EASTERN REGIONAL POWER COMMITTEE

ADDITIONAL AGENDA FOR 184th OCC MEETING TO BE HELD ON 26.10.2021(TUE) AT 10:30 HRS

ITEM NO.1: Data for preparation of LGBR of ERPC for the year 2022 – 23

As per the IEGC under Clause 2.4.2 (d) & (e) issued by CERC on 28.04.2010, the planning of maintenance of generating units of various generating companies of the region as well as outage of transmission system on annual basis in respect of Eastern Region for the year 2022-23 is to be finalized by January 2022. In this context, the Director (OPM), CEA desired the approved programme of planned maintenance in respect of Thermal, Hydro stations in the region for the year 2022-23 and the estimated energy requirement(MU) and peak/off-peak demand (MW) for the next year for each state / utility shall be furnished by 27th, October-21. To facilitate the preparation of LGBR of Eastern Region, the following data/ information for the year 2022-23 in respect of the constituents/ generators of Eastern Region is required:

State and Central Sector Generators/ IPPs/CPPs/SLDCs/Utilities

i) The Unit wise and Station wise monthly energy generation proposed from existing units during 2022-23 (thermal, hydro and RES).
ii) Annual maintenance programme for each of the generating units (thermal, hydro and RES)
iii) Generating units under R&M/ long outage indicating date of outage and reasons of outage and expected date of return (thermal and hydro both.).
iv) Partial and forced outage figures (in %) of generating units and aux.power consumption for the last 3 years.
v) Month wise peak/off-peak demand (MW) – restricted and unrestricted.
vi) Month wise energy requirement (in MU).
vii) Month wise and source wise power (both MU & MW) purchase and sale plan
viii) Schedule of commissioning of new generating units during 2022-23 and unit-wise monthly generation programme (in MU) upon COD
ix) Allocation of power from new generating units

ISTS/STU/Transmission licencees in the states and Central Sector

x) Month wise and annual planned outage of transmission system (Transmission lines 220kV and above / ICTs / Reactors/ other elements (TCSC, SC etc.).

All the concerned utilities are advised to send the above information (as applicable) on or before **27.10.2021** for compilation of data and preparation of draft **LGBR of ER for the year 2022-23.**

Members may update

ITEM NO.2: 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.

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

CESC may explain.

ITEM NO.3: Low frequency oscillation observed on 20th September 2021 due to Budge-Budge Plant of CESC.

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.**

CESC may explain.

ITEM NO.4: Event of Smelter Load tripping at Sterlite CPP on 20th & 28th September 2021-ERLDC

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 of more than 1000 MW.

- This has caused under drawl of Odisha by more than 1000 MW. Subsequently with SPS action at Sterlite, injection to grid was limited up to 800 MW.
- Intimation of such events is necessary in real time as grid flow pattern gets affected considerably and also this is important for frequency response assessment purpose.

Report by ERLDC is attached at **Annexure C.**

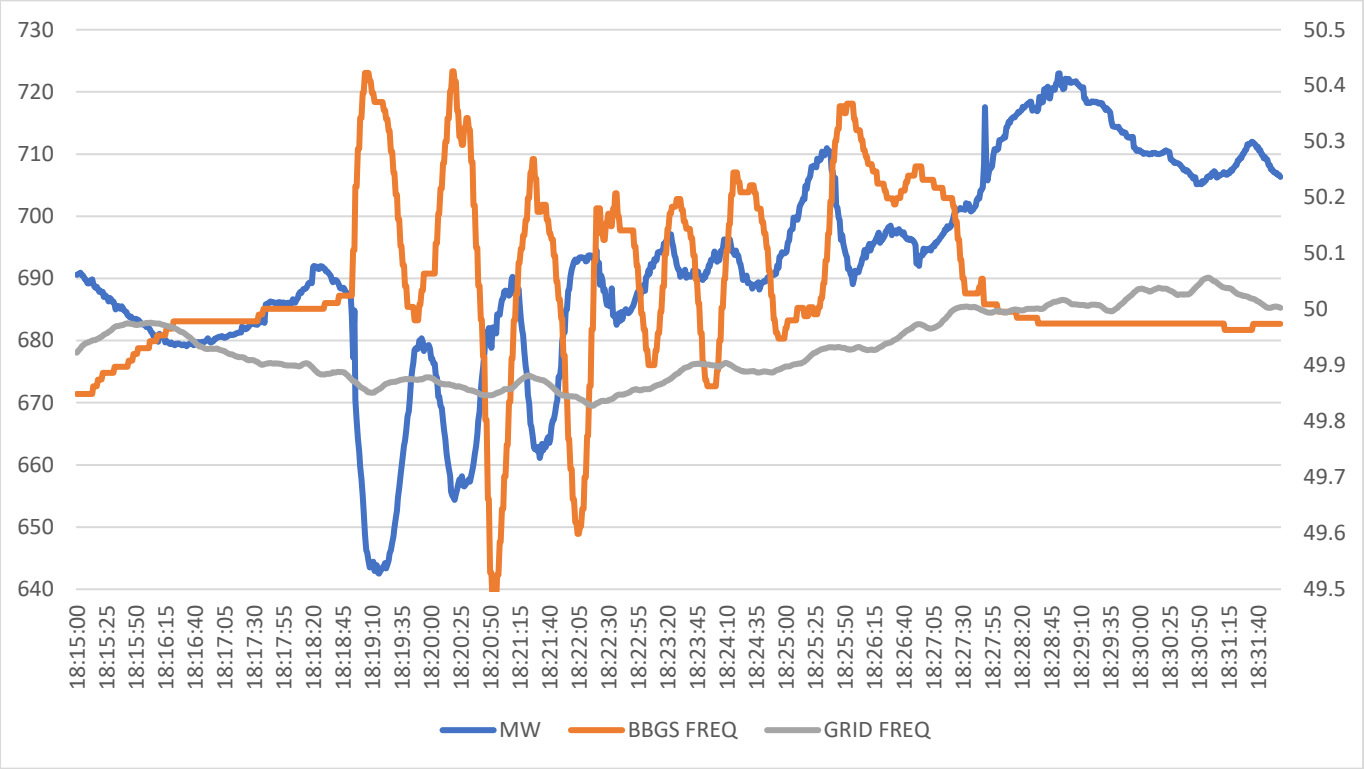
SLDC Odisha may explain.

Islanding Performance and Observations During Past Islanding of CESC

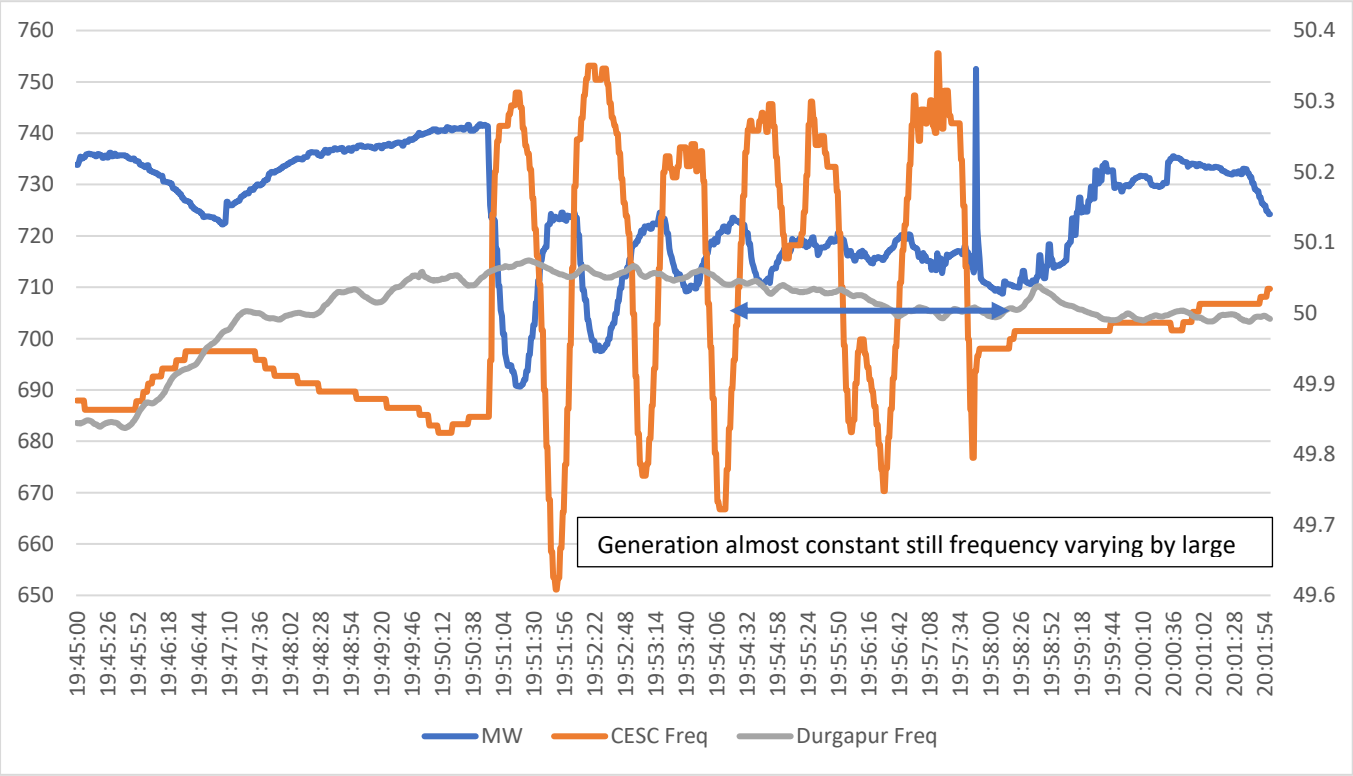
Islanding Performance and Frequency variation for past few Islanding events were checked for Island stability evaluation and following observations are listed in regard to this, (Plots for each event in attached)

- 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).**

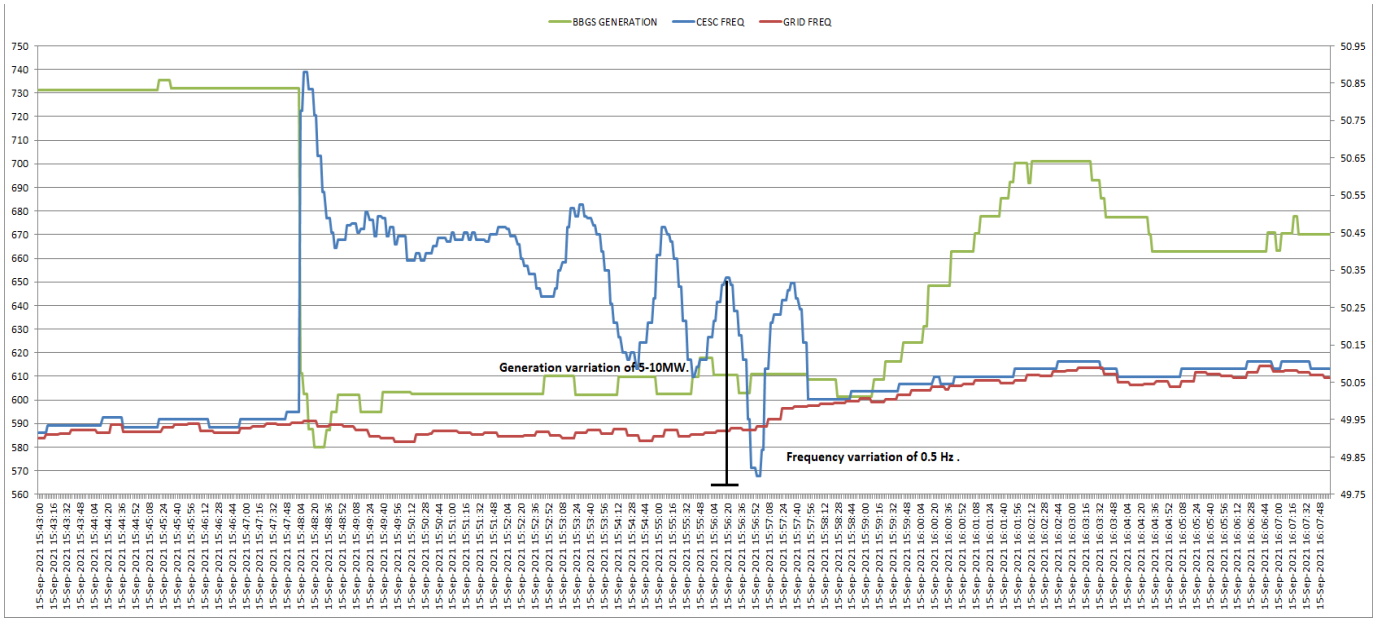
SCADA plot for EVENT 1: 01st August 18:18Hrs, Budge-Budge generation Vs CESC frequency vs Grid Frequency



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

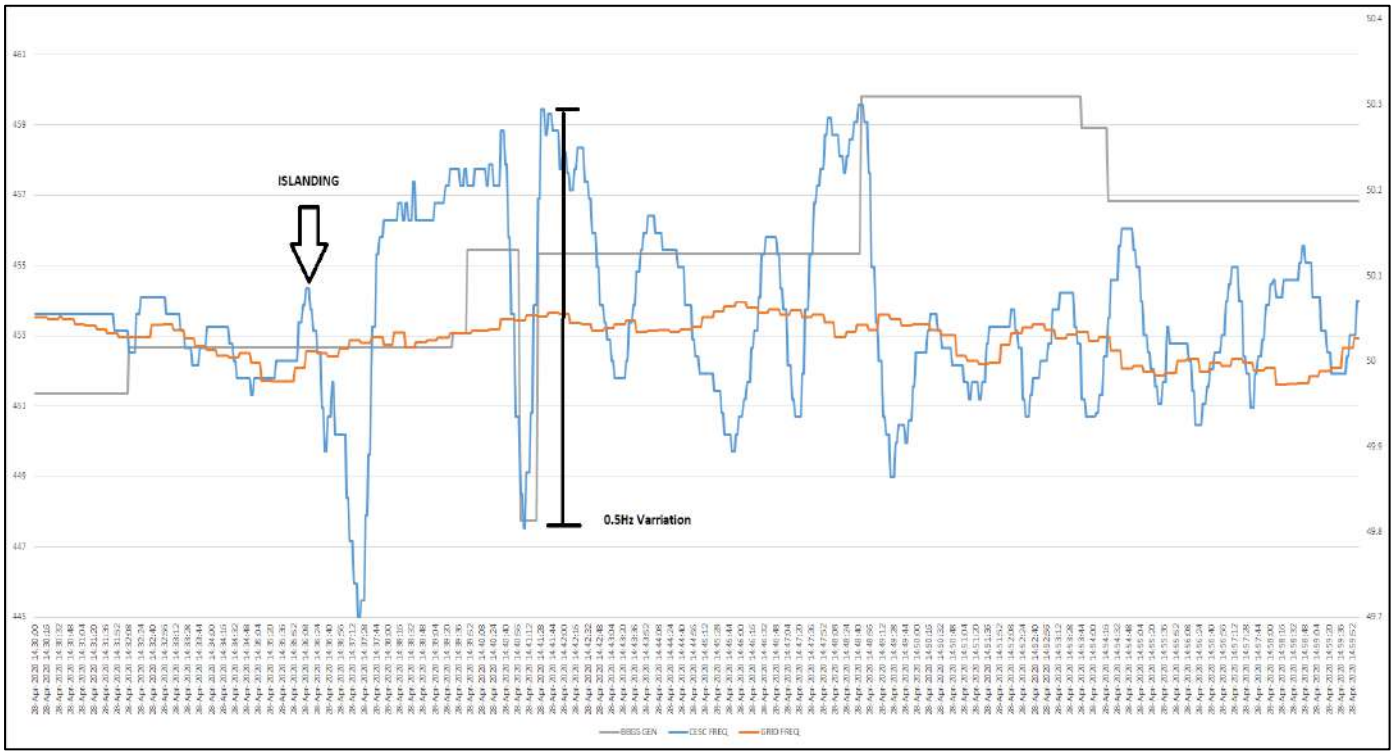


EVENT 3: Variation on 15Th September Islanding: SCADA plot with 2 second resolution
Same pattern of Frequency variation observed. Governor performance during Islanding needs to be checked. In 15th September event also Budge-budge generation is oscillatory this needs to be checked and also any cyclic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

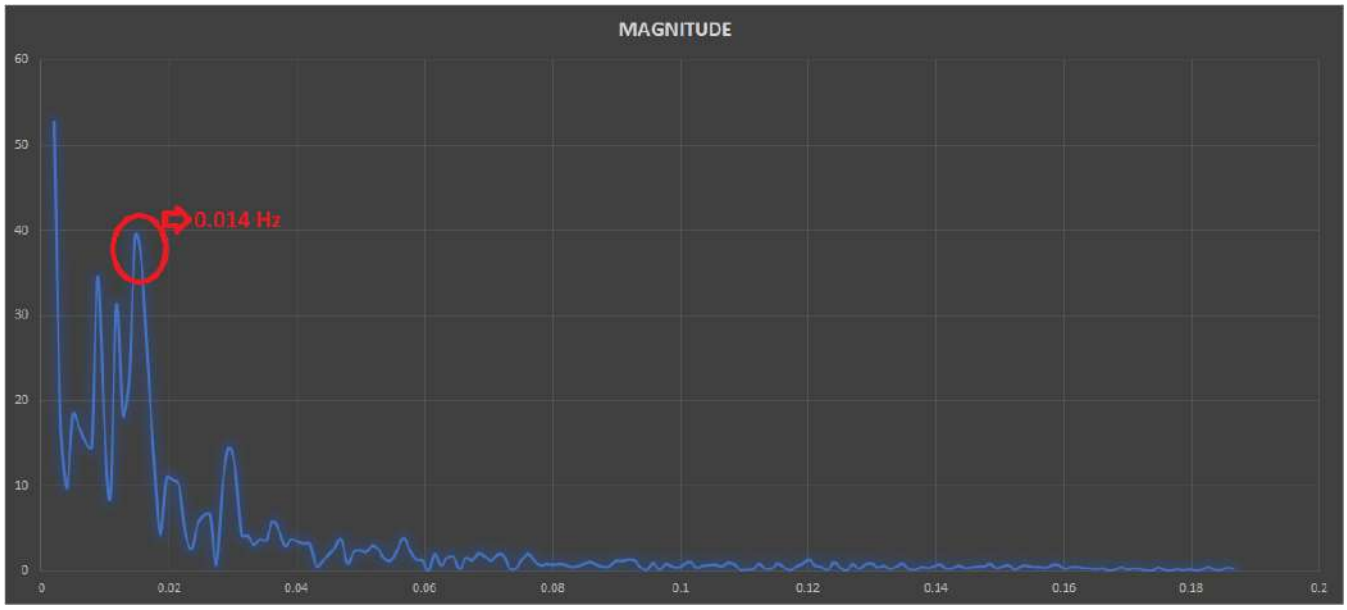


EVENT 4 :PAST ISLANDING ON 28 APRIL 2020:

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

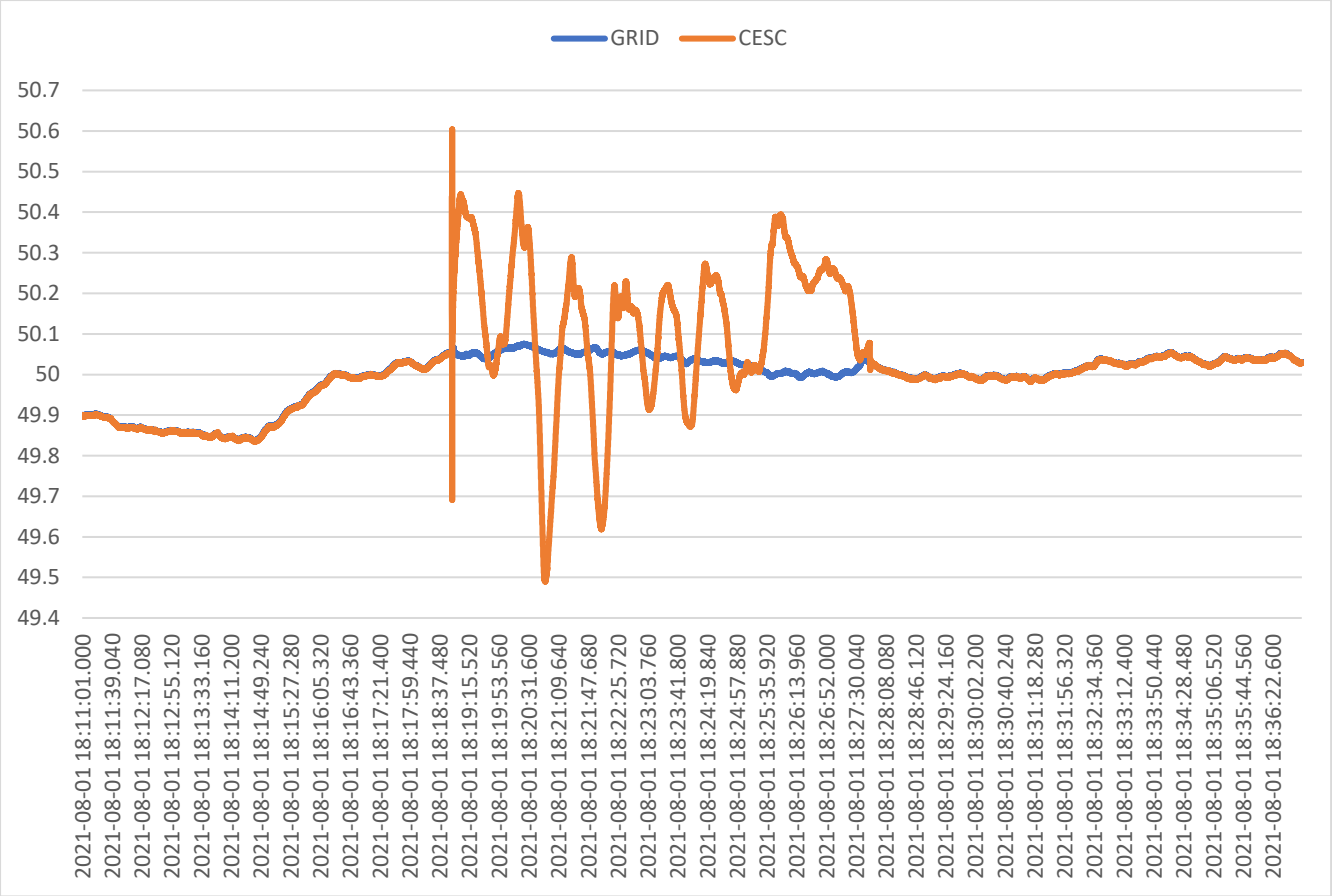


UFR setting for First Two stages:

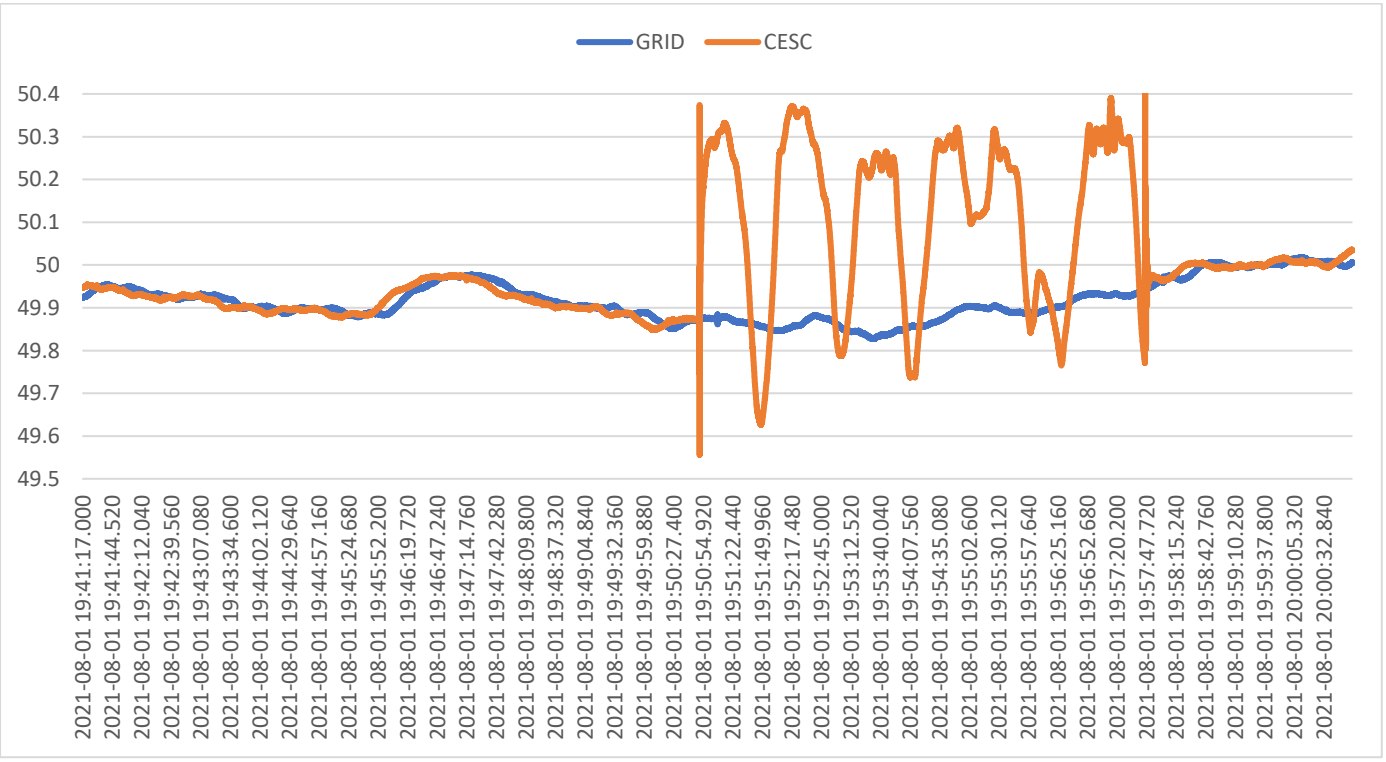
Settings of Under frequency relays				
CESC system				
Stage	**132/33kV G/S/S**	**33kV Feeder**	**Max Load in MW**	
Stage-I			SUMMER	WINTER
49.4Hz	CHAKMIR	55 MVA TRF - 1 & 2	47	29
	NCGS	KAMARHATI TRF - 1	8	6
		KUTIGHAT TRF - 3	10	8
TOTAL			**65**	**43**
Stage-II				
49.2Hz	DUMDUM	NEW DUMDUM TRF - 1	15	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

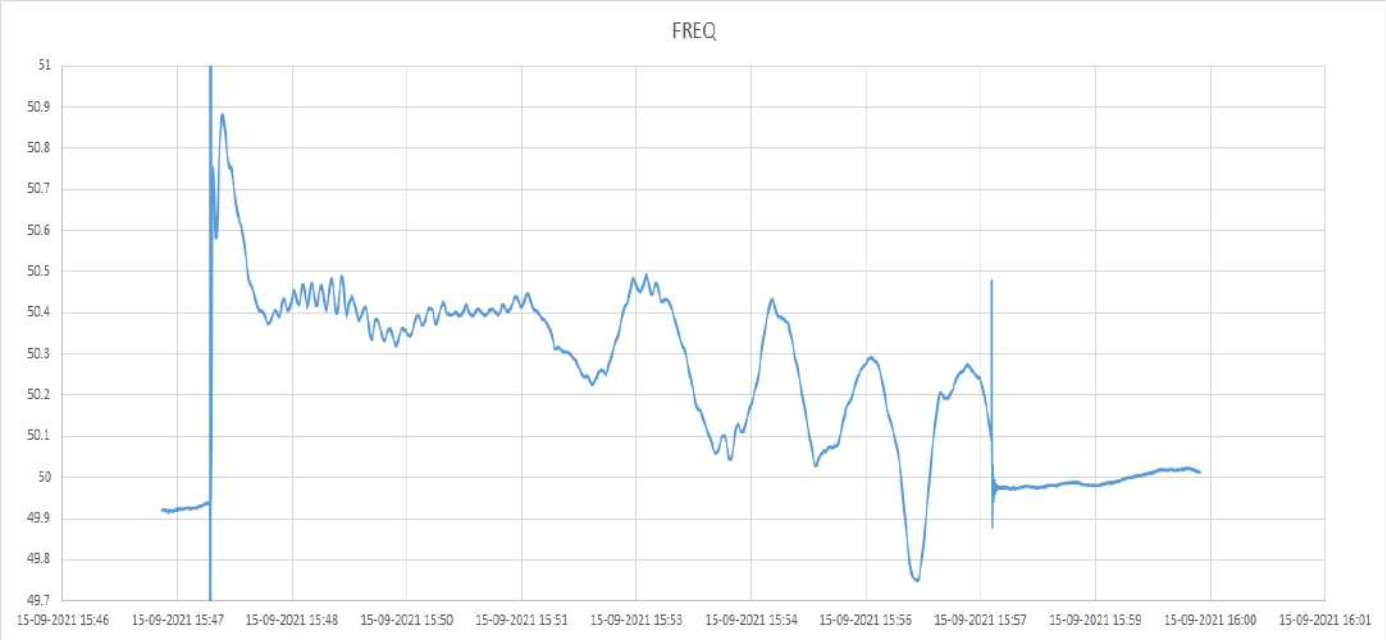
EVENT 1: Frequency comparison by PMU Plot:



EVENT 2 Frequency comparison by PMU Plot:



EVENT 3: PMU PLOT 15 September 2021



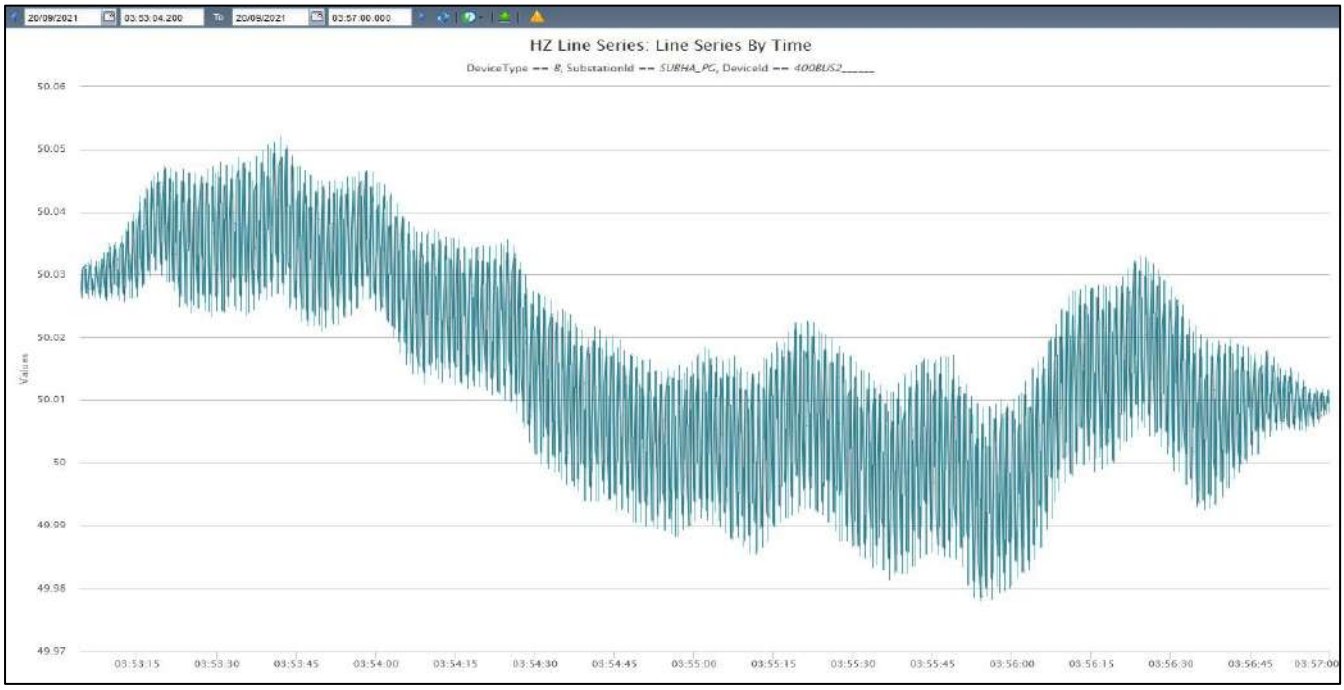
LOW FREQUENCY OSCILLATION BETWEEN 03:52 TO 03:58 Hrs ON 20/09/2021

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 .

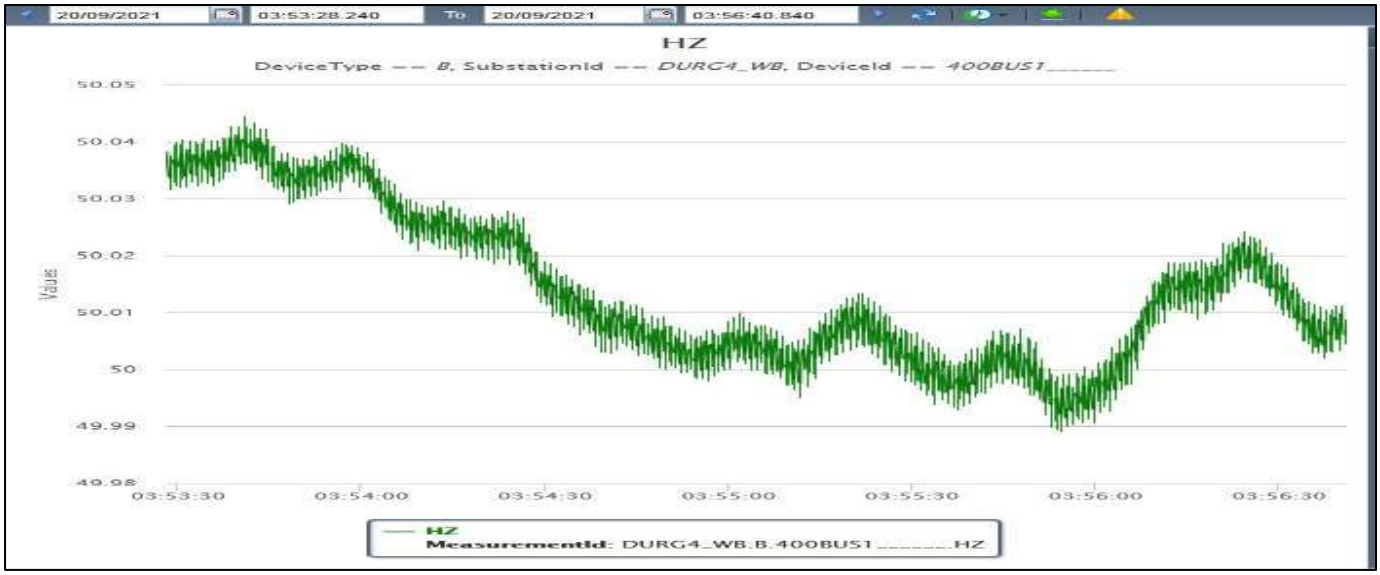
It was most prominent in Frequency only.

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

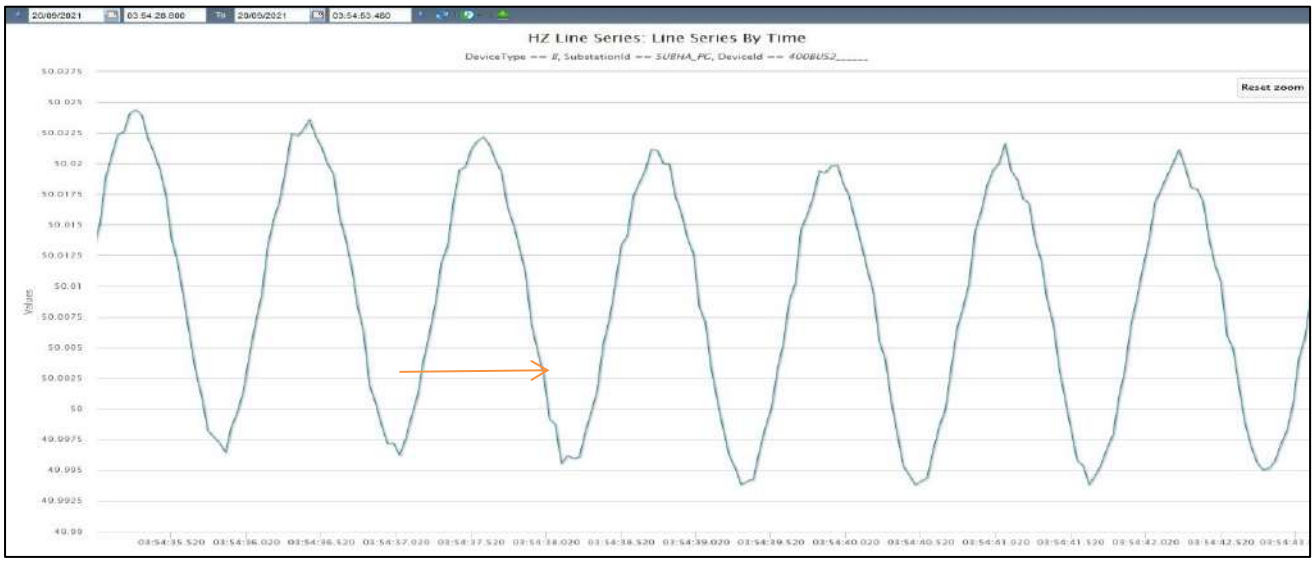
Subhas gram Frequency



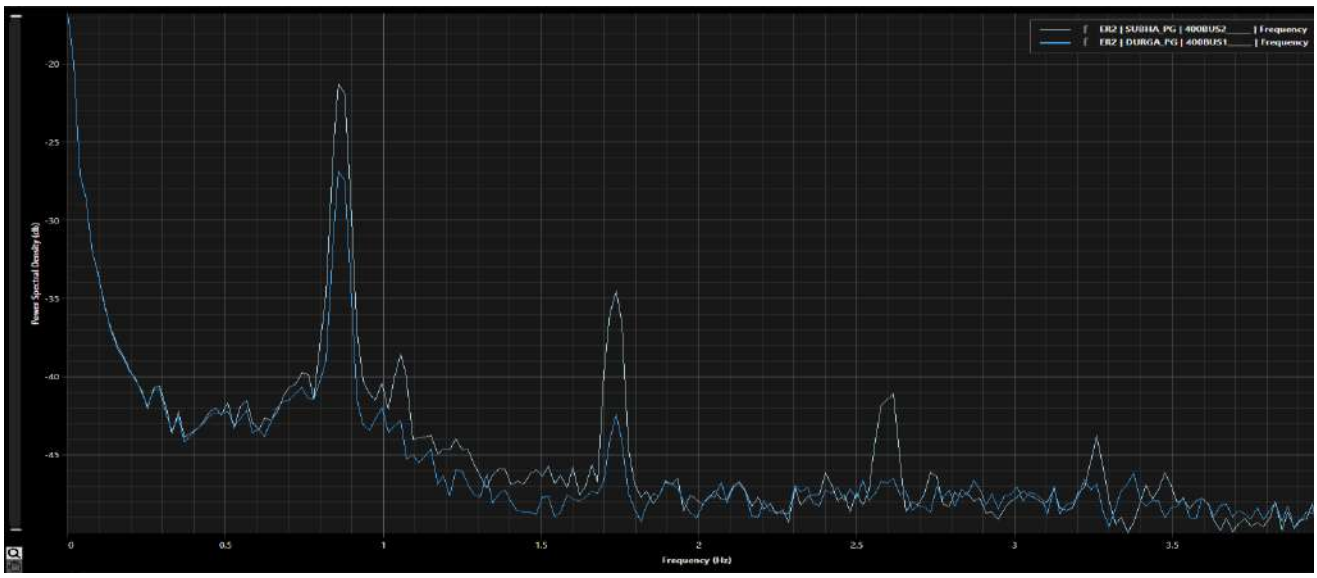
Durgapur Frequency: Frequency variation in Durgapur was comparatively less as moving away from Subhasgram

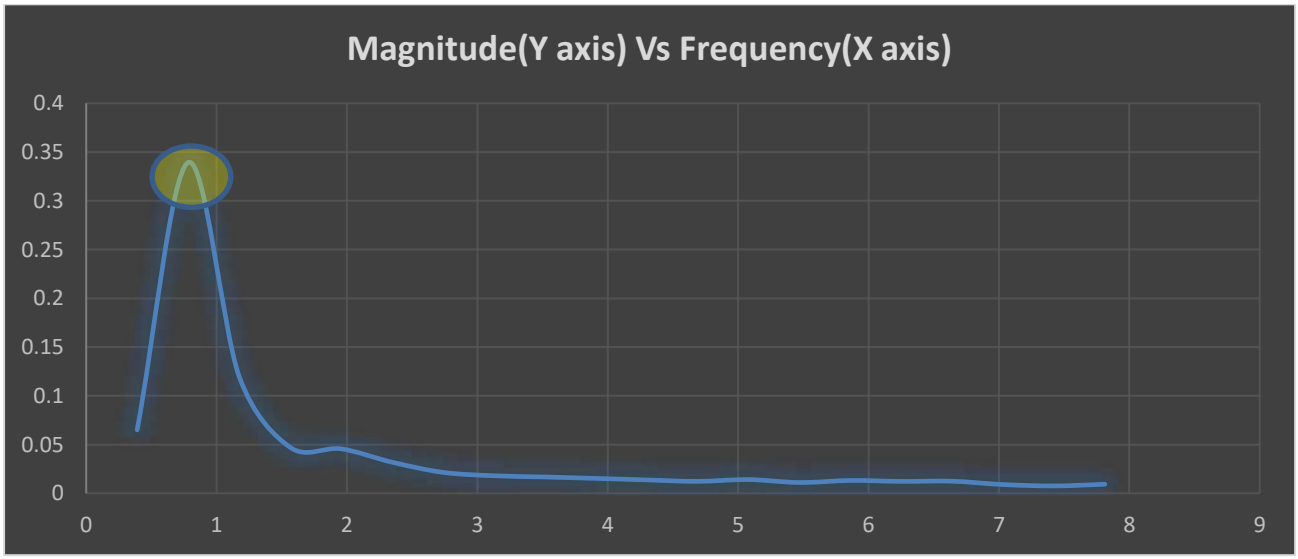


Mode : 0.8 to 0.9 hz (Local mode) ,This also indicates towards oscillation of any plant against the whole grid of Hunting of any unit due to any problem.



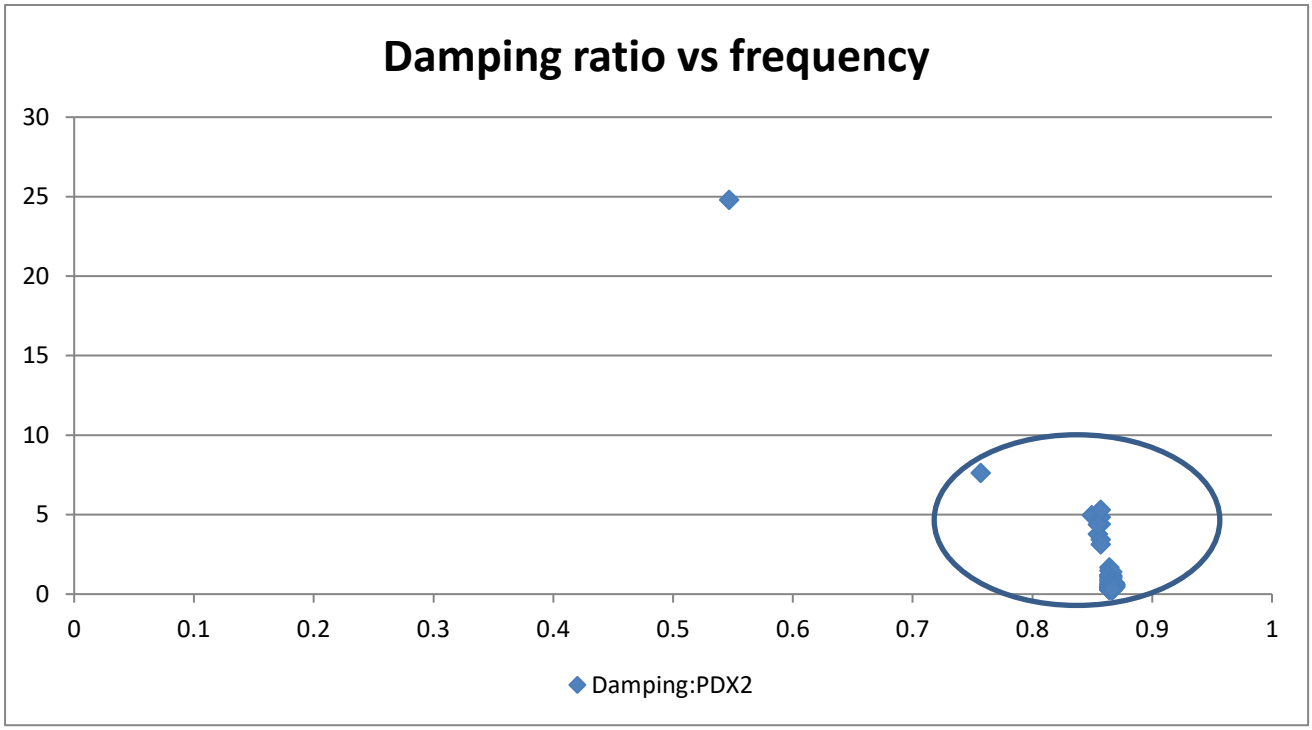
Power Spectral Density as shown below also shows that the highest energy is of 0.8-0.9Hz .



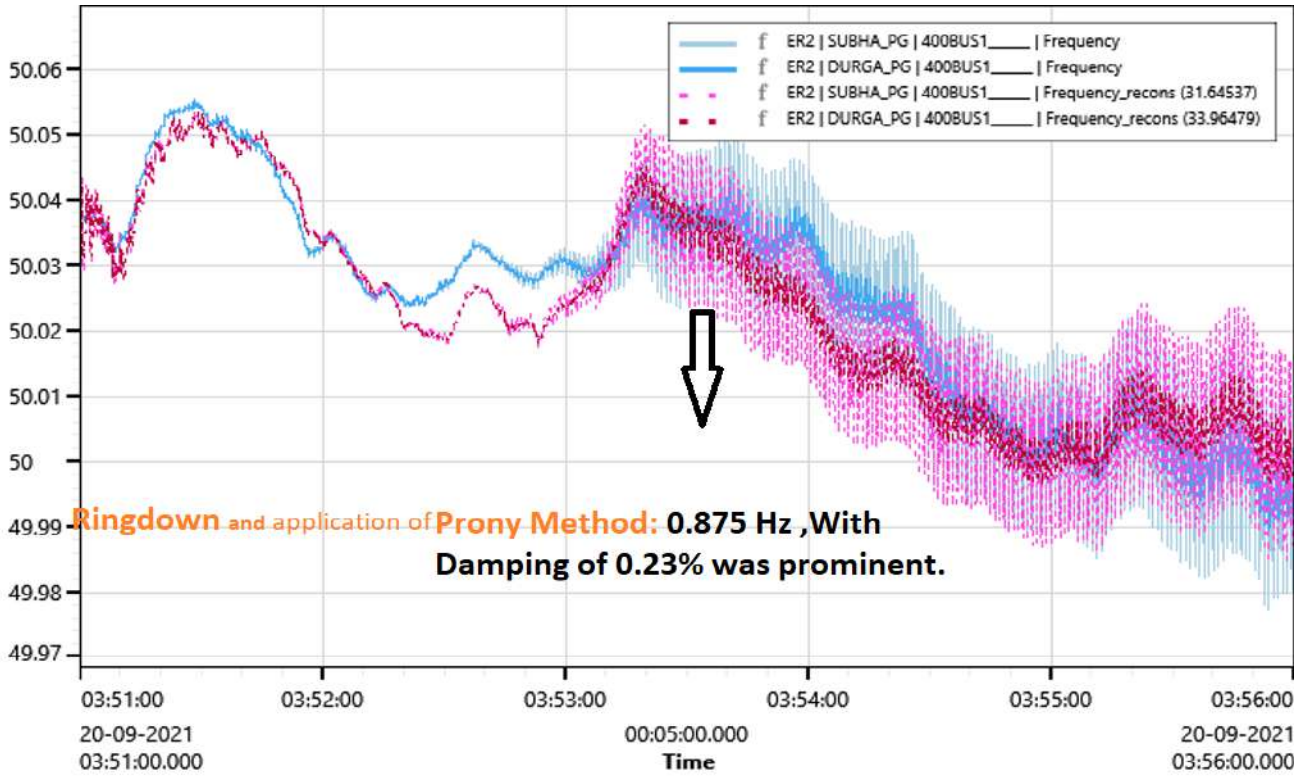


Above signal conditioning PSD and FFT of plot also shows Prominent mode of oscillating frequency 0.8-0.9 Hz (Local mode).

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



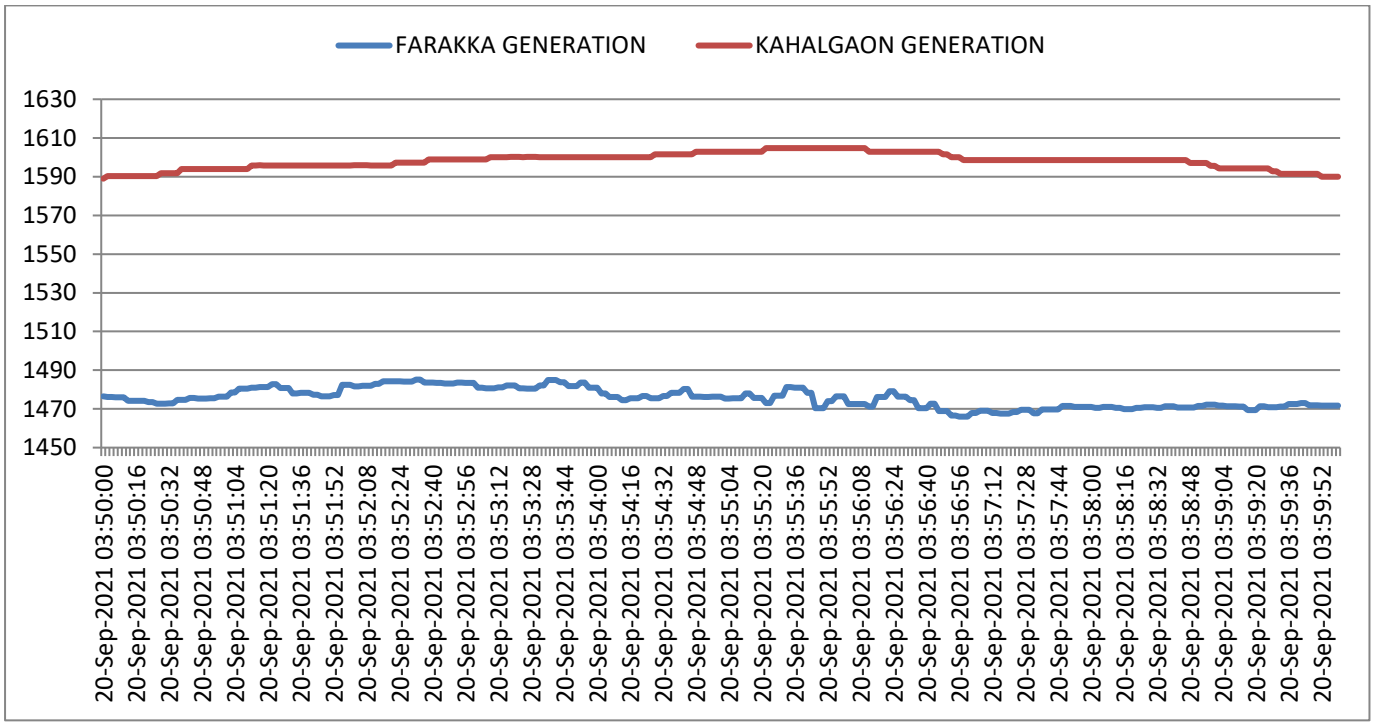
SOURCE OF OSCILLATION:

Scada plot of active power variation of Nearby units:

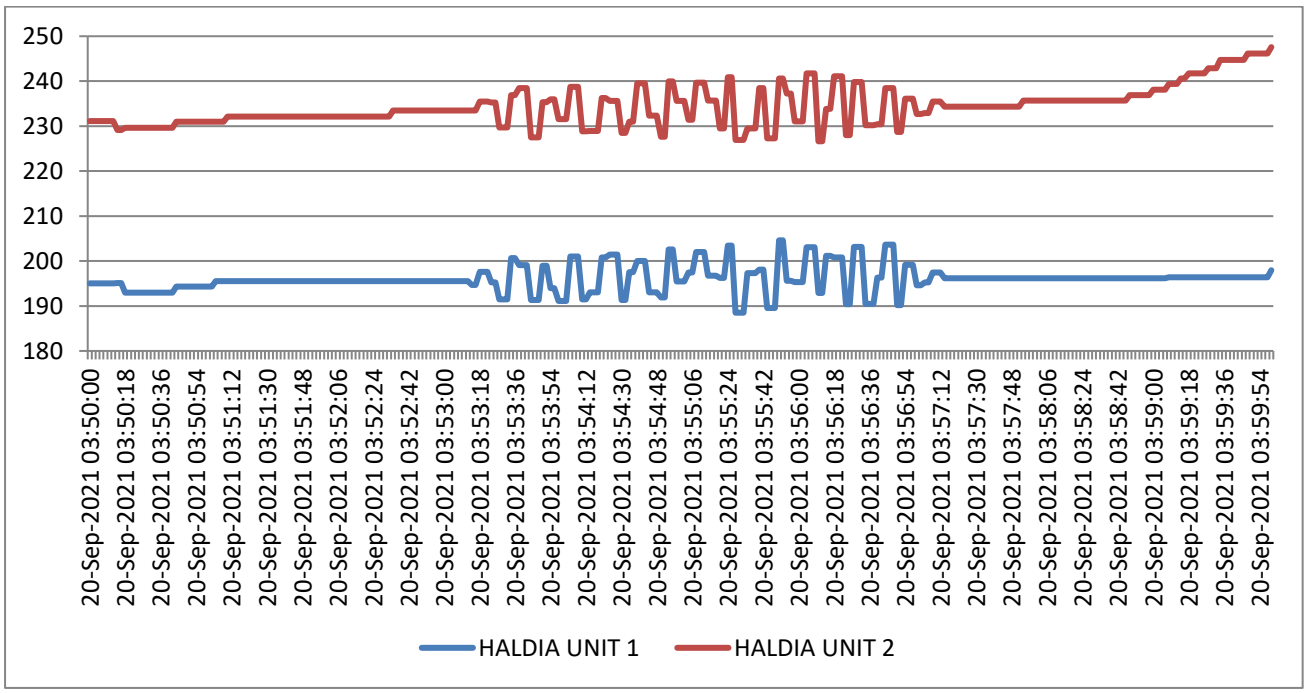
Farakka –Kahalgaon generation:

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

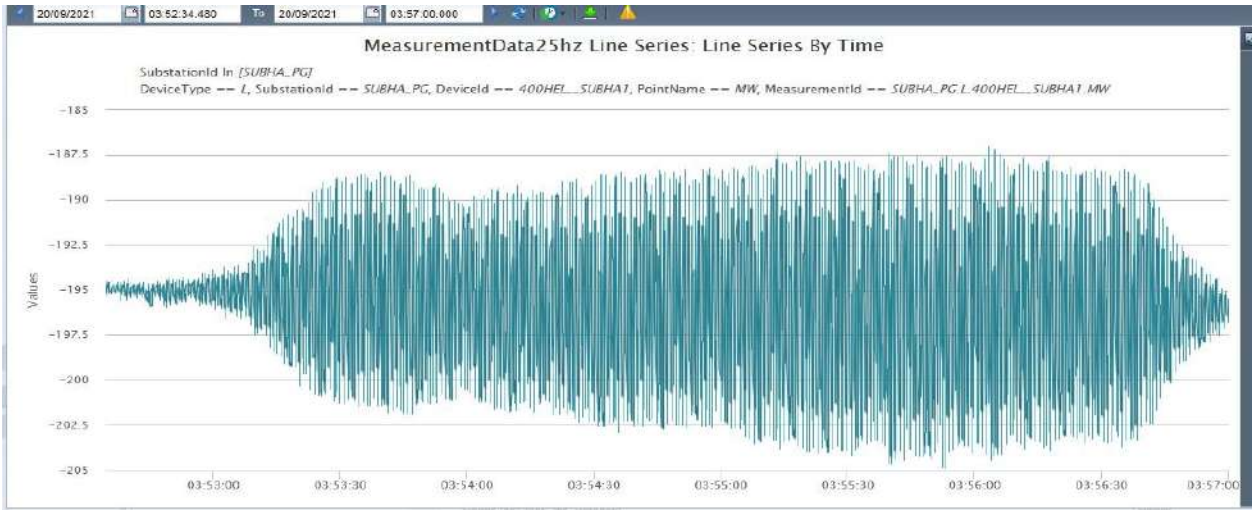
While Kahalgaon no variation observed. This also indicates as we are moving further away from Subhasgram ,units are having less impact .



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

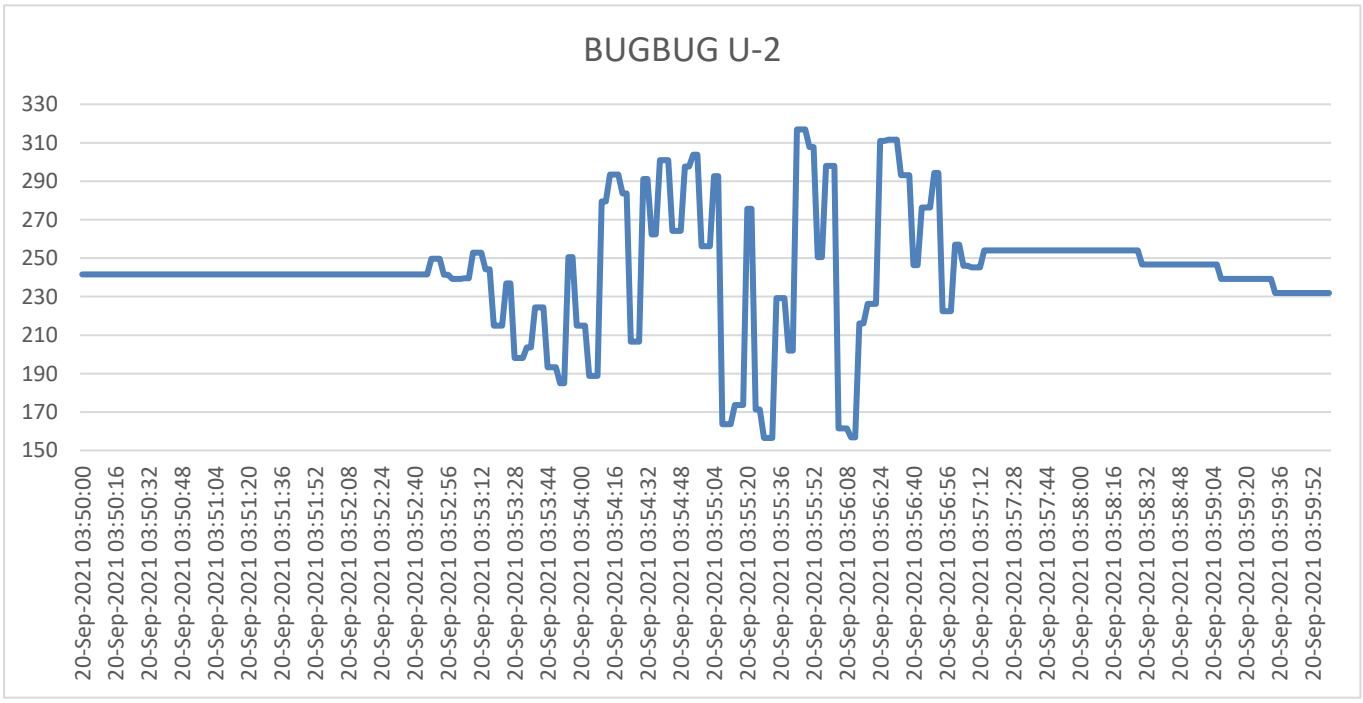


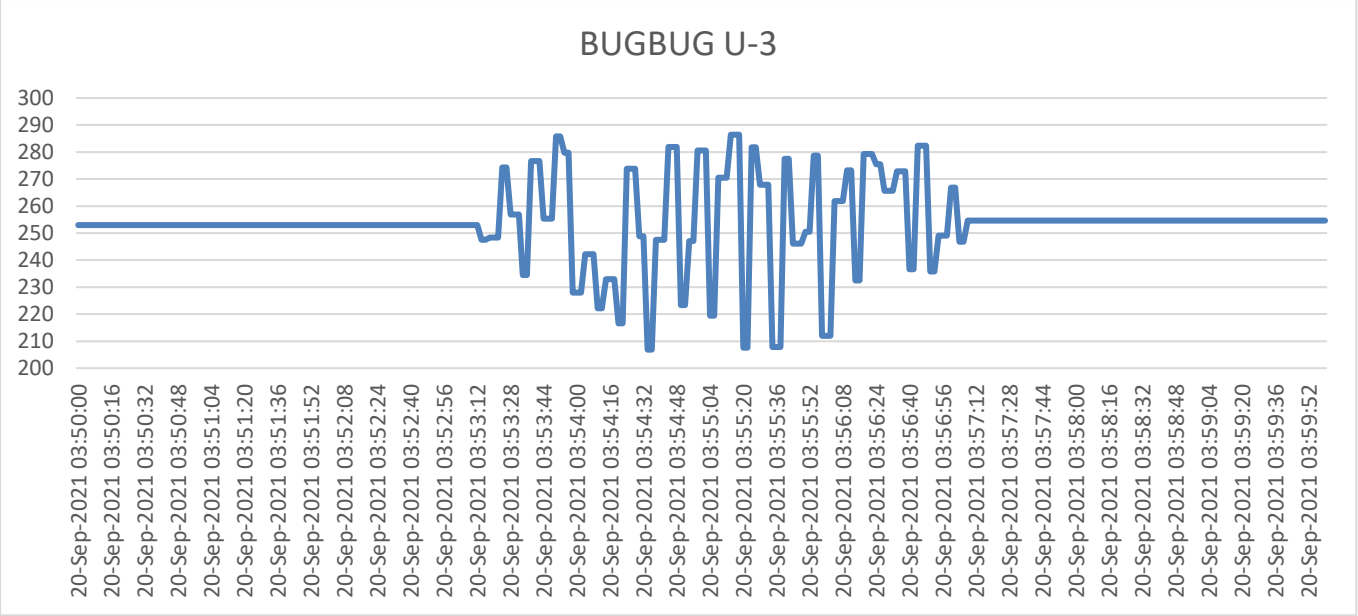
Same was also observed in Haldia Subhasgram power flow variation: 10 Mw variation in each circuit observed as Haldia generation varied.



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:





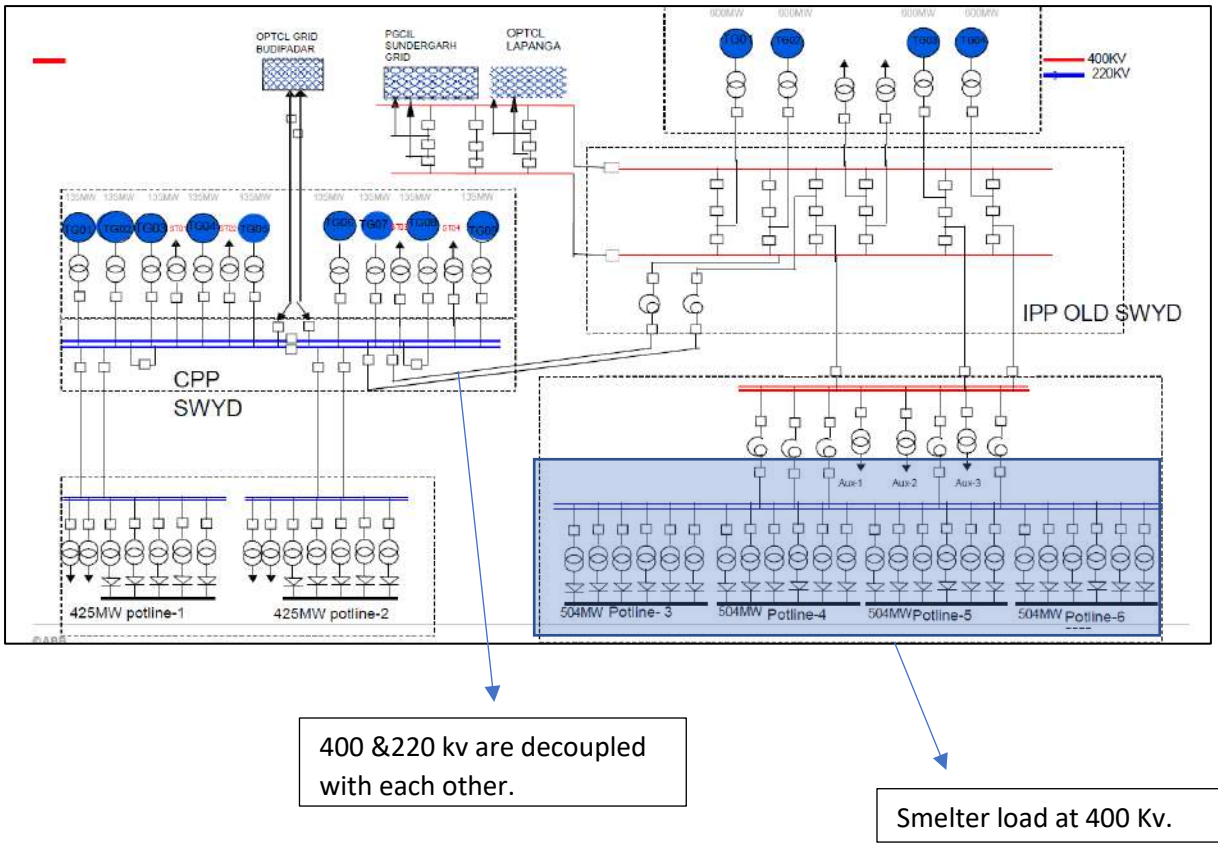
As observed from the above plots maximum variation in MW oscillation was observed for Budge-budge units ,which appears to be the source of oscillation as the Mw variation damped out ,oscillation was also damped .

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:



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 .

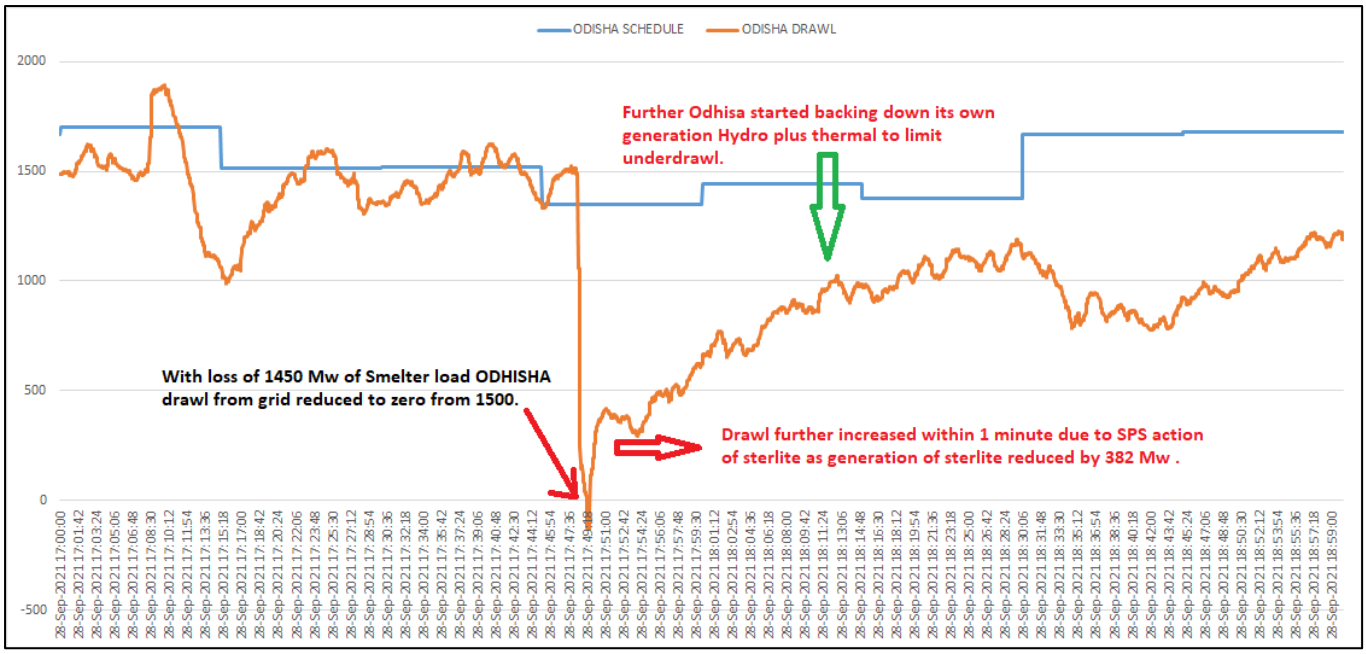
- As Sterlite load reduced ,Sterlite started exporting to the grid by 1182 Mw so total load reduced was 1450 Mw .
- At Sterlite SPS is there to take care of Huge injection in the grid which was set at 800Mw whenever injection is more than 800 MW it will limit it by generation reduction logic .
- Hence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