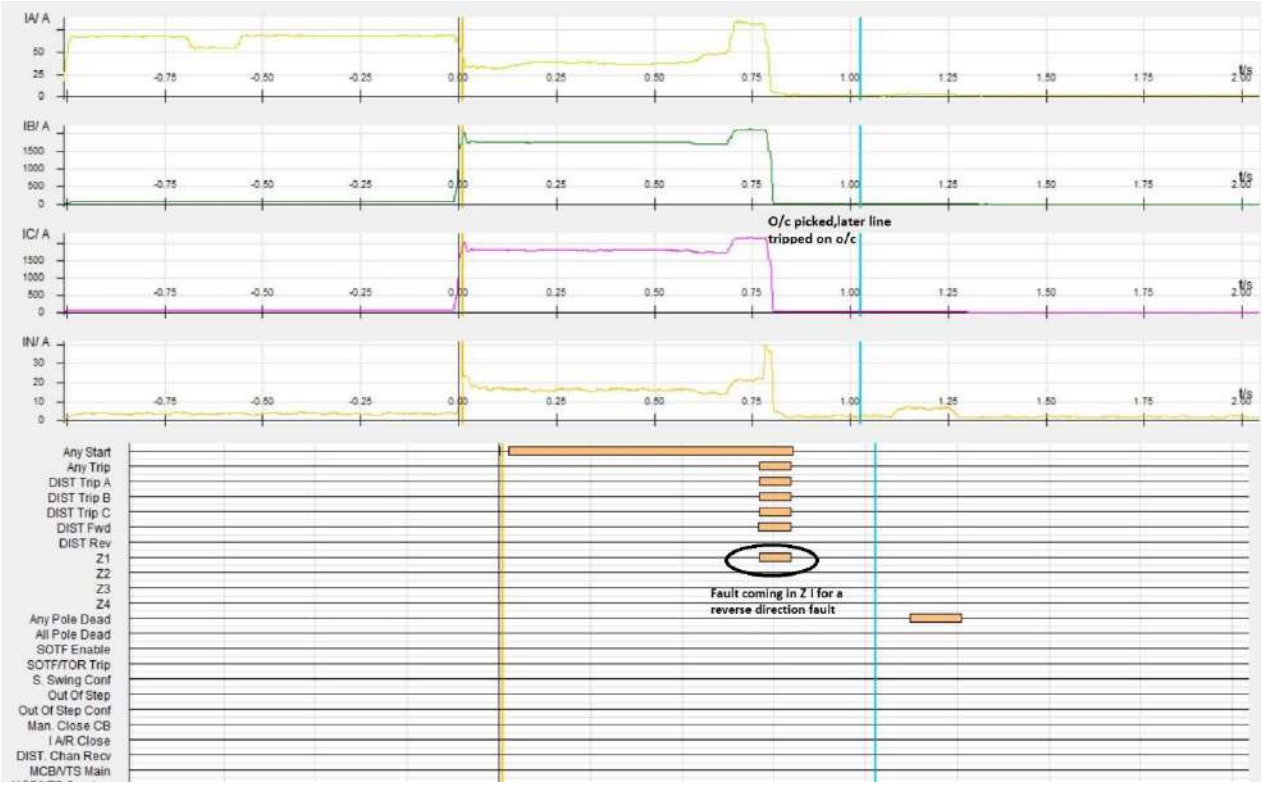
Sequence of event not recorded at the time of event.

Annexure 2: DR recorded

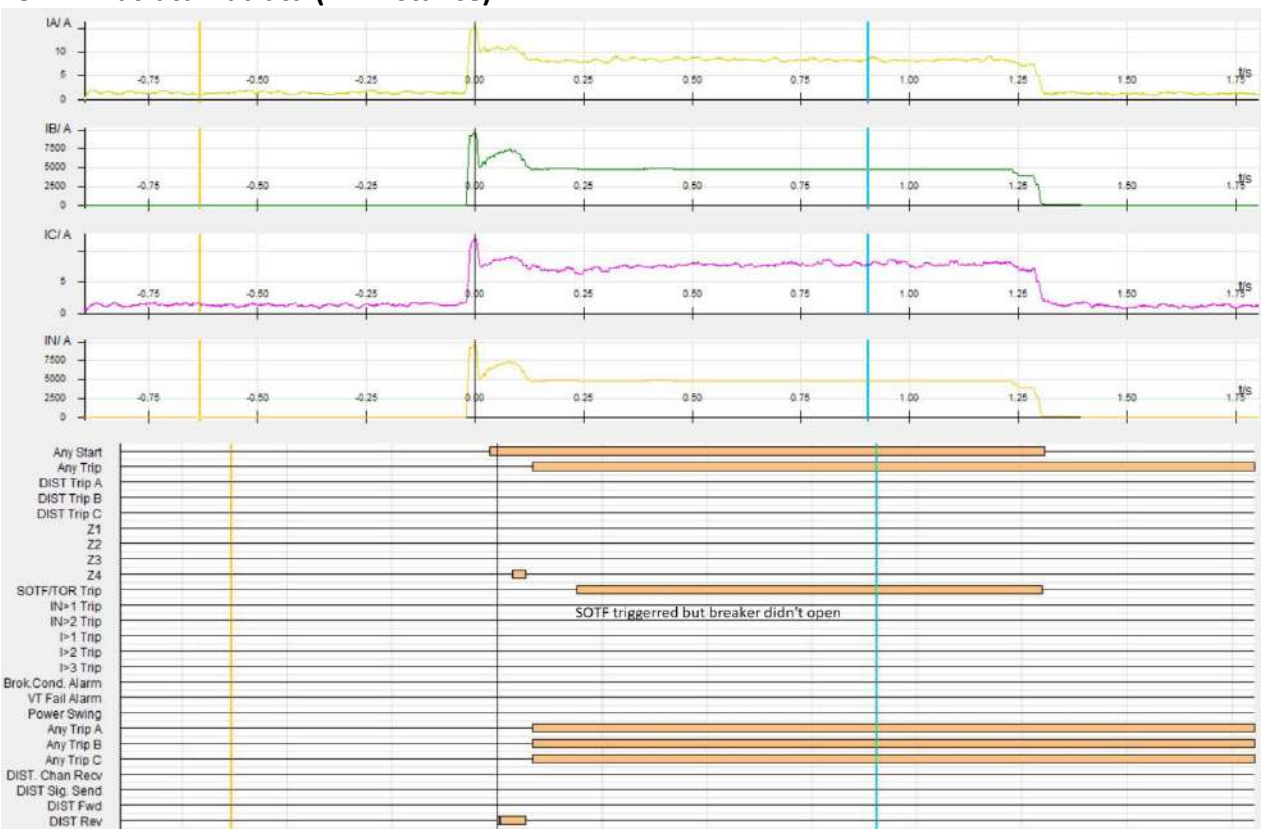
132 kV Patratu-Patratu (DVC)-1st instance



132 kV Patratu-Hatia



132 kV Patratu-Patratu (2nd instance)



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घटना संख्या: **03-09-2021/1** दिनांक: **01-10-2021**

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

Summary of the event (घटना का सारांश):

At 21:52 hrs, R_ph Bus PT of 220 kV Bus-2 at Ramchandrapur burst, leading to tripping of both 220 kV buses at Ramchandrapur. This led to total power failure at Ramchandrapur. Around 200 MW load loss occurred in Adityapur, Rajkharsawan and Jadugoda.

Date / Time of disturbance: 03-09-2021 at 21:52 hrs

- **Event type:** GD-1
- **Systems/ Subsystems affected:** 220/132 kV Ramchandrapur
- **Load and Generation loss**.
    - No generation loss was reported during the event.
    - Around 200 MW load loss reported during the event at Adityapur, Chandil, Jadugoda

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

- NIL

Major elements tripped (प्रमुख ट्रिपिंग):

- 220 kV Main Bus I & II at Ramchandrapur
- 220 KV Jamshedpur-Ramchandrapur I, II & III (400/220 kV ICT I, ICT II & ICT III at Jamshedpur)
- 220 kV Joda-Ramchandrapur
- 220 kV Chandil-Ramchandrapur
- 220 kV Chaibasa-Ramchandrapur D/c
- 3*150 MVA 220/132 kV ICT I, ICT II, ICT III at Ramchandrapur

Network across the affected area (प्रभावित क्षेत्र का नक्शा)

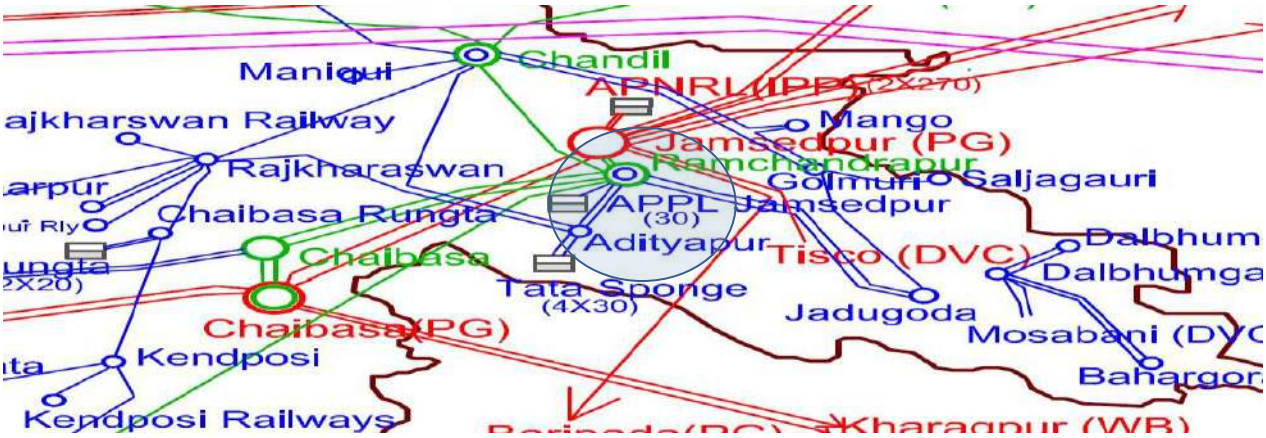


Figure 1: Network across the affected area

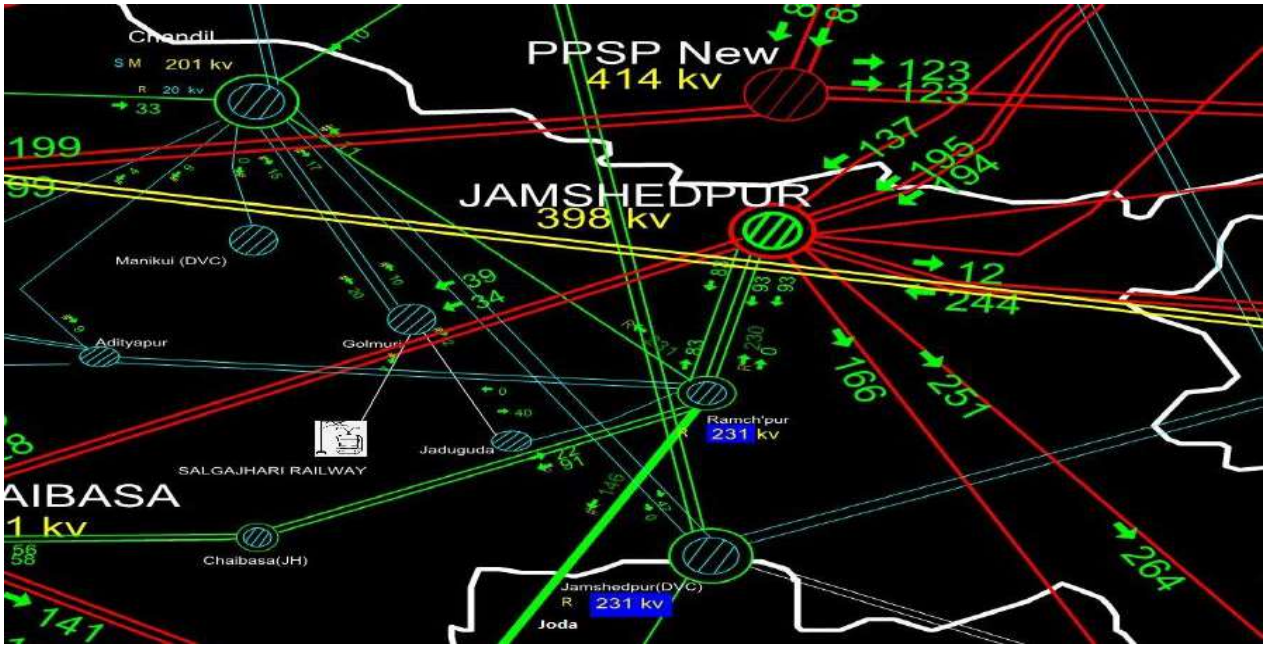


Figure 2: SCADA snapshot of the system

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

समय	नाम	उप केंद्र 1 रिले संकेत	उप केंद्र 2 रिले संकेत	पीएमयू पर्यवेक्षण
21:52	220 kV Bus-I, Bus II at Ramchandrapur	R_ph Bus PT of 220 kV Bus I burst	-	Around 50 kV dip in R_ph, 28 kV dip in Y_ph at Jamshedpur
	220 kV Ramchandrapur-Jamshedpur I, II, III		Didn't trip from 400kV side	
	220 kV Ramchandrapur-Chaibasa D/c		-	
	220 kV Ramchandrapur-Chandil		-	
	220 kV Ramchandrapur-Joda		-	
	3*150 MVA 220/132 kV ICTs at Ramchandrapur		-	

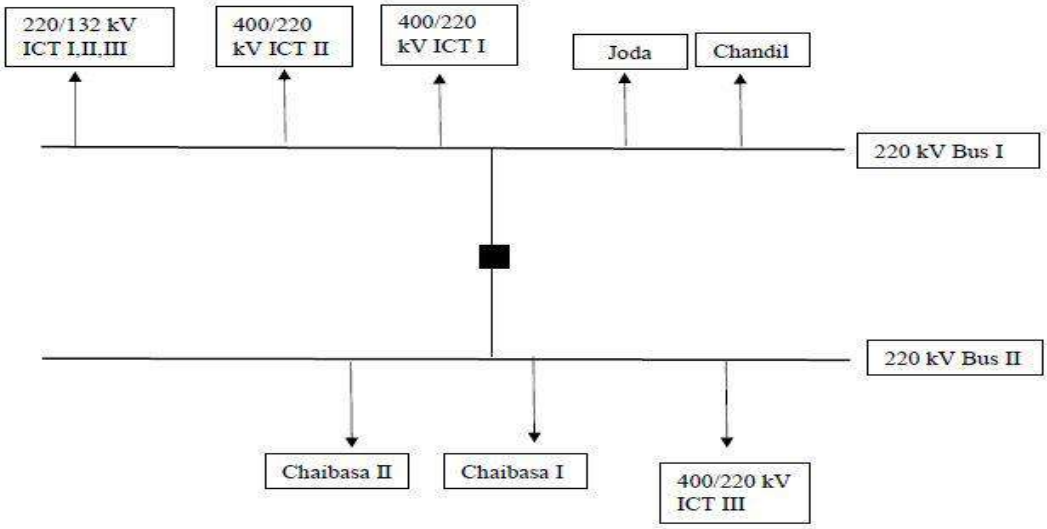
Figure 3: PMU snapshot of 400/220 kV Jamshedpur S/s

Restoration (पूर्वावस्था की प्रप्ति)

Transmission/Generation element name	Restoration time
220 kV Bus 1 at Ramchandrapur	01:28
220 kV Bus 2 at Ramchandrapur	02:56
220 kV Jamshedpur-Ramchandrapur I	01:39
220 kV Jamshedpur-Ramchandrapur II	01:47
220 kV Jamshedpur-Ramchandrapur III	02:56
220 kV Ramchandrapur-Chandil	01:43
220 kV Joda-Ramchandrapur	02:48
220 kV Ramchandrapur-Chaibasa I	01:28
220 kV Ramchandrapur-Chaibasa II	14:31 (04.09.2021)
150 MVA 220/132 kV ICT I at Ramchandrapur	01:39
150 MVA 220/132 kV ICT II at Ramchandrapur	01:47
150 MVA 220/132 kV ICT III at Ramchandrapur	02:56

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

- Schematic Bus diagam of Ramchandrapur is as below:



220/132 kV Ramchandrapur Schematic Bus diagram

- R_ph Bus PT of 220 kV Bus II burst. As there was no busbar protection, the fault should be cleared either by Zone-4 of local end or Z-2 of remote end.
- Chaibasa Ckt-2 tripped in Zone-2 from Chaibasa end, and in Zone-4 from Ramchandrapur end.
- Chaibasa ckt-1 tripped in E/F (Non directional within 100 ms) from Ramchandrapur end, While from Chaibasa end R_phase breaker opened immediately and rest two phase opened after 1.2 seconds**. (Same was also observed in previous disturbance, needs to be rectified).**
- Bus coupler tripped within 100 ms, still Remote ends connected to BUS-1 (Chnadil, Joda) were seeing the fault and tripped in Zone-2, this shows that PT burst of BUS-2 may also have caused fault in Bus 1. Local end RCP for both the lines sensed fault in zone-4.
- 220/132 Kv ICT 1&2 &3 tripped on non-directional high set O/C within 50ms**. (This needs to be reviewed and some delay of 100-150 ms may be provided with proper study).** As for close end line fault clearance within z-1 may also cause tripping of ICT.
- 400/220 kV ICT I tripped on differential protection (R_ph). Fault was on 220 kV bus then why differential protection operated for external fault.
- Root cause analysis for PT burst to be done.

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

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

Status of Reporting (रिपोर्टिंग की स्थिति):

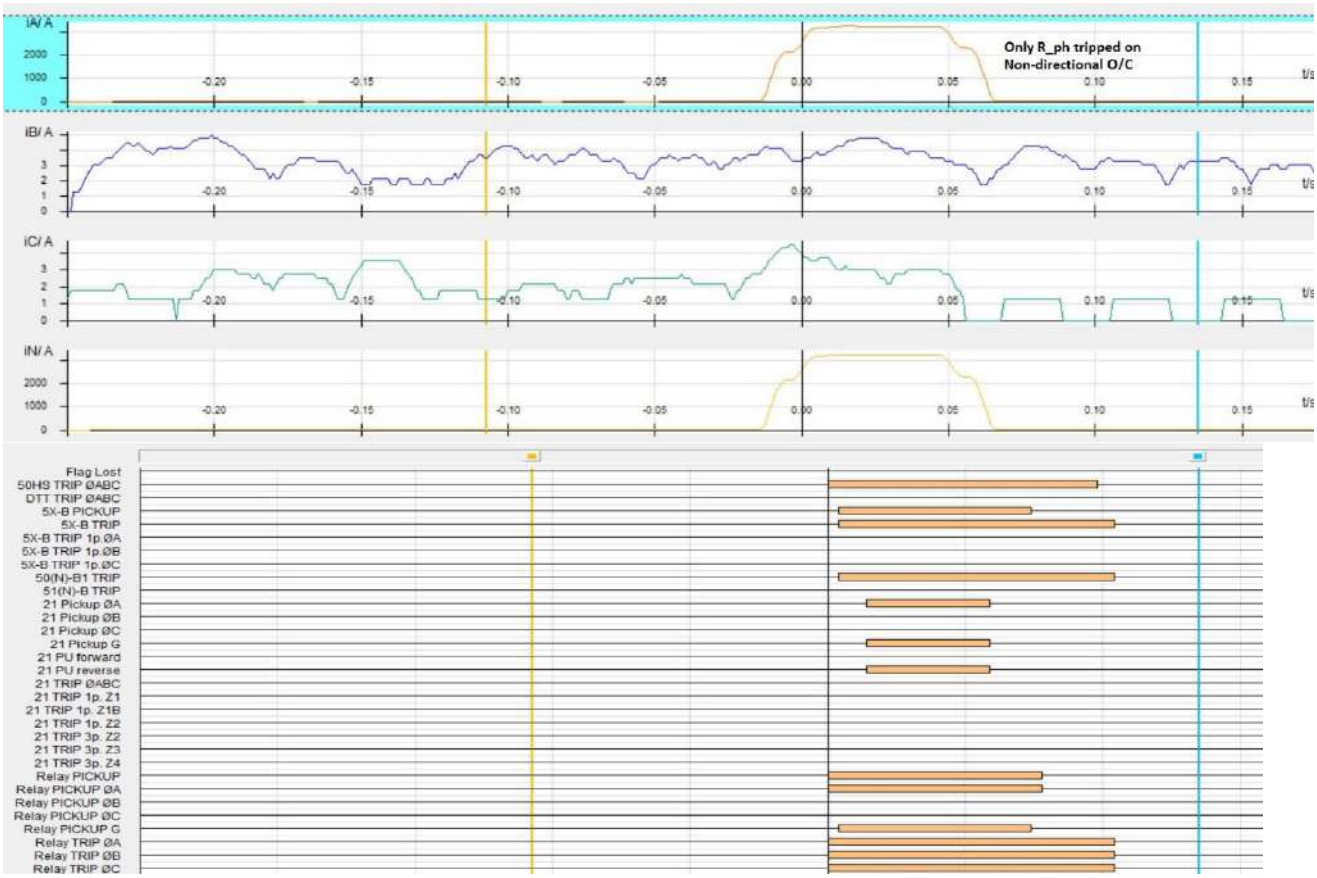
- DR/EL received from JUSNL
- DR/EL received from PG ER-I

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

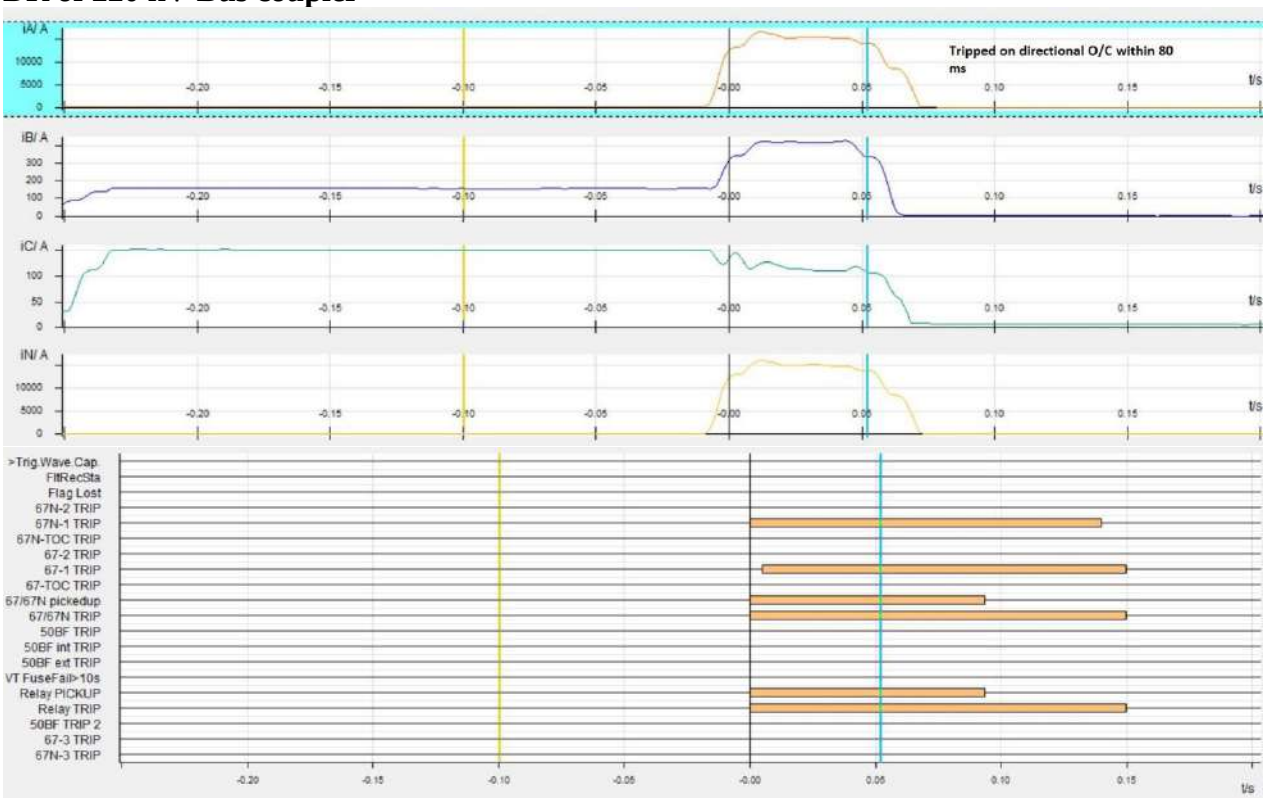
Sequence of event not recorded at time of event.

Annexure 2: DR recorded

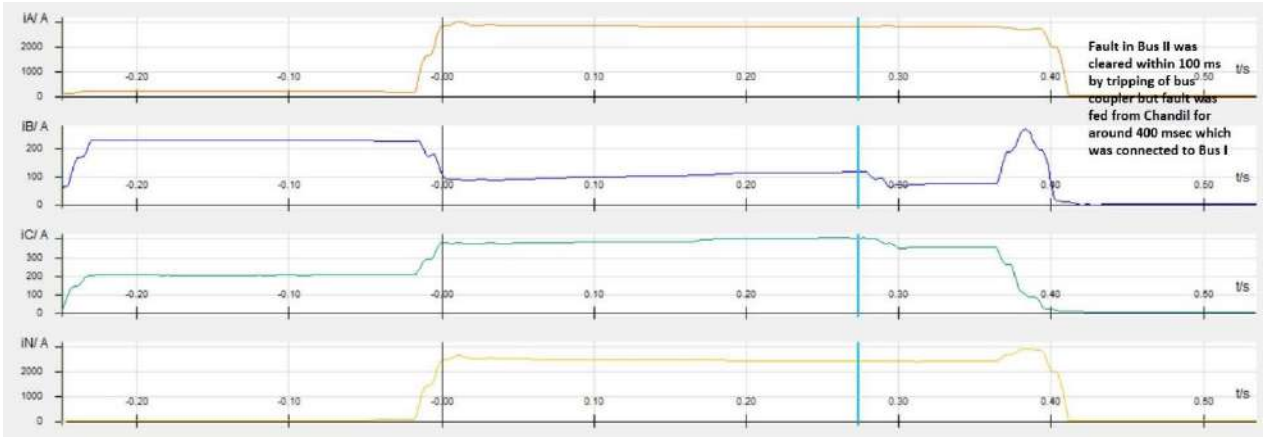
DR of 220 kV Ramchandrapur-Chaibasa I



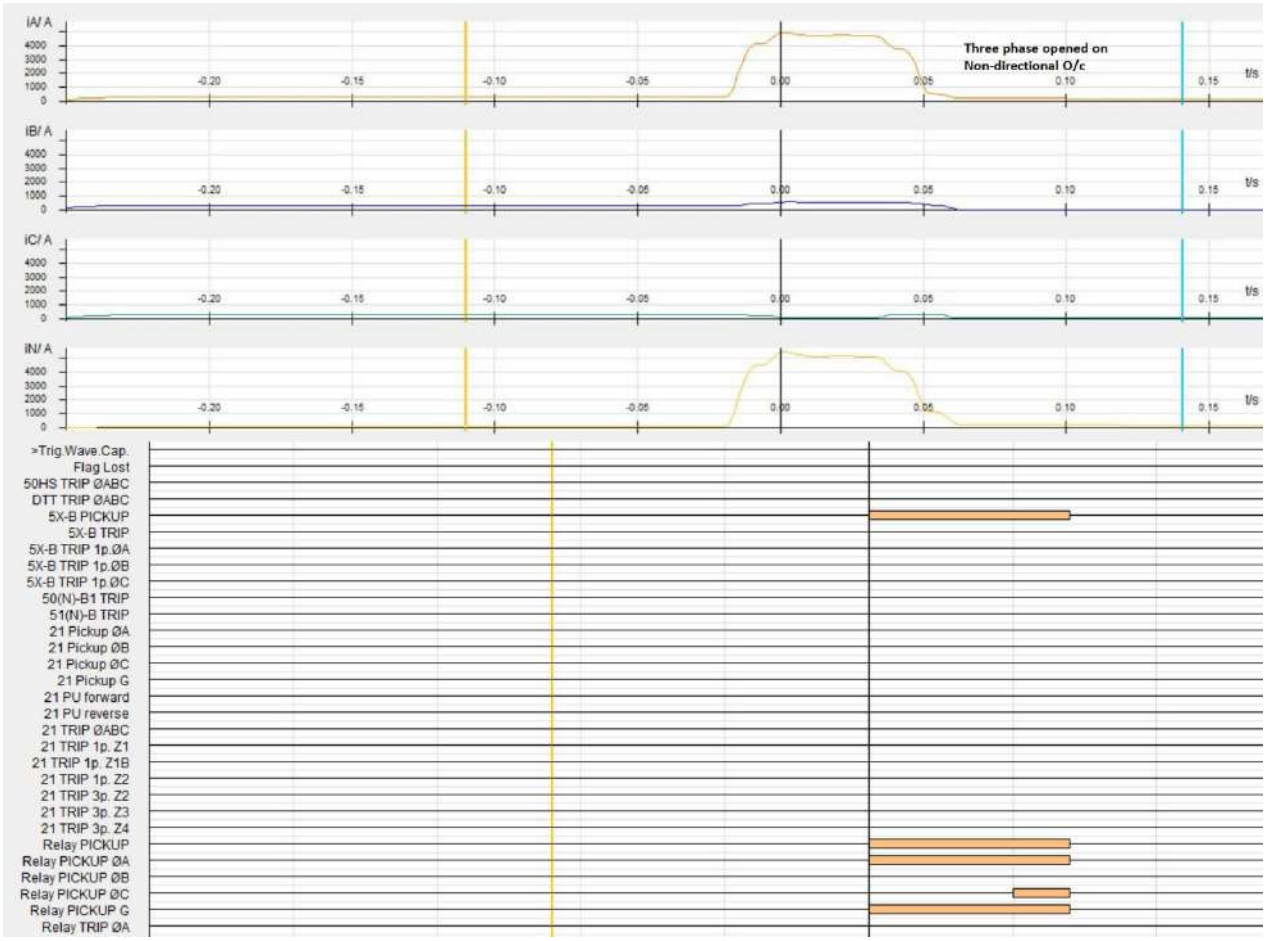
DR of 220 kV Bus coupler



DR of 220 kV Ramchandrapur-Chandil at Chandil



DR of 220/132 kV ICT I



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घटना संख्या: **26-09-2021/1** दिनांक: **07-10-2021**

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

Summary of the event (घटना का सारांश):

At 15:31 Hrs, 220 kV Daltonganj-Garhwa(New) D/c tripped on B-phase to earth fault, leading to total power failure at 220/132 kV Garhwa(New) S/s. There was total load loss of 34 MW during the event (including traction load loss of 11 MW at Garhwa).

Date / Time of disturbance: 26-09-2021 at 15:31 hrs

- **Event type:** GD-1
- **Systems/ Subsystems affected:** 220/132 kV Garhwa (New)
- **Load and Generation loss**.
    - No generation loss was reported during the event.
    - Around 34 MW load loss reported during the event at Garhwa by Jharkhand SLDC.

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

- NIL

Major elements tripped (प्रमुख ट्रिपिंग):

- 220 kV Daltonganj-Garhwa (New) D/c
- 220 kV Bus 1 & Bus 2 at Garhwa (New)

Network across the affected area (प्रभावित क्षेत्र का नक्शा)

Figure 1: Network across the affected area

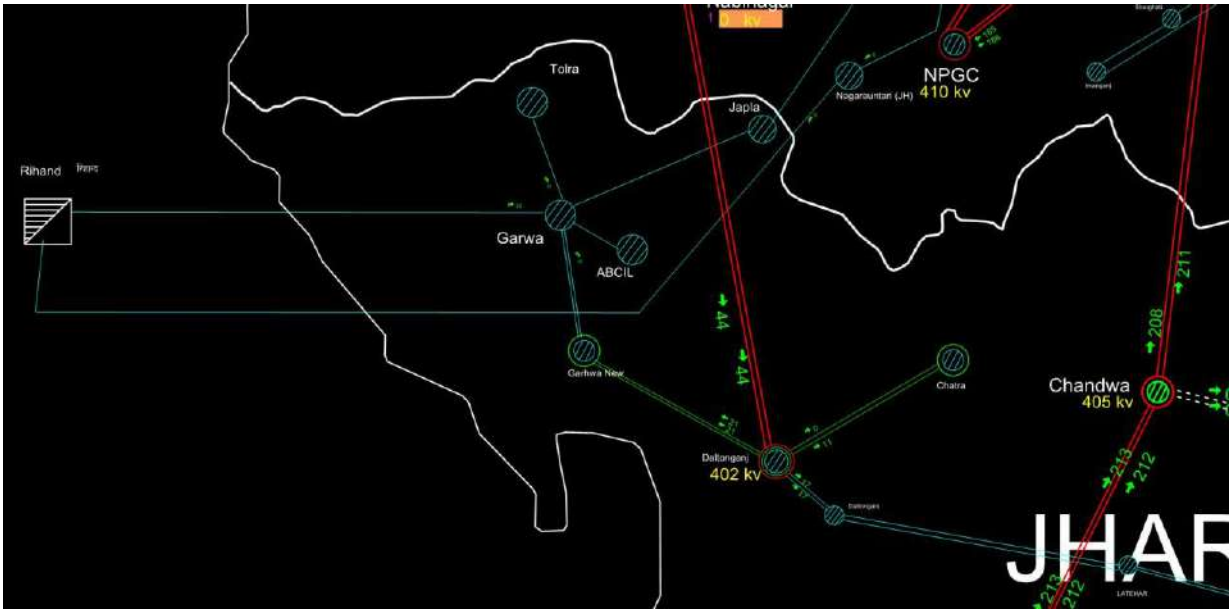


Figure 2: SCADA snapshot of the system

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

समय	नाम	उप केंद्र 1 रिले संकेत	उप केंद्र 2 रिले संकेत	पीएमयू पर्यवेक्षण
15:31	220 kV Bus-1, Bus 2 at Garhwa (New)	-	-	Around 52 kV dip in B_ph at Daltonganj. A/r failed
	220 kV Daltonagnj-Garhwa(New)-1	B_N, FC-1.7 kA, FD-56 km	B-N, FC-1.4kA, FD- 59 km	
	220 kV Daltonagnj-Garhwa(New)-2	Didn't trip	B-N, FC-1.4Ka, FD- 65 km	

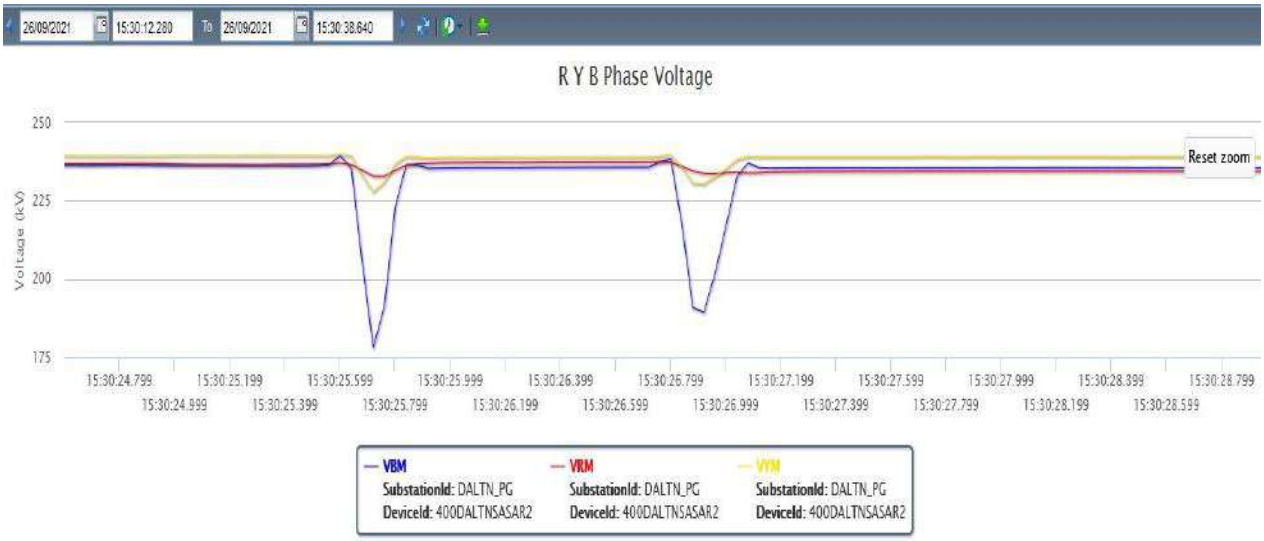


Figure 3: PMU snapshot of 400/220 kV Daltonganj S/s

Restoration (पूर्वावस्था की प्रप्ति)

Transmission/Generation element name	Restoration time
220 kV Bus 1 at Garhwa (New)	16:26
220 kV Bus 2 at Garhwa (New)	16:26
220 kV Daltonganj-Garhwa (New)-1	16:26
220 kV Daltonganj-Garhwa (New)-2	17:11

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

- There was a B-phase to earth fault in 220 kV Daltonganj-Garhwa (New)-1 which was cleared within 100 msec. After 1 second, A/r attempt failed.
- As 220 kV Daltonganj-Garhwa (New) D/C lines are radial in nature therefore POTT scheme has been implemented.
- At the A/R instance of ckt-1, Daltonganj end of ckt-2 was sensing the fault of ckt-1 in Zone-II and was sending carrier to Garhwa end.
- Thereafter A/R of Ckt-1 got failed leading to its tripping from Garhwa end. With this, suddenly current reversal took place in ckt-2 and Garhwa end of ckt-2 started sensing the same fault in zone-2, and it was receiving the carrier also so tripping condition for ckt-2 at Garhwa end got satisfied and caused tripping of Ckt-2 from Garhwa only. This also caused the load loss at Garhwa.
- Proper implementation of Current reversal guard needs to be ensured to avoid such tripping.

Nature of the Fault & Frequent Tripping of 220 kV Daltonganj-Garhwa

220 kV Daltonganj-Garhwa-2 tripped frequently in the month of September'21. Details of all tripping are given as below:

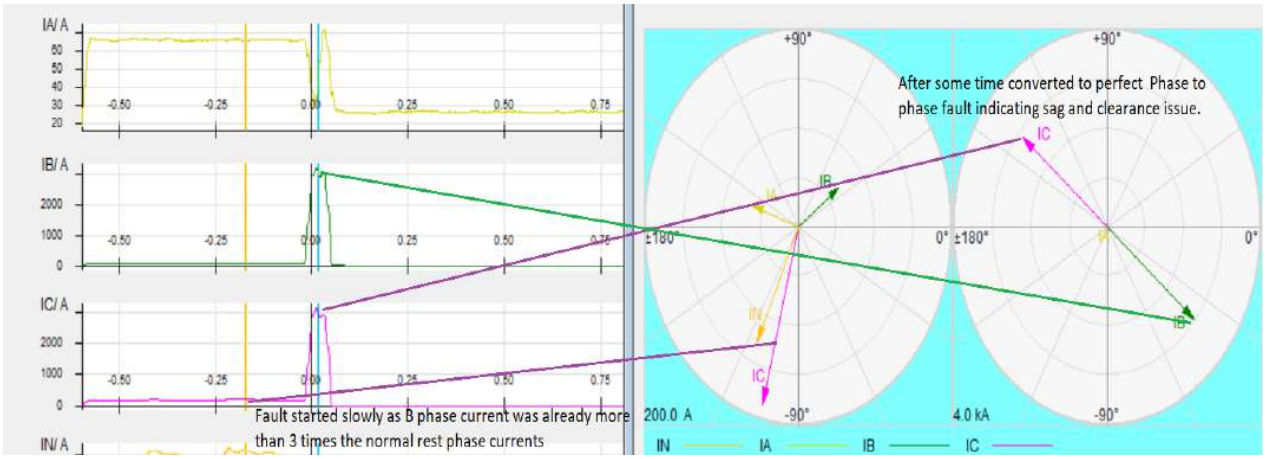
Sr No	Element Name	Tripping Date	Tripping Time	Reason	Remarks
1	220KV-DALTONGANJ-GARHWA (NEW)-2	03-09-2021	12:22	GARHWA: Z1, YB, Iy-518A, Ib-555A, 49.59km DALTONGANJ: YB, Iy-2.8kA, Ib-2.9kA, 27.6km	B-phase fault started first and after some time converted to perfect phase to phase fault indicating, sag and clearance issue. For Phase-to-phase fault at Daltonganj end R phase did not open and was holding, only Y&B phase opened.
2	220KV-DALTONGANJ-GARHWA (NEW)-2	06-09-2021	09:16	Garhwa B-N, 479.9 A 60.5 km	B phase fault but at Garhwa end ,No A/R occurred and breaker was open for some time after that tripped in PD ,while at Daltonganj A/R was successful. Arc over occurring at Peak voltage.
3	220KV-DALTONGANJ-GARHWA (NEW)-2	07-09-2021	14:43	Daltonganj:- R-Y, 64.4KM, Ir=Iy=1.8KA, Z-2 GARHWA:- Z-1, 25.2KM, R-Y, Ir=Ib=1.1KA	Y phase fault converted to perfect R-Y phase to phase fault , with fault occurring at Voltage peak.

4	220KV-DALTONGANJ-GARHWA (NEW)-2	13-09-2021	18:38	Daltonganj: A/R successful,137.7Km,0.978Ka,b-n Garhwa New: Z-I, 18.07 kM,Ia=165.9A, Ib=219.3A, Ic=916.2A	B phase fault but at Garhwa end ,No A/R occurred and breaker was open for some time after that tripped in PD ,while at Daltonganj A/R successful. Arc over occurring at Peak voltage.
5	220KV-DALTONGANJ-GARHWA (NEW)-2	17-09-2021	11:23	A/R SUCCESSFUL FROM DALTONGANJ; GARHWA: Z-1, B-N, Fc= 0.88 kA, Fd= 54.25km	B phase fault but at Garhwa end, No A/R occurred and breaker was open for some time after that tripped in PD, while at Daltonganj A/R successful. Arc over occurring at Peak voltage.
6	220KV-DALTONGANJ-GARHWA (NEW)-2	26-09-2021	15:31	Garhwa: B-N,1.4kA, 65Km, Daltonganj - did not trip	B phase fault , A/R unsuccessful at both end in ckt-1 while ckt-2 tripped from only Garhwa end .Current reversal guard implementations to be checked as racing has caused tripping of ckt-1.

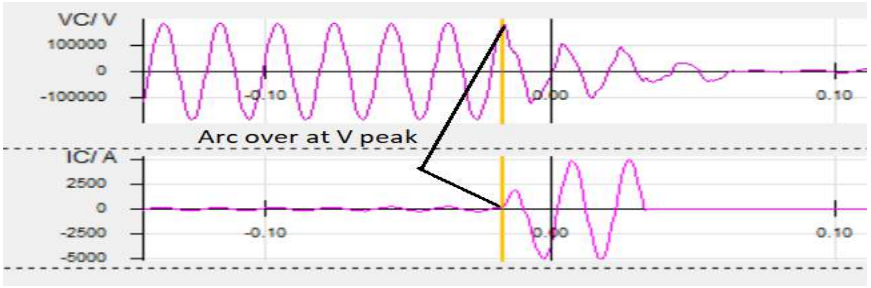
Fault Nature, Sag and Clearance Issue:

It can be observed from below plots that B phase current started rising slowly and then got converted to perfect phase to phase fault (as phase currents of Y and B are 180 degrees apart) due to arc over at voltage peak instance. B phase was involved in each fault.

Same phenomenon as mentioned above is observed in almost all cases, which indicates that the fault i**s occurring due to sag and clearance issues,** hence proper line patrolling and healthiness of line should be maintained, same kind of fault nature was also observed in this line few months ago which was resolved by, jumper tightening and tree pruning at some locations. This needs to be looked into again and taken care.



ARC OVER AT Volatge Peak:



Non-Operation of Auto Reclose:

In 3 instances, it was observed that for B-Earth single phase fault Single(B) phase opening is occurring at Garhwa end but, after dead time A/R is not occurring and B phase kept opened until Pole discrepancy operated and caused tripping of line .For all these instances A/R was successful from Daltonganj end proper A/R operation at Garhwa end could have avoided tripping .

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

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

Status of Reporting (रिपोर्टिंग की स्थिति):

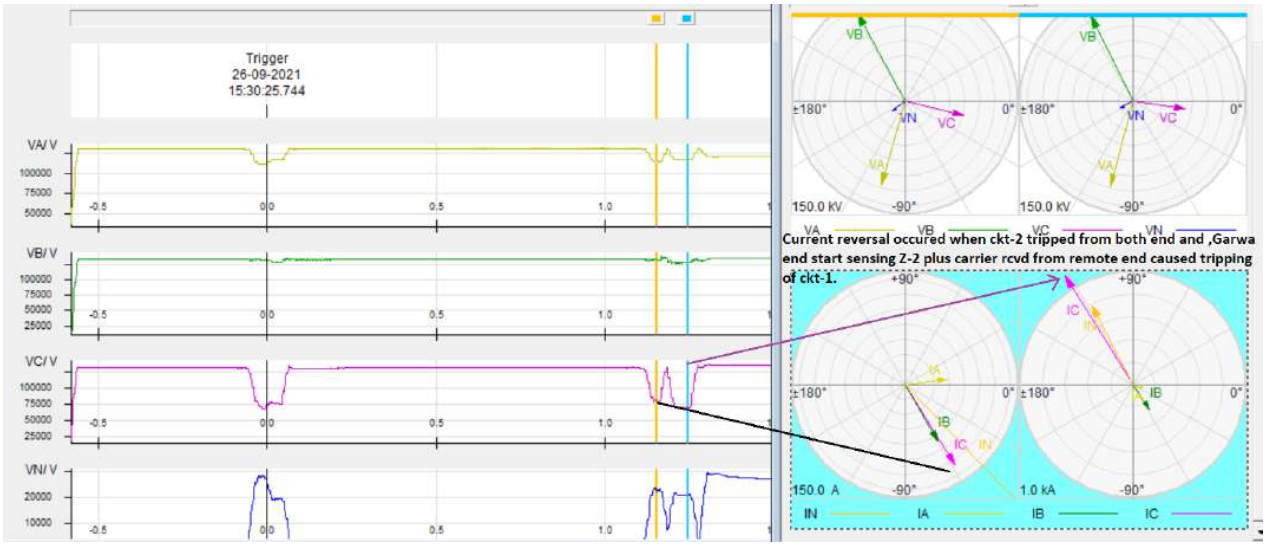
- DR/EL received from JUSNL
- DR/EL received from PG ER-I

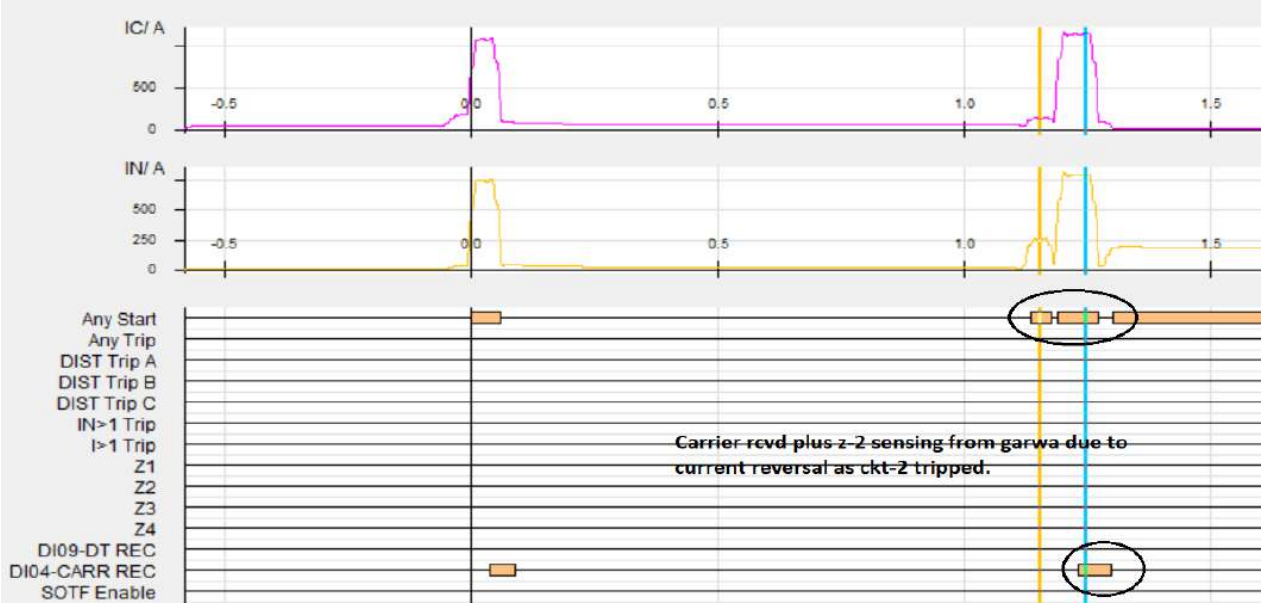
Annexure 1: Sequence of events recorded at ERLDC SCADA data at the time of the event.

Sequence of event not recorded at time of event.

Annexure 2: DR recorded

DR of 220 kV Daltonganj-Garhwa II (Garhwa end)




IC/ A
500
0
-0.5
0.0
0.5
1.0
1.5
IN/ A
500
250
0
-0.5
0.0
0.5
1.0
1.5
Any Start
Any Trip
DIST Trip A
DIST Trip B
DIST Trip C
IN>1 Trip
I>1 Trip
Z1
Z2
Z3
Z4
DI09-DT REC
DI04-CARR REC
SOTF Enable
Carrier rcvd plus z-2 sensing from garwa due to current reversal as ckt-2 tripped.

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

घटना संख्या: **28-09-2021/1** दिनांक: **01-10-2021**

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

Summary of the event (घटना का सारांश):

At 17:18 hrs, all 220 kV lines emanating from Hazipur tripped. Consequently total power failure occurred at Hzaipur and Amnour. Around 230 MW load loss occurred at Hazipur, Siwan, Chhapra, Amnour and Sithalpur.

Date / Time of disturbance: 28-09-2021 at 17:18 hrs

- **Event type:** GD-1
- **Systems/ Subsystems affected:** 220/132 kV Hazipur, 220/132 kV Amnour
- **Load and Generation loss**.
    - No generation loss was reported during the event.
    - Around 230 MW load loss reported during the event at Hazipur, Siwan, Chhapra, Amnour, Sithalpur

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

- 220kV Hazipur-Barauni (BTPS)-1

Major elements tripped (प्रमुख ट्रिपिंग):

- 220 kV Main Bus I & II at Hazipur
- 220 kV Hazipur-Muzaffarpur D/c
- 220 kV Hazipur-Amnour D/c
- 220 kV Hazipur-Barauni (BTPS)-2
- 1*200 MVA 220/132 kV ICT I at Hazipur
- 2*100 MVA 220/132 kV ICT I, ICT II at Hazipur

Network across the affected area (प्रभावित क्षेत्र का नक्शा)

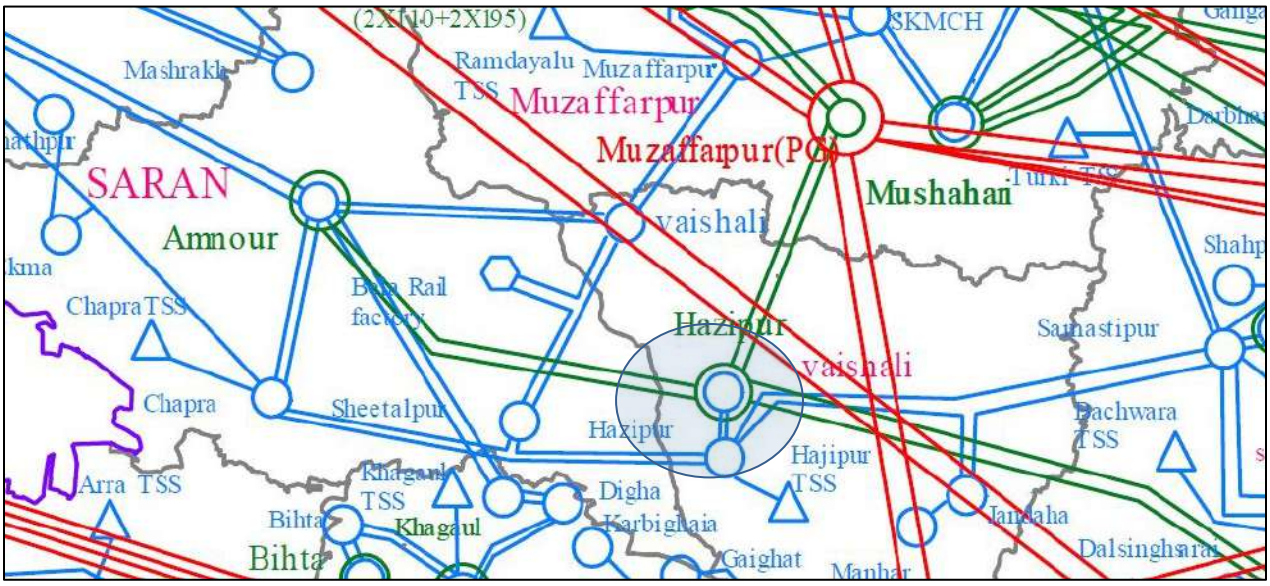


Figure 1: Network across the affected area

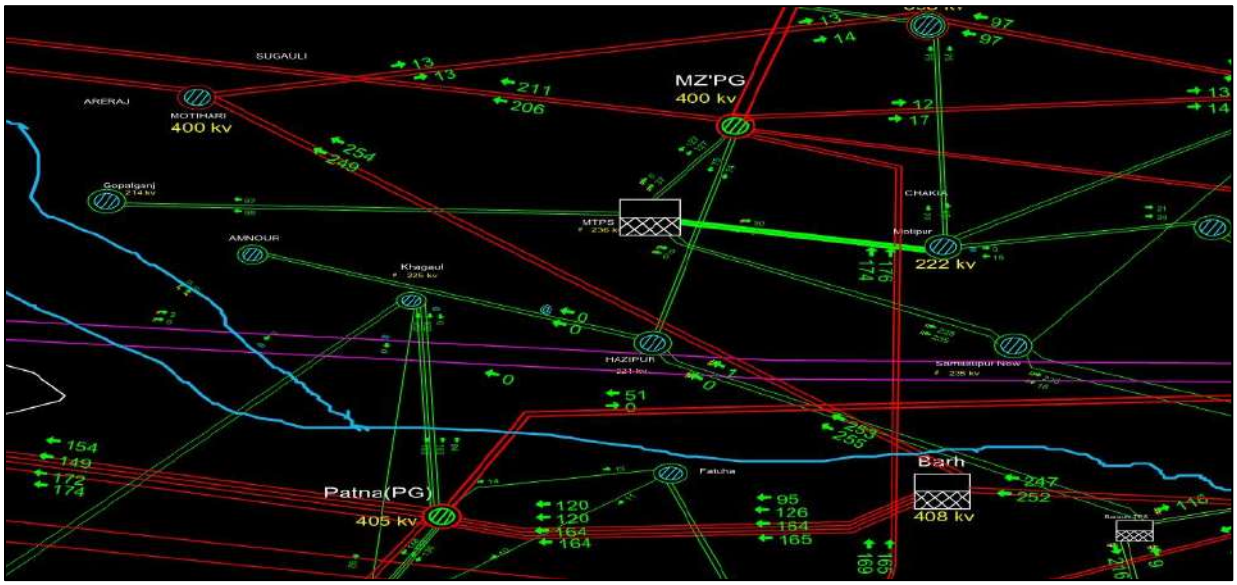


Figure 2: SCADA snapshot of the system

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

समय	नाम	उप केंद्र 1 रिले संकेत	उप केंद्र 2 रिले संकेत	पीएमयू पर्यवेक्षण
17:18	220 kV Bus-I, Bus II at Hazipur	Z-1 in Amnour-2 but breaker did not opened initiated LBB which caused tripping of all ckts from Hazipur end.		23 kV dip in R phase with fault clearance time of 250ms.
	220 kV Hazipur-Muzaffarpur-I		Didn't trip	
	220 kV Hazipur-Muzaffarpur-II			
	220 kV Hazipur-Amnour I			
	220 kV Hazipur-Amnour II			

	220 kV Hazipur-Barauni (BTPS)-II		Didn't trip	
	2*100 MVA 220/132 kV ICTs at Hazipur			

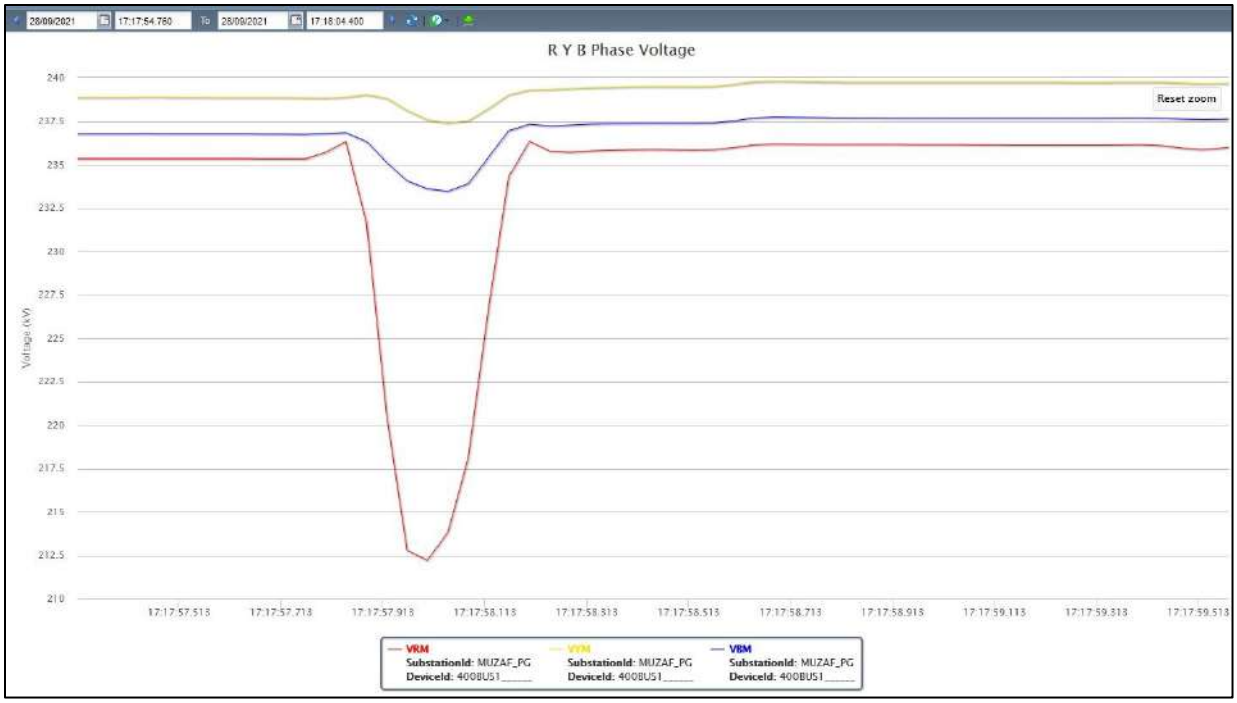


Figure 3: PMU snapshot of 400/220 kV Muzaffarpur S/s

Restoration (पूर्वावस्था की प्रप्ति)

Transmission/Generation element name	Restoration time
220 kV Bus 1 at Hazipur	17:30
220 kV Bus 2 at Hazipur	17:30
220 kV Muzaffarpur-Hazipur I	17:34
220 kV Muzaffarpur-Hazipur II	18:11
220 kV Hazipur-Amnour I	17:34
220 kV Hazipur-Amnour II	
220 kV Hazipur-Barauni (BTPS)-II	17:30
100 MVA 220/132 kV ICT I at Hazipur	
100 MVA 220/132 kV ICT II at Hazipur	

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

- Fault was in 220 kv Hazipur-Amnour -II ,Distance protection picked and gave trip command but Breaker did not opened hence LBB initiated.

- Further LBB gave tripping command after 250ms to all the elements from Hazipur substation and all elements tripped and fault was isolated. Zone-4 of all lines at Hazipur end also picked but prior to that LBB gave trip command to all lines.

- Ideally With LBB initiation only the elements which are at same bus as of Amnour -2 should have tripped along with the bus coupler and all elements with other bus should have remained in service this needs to be checked **(BSPTCL to reply).** With proper LBB operation Load loss could have been avoided.

- As the Hazipur is GIS reason for non-opening of breaker also needs to be checked and resolved**. (BSPTCL to reply).**

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

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

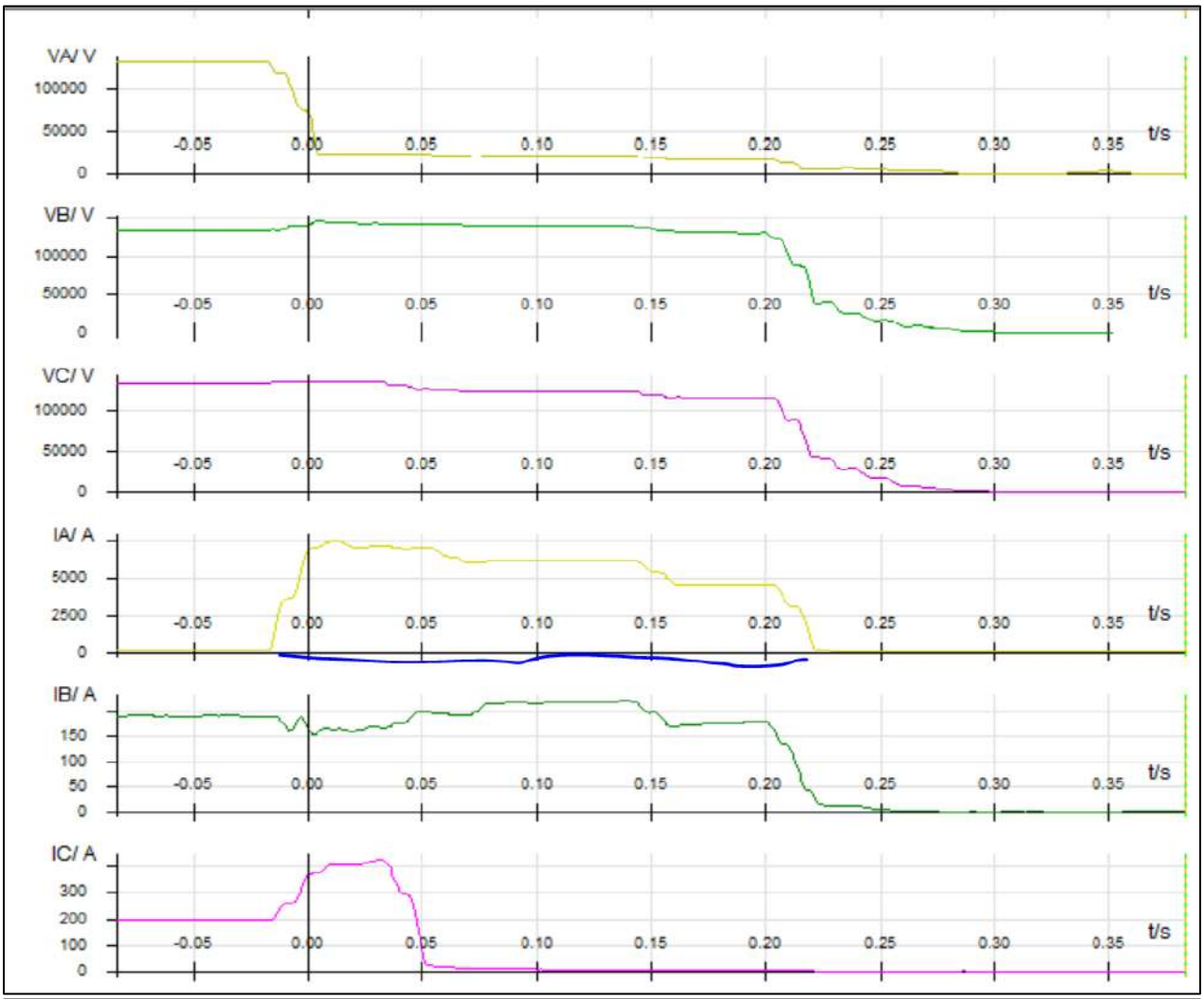
Status of Reporting (रिपोर्टिंग की स्थिति):

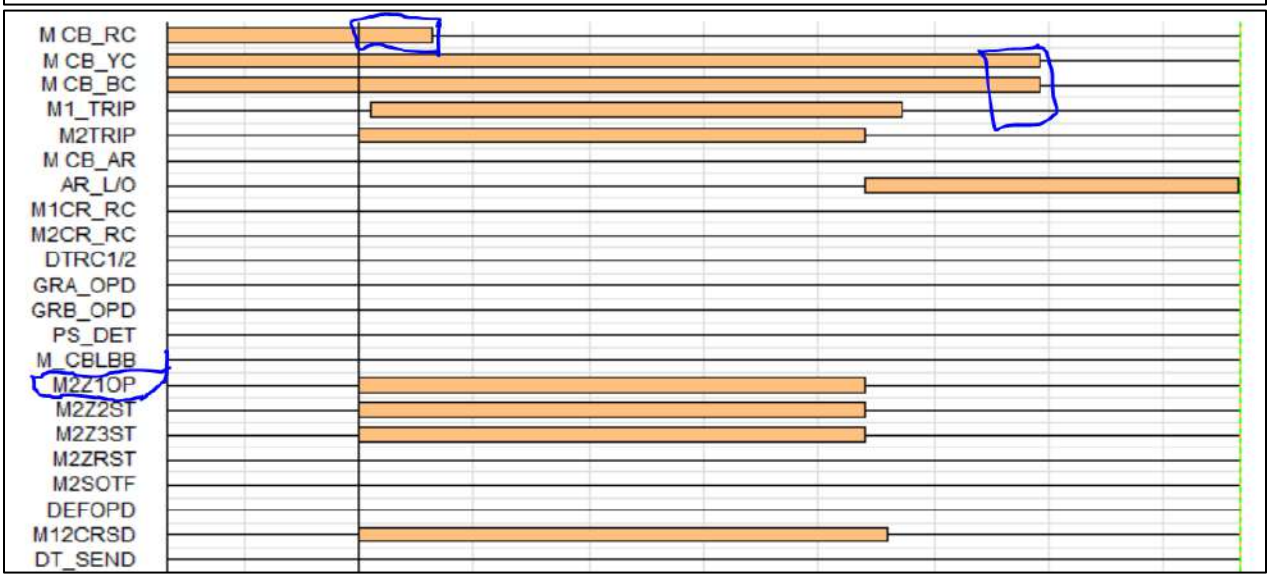
- DR/EL yet to be received from Barauni.
- DR/EL yet to be received from PG ER-I

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

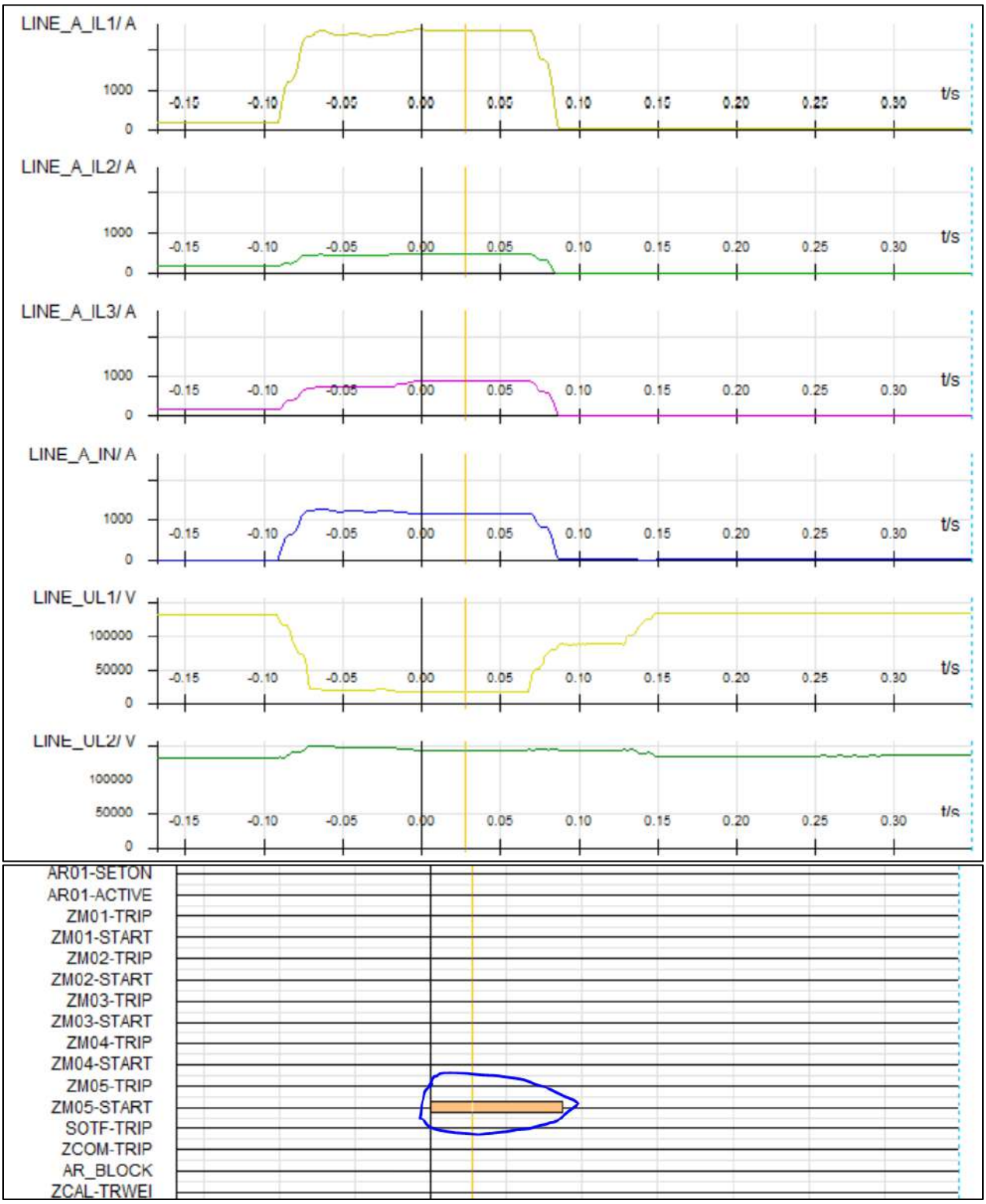
Sequence of event not recorded at time of event.

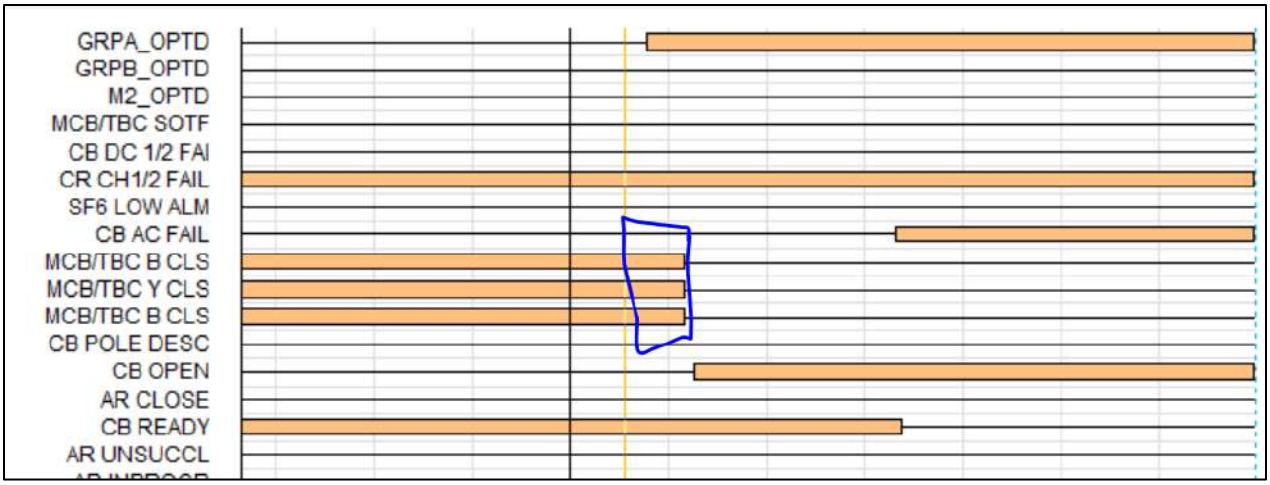
Annexure 2: DR recorded at Hazipur end for Amnour-II





DR recorded at Hazipur end for Muzzafferpur-I




GRPA_OPTD
GRPB_OPTD
M2_OPTD
MCB/TBC SOTF
CB DC 1/2 FAI
CR CH1/2 FAIL
SF6 LOW ALM
CB AC FAIL
MCB/TBC B CLS
MCB/TBC Y CLS
MCB/TBC B CLS
CB POLE DESC
CB OPEN
AR CLOSE
CB READY
AR UNSUCCL

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

घटना संख्या: **29-09-2021/2** दिनांक: **07-10-2021**

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

Summary of the event (घटना का सारांश):

At 11:28 hrs, 220 kV Hazipur-Amnour-1 tripped due to operation of bus bar protection at Hazipur. Total power failure occurred at Amnour as it was being through 220 kV Hazipur-Amnour-1, Ckt-2 was under breakdown. Around 140 MW load loss occurred at Siwan, Chhapra and Amnour.1

Date / Time of disturbance: 29-09-2021 at 11:28 hrs

- **Event type:** GD-1
- **Systems/ Subsystems affected:** 220/132 kV Amnour
- **Load and Generation loss**.
    - No generation loss was reported during the event.
    - Around 140 MW load loss reported during the event at Siwan, Chhapra, Amnour

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

- 220kV Hazipur-Amnour-2

Major elements tripped (प्रमुख ट्रिपिंग):

- 220 kV Main Bus I & II at Amnour
- 220 kV Hazipur-Muzaffarpur I
- 220 kV Hazipur-Amnour I
- 220 kV Hazipur-Barauni (BTPS)-2
- 220 kV Bus I at Hazipur

Network across the affected area (प्रभावित क्षेत्र का नक्शा)

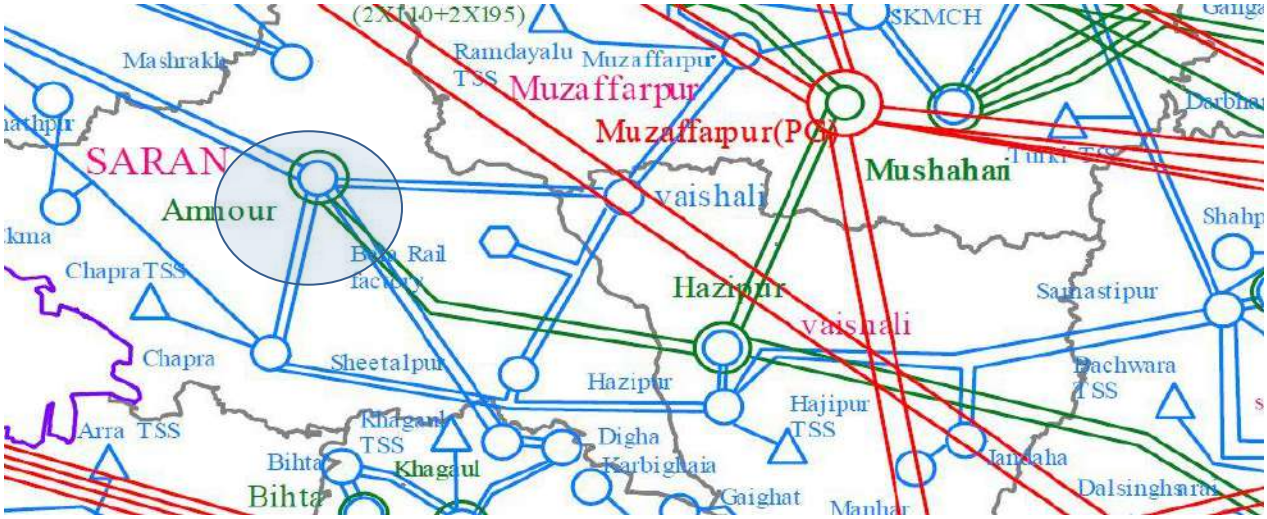


Figure 1: Network across the affected area

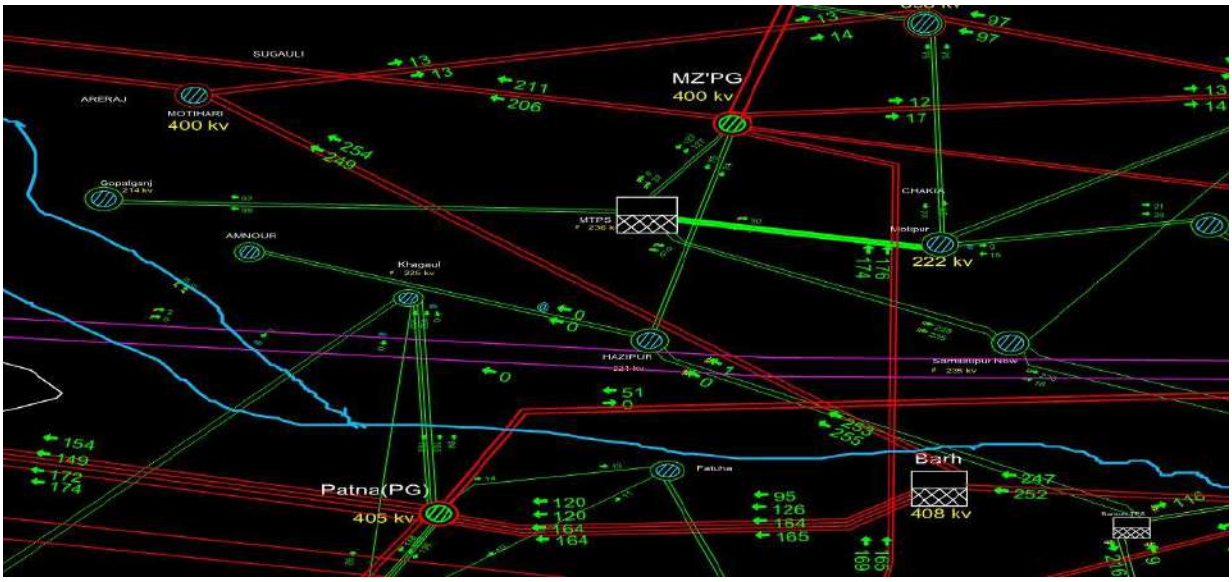


Figure 2: SCADA snapshot of the system

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

समय	नाम	उप केंद्र 1 रिले संकेत	उप केंद्र 2 रिले संकेत	पीएमयू पर्यवेक्षण
11:28	220 kV Bus-I at Hazipur	Bus bar protection operated at Hazipur		No fault observed in PMU
	220 kV Hazipur-Muzaffarpur-I		Didn't trip	
	220 kV Hazipur-Barauni (BTPS)-II		-	
	220 kV Hazipur-Amnour I		-	
	220 kV Bus-I,II at Amnour	Loss of power suppply		

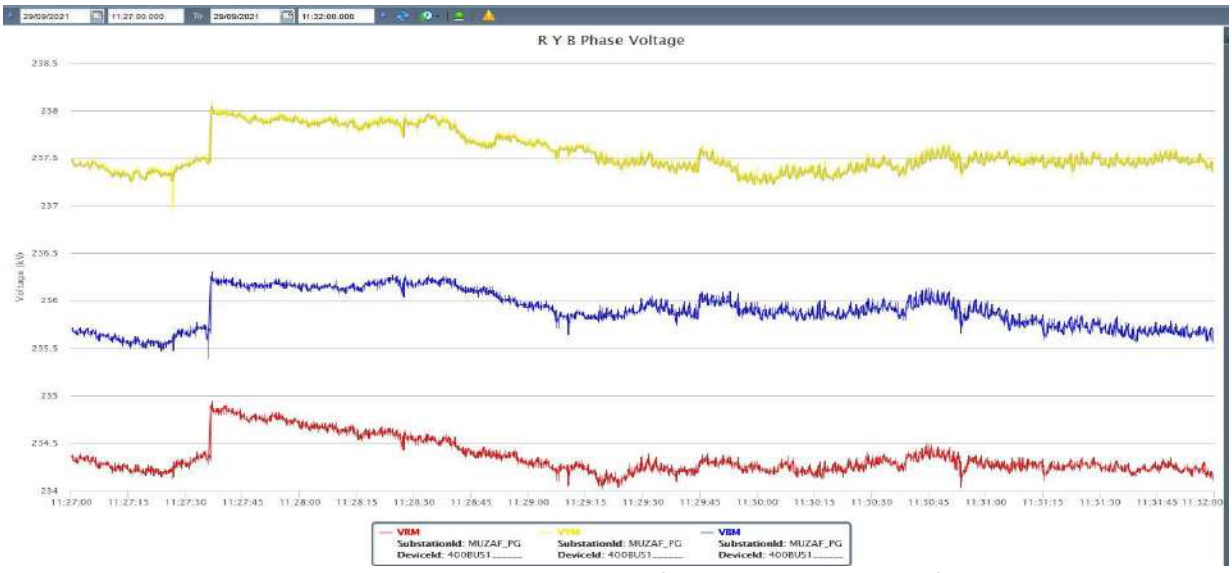


Figure 3: PMU snapshot of 400/220 kV Muzaffarpur S/s

Restoration (पूर्वावस्था की प्रप्ति)

Transmission/Generation element name	Restoration time
220 kV Bus 1 at Hazipur	11:37
220 kV Muzaffarpur-Hazipur I	11:55
220 kV Hazipur-Amnour I	11:55
220 kV Hazipur-Barauni (BTPS)-II	11:37

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

- No fault observed in PMU.
- As reported, during testing of 220 kV Hazipur-Amnour II (which was under breakdown), bus bar protection of 220 kV Bus I operated. Proper precaution should be taken during any testing to avoid such kind of tripping which resulted in load loss.

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

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

Status of Reporting (रिपोर्टिंग की स्थिति):

- DR/EL yet to be received from BSPTCL
- DR/EL yet to be received from PG ER-I

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

Sequence of event not recorded at time of event.

Annexure 2: DR recorded

DR yet to be received.

पावर सिस्टम ऑपरेशन करपोरेशन लिमिटेड
(भारत सरकार का उद्यम)
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CIN: U40105DL2009GOI188682
फ़ोन: 033- 24235755, 24174049 फैक्स : 033-24235809/5029 Website:www.erldc.org, Email ID- erldc@posoco.in

घटना संख्या: **18-09-2021/1** दिनांक: **01-10-2021**

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

Summary of the event (घटना का सारांश):

At 17:59 hrs, all three circuits emanating from 220 kV UpperKolab HEP tripped and 220 kV bus became dead while synchronizing U#2 at UpperKolab. 73 MW generation loss occurred due to tripping of running U#1.

Date / Time of disturbance: 18-09-2021 at 17:59 hrs

- **Event type:** GD-1
- **Systems/ Subsystems affected:** 220 kV UpperKolab
- **Load and Generation loss**.
  - 73 MW generation loss occurred
  - No load loss occurred during the event

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

- NIL

Major elements tripped (प्रमुख ट्रिपिंग):

- 220 kV Main Bus I & II at UpperKolab
- 220 kV UpperKolab-Jaynagar-1
- 220 kV UpperKolab-Jaynagar-2
- 220 kV UpperKolab-Therubali-1
- 80 MW U#1 at UpperKolab

Network across the affected area (प्रभावित क्षेत्र का नक्शा)

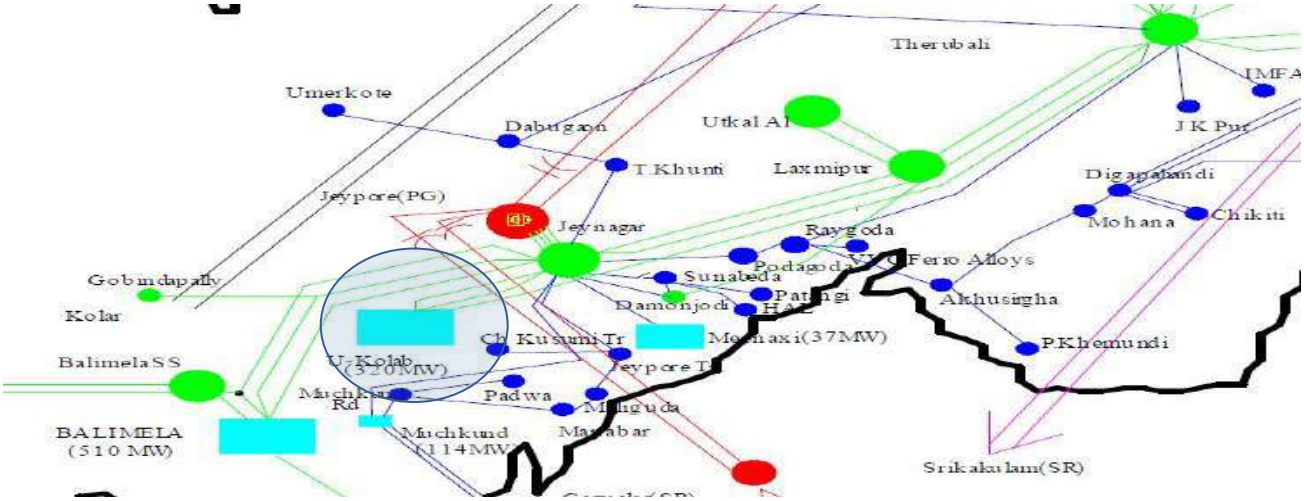


Figure 1: Network across the affected area

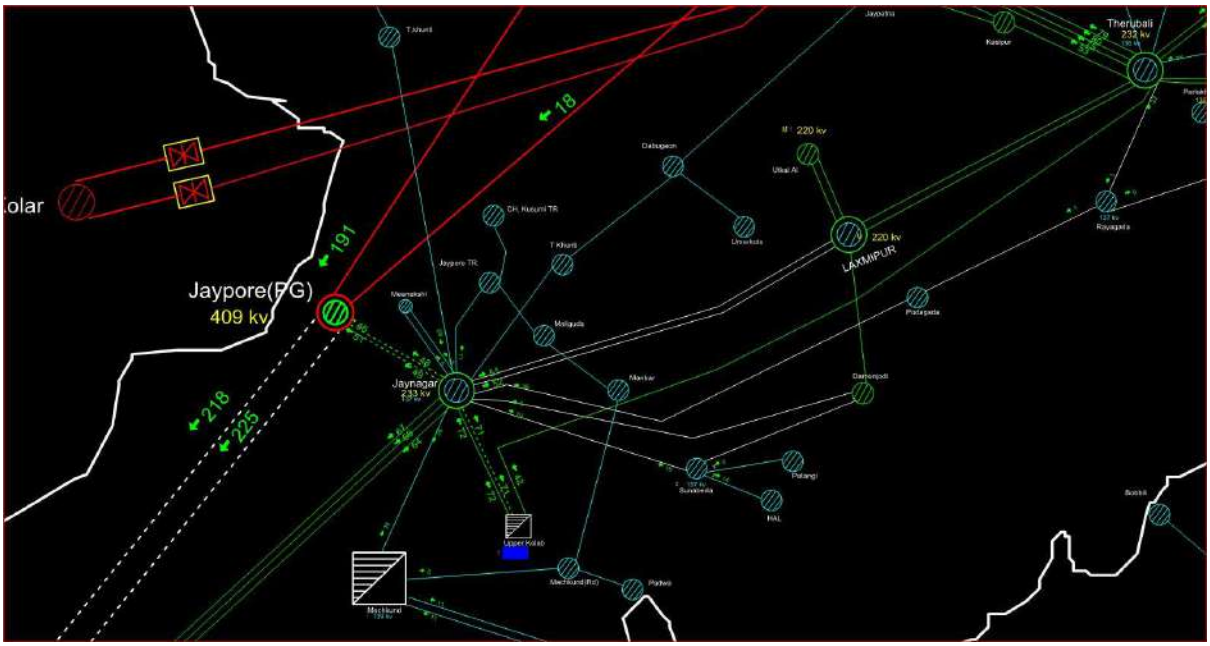


Figure 2: SCADA snapshot of the system

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

समय	नाम	उप केंद्र 1 रिले संकेत	उप केंद्र 2 रिले संकेत	पीएमयू पर्यवेक्षण
21:52	220 kV Bus-I, Bus II at UpperKolab	U#2 LBB operated	-	No fault observed in PMU
	220 kV UpperKolab-Jaynagar-1		-	
	220 kV UpperKolab-Jaynagar-2		-	
	220 kV UpperKolab-Therubali		-	
	80 MW U#1 at UpperKolab		-	

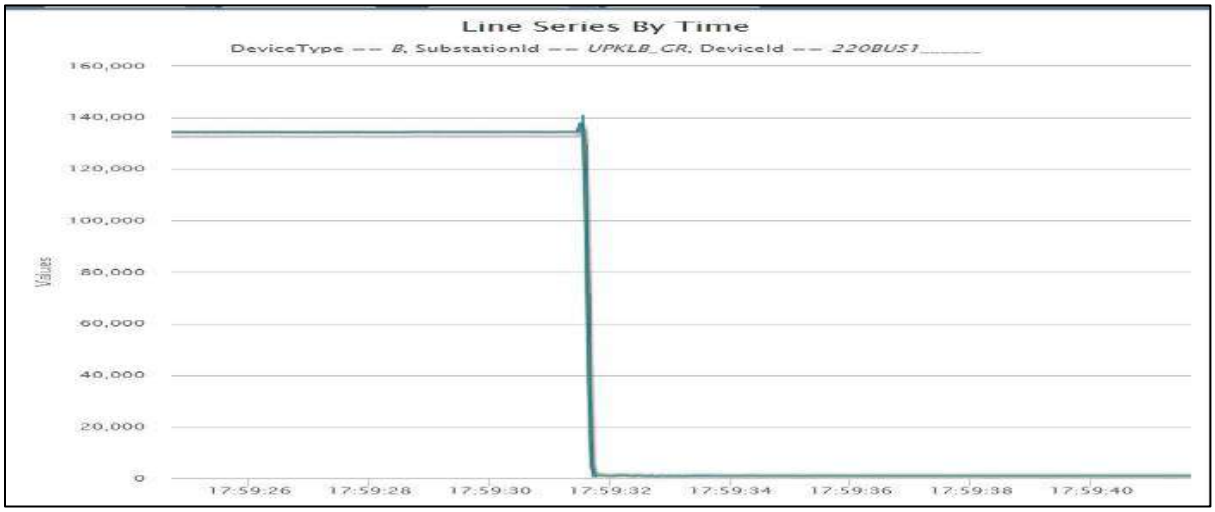


Figure 3: PMU snapshot of 220 kV UpperKolab S/s

Restoration (पूर्वावस्था की प्रप्ति)

Transmission/Generation element name	Restoration time
220 kV Bus 1 at UpperKolab	18:47
220 kV Bus 2 at UpperKolab	18:47
220 kV UpperKolab-Jaynagar-1	18:47
220 kV UpperKolab-Jaynagar-2	18:47
220 kV UpperKolab-Therubali-1	20:02

Analysis of the event (घटना का विश्लेषण):

- As per PMU plot at UpperKolab, no fault was observed. The reason of operation of LBB of U#2 may be analysed.

Protection issue (सुरक्षा समस्या):

- Both 220kV buses tripped on LBB. OHPC to explain.

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

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

Status of Reporting (रिपोर्टिंग की स्थिति):

- DR/EL yet to be received from OHPC & OPTCL

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

Sequence of event not recorded at time of event.

Annexure 2: DR recorded

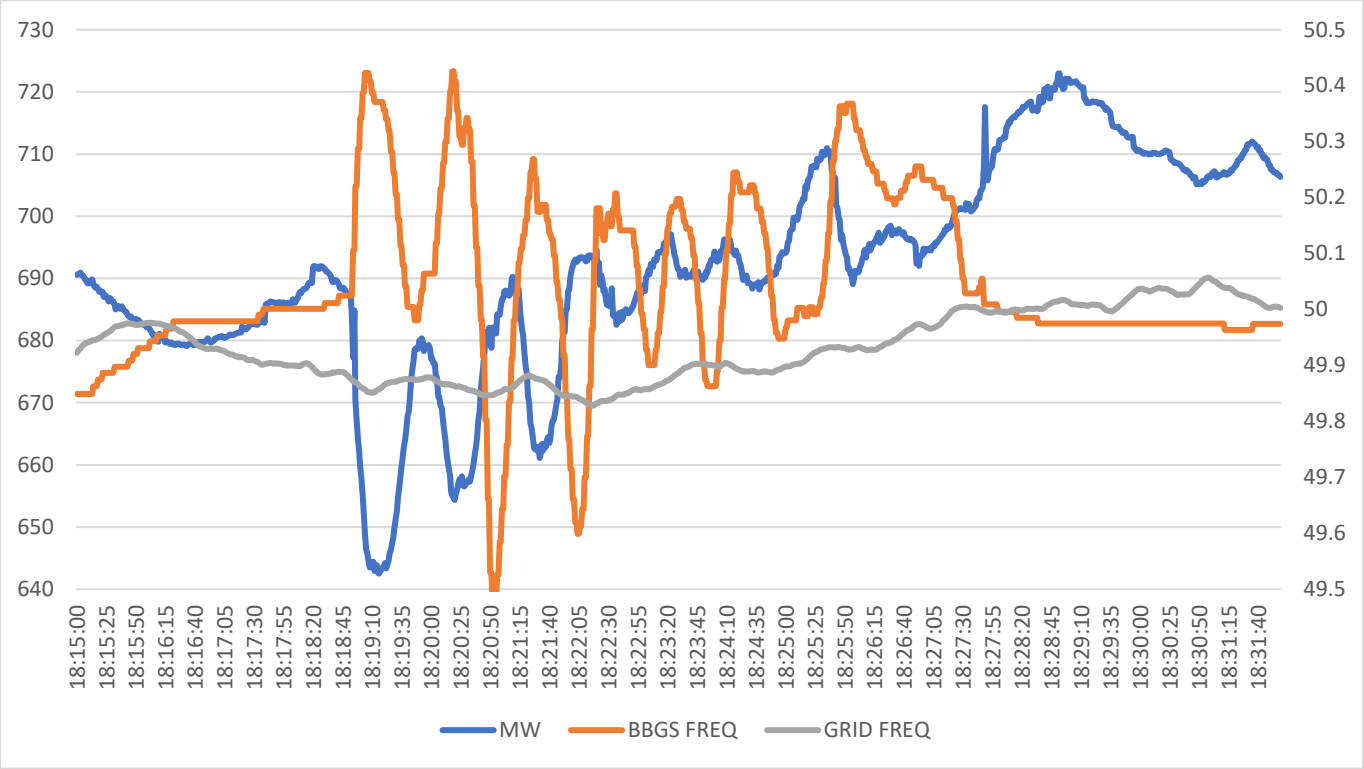
DR yet to be received.

Islanding Performance and Observations During Past Islanding of CESC

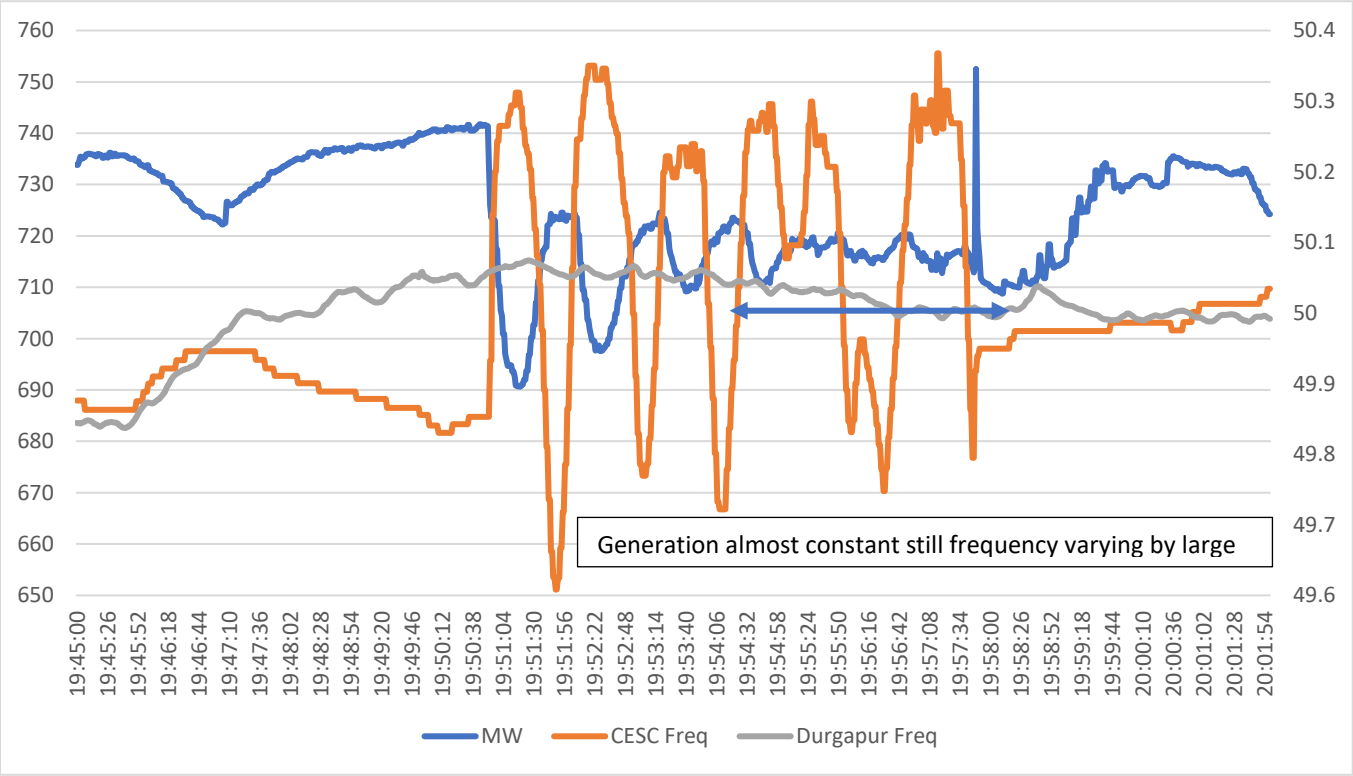
Islanding Performance and Frequency variation for past few Islanding events were checked for Island stability evaluation and following observations are listed in regard to this, (Plots for each event in attached)

- Oscillating Variation of frequency after island formation in Budge-budge frequency is observed upto (0.5-1Hz) and was varying continuously till it got synchronised with grid at Howrah point, this may also be checked.
- Such pro longed variation of frequency during whole islanded mode may be checked.
- In event 3 Budge-Budge Unit generation was also oscillating, root cause for which needs to be looked into which is ultimately driving the frequency of island.(Plot attached)
- Any cyclic load changes or other behaviour may also be analysed. Variation of traction and Metro load may also be studied.
- **Governor parameter tuning during islanded mode may also be checked along with PSS for stability during islanded mode.**
- **Reason for such continuous high oscillating variation in frequency may be analysed and possible consequences may also be looked.**
- **Frequency of oscillation was very slow 1 cycle in a minute so approx. 0.014Hz. So mechanical parameters associated with Machines may be checked for root cause analysis .**
- **Under frequency load shedding setting as shared within the island starts from 49.4Hz and may cause operation of UFR relay in some cases inside the island. Which is detrimental for island survival.**
- **As observed in below cases for 2 events, Frequency dipped upto 49.5 & 49.6Hz due to these variations. Chakmir -47Mw is under UFR shedding at 49.4Hz, tripping of which may further cause stability problem within island. (Setting attached)**
- **Same variation pattern was also observed during past events also one such event of 28April 2020 was checked and same observation found (Plot attached).**

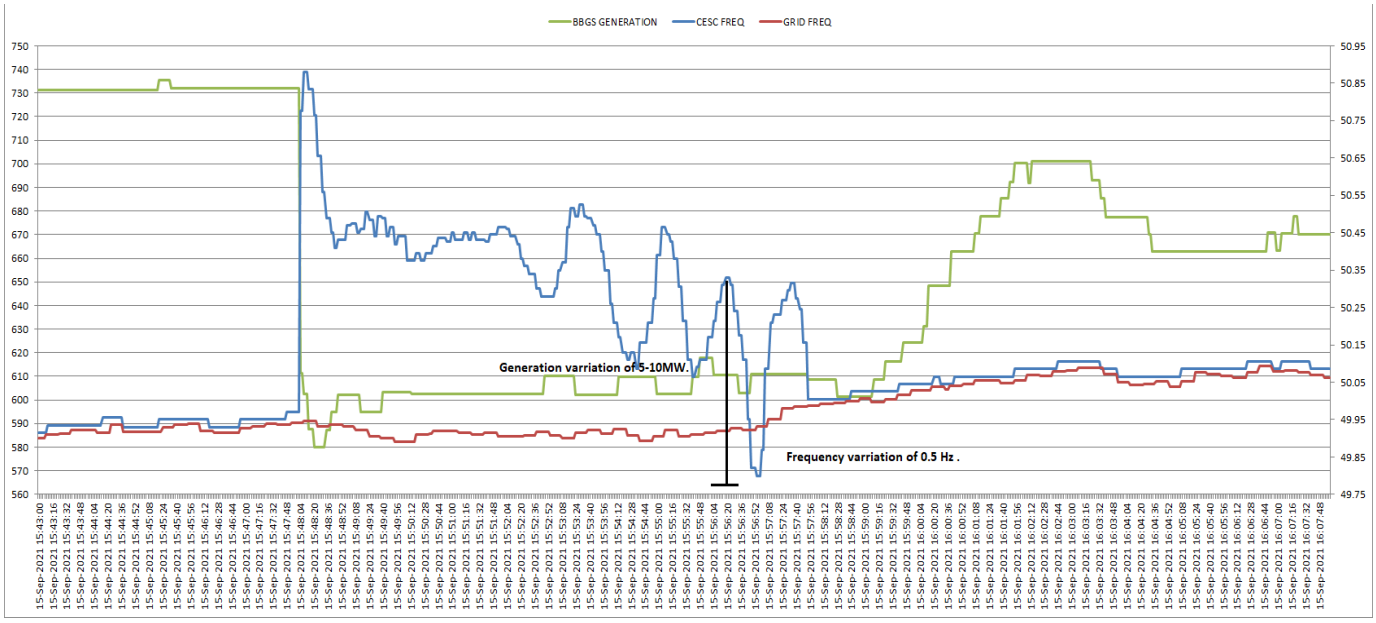
SCADA plot for EVENT 1: 01st August 18:18Hrs, Budge-Budge generation Vs CESC frequency vs Grid Frequency



SCADA plot for EVENT 2: 01st August 19:50 Hrs ,BugBug generation Vs CESC frequency vs Grid Frequency

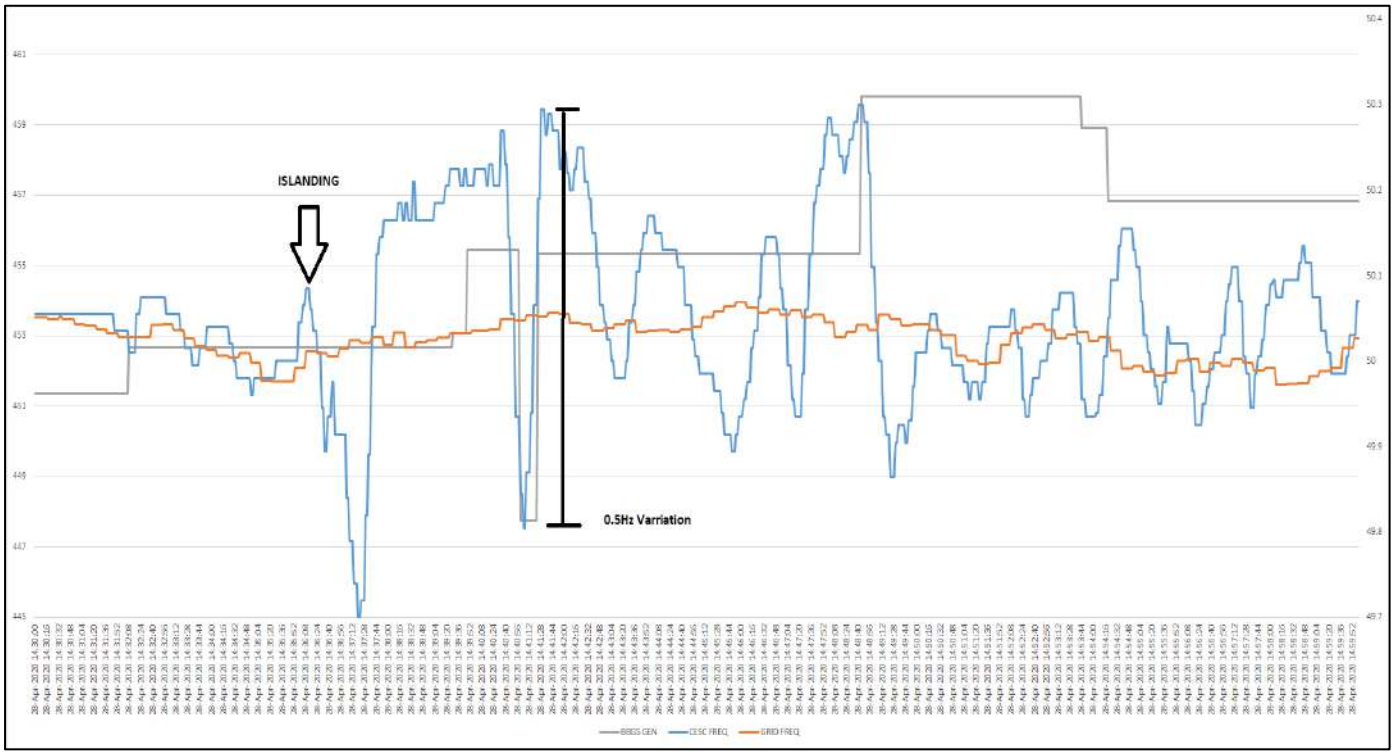


EVENT 3: Variation on 15Th September Islanding: SCADA plot with 2 second resolution
Same pattern of Frequency variation observed. Governor performance during Islanding needs to be checked. In 15th September event also Budge-budge generation is oscillatory this needs to be checked and also any cyclic load variation for the same to be looked.

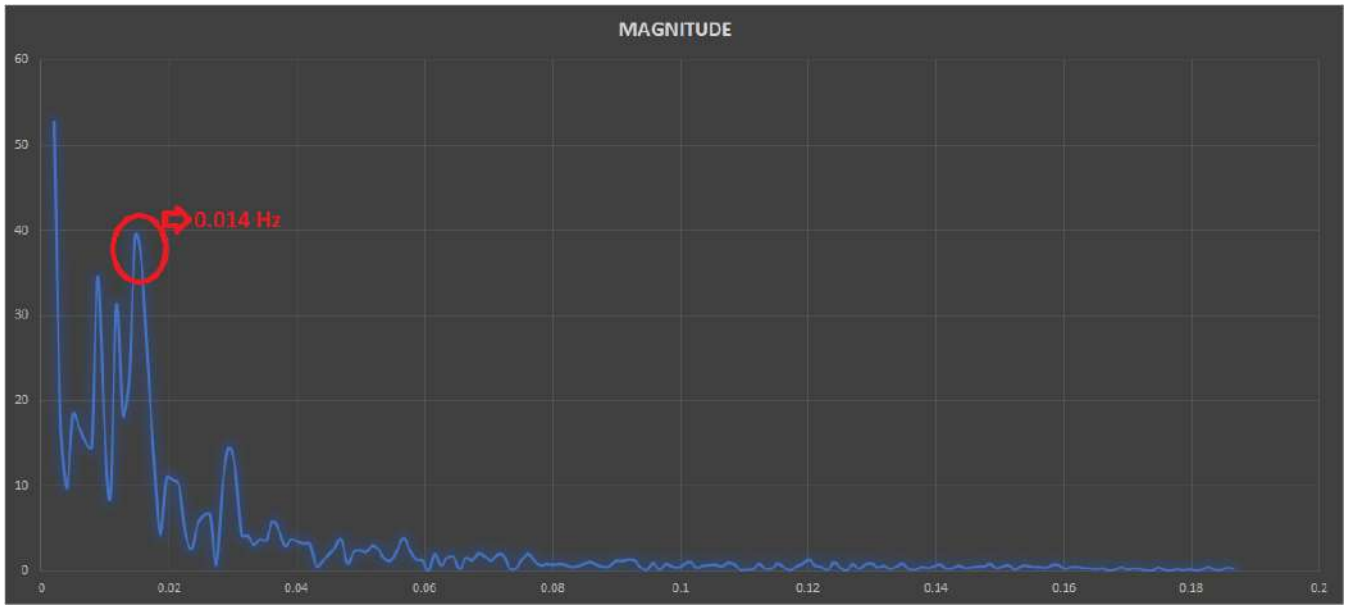


EVENT 4 :PAST ISLANDING ON 28 APRIL 2020:

In the 2020 Event also same very low frequency oscillatory variation observed



Oscillation Frequency as observed from FFT Spectrum: Very low frequency of 0.014 Hz observed

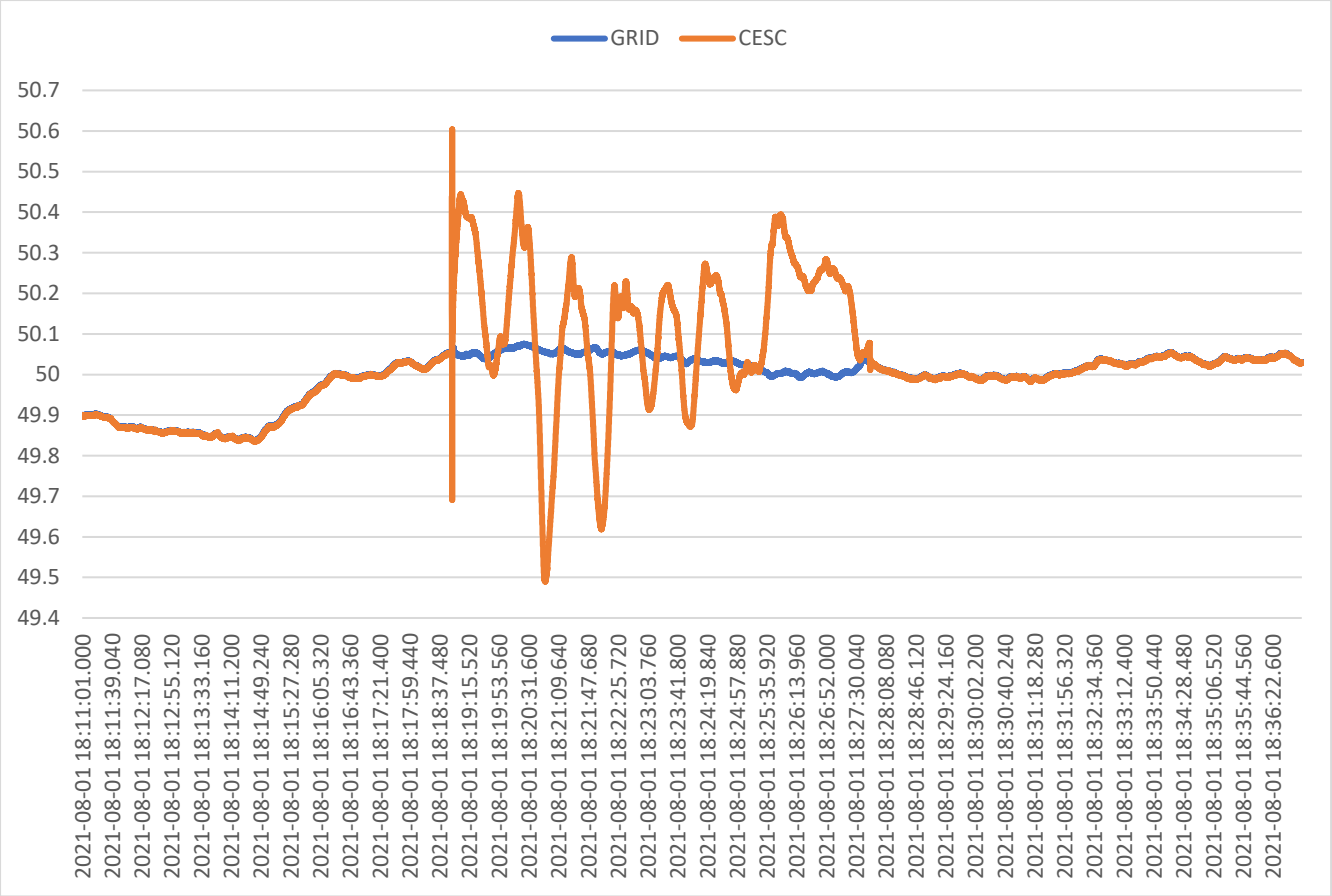


UFR setting for First Two stages:

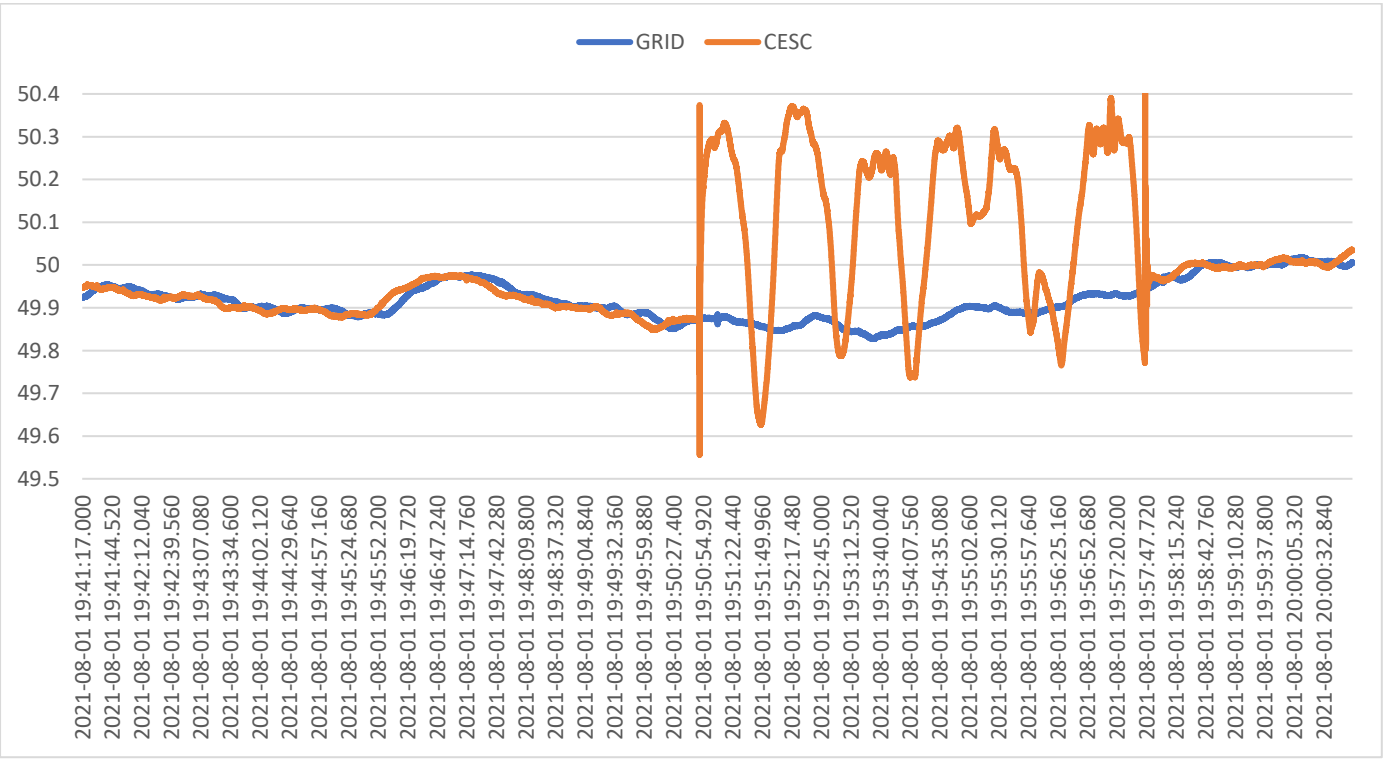
Settings of Under frequency relays				
CESC system				
Stage	**132/33kV G/S/S**	**33kV Feeder**	**Max Load in MW**	
Stage-I			SUMMER	WINTER
49.4Hz	CHAKMIR	55 MVA TRF - 1 & 2	47	29
	NCGS	KAMARHATI TRF - 1	8	6
		KUTIGHAT TRF - 3	10	8
TOTAL			**65**	**43**
Stage-II				
49.2Hz	DUMDUM	NEW DUMDUM TRF - 1	15	11
		NEW DUMDUM TRF - 2	14	9
		SOUTH DUMDUM TRF - 1	15	8
		DUMDUM TRF - 3	12	7
	BBGS	BAURIA 1 & 3	18	12
		FORESHORE RD D/S(6 KV FEEDER)	9	5
		SALIMAR D/S (6 KV FEEDER)	7	3
TOTAL			**90**	**55**

VERIFICATION BY PMU PLOTS FOR ALL EVENTS

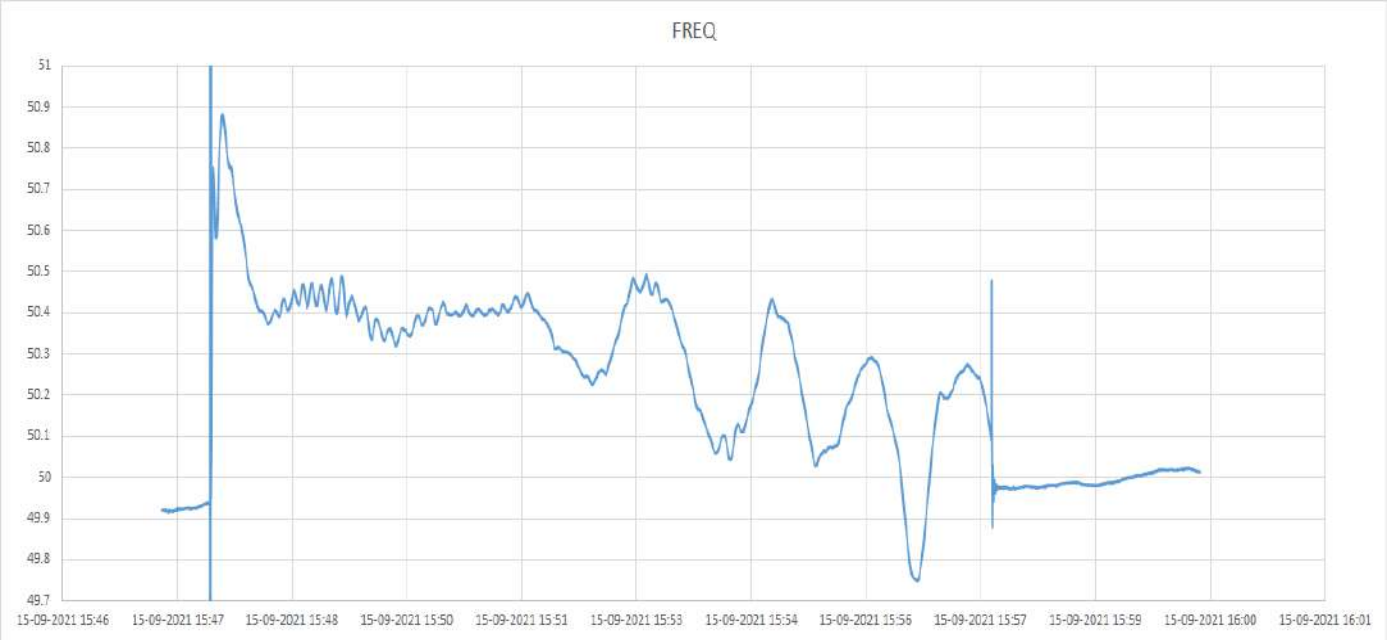
EVENT 1: Frequency comparison by PMU Plot:



EVENT 2 Frequency comparison by PMU Plot:



EVENT 3: PMU PLOT 15 September 2021



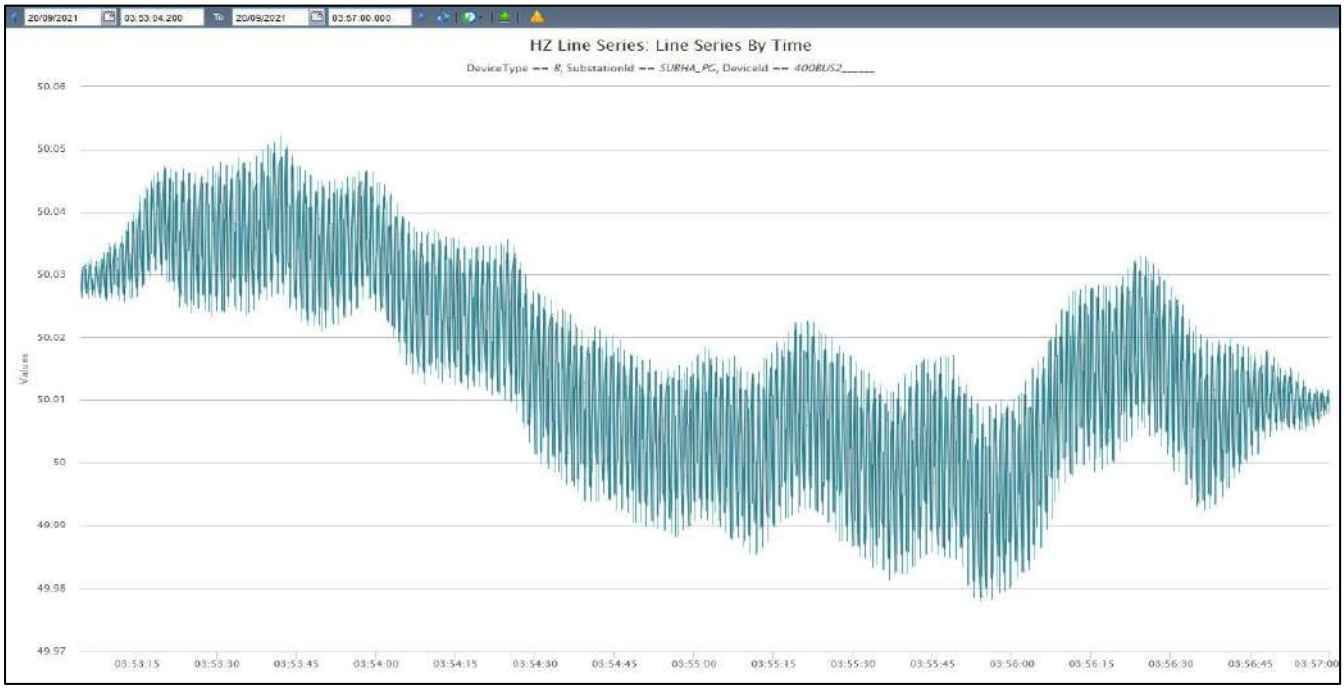
LOW FREQUENCY OSCILLATION BETWEEN 03:52 TO 03:58 Hrs ON 20/09/2021

LFO **of 0.8-0.9 Hz** was observed between 03:53 Hrs to 03:57 Hrs near Subhasgram area ,magnitude of which was observed most near Subhas gram and magnitude started reducing as moving away from Subhasgram .

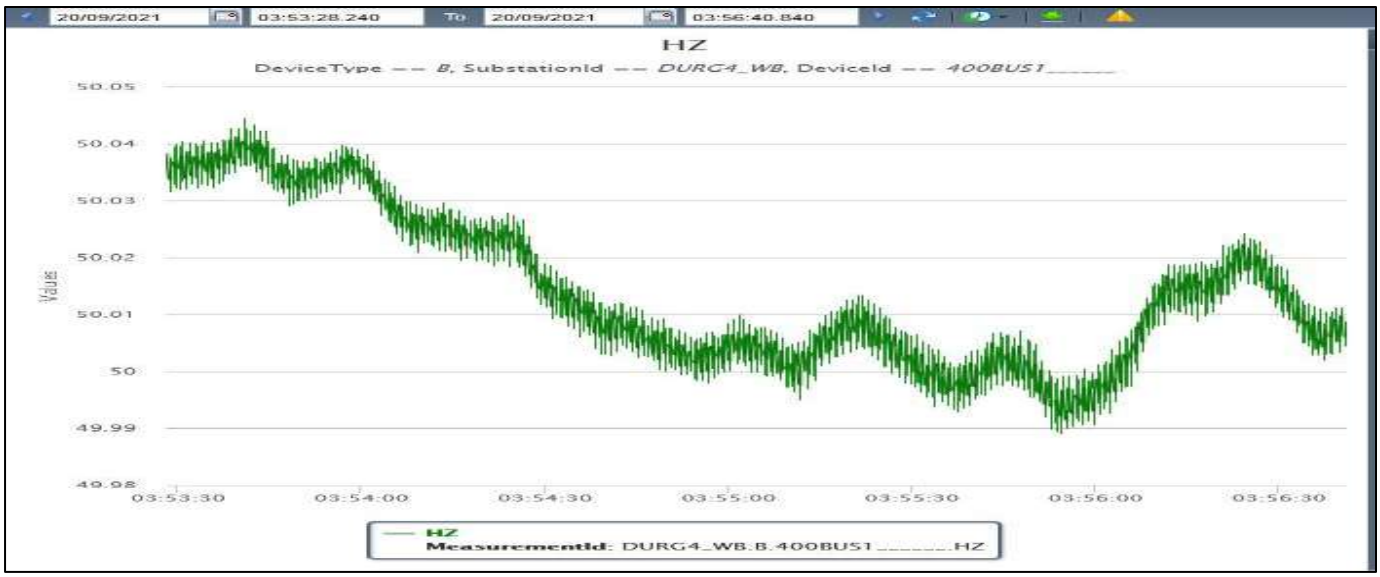
It was most prominent in Frequency only.

LFO was of Local mode which indicates that the oscillation initiated with hunting of any nearby unit.

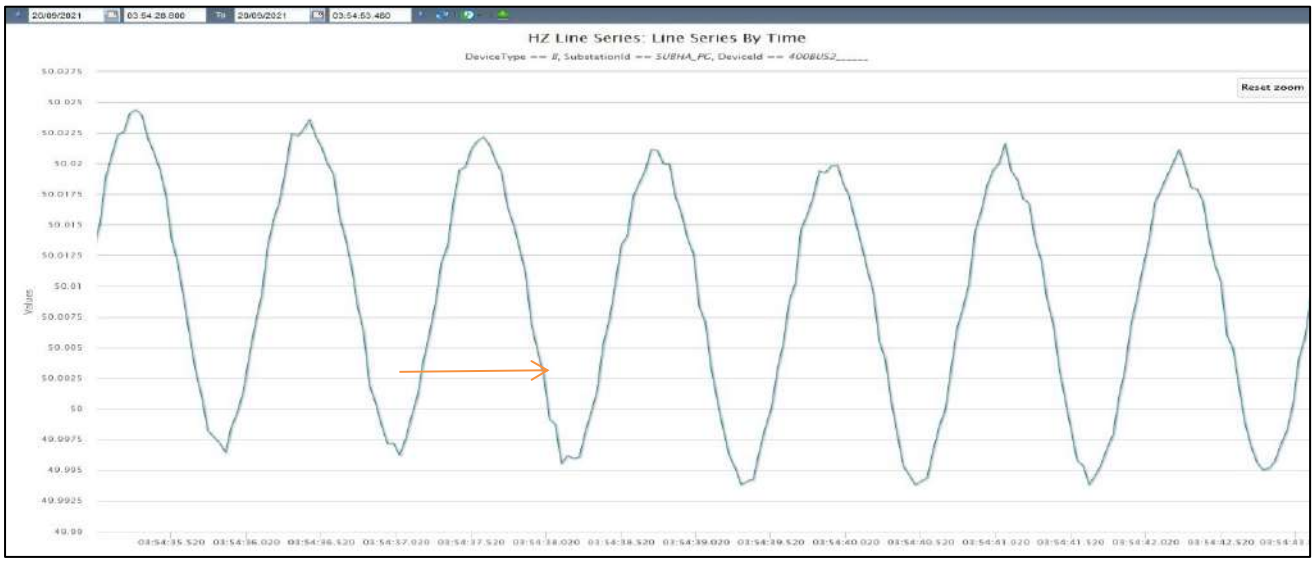
Subhas gram Frequency



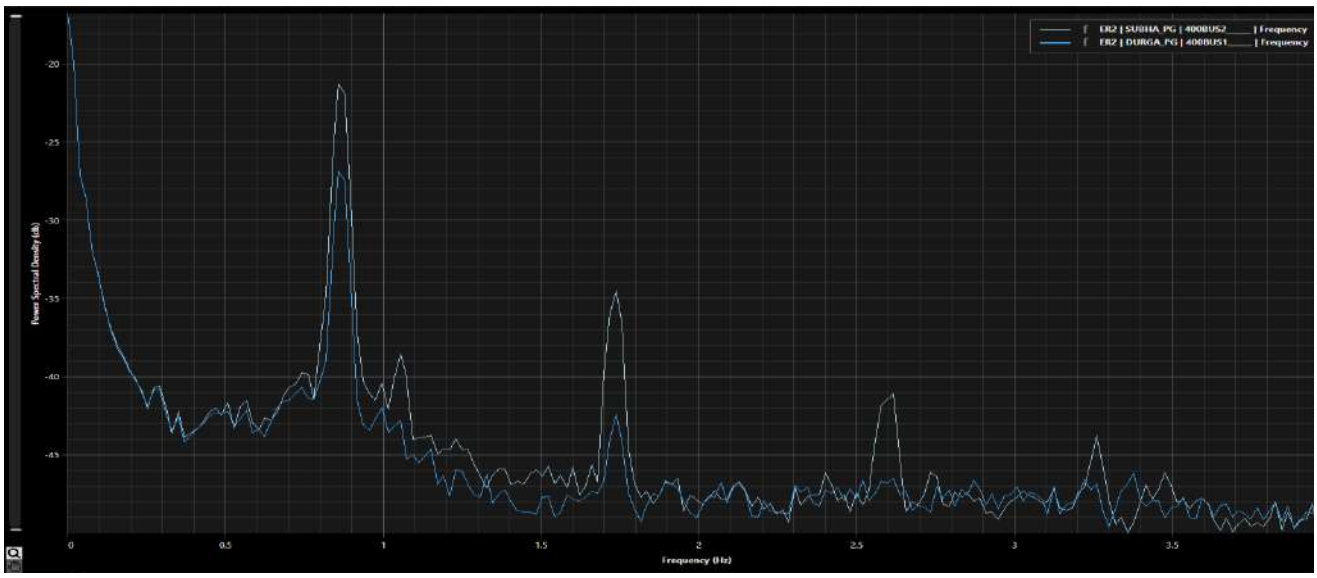
Durgapur Frequency: Frequency variation in Durgapur was comparatively less as moving away from Subhasgram

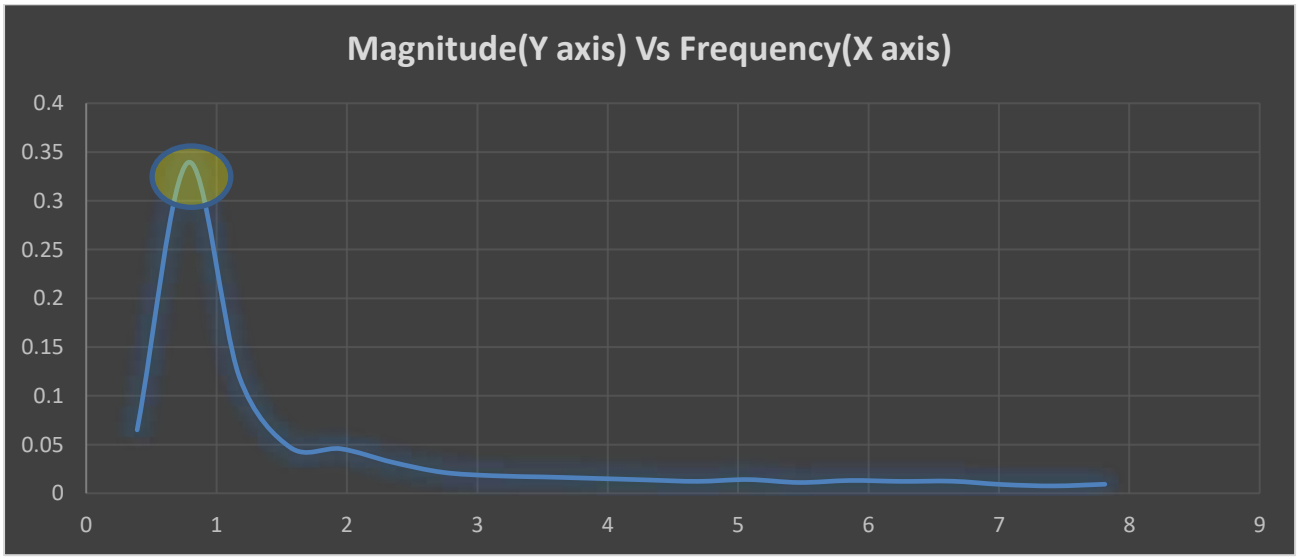


Mode : 0.8 to 0.9 hz (Local mode) ,This also indicates towards oscillation of any plant against the whole grid of Hunting of any unit due to any problem.



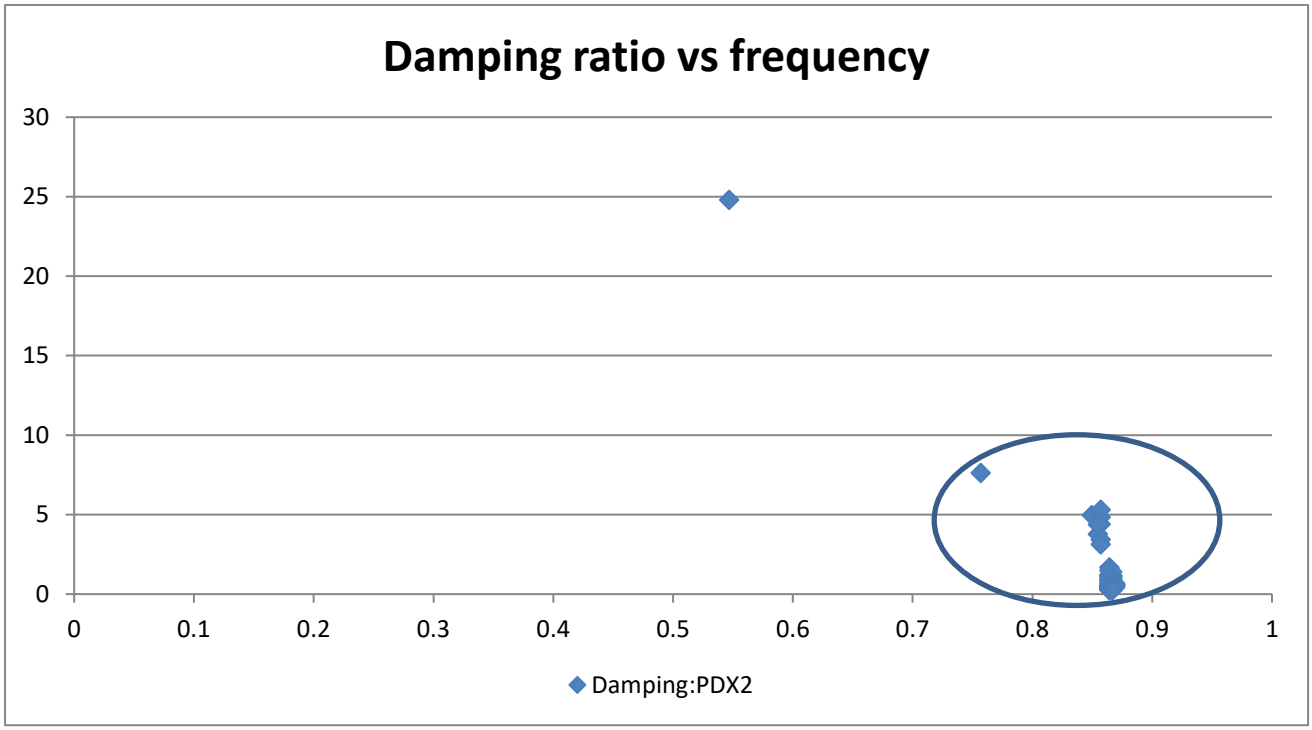
Power Spectral Density as shown below also shows that the highest energy is of 0.8-0.9Hz .



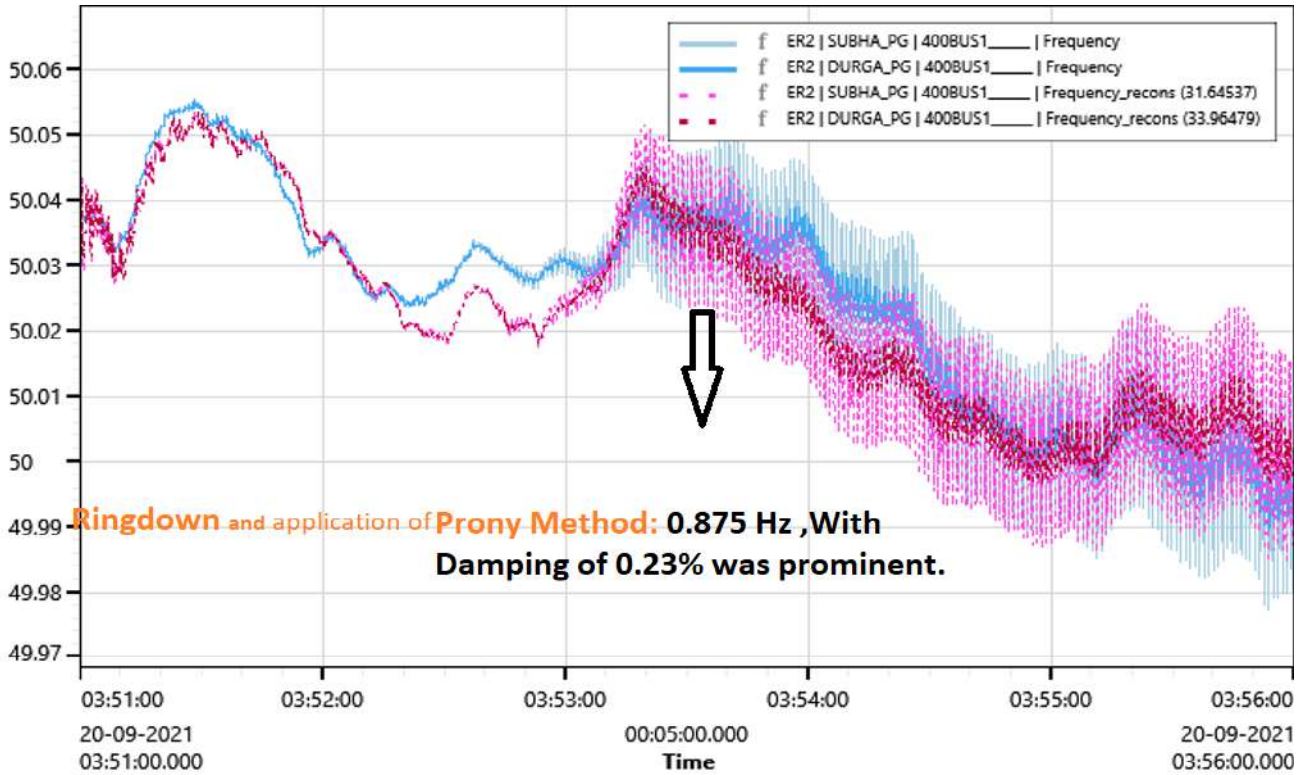


Above signal conditioning PSD and FFT of plot also shows Prominent mode of oscillating frequency 0.8-0.9 Hz (Local mode).

Critical modes as observed from below plot can be seen as between 0.8-0.9Hz with damping ratio less than 5%



Ringdown and application of Prony Method: 0.875Hz with Damping ration of 0.23 Hz



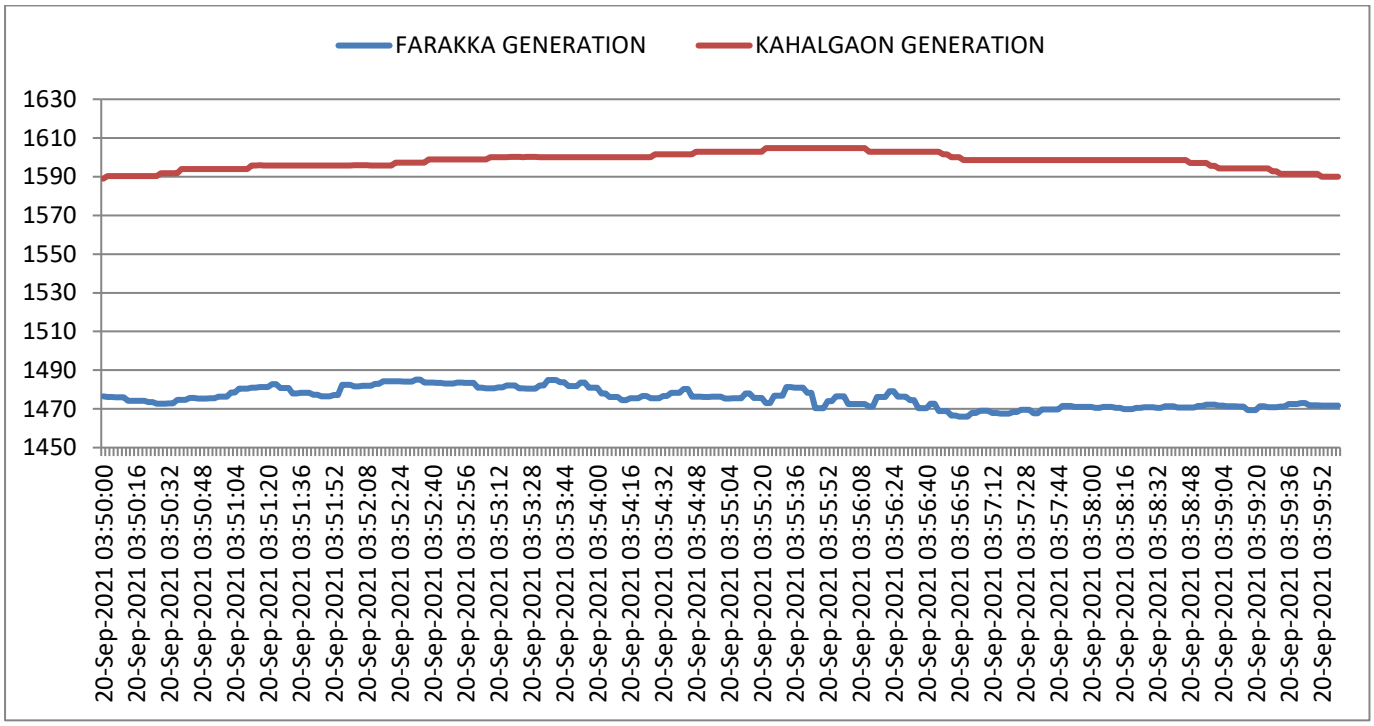
SOURCE OF OSCILLATION:

Scada plot of active power variation of Nearby units:

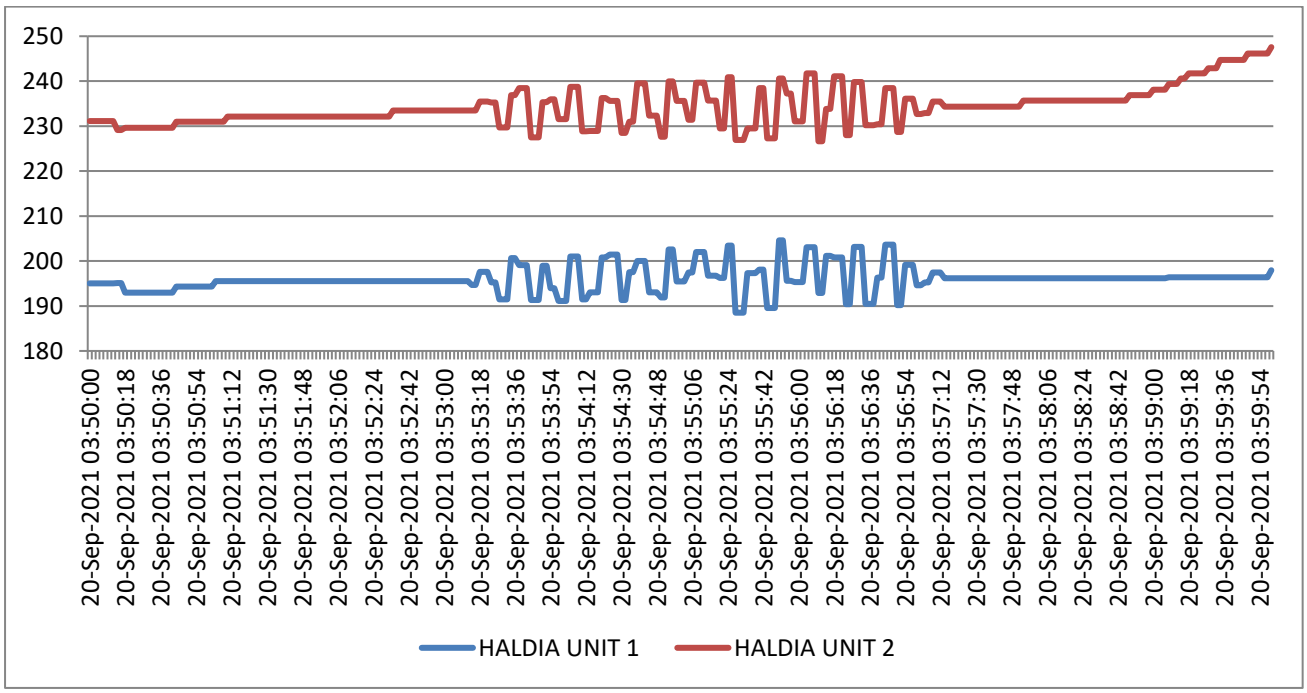
Farakka –Kahalgaon generation:

Farakka overall plant wise only 10 Mw variation unit wise it was only 2 to 3 Mw.

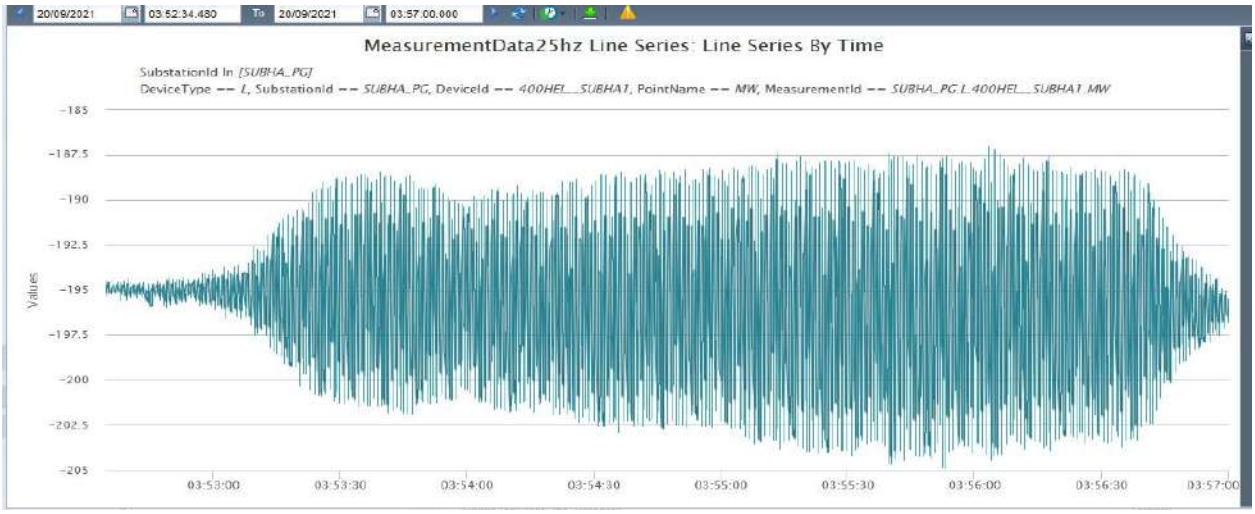
While Kahalgaon no variation observed. This also indicates as we are moving further away from Subhasgram ,units are having less impact .



HALDIA GENERATION VARRIATION: 10 TO 20 Mw in each unit of Haldia observed .

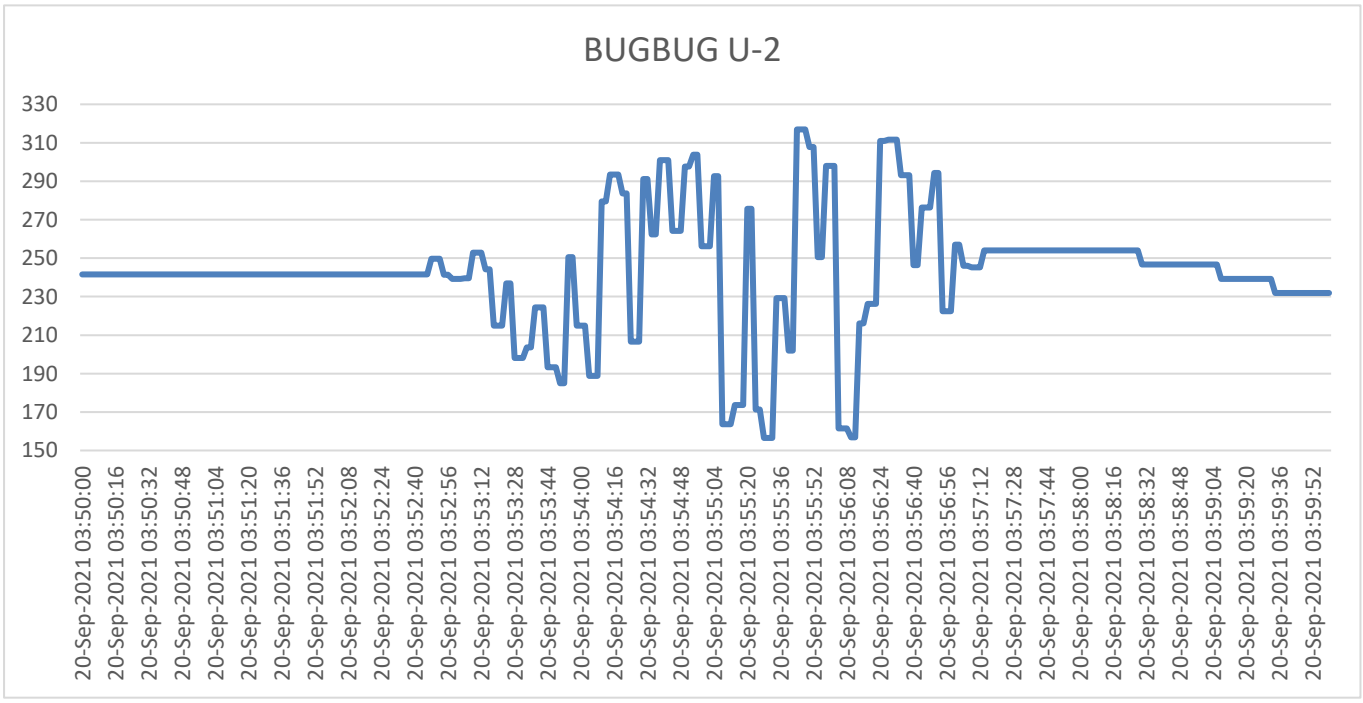


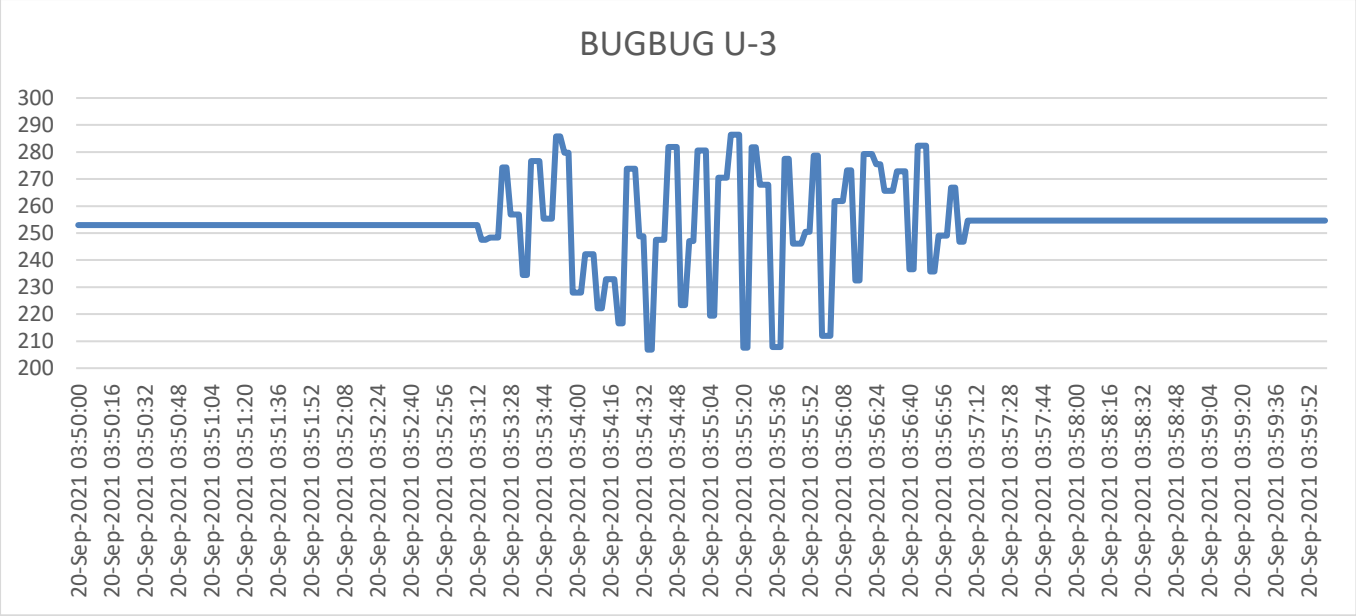
Same was also observed in Haldia Subhasgram power flow variation: 10 Mw variation in each circuit observed as Haldia generation varied.



It was most prominent in Budge-budge units: 140 to 160 Mw variation observed in each unit ,which is maximum and hunting of these units seems to be the source of oscillation .CESC also observed the hunting in these units.

Unit wise variation of Budge-budge Plant:





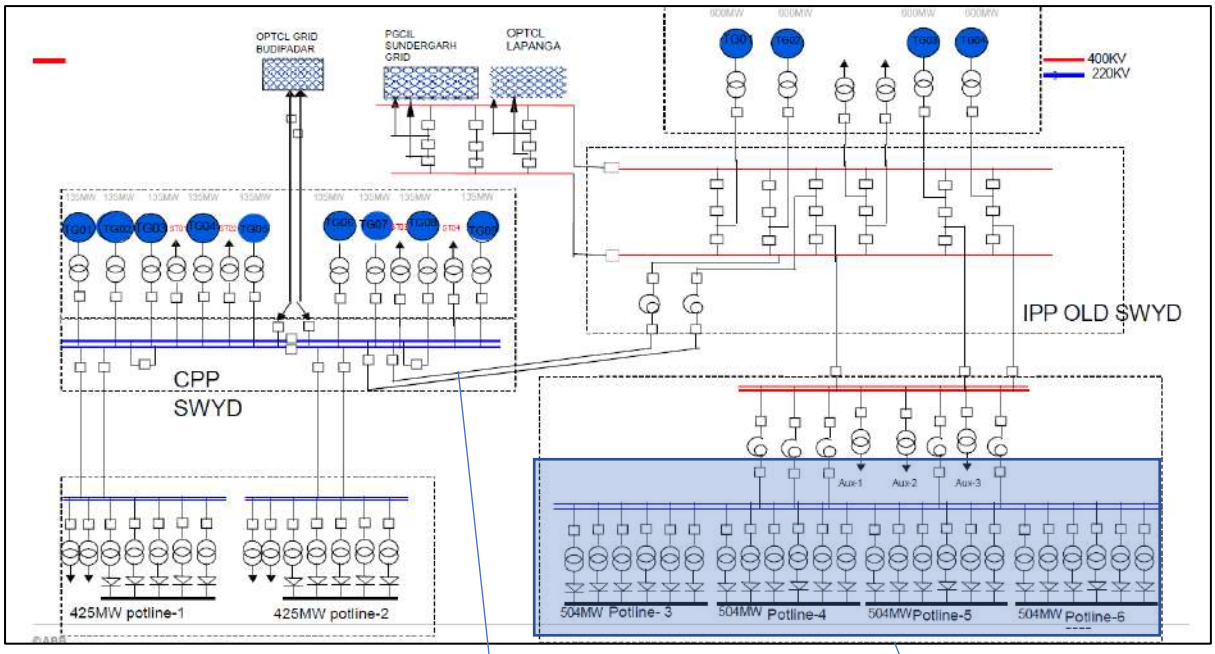
As observed from the above plots maximum variation in MW oscillation was observed for Budge-budge units ,which appears to be the source of oscillation as the Mw variation damped out ,oscillation was also damped .

At 03:46 Hrs BUDGE-BUDGE unit -1 was taken out due to suspected ash bridging over bottom ash hopper and after 8 minutes of taking unit 1 out hunting started .

Detailed root cause analysis from CESC and reasons are required for the hunting of BUDGE-BUDGE units .

EVENT OF SMELTER LOAD TRIPPING ON 28th September

Sterlite SLD:



400 &220 kv are decoupled with each other.

Smelter load at 400 Kv.

Plant scenario prior to event:

- Unit 3 was out and Unit 1,2&4 was running with total **generation of 1232 Mw**.
- Sterlite was **drawing 258 Mw from** Grid ,so **total load was 1490 MW.**

At 17:48 Hrs due to fault in downstream within 400 kv Sterlite switchyard ,Smelter load reduced by 1450 Mw .

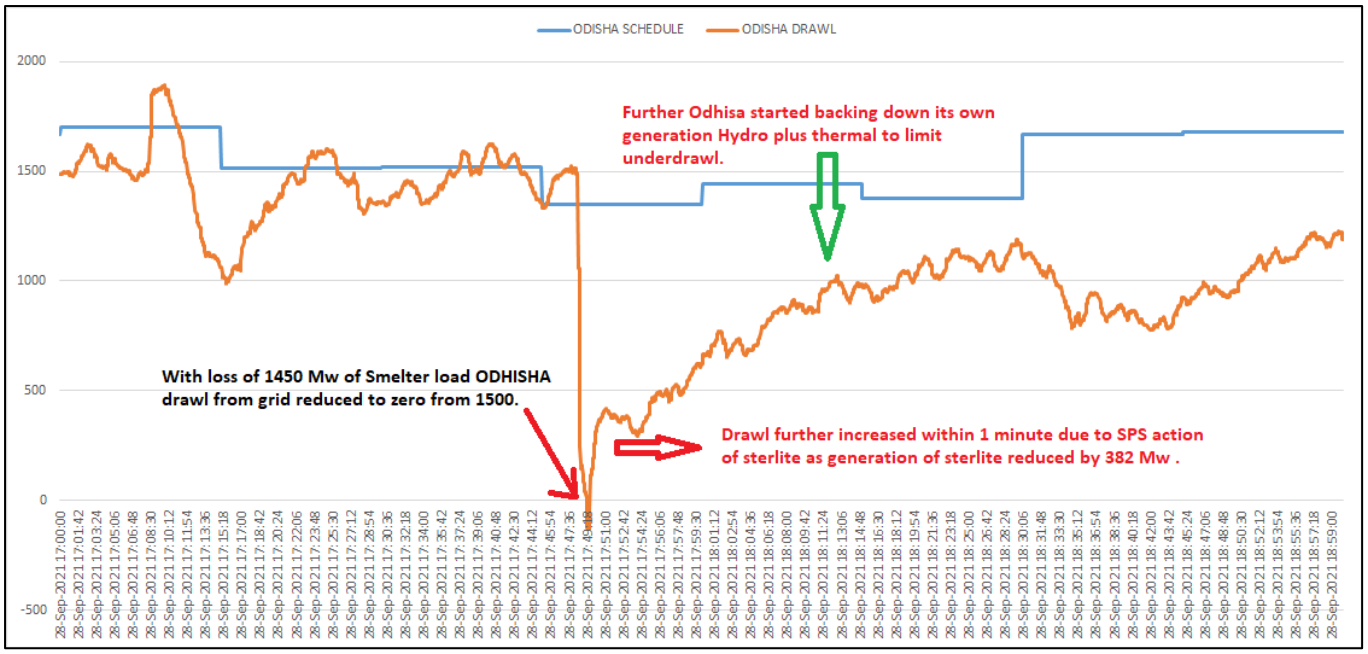
- As Sterlite load reduced ,Sterlite started exporting to the grid by 1182 Mw so total load reduced was 1450 Mw .
- At Sterlite SPS is there to take care of Huge injection in the grid which was set at 800Mw whenever injection is more than 800 MW it will limit it by generation reduction logic .
- Hence total generation to be reduced to limit till 800 Mw was ,1182-800= 382 Mw.

As per logic shown below priority 6 was satisfied

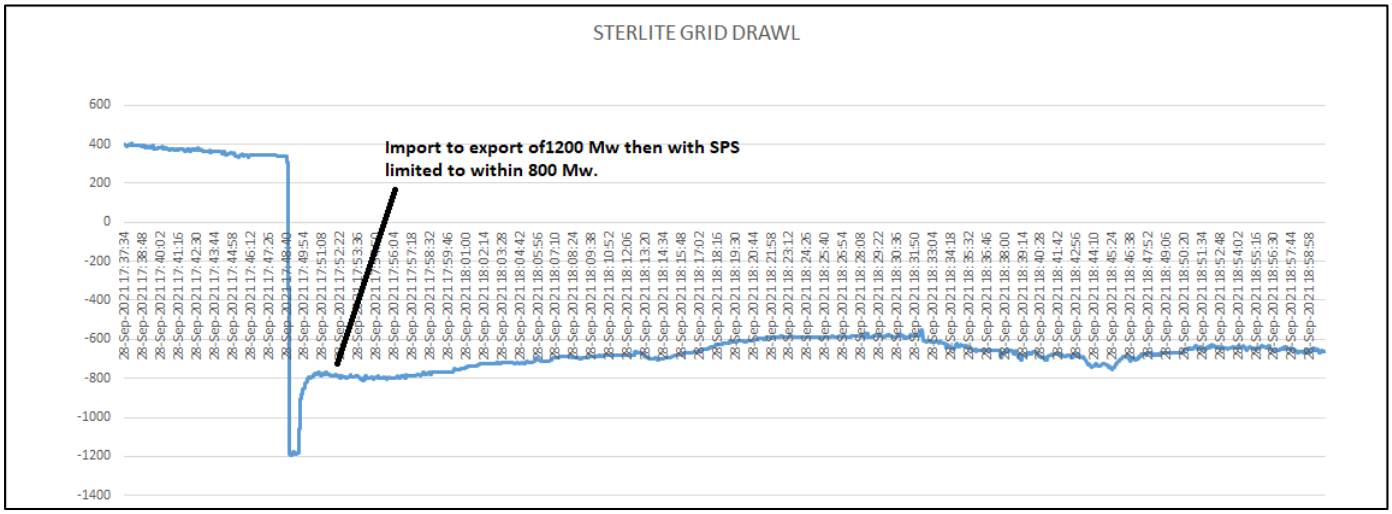
So generator 1 HP,LP Bypass occurred with generator 1 shedding which reduced the grid export within 800 Mw within 1 minutes .

Acuumulated generation shed table	Priority	MW
GEN2 HPLP	1	81.417
GEN2 HPLP+GEN1 HPLP	2	225.621
GEN2HPLP+GEN1 HPLP+GEN 4 HPLP	3	369.45
GEN2HPLP+GEN1 HPLP+GEN 4 HPLP+GEN3 HPLP	4	369.45
GEN2	5	271.39
GEN2+ GEN1 HPLP	6	415.594
GEN2+ GEN1 HPLP+GEN4 HPLP	7	559.423
GEN2+ GEN1 HPLP+GEN4 HPLP+GEN 3 HPLP	8	559.423
GEN2+GEN1	9	752.07
GEN2+GEN1+GEN4 HPLP	10	895.899
GEN2+GEN1+GEN4 HPLP+GEN3 HPLP	11	895.899
GEN2+GEN1+GEN4	12	1231.5
GEN2+GEN1+GEN4+GEN3 HPLP	13	1231.5
GEN2+GEN1+GEN4+GEN3	14	1231.5

ODISHA schedule vs Drawl



Sterlite Drawl from Grid:



Repeated Tripping of 220KV DALTONGANJ – GARWA D/C and related Issues.

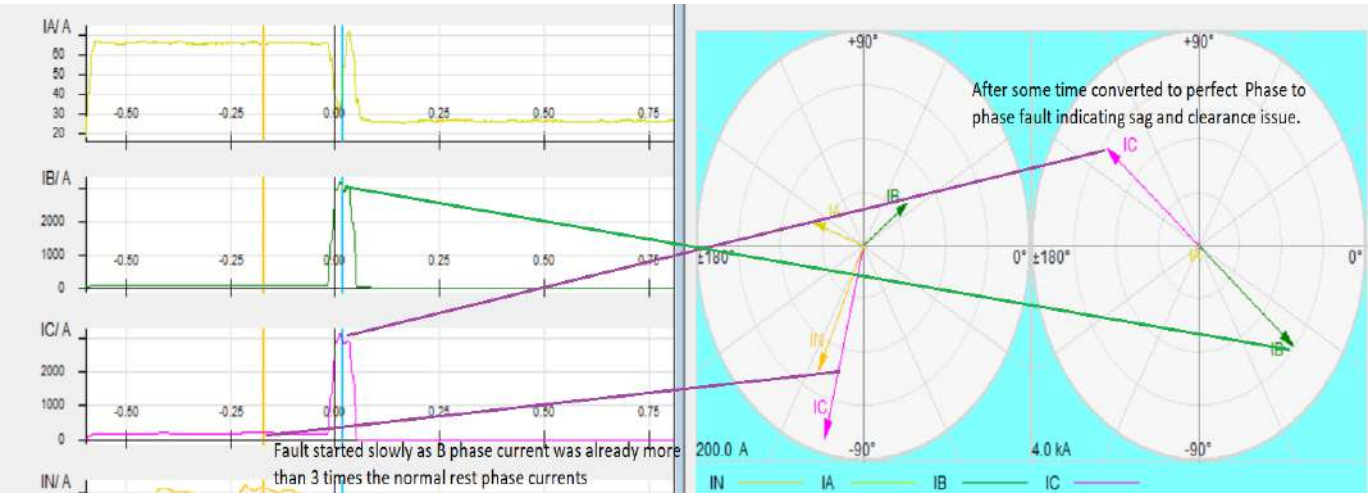
Following tripping's Occurred during month of September and brief remarks are also mentioned. Detailed issues as found are also mentioned below.

Sr No	Element Name	Tripping Date	Tripping Time	Reason	Remarks
1	220KV-DALTONGUNJ-GARWAH (NEW)-2	03-09-2021	12:22	GARWAH: Z1, YB, Iy-518A, Ib-555A, 49.59km DALTONGUNJ: YB, Iy-2.8kA, Ib-2.9kA, 27.6km	B phase fault started first and after some time converted to perfect phase to phase fault indicating, sag and clearance issue. For Phase-to-phase fault at Daltonganj end R phase did not opened and was holding only YB phase opened.
2	220KV-DALTONGUNJ-GARWAH (NEW)-2	06-09-2021	09:16	Garwah B-N, 479.9 A 60.5 km	B phase fault but at Garwa end ,No A/R occurred and breaker was open for some time after that tripped in PD ,while at Daltonganj A/R successful. Arc over occurring at Peak voltage .
3	220KV-DALTONGUNJ-GARWAH (NEW)-2	07-09-2021	14:43	DALTONGUNJ:- R-Y, 64.4KM, Ir=Iy=1.8KA, Z-2 GARWAH:- Z-1, 25.2KM, R-Y, Ir=Ib=1.1KA	y phase fault converted to perfect R-Y phase to phase fault , with fault occurring at Voltage peak.
4	220KV-DALTONGUNJ-GARWAH (NEW)-2	13-09-2021	18:38	Daltongunj: A/R successful,137.7Km,0.978Ka,b-n Garwa New: Z-I, 18.07 kM,Ia=165.9A, Ib=219.3A, Ic=916.2A	B phase fault but at Garwa end ,No A/R occurred and breaker was open for some time after that tripped in PD ,while at Daltonganj A/R successful. Arc over occurring at Peak voltage .
5	220KV-DALTONGUNJ-GARWAH (NEW)-2	17-09-2021	11:23	A/R SUCCESSFUL FROM DALTONGANJ; GARHWA: Z-1, B-N, Fc= 0.88 kA, Fd= 54.25km	B phase fault but at Garwa end ,No A/R occurred and breaker was open for some time after that tripped in PD ,while at Daltonganj A/R successful. Arc over occurring at Peak voltage .
6	220KV-DALTONGUNJ-GARWAH (NEW)-2	26-09-2021	15:31	Garwah: B-N,1.4kA, 65Km , Daltongunj - did not trip	B phase fault , A/R unsuccessful at both end in ckt-1 while ckt-2 tripped from only Garwa end .Current reversal guard implementations to be checked as racing has caused tripping of ckt-1.

- **Fault Nature ,Sag and Clearance Issue:**

It can be observed from below plots that B phase current started rising slowly and then got converted to perfect phase to phase fault (as phase currents of Y and B are 180 degree apart) due to arc over at voltage peak instance. B phase was involved in each fault.

Same phenomenon as mentioned above is observed in almost all cases, which indicates that the fault i**s occurring due to sag and clearance issues, hence** proper line patrolling and healthiness of line should be maintained, same kind of fault nature was also observed in this line few months ago which was resolved by, jumper tightening and tree pruning at some locations. This needs to be looked into again and taken care.



ARC OVER AT Volatge Peak:

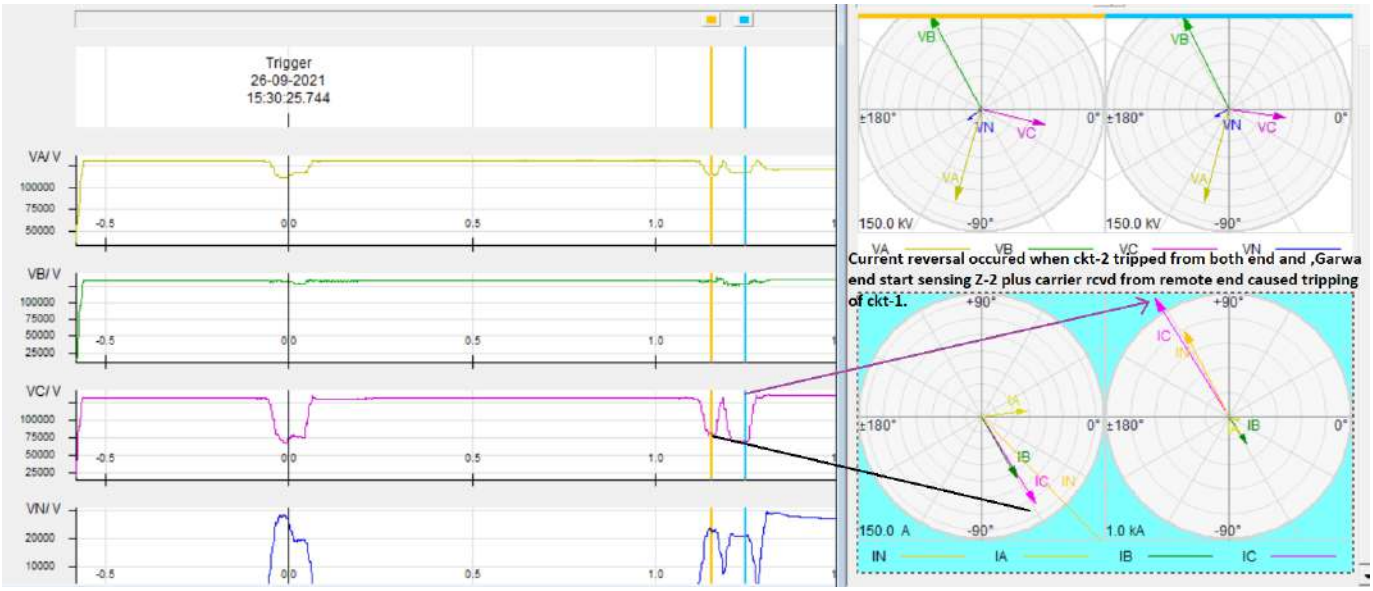
- **Non-Operation of Auto Reclose:**

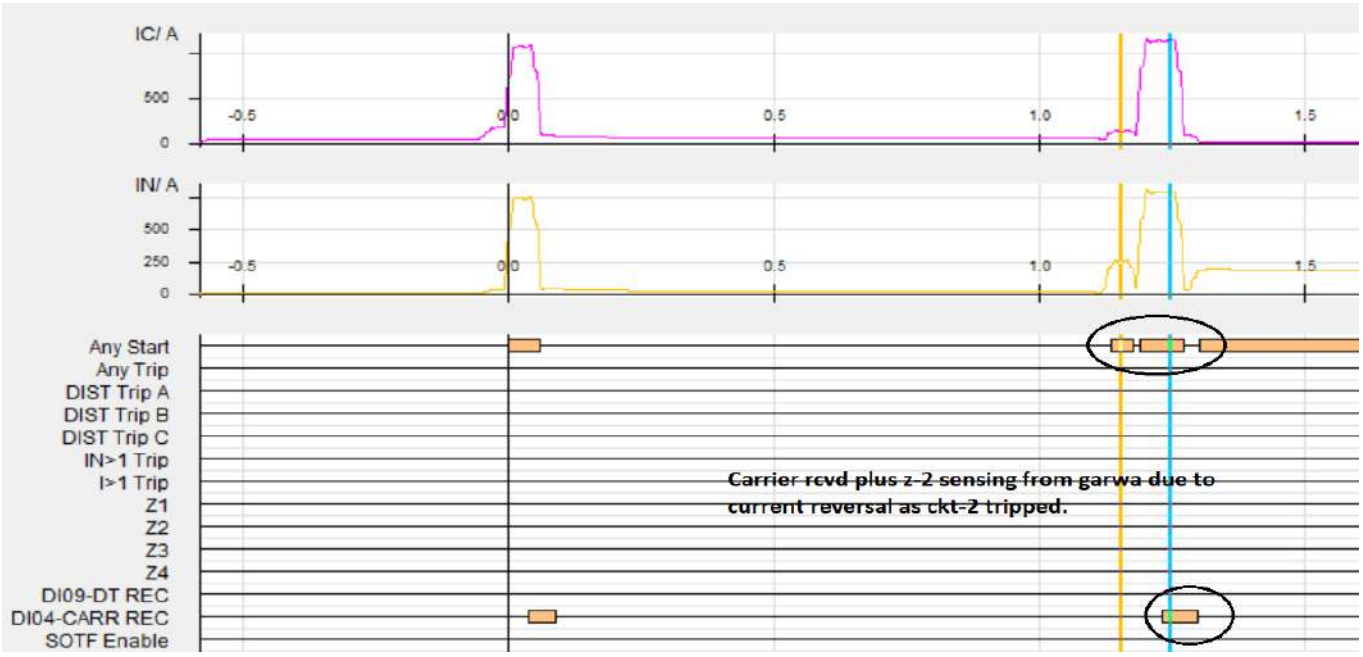
At 3 instances it was observed that for B-Earth single phase fault Single(B) phase opening is occurring at Garwa end but ,after dead time A/R is not occurring and B phase kept opened until Pole discrepancy operated and caused tripping of line .For all these instances A/R was successful from Daltonganj end proper A/R operation at Garwa end could have avoided tripping .

- **Implementation of proper Current Reversal guard for POTT scheme:**

As the line is radial in nature POTT scheme is implemented, it was observed that on 26th for the fault in Ckt-2 both lines tripped .

- At the A/R instance of ckt-2 ,Daltonganj end of ckt-1 was sensing the fault of ckt-2 in Zone-2 and was sending carrier to Garwa end .
- Then as the A/R of Ckt-2 got failed and ckt-2 opened from garwa end ,suddenly current reversal took place and Garwa end of ckt-1 started sensing the same fault in zone -2 ,and it was receiving the carrier also so tripping condition for ckt-1 at Garwa end got satisfied and caused the ckt-1 tripping from Garwa end only(can be observed from below plot) .This also caused the load loss at Garwa.
- Proper implementation of Current reversal guard needs to be ensured to avoid such tripping


Trigger
26-09-2021
15:30:25.744
VA/ V
VB/ V
VC/ V
VN/ V
VB
VN
VC
VA
±180°
0°
-90°
150.0 kV
VA VB VC VN
Current reversal occured when ckt-2 tripped from both end and ,Garwa end start sensing Z-2 plus carrier rcvd from remote end caused tripping of ckt-1.
+90°
IC
IN
IB
150.0 A
1.0 kA
IN IA IB IC


IC/ A
IN/ A
Any Start
Any Trip
DIST Trip A
DIST Trip B
DIST Trip C
IN>1 Trip
I>1 Trip
Z1
Z2
Z3
Z4
DI09-DT REC
DI04-CARR REC
SOTF Enable
Carrier rcvd plus z-2 sensing from garwa due to current reversal as ckt-2 tripped.

TENUGHAT ISLANDING STUDY

1. Introduction:

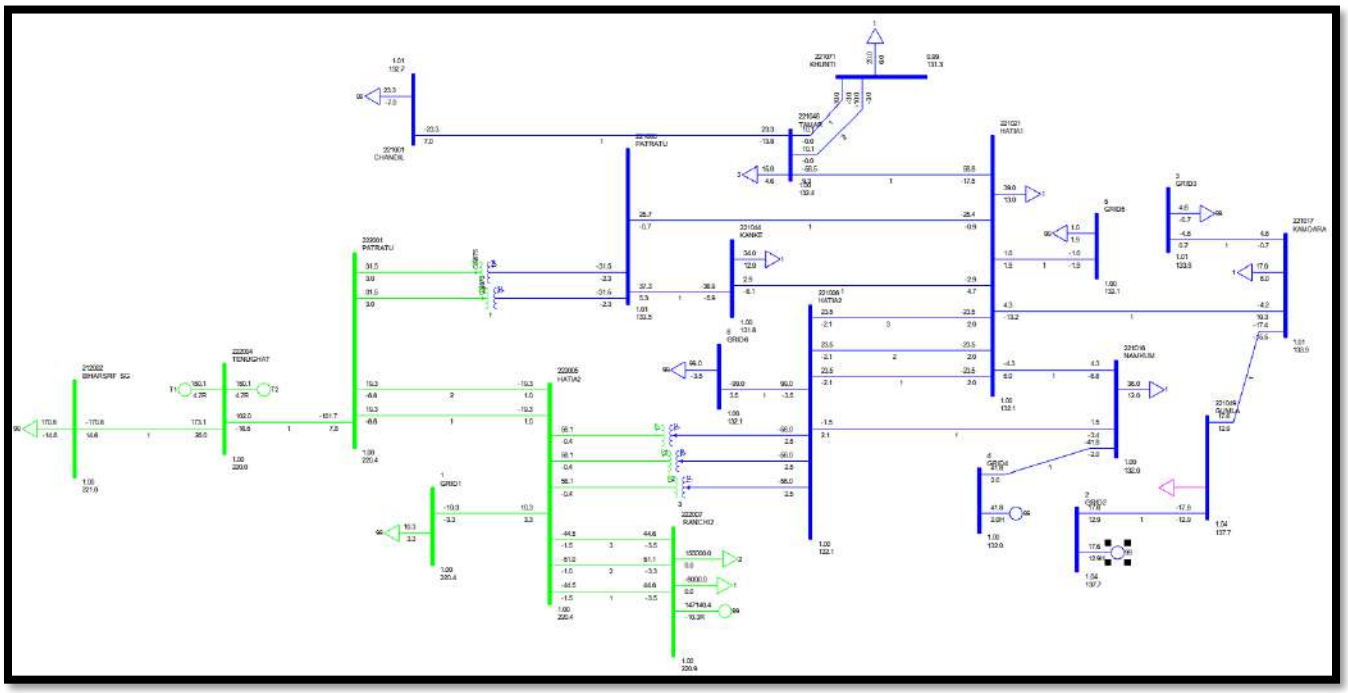
One of the key features of a resilient power system is robust islanding scheme. Success of an islanding scheme depends on the design as well as implementation of the logic. Logic needs to be robust as well as simple. Extensive study is required to design an effective islanding scheme. For TENUGHAT islanding scheme design various preliminary studies are done and the results are discussed below. However these studies are done based on certain assumption (which will be discussed below) and its purpose is to check the broader feasibility of an islanding scheme. Hence the final islanding logic must be finalized by the respective generating plants in consultation with their OEM.

2. Modeling:

A. Network:

Network modeling data is taken from latest PSSE base case as shared by Jharkhand SLDC. Only the part of Jharkhand network which corresponds to the Island to be formed, is taken into consideration. Rest of the grid is modeled as an equivalent generator or load.

In one of the equivalent generator bus(Ranchi Bus 222007) two loads are added: 1) Load 1 is a negative load and used for creating the frequency disturbance during the dynamic simulation. 2) Load 2 is All India load



B. Generator:

TENUGHAT generators are modeled as “GENROU” (cylindrical rotor synchronous machine) based on the OCC magnetization curve. The parameters of “GENROU” are populated based on the similar machine data:

Model GENROU for machine at bus 222004 'T1'

Model CONS | Model ICONS | Model VARS

	Con Value	Con Description
1	8.5000	T'do (> 0)
2	0.0400	T"do (> 0)
3	2.5000	T'qo (> 0)
4	0.1500	T"qo (> 0)
5	3.7340	H, Inertia
6	0.0000	D, Speed Damping
7	1.8280	Xd
8	1.7360	Xq
9	0.2290	X'd
10	0.4810	X'q
11	0.1790	X"d = X"q
12	0.1570	Xl
13	0.1201	S(1.0)
14	0.5981	S(1.2)

Figure 1: TENUGHAT generator parameters.

The equivalent generator representing the All-India grid is modeled by a simple classical cylindrical rotor “GENCLS” model and its Inertia value is used as per the inertia calculated during real frequency excursion event in the grid.

A. Exciter and PSS:

The BHEL brushless excitation system of TENUGHAT is represented by ST1C model of PSSE library :

Model ST1C for machine at bus 222004 'T1'

Model CONS | Model ICONS | Model VARS

	Con Value	Con Description
1	0.0200	TR (sec)
2	99.0000	VI MAX
3	-99.0000	VI MIN
4	1.0000	TC (sec)
5	3.6364	TB (sec)
6	0.0200	TC1 (sec)
7	0.0138	TB1 (sec)
8	200.0000	KA
9	0.2000	TA (sec)
10	6.0000	VA MAX
11	-6.0000	VA MIN
12	6.0000	VR MAX
13	-6.0000	VR MIN
14	0.0696	KC
15	0.0000	KF
16	1.0000	TF > 0 (sec)
17	0.0000	KLR
18	1.0000	ILR

Figure 2: TENUGHAT exciter model AC6C

C. Governor model:

BHEL governor model and parameters not received from Tenughat. Therefore, model from similar capacity machine and make is used and following parameters are considered in simulation:

Model IEEEG1SDU for machine at bus 222004 'T1'

Model CONS | Model ICONS | Model VARS

	Con Value	Con Description
1	17.0000	K
2	0.1000	T1
3	0.0300	T2
4	0.1500	T3 (> 0)
5	0.1300	Uo
6	-1.0000	Uc (< 0.)
7	0.4700	PMAX
8	0.4000	PMIN
9	0.1700	T4
10	0.2660	K1
11	0.0000	K2
12	8.2500	T5
13	0.3295	K3
14	0.0000	K4
15	0.4200	T6
16	0.4045	K5
17	0.0000	K6
18	0.0000	T7
19	0.0000	K7
20	0.0000	K8
21	0.0000	DBH (pu freq. deviation), deadband for overspeed. (>=0)
22	0.0000	DBL (pu freq. deviation), deadband for underspeed. (<=0)
23	0.0000	Trate (MW), Turbine rating, if zero, then MBASE used

Figure 3: TENUGHAT Turbine and governor Model

However, the above model doesn't take for the RGMO and maximum output limit. 5% of MCR value is used for maximum governor output.

During few simulation the lower limit of the governor is not restricted to 5% of MCR , the reason is as follows:

We know that there is a speed controller in generator, which starts unloading the unit even beyond the 5% limit of RGMO when speed crosses some value and speed controller takes over the load controller. Also HP-LP bypass system is there for quick load reduction.

C. Load modeling:

Loads are modeled as below:

Real Power: 100% Constant Current

Reactive Power: 100% Constant Admittance

Frequency dependency of the load is not modeled.

3. Design logic:

Following points are considered in designing the islanding logic:

i. Frequency setting for last stage of the existing All-India UFLS scheme is 48.8 HZ; therefore island formation should happen below this frequency with sufficient margin.

ii. Inside the Island it is assumed that there is no UFLS relays as per grid side requirement.

iii. However, during few scenarios after the formation of the island, island may be generation deficit. To tackle such some UFLS scheme is designed for island. But this UFLS scheme starts much below the grid side UFLS scheme.

iii. Present frequency protection setting for TENUGHAT units is as follows:

UNIT1:
Under Frequency: 47.3 Hz,1.5sec
Over frequency: 52 .7Hz, 1 sec

UNIT2:
Under Frequency: 47.5 Hz, 1.5 sec
Over frequency: 53.13 Hz, 1 sec

However, over speed setting as per C&I are: STAGE1-3180 rpm and STAGE2-3250 rpm.

Based on the above inputs following islanding logic is proposed:

i. Islanding should commence before pick up of any of the under-frequency protection stage of TENUGHAT units and that's why island formation will start at 48.4 Hz with a delay of 1 sec. (however it would be better to keep it 500 ms, TENUGHAT may suggest)

ii. Under frequency inside the island is proposed to trigger at 48.2 Hz. The details is as follows

48.2 HZ 500msec 30 % of island load

48 Hz 500 msec 10% of Island load

47.8 Hz 500 msec 10 % of Island load

iii. The island is generation excess for all the scenario and therefore one unit tripping is proposed based on the generation excess. If generation inside the island is 50 MW more than the generation then one unit should be tripped immediately at the time of island formation.

4. Simulation:

Different LGB scenario is studied in the simulation for checking the robustness of the proposed scheme. Details of different scenario are summarized as follows:

Scenario	Generation	Load	Surplus(+)/Deficit(-)
Scenario-1	300 MW	161+25 MW	114 MW
Scenario-2	300MW	84+25 MW	190 MW
Scenario-3	220 MW	161+25 MW	34 MW
Scenario-4	220 MW	84+25 MW	111MW

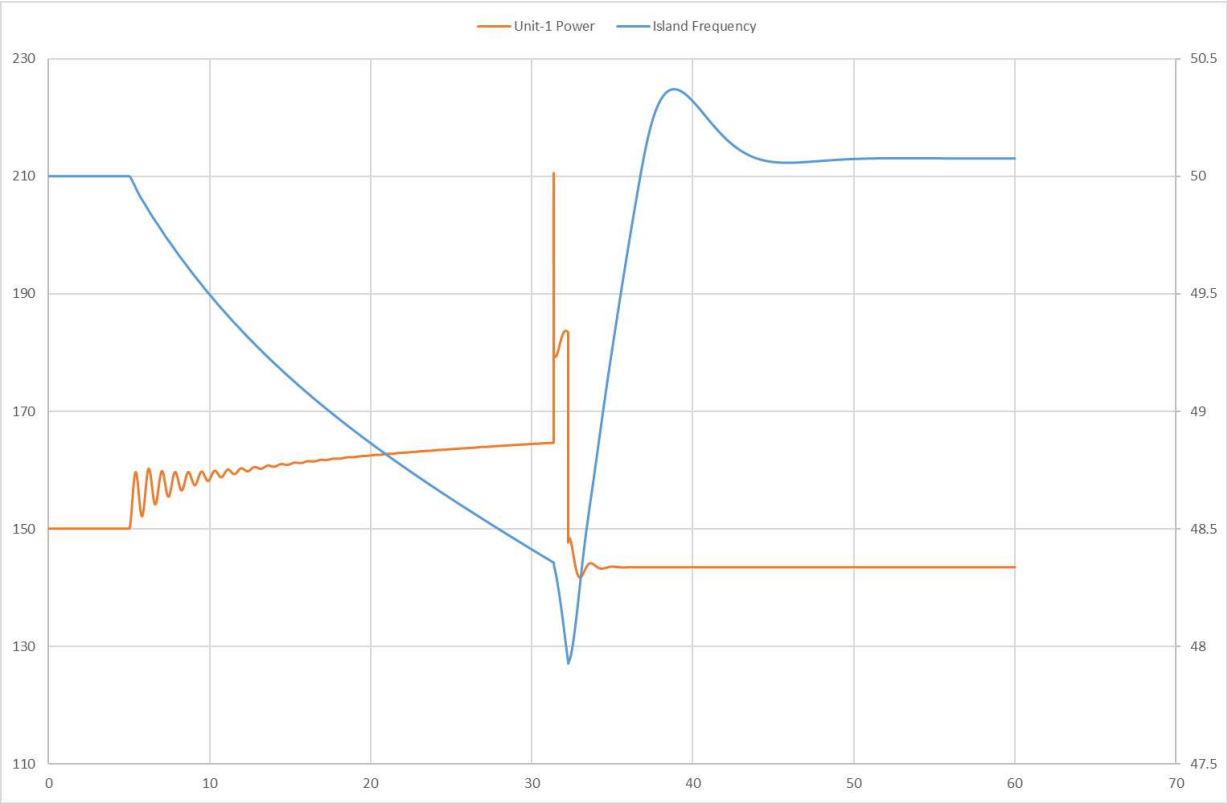
The above LGB is prepared based on input from SLDC.

With above islanding logic following steps are followed:

Step-1. First a grid disturbance is created by tripping 8000 MW generation (i.e. the negative load). This triggers the island formation logic in which the equivalent generator or load buses are tripped, 1 sec after the frequency drops to 48.6 Hz. And island is formed

Step-2. After formation of island the simulation is further carried out for 60 sec to check stabilization of the island frequency with all generator protection and island UFLS in action.

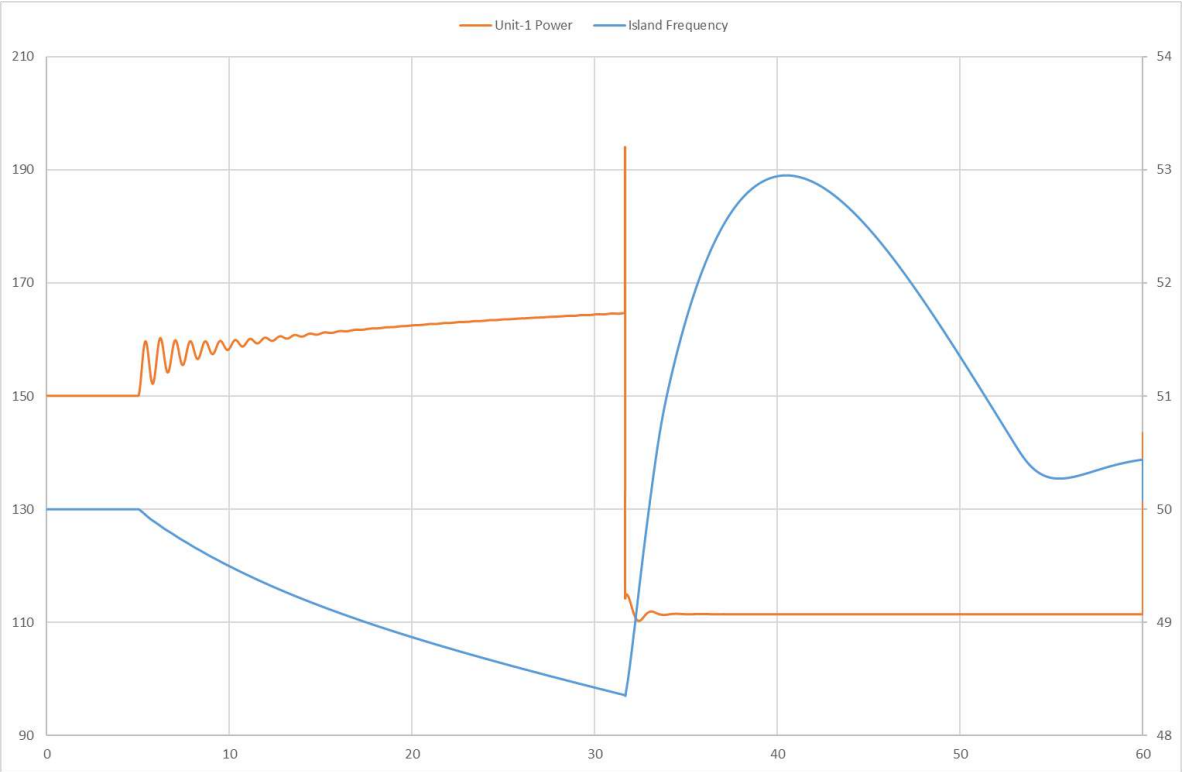
Scenario-1: Maximum generation & Maximum load



Discussion:

1. In max generation max load scenario there is 114 MW surplus generation inside the Island if both unit is considered. However if one unit is considered then the island is 35 Mw deficit.
2. Here one unit inside the island is tripped immediately after island is formed.
3. With this setting island frequency stabilizes around 50.07 Hz

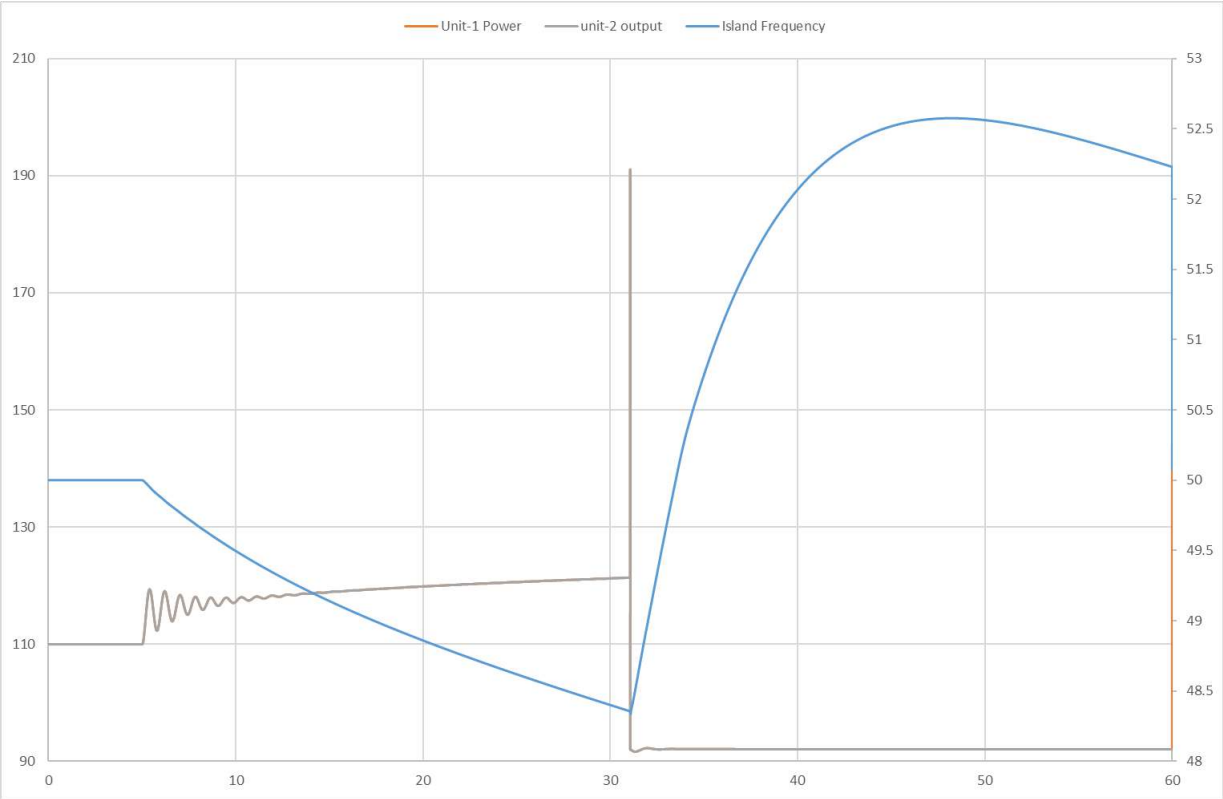
Scenario-2 : Maximum generation & Minimum load



Discussion:

1. In max generation min load scenario there is 190 MW generation surplus inside the Island
2. Therefore after island formation frequency start raising at faster rate, as the inertia of the island is low.
3. One unit is therefore tripped immediately
4. The island is survived with 50.43 Hz frequency.

Scenario-3: Minimum generation & Maximum load

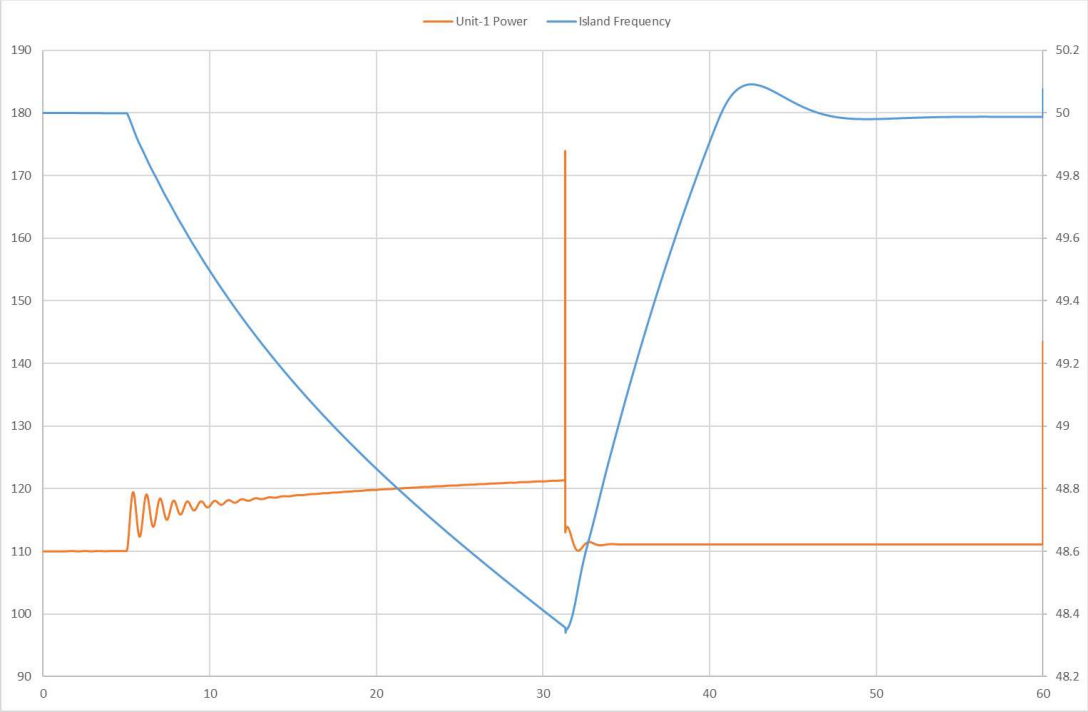


Discussion:

1. In min generation max load scenario there is 34 MW generation surplus inside the Island
2. Therefore after island formation frequency start rising fast, as the inertia of the island is low.
3. With this setting finally island frequency stabilizes around 52 Hz.
4. Here Both the unit survived

Scenario-4: Minimum generation & Minimum load

In scenario fourth the island is 111 MW generation surplus.



Discussion:

1. In min generation max load scenario there is 111 MW generation surplus
2. Therefore, one unit is tripped and the island is stabilized at 49.98 HZ.

5. Summary:

Logic	Islanding at 48.4 HZ and 1 sec, UFLS(Inside island): 48.2 Hz, 500ms 30% of Island load 48.0 Hz 500 ms 10 % of Island load 47.8 Hz 500 ms 10 % of Island load				
	Generation	**Load**	**Surplus/Deficit**	**Number of unit survived**	**Remarks**
Scenario-1	300 MW	186 MW	114 MW	1 unit	In this scenario, island can be survive with two unit also. However change in logic will be required.
Scenario-2	300MW	110 MW	190 MW	1 unit	
Scenario-3	220 MW	186 MW	36 MW	2 unit	
Scenario-4	220MW	110 MW	111 MW	1 unit	

Based on the above study following islanding logic is proposed:

i. Islanding should happen before pick up of any of the frequency protection stage and that's why island formation will start at 48.4 Hz with a delay of 1 sec.

ii. Under frequency inside the island is proposed to trigger at 48.2 Hz. The details is as follows

48.2 HZ 500 ms 30 % of island load
48.0 Hz 500 ms 10% of Island load
47.8 Hz 500 ms 10 % of Island load

iii. However the over frequency trip setting of unit -1 may be changed from 52.7 to 53 Hz . Tenughat have to confirm it.

Limitation of the study:

1. In absence of any guideline for islanding study, we have applied a frequency disturbance in the grid and grid is simulated with closely matching inertia and Governor Response. However it is well known that during such large disturbance lot of other protective control features of various generators, other equipment may come into picture. Also UFLS of grid side impacts the frequency dynamics and the ROCOF. Those phenomena are difficult to consider in the study. Therefore not considered here.
2. The exact governing behavior of the units has high impact on the island study, however those detailed model of a plant considering influences from speed and pressure control loop is not modeled here. Plants may consult OEM for the detailed study considering those control action.
3. Initial ROCOF has also has huge impact of island stability after separation, however this ROCOF depends on lot of things and very difficult to predict. Also there is no guideline in Indian context what ROCOF should be considered during such study.
4. Therefor the above study is only showing a tentative frequency excursion of the island and helping in arriving at a suitable starting logic.

Annexure B.11

List of important transmission lines in ER which tripped in SEPTEMBER-2021

S.NO	LINE NAME	TRIP DATE	TRIP TIME	RESTORATION DATE	RESTORATION TIME	Relay Indication LOCAL END	Relay Indication REMOTE END	Reason	Fault Clearance time in msec	Remarks	LOCAL END UTILITY	REMOTE END UTILITY	Utility Response
1	220KV DARBHANGA (DMTCL)-LAUKAHI-2	01-09-2021	08:44	01-09-2021	09:24	Darbhanga: B_N, Z I, 68.56 km, 1.425 kA	Laukahi: B_N, 68.56 km, 1.425 kA	B-Earth	100	Three phase tripping for single phase fault from both ends.	DMTCL	BSPTCL	
2	400KV MERAMUNDALI-LAPANGA-1	01-09-2021	10:02	01-09-2021	12:46	Meramundali: B_N, 188 km, 2.5 kA	Lapanga: B_N, 3.582 km, 20.86 kA	B-Earth	100	A/r failed.But at Lapnaga end MCB &TCB are reclosing one after another within 100ms causing repeated fault feeding.	OPTCL	OPTCL	
3	220KV TENUGHAT-PATRATU-1	01-09-2021	11:01	01-09-2021	13:29	Tenughat: Y_N	Patratu: Y_N, 20.64 km, 7.07 kA	Y-Earth	100	Three phase tripping for single phase fault. A/r not in service	JUSNL	JUSNL	
4	220KV JODA-RAMCHANDRAPUR-1	01-09-2021	11:20	01-09-2021	12:20	Joda: Y_N, 1.55 kA	Ramchandrapur: 4.4 km, 0.75 kA	Y-Earth	700	Tripped on DEF protection from Joda in 700 msec F/c was 1.6ka why Distance did not picked at Joda end . Single phase tripping within 100 msec from Ramchandrapur	OPTCL	JUSNL	
5	220KV TENUGHAT-PATRATU-1	02-09-2021	10:14	02-09-2021	18:04	Tenughat: B_N, 2.326 kA, 39.46 km		B-Earth	100	All three phases tripped from Tenughat within 100 msec for single phase fault.	JUSNL	JUSNL	

6	220KV JODA-RAMCHANDRAPUR-1	02-09-2021	10:20	02-09-2021	11:16	Joda: 41 km, 0.5 kA	Ramchandrapur: 97.4 km, 1.9 kA	R-Earth	900	R_ph opened from Joda within 100 msec, rest two phase opened after 500 msec.	OPTCL	JUSNL	
7	220KV BUDHIPADAR-KORBA-1	02-09-2021	12:18	02-09-2021	14:14	Budhipadar: B_N, 104.2 km		B-Earth	100	Three phase tripping for single phase fault	OPTCL	WR	
8	400KV MERAMUNDALI-LAPANGA-1	02-09-2021	14:36	02-09-2021	17:54		Lapanga: Y_N, 67.6 km, 4.5 kA	Y-Earth	100	end MCB &TCB are reclosing one after another within 100ms causing repeated fault feeding.	OPTCL	OPTCL	
9	220KV JODA-RAMCHANDRAPUR-1	03-09-2021	10:24	03-09-2021	11:10	Joda: R_N, Z I, 42.37 km, 1.377 kA	Ramchandrapur: R_N, 98.4 km, 1.89 kA	R-Earth	150	A/r not in service. Fault cleared within 150 msec from RCP.	OPTCL	JUSNL	
10	220KV TENUGHAT-BIHARSHARIF-1	03-09-2021	10:51	03-09-2021	11:41	Tenughat: R_N, Z I, 1.47 kA, 88.1 km	Biharsharif: R_N, Z I, 1.236 kA, 113.9 km	R-Earth	100	Three phase tripping for single phase fault	JUSNL	BSPTCL	
11	400KV PATNA-KISHANGANJ-2	03-09-2021	11:54	03-09-2021	13:43	Patna: R_N, Z I, 1.7 kA, 25 km	Kishanganj: R_N, 3.2 kA, 123 km	R-Earth	100	A/r failed	PG ER-1	PG ER-1	
12	220KV DALTONGUNJ-GARWAH(NEW)-2	03-09-2021	12:22	03-09-2021	20:13	Daltongunj: Y_B, Iy:2.8 kA, Ib: 2.9 kA, 27.6 km	Garwah: Y_B, Iy: 0.51 kA, Ib: 0.55 kA, 49.59 km	Y_B-Earth	100	R_ph breaker didn't open from Daltonganj for 3 seconds.Reason for same may be mentioned.	PG ER-1	JUSNL	
13	220KV BEGUSARAI-NEW PURNEA-1	03-09-2021	13:21	03-09-2021	18:41		New Purnea: B_N, Z I, 137.4 km, 1.7 kA	B-Earth	100	Time-length of DR is less at New Purnea. A/r operation cannot be ascertained.	BSPTCL	PG ER-1	
14	220KV CHANDIL-SANTALDIH(STPS)-1	03-09-2021	13:54	03-09-2021	14:21	Chandil: R_N, Z I, 1.75 kA, 101.1 km	Santaldih: R_N, 17.9 km, 4.007 kA	R-Earth	100	Z-1 from Chandil .	JUSNL	WBSETCL	
15	220KV CHANDIL-SANTALDIH(STPS)-1	03-09-2021	17:50	03-09-2021	18:22	Chandil: R_N, Z I, 2.61 kA, 30.07 km	Santaldih: R_N, Z II, 93.282 km, 9.230 kA	R-Earth	350	Z-2 from Chandil .	JUSNL	WBSETCL	
16	220KV CHANDIL-RANCHI-1	03-09-2021	23:15	04-09-2021	16:37	Chandil: B_N, 2.09 kA, 44.4 km, A/r failed	Ranchi: B_N, 4.316 kA, 36.893 km	B-Earth	350	Carrier signal sent from Ranchi but line tripped from Chandil in Z II time. A/r failed from Ranchi end	JUSNL	PG ER-1	

17	220KV BEGUSARAI-NEW PURNEA-1	04-09-2021	09:01	04-09-2021	21:34	Begusarai: B_N, Z I, 59.83 km, 2.981 kA	New Purnea: B_N, 117.26 km, 1.64 kA	B-Earth	100	Time-length of DR is less at New Purnea. A/r operation cannot be ascertained.	BSPTCL	PG ER-1	
18	220KV CHANDIL-SANTALDIH(STPS)-1	04-09-2021	09:50	04-09-2021	10:16		Santaldih: R_N, 18 km, 4.69 kA	R-Earth	200	3 phase tripping from chandil end for single phase fault	JUSNL	WBSETCL	
19	400KV PATNA-KISHANGANJ-2	04-09-2021	10:41	04-09-2021	11:38		Kishanganj: R_N, 134.33 km, 2.79 kA	R-Earth	100	A/r failed. DR of A/r instance uploaded	PG ER-1	PG ER-1	
20	220KV CHANDIL-SANTALDIH(STPS)-1	04-09-2021	11:49	04-09-2021	12:27	Chandil: B_N, 50.1 km, 1.5 kA	Santaldih: AR successful	B-Earth	100	3 Phase tripping from Chnadil END ,A/R successful from STPS end.	JUSNL	WBSETCL	
21	400 KV KHARAGPUR-KOLAGHAT-1	04-09-2021	11:57	04-09-2021	12:23	Kharagpur: R_N, Z I, 15.7 km, 9.338 kA	Kolaghat: R_N, Z I, 77.67 km, 4.534 kA	R-Earth	100	A/R unsuccessful ,fault at same location	WBSETCL	WBSETCL	
22	400 KV KHARAGPUR-KOLAGHAT-1	04-09-2021	12:26	04-09-2021	16:39	aragpur: R_N, Z I, 15 km, 9.4	Kolaghat: R_N, Z I, 77 km, 4.5 kA	R-Earth	100	A/R unsuccessful ,fault at same location	WBSETCL	WBSETCL	
23	220KV MUZAFFARPUR-HAJIPUR-1	04-09-2021	12:54	04-09-2021	13:31		Hajipur: B_N, Z I, 20.5 km, 2.82 kA	B-Earth	100	Three phase tripping from Muzaffarpur for single phase fault	PG ER-1	BSPTCL	
24	220KV NEW PURNEA-MADHEPURA-1	05-09-2021	11:08	06-09-2021	15:20	New Purnea: Y_B, Z I, Iy=Ib=13.37 kA		Y_B	130	A/r operated from Madhepura but at the A/R instance Phase to phase fault in zone-2 sensed and tripped after 350 ms due to non receipt of carrier .This may be looked.. Y_ph conductor snapped at loc. 42	PG ER-1	BSPTCL	
25	220KV BUDHIPADAR-RAIGARH-1	05-09-2021	11:37	05-09-2021	14:49	Budhipadar: B_N, 27.8 km, 3.46 kA	Raigarh: B_N, 64.84 km, 2.79 kA	B-Earth	100	Three phase tripping for single phase fault	OPTCL	WR	

26	220KV DALTONGUNJ-GARWAH(NEW)-2	06-09-2021	09:16	06-09-2021	09:52		Garwah: B_N, .48 kA, 60.5 km	B-Earth	100	attempt not taken at Garwah. PD time also maybe checked at garwa .A/R seems successful fromDaltonganj end.	PG ER-1	JUSNL	
27	400KV PPSP-BIDHANNAGAR-2	06-09-2021	14:06	06-09-2021	14:37	PPSP: R_N, Z I, 101.9 km	Bidhannagar: R_N, Z I, 47.5 km, 5.325 kA	R-Earth	100	No A/R .	WBSETCL	WBSETCL	
28	400/220 KV ICT-1 AT JAMSHEDPUR	06-09-2021	17:43	06-09-2021	19:50	Tripped from 220kV side while working on main bus-1 PT of Ramchandrapur				Reason of tripping maybe shared by JUSNL	PG ER-1	NA	
29	220KV CHANDAUTI-SONENAGAR-1	06-09-2021	17:44	06-09-2021	18:06		Sonenagar: R_N, 1.957 kA, 32.83 km	R-Y-B	100	Three phase fault	PMTL	BSPTCL	
30	400 KV KISHANGANJ-TEESTA III-1	07-09-2021	02:31	07-09-2021	02:56	Kishanganj: B_N, Z III, 2.14 kA	Teesta III: B_N, Z I, 1.2 kA	B-Earth	900	Tripped on DEF protection from Kishanganj and DT sent to Teesta III.While at Teesta 3 end B phase breaker tripped in zone-1 ,which should not occur as fault currnet was very low.Why z-1 picked at Teesta 3	PG ER-1	TUL	
31	220 KV MAITHON-DHANBAD-1	07-09-2021	12:48	07-09-2021	13:18	Maithon: R_N, 62 km, 3.14 kA, A/r successful	Dhanbad: R_N, 3.63 kA, 11.60 km	R-Earth	100	A/r successful from Maithon end only.From Dhanbad 3 phase trippping occurred	PG ER-2	DVC	
32	220 KV MAITHON-DHANBAD-2	07-09-2021	12:48	07-09-2021	13:18	Maithon: R_N, 49.3 km, 3.19 kA, A/r successful	Dhanbad: R_N, 3.56 kA, 17 km	R-Earth	100	A/r successful from Maithon end only.From Dhanbad 3 phase trippping occurred	PG ER-2	DVC	
33	220 KV BARIPADA-BALASORE-1	07-09-2021	13:46	07-09-2021	14:46	Baripada: A/r successful	Balasore: R_N, 6.5 kA, 2.36 km	R-Earth	100	A/r successful from Baripada only	PG Odisha Projects	OPTCL	
34	400 KV NEW PSSP-NEW RANCHI-1	07-09-2021	13:54	07-09-2021	14:30	New PPSP: Y_B, Z I, Iy:5.61 kA, Ib: 5.5 kA, 58.2 km	New Ranchi: Y_B, Z I, Iy=Ib=9.3 kA, 58.2 km	Y_B	100	Phase to phase fault	WBSETCL	PG ER-1	
35	220 KV DALTONGANJ-GARWAH(NEW)-2	07-09-2021	14:43	07-09-2021	15:54	Daltonganj: R_Y, Ir=Iy=1.8 kA, 64.4 km, Z II	Garwah: R_Y, Ir=Iy=1.1 kA, 25.2 km	R_Y	100	Phase to phase fault	PG ER-1	JUSNL	
36	400 KV FSTPP-MALDA(PG)-2	07-09-2021	15:37	09-09-2021	18:00	LBB of its main bay maloperated and Bus II at FSTPP also tripped		No Fault	NA	Reason for maloperation may be shared.	NTPC FSTPP	PG ER-2	
37	400KV FSTPP-KHSTPP-4	09-09-2021	11:43	09-09-2021	12:37	FSTPP: DT received	KhSTPP: Didn't trip	No Fault	NA	Reason for maloperation may be shared.	NTPC FSTPP	NTPC KHSTPP	

38	400KV NEW PSSP-NEW RANCHI-1	09-09-2021	15:27	09-09-2021	18:15	New PPSP: Spurious DT sent	New Ranchi: DT received	No Fault	NA	Reason for maloperation may be shared.	WBSETCL	PG ER-1	
39	400KV BINAGURI-RANGPO-1	10-09-2021	21:58	10-09-2021	22:13	Binaguri: R_N, 89.58 km, 3.359 kA	Rangpo: R_N, 25.485 km, 4.395 kA	R-Earth	100	Tripped in reclaim time from Binaguri.But at the time of fault in reclaim time 3 phase TCB opened but only R phase MCB opened and after 1.5 second of that Y and B phase MCB opened . While at Rangpo end 3 phase tripping occurred directly without any A/R attempt.	PG ER-2	PG ER-2	
40	400KV BINAGURI-TALA-1 (Idle Charged)	10-09-2021	22:17	10-09-2021	22:47	Binaguri: B_N, 39.22 km, 7.84 kA		B-Earth	100		PG ER-2	Bhutan	
41	400 KV JEYPORE-GAZUWAKA-1	10-09-2021	03:58	10-09-2021	05:44	Jeypore:DT received	Gazuwaka: CT burst	Y-Earth	100		PG Odisha Projects	SR	
42	400KV JEYPORE-GAZUWAKA-2	10-09-2021	04:02	10-09-2021	07:39	Jeypore:DT received	Gazuwaka: CT burst	Y-Earth	100		PG Odisha Projects	SR	
43	400KV BINAGURI-RANGPO-1	11-09-2021	07:56	11-09-2021	07:56	Binaguri: R_N, 2.963 kA, A/r unsuccessful	Rangpo: R_N, 19.54 km, 4.1 kA	R-Earth	700	Tie CB at Binaguri attempted AR after failure of main CB AR also.Delayed clearanc at the time of A/R of MCB as it did not open .While No AR attempt at Rangpo	PG ER-2	PG ER-2	
44	400KV ANGUL-JITPL-1	12-09-2021	18:33	12-09-2021	19:45	Angul: R_N, 33 km, 7.7 kA, A/r successful	JITPL: R_N, 4.69 kA, 39.4 km	R-Earth	100	A/r attempt succesful at Angul end	PG Odisha Projects	JITPL	

45	220KV NEW PURNEA-MADHEPURA-1	12-09-2021	19:48	12-09-2021	20:01	New Purnea: R_N, 28 km, 4.92 kA, A/r successful		R-Earth	100	A/r attempt not taken from Madhepura	PG ER-1	BSPTCL	
46	220KV BIRPARA-MALBASE-1	13-09-2021	12:31	13-09-2021	12:58	Birpara: B_N, Z I, 4.511 kA, 39.8 km, A/r successful		B-Earth	100	A/r succesful from Birpara only	PG ER-2	Bhutan	
47	220 KV DALTONGANJ-GARWAH(NEW)-2	13-09-2021	18:38	13-09-2021	19:10	Daltonganj: B_N, 137.7 km, 0.978 kA	Garwah: B_N, 18.07 km, 0.916 kA	B-Earth	100	A/r successful from Daltonganj end. Single phase tripping from Garwah, no A/r attempt. PD time maybe checked at Garwah, other two phase didn't open even after 2.5 seconds	PG ER-1	JUSNL	
48	220KV TENUGHAT-PATRATU-1	14-09-2021	15:11	14-09-2021	16:00	Tenughat: R_N, 1.689 kA, 55.58 km	Patratu: R_N, 8.095 km	R-Earth	100		JUSNL	JUSNL	
49	220KV DALTONGANJ-CHATRA-1	14-09-2021	22:57	16-09-2021	11:43	Daltonganj: Y_B, 31.55 km, Iy: 3.1 kA,		Y-B	100	Phase to phase fault	PG ER-1	JUSNL	
50	400KV MEDINIPURA-NEW CHANDITALA-2	15-09-2021	04:43	15-09-2021	05:08	Medinipur: Y_B, 42.5 km, Iy: 7.9 kA, Ib: 7.2 kA	New Chanditala: Y_B, 60.01 km, Iy: 6.63 kA, Ib: 7.2 kA	Y-B	100	Phase to phase fault	PMJTL	WBSETCL	
51	220KV DALTONGANJ-CHATRA-2	15-09-2021	12:30	15-09-2021	14:46	Daltonganj: R_N, 239 km, Z III, 0.96 kA	Bus bar protection operated at Chatra	R-Earth	400	DT received at Daltonganj	PG ER-1	JUSNL	
52	400KV MUZAFFARPUR-DHALKEBAR-2	15-09-2021	20:11	15-09-2021	21:39	Muzaffarpur: PLCC maloperated		No Fault	NA	Reason may be shared. No fault observed from PMU	PG ER-1	Nepal	
53	400 KV JEERAT-NEW JEERAT-1	16-09-2021	05:39	16-09-2021	07:42	Jeerat: Y_N, Z III, 51 km, 2.84 kA		Y-Earth	100	Anti theft setting wasnt revised.	WBSETCL	PMJTL	
54	400KV JEERAT-NEW JEERAT-2	16-09-2021	05:39	16-09-2021	07:42	Jeerat: Y_N, Z III, 51 km, 2.8 kA		Y-Earth	100	Anti theft setting wasnt revised.	WBSETCL	PMJTL	
55	220KV NEW PURNEA-KHAGARIA-2	16-09-2021	14:08	16-09-2021	15:35			B-Earth	100	Three phase tripping for single phase fault	PG ER-1	BSPTCL	
56	220KV SANTALDIH (STPS)-CHANDIL-1	17-09-2021	10:35	17-09-2021	11:50	Santaldih: R_N, Z II, 101 km, 1.33 kA	Chandil: R_N, Z I, 24 km, 2.12 kA	R-Earth	100	3 phase tripping	WBSETCL	JUSNL	
57	220KV JODA-RAMCHANDRAPUR-1	17-09-2021	11:13	17-09-2021	11:38	Joda: A/r successful	Ramchandrapur: R_N, Z I, 16 km, 2.28 kA	R-Earth	100	A/r from Joda end only. PD time at Ramchandrapur end may be checked. Other two phase didn't open even after 2.5 seconds	OPTCL	JUSNL	

58	220KV DALTONGANJ-GARWAH(NEW)-2	17-09-2021	11:23	17-09-2021	12:00	Daltonganj: A/r successful	Garwah: B_N, Z I, 0.88 kA, 54.25 km	B-Earth	100	A/r successful from Daltonganj end. Single phase tripping from Garwah, no A/r attempt. PD time maybe checked at Garwah, other two phase didn't open even after 2.5 seconds	PG ER-1	JUSNL	
59	400KV KHARAGPUR-MEDINIPUR-2	17-09-2021	11:53	17-09-2021	12:15	Kharagpur: B_N, Z I, 16.5 km, 9.9 kA	Medinipur: B_N, 74.2 km, 2.919 kA	B-Earth	100	A/r attempt failed	WBSETCL	PMJTL	
60	400KV NEW PURNEA-MUZAFFARPUR-1	17-09-2021	15:13	17-09-2021	15:45	New Purnea: B_N, Z I, 123.3 km, 4.03 kA	Muzaffarpur: B_N, Z I, 125.58 km, 3.97 kA	B-Earth	100	Three phase tripping for single phase fault. Issue of A/r not resolved yet	PG ER-1	PG ER-1	
61	400KV BINAGURI-MALBASE-1	17-09-2021	18:25	17-09-2021	19:37		Malbase: B_N, Z I, 44.8 km, 1.157 kA	B-Earth	100	A/r not observed in PMU	PG ER-2	BHUTAN	
62	400KV BIHARSHARIF-MUZAFFARPUR-1	18-09-2021	02:56	18-09-2021	23:14	Biharsharif: R_N, 64.89 km, 4.59 kA	Muzaffarpur: R_N, Z I, 56.17 km, 4.78 kA	R-Earth	100	A/r attempt failed	PG ER-1	PG ER-1	
63	220KV SITAMARHI-MOTIPUR-1	18-09-2021	07:39	18-09-2021	09:03	Sitamarhi: B_N, 62.1 km, 3.646 kA	Motipur: E/F	B-Earth	100	First b phase fault then after 400ms Y phase fault also appeared .	PMTL	BSPTCL	
64	220KV SUBHASHGRAM (PG)-NEWTOWN-1	18-09-2021	10:24	18-09-2021	10:38	Subhashgram: Y_N, Z I, 4.5 km, 14.3 kA	NewTown: Y_N, Z I, 14.6 km, 6.2 kA	Y-Earth	100	Bus bar operated at Subhashgram	PG ER-2	WBSETCL	
65	400KV PPSP-BIDHANNAGAR-1	18-09-2021	12:29	18-09-2021	12:49	PPSP: B_N, Z I, 47.9 km	Bidhannagar: B_N, Z I, 156.4 km, 2.159 kA	B-Earth	100	A/r attempt not taken. Three phase tripping for single phase fault	WBSETCL	WBSETCL	
66	400KV FSTPP-SAGARDIGHI-1	18-09-2021	13:21	18-09-2021	13:56	FSTPP: R_N, 58.08 km, 4.338 kA	Sagardighi: R_N, 0.8 km	R-Earth	500	A/r attempt successful at Sagardighi after 650 msec	NTPC FSTPP	WBSETCL	
67	BHERAMARA-4 (AntiTheft Charged)	18-09-2021	13:37	18-09-2021	15:34	Baharampur: Y_N, 90.25 km, 3.99 kA		Y-Earth	100	Idle charged line tripped on single phase fault	PG ER-2	BANGLADESH	
68	220KV CHANDIL-SANTALDIH(STPS)-1	18-09-2021	14:50	18-09-2021	15:08	Chandil: R_N, 2.77 kA, 43 km		R-Earth	100	Three phase tripping at Chandil for single phase fault. Bus PT input taken at Chandil	JUSNL	WBSETCL	
69	220KV BEGUSARAI-NEW PURNEA-1	19-09-2021	15:30	19-09-2021	16:34	Begusarai: B_N, Z II, 150.84 km, 1.07 kA	New Purnea: B_N, Z I, 33.6 km, 6.83 kA	B-Earth	100	Other two phase tripped after 400 msec from New Purnea. PD time may be checked	BSPTCL	PG ER-1	
70	220KV BUDHIPADAR-RAIGARH-1	20-09-2021	09:43	20-09-2021	10:58	Budhipadar: R_N, Z I, 35 km, 2.64 kA		R-Earth	100	Three phase tripping for single phase fault	OPTCL	WR	
71	400KV PPSP-BIDHANNAGAR-2	20-09-2021	10:10	20-09-2021	10:46	PPSP: R_N, 139.6 km	Bidhannagar: R_N, Z I, 44.12 km, 5.93 kA	R-Earth	100	A/r attempt not taken. Three phase tripping for single phase fault	WBSETCL	WBSETCL	

72	400KV PPSP-BIDHANNAGAR-2	20-09-2021	14:05	20-09-2021	14:27	PPSP: R_N, Z I, 144.5 km	Bidhannagar: R_N, 44.5 km, 5.8 kA	R-Earth	100	A/r attempt not taken. Three phase tripping for single phase fault	WBSETCL	WBSETCL	
73	400KV MUZAFFARPUR-DHALKEBAR-2	20-09-2021	15:08	20-09-2021	17:25	Muzaffarpur: R_Y, 60.09 km, Ir: 7.024 kA, Iy: 6.99 kA		R-Y	100	Phase to phase fault	PG ER-1	Nepal	
74	400KV KHSTPP-MAITHON-1	20-09-2021	15:47	20-09-2021	16:31	LBB of tie bay at Maithon operated		No Fault	NA	No fault signature in PMU. Reason for LBB operation may be shared	NTPC KHSTPP	PG ER-2	
75	400KV MAITHON-MAITHON RB-2	20-09-2021	15:47	20-09-2021	17:49	LBB of tie bay at Maithon operated		No Fault	NA		PG ER-2	MPL	
76	400KV NEW DUBURI-MERAMUNDALI-2	20-09-2021	19:52	20-09-2021	21:13	New Duburi: R_N, Z I, 3.94 kA, 63.3 km		R-Earth	100	A/r dead time at New Duburi is 350 msec. Line tripped again within reclaim time	OPTCL	OPTCL	
77	220KV RENGALI(PH)-TSTPP-1	20-09-2021	20:31	20-09-2021	23:34	Rengali(PH): Y_N, 18.65 km, 4.843 kA	TSTPP: Y_N, Z II, 26.5 km, 5.0 kA	Y-Earth	120		OHPC	NTPC TSTPP	
78	765KV JHARSUGUDA-RAIPUR PS(DURG)-2	21-09-2021	04:48	21-09-2021	12:16	Jharsuguda: R_B, Ir: 6.06 kA, Ib: 6.22 kA, 182.4 km		R-B	100	Phase to phase fault	PG Odisha Projects	WR	
79	220KV DALTONGANJ-CHATRA-1	21-09-2021	09:03	21-09-2021	16:51	Daltonganj: DT received	Chatra: operator mistake	No Fault	NA	Three phase tripping. No fault present.	PG ER-1	JUSNL	
80	220KV CHUKHA-BIRPARA-1	21-09-2021	11:16	21-09-2021	11:52		Birpara: Y_B, 66.03 km, Iy: 3.25 kA, Ib: 3.241 kA	Y_B-Earth	500	Delayed fault clearance. Carrier protection scheme not operated successfully	Bhutan	PG ER-2	
81	220KV CHUKHA-BIRPARA-1	21-09-2021	14:38	21-09-2021	15:19		Birpara: Y_B, 38.24 km, Iy: 5.11 kA, Ib: 3.2 kA, A/r successful	B-Earth	100	Carrier protection operated successfully	Bhutan	PG ER-2	
82	400KV RENGALI-INDRAVATI-1	21-09-2021	15:55	21-09-2021	16:58		Indravati: O/v	B-Earth	100	No A/r observed in PMU. Around 50 kV dip in B_ph	PG Odisha Projects	PG Odisha Projects	
83	400KV TSTPP-ROURKELA-1	21-09-2021	15:55	21-09-2021	18:14	TSTPP: R_N, Z I, 3.271 km, 26.96 kA		R-Earth	100	No A/r observed in PMU	NTPC TSTPP	PG Odisha Projects	
84	220KV TTPS-TSTPP-1	21-09-2021	16:42	21-09-2021	18:54	TTPS: B_N, 22.64 km, 5.9 kA	TSTPP: B_N, 4.817 km, 12.98 kA	B-Earth	100		OPTCL	TSTPP	
85	220KV DEHRI-GAYA-2	21-09-2021	16:45	21-09-2021	17:29		Gaya: Didn't trip	No Fault	NA		BSPTCL	PG ER-1	
86	220KV DEHRI-GAYA-2	21-09-2021	17:49	21-09-2021	20:53			No Fault	NA		BSPTCL	PG ER-1	
87	220KV DALTONGANJ-CHATRA-1	22-09-2021	12:09	25-09-2021	13:21	Daltonagnj: Y_B, 31.49 km, Iy: 3.204 kA, Ib: 3.207 kA		Y-B	100	Phae to phase fault	PG ER-1	JUSNL	
88	765KV JHARSUGUDA-DHARAMJAIGARH-1	23-09-2021	06:23	23-09-2021	11:04	Jharsuguda: B_N, 126.6 km, 4.33 kA	Dharamjaigarh: B_N, 19.5 km	B-Earth	100		PG Odisha Projects	WR	
89	220KV KISHANGANJ(PG)-KISHANGANJ-1	23-09-2021	11:26	23-09-2021	12:00	Kishanganj (PG): Didn't trip	Bus bar operated at BSPTCL end	No Fault	NA	Bus bar protection operated at BSPTCL end. Line didn't trip from PG end	PG ER-1	BSPTCL	
90	220KV KISHANGANJ(PG)-KISHANGANJ-4	23-09-2021	11:26	23-09-2021	12:00	Kishanganj (PG): Didn't trip	Bus bar operated at BSPTCL end	No Fault	NA		PG ER-1	BSPTCL	
91	400KV JEYPORE-INDRAVATI-1	23-09-2021	12:02	23-09-2021	12:46	Jeypore: R_N, 72 km, 1.8 kA	Indravati: R_N, 27.25 km, 10.1 kA	R-Earth	100	A/r attempt failed	PG Odisha Projects	PG Odisha Projects	
92	220KV MAITHON-DHANBAD-2	24-09-2021	05:43	24-09-2021	06:18	Maithon: R_N, 33.7 km, 4.414 kA, A/r successful		R-Earth	100	A/r successful from Maithon end only.From Dhanbad 3 phase trippping occurred	PG ER-2	DVC	
93	400KV FSTPP-KHSTPP-4	24-09-2021	11:53	24-09-2021	12:55	FSTPP: DT received		No Fault	NA	No fault observed in PMU	NTPC FSTPP	NTPC KHSTPP	

94	220KV KATAPALLI-BOLANGIR(PG)	24-09-2021	12:21	24-09-2021	12:34	Katapalli: Didn't trip	Bolangir: R_N, Z II, 83.6 km, 1.64 kA	R-Earth	100		OPTCL	PG Odisha Projects	
95	400KV FSTPP-KHSTPP-4	24-09-2021	16:10	24-09-2021	18:23	Tripped from Farakka only. Spurious DT sent from KHSTPP during testing of main bay		No Fault	NA	No fault observed in PMU	NTPC FSTPP	NTPC KHSTPP	
96	220KV CHANDIL-RANCHI-1	24-09-2021	16:56	24-09-2021	17:45	O/c, E/F	Didn't trip		NA	No fault observed in PMU. Reason for tripping from Chandil may be shared	JUSNL	PG ER-1	
97	220KV PUSAULI-SAHUPURI	25-09-2021	11:05	25-09-2021	12:25	Pusauli: B_N, Z I, 8.86 km, 9.1 kA	Sahupuri: B_N, 54.94 km, 2.577 kA	B-Earth		Three phase tripping for single phase fualt. A/r attempt not taken	PG ER-1	BSPTCL	
98	500 MVA 400/220 KV ICT 1 AT DARBHANGA (DMTCL)	25-09-2021	12:38	25-09-2021	13:56	Directional O/c			100	BackUp Directional O/c operated within 100 msec for an external fault	DMTCL	NA	
99	500 MVA 400/220 KV ICT 2 AT DARBHANGA (DMTCL)	25-09-2021	12:38	25-09-2021	13:59	Directional O/c			100	BackUp Directional O/c operated within 100 msec for an external fault	DMTCL	NA	
100	220KV TENUGHAT-BIHARSHARIF-1	25-09-2021	14:46	25-09-2021	15:29	Tenughat: R_N, Z I, 116 km, 0.627 kA	Biharsharif: R_N, Z I, 58 km, 1.130 kA	R-Earth	500	Three phase tripping for single phase fault. Tripped in Z II time from Biharsharif	JUSNL	BSPTCL	
101	220KV JODA-RAMCHANDRAPUR-1	25-09-2021	18:42	15-09-2021	19:33	Joda: B_N, Z II, 128 km, 1.28 kA	Ramchandrapur: B_N, 9.6 km, 10 kA	B-Earth	400	Three phase tripping for single phjase fault	OPTCL	JUSNL	
102	220KV BUDHIPADAR-KORBA-1	26-09-2021	09:24	26-09-2021	10:19	Budhipadar: B_N, Z I, 12.8 km, 4.2 kA	Korba: B_N, Z II, 163.3 km, 0.972 kA	B-Earth	100	Three phase tripping for single phase fault	OPTCL	WR	
103	220KV PUSAULI-DEHRI-1	26-09-2021	12:32	26-09-2021	13:30	Pusauli: Y_N, Z II, 51.4 km, 2.8 kA	Dehri: Y_N, Z I, 10.9 km, 3.6 kA	Y-Earth	100	A/r successful at Dehri only. No A/r attempt at Pusauli end	PG ER-1	BSPTCL	
104	220KV Jamshedpur-Jindal (JSPL)	26-09-2021	14:33	26-09-2021	15:45	Jamshedpur: Y_N, 0.348 kA	Jindal: Y_N, 0.91 kA	Y-Earth	100		DVC	OPTCL	
105	220KV DALTONGANJ-GARWAH(NEW)-1	26-09-2021	15:31	26-09-2021	17:11	Daltonganj: B_N, 56 km, 1.7 kA	Garwah: B_N, 59 km, 1.4 kA	B-Earth	100	A/r failed after 1 sec	PG ER-1	JUSNL	
106	220KV DALTONGANJ-GARWAH(NEW)-2	26-09-2021	15:31	26-09-2021	16:26	Daltongunj: Didn't trip	Garwah: B_N, 1.4 kA, 65 km	B-Earth	100	A/r failed after 1 sec	PG ER-1	JUSNL	

107	220KV BUDHIPADAR-RAIGARH-1	27-09-2021	13:19	27-09-2021	15:59	Budhipadar: B_N, Z I, 33.5 km, 2.7 kA	Raigarh: B_N, Z I, 63.14 km, 2.70 kA	B-Earth	100	Three phase tripping for single phase fault	OPTCL	WR	
108	220KV DARBHANGA (DMTCL)-SAMASTIPUR-1	27-09-2021	15:19	27-09-2021	16:49	Darbhanga: B_N, Z II, 40.4 km, 2.91 kA	Samastipur: B_N, Z I, 5.3 km, 6.65 kA	B-Earth	100	Single phase tripping at DMTCL end, no A/r observed after 1 sec	DMTCL	BSPTCL	
109	400KV PATNA-BALIA-1	28-09-2021	07:21	28-09-2021	08:37	Patna: B_N, Z I, 195.32 km, 1.7 kA		B-Earth	100	Bus II tripped at Balia. DT received in both lines	PG ER-1	NR	
110	400KV BIHARSHARIF-BALIA-2	28-09-2021	07:21	28-09-2021	11:59	Biharsharif: B_N, 241.8 km, 1.839 kA		B-Earth	180		PG ER-1	NR	
111	220KV TENUGHAT-BIHARSHARIF-1	28-09-2021	19:05	28-09-2021	19:53	Tenughat: B_N, Z II, 173.3 km, 1.164 kA	Biharsharif: B_N, Z I, 4.951 km, 16.21 kA	B-Earth	400	Three phase tripping for single phase fault. Tripped in Z II time from Tenughat	JUSNL	BSPTCL	
112	400KV JEYPORE-INDRAVATI-1	29-09-2021	12:08	29-09-2021	12:37	Jeypore: Didn't trip		Y-B	100	Phae to phase fault	PG Odisha Projects	PG Odisha Projects	
113	220KV JODA-RAMCHANDRAPUR-1	30-09-2021	04:45	30-09-2021	04:45	Joda: B_N, Z I, 47.4 km, 2.6 kA		B-Earth	100	A/r attempt from Joda end failed after 1 sec	OPTCL	JUSNL	
114	220KV PATNA-KHAGAUL-1	30-09-2021	10:05	30-09-2021	10:05	Patna: B_N, 8.51 km, 11.15 kA		B-Earth	100	Three phase tripping at Patna. A/r attempt not taken at Patna while A/r successful from Khagaul	PG ER-1	BSPTCL	
115	220KV MAITHON-KALYANESHWARI-1	30-09-2021	12:22	30-09-2021	13:51	Didn't trip		B-Earth	100		PG ER-2	DVC	

ANNEXURE-C.4

Sl No.	Name of the incidence	PCC Recommendation	Latest status
1.	Total Power Failure at 220 kV TTPS S/s on 11.08.2021 at 13:34 Hrs	In 106th PCC Meeting, PCC advised OPTCL to submit present status of PLCC communication for all the lines connected to 220 kV TTPS S/s and take actions to operationalize PLCC communication so that carrier-aided tripping scheme and auto-recloser scheme can be implemented in those lines.	
2.	Tripping of Bus-1 at 220 kV Ramchandrapur on 20/08/2021 at 20:24 Hrs.	In 106th PCC Meeting, PCC advised JUSNL following: ➢ To restore the busbar protection at 220 kV Ramchandrapur S/s within a month. ➢ To check the settings as well as directionality of earth fault relay for 220 kV RCP-Chaibasa line at RCP end. ➢ Regarding tripping of ICT-4 at Chandil, PCC advised JUSNL to check the stabilizing resistor value for REF relay in addition to the wiring issue. The relay shall be checked and tested before putting it into service.	
3.	Repeated Tripping of 132 kV Sultanganj- Deogarh D/C	In 106th PCC Meeting, PCC advised BSPTCL to resolve all clearance issues in the line and complete the insulator replacement work at the earliest.	
4.	Total Power Failure at 220 kV Rengali HEP on 27/07/2021 at 08:57 Hrs	In 106th PCC Meeting, PCC advised OHPC to check CVT secondary earthing circuits for any double earthing/grounding as double earthing leads to high voltage during fault.	
5.	Repeated Tripping of 220 kV Budhipadar-Korba & 220 kV Budhipadar-Raigarh line and associated Issues	In 106th PCC Meeting,PCC advised OPTCL to implement auto-recloser scheme for remaining feeders at 220 kV Budhipadar end at the earliest.	

6.	Disturbance at 220 kV Biharsharif Substation on 01.06.2021 at 17:10 Hrs	In 106th PCC Meeting, Powergrid informed that proposal of extending inter-trip command from LV side to HV side of the ICT through numerical relay instead of 86 relays was going to be implemented through separate cables for ICT-1 & ICT-3. They added that the work is in progress and the scheme would be implemented by October-21.	
7.	Total Power Failure at Dumka S/s on 15/05/2021 at 12:01 Hrs	Regarding 220 kV Maithon-Dumka-1, JUSNL intimated that there was card issue in PLCC panel. The OEM (M/s ABB) had been communicated regarding the issue and the same would be resolved by September' 21.	
8.	Disturbance at Jasidih(JUSNL) S/S on 27/05/2021 at 10:13 Hrs	In 106th PCC Meeting, it was informed that draft overvoltage settings philosophy has been received from JUSNL. PCC advised ERLDC/ERPC secretariat to submit their observations on the draft philosophy to JUSNL.	
9.	Grid event at 132 kV Motihari (DMTCL) S/S on 21-04-2021 at 20:19 hrs	In 106th PCC Meeting, PMTL informed that offers received from OEM i.e., M/s TBEA regarding restoration of the damaged GIS section is under examination. Regarding timeline to complete the work, PMTL informed that since all materials required for restoration work are to be imported from China, it would take 40-50 days for restoration after placing the supply order.	
10.	Repeated delayed clearance of faults at 220 kV Chandil STPS S/C	In 106th PCC Meeting, JUSNL informed that cost estimate was received from OEM and work order for rectification work of PLCC panel would be placed after getting approval from higher authority. They	

		added that the PLCC issue would be resolved within Nov-21.	
11.	Backup Overcurrent Relay coordination for Sikkim Complex.	In 106th PCC Meeting, PCC advised PRDC to analyse the tripping of the 400 kV Teesta III – Kishangunj line on 03.09.2021 and the settings may be proposed considering the actual fault current observed in the line. PCC advised Powergrid to implement the proposed DEF settings as given in the report of PRDC at their end. PCC further advised PRDC to carry out a study for DEF relay coordination for the lines at Sikkim complex considering fault level corresponding to minimum hydro generation at Sikkim complex.	