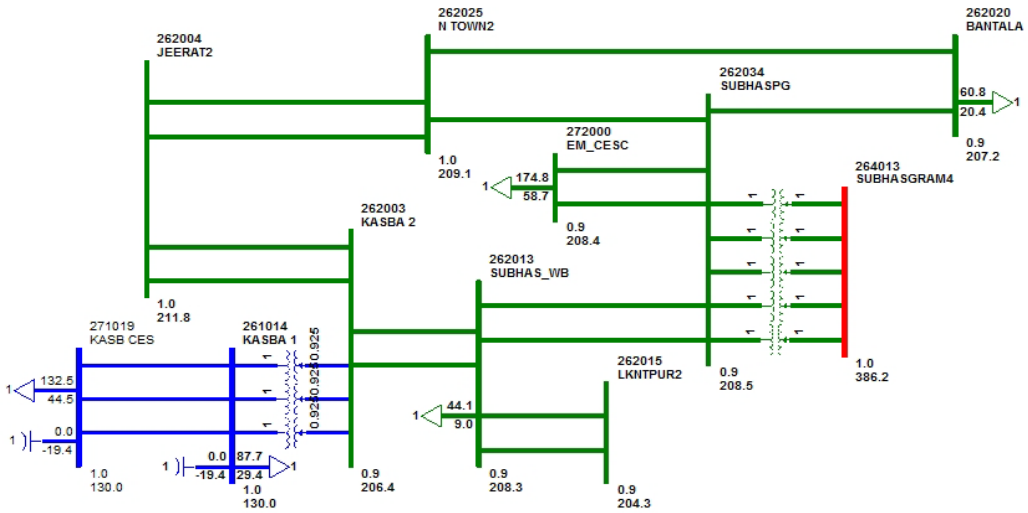
Minutes of Special Meeting on Frequent Line Trippings in and around 220kV Kasba S/s held at ERPC, Kolkata on 3rd May, 2016

List of participants is at **Annexure-A**.

Member Secretary, ERPC welcomed all the participants to this meeting and informed that the meeting was called to discuss the frequent trippings around 220kV Kasba S/s as per the decision of 42nd PCC meeting. He also informed that the disturbance at 132kV Jeerat, Dharampur and Bandel TPS on 10.04.2016 will also be discussed

1. **Disturbance in 220kV WBSETCL & CESC on 01-03-16 at 09:31 hrs.**

At 09:31 hrs, all the 220kV lines connected to Main Bus-I of Subhasgram (PG) S/s (i.e. 220kV Subhasgram (PG) - Subhasgram (WB) D/C, Subhasgram (PG) - CESC-II & Subhasgram (PG) - New Town S/c) tripped due to mal-operation of LBB protection. At 09:39 hrs, 220kV Jeerat- Kasba line-I tripped on zone 1, Y-ph fault from both ends but 220kV Jeerat- Kasba line-II was tripped from Jeerat end only on indication of Z-I, Y-Ph.



After tripping of 220kV Subhasgram(PG)-Subhasgram (WB) D/c and 220kV Jeerat-Kasba D/c lines, part of WBSETCL network along with CESC system got isolated from the ER grid and around 180 MW power was being exported to the part of WBSETCL network from CESC's EM Substation through 132 KV EMSS (CESC) – Kasba (WBSETCL) circuits.

Hence, the frequency of the CESC System sharply dipped to 47.7 Hz leading to load shedding of around 200 MW within CESC's network through UFR operation at various Substations.

At the same time, 132 kV Bus Coupler- I at EMSS tripped through SPS for Islanding Scheme (triggered by U/F relay at 47.8 Hz) by which the CESC system has finally isolated from WBSETCL System.

Due to loss of 200 MW (load shedding through U/F relays) & 180 MW of WBSETCL load (due to final isolation of WBSETCL Kasba S/S from CESC system) caused sudden rise of frequency in islanded CESC system which was arrested by reduction of Budge-Budge generation through

operation of HP/LP bypass system. Later CESC System was synchronized at WBSETCL Howrah Point at 09:46 hrs.

The following elements were tripped during the disturbance:

Time (Hrs)	**Details of tripping**	**Relay at local end**	**Relay at remote end**
09:31 hrs	220kV Subhasgram (PG)-Subhasgram (WB) D/C	Due to Maloperation of LBB at 220kV Main Bus- I of Subhasgram(PG)	
	220kV Subhasgram- CESC –II		
	220kV Subhasgram-Newtown S/c		
09:39 hrs	220kV Jeerat- Kasba-I	At Jeerat 186A,186B,86T-(3 nos.),AUXILIARY RELAY-A,86, 86ABC, Y-Ph, 40k.m.	At Kasba Y-Ph, Z-1,86,10.6 K.M.
	220kV Jeerat- Kasba-II	At Jeerat 86B (2Nos.),186(3Nos), Z-1,Y-ph, 35.40K.M.	At Kasba Did Not Trip

Analysis of PMU plots:

At 09:39:34 hrs

- From the Durgapur PMU plot 5kV voltage dip was observed in Y-Ph.
- Fault clearance time was less than 100 ms.

At 09:39:35 hrs

- From the Durgapur PMU plot 4kV voltage dip was observed in both Y & B-Ph respectively.
- After 1000 ms further 4kV dip has been observed in both Y & B-Ph respectively.
- Fault clearance time was less than 100 ms.

In 42nd PCC, Powergrid informed that one of the 400/220 kV ICT was under shutdown for maintenance activities and the bus side isolator was in closed while carrying out the testing. Also the CT was earthed on both side but there was an LBB DC initiation due to earlier tripping of line. While carrying out the DCRM test of line circuit breakers at Subhasgram S/s there was mal-operation of LBB, which tripped all the elements of Main bus-I.

Regarding tripping of 220kV Jeerat- Kasba D/c lines, WBSETCL explained that 220kV Jeerat-Kasba Line-I tripped from both ends on zone 1, Y-N fault. Thereafter, 220kV Jeerat- Kasba Line-II tripped from Jeerat end only on B-ph Zone 1 protection. WBSETCL informed that even though the B-ph PT fuse failed, the Micom P442 is showing 20 V secondary voltage and this resulted in tripping of the line-2. WBSETCL added that the issue of malfunction of Micom P442 has been referred to relay manufacturer.

Deliberation in the meeting

It was felt that while carrying out maintenance bus isolator along with LBB link of particular breaker should be kept opened in order to avoid the unwanted operation of LBB during breaker maintenance. Moreover, Powergrid kept both the 220kV Subhasgram (PG)- Subhasgram (WB) D/C lines in Main Bus-I which resulted in isolation of CESC system from 220kV Subhasgram (PG) on operation of LBB protection.

Members advised Powergrid to follow standard maintenance practice in future and not to keep the 220kV Subhasgram (PG)- Subhasgram (WB) D/C lines both on the same bus.

Powergrid agreed to take care in future.

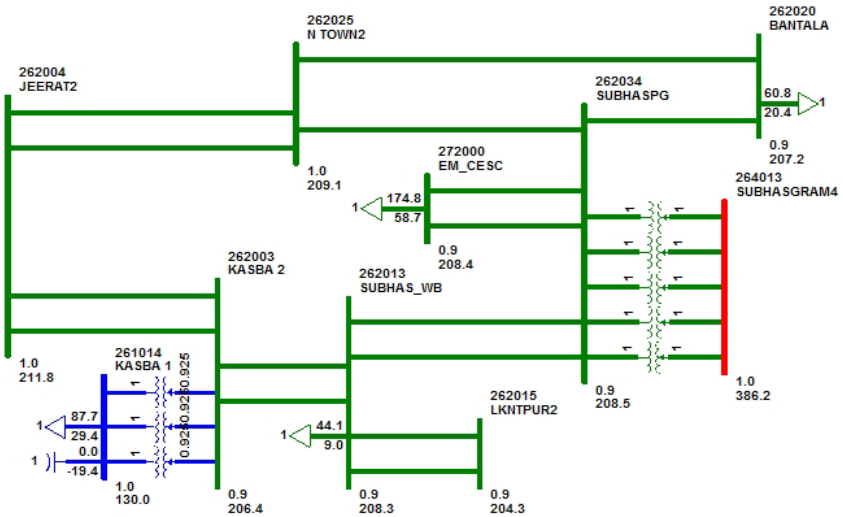
Powergrid informed that the provision of DT is not available in 220 kV WBSETCL lines. Further it was informed that 220kV Subhasgram(PG)-Subhasgram(WB) line is a short line and it is difficult to coordinate using distance protection. But the differential protection is yet to be installed in 220kV Subhasgram(PG)-Subhasgram(WB) line.

The members advised WBSETCL to implement DT feature for all the lines and implement the differential protection for 220kV Subhasgram(PG)-Subhasgram(WB) line.

2. Total Power failure at 220kV Kasba S/s of WBSETCL system on 19-03-16 at 16:53 hrs.

At 16:53 hrs, SLG (i.e R-N) fault occurred in 220kV Jeerat- Kasba –II near to Kasba but Kasba end failed to clear the fault. Subsequently, 220kV Jeerat-Kasba-I, Subhasgram (PG)- Subhasgram (WB) D/C & Subhasgram (PG)- Bantala S/C lines tripped on directional earth fault relay.

CESC got separated from West Bengal system and later it was synchronized at Howrah Point at 17:03 hrs.



Relay indications are as follows:

Time (Hrs)	Details of tripping	Relay at local end	Relay at remote end
16:53 hrs	220kV Jeerat- Kasba-II	At Jeerat Fault location from Jeerat 58.26 km towards Kasba, Fault Current- 2.24 KA, R-N fault, Fault Duration - 344.06 Ms (informed by PGCIL)	At Kasba Information not available
	220kV Jeerat- Kasba-I	Tripped (But from which end not mentioned)	
	220kV Subhasgram (PG)-Subhasgram (WB) D/C	At Subhasgram (PG) directional earth fault relay picked up	At Subhasgram (WB) Did Not trip
	220kV Subhasgram(PG)-Bantala S/c	At Subhasgram (PG) directional earth fault relay picked up	At Bantala Did Not trip

Analysis of PMU plots:

- 12kV voltage dip has been observed in R-Ph at 16:53:24 hrs from the Durgapur PMU plot.
- Fault persistence time was 340 ms.

Status of Reporting:

- PGCIL has given the preliminary tripping report through mail on 23/03/16.
- Reports are awaited from both WBSETCL & CESC.

Deliberation in the meeting

WBSETCL explained that there was R-N fault at 220kV Kasba bus due to dropping of some foreign particles. As there is no bus-bar protection available at 220kV Kasba S/s, the fault got cleared from remote ends on zone 2 distance protection. WBSETCL added that 220kV Kasba-Subhasgram(WB) D/C lines were also tripped from Subhasgram (WB) end on zone 2 distance protection.

Powergrid informed that directional earth fault relays at Subhasgram (PG) end of 220kV Subhasgram (PG)- Subhasgram (WB) D/C and 220kV Subhasgram(PG)- Bantala S/c had picked up the fault but did not trip.

It was felt that the tripping was in order.Hhowever WBSETCL was advised to implement bus bar protection at 220kV Kabsa S/s as it is an important 220 kV interconnecting Sub-station.

Powergrid informed that repeated trippings are being occurred in 220kV Jeerat-Kasba D/C line which are being fed through Subhasgram ICTs..

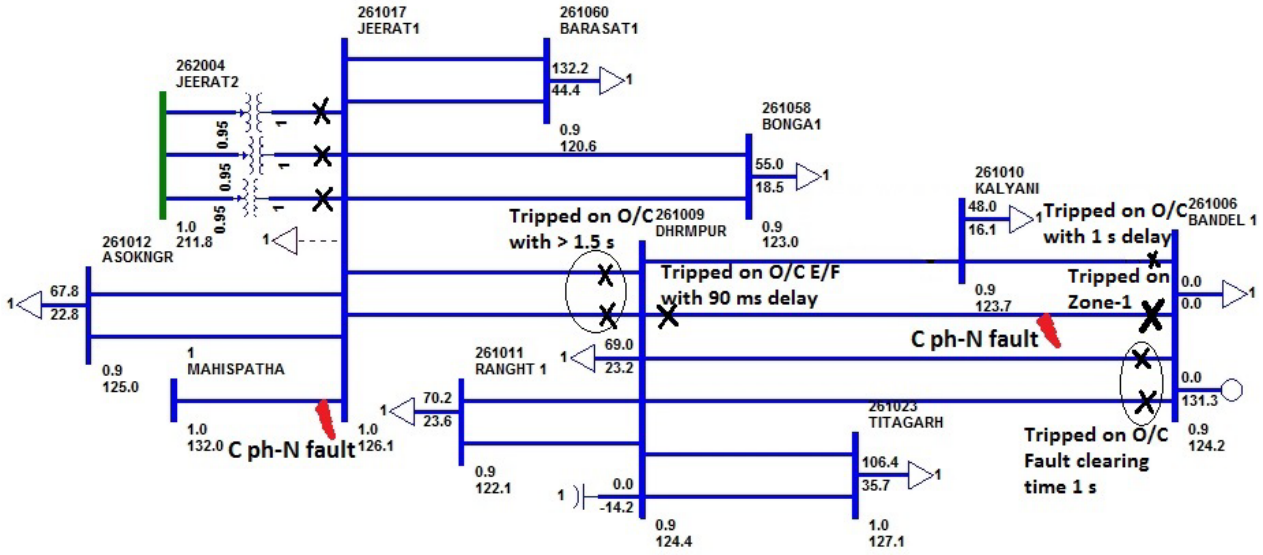
WBSETCL was requested to take the corrective measures to reduce the trippings.

WBSETCL agreed.

CESC informed that there is a need for time co-ordination between CESC and WBSETCL systems at CESC interconnection points (132kV Howrah and Kasba S/s).

It was felt that 33kV and below voltage level feeders of CESC should be allowed to trip first, then 132kV CESC-WBSETCL interconnectors. Therefore, WBSETCL and CESC were advised to co-ordinate the over current time settings bilaterally and resolve the issue.

3. Disturbance at 132kV Jeerat and Bandel S/s on 10.04.16 at 13:13 hrs.



WBSETCL informed that there was a C ph-N fault (close to Jeerat end) in 132kV Jeerat-Mohispota line (under construction), which was idle charged from Jeerat end. Jeerat end failed to clear the fault. As a result the following lines tripped:

- All the three 160 MVA, 220/132kV ATRs at Jeerat tripped from LV side non-directional over current protection.
- 132kV Jeerat-Dharmpur D/C lines tripped from Dharmpur end on over current earth fault protection (C-N). The fault clearing time of line 1 is 1.562 s and line 2 is 1.602 s.

Simultaneously, another C ph-N fault was occurred in 132kV Bandel-Dharmpur line I at 4.4 km from 132kV Bandel S/s. The fault was cleared from Bandel end on zone 1 distance protection and tripped from Dharmpur on over current E/F protection. The fault clearing time from Dharmpur end was 90 ms.

However, the 132kV Bandel-Dharmpur line II & III and 132kV Bandel-Kalyani line also tripped from Bandel end on over current protection and Bandel Unit #5 motor feeder tripped on over voltage. As a result, U#5 tripped on flame failure.

WBPDCL added that they have definite time setting in over current protection at 132kV Bandel S/s with 1 s time delay.

Deliberation in the meeting

WBSETCL informed that there was a C ph-N fault (close to Jeerat end) in 132kV Jeerat-Mohispota line (under construction), which was idle charged from Jeerat end. Jeerat end CB failed to trip the line.

After detailed deliberation, concluded the tripping incidence as follows:

The distance protection at Dharampur end of 132kV Jeerat-Dharampur D/C lines which was supposed to clear the fault (near to 132kV Jeerat S/s) in zone 2/zone 3 has failed and over current earth fault protection at Dharampur end took more than 1.5 s to clear the fault. As a result, the fault got fed from Bandel TPS through 132kV Bandel-Dharampur line II & III and 132kV Bandel-Kalyani-Dharampur lines. Since over current protection settings at 132kV Bandel and Kalyani S/s of these lines is Definite time with 1 s delay which is less than the fault clearing time (which is more than 1.5 s) at Dharampur end, the lines were tripped from Bandel end before the fault got cleared from Dharampur end.

In order to avoid such uncoordinated trippings, the committee recommended the following:

- *WBSETCL was advised to cover the total line length of the 132kV Jeerat-Mohispota (under construction) line in zone 1 from Jeerat end.*
- *WBSETCL was advised to review the distance protection settings of 132kV Jeerat-Dharampur D/C line and 132kV Bandel-Dharampur line at Dharampur end.*
- *It was observed that over current earth fault protection characteristics of 132kV Jeerat-Dharampur D/C lines at Dharampur end were IDMT characteristics and over current protection characteristics of 132kV Bandel-Dharampur line I, II & III and 132kV Bandel-Kalyani at 132kV Bandel end were Definite time characteristics.*
- *It was felt that characteristics of over current relays should be identical for proper relay coordination. WBPDCL was advised to review the over current settings at Bandel end as per the OEM requirement of Bandel generators. Accordingly, WBSETCL to set the identical characteristics at 132kV Kalyani and Dharampur S/s and coordinate the relays by selecting proper time delay.*
- *WBPDCL and WBSETCL agreed to coordinate and resolve the issue bilaterally.*

Meeting ended with vote of thanks to the Chair.

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Participants in Special Meeting on Relay Coordination between Powergrid, WBSETCL and CESC systems in around Subhasgram

Venue: ERPC Conference Room, Kolkata Time: 11:30 hrs Date: 03.05.2016 (Tuesday)

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"Coming together is a beginning, staying together is progress, and working together is success." –Henry Ford