भारत सरकार
Government of India
केन्द्रीय विद्युत प्राधिकरण
Central Electricity Authority
पश्चिम क्षेत्रीय विद्युत समिति
Western Regional Power Committee
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ISO : 9001-2008

संख्या : पक्षेविस /रक्षण/ पीसीएम / कार्यवृत्त /2020/ 3293 दिनांक : 05.03.2020
No. : WRPC/Protection/PCM/Minutes/2020/ Date:

सेवा में / To

As per List (सूची के अनुसार)

विषय : 139 वीं रक्षण समिति की बैठक की कार्यवृत्त।
Sub : Minutes of the 139th Protection Committee Meeting.

महोदय / Sir,

इस पत्र के साथ दिनांक 06.02.2020 & 07.02.2020 को 10:30 बजे, कान्फ्रेंस हाल, प. क्षे. वि. स , एमआइडीसी मरोल, अंधेरी पूर्व, मुंबई में संपन्न हुई रक्षण समिति की **139** वीं बैठक की कार्यवृत्त संलग्न है।

Please find enclosed & herewith Minutes of the 139th Protection Committee Meeting of WRPC held on 06.02.2020 & 07.02.2020 at 10:30 Hrs at Conference Hall, WRPC, MIDC Marol, Andheri (E), Mumbai-400 093. **It is to be noted that the Minutes of the above meeting is also available on website www.wrpc.gov.in in news and Meetings section.**

भवदीय / Yours' faithfully,

B. Venkata Sandeep

(B.V.Sandeep)
कार्यपालक अभियंता (रक्षण) / Executive Engineer (Protection)

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50. Director (NPC), CEA, Katwaria Sarai, New Delhi

Minutes of the 139th Protection Sub Committee Meeting (PCM) of WRPC held on 6th & 7th February, 2020 at WRPC Mumbai.

The 139th meeting of Protection sub-Committee was held on 6th and 7th February, 2020 at WRPC Mumbai. The list of participants is enclosed at **Annexure-A**.

Shri Satyanarayan S., Member Secretary (MS), WRPC welcomed all the participants of the 139th PCM. He informed that occurrences for the period from September to December 2019 will be discussed in this meeting (139th PCM). He informed that the proposal of empanelment of protection auditors for the Third Party Protection Audit (TPPA) was discussed in the 39th WRPC meeting and most of the proposed conditions were approved. He further informed that WRPC was issuing compendiums of system occurrences regularly before 2009. Now the activity of preparing compendium has been taken up.

After his opening remarks, the agenda items were taken up for discussion

ITEM NO.1: Confirmation of Minutes of the 138th PCM

MS WRPC informed that the 138th meeting of protection sub-committee was held on 17th October 2019 at WRPC Mumbai. The MoM was circulated vide letter WRPC/Protection/ PCM/Minutes/2019/13678 dated 14.11.2019.
No comments have been received on the MoM.

The sub-Committee confirmed the MoM of the 138th PCM without modification.

ITEM 2:- Major Occurrences/grid disturbances:

2A. Occurrences in Gujarat system:

2A.1. Grid Incidence at 400/220 kV Charanka s/s on 8th September 2019.

Event Category: *GI-2*

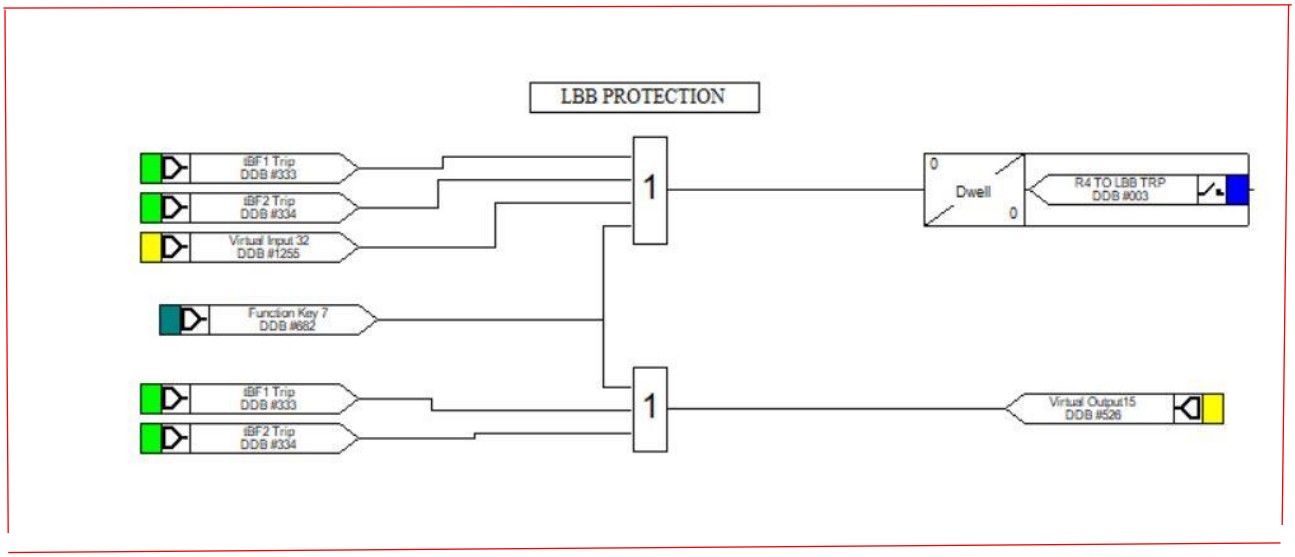
Details of Occurrence as per GETCO report:

On 08.09.2019 at 11.02 hrs 400kV Bus-B tripped with LBB relay operation. With this followings Lines, Reactor and Transformer connected on 400kV Bus-B tripped.

1) 400 KV CHARANKA – KANSARI -2 LINE
2) 400 KV CHARANKA –VELODA-2 LINE
3) 400/220 KV - ICT-NO-2 (HV)
4) 400 KV BUS REACTOR
5) 400 KV CHARANKA- MUNDRA-1
6) 400 KV BUS COUPLER
7) 400/220 KV - ICT-NO-2 (LV Side).

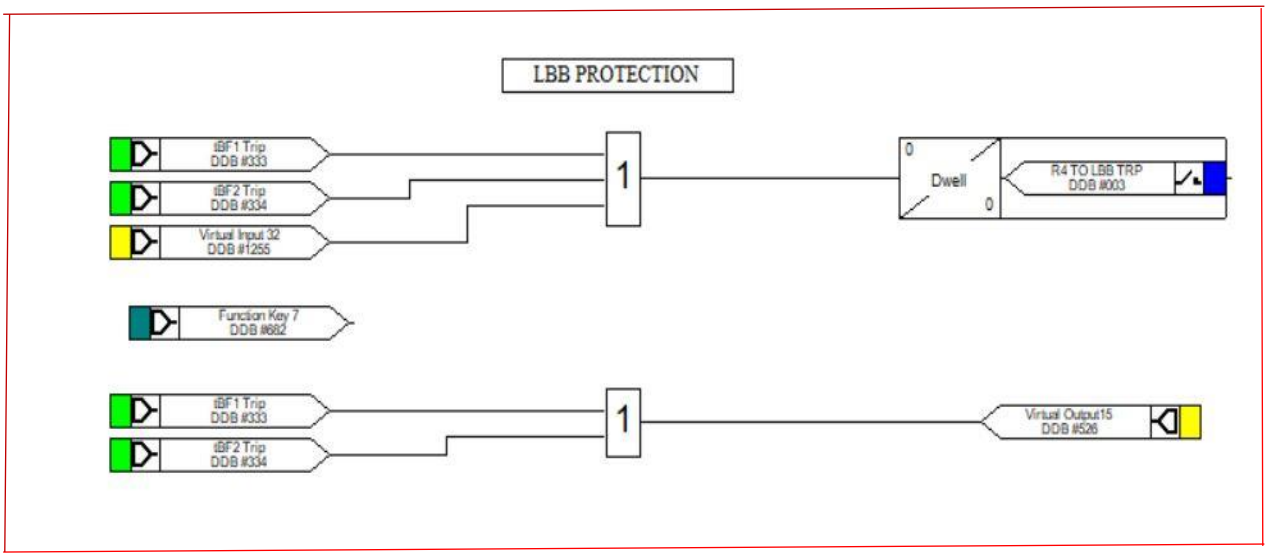
At the time of Occurrence in 400kV Mundra line main-1 relay VT fuse fail Alarm LED was come. LED was not reset from SCADA hence shift in charge got to Kiosk and tray to reset LED in Main -1 relay. During this by mistake he pressed F8 Key and

F7 Key and 400kV Bus-B tripped. From SCADA events and 400kV Mundra Line Distance Main-1 relay (Areva P444) events it was found that, at the time of occurrence, 400Kv Mundra line on Main-1 relay pressing F7 KEY direct GOOSE signal "LBB Prot. goose send" send by Main-1 relay to SCADA and All others Lines, reactor and Transformer connected on BUS-B GOOSE Signal "LBB Prot.Goose Receive" received and tripped. Further check in 400kV Mundra line Main-1 relay PSL it was found that F7 Key was used to Send Direct Goose command for "LBB Prot. Goose send" (Virtual Output 15). 400kV Mudra Line Distance relay Main-1 Final Testing done on 01/03/2017 and PSL is OK. This PSL change is done on dated 04/03/2017 while taking GOOSE timing by SCADA Engineer but after testing removing of F7 key link in PSL forgotten by SCADA Engineer.



Rectification initiatives taken by GETCO:

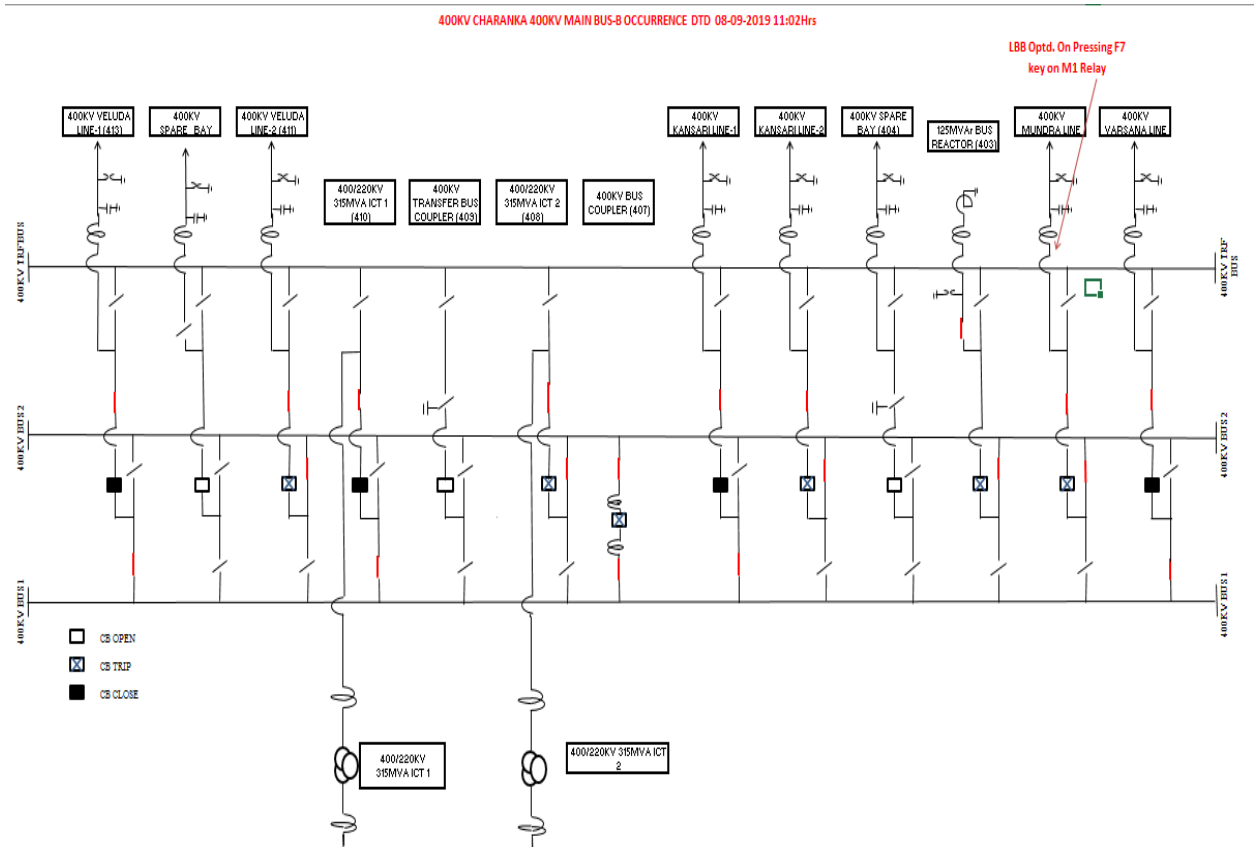
In 400kV Mundra Line Distance Main-1 relay (Areva P444) in PSL F7 key Link is remove from "LBB Prot. Goose send" (Virtual Output 15). Hence in future these types of occurrence not happen.



SLD/Event report is enclosed as ***Annexure 2A.1****.*

Discussion in 139th PCM :

GETCO representative informed that at 400KV Charanka Substation, LBB Protection configured in Main-1 Distance Protection Relay (Make: AREVA , Type: P444) of 400KV Mundra Line, operated – leading to tripping of all Line & Equipment Breakers connected with 400KV Bus-B. At 400KV Charanka substation on 08-09-2019, prior to occurrence, VT Fail alarm was observed in 400KV Mundra line bay and same was not getting reset from SCADA PC. So the operator tried to reset from P444 relay manually and pressed F8, F7 keys on relay – by mistake. The PSL file of Main-1 Distance Protection relay P444 of 400KV Mundra Line was checked and it was found that Function Key-7 was assigned with LBB [96] Trip and LBB Goose send [Virtual Output-15]. The configuration of F7 was done temporarily by OEM Engineer for GOOSE Signal Timing check – during testing work, and same was not removed after completion of Testing. DR extracted from the P444 Relay for 400KV Mundra line confirms that there was no fault current and normal currents were recorded in the DR. Further, during the incident, 400KV Charanka-Mundra & 400KV Charanka-Kansari-2 lines did not trip from remote end, even though DT was sent from Charanka end. The SLD is as given below;



PGCIL representative informed that the tripping related communications in their system are hard wired and trip is never configurations through GOOSE**.** GOOSE (Generic Object Oriented Substation Events) messaging has been applied for status interactions between IEDs including protection relays by replacing the conventional method of using binary inputs/outputs and wires with communication by GOOSE messages over Ethernet cables/fibres.

GETCO representative informed that after the occurrence, the P444 relay PSL file was modified and the earlier Configuration of F7 removed. The R phase PT Secondary fuse which was found blown off – in Mundra Line Panel, was replaced. PT Circuit connections also checked and tightened. The tripping of Remote end CBs of 400KV Charanka-Mundra & 400KV Charanka-Kansari-2 through DT signal will be checked during next outage.

Committee felt that the event would have been avoided, if proper care would have been taken by the vendor after the testing, in restoring the configuration. A standard protocol/configuration for GOOSE messaging be followed by the utilities. MSETCL/PGCIL would submit the standard configuration for GOOSE messaging in the next PCM, so that the same could be discussed by the committee and standardised.

2A.2. Grid Incidence at 400/220 kV Chorania s/s on 1st October 2019.

Event Category: *GI-2*

Event Summary:

At 400/220 kV Chorania s/s, heavy sparking occurred in Pre-Insertion Resistor (PIR) of B phase CB of 400kV Chorania - Asoj -2 which resulted in 400 kV Bus 2 Bus bar protection operation, causing tripping of all the connected elements of 400 kV Bus 2. 400kV Chorania-Asoj-2 and Chorania-Charal tripped from remote end on DT receipt but also picked up Zone-1 protection. All other ckts except 400kV Chorania -Amreli tripped from remote end on DT receipt.

The sequence of tripping and restoration:

S No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1	400 kV Chorania-Bhachau	09:15:02	BB operated	DT received	10:54
2	400 kV Chorania- Charal	09:15:02	BB operated	M1, M2, optd, Z1, B Ph, Dist- 61.46 km, FC -2.637.12 KA DT Received	12:58
3	400 kV 125MVAR BR	09:15:02	BB operated		13:10
4	400 kV Bus coupler	09:15:02	BB operated		13:20
5	400/220kV 500MVA ICT 3	09:15:02	BB operated HV - 86A & 86B, OC & EF, FC - 838.6	BB operated LV - Back up protection - FC 1.722 KA, Trip relay 86A & 86B	13:25
6	400kv Chorania- Amreli	09:15:02	BB operated	Not tripped	13:39
7	400 kV Chorania-Kasor	09:15:02	BB operated	DT received	13:57
8	400 kV Chorania -Vadavi	09:15:02	BB operated	DT received	14:04
9	167 MVA spare ph ICT	09:15:02	BB operated, 86A optd		14:38
10	400kv Chorania- Asoj 2	09:15:02	BB operated	B ph, Z1, Distance –137.6 km, DT received	15:32

SLD/Event report is enclosed as ***Annexure 2A.2****.*

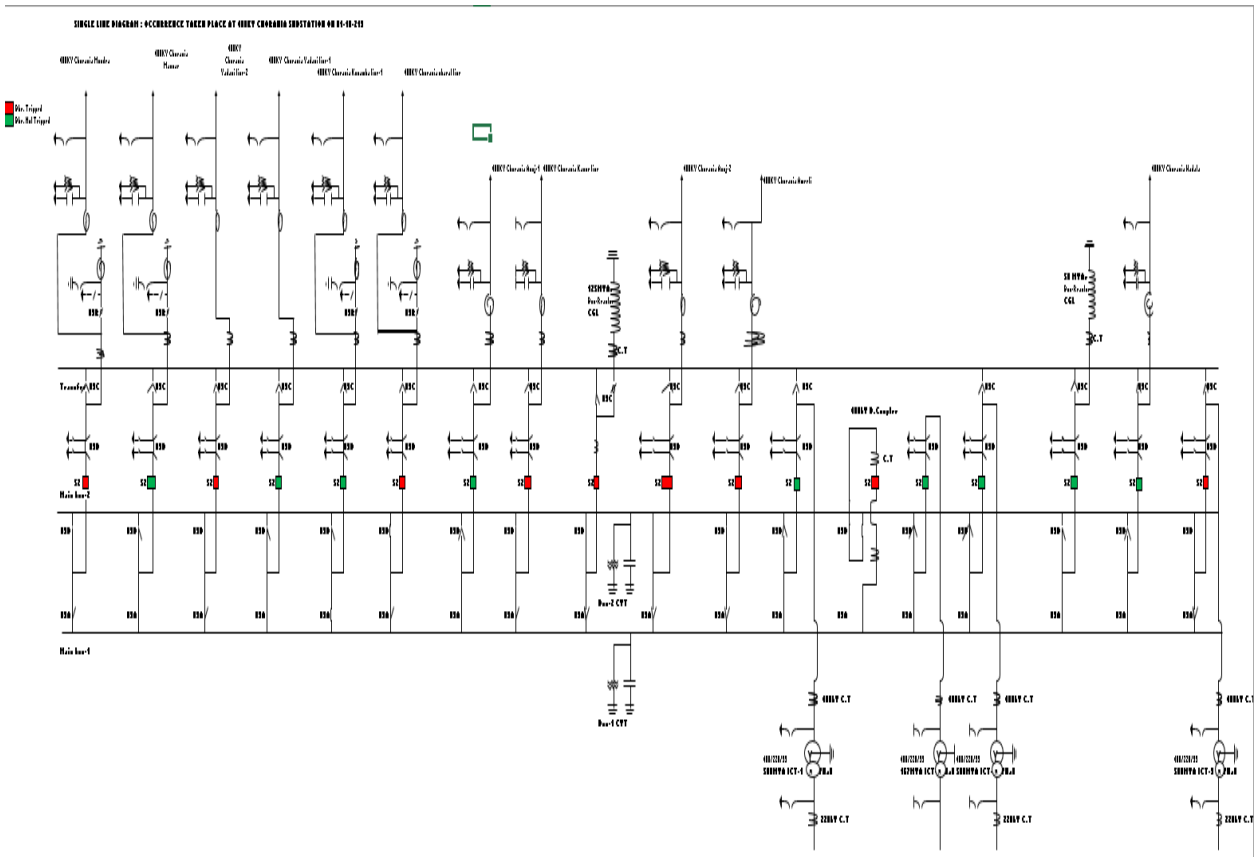
Discussion in 139th PCM :

GETCO representative informed that flashover took place on B Phase PIR(Line Side) of 400KV Breaker of Asoj Line No.2 bay. Busbar protection zone-2 operated leading to tripping of all elements connected to bus-2. Thorough inspection of the 400kV Main Bus-2 & bay insulators of all the elements connected to Main Bus-2.Tan delta, DCRM and CRM tests taken for Asoj Line No.2 breaker - after cleaning flash spots on PIR (line side) - results found normal. It is suspected that, flashover took place due to dust deposition on PIR insulators. The area is highly humid and saline. The online washing frequency have been increased.

Further, Line Impedance Measurement and Distance relay testing of 400KV Chorania line at 400KV Charal and 400KV Asoj Substation will be carried out in view of Overreaching of the DPR of these lines. Non-receipt of DT at Amreli end would be checked with PLCC Engineer.

WRLDC representative informed that the DR of all bay peripheral units and bus bar central unit are not time synchronized and the same may please be got synchronised.

The SLD of the S/s is as given below



Committee felt that the flashover might have taken place external to the PIR as was shown in the CCTV camera footage. The flashover might have taken place due external object falling (long piece of wire/thread) at the end of the PIR and the structure of the breaker. There was no damage to the PIR as the same breaker was taken into service after cleaning it. Committee suggested that the online washing frequency be increased.

2A.3. Grid Incidence at 400/220 kV Amreli s/s on 25th October 2019.

Event Category: *GI-2*

Event Summary:

While carrying out testing works in 400/220 kV 315 MVA Amreli ICT-2, external LBB of Backup protection relay operated at 11:21 Hrs, resulting in the tripping of 400kV Amreli Bus 1 along with all the connected elements. There was no fault in the system. There was no load loss due to the event.

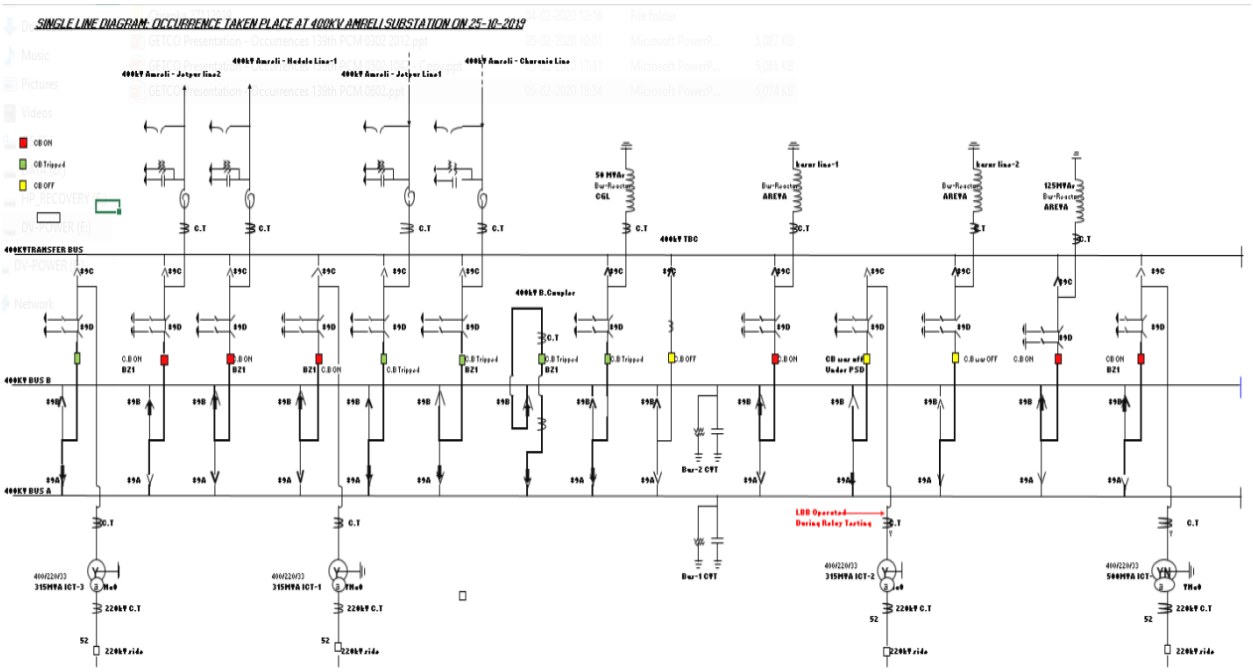
The sequence of tripping and restoration:

Sl No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1	400 kV Amreli-Chorania	11:21:41	LBB, Bus Zone 1 trip	DT received	12:08
2	400 kV Amreli-Jetpur 1	11:21:41	LBB, Bus Zone 1 trip	DT received	12:02
3	400/220 kV 315 MVA Amreli ICT 3	11:21:41	HV side: LBB, Bus Zone 1 trip LV side: Inter-trip		16:29
4	400 kV 50 MVAR Amreli Bus reactor	11:21:41	LBB, Bus Zone 1 trip		11:59
5	400 kV Bus coupler	11:21:41	LBB, Bus Zone 1 trip		11:56

SLD/Event report is enclosed as ***Annexure 2A.3.***

Discussion in 139th PCM :

GETCO representative informed that during routine testing of Dir. O/C & E/F relay (Make: ABB, Type:REF615) of HV Side of 400/220KV, 315MVA ICT-2, external LBB configured in same relay operated and all equipments connected to 400KV BUS-1 tripped on LBB BUS ZONE-1 operation. The SLD is as given below;



He further informed that Testing Engineers forgot to take out LBB Links during testing of Dir. O/C & E/F relay for HV Side of 400/220KV ICT No.2 resulting in LBB operation, leading to tripping of all bays connected to 400KV Bus A.

WRLDC representative informed that there was a time difference of 30 minutes at Amreli end and Chorania line SOE and requested GETCO to resolve the issue at the earliest.

Committee observed that LBB links of respective protection relay should be taken out, without fail, before carrying out relay testing work.

2A.4. Grid Incidence at 400/220 kV Amreli s/s on 13th November 2019.

Event Category: *GI-2*

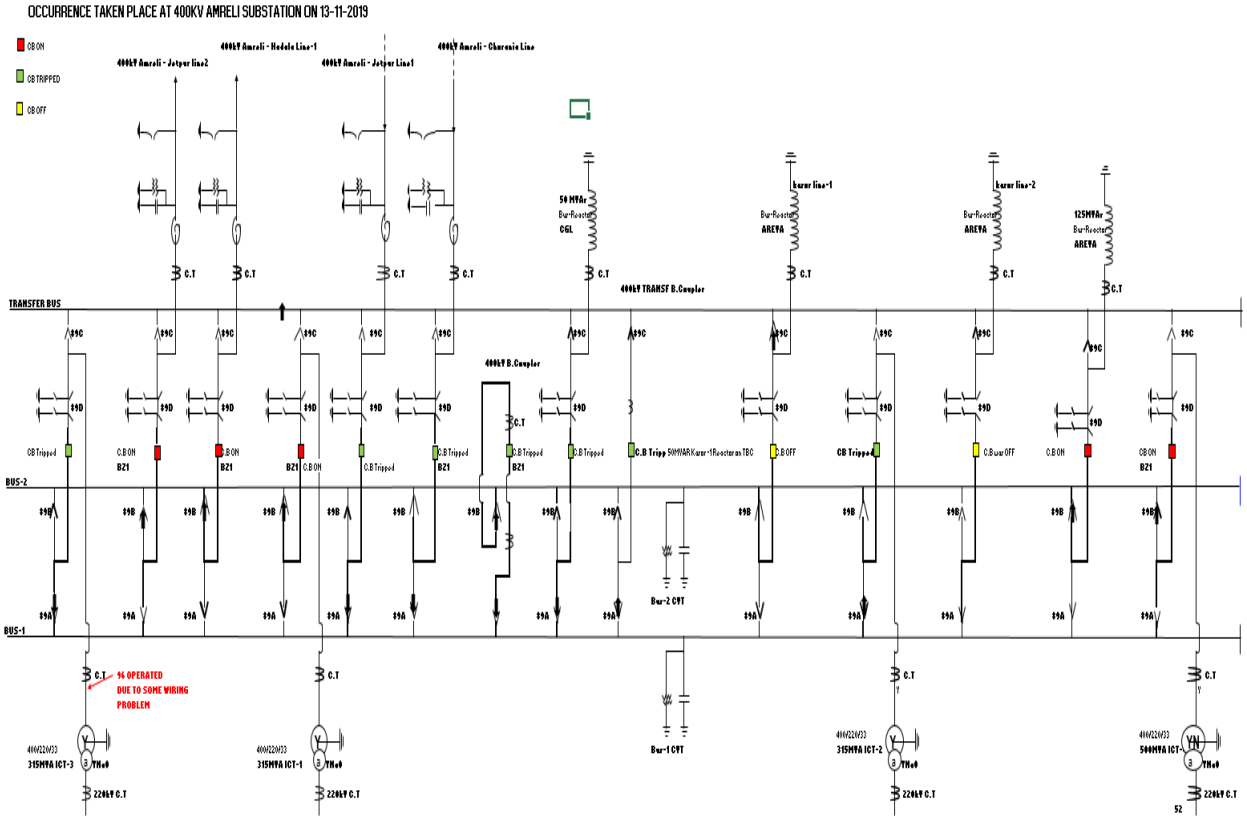
Event Summary:

At 400/220 kV Amreli s/s, due to malfunction in external LBB Hard wiring scheme of 400/220KV ICT-3 Bay, all the elements connected to 400 kV Bus 1 tripped on LBB operation.

SLD/Event report is enclosed as ***Annexure 2A.4****.*

Discussion in 139th PCM :

GETCO representative informed that LBB protection for 400KV Bays was in service through LBB protection configured in 400kV Numerical Bus Bar Protection Scheme (MICOM P741) – at 400KV Amreli Sub station. At 18:13 Hrs., suddenly due to some problem in external LBB hard wiring of 96 relay of 400/220KV, ICT-3 Bay, it operated. ICT-3 was connected to 400KV Bus-1. All elements connected with 400KV Bus-1 tripped on LBB Zone-1 operation. The SLD is as given below;



GETCO representative further informed that external LBB was out of service and the built in LBB of the numerical relay was in service. After the occurrence, hard wiring part of LBB made out of service (LBB Protection is in service through Bus Bar protection CU and PUs). After proper checking and rectification of the hard wiring, the same would be taken in service. Committee noted.

2A.5. Grid Incidence at 400/220 kV Asoj s/s on 20th November 2019.

Event Category: *GI-2*

Event Summary:

At 400/220 kV Asoj s/s, a monkey jumped on R Phase earth switch dead weight of Bus 2. This led to the tripping of all the feeders of connected to 400 KV Bus 2 on Bus bar protection operation along with bus coupler.

The sequence of tripping and restoration:

Sl No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1.	400 kV Asoj Bus 2	16:37:07	BB protection		17:17
2.	400 kV Asoj- Vadodara 2	16:37:07	BB protection	DT received	17:34
3.	400 kV Asoj- Indore 2	16:37:07	BB protection	DT received	17:31
4.	400 kV Asoj- Chorania 1	16:37:07	BB protection	DT received	17:35
5.	400 kV Asoj- Chorania 2	16:37:07	No trip	Zone 1, 2& 3 picked up, carrier sent, A/R blocked	17:46
6.	400 kV Asoj- Wanakbori	16:37:07	BB protection	DT received	17:28
7.	400/220 kV Asoj ICT 4	16:37:07	BB protection		17:26

SLD/Event report is enclosed as ***Annexure 2A.5****.*

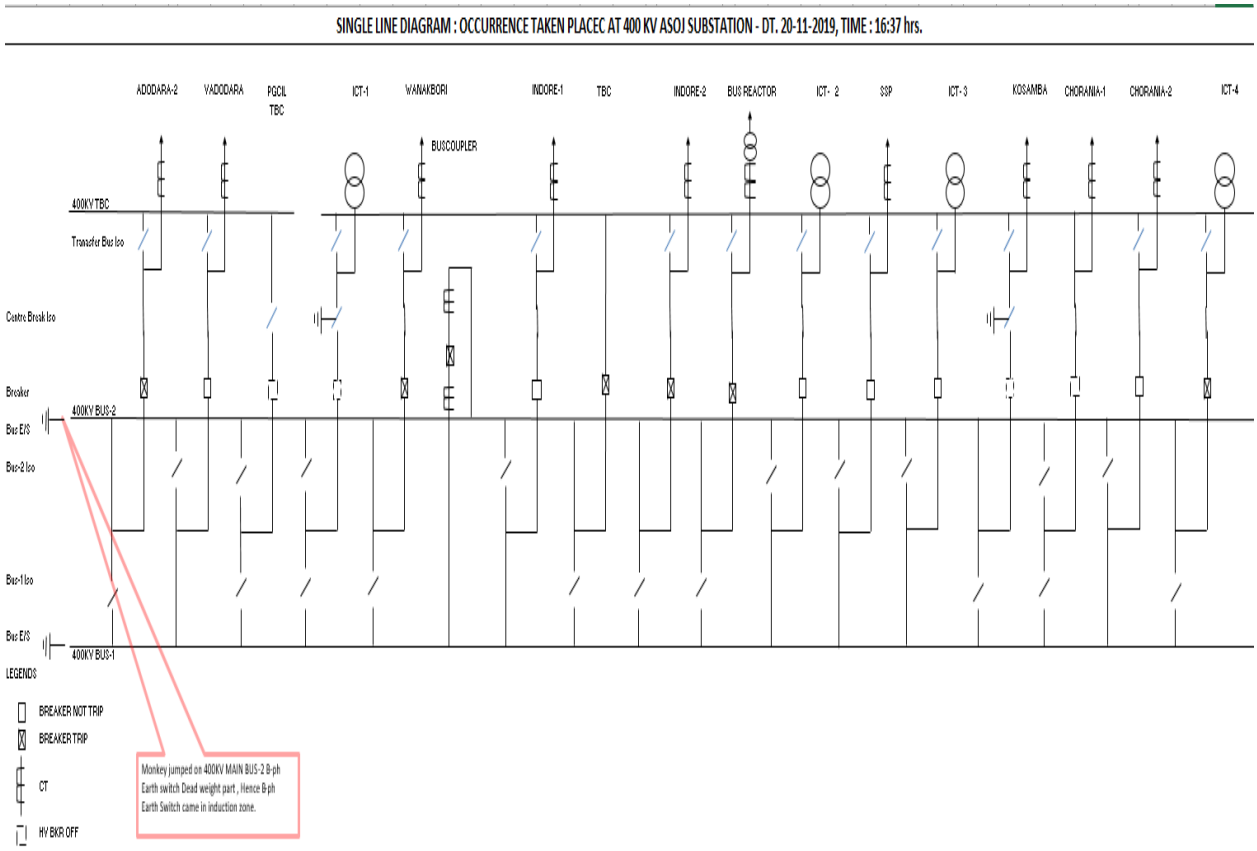
Discussion in 139th PCM :

GETCO representative informed that 400KV Main bus -2 tripped at 16:37 hrs. Monkey jumped on the 400kV Main Bus-2 Earth Switch dead weight part of B Ph. This caused Earth Switch movement to enter in induction zone - leading to fault on Main Bus-2. All lines, equipment connected to 400KV Main Bus-2 tripped within 45ms and fault was cleared. The fault current of 30kA was recorded in Bus bar Protection Central unit. Alstom make Bus Bar Protection scheme operated correctly.

400KV Chorania-1 line was on TBC. DT was not received at remote end, same would be rectified by modifying the PSL. For 400KV Vadodara-2-line time difference of -05:30 hrs was observed, as local offset time was set to 0min instead of 330mins. 400KV Asoj-Chorania-2 line tripped at 400KV Chorania end only due to Overreaching.

WRLDC representative informed that tripping of 400kV Indore-Asoj-2 at Asoj end is not logged in SCADA SOE. Further External LBB operated signal is going high after 26 ms of zone pickup and requested GETCO to investigate the issue and rectify the same.

The SLD of S/S is as given below;



He further informed that permanent locking arrangement was provided for the Earth Switch after the event. Earlier locking was provided with armour wires, the same got corroded and broken. Regarding over reaching of P442 Distance Protection Relay of 400KV Asoj-Chorania line No.2 at 400KV Chorania end, the matter has been taken up with the OEM.

Committee noted the measures taken by GETCO.

2A.6. Grid Incidence at 400 kV Charanka s/s on 27th November 2019.

Event Category: *GI-2*

Event Summary:

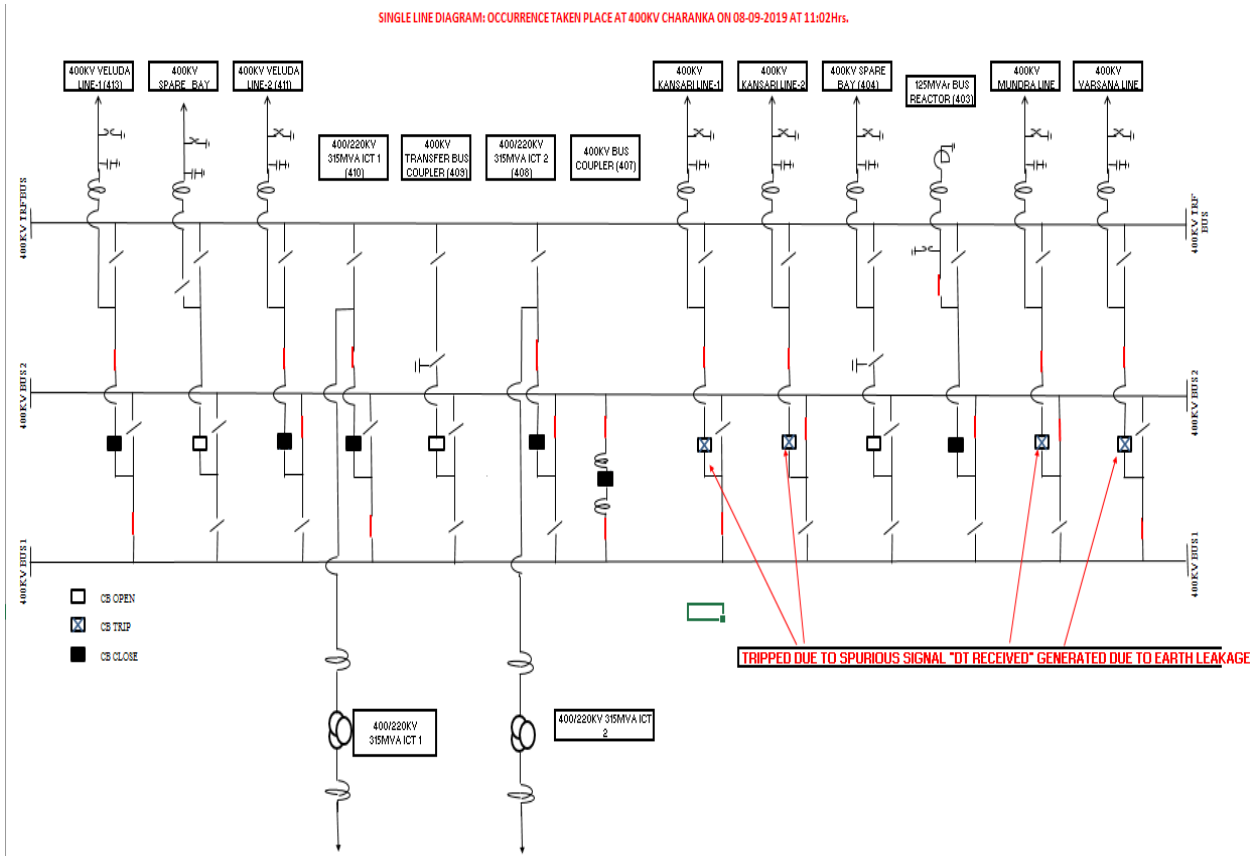
At 400/220 kV Charanka s/s, due to the earth leakage in PLCC BCU, PLCC BCU issued DT received command which resulted in 86 A and 86 B relay operation and tripping of 400 kV Varsana, APL Mundra and Kansari 1&2. All the lines tripped only from Charanka end and remained in charged condition from the respective remote ends.

The sequence of tripping and restoration:

Sl No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1.	400 kV Charanka - Varsana	13:23:19	86 A&B operated, DT received	No trip	16:28
2.	400 kV Charanka - APL Mundra	13:23:19	86 A&B operated, DT received	No trip	20:48
3.	400 kV Charanka - Kansari 2	13:23:18	86 A&B operated, DT received	No trip	22:00
4.	400 kV Charanka - Kansari 1	13:23:18	86 A&B operated, DT received	No trip	16:12

Discussion in 139th PCM :

GETCO representative informed that At 400KV Charanka substation, at 13:24 Hrs.; 400KV Charanka-Mundra-1 line, 400KV Charanka-Varsana-2 line, 400KV Charanka-Kansari line-1 and 400KV Charanka- Kansari line-2 tripped simultaneously only from 400KV Charanka substation. There was no fault. Battery Charger maintenance work was taken up at the time on the incidence. DC Earth leakage was prevailing at the time of Incidence. Earth leakage checking work was also under progress. From PLCC BCU events, it is seen that - DT receive signals were issued to above lines, hence all the lines tripped at local end instantaneously. Due to DC Earth leakage, spurious signal for DT receive generated for 400KV Kansari 1&2, 400KV Mundra and Varsana lines and all lines tripped at local end only. The SLD of the S/S is as given below;



Committee observed that the four lines tripped due to spurious signal "DT received" because of earth leakage and suggested that the DC earth leakage should be monitored closely and attended immediately.

2A.7. Grid Incidence at Kadana Power Station on 6th September 2019.

Event Category: *GI-2*

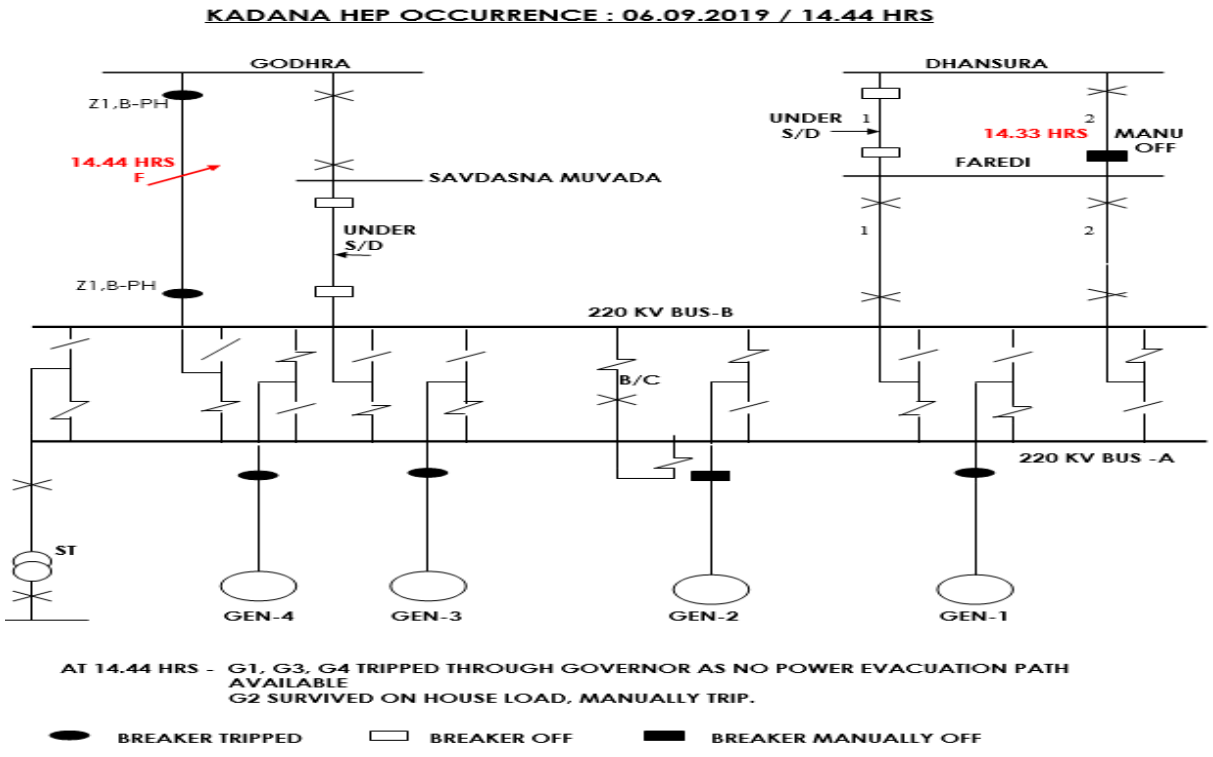
Event Summary:

At 14:44 Hrs 220kV Kadana- Godhara S/c tripped on B-phase fault. After this tripping, 220kV Kadana was isolated from grid and connected radially to Modasa s/s only with 66 kV load of 15 MW. Kadana Units 1,2 and 4 tripped due to the load throw off as generation was 200 MW and load was only 15 MW. Kadana Unit 3 survived on house load and was manually taken out of service. There was a load loss of 15 MW and generation loss of 200 MW due to the event.

The sequence of tripping and restoration:

Sl No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1	220 kV Kadana-Godhra	14:44:18	B phase Zone 1 DPR	B phase Zone 1 DPR	16:09
2	Kadana 60 MW Unit 1	14:44	Governor trip		18:30
3	Kadana 60 MW Unit 2	14:44	Governor trip		18:00
4	Kadana 60 MW Unit 3	14:44	Governor trip		18:45
5	Kadana 60 MW Unit 4	14:44	Survived with House load and Manually switched off		17:30

Single Line Diagram:



SLD/Event report is enclosed as ***Annexure 2A.7****.*

Discussion in 139th PCM :

It was informed that 3 Nos of evacuation lines (220kV Dhansura-Modasa-1&2 and 220kV Kadana-Lunavada) from Kadana were under emergency outage, simultaneously. 220kV Kadana-Savdasna Muvada, 220kV Faredi Dhansura-1 were already under outage. 220kV Faredi Dhansura-2 was handtripped at 14:33hrs, to attend hot spot. The generation at Kadana was being evacuated through 220kV Kadana Godhra line only. At 14:44hrs 220kV Kadana Godhra line tripped on distance protection, Zone-I, B-phase fault. Since there was no evacuation system Unit #1, 2 and 4 tripped through Governor on "Load thrown OFF". Unit#3 survived on house load but was manually taken out of service afterwards.

Committee felt that tripping of units was due to loss of evacuation system and requested GETCO to increase the periodicity of the line maintenance. The outages of lines evacuating from generating stations can be planned and the emergency outages can be avoided. GSECL/GETCO was further requested to check the A/R of 220kV Kadana Godhra line.

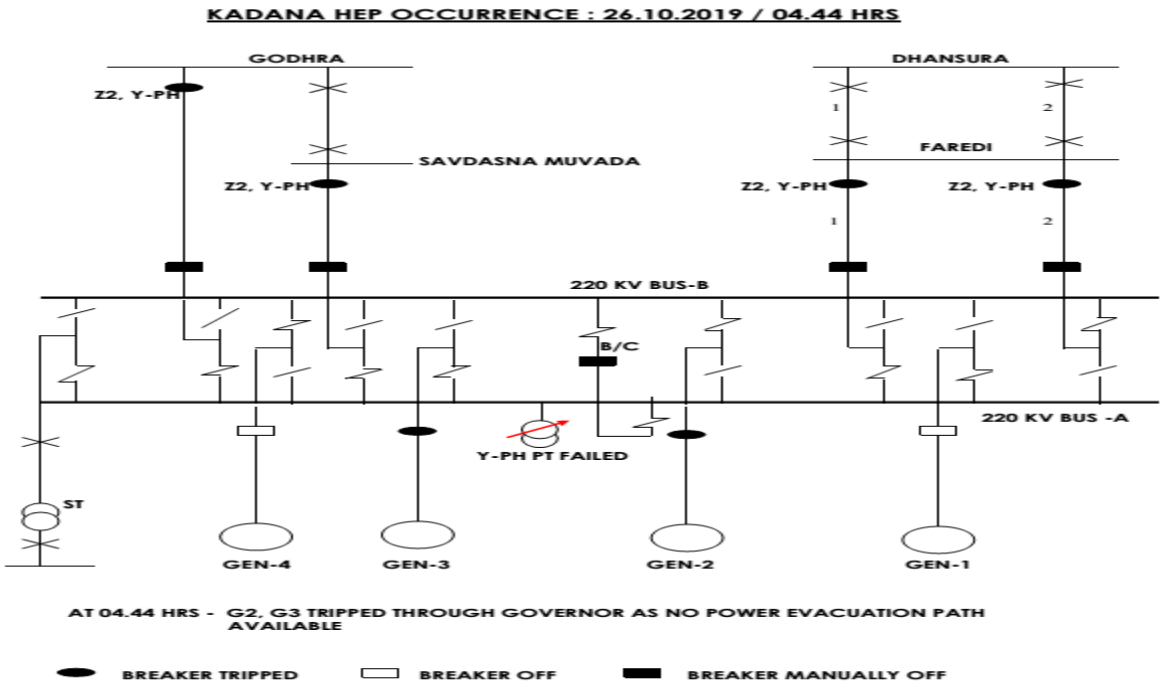
2A.8. Grid Incidence at 220 kV Kadana hydro power station on 26th October 2019.

Event Category: *GD-I*

Event Summary:

Y phase PT of 220 kV Bus 1 blasted at Kadana hydro power station. Bus bar protection of 220 kV Bus 1 did not operate and resulted in tripping of all the connected lines from the remote end on Zone 2 distance protection operation. As there was no evacuation path, Kadana Units 2 & 3 tripped.

Single Line Diagram:



Page 1 of 1

SLD/Event report is enclosed as ***Annexure 2A.8****.*

Discussion in 139th PCM :

It was informed that Y phase PT of 220 kV Bus 1 blasted at Kadana hydro power station. Bus bar protection of 220 kV Bus 1 did not operate and resulted in tripping of all the connected lines from the remote end on Zone 2 distance protection operation. The fault was 3 phase fault and was cleared in 480ms as seen from the PMU data. Since there was no evacuation path Units #2&3 tripped leading to a generation loss of 110MW. The BB differential relay 87A/87B/87CH, Bus wire supervision relay 95A/95B, DC supply circuits were checked after taking 220kV Bus 1 & 2 shut downs. No abnormality was observed. The 220kV PT was replaced on 30.10.2019. 400kV Kadana Madosa 2 was charged at 06:28hrs followed by other elements.

Committee requested GSECL to test the BB protection scheme thoroughly. Further the tripping of 220kV Kadana Godhra line tripping at Kadana end also needs to be investigated.

2B. Occurrences in Madhya Pradesh system:

2B.1. Grid Incidence at 220/132 kV Bhanpura s/s on 1st September 2019.

Event Category: *GI-2*

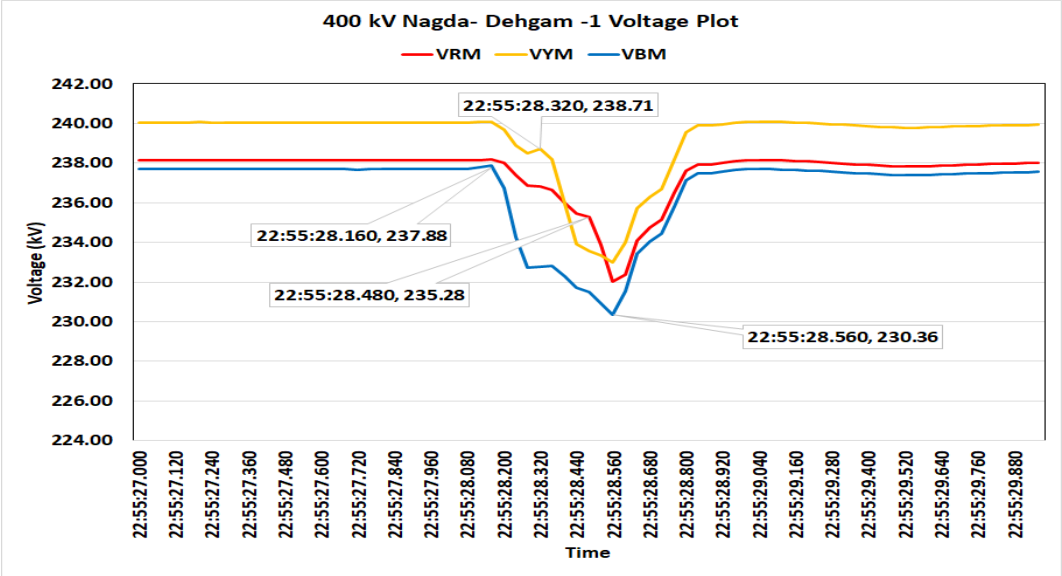
Event Summary:

At 220/ 132 kV Bhanpura s/s, 132 kV B phase Bus PT blasted at 22:55 Hrs and resulted in tripping of all the 132 kV lines on Zone 2 protection operation from remote end and tripping of ICT on Back up Earth fault protection. There was no BB protection at 132 kV Side of Bhanpura s/s, the fault was cleared in 400 ms by Back up protection of ICT and Zone 2 operation of lines at respective remote ends. There was a load loss of 10 MW due to the event.

The sequence of tripping and restoration:

Sl No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1.	220/132 kV 160 MVA Bhanpura ICT 1	22:55:28	HV side: B/U E/F & DTOC (RYB)		23:38
2.	132 kV Bhanpura-Gandhisagar 1	22:55:28	No tripping	Zone 2 DPR	00:20 (02-09-19)
3.	132 kV Bhanpura-Gandhisagar 2	22:55:28	No tripping	Zone 2 DPR	NA
4.	132 kV Bhanpura- Garoth	22:55:28	No tripping	Zone 2 DPR	00:20 (02-09-19)
5.	132 kV Bhanpura- Suwasra	22:55:28	No tripping	Zone 2 DPR	01:36 (02-09-19)

400 kV Nagda-Dehgam 1 Voltage plot during the event:



From PMU voltage plot of 400kV Nagda- Dehgam-1 line of Nagda end, it was observed that there was 7kV voltage drop in B phase (due to failure of B ph Bus PT). The fault was cleared in 400 milli seconds indicating delayed clearance. SLD/Event report is enclosed as ***Annexure 2B.1****.*

Discussion in 139th PCM :

WRLDC representative informed that the tripping of the elements is not logged in the SOE at WRLDC, except for 220/132kV ICT at Bhanpura. DR submitted for 220/132kV ICT is not time synchronized.

Committee observed that there was no representation from MPPTCL in the meeting. Since there was no BB protection at 132 kV side of Bhanpura s/s, tripping of elements from remote ends on opetration of back up protection of ICT and Zone 2 operation of lines was in order. However it was suggested that BB protection be provide by MPPTCL on the 132kV Bus.

2B.2. Grid Incidence at 400/220 kV Bhopal s/s on 4th September 2019.

Event Category: *GI-2*

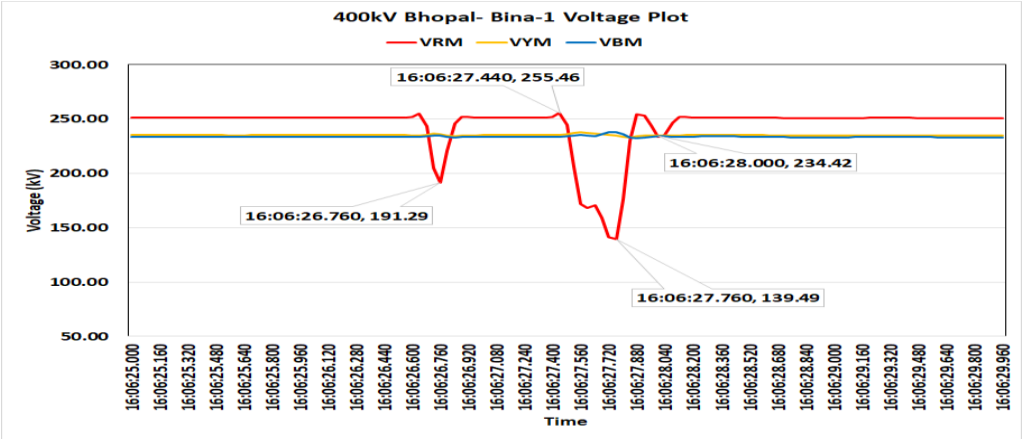
Event Summary:

R phase fault occurred at 220 kV Bhopal(MP)-Bairagarh 1 due to R phase string failed at location number 8 and R phase wave trap of 220 kV Bairagarh 1 failed at Bhopal (MP). A/R was attempted at both the ends, since the fault was permanent, the CB should have tripped during A/R but did not trip at Bhopal end. This led to the LBB operation of Bairagarh 1 and tripping of all the elements connected to 220 kV Bhopal Bus 1.

The sequence of tripping and restoration:

Sl No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1	220 kV Bhopal-Bairagarh 1	16:06:27	LBB operation	R phase,Zone 1 DPR, A/R optd & L/O	17:48 (05-09-19)
2	220 kV Bhopal- Bhopal 1	16:06:27	LBB operation	No tripping	17:17
3	220 kV Bhopal- Ganj Basoda	16:06:27	LBB operation	No tripping	17:02
4	220 kV Bhopal- Mungalia Chap	16:06:27	LBB operation	No tripping	17:16
5	220 kV Bhopal- Shujalpur 1	16:06:27	LBB operation	Already OFF from Shujalpur end for load management	19:33
6	400/220 kV 315 MVA Bhopal ICT 1	16:06:27	LBB operation		17:26
7	400/220 kV 315 MVA Bhopal ICT 3	16:06:27	LBB operation		17:00

400 kV Bhopal-Bina 1 Voltage plot during the event:



As observed from PMU plot auto recloser was attempted in R phase but was unsuccessful. It seems A/R dead time is different at both ends. Two R-phase dips were observed after the initial fault.
SLD/Event report is enclosed as ***Annexure 2B.2****.*

Discussion in 139th PCM :

WRLDC representative informed that there was a time difference of around 1 second between the actual event and the SCADA SOE. MPPTCL may kindly look into the issue.

Committee observed that there was no representation from MPPTCL in the meeting. It was informed that as per the DR the A/R dead time was around 800ms at Bhopal end. Committee suggested that MPPTCL may look into it and correct the dead time to 1.0 sec. Further the time difference in SOE and actual event should be got corrected.

2B.3. Grid Incidence at 220 kV Sukha s/s on 7th September 2019.
Event Category: *GI-2*
Event Summary:
Due to spurious signal generation, LBB of 400/220 kV Jabalpur ICT 2 operated and all the elements connected to 220 kV Sukha Bus 2 tripped at 16:15 Hrs. There was no fault in the system and the tripping was a mal-operation. There was no load loss due to the event.

The sequence of tripping and restoration*:*

Sl No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1.	220 kV Sukha Bus 2	16:15	LBB operation		16:45
2.	220 kV Sukha- Panagar 2	16:15	LBB operation	No tripping	17:11
3.	220 kV Sukha- Narsingpur 2	16:15	LBB operation	No tripping	16:46
4.	220 kV Sukha- Jabalpur 2	16:15	LBB operation	No tripping	16:48
5.	400/220 kV 315 MVA Jabalpur ICT 2	16:15	LBB operation		17:05

SLD/Event report is enclosed as ***Annexure 2B.3****.*

Discussion in 139th PCM :

Committee observed that there was no representation from MPPTCL in the meeting. It was noted that the faulty control cable was replaced. WRLDC informed that no SOE was recorded in the WRLDC SCADA, MPPTCL may resolve the same.

Committee may like to discuss.

2B.4. Grid Incidence at 400/220 kV Astha s/s on 21st September 2019.
Event Category: *GI-2*

Event Summary:

At 400/220 kV Astha s/s, 220 kV R phase Bus 1 PT blasted causing tripping of all elements connected to Bus1 on busbar protection operation. Oil of the failed R phase Bus PT spilled over B phase CB of 220kV Dewas 2 feeder, lying adjacent to it, and caused flash over. As 220kV Dewas circuit 2 was connected on 220kV bus 2, 220kV Bus 2 busbar protection operated and resulted in tripping of all the elements connected to 220 kV Astha Bus 2.

The sequence of tripping and restoration:

Sl No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1	220 kV Astha-Dewas-1	14:58:53	BB protection	Not trip	16:13:00
2	220 kV Astha-Shajapur 1	14:58:53	BB protection	Not trip	16:16:00
3	220 kV Astha-Indore 1	14:58:53	BB protection	Not trip	16:14:00
4	220 kV Astha-Mugliyachap	14:58:53	BB protection	Not trip	16:39:00
5	220/132 kV Astha ICT 1	14:58:53	BB protection	Not trip	15:54:00
6	220 kV Astha-Dewas-2	14:58:54	BB protection	Zone-2 DPR	16:13:00
7	220 kV Astha-Shajapur 2	14:58:54	BB protection	Not trip	16:17:00
8	220 kV Astha-Indore 2	14:58:54	BB protection	Not trip	17:16:00
9	220 kV Astha-Bhopal	14:58:54	BB protection	Not trip	16:48:00
10	220/132 kV Astha ICT 2	14:58:54	BB protection	Not trip	17:52:00

SLD/Event report is enclosed as ***Annexure 2B.4****.*

Discussion in 139th PCM :

Committee observed that there was no representation from MPPTCL in the meeting. The occurrence could not be discussed for want of details.

2B.5. Grid Incidence at 400/220 kV Julwania s/s on 22nd September 2019.

Event Category: *GI-I*

Event Summary:

At 400/220 kV Julwania s/s, B-phase CT of 220 kV Julwania-Julwania I/C 1 blasted and resulted in tripping of all the elements connected to 220 kV Bus 1 on bus bar protection operation.

The sequence of tripping and restoration:

Sl No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication		Time of restoration (hh:mm)
			From	To	
1	220 kV Julwania Bus 1	18:27:15	BB protection	Not tripped	19:55
2	220 kV Julwania-Julwania I/C 1	18:27:15	BB protection	Not tripped	20:08 (25-09-2019)
3	220 kV Julwania-Nirmani	18:27:15	BB protection	Not tripped	19:57
4	4.220 kV Julwania-Sendhwa 1&2	18:27:15	BB protection	Not tripped	19:57
5	400/220 kV 315 MVA Julwania ICT 1	18:27:15	BB protection		19:55
6	220/132 kV 160 MVA Julwania ICT 1	18:27:15	BB protection		19:57

SLD/Event report is enclosed as ***Annexure 2B.5****.*

Discussion in 139th PCM :

WRLDC representative informed the following;

- Isolator status is not telemetered. In DMT bus scheme, without isolator status, it is not possible to identify which element is connected to which bus.
- As informed from site, DT was not sent to remote end. MPPTCL may look into the provision of DT sent to remote end in case of bus bar protection.
- From SOE, it is observed that 220kV Julwaniya-Julwaniya I/C-2 also tripped from both ends. As confirmed from site the ckt did not trip. From DR of 220kV Julwaniya-Julwaniya I/C-1, current raised to 7.8kA in B phase but voltage dip is observed in Y phase (Annexure-1). It appears like voltage channel is wrongly configured in DR.
- From SCADA SOE, it is observed that there is time difference 870 msec in opening of Bus coupler and Transfer Bus coupler.

Committee observed that there was no representation from MPPTCL in the meeting. The trippings were in order except the discrepancies reported by WRLDC, as above. MPPTCL was requested to attend the same.

2B.6. Grid Incidence at 400/220 kV Badnawar s/s on 16th November 2019.

Event Category: *GI-2*

Event Summary:

R-phase jumper from 220 kV Line side Isolator of 400/220 kV 315MVA Badnawar ICT snapped and created R-E fault. This resulted in tripping of all the 220 kV elements connected to 220 kV Bus 1&2 on Bus bar Zone 1&2 protection operation.

The sequence of tripping and restoration:

Sl No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1	220 kV Badnawar-Badnagar 1	08:30:10.520	BB Zone 1&2	No trip	16:52
2	220 kV Badnawar-Badnagar 2	08:30:10.520	BB Zone 1&2	No trip	12:23
3	220 kV Badnawar- Kanwan 1	08:30:10.520	BB Zone 1&2	DT received	16:57
4	220 kV Badnawar- Kanwan 2	08:30:10.520	BB Zone 1&2	DT received	12:31
5	220 kV Badnawar- Ratlam 1	08:30:10.520	BB Zone 1&2	No trip	17:03
6	220 kV Badnawar- Ratlam 2	08:30:10.520	BB Zone 1&2	No trip	12:39
7	400/220 kV Badnawar ICT	08:30:10.520	BB Zone 1&2		18:49

SLD/Event report is enclosed as ***Annexure 2B.6****.*

Discussion in 139th PCM :

It was informed that as per the report received from MPPTCL, R-phase jumper from 220 kV Line side Isolator of 400/220 kV 315MVA Badnawar ICT snapped and created R-E fault. This resulted in tripping of all the 220 kV elements connected to 220 kV Bus 1&2 on Bus bar Zone 1&2 protection operation. Since the fault was inside the BB Zone 1, tripping of the 220 kV Bus 2 on BB Zone 2 protection operation was undesirable. As reported by MPPTCL, the problem was taken up with OEM and root cause analysis report is awaited.
WRLDC representative informed that 220 kV Badnawar- Badnagar 1&2 and 220 kV Badnawar- Ratlam 1&2 tripped only at Badnawar end (For BB operation, DT not sent to remote end). Whereas, 220 kV Badnawar- Kanwan 1&2 tripped at Kanwan end on DT receipt.

Committee observed that there was no representation from MPPTCL in the meeting. Committee suggested that the feedback received from the OEM of BB be shared with the forum. Also the non transmission of the DT to remote end on BB operation, should be resolved by MPPTCL.

2B.7. Grid Incidence at 400/220 kV Indore (MP) s/s on 28th December 2019.

Event Category: *GI-2*
Event Summary:

At 400/220 kV Indore(MP) s/s, B-phase CT of 400 kV Nagda blasted and resulted in tripping of all the elements connected to 400 kV bus 1 on Bus bar protection operation. ISP Unit 1 tripped on overall GT Differential protection operation.

SLD/Event report is enclosed as ***Annexure 2B.7****.*

Discussion in 139th PCM :

Committee observed that there was no representation from MPPTCL in the meeting and therefore the disturbance could not be discussed.

2B.8. Grid Incidence at 220 kV Omkareshwar power station on 27th September 2019.

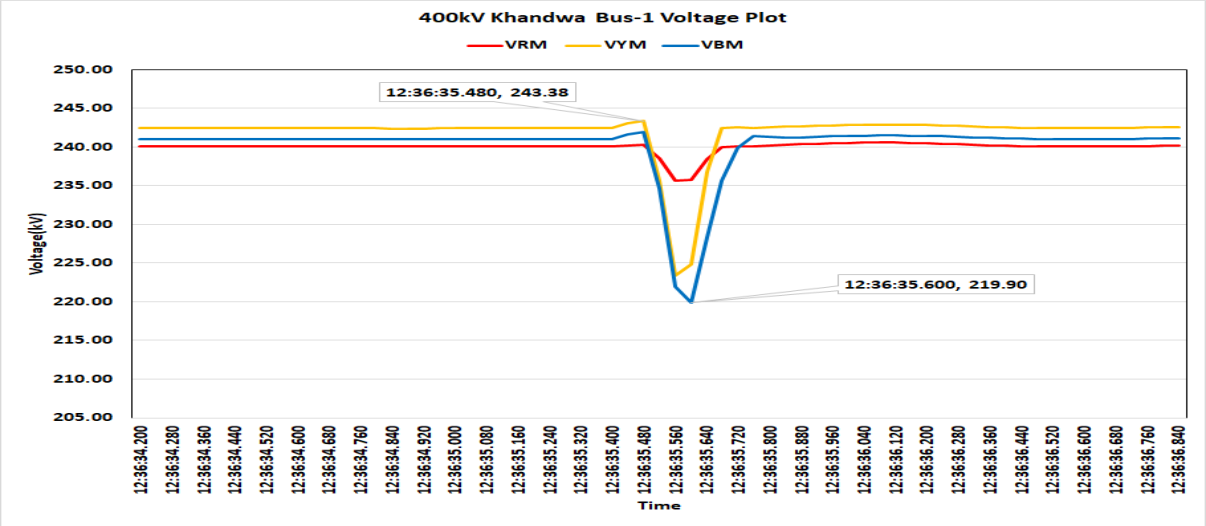
Event Category: *GI-1*
Event Summary:

220 kV Omkareshwar- Julwania tripped on Y-B phase fault on distance protection operation at 12:36 Hrs. At the same time 220 kV Chhegaon and 220 kV Khandwa feeders also tripped on Y-B phase fault along with all the eight units at Omkareshwar. On patrolling, it was found that disc insulator of B phase of 220kV Omkareshwar – Julwania at location no. 30 was faulty. There was a generation loss of 434 MW due to the event.

The sequence of tripping and restoration:

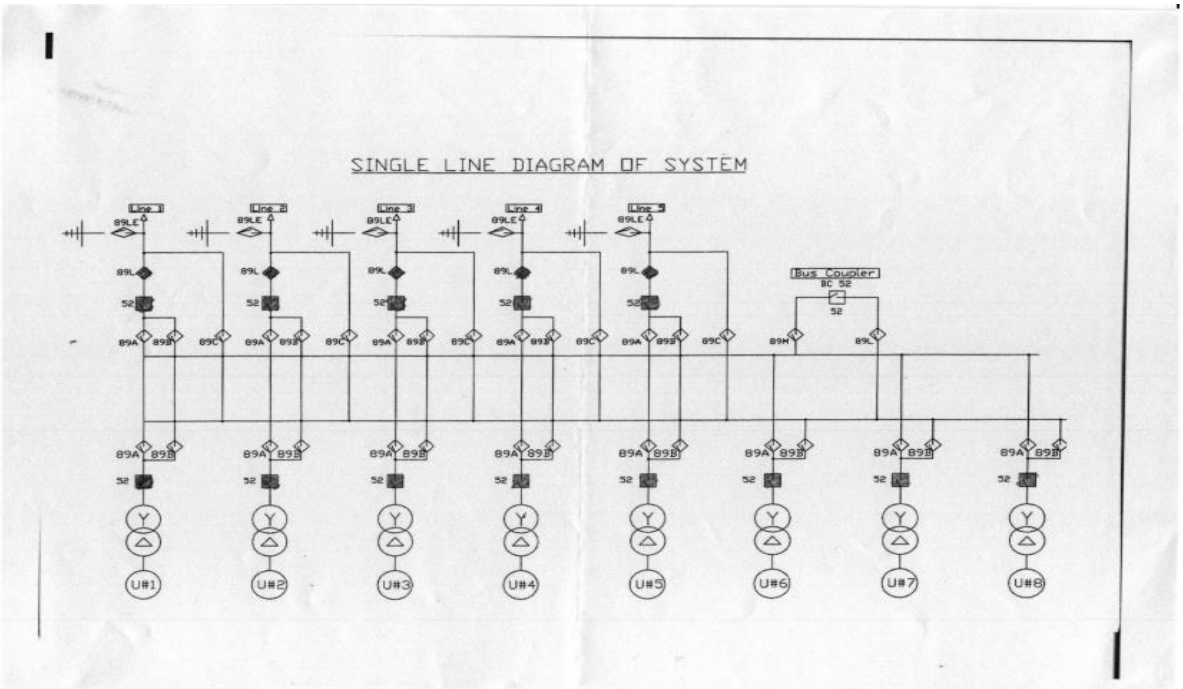
Sl No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1.	220 kV OSP-Julwania	12:36:35	Zone 1, Y-B phase, DPR	Zone 2 DPR	08:28 (28-09-19)
2.	220 kV OSP-Chhegaon	12:36:35	Zone 1, Y-B phase, DPR	NA	08:37 (28-09-19)
3.	220 kV OSP-Khandwa	12:36:35	Zone 1, Y-B phase, DPR	NA	09:23 (28-09-19)
4.	8*65 MW OSP Units	12:36:35	Unit 2&6- Generator differential protection, Rest of the units- External Trip received on fault		Restoration time is given in annexure

Khandwa Bus 1 Voltage plot during the event:



As seen from the Voltage plot from Khandwa PMU, the fault was in Y and B phase and it got cleared within 120 ms.

Single Line Diagram:



SLD/Event report is enclosed as ***Annexure 2B.8****.*

Discussion in 139th PCM :

Committee observed that there was no representation from MPPGCL in the meeting and therefore the disturbance could not be discussed.

2B.9. Grid Incidence at 400 kV Indrasagar s/s on 18th October 2019.

Event Category: *GI-2*
Event Summary:

At 400 kV Indrasagar, while withdrawing unit-7, 400kV Bus-2 tripped on maloperation of 410 bay (Unit-7) LBB.
SLD/Event report is enclosed as ***Annexure 2B.9****.*

Discussion in 139th PCM :

Committee observed that there was no representation from MPPGCL in the meeting and therefore the disturbance could not be discussed.

2B.10. Grid Incidence at 400 kV ISP Hydro power station on 13th November 2019.

Event Category: *GI-2*
Event Summary:

At 400 kV ISP Hydro power station, 400 kV Bus-2 and all connected elements tripped on LBB operation while withdrawing unit-6(125MW) as per schedule.
SLD/Event report is enclosed as ***Annexure 2B.10****.*

Discussion in 139th PCM :

Committee observed that there was no representation from MPPGCL in the meeting and therefore the disturbance could not be discussed.

2C. Occurrences in Maharashtra system

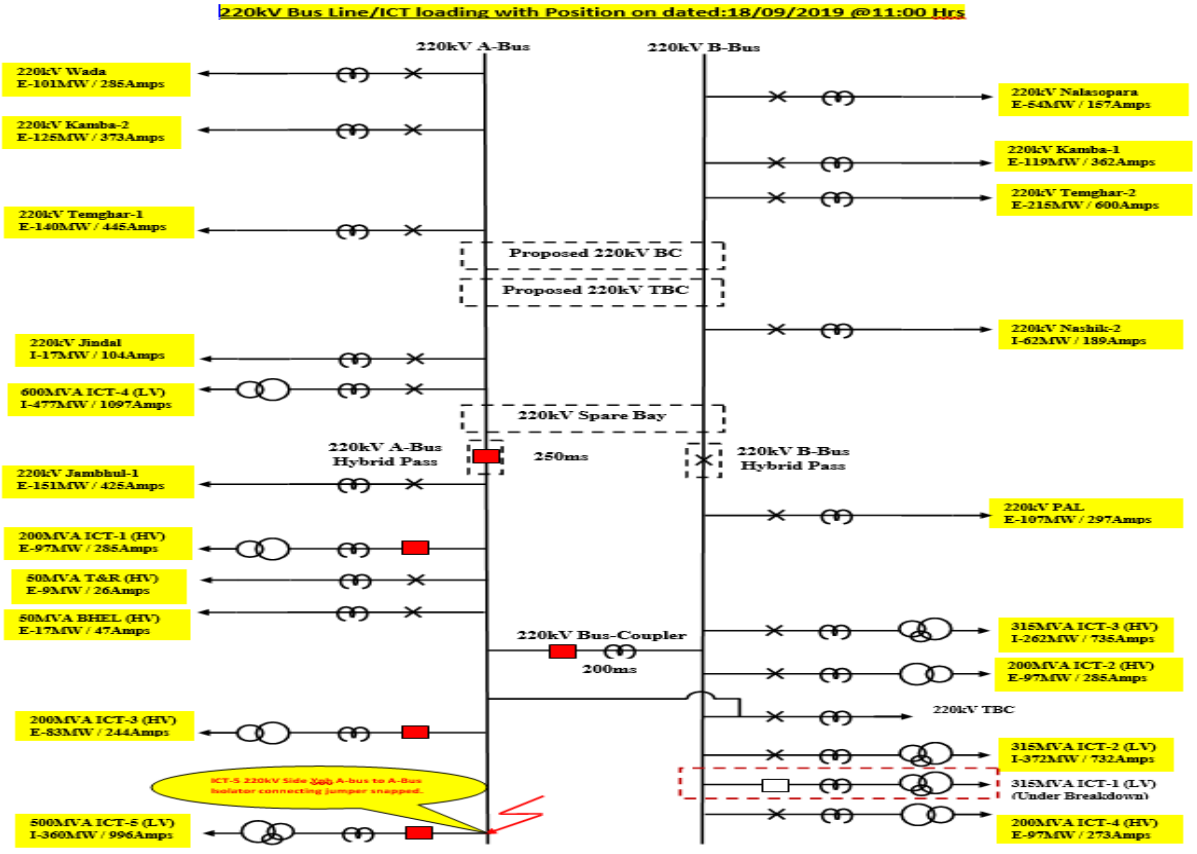
2C.1. Grid Incidence at 400/220 kV Padghe s/s on 18th September 2019.

Event Category: *GI-I*

Event Summary :

At 400/220 kV Padghe s/s, 220 kV side Y phase Jumper connecting 220 kV Bus 1 and isolator of 400/220 kV 500 MVA ICT 5 snapped and created fault in upper section of 220 kV Padghe bus 1. Bus bar protection did not operate causing tripping of the connected elements of 220kV Bus 1 i.e. 220kV Bus coupler, 220kV Bus 1 Sectionalizer, 400/220 kV 500 MVA ICT 5, 220/100kV 200MVA ICT-1& 3 on Backup OC/EF protection. 220kV Padghe- Jambhul connected to Bus 1 and 220kV Padghe-Jindal connected to other section of Bus-1 tripped from remote end on Zone-2 protection. Due to the tripping of 220/100kV ICT-1 & ICT-3, ICT-2 & ICT-4 got overloaded and load trimming scheme (LTS) implemented for overloading of the ICTs operated. The LTS operation resulted in tripping of 100 kV Murbad-1, Murbad -2, Mohane, Ambernath line and 22kV feeders at Padghe. 400kV Boisar- Padghe -1 tripped on L/R differential protection operation at Padghe end and on DT received at Boisar end .

Single Line Diagram:



The Event Report is enclosed at Annexure 2C.1.

Discussion in 139th PCM :

MSETCL representative informed the following;

- On 18.09.2019 @ 11.50, 500MVA 400/220 KV , LV side Y phase A bus to A bus insulator jumper snapped and Created Y phase bus fault. During this bus bar protection did not operate. Hence the fault was cleared by bus-coupler (time 200ms) and bus sectionaliser (Time 250ms) tripping on OC protection operated.
- 500MVA 400/220kV ICT 5 tripped on LV B/U high set operated in 400ms. (note- It will be tested during outage coming outage for its directional feature.)
- 220kV Jambhul and Jindal line tripped at remote end on Zone 2 distance protection (400ms & 300ms) respectively.
- 200MVA 220/100kV ICT 3 tripped on HV B/U protection. (615ms).
- 200MVA 220/100kV ICT 1 tripped on LV B/U protection. (833ms).
- Due to tripping of 200MVA ICT1 and ICT 3, 200MVA ICT2 and ICT4 overloaded, which result into operation of LTS.
- Further one section of A bus out of two became dead, due to tripping of all sources connected to A bus section, further 50MVA 220/22kV TF1 and TF2 transformer hand tripped, 220 KV Jambhul and 220kV Jindal also hand tripped as tripped from remote end.
- In the RADSS Bus bar protection, the control cable in bus bar core are of aluminum & more than 30 years old. The healthiness of control cables is required to be checked by availing the outage and replacement of deteriorated cables. Replacement of old busbar protection by numerical for 220KV Bus is in process

WRLDC representative informed that the event is not logged in SOE of WRLDC SCADA except for 400kV Boisar-Padghe from Boisar end. MSTECL to look into the issue.

Committee observed that the Busbar protection failed to operate which was not desirable and suggested that the control cables be checked at the earliest, till the BB scheme is replaced by Numerical BB protection scheme. Tripping of elements from remote end due to non operation of BB scheme was in order except 220 kV Padghe – Jindal line which was on other section (Bus1) tripped on Zone-2 protection in 400 msec even when the bus sectionalizer tripped in 250 msec. After isolation of the faulty bus section the Jindal end relay should have reset. Therefore tripping of 220kV Padghe – Jindal on Zone-2 protection from Jindal end was undesirable and the DPS at Jindal end should be checked. Tripping of 400 kV Padghe-Boisar line on operation of reactor differential protection for a through fault was undesirable, PGCIL to check the same for through fault stability. Being an old S/S, MSETCL may look into the R & M of the S/S. Further it was noted that the RADSS BB protection scheme is under replacement.

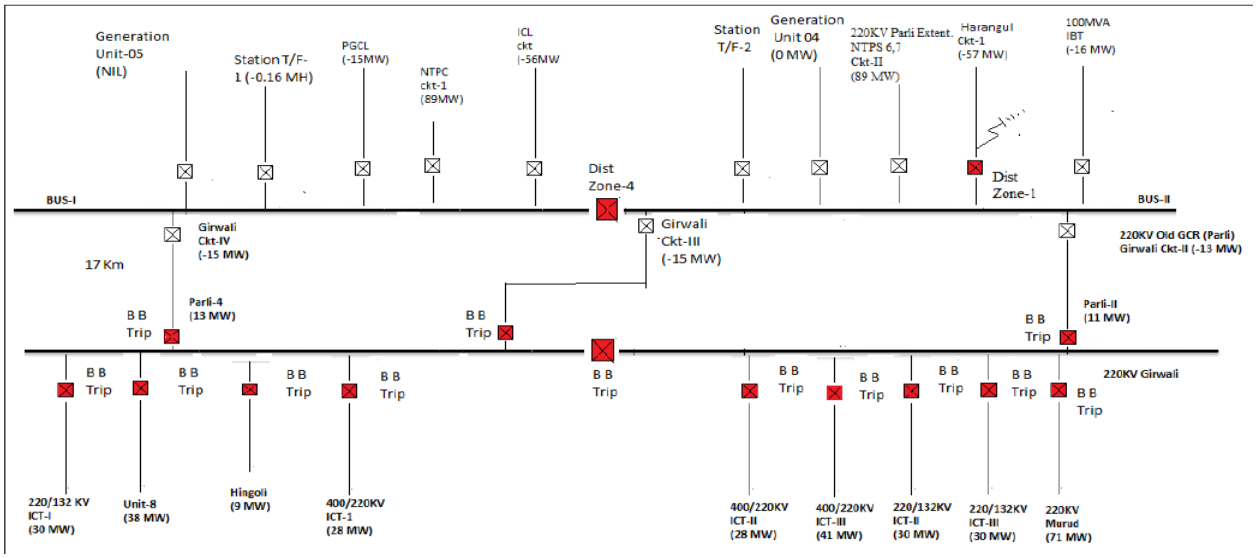
2C.2. Grid Incidence at 220 kV old GCR Parli s/s on 2nd October 2019.

Event Category: *GI-I*

Event Summary:

At 220 kV old GCR Parli, B phase LA of 220 kV Harangul feeder failed and BB protection operated at 220 kV Parli s/s for the through fault, which is connected to old GCR Parli s/s via 220kV Parli- old GCR Parli T/C and all its elements connected to the 220 kV Bus 1 and 2 tripped.

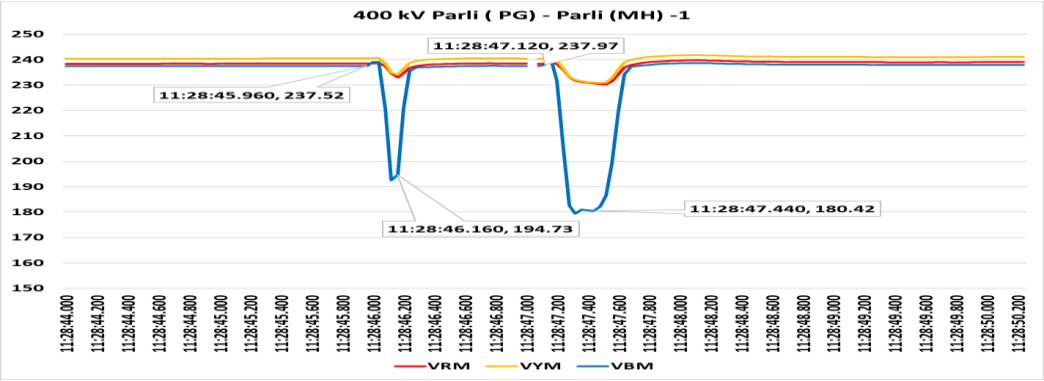
Single Line Diagram:



The sequence of tripping and restoration:

S No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1	220 kV Old GCR - Harangul	11:28:47	Zone I, B phase to earth, FC- 24 KA	B-E, Z-1,	12:17
2	220 kV Old GCR Bus coupler	11:28:47	O/C protection		12:30
3	220 KV Parli (MH)- Old GCR Parli -2	11:28:47	Bus bar Main Bus-2 optd	Z-II operation	12:31
4	400/220 kV, 315 MVA ICT 2	11:28:47	Bus bar Main Bus-2 optd		12:39
5	400/220 kV, 500 MVA ICT 3	11:28:47	Bus bar Main Bus-2 optd		12:40
6	220 kV Parli- Murud	11:28:47	Bus bar Main zone II optd	Not tripped	12:43
7	220 kV Parli - Hingoli	11:28:47	Bus bar Main zone I optd	Not tripped	12:47
8	220 kV Parli (MH)- Old GCR Parli -3	11:28:47	Bus bar Main zone I optd	Not tripped	12:52
9	220 kV Parli (MH)- Old GCR Parli -4	11:28:47	Bus bar Main zone I optd	Not tripped	12:53
11	400/220 kV, 315 MVA ICT 1	11:28:47	Bus bar Main zone I optd		14:00
12	220/132 kV, 200MVA ICT-1	11:28:47	Bus bar Main zone I optd		14:53

400kV Parli (PG) – Parli (MH) -1 Voltage Plot:



As observed from the PMU plot, fault occurred in B phase of 220kV Old GCR Parli – Harangul line (due to LA failure) at 11:28:45.960 and auto-reclosed after 1 sec on persistent fault. The voltage dip was observed for 400msec which indicates delayed tripping of the line after reclose.

The Event Report is enclosed at Annexure 2C.2.

Discussion in 139th PCM :

MSETCL representative informed the following;

- On date 02/10/19 at 11:29 hrs, failure of B ph LA of 220kV Old GCR Harangul ckt-I caused operation of Busbar protection at 220kV Girwali S/S.
- Autorecloser operated & however after reclosing CB opened by 357ms for permanent LA failure at 220kV OLD GCR S/S
- 220kV Bus bar protection operated at 220kV Girwali end S/S. (Busbar Make: English Electric,Electromechanical Type:CAG)
- 220KV NTPS –Old GCR ckt-2 tripped in Zone-2 at 220KV New TPS end Ss. (Remote end Sub-Station).
- Restoration of 220kV bays to normalcy carried out sequentially.
- New Sifang Make Numerical Busbar scheme is sanctioned & work is in progress.(SE/TCC/ABD/TS/0387 date 13/11/19).

WRLDC representative informed DR of 220 kV Old GCR Parli- Harangul ckt is not time synchronized. Also • Millisecond data is not available in the SOE from Parli, Old GCR, Harangul S/S. From Harangul feeder DR (Annexure 2), it is observed that after the breaker reclose, the fault was persisting and the A/R lockout signal went high after 400 msec of reclose which caused delayed tripping of the line. MSTECL is requested to check the delay in A/R lockout operation.

Committee observed that the BB protection mal operated for through fault, trough fault stability of the same needs to be checked. It was noted that the EE make elctromechanical BB scheme is under replacement by Numerical BB scheme.

2C.3. Grid Incidence at 400 kV Chandrapur (MH) power station on 25th October 2019.

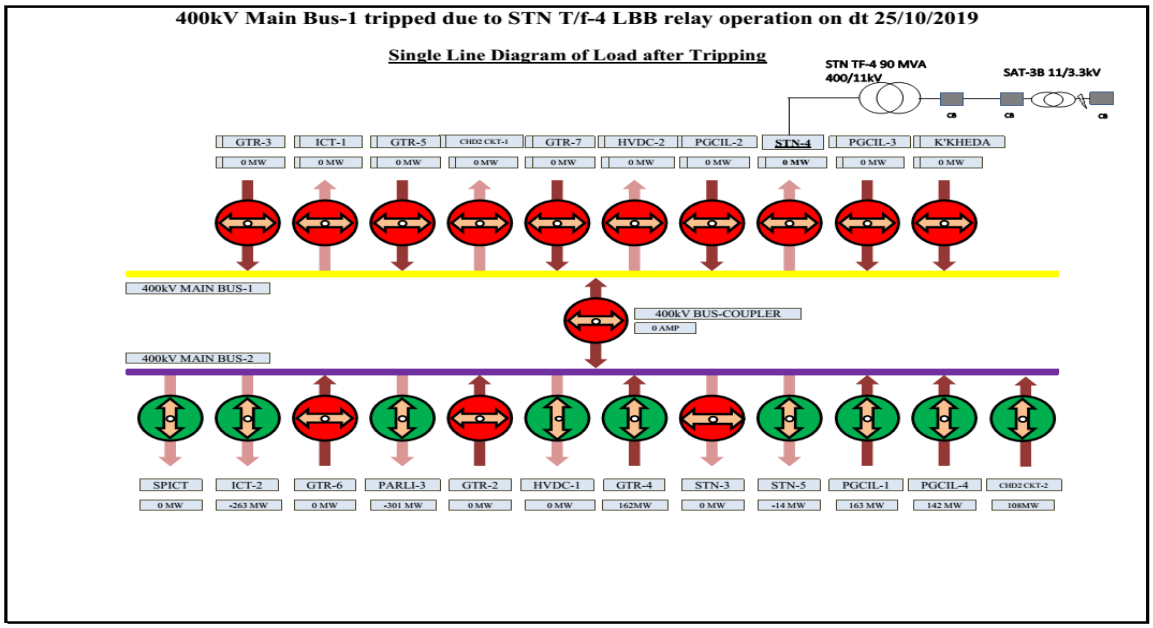
Event Category: *GI-II*

Event Summary:

While charging 11/3.3 kV Station Auxiliary Transformer (SAT)-3B at 01:03 Hrs, 11 kV side standby E/F protection relay operated due to the fault at 3.3 kV side. 11/3.3 kV SAT-3B was connected to 400/11 kV ST-4 and Standby E/F relay of SAT-3B gave trip command to HV side CB of ST-4. B phase pole of 400 kV TBC 2 (through which ST-4 connected to Bus 1) did not open on trip circuit 1&2 faulty due to the burned R20 resistor which is in series with trip coil 1&2. After 100 ms Pole Discrepancy Relay of the TBC 2 operated and gave trip command again but the B phase pole was not opened due to faulty trip circuit and LBB of ST-4 operated. This resulted in tripping of all the elements connected to 400 kV Chandrapur bus 1. As the auxiliary supply of Chandrapur Unit 6 was taken from ST-4, Chandrapur Unit 6 which was connected to 400 kV Bus 2 also tripped. After the tripping of 400/220 kV Chandrapur ICT 1 on 400 kV Bus 1, ICT 2 got overloaded and led to the LTS operation and tripping of 220 kV SICOM 1&2. As reported by MSETCL, the burnt resistor R20 was replaced on the same day. As reported by MSETCL, the 11 kV Auxiliary supply for HVDC Pole 1 failed due to the tripping of the station transformer 4, which resulted in tripping of Valve Cooling motor, Converter breaker of HVDC Pole-1 and the Tie breakers between the Poles on "Main Circuit Flow - Low" alarm.

There was a generation loss of 825 MW due to the event. There was a frequency change of 0.09 Hz due to the event.

Single Line Diagram:



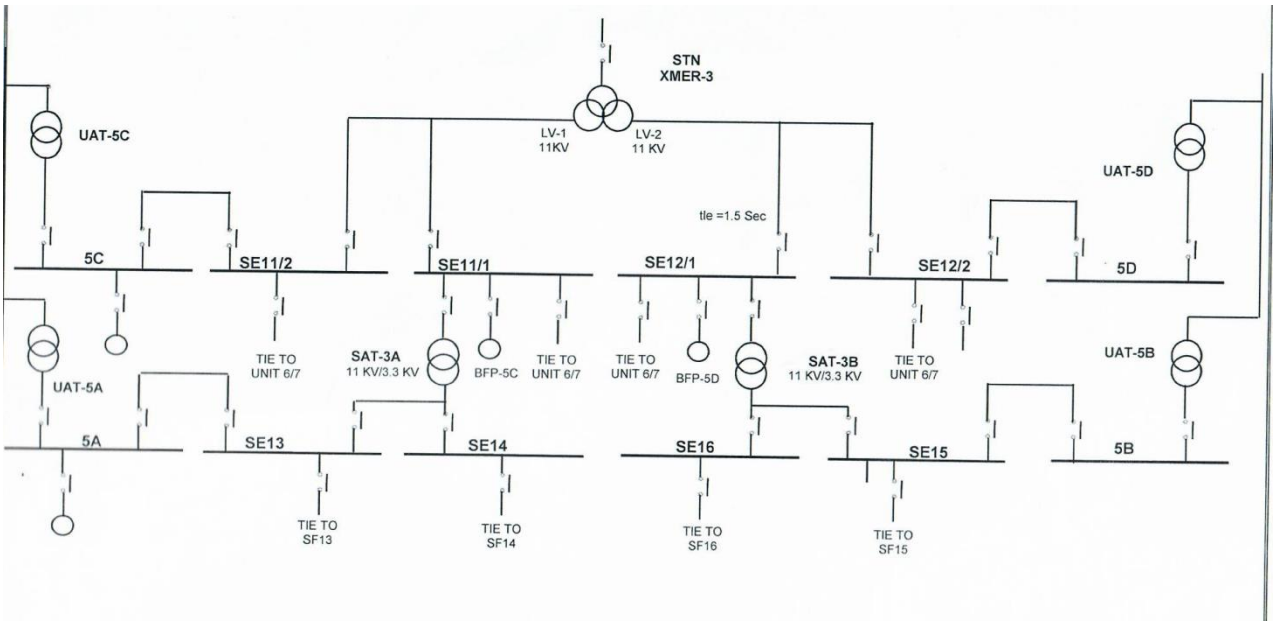
The Event Report is enclosed at Annexure 2C.3.

Discussion in 139th PCM :

MSPGCL representative briefly described the disturbance. Further he informed the following;

- *Stn T/F St-3 of Unit-5 is not available.*
- *Both SAT-3B & Sat-4B were charged from ST-4 of unit-6.*
- *ST-4 is a 3-wdg. T/F HV/LV1/LV2 & all the three wdgs are star connected having vector group $Y_N y_{no.}$ HV wdg is solidly grounded whereas LV1 & LV2 star point is grounded through 22 Ohm resistance (Fault Current of @300A)*
- *Both SAT-3B & Sat-4B are two wdg T/F and both wdgs are star connected hwving vector group $Y_N y_{no.}$ HV wdg is solidly grounded and LV wgd star point is grounded through grounding resistance.*
- *In unit-6, outgoing 11kV cable for CHP was charged from 11kV Tie feeder at station switchgear developed earth fault. E/F protection of tie feeder operated and the tie feeder breaker tripped within 3 sec. At the same time before tripping of the tie feeder heavy fault current flew from both solidly grounded star point of Sat-3B & SAT-4B, resulting in tripping of both SAT on sensitive E/F (50GH) protection, which was undesirable (non- selective tripping). It was suspected that due to star point grounding of 11kV side through grounding resistance, the fault current was found to be restricted to around 300A and heavy fault current might have flown through the neutral of SAT-3B & SAT-4B, without fault on HV side.*
- *The time delay setting for E/F relay of CHP tie feeder was set to 1 sec, however the time of operation was found to be 3 sec during subsequent testing of the relay. The time setting of the E/F (50GH) protection on SAT was set to 3 sec. resulting in tripping of both SAT's along with CHP tie feeder.*
- *To study the above exact replica of the actual system of SAT & ST was established in the lab and the fault was simulated through a controlled source as shown in the ckt dig below. It was found that maximum E/F current was flowing trough the solidly grounded star point of SAT (HV) and very negligible E/F current through the resistance grounded star of station T/F. Based on the studies following was recommended;*
    - *Remove the solid grounding of HV side (11kV) neutral of all SAT (3A,3B,4A & 4B) of unit-5&6 i.e. the neutral is to be kept floating.*
    - *LV(3.3kV) neutral grounding through grounding resistance to be retained.*

Arrangement of Auxiliaries at Chandrapur Stn



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ST & SAT arrangement

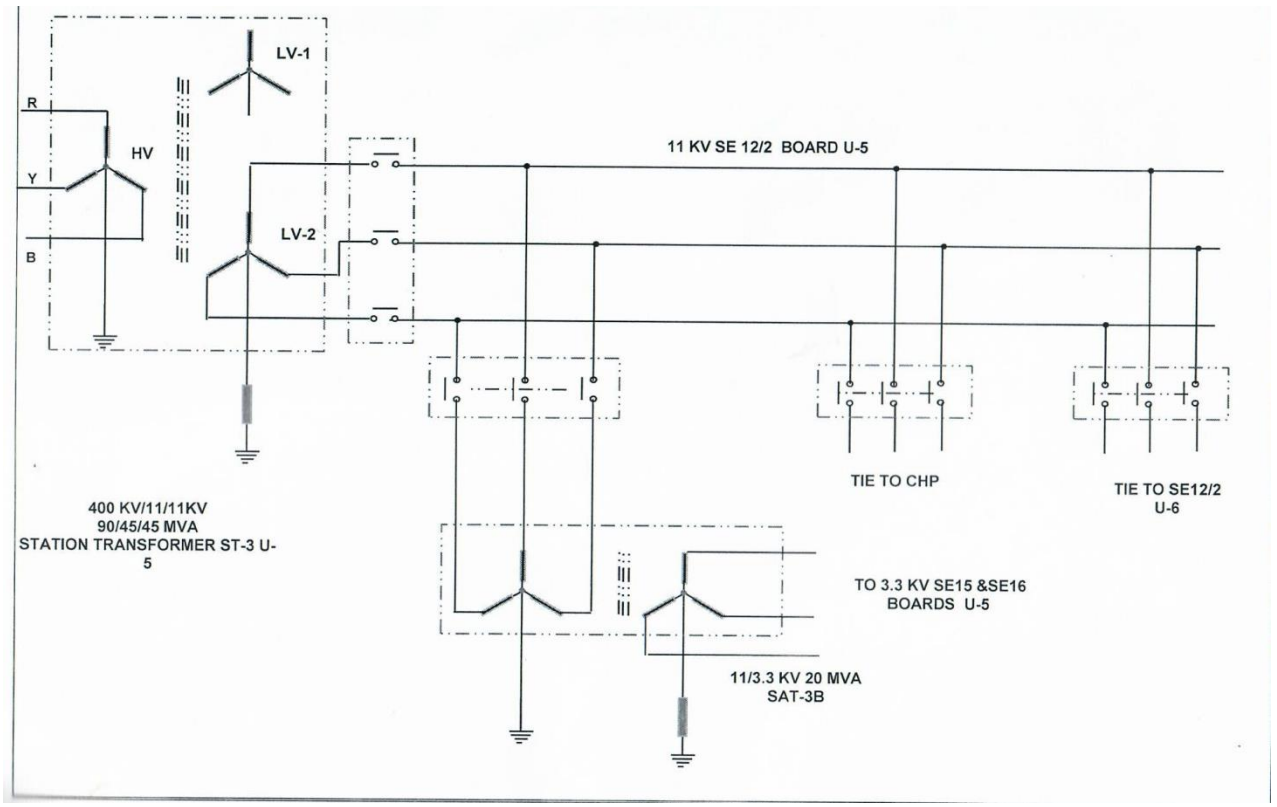
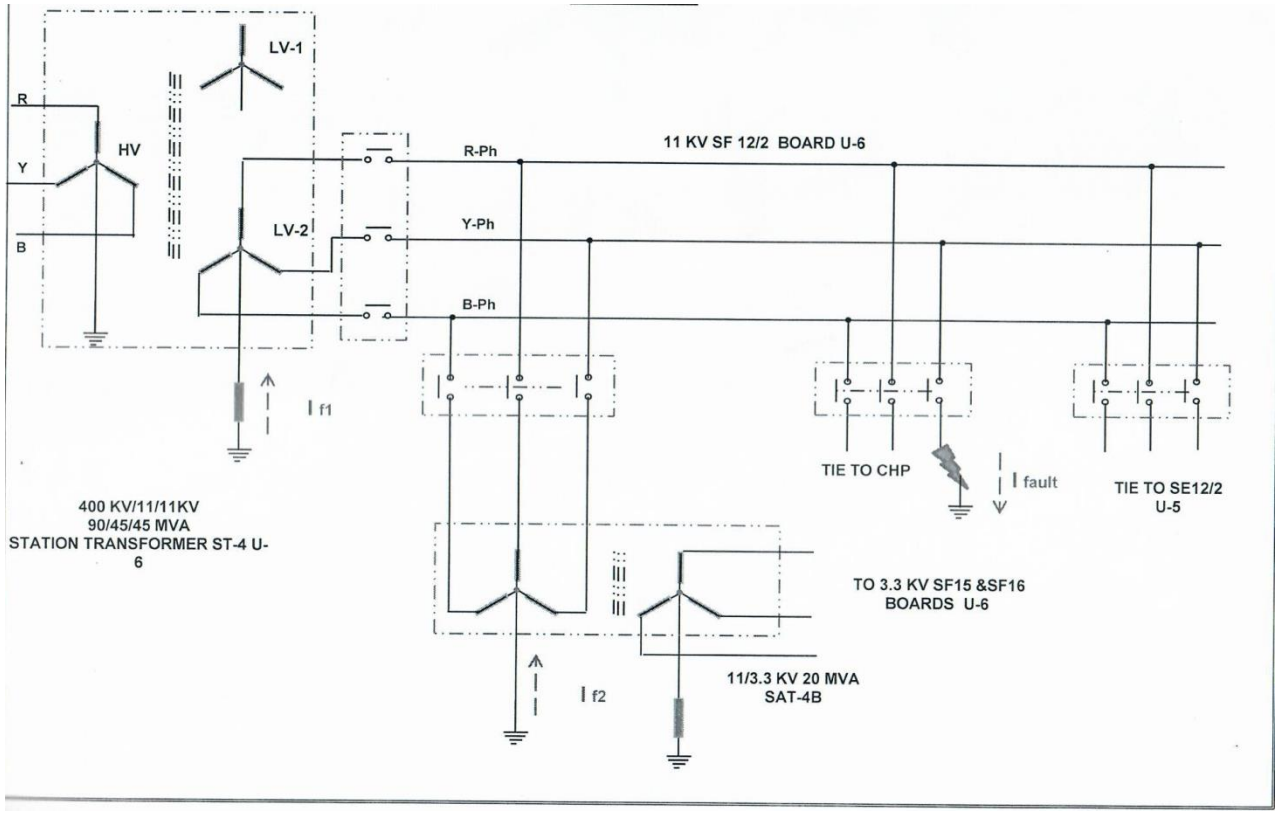
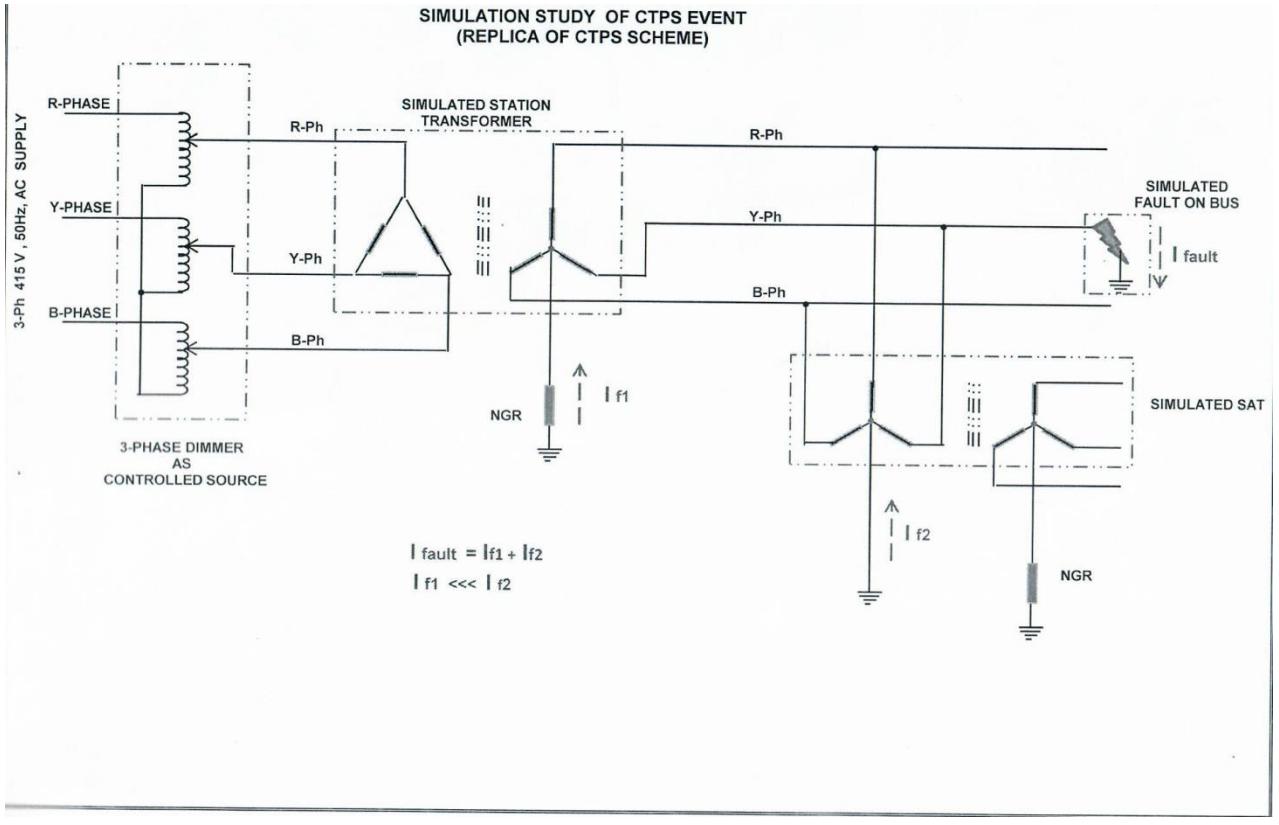


Diagram showing actual fault.



Simulation in Lab



Committee appreciated the efforts taken by MSPGCL in analyzing the non-selective tripping of SAT & ST. It was felt that ST-3 of unit-5, UAT-6A & UAT-6C of unit-6 should be brought into service at the earliest. The time drifts in the timers of the electromechanical relays be checked regularly and the electromechanical relays be replaced with numerical relays. The time and magnitude(fault current) settings be properly co-ordinated. Regular overhauling of the breakers be carried out especially older breaker overhaul frequency should be increased. It was also felt that keeping the HV side neutral point floating will make it insensitive to E/Fs on HV winding, therefore E/Fs of HV windings of SAT would be sensed/cleared by E/F protection on HV side of ST, since the LV side of the ST is grounded through resistance grounding. MSPGCL may like to give a thought to this before implementing floating neutral of HV side of SAT.

2C.4. Grid Incidence at 400kV Kolhapur s/s on 30th October 2019.

Event Category: *GI-II*

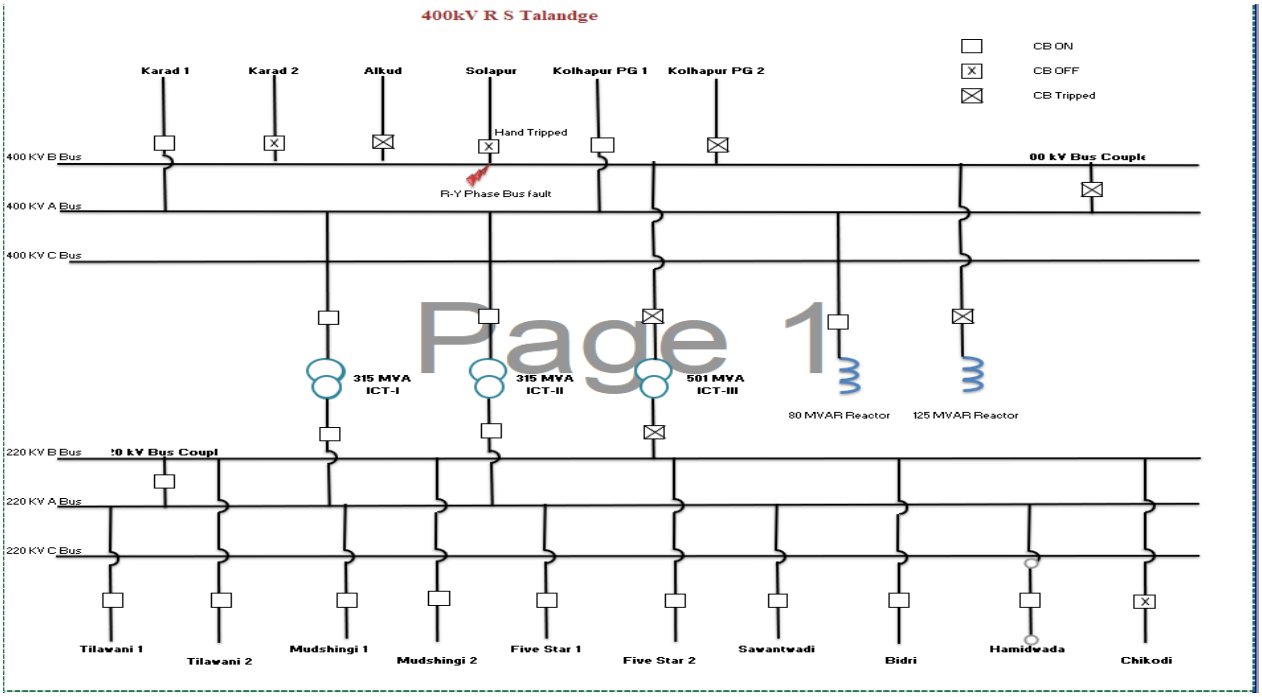
Event Summary:

Emergency shutdown was facilitated on 400kV Kolhapur (MH)-Solapur (PG) to attend isolator sparking at Kolhapur(MH) end. At 13:15hrs, CB was hand tripped at Kolhapur (MH) end but R-phase of CB got stuck and due to severe sparking, it created R-Y phase fault in 400 kV Kolhapur(MH) Bus 2. This resulted in tripping of all the elements connected to 400 kV Kolhapur (MH) Bus-2 on BB protection operation along with the bus coupler.

The sequence of tripping and restoration:

Sl No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1	400 kV Kolhapur(MH)-Kolhapur(PG) 2	13:15:07	BB Zone 2 trip	DT received	13:34
2	400 kV Kolhapur(MH)-Solapur(PG)	13:15:07	H/T	DT received	15:28 (Charged thro' TBC)
3	400 kV Kolhapur(MH)-Alkud	13:15:07	BB Zone 2 trip	DT received	13:36
4	400/220 kV Kolhapur(MH) 500 MVA ICT 3	13:15:07	BB Zone 2 trip		13:31
5	400 kV Kolhapur(MH) 125 MVAR BR	13:15:07	BB Zone 2 trip		13:40
6	400 kV Kolhapur(MH) Bus coupler	13:15:07	BB Zone 2 trip		13:28

Single Line Diagram:



The Event Report is enclosed at Annexure 2C.4.

Discussion in 139th PCM :

MSETCL representative informed that heavy sparking was observed on 400KV Solapur Bay R phase Main Bus 2 isolator, due heavy wind flow. Hence permission for hand trip was taken from LD. CB of 400 kV Solapur line was Hand Tripped but due to problem in CB, R phase of CB did not tripped. Meanwhile due to heavy flashover on 400KV Solapur Bay R phase Main Bus 2 isolator, Busbar protection for Main bus-2 operated. This 400kV Solapur bay pertains to PGCIL. Also testing & maintenance of this bay is carried out by PGCIL and not by MSETCL. Siemens make PG Isolator have problem of sparking in high wind condition. This type of isolators are needed to be replaced. Replacement work of isolators pertains to M/s PGCIL. Proper testing & maintenance of all the bay equipments needs to be carried out by PGCIL.

WRLDC representative informed that in WRLDC SCADA SOE, 13 second time difference was observed and milli second data is not reporting from Kolhapur (MH) substation. BR, Alkud and Solhapur(PG) bays SOE was also not recorded. Remote end SOE also not recorded during the event. WRLDC requested MSETCL and PGCIL to resolve the issue at the earliest.

Committee felt that the arc spread of the isolator due to heavy wind pressure, led to the fault. The Siemens make PG isolator having problem in the heavy wind pressure areas may be replaced.

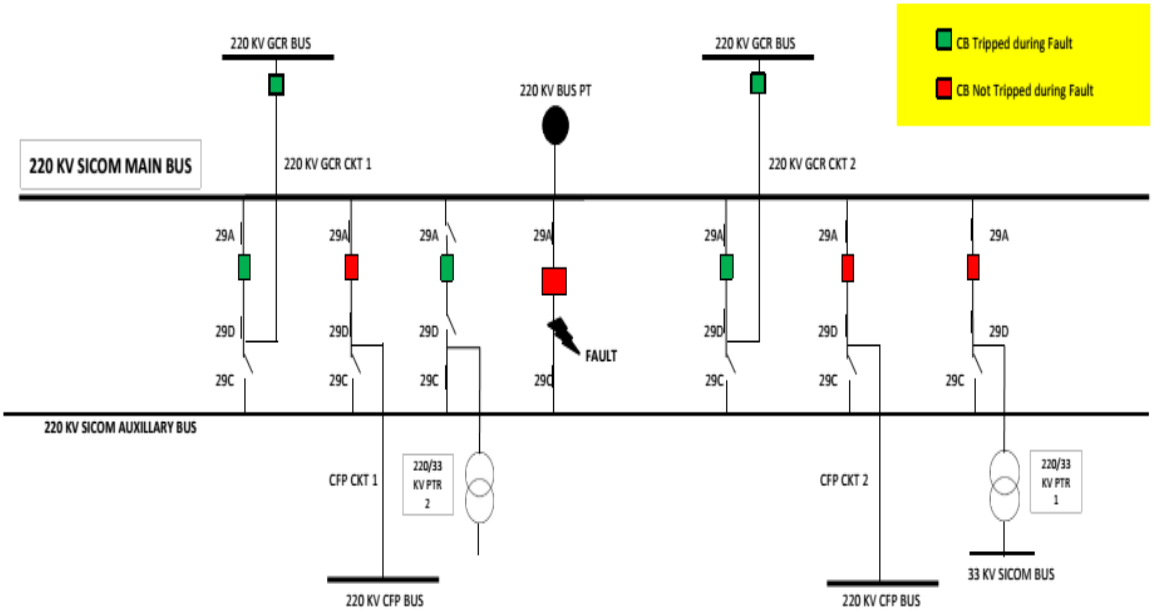
2C.5. Grid Incidence at 220 kV SICOM s/s on 31st October 2019.

Event Category: *GD-I*

Event Summary:

At 220 kV SICOM s/s, R phase Bus post insulator of 220 kV TBC bay failed (Newly commissioned 220/33 kV ICT-2 was charged through TBC) and created Bus fault. Old BB scheme was not in service (new BB scheme kept in alarm mode), and the fault cleared in Zone-2 distance protection from Chandrapur end and Zone 4 distance protection at local end. There was a load loss of 42 MW due to the event.

Single Line Diagram:



The Event Report is enclosed at Annexure 2C.5.

Discussion in 139th PCM :

MSETCL representative briefly explained the disturbance.
WRLDC representative informed that milli second data is not being reported in WRLDC SCADA from Chandrapur(MH) substation. There was a time difference of 2 second between actual tripping and SOE.

Committee felt that the old BB scheme should not have been kept out of service while the new BB scheme was only in alarm mode.

2C.6. Grid Incidence at 765/400 kV Ektuni s/s on 7th November 2019.

Event Category: *GI-II*

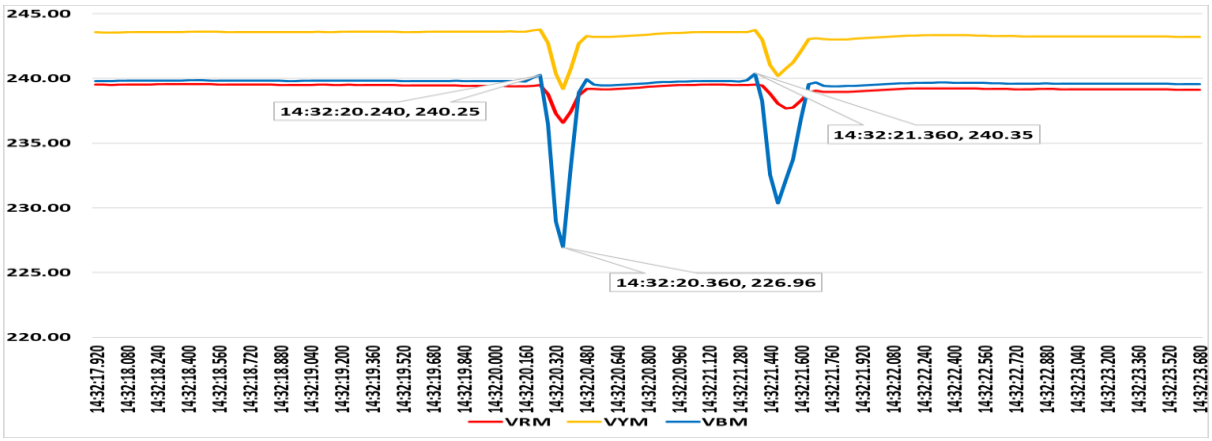
Event Summary:

At 14:32:21hrs, 765/400 kV Ektuni s/s, B-E fault occurred on 400kV Babhaleshwar – Ektuni ckt II, which resulted in tripping of 765/400 kV 1500 MVA Ektuni ICT 1 (which is in same dia) as 400 kV Bus -2 at Ektuni was under shutdown. At 14:33:14hrs, 400 kV Ektuni-Taptitanda-1 Main CB Y phase pole interrupter blasted after internal arching. No ground fault was created due to the failure Y phase of Main CB of Taptitanda-1 and therefore no protection triggered. Broker conductor alarm and SF6 lockout were detected immediately.

The sequence of tripping and restoration:

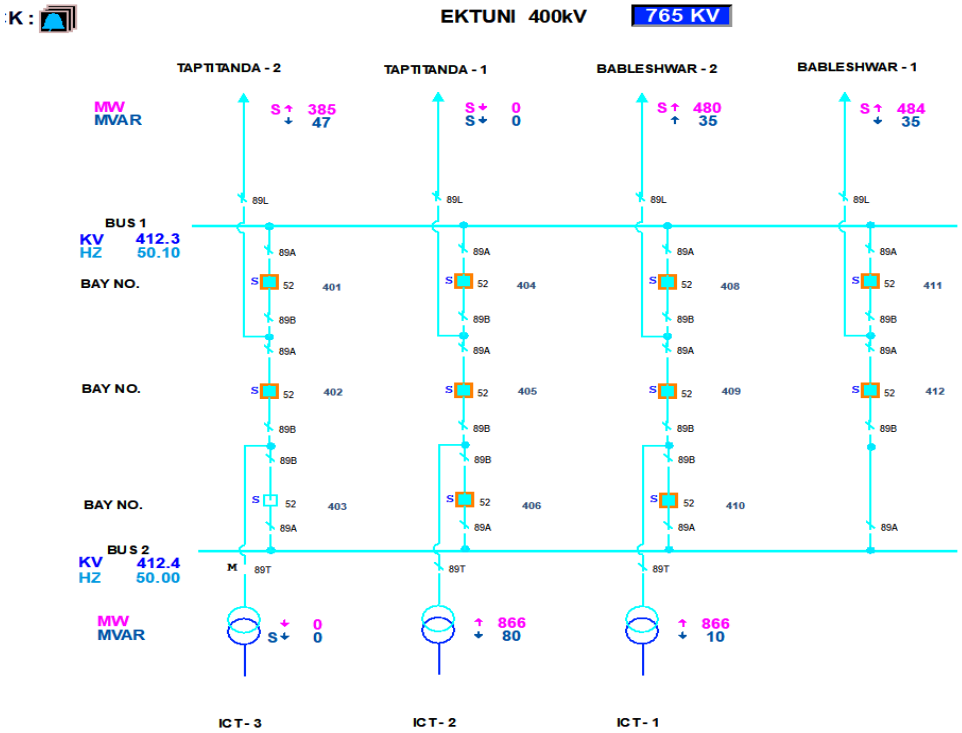
S No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1	765/400kV 1500 MVA Ektuni ICT-1	14:32:20	No protection optd		16:18
2	400 kV Babhaleshwar - Ektuni- II	14:32:20	Z1 trip, Ph B, FC=5.89kA, Dist – 101kM	Zone-1 trip, Bph-N, AR Operated, AR Lockout, Ib=8KA	20:11

Voltage Plot of 400 kV Akola – Aurangabad -1 at Aurangabad end:



As observed from PMU plot 400 kV Babhaleshwar – Ektuni ckt II auto reclosed but tripped as fault was permanent. Signature of Y ph M/CB pole failure of Taptitanda -1 is not seen in PMU.

Single Line Diagram:



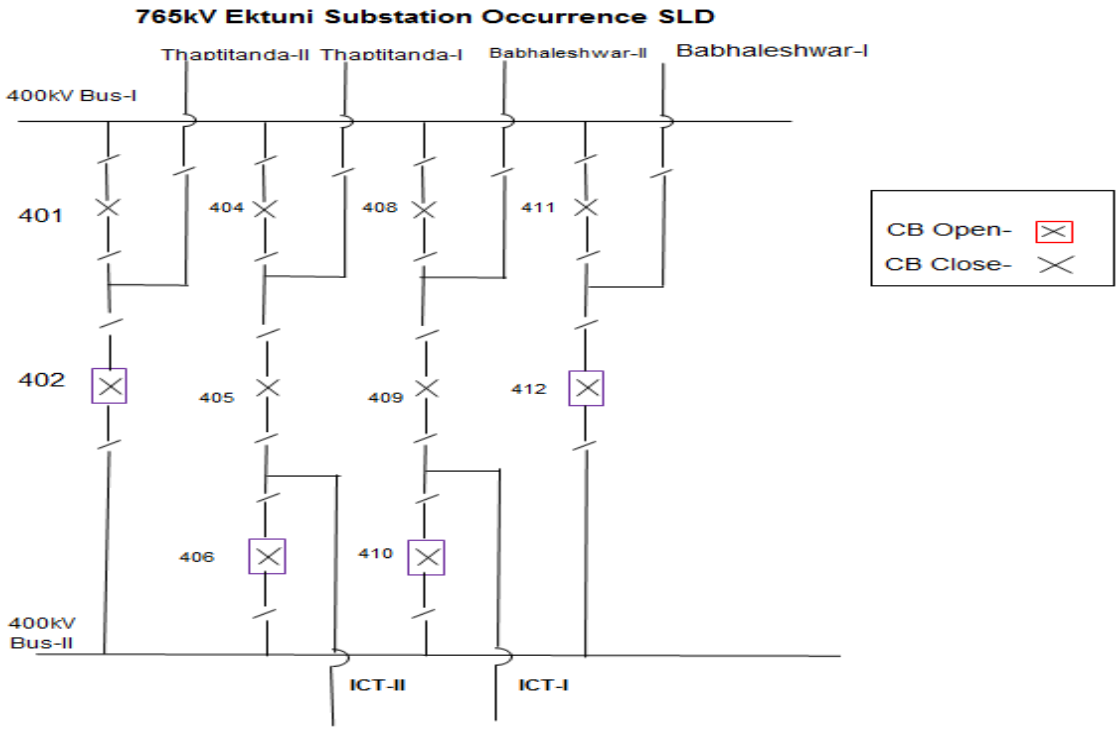
The Event Report is enclosed at Annexure 2C.6.

Discussion in 139th PCM :

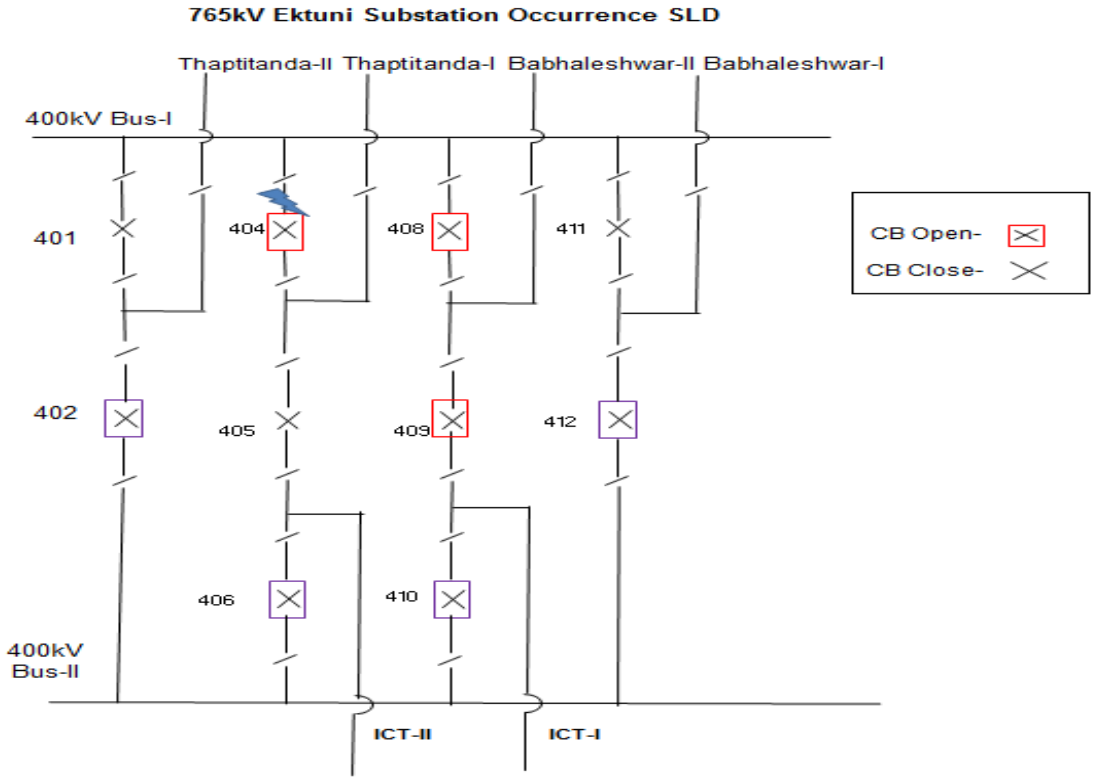
MSETCL representative informed the following;

- On 07/11/19 at 14:32:20Hrs, 400kV Ektuni-Babhaleshwar ckt-II tripped with Phase B, Zone-I on Distance protection
- 400kV Thaptitanda Ckt-I main CB (404) Y phase pole burst at 14:33:04 Hrs without involving Earth fault, remaining pole R&B was healthy.
- 400kV Bus-II was in outage for Testing & Maintenance purpose
- Being 1-1/2 breaker scheme no supply got affected.
- As Bus-II was in outage & Babhaleshwar CB got opened which resulted into shifting of load of ICT-I to ICT-II.
- There was no any SF6 alarm & lockout condition, of Thaptitanda Ckt-I CB before tripping
- Circuit Breaker was commissioned in March 2016. There was no fault/ tripping on above equipment from the date of commissioning.
- There was no alarming condition of 404 bay Circuit Breaker before tripping. Sf 6 Alarm and lockout condition was healthy. SF 6 Alarm appeared on SCADA at 14:33:04 and Sf6 lockout appeared at 14:33:04 hrs.
- Diagnostic testing of circuit breaker was carried out on 16.11.2017 and test results were in order.

Pre fault SLD



Post fault SLD



Committee felt the tripping was in order. However the failure of CB interrupter within short period of commissioning was undesirable. It was felt that the matter may be referred to the OEM of the CB and a detailed report be obtained and shared with the forum.

2C.7. Grid Incidence at 400/220 kV Nagothane s/s on 15th November 2019.

Event Category: *GI-II*

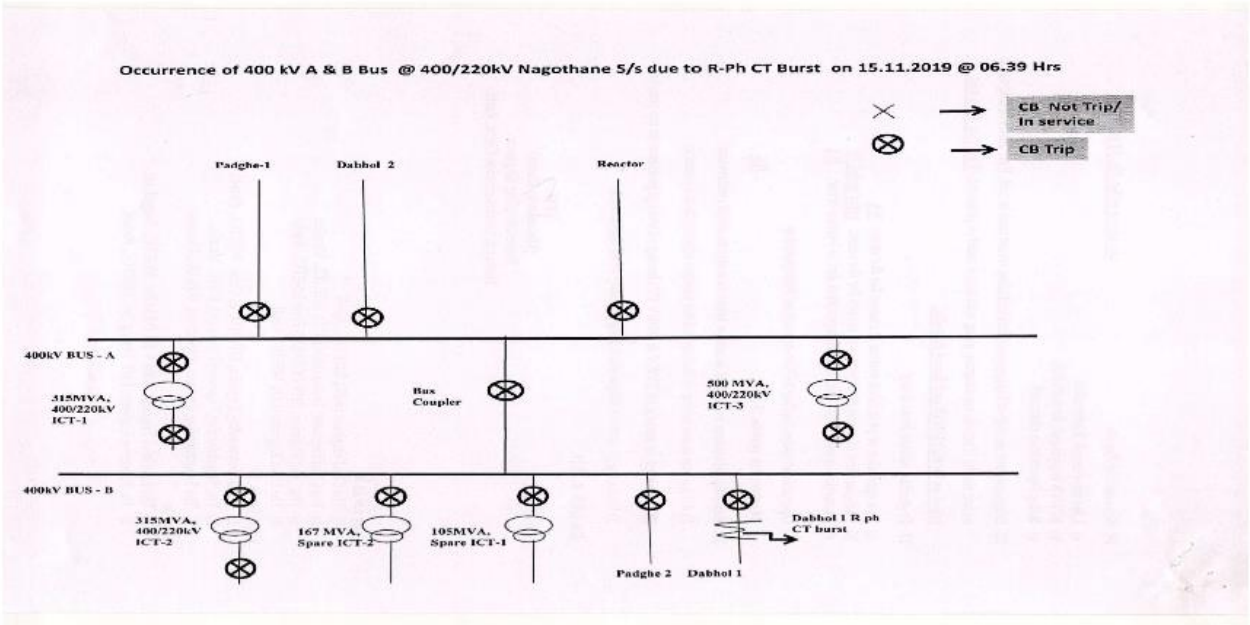
Event Summary:

At 400/220 kV Nagothane s/s, 400 kV RGPPL ckt 1 R phase CT blasted and resulted in tripping of all the 400 kV elements on Bus 1&2.

Relay/flag indication:

Sr. No.	Name of Feeder/bays	Local End Indication		Remote End Indication	
		WI	RI	WI	RI
1	400 Bus coupler	RADSS BUSBAR ZONE 2 OPERATED	A)RADSS –R-U Flags B/B Trip relays B) LED'S on B/B panel 1) B/B zone A operated 2) B/B zone B operated 3)Alarm DS 4) Alarm INT link	NA	NA
2	400 kV PADGHA-1	Definite trip A/R lock out	79/186X2	DT received	Master trip relay
3	400 kV DABHOL-2	--II--	86-B	DT received	Master trip relay
4	80 MVAR REACTOR	NIL	86	NA	NA
5	315 MVA ICT-1	NIL	HV 86-A	NA	NA
6	501 MVA ICT-3	master trip group A operated	HV 86-A	NA	NA
7	400 KV PADGHA-2	Definite trip A/R lock out	79/186X2	DT received	Master trip relay
8	400 KV DABHOL-1	Main-1 Protection operated, Definite trip A/R lock out	186,79/186X2	DT received	Master trip relay
9	315 MVA ICT-2	Bus Bar protection operated	HV 85-1 LV 86-1.86-B		
10	105 MVA SPARE ICT-1	NIL	HV 86		
11	167 MVA SPARE ICT-2	NIL	HV 86		

Single Line Diagram:



The Event Report is enclosed at Annexure 2C.7.

Discussion in 139th PCM :

MSETCL representative informed the following;

On 15.11.2019 @ 06:39 hrs, at 400kV Nagothane Sub-Station, due to Bursting of R Ph CT of 400 KV Nagothane-Dabhol-1 bay, both Bus Zones Optd. due to Bus interconnection on 400 KV Padghe- 2 Bay in NR make B/B panel. Presently isolator status for NR make BB was taken from isolator contact multiplier relay, Padghe 2 was on B-bus so 29LBX was operated and reset coil of 29LAX was faulty so 29LAX was also operated, which resulted in Bus-interconnection on NR make BB. There was heavy oil leakage in R-Ph CT of Dabhol-1 line which was reported to maintenance in-charge.

Further all isolator status wiring shifted on Isolator position selector switch contacts. Instructed to replace all 220KV & 400KV CTs having oil leakage problems on top priority. Instructed to carryout diagnostic testing regularly of all equipments

Committee noted the remedial steps taken by MSETCL.

2C.8. Grid Incidence at 400/220 kV Kolhapur(MH) s/s on 9th December 2019.

Event Category: *GI-II*

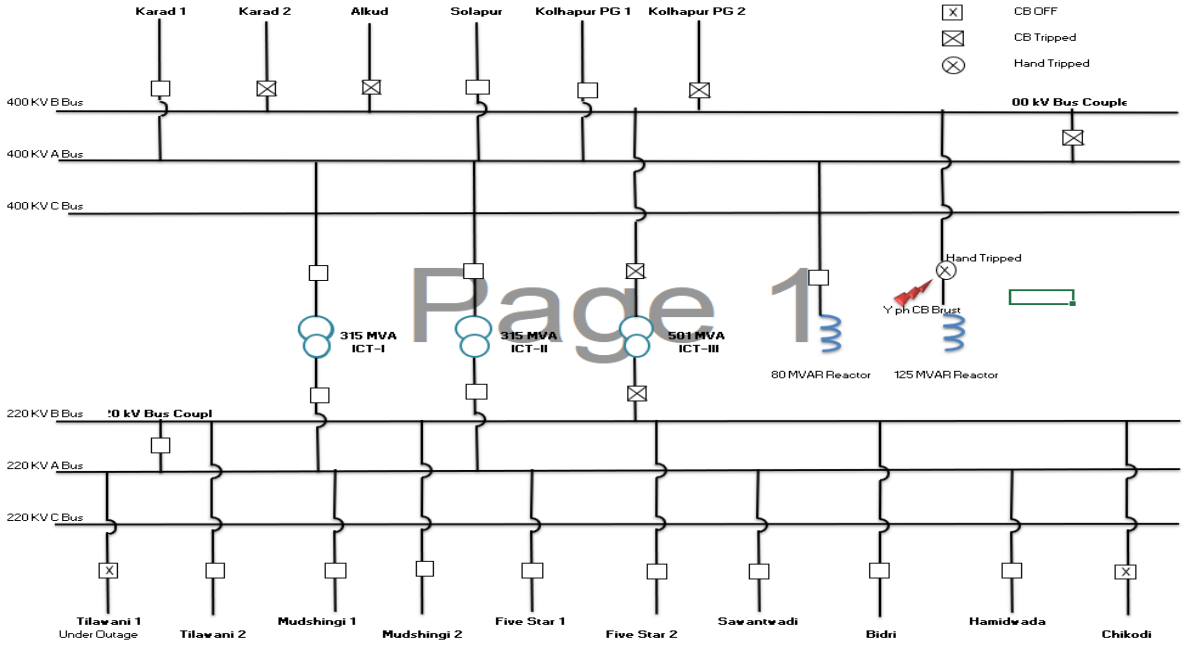
Event Summary:

At 400/220 kV Kolhapur(MH) s/s, while opening 400 kV 125 MVAR reactor at Kolhapur(MH) for Voltage regulation, Y phase CB of the reactor got blasted and created fault in 400 kV Bus 2. This resulted in tripping of all the elements connected to 400 kV Bus 2 along with the bus coupler on BB operation.

The sequence of tripping and restoration:

Sl No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1	400 kV Kolhapur(MH)-Kolhapur(PG) 2	10:25:13	BB Zone 2 trip	DT received	10:54
2	400 kV Kolhapur(MH)-Karad 2	10:25:13	BB Zone 2 trip	DT received	11:10
3	400 kV Kolhapur(MH)-Alkud	10:25:13	BB Zone 2 trip	DT received	11:52
4	400/220 kV Kolhapur(MH) 500 MVA ICT 3	10:25:13	HV side: BB Zone 2 trip LV side: Inter-trip		11:04
5	400 kV Kolhapur(MH) 125 MVAR BR	10:25:13	H/T for Voltage regulation		Not yet revived
6	400 kV Kolhapur(MH) Bus coupler	10:25:13	BB Zone 2 trip		10:50

Single Line Diagram:



The Event Report is enclosed at Annexure 2C.8.

Discussion in 139th PCM :

MSETCL representative informed that during Hand tripping of 125 MVAR Reactor, for voltage control as per instruction by LD Kalwa, Y ph CB pole of 125 MVAR reactor burst & heavy spark occurred. 400kV Main Bus 2 Busbar protection operated. Feeders /ICT connected to main Bus-2 i.e. 400kV Kolhapur PG –II Ckt., 400kV Karad-II Ckt., 400kV Alkud Ckt., 501MVA ICT-III & 400kV Bus Coupler tripped. Operation of Busbar protection of Main Bus –II was in order. He further informed that the The CB was new and commissioned on 07.02.2018. The CB had not even completed 2 year of service life. The failure of the BB was communicated to manufacture for detail analysis. The testing of the CB was carried out on 11.10.2018 and the results were as follows;

CB Timing	R	Y	B
Close mS	100.1	99.7	99.9
TC1 mS	21.1	21.1	21.1
TC2 mS	21.7	21.8	21.7
CB CRM	R	Y	B
Bus side contact micro ohm	46.3	45.8	46.1
CT side contact micro ohm	44.2	42.7	43

PGCIL & GETCO representatives stated that the frequent operations of the reactor CB for controlling the system voltage is leading to the failure of the CB's. The reactors switching be done on rotational basis (Frequent taking in and out the same reactor should be avoided, so that the ON/OFF operations of the same CB

could be avoided). Other reactors in the system be identified (for switching ON/OFF) for controlling the system voltages and may be made ON/OFF on rotational basis.

WRLDC and SLDC Gujarat representative informed that the system voltage variations are local phenomenon and can only be controlled by certain reactors. System operators are acting to the best of their judgments to control the voltage in the system.

MSETCL representative informed that the OEM M/s Siemens had informed that the failure of the CB was due to improper tuning of the CSD.

PGCIL representative informed that CSD plays a very important role while braking or making the reactive currents and therefore all the reactors and transformers should be switched ON/OFF with the CSD.

It was also informed that the Y phase is most prone to such failures. It has also been observed that the Y phase voltage is slightly higher than other phases.

Committee appreciated the concerns of the Utilities regarding frequent operation of the reactor. It was suggested that instead of giving instructions to put ON & OFF the same reactor, if possible, WRLDC/SLDCs may explore identification of reactors in the nearby system, capable of controlling the voltage variability in a particular pocket, for switching ON/OFF. The opening/closing of the lines in a planned manner, to control the system voltages be explored, before taking out the reactors. Tunning of the CSD should be done at regular intervals, since the breaker timings get changed over a period of time.

2C.9. Grid Incidence at 400 kV Koyna Stage IV power station on 21st September 2019.

Event Category: *GI-II*

Event Summary:

On 21.09.19 at 06:38 hrs, charging of 400 kV Stage IV –Lonikhand (kept out on Voltage Regulation) was attempted from Lonikhand end and the line tripped on distance protection. After carrying out line patrolling, charging trial was taken from Lonikhand end at 14.34 hrs, but the line tripped again on distance protection. To find out exact faulty section, MSETCL opened Y phase jumper at location no -203 (cutpoint). At 18.29 hrs 400 kV Stage IV-Lonikhand line was charged from Lonikhand end with Y phase Jumper open at location No. 203. As the line stood ok from Lonikhand end, it was synchronized at Stage IV end.

As only R & B phase voltages were healthy and Y-phase voltage was less than threshold value (jumper left open), VT fuse alarm operated at Koyna IV (DR as

Annexure 2) and before synchronization, both Main 1 & Main 2 distance protection relays got blocked. The fault in the line was cleared by Definite time Over Current protection after 1.0 sec delay. Till then, 400 kV Koyna Stage IV- New Koyna 1&2,400 kV New Koyna-Dabhol 1&2, and 400 kV Koyna Stage IV-
Jejuri, tripped from remote end on zone 3 protection causing blackout in Koyna IV s/s. ICTs at 400 KV New Koyna and 220kV New Koyna -Pedambe tripped on OC/EF Protection. Generation loss of 444 MW (unit 3 and Unit 4) occurred due to the event.

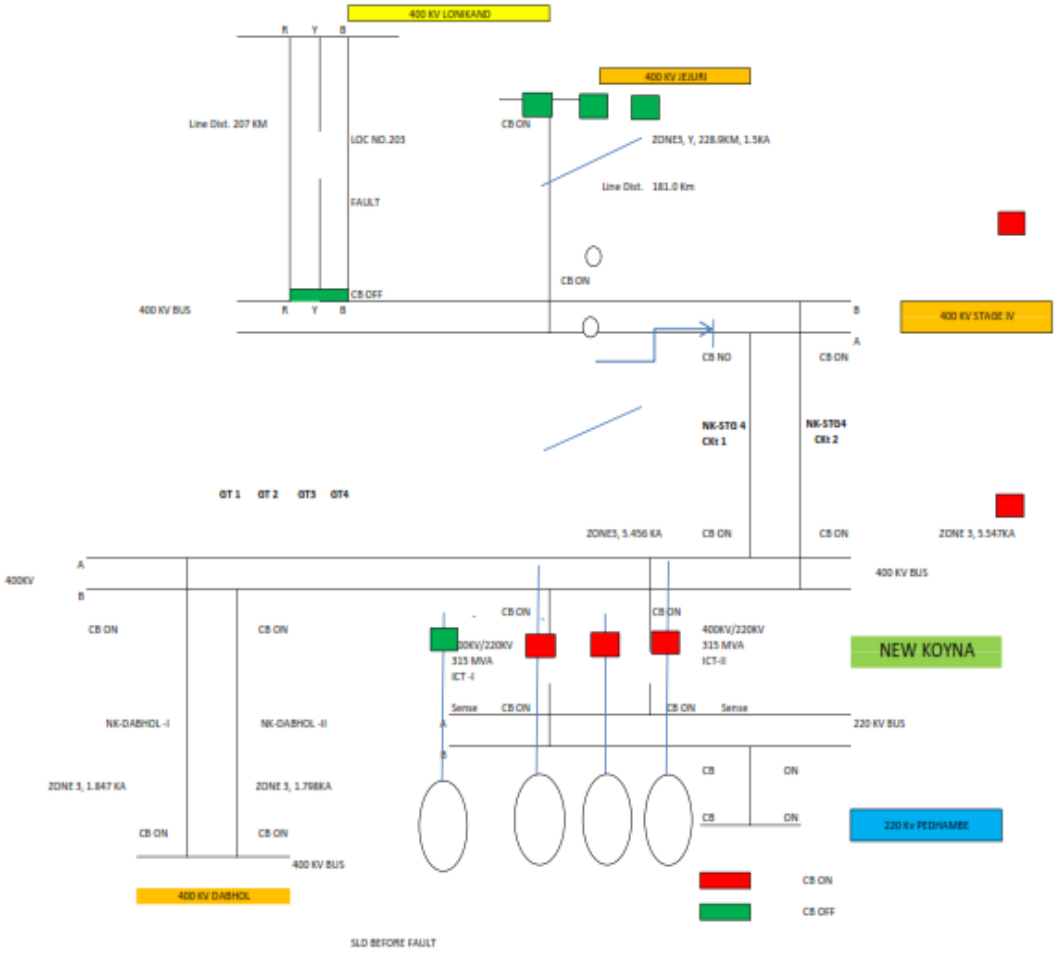
Relay/Flag Indications:

Sr. No.	Name of Feeder/bays	Local End Indication		Remote End Indication	
		WI	RI	WI	RI
	Stage 4 – Lonikand 2 Line	VT fuse Fail	Trip I>1 Fault duration 1.034 sec. VT Fuse fail OC Optd Trip I>1 Fault duration 1.034 sec	Main 2 Dist. Prot. Optd.	Main I Dist Relay Micom P442–NIL Main II Dist Relay ABB make RAZFE- U T-N Zone 1 Zone 3
	Stage 4 –New Koyna Ckt 1	NIL	NIL	Main 1 and Main 2 Dist Prot Optd	Main 1 Dist Relay – Micom P442 Stared Phase BC N Fault Current Ib -5.543 KA Ic 704.0 A Fault Loc. – 40.39 KM Dist Trip Fault in Zone 3 Main 2 Dist Relay –ABB make REL 670 IL2- 5486.36 Amp IL3 -26.3 Amp Zone 3 .
	Stage 4 –New Koyna Ckt 2	NIL	NIL	Main 1 and Main 2 Dist Prot Optd	Main 1 Dist Relay – Micom P442 Stared Phase BC N Ib - 5.547KA Ic 775.0 A Fault Loc. – 39.50 KM Dist Trip Fault in Zone 3 Main 2 Dist Relay –ABB make REL 670 IL2- 5611.09 Amp IL3 789.22 Amp Zone 3 .
	Stage 4 – Jejuri	NIL	NIL	Main 1 and Main 2 Dist Prot Optd	Main 1 Dist Relay – Micom P442 Ib - 1.5KA Ic -64.0Amp A Fault Loc. – 228.9 KM Dist Trip Fault in Zone 3

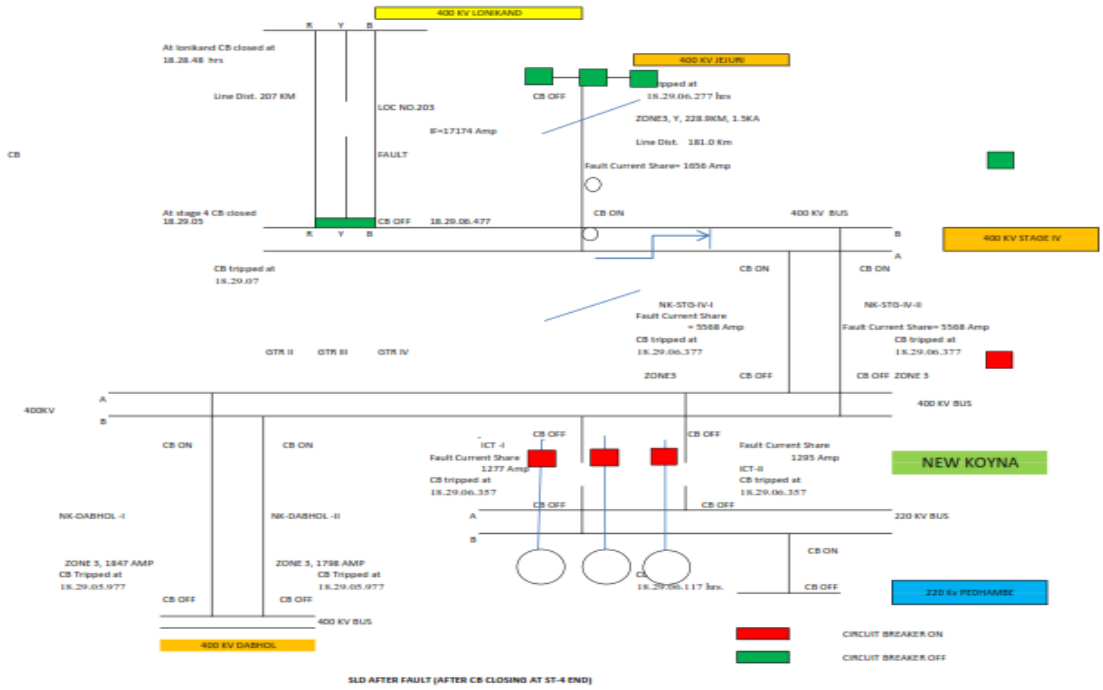
Remedial Measures suggested & action taken in order to avoid recurrence.

While charging/ test charging the EHV line operating procedure should be followed strictly by on duty operating staff to avoid such mis-hap. Instructed to the concern to check the settings for all the lines for Zone 3 as per R. K. Committee and make necessary changes in settings at Dabhol end also, being other utility for compliance.

Single Line Diagram before occurrence:



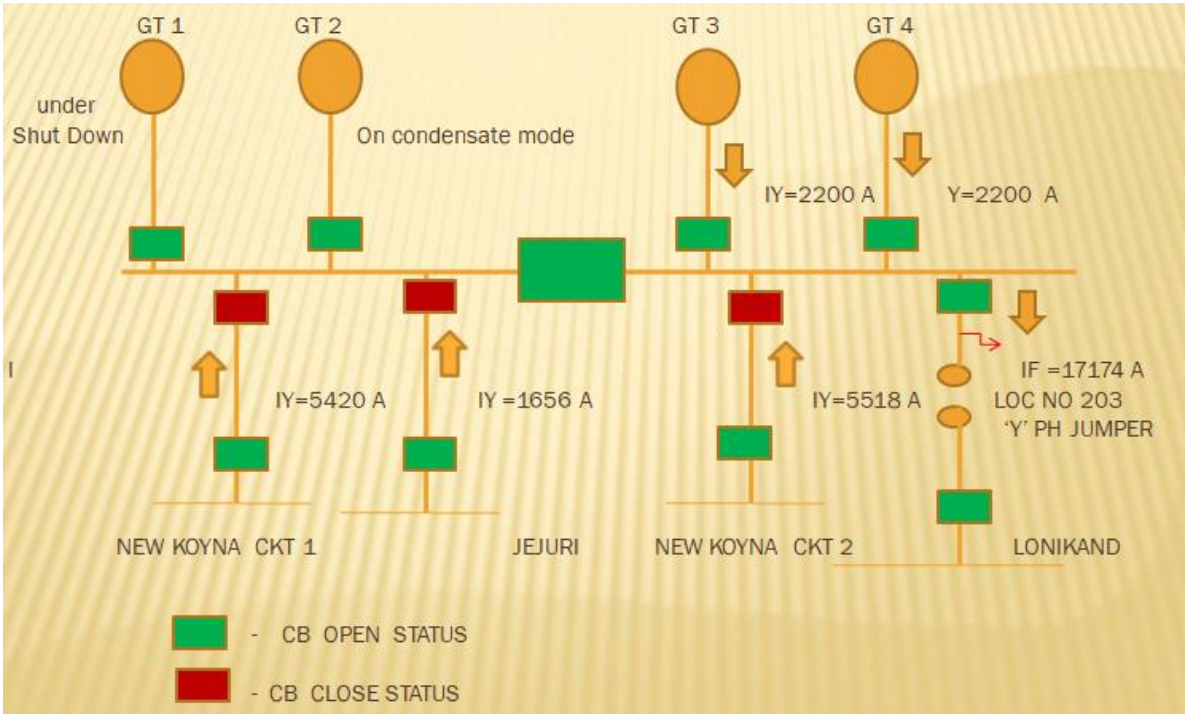
Single Line Diagram after occurrence:



The Event Report is enclosed at Annexure 2C.8.

Discussion in 139th PCM :

MSETCL representative briefly explained the disturbance as above.
The fault current sharing as per the DRs is as shown in the fig;



He further informed that for such type of fault with both Line Distance Protection in blocked mode due to VT Fuse Fail and with Generating Transformer connected to Bus, the in built directional E/F of DPS would not have operated, since the directional feature requires voltage and there was no voltage of Y Phase during the above fault. The DTOC function could be properly co-ordinated with its Zone-3 time for remote end faults, since it is independent of the voltage. After the Lonikand Line tripped on DTOC after 1.0 sec, the Unit tripped on Over Frequency and over speeding. If the Lonikand line would have failed to trip on DTOC, the fault might have been continuously fed by Units on bus, since all lines had tripped from remote ends in Zone-3, which might have led to damage to Generating Transformer and Gen Units. As regards to Protecting Generating Unit for such fault he proposed that DTOC function may be a very useful Protection, under the VT Fuse Fail and DPS block condition. Also instantaneous tripping by using AND logic with VT Fuse Fail and OC function can be configured.

Committee observed that while charging/ test charging the EHV line operating procedure should be followed strictly, to avoid recurrence of such disturbance. The charging of line by opening the jumper should have been avoided. Further the members deliberated on the issue of reducing the Zone-3 timings of the lines connected to the generating stations, from the stipulated Zone-3 timing in the Ramakrishna Report. After detailed discussions, it was felt that faults in the system needs to be cleared as early as possible without sacrificing selectivity. If the co-ordination with the downstream and upstream Z-3 and backup protections timings can be achieved with lower Zone-3 timings, without sacrificing the selectivity, the same can be adopted, so that the faults are cleared within shortest possible time.

Committee further observed that Koyna Generating Complex is handling the Generation about 1956 MW. 400 New Koyna is connected to 400 KV Dabhol which have the Generation Capacity of @1967 MW. It is also connected to 400 KV Jaigad S/stn which have the Generation capacity about 1200 MW. Proper Co-Ordination of Protection Relays is required to be done for the lines from these S/stns. Therefore, there is a need of proper relay co-ordination around the Koyna complex and the same shall be taken up in the next Maharashtra State Relay Co-ordination Group meeting, by MSSLDC.

2D.Occurrences in Goa system:

(138th PCM Agenda item no 2D.1, 2D.2 and 2D.3 Goa representative was not present in the 138th PCM meeting and therefore the following disturbance could not be explained to the sub-committee. The same is taken up in the 139th PCM for discussion.)

2D.1. Grid Incidence at 220kV Ponda S/s on 29th July 2019.

Event Category: *GD-1*

Event Summary:

On 29.07.2019 at 17.38 hrs there was a grid incidence at 220kV Ponda S/s. At 220kV Ponda, Bus 2 bus fault occurred due to the de-capping of bus insulator and resulted in tripping of all the elements connected to it.220 kV Mahalashmi-Amona also tripped during the event. Tripping of 220 kV Ponda-Xeldem 1&2, led to black out at 220kV Xeldem S/S. The 220 kV Ponda Bus 2, 220 kV Ponda-Xeldem 1&2, 220 kV Mahalakshmi-Amona, 220/110 kV Ponda ICTs 2&3 and 220 kV Amona-Ponda 1&2 tripped.

The sequence of tripping and restoration:

Sl No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1	220kV Ponda Bus2	17:38:05	**NA**	**NA**	
2	220kV Amona-Ponda 1	17:38:05	**NA**	**Z-1, B-ph**	19:20
3	220kV Amona-Ponda 2	17:38:05	**NA**	**NA**	19:20
	220kV Amona-Ponda 3	17:38:05	**NA**	**NA**	NA
4	220 kV Ponda-Xeldem 1	17:38:05	**NA**	**NA**	18:05
5	220 kV Ponda-Xeldem 2	17:38:05	**NA**	**NA**	18:29
6	220 kV Mahalakshmi-Amona	17:38:05	**NA**	**NA**	18:24

The SLD/Event Report is enclosed at ***Annexure 2D.1***

Discussion in 139th PCM :

Committee observed that Goa Electricity Department representative was not present for the meeting and therefore it was decided to discuss the disturbance in the next (140th) PCM.

2D.2. Grid Incidence at 220 kV Amona S/s on 13th August 2019.

Event Category: *GI-1*

Event Summary:

The bus dropper of 220kV PXR-II line snapped and fallen on main Bus-I at Ponda S/s and it pulled the 220kV Mapusa-Ponda I line and CB of 220kV Mahalaxmi-Amona at Amona S/s. Due to source tripping of above two lines the main Bus-I having 2 nos. of 100MVA ICTs at Ponda Ss became dead. 220kV Mapusa-Ponda I line tripped and CB of 220kV Mahalaxmi-Amona at Amona S/s

The sequence of tripping and restoration:

Sl No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1	220 kV Mahalakshmi-Amona	19:31:17	Did not trip	NA	20:30
2	220kV Mapusa – Ponda	19:31:17	Z-2 Y-ph DPR	NA	20:49
3	220kV Ponda- Amona -2	19:31:18	H/T	Did not trip	20:45
3	220 kV Ponda-Xeldem	19:31:18	NA	NA	02:10 (14.08.19)

The SLD/Event Report is enclosed at ***Annexure 2D.2.***

Discussion in 139th PCM :

Committee observed that Goa Electricity Department representative was not present for the meeting and therefore it was decided to discuss the disturbance in the next (140th) PCM.

2D.3. Grid Incidence at 220 kV Amona S/s on 15th August 2019.

Event Category: *GI-1*

Event Summary:

Due to failure of 'R' phase LA at Amona connected of 220kV Tillari-Amona line, the 220kV Halkarni-Tillari line tripped. The line CB of Tillari-Amona did not trip. 220 KV Mahalaxmi Amona breaker at Amona tripped.

The sequence of tripping and restoration:

Sl No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1	220 kV Amona-Mahalaxmi	07:00:25	DPR, Rph, 1.05kA, 0.4km	Did not trip	08:16
2	220kV Amona– Ponda-2	07:00:25	R-E, 2.73kA, 0.2km	NA	08:19
3	220kV Amona- Ponda-3	07:00:25	R-E, 2.73kA	NA	08:20
4	220 kV Tillari-Amona	07:00:25	R-N,6.9kA, 2.7km.	Did not trip	14:13
5	220kV Halkarni-Tillari	07:00:25	NA	NA	09:58

The SLD/Event Report is enclosed at ***Annexure 2D.3.***

Discussion in 139th PCM :

Committee observed that Goa Electricity Department representative was not present for the meeting and therefore it was decided to discuss the disturbance in the next (140th) PCM.

2D.4. Grid Incidence at 220 kV Ponda s/s on 19th September 2019.

Event Category: *GI-1*

Event Summary:

At 220 kV Ponda s/s, Ponda-Xeldem-2 tripped due to B phase Insulator lashover on location 263. 220 kV Mahalakshmi-Amona and Ponda ICT 1 also tripped during the event. The fault was cleared within 120msec. Load loss of 120MW occurred due to the event.

The sequence of tripping and restoration:

Sl No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1	220 kV Mahalakshmi-Amona	19:34:41	No trip	DPR	20:22
2	220/110kV Ponda ICT 1	19:34:41	E/F	No trip	19:36
3	220 kV Ponda-Xeldem-2	19:34:41	DPR	N/A	20-09-19@ 14:36Hrs.

The SLD/Event Report is enclosed at ***Annexure 2D.4.***

Discussion in 139th PCM :

Committee observed that Goa Electricity Department representative was not present for the meeting and therefore it was decided to discuss the disturbance in the next (140th) PCM.

2D.5. Grid Incidence on 220 kV Mapusa-Ponda online on 16th October 2019.

Event Category: *GI-1*

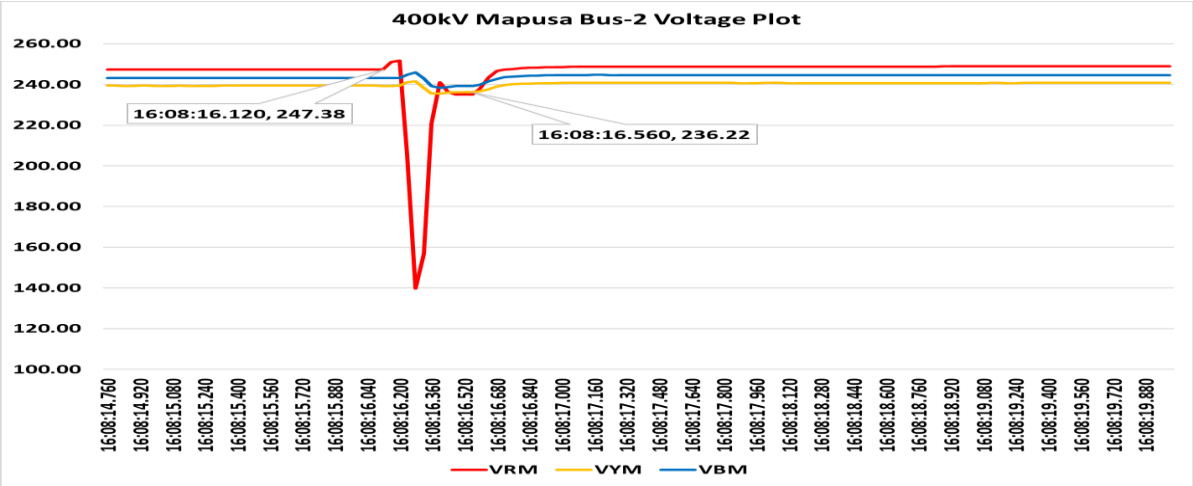
Event Summary:

220 kV Mapusa-Amona tripped on R phase fault in Z1 from Mapusa end. The fault was cleared from Amona end after 650msec. 220kV Mapusa-Ponda and 220 kV Amona Ponda 1 also tripped during the event. Load loss of 200 MW occurred due to the event.

The sequence of tripping and restoration:

S. No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1	220 kV Mapusa-Amona	16:08:16	Z1, R-ph carrier sent	DPR, B ph	17:07
2	220 kV Mapusa-Ponda	16:08:16	Not trip	DPR, R-ph	16:32
3	220 kV Amona-Ponda 1	16:08:16	DPR, B phase	NA	17:07

400 kV Mapusa Bus-2 Voltage plot during the event:



As observed from PMU plot, voltage recovery for R phase fault started after 80msec but the fault persisted for 420 milliseconds in the system.
The SLD/Event Report is enclosed at ***Annexure 2D.5.***

Discussion in 139th PCM :

Committee observed that Goa Electricity Department representative was not present for the meeting and therefore it was decided to discuss the disturbance in the next (140th) PCM.

2D.6. Grid Incidence on 110kV Tivim-Ponda lines on 16th October 2019.

Event Category: *GI-1*

Event Summary:
Due to the fault on 110kV Tivim-Ponda 1, 110kV Tivim-Ponda 2, 220/110 kV Tivim ICT 3 and 220/110kV Ponda ICTs 2&3 tripped. Since Kadamba S/s is fed from 110kV Tivim-Ponda 1&2, the entire loads of Kadamba S/s was affected alongwith part load of Ponda S/s.
The SLD/Event Report is enclosed at ***Annexure 2D.6.***

Discussion in 139th PCM :

Committee observed that Goa Electricity Department representative was not present for the meeting and therefore it was decided to discuss the disturbance in the next (140th) PCM.

2D.7. Grid Incidence at 220 kV Ponda s/s on 25th October 2019.

Event Category: *GI-1*

Event Summary:

220kV Ponda Bus 1 tripped on R-phase fault along with the connected elements. 220kV Mahalaxmi-Amona and 220kV Tillari-Amona also tripped during the event. The SLD/Event Report is enclosed at ***Annexure 2D.7.***

Discussion in 139th PCM :

Committee observed that Goa Electricity Department representative was not present for the meeting and therefore it was decided to discuss the disturbance in the next (140th) PCM.

2E.Occurrences in Chhattisgarh system:

(138th PCM Agenda item no 2E.1, 2E.2 and 2E.3 Chhattisgarh representative was not present in the 138th PCM meeting and therefore the following disturbances could not be explained to the sub-committee. The same is taken up in the 139th PCM for discussion.)

2E.1. Grid Incidence at 220/132 kV Bemetara S/s on 13th July 2019.

Event Category: *GD-1*

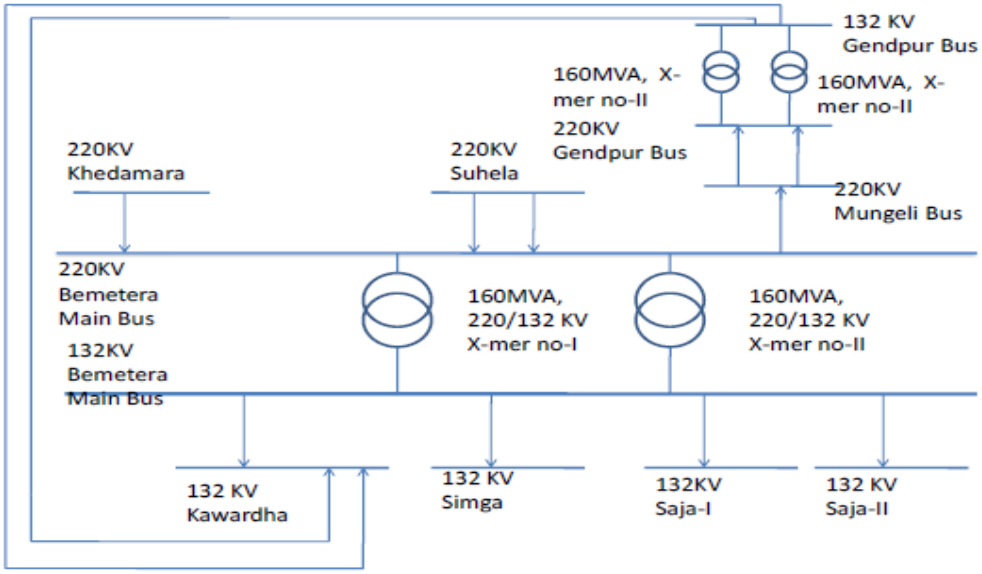
Event Description:

The two nos of 220/132kV 160MVA ICTs at Bemetra have different impedance due to which there is difference in sharing of their load. On 13.07.2019 at 22:20 hrs, Bemetra ICT 2 tripped on overload due to increase in agricultural load, causing tripping of ICT-1 also on overload. With the tripping of both the ICTs, load of 132kV Kawardha shifted on 132kV Gendpur-Kawardha D/C causing overload and tripping of 220/132kV Gendpur ICT-2. Gendpur ICT-1 was out of service. This led to cascade tripping of 132kV feeders causing total blackout at 132kV Kawardha, Pandariya and Saja.

Sequence of tripping and restoration :

Sl No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1	220/132kV Bemetra ICT-1	22:20:03	O/C		23:10
2	220/132kV Bemetra ICT-2	22:20:03	O/C		23:00
3	220/132kV Gendpur ICT-2	22:20:05	O/C		22:34

SLD indicating network around 220/132 KV Bemetra S/S



The SLD/Event Report is enclosed at ***Annexure 2E.1.***

Discussion in 139th PCM :

CSPTCL representative informed that on 13.07.2019 the 160MVA Transformer-II (Telk – Make) at 220KV S/S Bemetara tripped on over load due to sudden increase in agricultural load . After tripping of the 160MVA Transformer-II, 60MVA Transformer-I tripped. During parallel operation T/F-II shares more load than T/F-I due to different impedances.

Thereafter 160MVA at 220KV S/S Gendpur (Kawardha) (2nd 160 MVA commissioned and new connectivity from 220 kV Gebdpur is under progress/discussion) also tripped on over load. 2Nos of 220kV lines and 8 Nos of 132kV lines tripped. After the disturbance, load trimming scheme has been implemented to prevent reoccurrence of such events in future. He further informed that the 3rd ICT has been proposed at Bemetara S/stn. The setting adopted for Over-current is 110%.

Committee observed that trpping of T/F-II led to overloading of other T/F's leading to cascade trippings in the area. It was noted that the load trimming scheme has been implemented. It was suggested that the O/C setting of 120% be adopted with alarm at 90% and load trimming scheme operation at 100-110%.

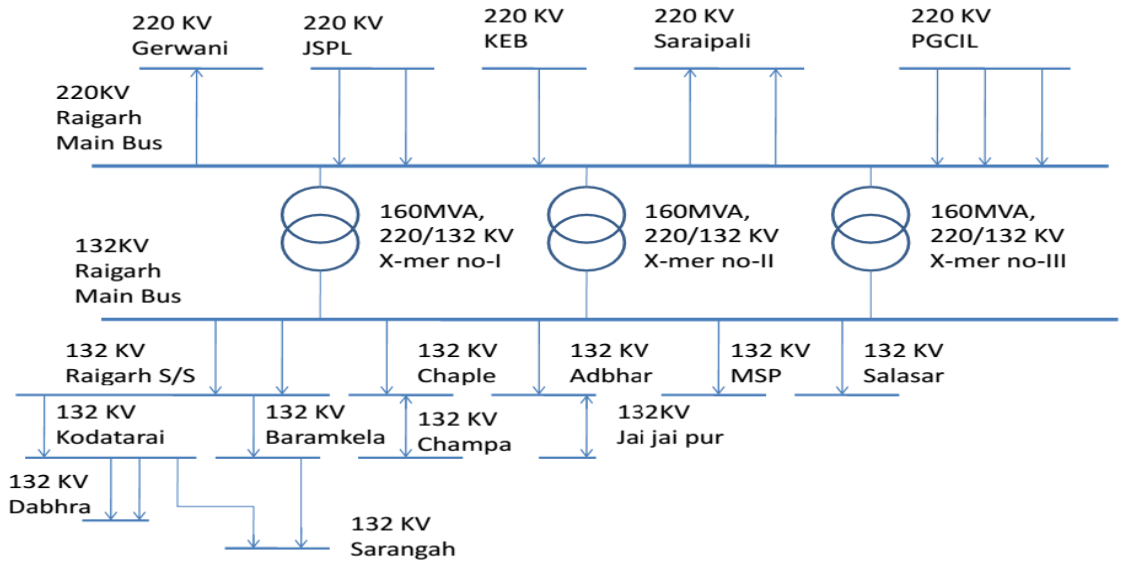
2E.2. Grid Incidence at 220 kV Raigarh S/s on 24th July 2019.
Event Category: *GD-1*
Event Summary :
On 24.07.2019 at 18.11 hrs there was a grid incidence at 220 kV Raigarh S/s. R-E fault occurred at 132 kV Raigarh-Salasar feeder at 2.3 km from Raigarh end in Zone 1 and distance protection relay gave trip command to open the CB. The CB got mechanically jammed and resulted in LBB operation and tripping of all the elements connected to 132 kV Bus. 132 kV Raigarh-Raigarh Interconnector 1&2 tripped and 132 kV Raigarh,132KV Kodatarai, 132KV Dabhra and 132KV S/S Baramkela

supply got interrupted due to the event. There was a load loss of 125 MW due to the event. The detailed report submitted by the utility is attached as annexure. The 220/ 132 kV 160 MVA Bemetara ICT 1, 220/ 132 kV 160 MVA Bemetara ICT 2 and 220/ 132 kV 160 MVA Gendpur ICT 26.220KV Urla –Siltara tripped.

The sequence of tripping and restoration:

Sl No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1	132 kV Raigarh-Salasar	18:11:29	R phase Zone 1 DPR 2.3 km In-13.8 kA	Ideally charged from Raigarh end	Not charged yet
2	220/132 kV 160 MVA Raigarh ICT 1	18:11:29	132 kV Salasar LBB operation		18:50
3	220/132 kV 160 MVA Raigarh ICT 3	18:11:29	132 kV Salasar LBB operation		18:54

Single line diagram:-



The total interruptions occurred due to mechanical jamming in Circuit Breaker of 132KV Salasar feeder at 220 KV S/S Raigarh.
The SLD/Event Report is enclosed at ***Annexure 2E.2***

Discussion in 139th PCM :

CSPTCL representative informed that after CB overhauling, testing was carried out and the results were found satisfactory.

Committee suggested that Load trimming scheme should be implemented to avoid cascade tripping.

2E.3. Grid Incidence at 220/132 kV Siltara S/S on 28th August 2019.

Event Category: *GI-1*

Event Summary:

At 15:36Hrs, due to the R phase LA flashover, 132 kV Siltara - Vandana feeder tripped on distance protection and 220/ 132 kV Siltara ICTs 2&3 tripped on O/c protection causing load loss of 192MW.

The sequence of tripping and restoration:

Sl No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1	132kV Siltara-Vandana	15:36:27	Z-1	NA	NA
2	220/132kV ICT-II	15:36:27	O/c, Master trip relay(86A/B)		16:02
3	220/132kV ICT-III	15:36:27	O/c, Master trip relay(86A/B)		15:55

The SLD/Event Report is enclosed at ***Annexure 2E.4.***

Discussion in 139th PCM :

CSPTCL representative informed that at around 15:36 Hrs, 132 kV Vandana feeder tripped R-Ph distance protection trip indication in Zone-1 due to R-Ph LA fail of 132 kV Vandana feeder bay at 220 kV S/s Siltara. The fault magnitude measured was about 15 KA, the fault got cleared with opening of its CB within 50 ms. The fault severity was such that the R-phase dropper jumper of wave trap got broken. At the same time, 160 MVA X'mer-II & 160 MVA X'mer-III, running parallel (160 MVA X'mer-I ideally charged from 220 kV side), tripped from 132 kV side with Highset Overcurrent/Earthfault indication with fault magnitude of 6.9 KA & 7.0 KA resp. Setting adopted for Highset trip of transformer being 6.0 KA with 0 ms delay. With both the transformers tripped and no other source available, 132 kV Kachana-I and 132 kV Kachna-II tripped from 132 kV Kachna end with Reverse Power Trip (Overload tripping scheme provided at 132 kV Kachna S/s to avoid interruption in similar situation). This resulted in total interruption of 132 kV Bus at 220 kV S/s Siltara. The Highset Overcurrent/Earthfault settings of 132 kV side of 160 MVA X'mers were revised to 6.0KA with 140 ms delay and 8.0 KA with 80 ms delay to avoid any such occurrence in future.

Committee noted that the over load trimming scheme has been implemented. Further it was suggested that the HS O/C time settings be kept without any delay (i.e. 0 sec).

2E.4. Grid Incidence at 220 kV Urla s/s on 8th September 2019.

Event Category: *GI-1*

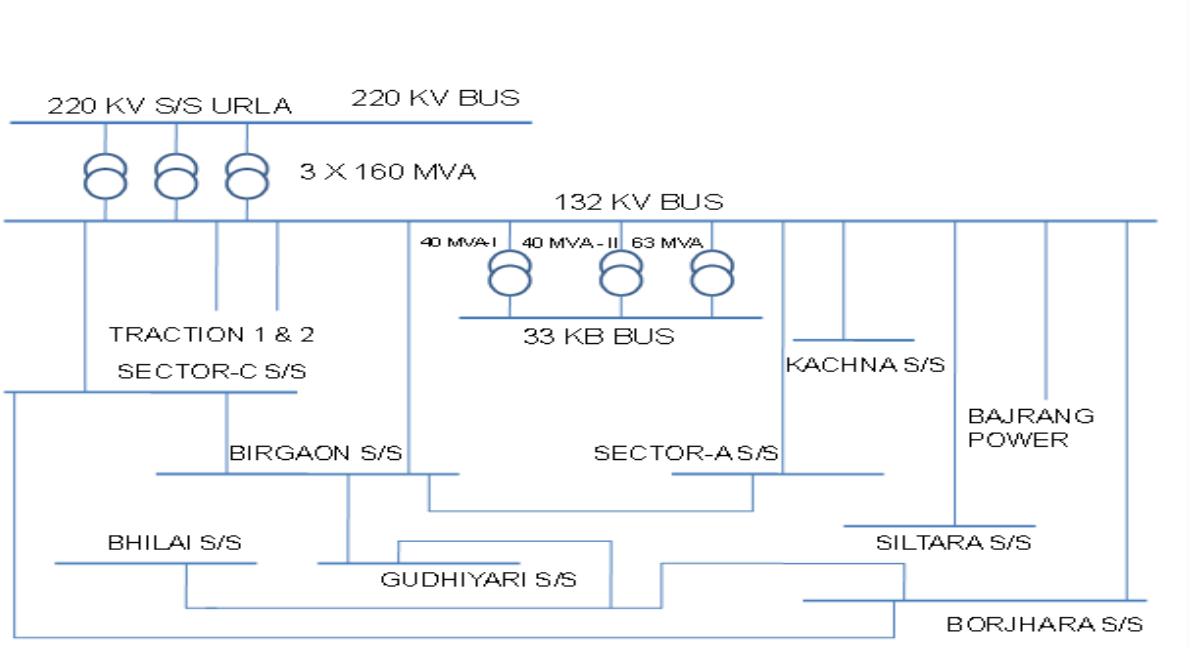
Event Summary:

At 220 kV Urla s/s, 220 kV Urla-Siltara tripped on R phase fault and at the same time, a continuous LBB initiation (false indication due to cable fault & DC leakage) was receiving in the LBB relay of 132kV Bus bar panel from 132 KV Bajrang feeder panel. During 220 kV line fault, there was a sudden increase in R-Ph current (2.0 A to 390 A) of Bajrang Power feeder. With LBB initiation ontinuously coming in the relay & raise of current above threshold value set for LBB function, LBB tripping occurred in R-Ph relay and thereby resulting in tripping of all feeder/ X-mers connected to the 132 kV Urla. The faulty cable of 132KV Bajrang power to Main bus bar protection LBB relay has been replaced with new one as remedial measures.

The sequence of tripping and restoration:

Sl No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1	220/132 kV 160 MVA Urla ICT 3	01:54:32	132kV BB protection		02:41
2	220/132 kV 160 MVA Urla ICT 1	01:54:32	132kV BB protection		02:52
3	220/132 kV 160 MVA Urla ICT 2	01:54:32	132kV BB protection		03:06
5	220 kV Urla-Siltara	01:54:32	DPR, Z-1, R-N,5.3 km	DPR, Z-1, R-N, 8.93 km	03:50

Single Line Diagram:



The SLD/Event Report is enclosed at ***Annexure 2E.4.***

Discussion in 139th PCM :

CSPTCL representative informed that at around 01:52 Hrs, a transient line fault occurred on 220 KV Urla-Siltara line which got tripped with R-Ph to ground fault in Zone-1 indication and the fault got cleared with opening of its CB within 50 ms. Also at the same time a continuous LBB initiation (false indication due to cable fault & DC leakage) was receiving in the LBB relay (132 KV Busbar: LBB function incorporated in the same) from 132 KV Bajrang feeder panel. As 132 KV Bajrang power is a generating unit, during 220 KV line fault, there was an abrupt/sudden increase in R-Ph current (2.0 A to 390 A) of this feeder. With LBB initiation continuously coming in the relay & raise of current above set threshold value for LBB function, LBB tripping occurred in R-Ph relay and thereby resulting in tripping of all feeder/ x-mers connected to the 132 KV Bus. The cable was replaced with new one, subsequently.

Committee noted.

2E.5. Grid Incidence at 400 kV Bhilai s/s on 10th October 2019.

Event Category: *GI-1*

Discussion in 139th PCM :

CSPTCL representative informed that on dated 10.10.2019 at 20:57:33 hrs 400KV Main Bus-1 tripped with tripping of all the 400KV main CBs of 400KV 315MVA transformers ICT-I, ICT-II, ICT-III, 400KV lines NTPC-I, NTPC-II, Raita 3, Bhatapara & Raipur I connected to Bus –I due to operations of Bus-Bar differential Main I & Main II of 400KV Bus I after failure of B-phase 400KV Tie CT (also working as Main CT for Bus I in this dia) of Raipur PGCIL feeder. No any interruption was involved on account of this and all other lines/transformers remained live through Tie CB except the following :-

400KV Raipur feeder :- It's B phase CT busted so tripped.
315MVA ICT III :- It tripped on operation of Main Buchholz protection, which is over sensitive and mal-operated probably due to heavy turbulence and internal thrust faced by the transformer during above 400KV Bus fault. No any gas was observed in the Buchholz during post fault checking. Also no any abnormality observed in DRs recorded in its relays. All the protection system operated correctly at 400KV S/S Khedamara except the main Buchholz of ICT 3, which will be checked in detail during next shut down. Due to busting of CT it caught fire in nearby area of switchyard and the same was quenched soon. The above deceased CT equipped in 400KV Raipur feeder is owned and maintained by M/s PGCIL Ltd along with complete metering and protection scheme of the said bay.
Defective CT has been replaced by PGCIL team on dated 16.10.2019 and taken in service.

The SLD/Event Report is enclosed at **Annexure 2E.5.**

Committee noted.

2E.6. Grid Incidence at 220 kV Korba(E) station on 1st November 2019.

Event Category: *GI-1*

Event Summary:

At 220 kV Korba(E) station, due to failure of bus coupler bay all the elements connected to 220 KV Bus-1 and 220 KV Bus-2 tripped.

The SLD/Event Report is enclosed at ***Annexure 2E.6.***

Discussion in 139th PCM :

Committee observed that there was no representation from CSPGL for the meeting and therefore the disturbance can be discussed in the next PCM.

2F.Occurrences in Dadra and Nagar Haveli system:

Nil

2G.Occurrences in Daman and Diu system:

Nil

2H.Occurrences in PGCIL systems:

2H.1. Grid Incidence at 800 kV HVDC Champa-Kurukshetra Terminal on 05th July 2019.

Event Category: *GI-2*

Event Summary:

On 05.07.2019 at 17.20 hrs there was a grid incidence at 800 kV HVDC Champa-Kurukshetra Terminal. 800 kV HVDC Champa-Kurukshetra Pole 1&2 tripped on Metallic Return Line Differential(MRLD) protection and Earth over current protection respectively due to Direct Metallic Return(DMR) line 1 short circuit fault. The 800 kV HVDC Champa-Kurukshetra Pole 1, 800 kV HVDC Champa-Kurukshetra Pole 2 tripped.

The SLD/Event Report is enclosed at ***Annexure 2H.1***

Discussion in 139th PCM :

Committee observed that there was no representation from HVDC Champa PGCIL for the meeting and therefore the disturbance can be discussed in the next PCM.

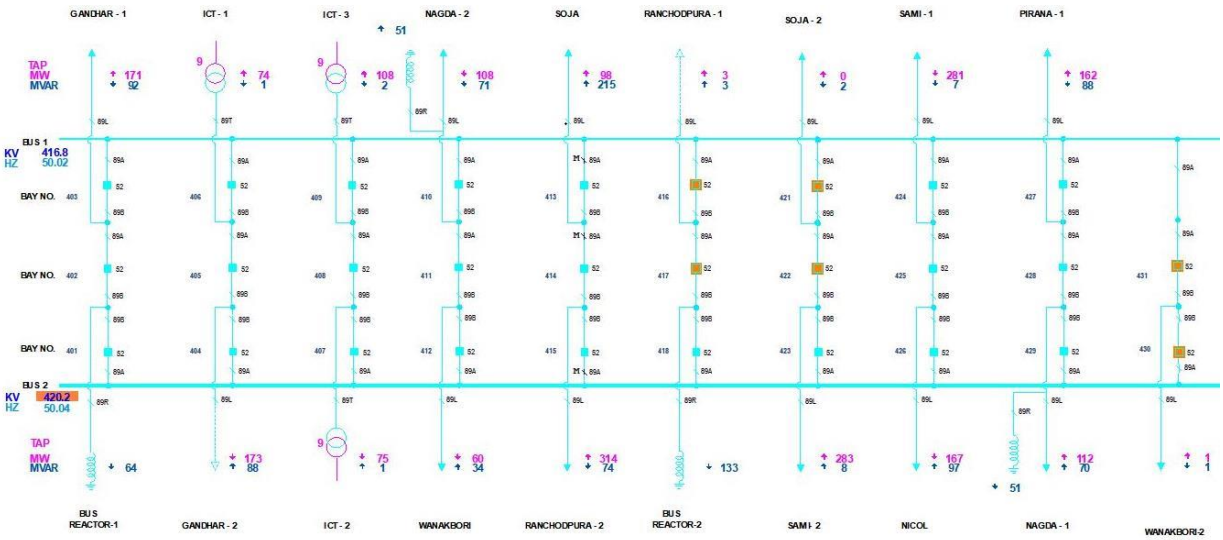
2H.2. Grid Incidence at 400/220 kV Dehgam s/s on 19th September 2019.

Event Category: *GI-2*

Event Summary as per WRLDC report:

At 400/220 kV Dehgam s/s, while testing A/R of the relay of upcoming 400 kV Dehgam-Wanakbori -2 line, by mistake bus bar 1 tripping command was extended by GETCO at 17:02 Hrs. This resulted in tripping of all the main bays connected to 400 kV Dehgam Bus 1. 400/220kV Dehgam ICT-1 tripped as the tie bay was already under outage (Gandhar-2 line in the same dia was out on planned outage). Even though 400kV Dehgam-Sami 1 was connected through tie bay, line tripped on Sami end only due to DT receipt. As per the information received from ATL, the 400 kV Sami-Dehgam 1 &2 was constructed earlier as half diameter whereas the Main and tie breakers were considered as Bus breakers and later 400 kV Dehgam-Pirana 2 (Now LILO at Nicol) circuit was commissioned. It is necessary to change existing protection scheme according to full diameter configuration. Sharing existing scheme of Pirana Line and modified scheme of Sami Dehgam line-1, was requested many times and it is still pending. Similar concern is applicable with upcoming Dehgam-Soja-2 line as well. 400 kV Nagda-Dehgam 1 A/R successful at Dehgam end only on R-E fault at 17:23 Hrs. A/R was not attempted at Nagda end and the line tripped from Nagda end, Voltage of the line at Nagda end rose from 240 kV to 258 kV resulted in Over Voltage Stage 1 protection operation and DT receipt at Dehgam end. Since the Main bay of 400 kV Dehgam-Pirana 1 was already out due to Bus bar tripping and the tie bay tripped due to O/V tripping of 400 kV Dehgam-Nagda 1, the line tripped at Dehgam end only. There was no load loss due to the event.

Single Line Diagram:



The SLD/Event Report is enclosed at ***Annexure 2H.2.***

Discussion in 139th PCM :

PGCIL representative informed that inadvertently +ve of DC got extended manually on Output contact of Tie Bay LBB relay used for extending tripping to Bus#1. Output contact distribution of A/R and LBB relays were as given below: -

- Main Bay A/R: BO 4, Terminals 5 – 6 for A/R Close command
- Tie Bay A/R: BO 5, Terminals 7 - 8 for A/R Close command
- Tie Bay LBB: BO 4, Terminals 5 – 6 for extending tripping to Bus#1

Remedial measures

- DT send Scheme of 400kV Sami Dehgam#1&2 Lines has been rectified and tested.
- Bus bar Protection is already under replacement. Outages were proposed in Jan'2020 but deferred due to system constraints. Now the outages are proposed from 10/02/2020

Committee noted.

2H.3. Grid Incidence at 800 kV HVDC Champa-Kurukshetra Terminal on 29th September 2019.

Event Category: *GI-2*

Event Summary:

800 kV HVDC Champa-Kurukshetra Pole 1&2 blocked due to the Type B filter tripping at Kurukshetra end during Pole 3 testing activities (for commissioning). Prior to the tripping, flow on Bipole was 460 MW.

The SLD/Event Report is enclosed at ***Annexure 2H.3.***

Discussion in 139th PCM :

Committee observed that there was no representation from HVDC Champa PGCIL for the meeting and therefore the disturbance can be discussed in the next PCM.

2H.4. Grid Incidence at 765/400/220 kV Gwalior(PG) s/s on 2nd October 2019.

Event Category: *GI-I*

Event Summary:

At 765/400/220 kV Gwalior(PG) s/s, R phase LA of 220 kV Gwalior2 (MP) feeder failed and resulted in tripping of the line. 220 kV Gwalior-Gwalior(MP) 1 and 220 kV Gwalior-Mahalgaon(MP) 1 tripped only from MPPTCL end.

The sequence of tripping and restoration:

S No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1	220 kV Gwalior PG - Mahalgaon -1	02:54:59	No trip	R-E fault	03:42
2	220 kV Gwalior PG – Gwalior II-1	02:54:59	No trip	R-E fault	04:06
3	220 kV Gwalior PG - Gwalior -II-2	02:54:59	R-E, Z-1	R-E fault	14:51

The SLD/Event Report is enclosed at ***Annexure 2H.4.***

Discussion in 139th PCM :

Committee noted that the tripping of 220 kV Gwalior-Gwalior(MP) 1 at 220kV Gwalior(MP), might have been due to short line length, the DPS of short lines shall be replaced by Line Differential scheme. The tripping of 220kV Gwalior- Mahalgaon(MP) 2 at 220kV Mahalgaon(MP) end was undesirable, the DPS shall be checked for reach settings.

2H.5. Grid Incidence at 400/220 kV Vapi s/s on 4th October 2019.

Event Category: *GI-I*

Event Summary:

At 400/220 kV Vapi s/s, while charging 220 kV Bhilosa ckt, LBB operated causing tripping of all the elements connected to 220 kV Vapi Bus 1

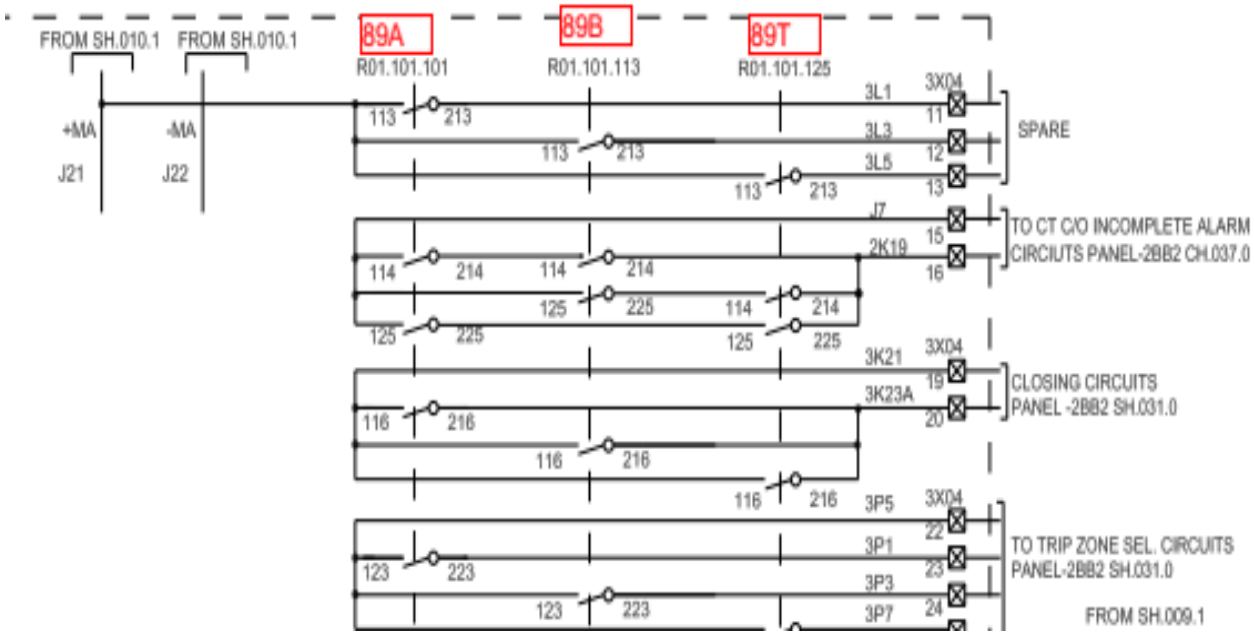
Discussion in 139th PCM :

PGCIL representative informed that 220kV Vapi Bhilosa Line was hand tripped at 16:54 hrs for attending open jumper at Loc. No. 31. Work permit was returned at 21:22 hrs and Line was charged from Bhilosa end at 22:19 hrsWhile synchronizing line at Vapi end through its Main bay (i.e. Bay No. 212), Main CB could not be closed as the same was tripping on Pole Discrepancy. For attending the same, line was hand tripped from Bhilosa end at 22:39 hrs and Direct Trip received at Vapi end and 3 Ph Gr. Relays operated. As Main CB was not ready for taking in service, RLDC code was taken for charging of Line through TBC bay. Line charged from Vapi end through TBC Bay at 22:52:25.950 hrs and synchronised from Bhilosa end at 22:52:57.219 hrs. At 22:52:57.426 hrs, LBB of Bhilosa Main Bay (Bay No - 212) optd which resulted in tripping of 220kV Bus#1 as after synchronization, load current crossed pick up level of LBB i.e. 200mA and processed the tripping after 200ms (Set time delay).

Due to above, following feeders connected on 220kV Bus#1 got tripped: -

- 400kV ICT#1 & 3
- 220kV Vapi Magarwada#1
- 220kV Vapi Sayali
- 220kV Vapi – Vapi GETCO
- 220kV Vapi Bhilad#2&3

For TBC CB closing, CB closing I/L checks for TBC bay 3 Ph Gr. Relays, hence the TBC CB got closed (at the time of tripping, 89A & 89B isolator of Bay 212 were open & 89T was closed). While analysing the same, it was observed that for 400/220kV ICT-3 both 89A & 89T CT switching relay (Make- ALSTOM, Type- MVAJ) were selected but in actual only 89A was closed & 89T was open. Reset coil of 89T CT Switching relay was not operating.



Actions taken –

1. Faulty Aux. relay used for CT inconsistency alarm had been replaced
2. Faulty CT switching relay 89T of ICT#3 had been replaced.

The SLD/ and detailed event Report is enclosed at **Annexure 2H.5.**

Committee noted the remedial actions taken by PGCIL.

2H.6. Tripping of multiple lines emanating from 220 kV Kala s/s on 22nd October 2019.

Event Category: *GI-I*

At 15:31 Hrs, 220 kV Kala-Khadoli 1 and 220 kV Kala-New Kharadpada 1 tripped on R-E fault and R-B fault respectively. At 15:34 Hrs 220 kV Kala- Khadoli 2 and 220 kV Kala- New Kharadpada 2 tripped on R phase fault. 220 kV New Kharadpada Bus 2 tripped due to damaged B phase conductor.

Bus Configuration before tripping as follows:

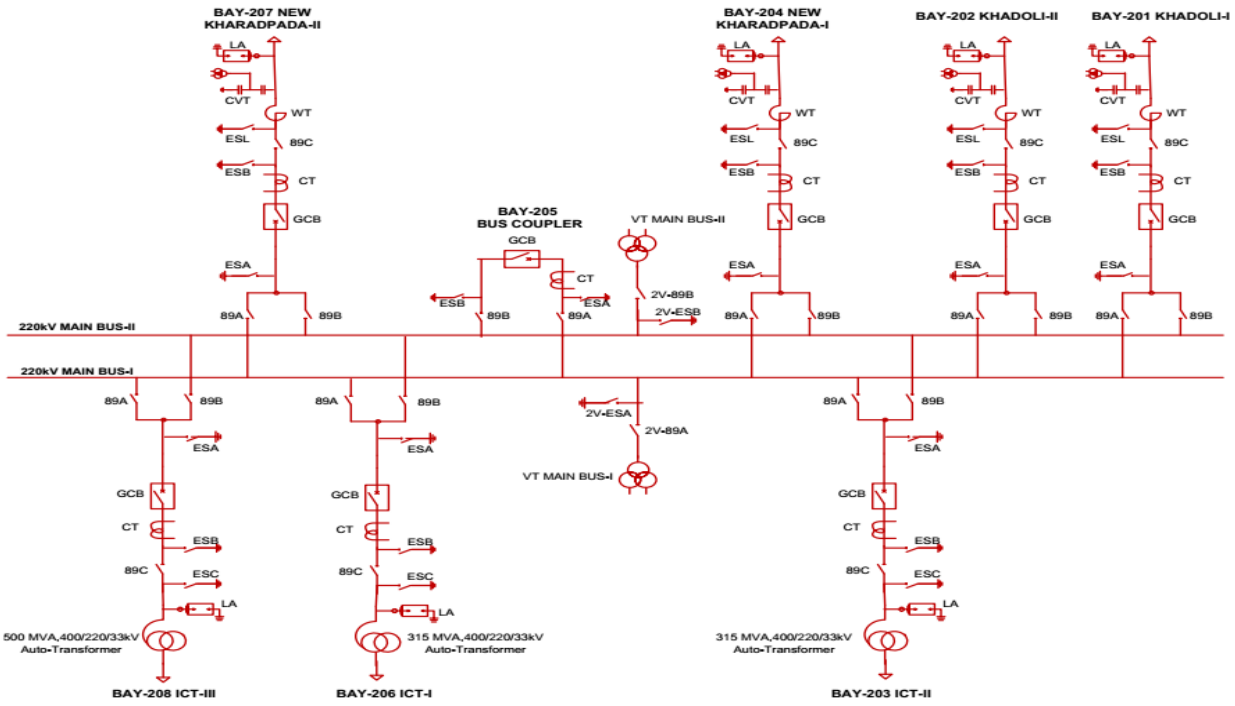
Feeders on 220kV Bus#1	***Feeders on 220kV Bus#2***
220 kV Kala New Kharadpada#1	*220 kV Kala New Kharadpada#2*
220 kV Kala Khadoli#1	*220 kV Kala Khadoli#2*
400/220kV ICT#1	*400/220kV ICT#3*
400/220kV ICT#2	

Relay indications during the incidence as follows:

Sr. No.	***Name of Line***	***Time of Tripping***	***Tripping Indications***	
			End-1	*End-2*
1.	*220 kV Kala New Kharadpada#2 Length – 27kM*	*15:31:17.536*	*R – E fault, 4.24kM Zone#1 Optd*	*AR successful at Kharadpada end, 21.63kM*
2.	*220 kV Kala Khadoli#1 Length – 7kM*	*15:31:17.811*	*R – E fault, 4.09kM Zone#1 Optd*	*Tripped from both the ends no AR attempt at Khadoli end, 2.035kM*
3.	*220 kV Kala Khadoli#2 Length – 7kM*	*15:31:17.828*	*No Tripping. Line remain charged from Kala end. Zone - 2 picked up*	*Tripped from Khadoli end only. Zone 1 optd, R – E fault. 288 mtrs*
4.	*220 kV Kala New Kharadpada#1 Length – 27kM*	*15:34:08.237*	*R-B fault loop picked up. Tripped on DT Receive*	*Tripped from New Kharadpada end also Bus fault occurred*

Single Line Diagram

220 kV Single Line Diagram



The SLD/Event Report is enclosed at ***Annexure 2H.6.***

Discussion in 139th PCM :

PGCIL representative explained the above trippings.

Committee noted that the tripping of 220 kV Kala-New Kharadpada 1 was due to Bus fault at New Kharadpada end. Tripping of 220 kV Kala- Khadoli 2 line at Khadoli end, might have been to short length (7km). The DPS on short lines be replaced with the Line Diff protection. It was also felt that DNH may implement load trimming scheme, since the loading of Kala S/S has increased and there is in sufficient evacuation system.

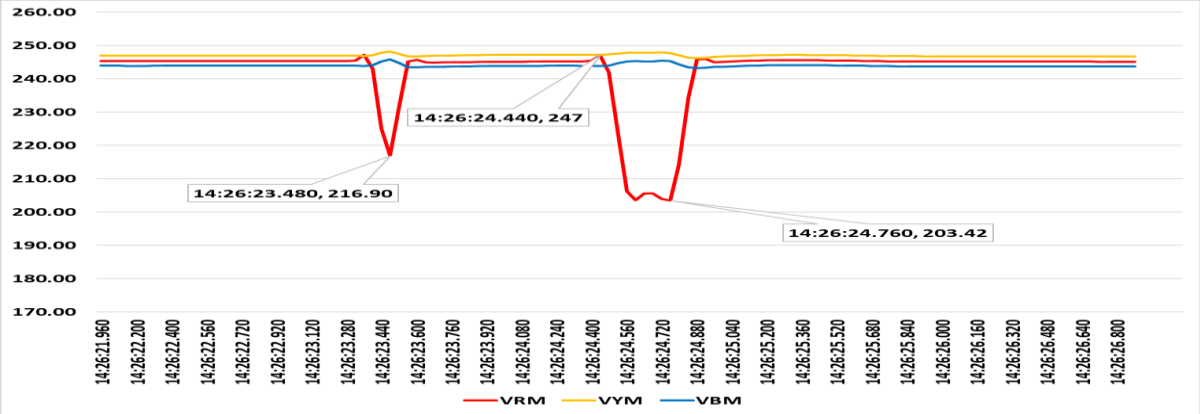
2H.7. Grid Incidence at 765/400 kV Wardha s/s on 8th November 2019.

Event Category: *GI-2*

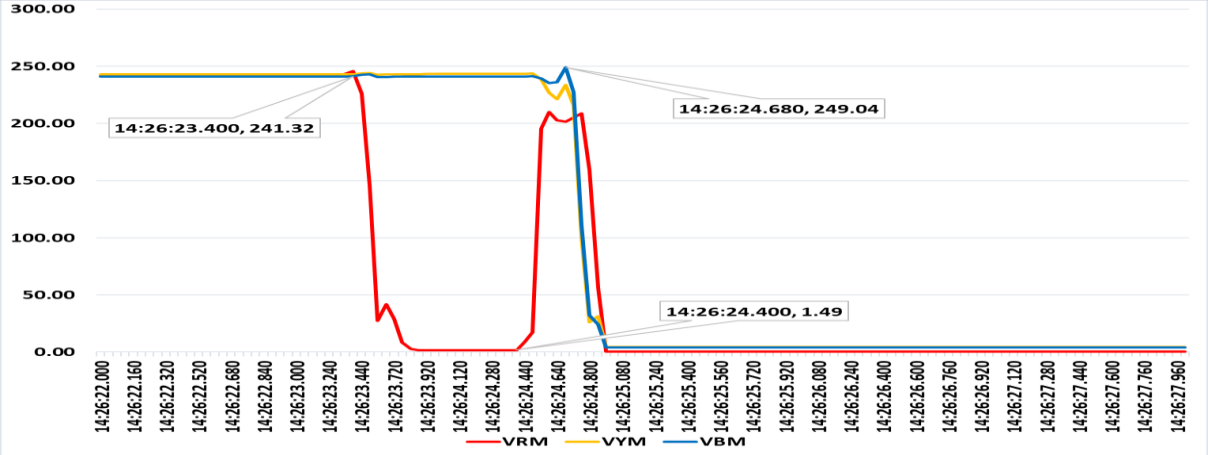
Event Summary:

At 765/400 kV Wardha s/s, during A/R attempt of 400kV Wardha-Akola-1, R phase pole of main bay CB (BHEL make) at Wardha end stuck up and resulted in tripping of 400kV Bus-1 on LBB operation. PGCIL informed that the trip coil circuit became faulty during the A/R operation which led to LBB operation.

Voltage Plot of 400 kV Wardha – Mouda -1 at Wardha end :



Current Plot of 400 kV Wardha – Akola -1 at Wardha end:



The sequence of tripping and restoration:

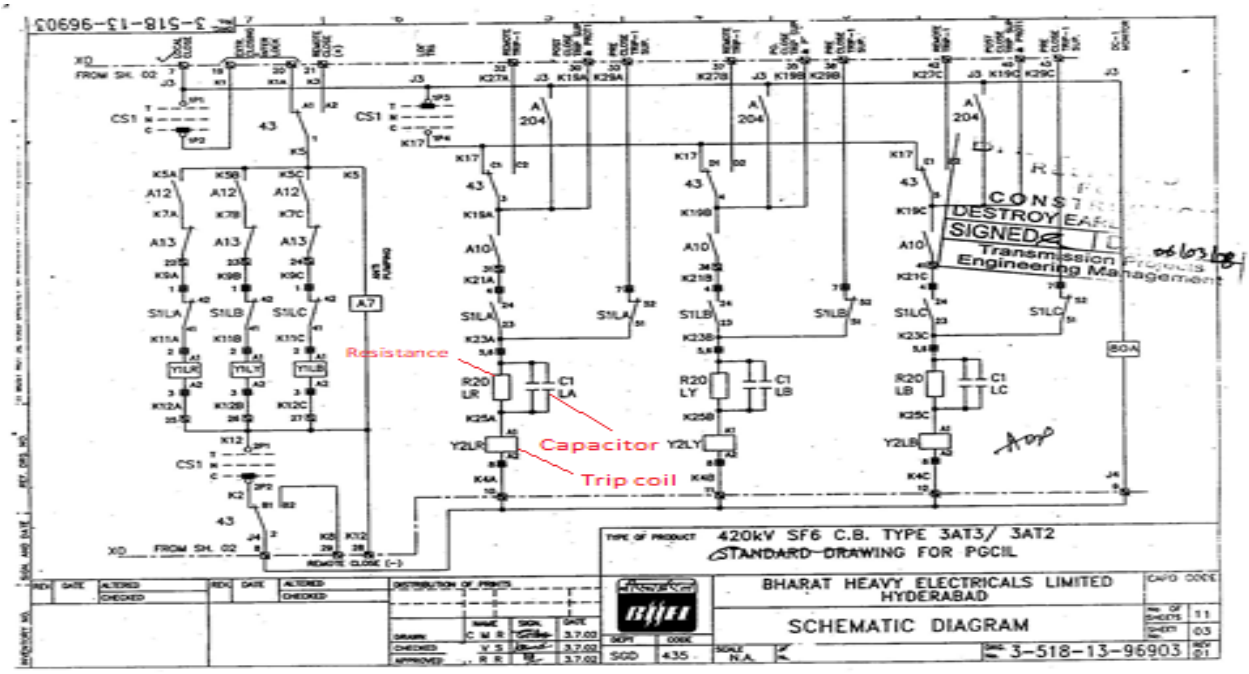
S No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1	400 kV Wardha – Akola- 1	14:26:24	R-G, FD=42.05km, FC=9.029KA,	R-G, FD= 114.5km, FC=2.99kA	15:32
2	400 kV Bus-1 Wardha	14:26:24	Bus bar protection optd, 419 bay LBB operated		15:33

Discussion in 139th PCM :

PGCIL representative informed that at 14:26 hrs/08.11.2019, 400Kv Wardha-Akola-1 tripped on R-ph Fault. During A/R attempt, R-ph pole of Main CB (41952) at Wardha end was stuck up and its LBB is operated which leads to tripping of 400KV Bus-1 at Wardha.

Fault details are as below.

- At Wardha end: R-G, Fault distance= 42.05km and Fault Current= 9.02kA.
- At Akola end: R-G, Fault distance= 114.5km and Fault Current= 2.99kA
- TL patrolling team intimated that de-capping of suspension insulator is found at Loc No.127.



Due to issues in BHEL Hydraulic Circuit Breakers, replacement works are already awarded to M/s GE. Replacement of 419 Bay CB is planned before March 2020

The SLD/Event Report is enclosed at **Annexure 2H.7.**

Committee noted.

2H.8. Grid Incidence at 800 kV HVDC Champa-Kurukshetra Terminal on 14th December 2019.

Event Category: *GI-2*

Event Summary:

At 800 kV HVDC Champa s/s, Pole 1 blocked due to the DC Undercurrent on CAT-B protection operation and Pole 3 blocked due to the failure of O/C relay (Delcon-make)at Kurukshetra end. After the relay replacement and resetting pole protections,the poles got deblocked.

The SLD/Event Report is enclosed at ***Annexure 2H.8.***

Discussion in 139th PCM :

Committee observed that there was no representation from HVDC Champa PGCIL for the meeting and therefore the disturbance can be discussed in the next PCM.

2H.9. Grid Incidence at 800 kV HVDC Champa-Kurukshetra Terminal on 30th December 2019.

Event Category: *GI-2*

Event Summary :
At 800 kV HVDC Champa s/s, Pole 1&2 blocked on Common Neutral Area Protection at Champa end and at the same time pole 3 blocked on CAT-B protection operation. The SLD/Event Report is enclosed at ***Annexure 2H.9.***

Discussion in 139th PCM :

Committee observed that there was no representation from HVDC Champa PGCIL for the meeting and therefore the disturbance can be discussed in the next PCM.

2H.10. Grid Incidence at 800 kV HVDC Champa-Kurukshetra Terminal on 30th December 2019.

Event Category: *GI-2*

Event Summary:
At 800 kV HVDC Champa s/s, Pole 2 blocked due to Earth overcurrent protection operation and pole 3 blocked on CAT-B protection operation.
The SLD/Event Report is enclosed at ***Annexure 2H.10.***

Discussion in 139th PCM :

Committee observed that there was no representation from HVDC Champa PGCIL for the meeting and therefore the disturbance can be discussed in the next PCM.

2I.Occurrences in NTPC/RGPPL systems:

2I.1. Grid Incidence at 400 kV VSTPS on 13th October 2019.
Event Category: *GI-2*

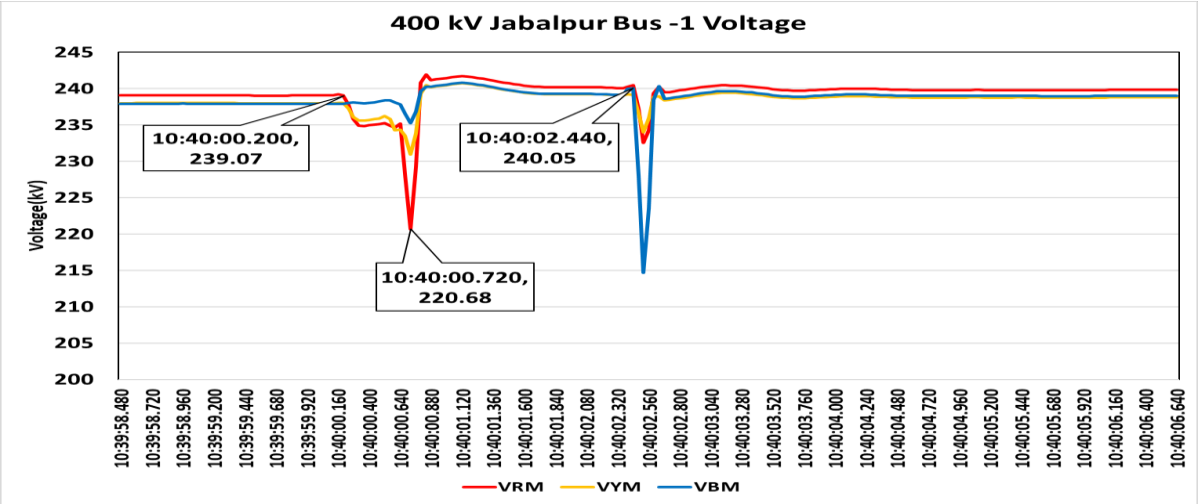
Discussion in 139th PCM :

NTPC representative informed that At 400 kV VSTPS, 400/132 kV 200MVA ICT 1 tripped on differential protection operation due to internal fault. R phase LA and bushing got damaged. The flames, due to burning of the transformer created B phase fault in 400 kV Bus 3 and all the connected elements tripped on BB protection operation. As informed by Vindhyachal, the event started with R phase fault in 132kV Vindhyachal-Waidhan -II. Vindhyachal ICT1 developed an internal fault while feeding the R phase fault in the line. The ICT blasted causing B phase fault in Bus 3 which tripped on BB protection operation.

The sequence of tripping and restoration:

Sl No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1	400/132 kV 200MVA VSTPS ICT1	10:40:00	Differential protection		Still out
2	400kV VSTPS-Satna-1,	10:40:02	BB operation	DT received	19:39@ 14-10-19
3	400kV VSTPS-Jabalpur-2	10:40:02	BB operation	DT received	13:34
4	400kV VSTPS-ESSAR Mahan	10:40:02	BB operation	DT received	12:53@ 14-10-19
5	400kV VSTPS-Sasan	10:40:02	DT received	Z2, DT received	12:48
6	VSTPS HVDC feeder 2	10:40:02	O/C		12:35
7	132kV VSTPS-Waidhan-2	10:40:02	Z1, O/C	Z-1,Master trip	13:22
8	VSTPS Unit 1 (210MW)	10:40:02	BB operation		16:42
9	VSTPS Unit 7 (500MW)	10:40:02	BB operation		14:43

765 kV Jabalpur Bus 1 Voltage plot during the event:



The SLD/Event Report is enclosed at ***Annexure 2I.1.***

WRLDC representative informed that as seen from the SCADA SOE available at WRLDC, the time difference of around 6 seconds at Vindhyachal and Jabalpur and around 30mins at Sasan end. PGCIL /NTPC/Sasan may rectify the time synchronization issue at the earliest.

On the issue of Zone 2 setting of the 400 kV Vindhyachal-Satna 1 (as the fault closer to bus was seen by the relay in Zone 3 instead of Zone 2), PGCIL representative informed that the underrach might have been due to the nature of the fault.

Committee observed that 400kV Vindhyachal -Sasan and Vindhyachal HVDC Feeder -2 which are connected to Bus- 1 tripped for fault on Bus -3 was undesirable and NTPC/PGCILshall look into the issue. Further the issue of 400kV Vindhyachal-Sasan tripped on DT received at both ends needs to be checked.

2I.2. Grid Incidence at 400kV RGPPL on 4th October 2019.

Event Category: *GI-2*

Event Summary:

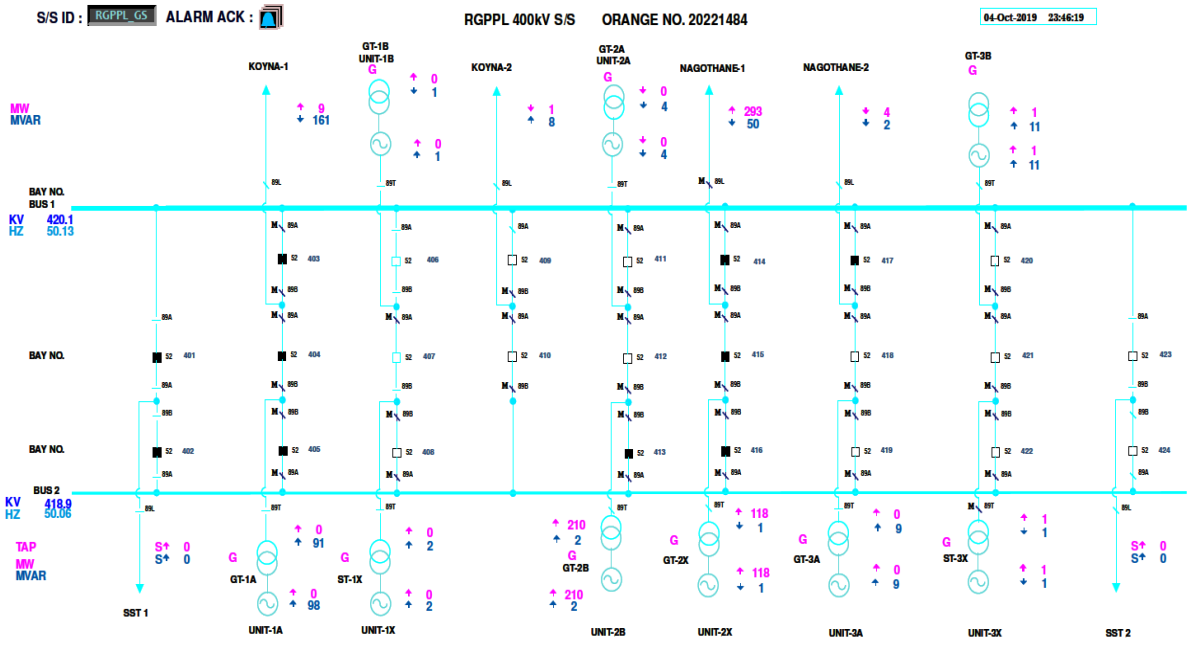
400kV RGPPL-Nagothane-2 tripped at Nagothane end only, on D/T receipt from RGPPL end at 20:48hrs. Trip coil had DC supply problem leading to mal-operation of O/V relay and sent D/T to remote end. But breaker at RGPPL remained closed as trip coil was faulty. At 400 kV RGPPL gas power station, while opening the isolator of 400 kV Nagothane 2, sparking was observed and it led to the operation of LBB and tripping of all the main bays of 400 kV Bus 1. 400 kV Nagothane 1 tripped at Nagothane end only on DT receipt.

To isolate the faulty breaker the bus side isolator of 400 kV Nagothane 2 main bay was manually opened and sparking was observed. This led to the operation of LBB and tripping of all the Main bays connected to Bus-1. With the tripping of the Bus-1, DT was sent to Nagothane end, causing tripping of 400kV RGPPL-Nagothane-1 at Nagothane end only. As Tie CB of Unit-3X was already open, the unit tripped. Unit-3B was manually hand-tripped immediately causing total generation loss of 268MW due to the event. Only unit 2B along with 2X remained in service on Bus-2.

The sequence of tripping and restoration:

S No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1	RGPPL - UNIT 3X	22:07:16	Bus bar protection optd		12:10 @ 05.10.19
2	RGPPL - 400KV - Bus 1	22:07:16	Bus bar protection optd		22:55
3	400KV-RGPPL-NAGOTHANE-1	22:07:16	Not trip, M/B open on BB protection	DT received	23:37
4	400KV-RGPPL-NAGOTHANE-2	20:48:00	LBB of Main bay	DT received.	01:01@ 05.10.19

Single Line Diagram:



Discussion in 139th PCM :

RGPPL representative informed that at 20:49 Hrs 400KV Dabhol N agothane#2 Main Breaker Electric Trouble alarm came. Although line was charged from RGPPL end but remote end breaker tripped on receiving direct trip and this was Informed to Electrical Maintenance. EM checked and found that DC supply of line relay / breaker panel was not available and Breaker in lockoutlinoperative condition. While attempting for isolator opening by EM to isolate the locked-out breaker, 400 KV bus#l become dead on LBB protection (407-52A-Nagothane-line#2). All 400 KV Breakers corresponding to Bus# 1 including running STG#3X tripped and CTG 3B was hand tripped. Later on, N agothane#2 Main breaker both side isolator opened and Bus#l charged from SST #1 22:57 Hrs. Nagothane #1 charged @ 23 :37 Hrs (code: 324), Koyna #1 Main Bkr taken in service at 23:42 Hrs (Code: 326), Nagothane#2 taken in service via tie breaker @ 01 :01 Hrs (332). CTG#2A Started and Synched at 01:33Hrs.

Nagothane line#2 main breaker 407-52A (R &B pole) trip mechanism was found jammed due to which both trip coil# 1 and #2 burnt and DC # 1 & #2 fuse blown and breaker was gone in locked out mode. Opening of breaker isolator to isolate the locked-out breaker creating arc which had operated the LBB protection of Nagothane line#2 breaker and bus#l tripped which led to opening of all breakers associated with Bus# 1. STG 3X was tripped because its tie breaker 408-52T was not taken in service after unit synchronizatio,n .CTG-3B was hand tripped because of STG-3X tripping. N agothane Line# 1 tripped on tripping of line breaker at remote end on operating bus bar# 1 protection, though line was connected to Bus#2 though its tie breitker 406- 52T at RGPPL end. Nagothane line#1 & line#2 breakers are electrically operated breakers of Areva make which is installed on 2009. Breaker overhaul is due after 12 years of operation.

The SLD/Event Report is enclosed at **Annexure 2I.2.**

Committee observed that this was a manual error of opening of isolator in breaker closed condition, through line was in no load condition. It was felt that instead of isolating the lockout/ inoperative breaker through the isolator it would have been appropriate to take bus shut down with proper precaution. Standard operating procedure should be followed. The existing Bus bar protection scheme (RADSS make) should be replaced with numerical type Bus bar Scheme.

2J. Occurrences in Green Infra Wind Energy Limited (GIWEL) system:

(138th PCM Agenda item no 2J.1. and 2J.2, GIWEL representative was not present in the 138th PCM meeting and therefore the following disturbance could not be explained to the sub-committee. The same is taken up in the 139th PCM for discussion.)

2J.1. Grid Incidence at 220 kV Vadva s/s on 12th August 2019.

Event Category: *GD-1*

Event Summary:

Due to the tripping of 220 kV Bhuj-Vadva S/C on B-E fault, 220/33 kV Vadva ICTs 1,2& 3 deenergized at 220 kv Vadva S/s. ***B*** *- phase temporary earth Fault.*

The sequence of tripping and restoration:

Sl No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm)	Relay indication		Time of restoration (hh:mm)
			From	To	
1	220kV Vadva-Bhuj	12-08-19 @ 05:48:43	Z-1, B-ph	Z-1, B-ph	06:56
2	220kV Vadva-Bhuj	24-08-19 @ 18:00:50	Low set O/c	No trip	19:49

The SLD/Event Report is enclosed at ***Annexure 2J.1.***

Discussion in 139th PCM :

Committee observed that there was no representation from MPPGCL in the meeting and therefore the disturbance could not be discussed.

2J.2. Grid Incidence at 220 kv Vadva s/s on 24th August 2019.

Event Category: *GD-1*

Event Summary:

Due to the tripping of 220 kV Bhuj-Vadva S/C on O/C current protection operation, 220/33 kV Vadva Icts 1,2& 3 deenergized at 220 kv Vadva S/s. line tripped in low set over current.

The sequence of tripping and restoration:

Sl No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm)	Relay indication		Time of restoration (hh:mm)
			From	To	
1	220kV Vadva-Bhuj	12-08-19 @ 05:48:43	Z-1, B-ph	Z-1, B-ph	06:56
2	220kV Vadva-Bhuj	24-08-19 @ 18:00:50	Low set O/c	No trip	19:49

The SLD/Event Report is enclosed at ***Annexure 2J.2.***

Discussion in 139th PCM :

Committee observed that there was no representation from MPPGCL in the meeting and therefore the disturbance could not be discussed.

2K. Occurrences in IPP's :

2K.1. Grid Incidence at 765/400 kV Bhopal s/s on 4th October 2019.

Event Category: *GI-2*

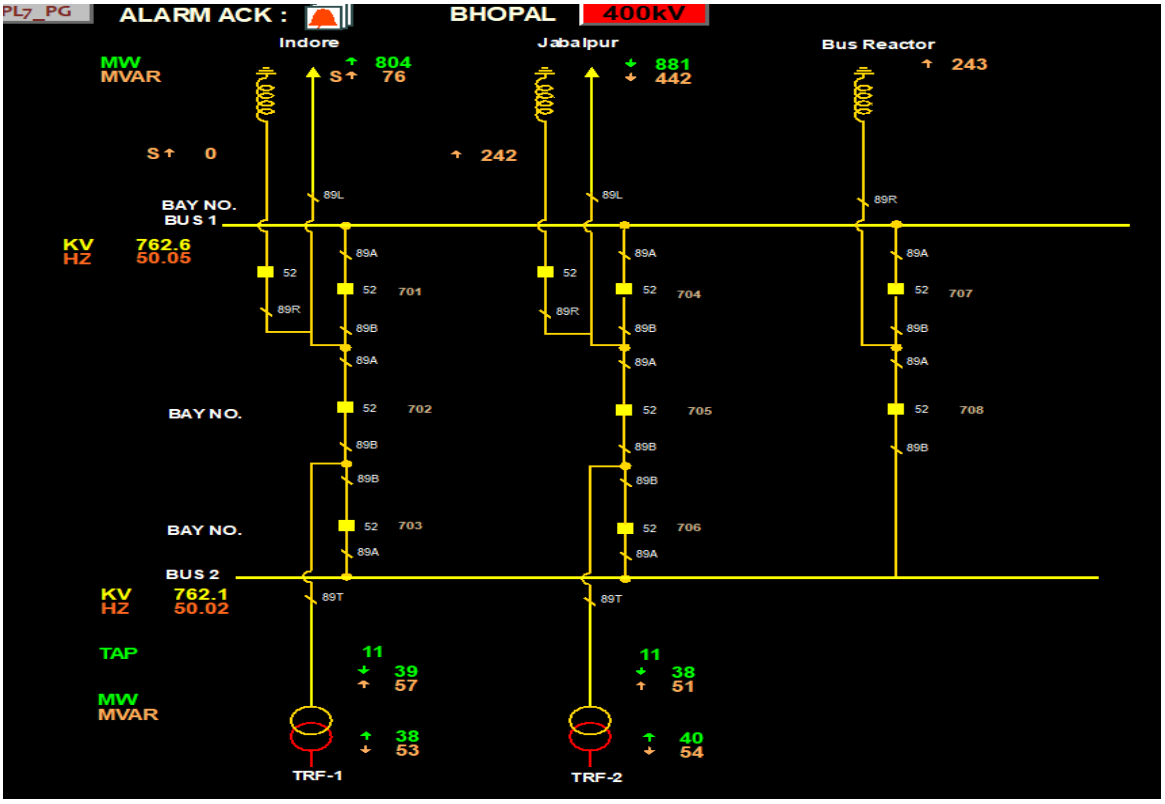
Event Summary:

At 765/400 kV Bhopal s/s, ICT-1 tripped at 07:25Hrs due to 400kV side Y phase LA damage. 706 Bay (ICT-2 Main Bay) was already out of service due to SF6 leakage from 12:06 hrs of 04-09-19. Hence 765kV Bhopal Bus-2 was connected to Bus 1 only through BR dia. At 09:03 Hrs 707 Bay (765 kV bus reactor main bay) tripped due to DC Earth Fault in tripping coil of circuit breaker. With the tripping of the Main bay of BR, Bus 2 was de-energized.

The sequence of tripping and restoration:

S No.	Name of the transmission element/ Unit	Time of Tripping (hh:mm:ss)	Relay indication End 1	Relay Indication End 2	Time of restoration (hh:mm)
1	765KV/400kV BHOPAL-BDTCL-ICT-1	07:25:35	Y ph Differential trip		10:00
2	BHOPAL-BDTCL – 765kV B/R 1 M/B	09:02:57	CB TC-1 faulty, Pole discrepancy		13:14

Single Line Diagram:



The SLD/Event Report is enclosed at ***Annexure 2K.1.***

Committee noted.

2K.2. Grid Incidence at 400 kV MB Power Power station on 17th December 2019.

Event Category: *GD-1*

Event Summary:
The sequence of tripping and restoration:

At 400 kV MB Power station, 400 kV MB Power-Jabalpur(PS) 1&2 tripped due to the receipt of DT from Jabalpur(PS). 600 MW MB Power Unit 2 tripped due to the loss of evacuation path. At the time of the tripping 400KV Bus 1 at Jabalpur(PS) was under planned outage.

*M**MB Power vide mail dated 14.01.2019 intimated as follows:***

M/S M B Power 2x600MW generating unit have observed Black out dated on 17/12/19 at 16.53.27 PM due to both 400kv power circuit-1&2 tripping. Unit-1 was under shutdown due to AOH & unit-2 was running on appx 540MW. As per our event recorded in main relay P442(21M1) of both the line, it was due to DT received from remote end 400KV S/S (PGCIL, Jabalpur). PLCC DT counter has also recorded DT receipt (TX/RX). But the same time PGCIL 400kv S/S end feeder breakers (for both line) were in service as informed by PGCIL authority. Tripping time of both 400KV line was almost same Line-1 tripped at 16.53.27.370 PM & Line-2 tripped at 16.53.27.368 PM as per main relay event record.

In M B Power 400kv S/S, GT-1Main- bay & Tie-bay breaker was open along with their isolators as unit-1 was under shutdown since 10th dec,19 due to AOH . Line-2 Main-bay breaker was also shut down from same day (10.0AM appx) as per approved outage during AOH, Line-2 was in service through Its Tie breaker, Line-1 was in service through main line-bay breaker as usual.
MB Power also shared their end PLCC DT (TX/RX) counter details along with Main relay event/DR record to PGCIL Jabalpur authority, MB Power requested PGCIL to share their event/DR of main line bay breakers to analyze reason of tripping along with PLCC counter details.
M B Power had incurred heavy losses due to unit-2 tripping which was running on appx 540MW load at that time.

The SLD/Event Report is enclosed at ***Annexure 2K.2.***

Discussion in 139th PCM :

PGCIL representative in brief explained the disturbance.

MB Power representative informed that they have not received any communication from PGCIL despite sending mails to PGCIL and also informed that in the past also there were several instances they were not received any communication from PGCIL.
WRLDC representative informed that the PSS was switched OFF during the disturbance, since severe oscillations were observed after the tripping.
MB Power representative informed that the loading on the generator was low before the disturbance and the setting of the PSS is such that the PSS switches OFF as per design and recommendations of the OEM.
The issue of Auto switching OFF of the PSS during low loading was discussed and it was felt that the chances of unstable operations of generating units, during the low loading conditions are more. Therefore, if the OEM has advised to put the PSS in Auto OFF mode during low loading conditions, the same should be maintained by MB Power. However the PSS should be switched ON as soon as the loading on the generating units are at comfortable level.
Committee felt that the information on tripping of evacuation lines from a generating station, whether due to mal operation or otherwise, should be shared with the generating station immediately, so that the generator can take further action based on the information received. PCGIL may take note of this and pass on the available information to the generators whenever such disturbance occurs.

2L. Compliance of 132th PCM to 138th PCM recommendations:

The updated compliance status of the 132th to 138th PCM recommendations is enclosed at **Annexure-2L.1.**

Committee requested to attend the pending compliances.

ITEM NO. 3: Tripping of lines / ICTs :

3.1) The minor incidences of tripping of lines and ICTs during the period 01-09-2019 to 31-12-2019 is enclosed at **Annexure–3.**

3.2) The minor incidences of tripping of lines and ICTs are not being reported by State TRANSCOs, since last 2-3 PCMs. These tripping are also important and are required to be submitted to WRPC every month. These trippings form a part of reports in the compendium.
Compendium preparation for the calendar year 2019 will be taken up by WRPC immediately after this PCM. In spite of regular follow up through email & telephonically, the data is not being submitted by the Utilities. Data regarding the trippings in the format enclosed at **Annexure-3.1** is required to be submitted by **MSETCL, GETCO, MPPTCL, CSPTL, NTPC, Goa, DD, DNH and State GENCOs before the meeting**.

3.3) Discusssions in 139th PCM :

It was requested to all the utilities that the single element trippings for all the 400kV elements and all the ISTS lines be submitted regularly to WRPC..

Committee noted.

ITEM NO. 4: State Level Relay Co-ordination Groups:

4A.1.)Back ground: In the 128th& 129th PCM the issue of formation of "State level Relay Co-ordination Group" (SRCG) was discussed in detail to review the relay settings within the State, so that the settings are coordinated. It was decided that SLDC shall be the convener of the group and the SRCG of the States shall periodically review the relay coordination in their State. The proposals for revision of relay settings then shall be put up to the PCM forum for ratification.

4A.2.) 131st& 132nd PCM discussion:

Following critical areas were identified for relay protection co-ordination in the 131st PCM;

Maharashtra : Akola, Talegoan, APL Tirora and Mumbai-MSETCL interconnections.
Gujarat : SSP, Kakrapar,Kawas&Gandhar.
MP : Omkareshwar&Damoh.
Chattisgarh: Korba (W) & Bhilai.

4A.3.) 136th PCM Discussions:

NPCIL representative informed that the implementation of revised distance relay settings of 220kV TAPS-Borivali feeder at TAPS end has been done on 26.04.2019.
MSLDC representative informed that based on the action taken report of the first and second meeting, they have proposed to conduct the third meeting most probably in the month of June 2019.
GETCO representative informed that most of the relay setting coordination issues were addressed during the first and second meetings and also informed that the third meeting will be held in the month of June 2019 or July 2019.
MS,WRPC stressed that regular meetings of the State level Relay Co-ordination groups be held for review of relay coordination of interconnections and the MoM to be shared with PCM.

4A.5.) 138th PCM Discussions:

MS WRPC informed that the SRCG's shall meet regularly and review all the interface utility settings within their States. Also the SLDC's based on mal-operations of relays and disturbances should identify the areas where relay settings needs to be reviewed. The Report of Task Forces have also recommended setting up these types of forums at State level. The recommendations of the SRCG and its implementation should be submitted before the PCM.

4A.5.) Developments after 138th PCM (3rd meeting of Maharashtra SRCG) :

The 3rd meeting of Maharashtra State SRCG was held on 19th November 2019 at SLDC Kalwa. The meeting was chaired by MS WRPC and attended by the representatives of utilities of Maharashtra State, IPPs and POWERGRID. In the meeting it was decided that after receipt of the confirmation of the implementation of the revised settings from the Utilities, MSLDC shall inform the same to the Protection Committee of WRPC. It was suggested to expand the scope of the forum to look into other interconnecting points (i.e.RGPPL-New Koyna, JSW-MSETCL, Chandrapur-Bhadravati etc.).

MP, Gujarat & Chattisgarh may please update the status on State SRGC activities.

4A.6.) 139th PCM Discussion:

State	Systems Identified in PCM	1st	2nd	3rd
Maharashtra	Akola, Talegoan, APL Tirora and Mumbai-MSETCL interconnections		(i)NPCIL-implemented revised DPS settings of 220kV TAPS-Borivali feeder at TAPS end. (ii)	3rd meeting held on 19.11.2019
Gujarat	SSP, Kakrapar, Kawas & Gandhar		settings reviewed and will be firmed up in 3rd meeting	Will be held in March 20.
MP	Omkareshwar & Damoh		settings reviewed	--
Chattisgarh	Korba (W) & Bhilai	Representative informed that it will be held shortly.		

MS WRPC informed that the main objective was to coordinate the interface points Zone-1, 2 & 3 settings given in the Ramakrishna Task Force Report (RTFR). Further power swing blocking and out of step protections at the interconnection points needs to be discussed in the SRGC's. He requested SLDC Gujarat to convene the meeting in March 2020. Also he requested Chattisgarh SLDC to start the activity of the group immediately, since Chattisgarh has many interconnection points with ISTS system. He further requested WRLDC to actively participate in the meetings. The 3rd SRGC of MS SLDC was held on 19.11.2019, which was attended by officials from WRPC Secretariat and it was suggested to expand the scope of the forum to look into other interconnecting points (i.e.RGPPL-New Koyna, JSW-MSETCL, Chandrapur-Bhadravati etc.). The agenda and

discussions/decisions taken in the meeting were fruitful and are enclosed at **Annexure-4.** All the SLDC's may follow the same model.
It was informed that the main purpose for forming the SRGC's was the blackout disturbance that took place at CGPL in 2015, wherein it was observed that there was a lack of information amongst the TRANSCOs regarding modifications (such as LILO, new transmission line integration, new IIP integration etc.), in the system adjacent to them. Since the SLDCs and WRLDC, in advance, are aware of such system addition/modification, it was decided that SLDCs would act as convener and identify such areas where system changes would take place for discussions/decisions on relay setting coordination of such areas. Further SLDCs and WRLDC would identify critical network areas in their purview based on the disturbances where mal-operation/lack of relay co ordination has been observed. All such systems shall form the agenda for the SRGC meetings, where the relay setting co ordinations would be reviewed and finalized.

Committee noted the above views and felt that WRLDC/ SLDCs shall take active initiative in framing the agenda for the SRCG's. The frequency of the SRCG's should be increased. The SRGC's can co-opt members from other utilities relevant or whose participation is required for finalization of the relay settings in the SRGC's.

ITEM NO. 5: Hon'ble CERCs orders on the Grid disturbance of 30.07.2012 & 31.07.2012

5.1: Compliance Status observations made in Protection Audit (Petition No. 220/MP/2012) BackGround:

5.1.1) Back ground:

CERC vide its order dated 21.02.2014 in respect to petition No. 220/MP/2012 filed by POWERGRID have directed that CTU and SLDCs shall submit quarterly Protection Audit Report to the respective RPC latest by 15th day of the first month of next quarter and RPCs shall submit the report to the Commission latest by 15th day of the second month of next quarter. The Member Secretary of Regional Power Committees shall monitor the protection related issues and bring to the notice of the Commission any instance of non-compliance of the Regulation 1.5 of the Grid Code in respect of the protection related issues considered in the instant petition.
Maharashtra representative stated that they are taking up the protection audit in a phased manner and they have already identified the S/Ss to be taken up for protection audit. Further the compliances are mainly pending for protection audits carried out in the recent past.
Gujarat & MP representatives stated that they have also taken up identification of the S/Ss for protection audit and the same shall be intimated to PCM as soon as it is done.

5.1.2) Protection Audit of all critical S/Ss above 220kV level:

Protection audit of all the critical S/Ss above 220kV level has to be carried out.
Take up protection audit of newly commissioned S/Ss and S/Ss where protection audit has been carried out 5 years back.

(Discussed in 132nd PCM)

5.1.3) Protection audit of second - phase:

The status regarding the taking up the protection audit of second - phase was discussed and the update on the same is as follows;

PGCIL, GETCO & MPPTCL representatives informed they have already planned the activity to be done through independent agency. MSETCL representative informed that they are planning to carry out the protection audit through independent agency. NSPCL representative informed that they have already carried out PA of their S/S. NTPC & CSPTCL representative informed that they will inform the status shortly.

(Discussed in 133rd PCM)

5.1.4) Submission of Protection audit status to Hon'ble CERC :

Protection Audit Report for the second quarter of 2019-20 (July 19 to September 2019) was submitted to Hon'ble CERC.

SLDCs and CTU/WRLDC are requested to submit the data at the end of every quarter to WRPC, in compliance to the above CERC order dated 21.02.2014, so that the quarterly data submission can be made by WRPC to CERC.

The updated status of the protection audit observations in the 139th PCM is as given below

Year	State /utility	No of S/s Audited	Observations						Status FC/ PC/ NC
			Category A (Procurement not required)			Category B (Procurement required)			
			No of Deficiencies			No of Deficiencies			
			Observed	rectified	pending	Observed	rectified	pending	
2012-13	Gujarat	S/s Audited before 2012 - 121	3781	3781	**0**	**NA**			FC
		S/s Audited before 2012 - 13 are - 121	1191	1191	0	NA			FC
	MP	12	80	79	1	76	38	38	PC
	Maharashtra	122	114	114	0	53	53	0	FC
	Chhattisgarh	13	15	15	0	61	61	0	FC
	PGCIL (WR-I)	11	9	9	0	0	0	0	FC
	PGCIL (WR-II)	15	4	4	0	0	0	0	FC
	NTPC	4	8	8	0	5	5	0	FC
2013-14	Gujarat	11	611	611	0	NA			FC
	MP	25	83	83	0	42	14	28	PC
	Maharashtra	154	147	147	0	92	92	0	FC
	Chhattisgarh	5	18	12	6	21	6	15	PC
	PGCIL	NA	NA	NA	NA	NA	NA	NA	FC
2014-15	Gujarat	NA	NA	NA	NA	NA	NA	NA	FC
	MP	18	94	89	5	55	30	25	PC
	Maharashtra	107	210	210	0	93	93	0	FC
	Chhattisgarh	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
	PGCIL	NA	NA	NA	NA	NA	NA	NA	FC
2015-16	Gujarat	NA	NA	NA	NA	NA	NA	NA	FC
	MP	17	79	76	3	35	16	19	PC
	Maharashtra	120	251	248	3	225	223	4	PC
	Chhattisgarh	1	1	1	0	1	1	0	FC
	PGCIL (WR-I)	6	18	18	0	0	0	0	FC
	PGCIL (WR-II)	4	NA	NA	NA	NA	NA	NA	FC
2016-17	Gujarat	NA	NA	NA	NA	NA	NA	NA	FC
	MP								
	Maharashtra	106	204	198	6	6	2	9	PC
	Chhattisgarh	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
	PGCIL	NA	NA	NA	NA	NA	NA	NA	FC

The update on 5.1.2 & 5.1.3, informed in 139th PCM by the Utility representatives is as follow;

PGCIL-WR-I- TPPA of all the S/Ss (newly commissioned & second phase of existing S/Ss) has been carried out by CPRI recently, reports will be shared with

WRPC/WRLDC.
PGCIL-WR-II- TPPA of all the S/Ss (newly commissioned & second phase of existing S/Ss) has been carried out by CPRI recently, reports are awaited and will be shared with WRPC/WRLDC after receipt.
NTPC Vindhyachal- TPPA has been awarded to Siemens and WIP.
CSPTCL- Internal audit has been completed and TPPA proposal has been initiated.
GETCO- TPPA has been awarded to PRDA.
MSETCL-The plan has been submitted and is enclosed at **Annexure 5.**
MPPTCL- update not available, since no representation in the meeting.
NPCIL/RGPPL- Requested that the TPPA may be carried out through the empanelled auditors of WRPC.

MS WRPC stated that the TPPA, whether internal or outsourced, should be carried out strictly as per the Ramakrishna Task Force Report (RTFR). He further informed that non compliance of the Ist phase TPPA observations is a serious issue and should be complied immediately.
MSETCL representative informed that all the category-A observations ahave been complied. Some category-B observations are pertaining to issues other than protection system such as SCADA, System strengthening etc.

Committee suggested that the TPPA observations other than protection system should be removed from the list of TPPA observations, since they are of the nature of system improvement not pertaining to protection system. Further Committee requested all the constituents to update on the status on 5.1.2 & 5.1.3 and submit the third party compliance of Ist & IInd phase of TPPA for the quarter ending Dec.'19. The category –A & B observations for the Ist phase should be completed immediately. The formats for TPPA as per the guidelines of RTFR are available on WRPC web site.

5.2: Relay Setting Database:

5.2.1) Background:

Hon"ble CERC"s vide order dated 22.02.2014 in the matter of grid disturbance occurred on 30.07.2012 & 31.07.2012 in petition No. 167/Suo-Motu/2012, have made certain observations and issued directions.
According to this order, all the RPCs have to maintain the relay settings data of all the ISTS lines and lines emanating from interface S/Ss of Utilities to ISTS (400 kV& above and 220 kV interfacing lines). Therefore, all utilities were requested to submit relay setting data to WRPC/WRLDC.

5.2.3) Data formats and regular updation of the data :

The formats for relay settings were re-aligned as per the requirement of WRPC and the same was sent to all the constituents vide email dated 07.06.2019.
Constituents are requested to send and update the data, strictly in the formats circulated by WRPC vide the above email.
All the IPPs/ISGS and State generators are also required to submit the switchyard setting data in the above formats. The generating Unit setting data should be submitted by all these generators in the format enclosed as ***Annexure 5.2.3.***

5.2.5) 138th PCM Discussions:

MS WRPC informed that as per the Hon'ble commissions order the respective State

SLDCs/STUs and WRLDCs/CTU are required to maintain the data base and submit the same to WRPC.
Committee observed that data from State GENCOs, NTPC, IPPs have not been received. The SLDCs/STUs and WRLDC/CTU is requested to co ordinate and submit the same to WRPC.

5.2.6) 9th NPC & 39th WRPC discussions :

In the 9th NPC meeting the matter was discussed and as per Clause 10.12.3 of Ramakrishna Committee Report a copy of the database is maintained by CTU/STU and copy given to RPC. WPRC is working on creation of database which will be hosted at the website and the same is likely to be completed 3-4 months and will also be shared with other regions if they wish.
The issue was also discussed in the 39th TCC/WRPC meeting held on 17.12.2019 wherein it was decided that renovation of existing WRPC web site would be taken up the same was approved by WRPC. In line with Ramakrishna Committee recommendations it is proposed to have an online database. The database will have information of relays, protection schemes and utility wise logging.
Before award of the works to outside agency, it is required to frame the specifications, so that the database can serve the purpose envisaged in the Ramakrishna Committee Report.

The proposed requirement is as given below.

A. Remote Users :

(i) The Utilities of WR shall be able to upload the relay settings as download from the relays (raw settings) in the field from remote terminals (which can be done by allotting user login to the Utilities).
(ii) The Utilities of WR shall be able to upload the relevant line data, transformer data, generator data and any other data required to cross check the relay settings.
(iii) The Utilities of WR shall be able to upload the date of relay setting/revision if any, the person affecting the relay setting/revision and a brief reason in case of revision of settings.

B. At the server/administrator :

(iv) A brief nomenclature of the lines, S/Ss available in the latest PSSE case being used for PoC.
(v) The software shall be capable to draw single line diagram.
(vi) The software shall be capable to compare the calculated settings based on the parameters vis-à-vis the actual settings of the relay and give report on the variations.
(vii) The software shall be capable to compare the co-ordination of Z-3, OC/EF, LBB and any other back up relay settings (actual) of the elements with the parameters of the elements.

A team can be formed to discuss in detail on the above requirement so that a detailed implementable specifications can be framed.

5.2.7) 139th PCM discussions :

It was informed that the relay setting data submitted by utilities to WRPC was in excel format. These settings are transmitted from field through various offices of the utilities in case of States and therefore are prone to errors. Therefore the raw data extracted directly from numeric relays be submitted through the software. The software would extract the useful data from the raw file and store it into data base so that any manual entry error is avoided. In case of static & electromagnetic relays the data can be submitted in excel format. All the raw files received would be stored at WRPC and would not be made available to any other utility. The relevant data for relay setting co-ordination would be made available to concern utility through a user name pass word validation that would be provided after development of the software.

MS WRPC stated that a small group be formed to firm up the requirements.

Committee decided that local/Mumbai based utility representatives may participate in the Group. Shri Jagtap/More from MSETCL, Shri Girish Jawale TATA Power were nominated by MSETCL & TATA Power. WRLDC may nominate member for the group. If any other member willing to participate may inform the same immediately.

ITEM NO. 6: Task Force report

Report of the Task Force on Power System Analysis Under Contingencies:

Background:

Ministry of Power, GoI constituted a "Task Force on Power System Analysis under Contingencies", in December 2012 under the chairmanship of Shri V. Ramakrishna as per the recommendation made by Enquiry Committee headed by Chairman, CEA on grid disturbances that took place in NEW grid on 30th and 31st July 2012. The terms of reference of Task Force broadly cover analysis of the network behavior under normal conditions and contingencies, review of operational philosophy of protection relays, review of islanding schemes and technological options to improve the performance of the grid. The report of the Task Force was discussed briefly in 122nd PCM and subsequently discussed in detail in a special meeting held on 18.12.2014. Thereafter the recommendations were discussed in the previous PCMs. A brief on suggestions given by Ramakrishna Committee, discussions/observations of the group and PCM are as follows.

6.1) Formulation of Special groups for studies and protection coordination:

The Task Force recommended forming a group for studies, protection coordination and relay settings. It also recommended that each utility should establish a protection application department with adequate man power & skills. The members of protection team shall undergo regular training to enhance their skills.

6.2) Tuning of power electronic devices & PSS:

The Task Force recommended carrying out studies & reviewing the network at regular intervals (3-4 years) with introduction of newer power electronic devices.

The results may be implemented within next 3-4 years. It also suggested that as this requires specialized dynamic modeling, the task may be entrusted to reputed independent agency and implementation of tuning be entrusted to respective manufacturer.
A meeting was held on 03.01.2017 at WRPC Mumbai, wherein representatives of all the generating companies, SLDCs and expert from IIT-B attended the meeting. WRP Committee in the 33rd WRPC meeting held on 01.02.2017, agreed and gave approval for funding the studies software as above from WRPC fund for developing the software through IIT-B. GETCO, CSPTCL, PGCIL WR-I & II representatives informed that they would confirm their representation for the study group shortly.
The 1st meeting of the WR Study Group was held on 29.10.2018 at WRPC, wherein it was stressed that the updated network upto 31.09.2018 and the planned network and system data upto March-2019 be submitted to WRPC for taking up the Capacitor Studies.
Committee requested to submit the updated network upto 31.09.2018 and the planned network and system data upto March-2019 to WRPC for taking up the Capacitor Studies.

6.4) 137th PCM Discussions:

The contact details of the study group members have been received which is tabulated below.

Sl No.	Name	Organization	Contact Number	Mail ID
1	Shri. SSS Srinivas	NTPC Solapur	9422508195	ssssrinivas@ntpc.co.in
2	Shri Sachin Lomate	SLDC Maharashtra	9029800895	msldcre@gmail.com
3	Shri Vekhade	MSETCL testing	8554993473	Shivam_vekhande@rediffmail.com
4	Shri G. T. Jawale	TPC	9223311419	gtjawale@tatapower.com
5	Shri Sandeep	APL		
6	Shri Sonu W. Korekar	Reliance	9324216663	sonu.korekar@relianceada.com
7	Smt.Pushpa Sheshadri	WRLDC	9869404482	pushpa@posoco.in
8	Shri. Pradeep Sachan	SLDC MPPTCL	9425805277	p.sachan@mptransco.nic.in
9	Shri. Kuleshwar Sahu	Power Grid Corporation of India Ltd -WR-I	6260169298	kuleshwar@powergridindia.com
10	Shri Sanjoy Das	Power Grid Corporation of India Ltd - WR-2	9429976244	sanjoydas@powergridindia.com

6.5) 139th PCM Discussions:

WRPC Secretariat informed that once the updated network data is available short circuit studies can be carried out and fault levels at various nodes can be determined. Dynamic data is required to be collected and updated so that the advances studies can be taken up. WRLDC was requested to co ordinate in this matter and submit the data to WRPC. The TTC/ATC calculations are done by WRLDC for the forthcoming quarters and the peak & off peak data considered for

this purpose may be submitted by WRLDC regularly. In the past WRLDC had submitted a peak case data for 2018 and a sample capacitor requirement study was carried out by co relating the short circuit MVAs, instead of traditional trial and error placement of capacitors at low voltage buses, iteratively. The method was found to be efficient and optimal. The results would be circulated along with the agenda for the Study Group meeting. Such studies can also be taken up for reactor requirement. Also studies for reactive power management by opening transmission lines for controlling HV in systems for real time operation needs can be done, once the updated data with off peak base case is made available. Short circuit studies, for relay co-ordination considering the in feed effects, can also be done once the peak case with updated X_d' & X_d'' is made available. On receipt of relevant data the studies can be undertaken and the results would be circulated among the members of the WR Study Group.

The PSS tuning status received from WRLDC is enclosed at Annexure-6.

It was decided that the nominations from STUs shall also be obtained since most of the studies are of planning in nature.

ITEM NO.7: Violation of CEA Protection (Grid) Standards-(NPC item):

7.1.1) CEA vide letter dated 30.08.2017, have intimated that following protection standards were reportedly violated in respect of following cases;

(1) Non-availability of A/R at both ends of 220kV lines

(2) Non-submission of DR/EL data to RLDC within 24 hours of the event.

(3) Non-intimation of main reason for the events after its complete analysis.

(4) Higher fault clearance time than prescribed in the standards.

CEA has further directed that if the non-compliance of Grid/Standards/ Grid Code continues, the matter may be reported to CERC under provisions of the Grid Code, with a copy of the report to CEA. Committee (131 to 136th PCM) requested all the utilities of WR to strictly follow the CEA's protection standard in future in order to ensure safe grid operation. A report of WRLDC on the above subject covering details from September 19 to November 19 is enclosed at **Annexure 7.**
All the constituents are requested to submit the compliance report on the report of WRLDC indicating violation of CEA Protection (Grid) Standard in case of tripping of inter-regional lines of voltage class 220 kV and above level of WR

7.2.1) Non-Auto recloser operation at RGPPL end (WRLDC item):

It is observed from the events in May '19 and June '19 that the A/R at RGPPL end did not operate and the lines tripped on transient faults. In all the events, A/R was attempted and successful at remote end only and in each event the line was holding.
The events are mentioned in the table below

Element name	Out date	out time	in date	in time	comments
400 kV RGPPL-New Koyna 2	21-05-19	02:41	21-05-19	03:16	Line tripped from Dabhol end only due to Y phase fault. A/R successful at New Koyna end.
400 kV RGPPL-New Koyna 2	22-05-19	01:10	22-05-19	10:35	Line tripped from Dabhol end only due to R phase fault.
400 kV RGPPL-Nagothane 1	26-05-19	02:47	26-05-19	03:22	Tripped at Dabhol only; Y phase fault; A/R successful at Nagothane

400 kV RGPPL-New Koyna 1	29-05-19	23:52	30-05-19	00:32	B Phase fault, A/R successful at New Koyna end. Line tripped at Dabhol end only.
400 kV RGPPL-Nagothane 2	30-05-19	03:08	30-05-19	09:44	Line tripped from Dabhol end only. A/R successful at Nagothane end.
400 kV RGPPL-New Koyna 1	03-06-19	06:23	03-06-19	06:56	Y phase fault, A/R successful at New Koyna tripped at Dabhol end only

RGPPL may kindly update the status of A/R of 400kV transmission lines at their end.

7.2.3) 138th PCM Discussions:

RGPPL representative informed that REL 511 relays having A/R facility are installed at RGPPL end, but they have not been enabled because of not having the voltage synchronization function. New relays having voltage synchronizing functions are required to be installed. Further it was informed that the yard is maintained by RGPPL and the Panels & Relays are maintained by MSETCL.
Committee requested RGPPL/MSETCL to resolve the issue mutually and commission the A/R at the earliest.

7.2.4) 139th PCM Discussions:

Following options were discussed in the meeting;

A) MSETCL representative informed that the synchronization signal from separate synchronization facility available at RGPPL can be obtained during the A/R attempt. MSETCL & RGPPL would explore implementation of the same in the A/R logic. This would be over and above the condition of checking the successful A/R attempt at the remote end by ascertaining voltage built up at RGGPL end for the faulted phase.

B) The matter of requirement of voltage synchronization function for A/R was discussed in detail. From the discussions following observations were made;
   - The A/R functions enabled are for Single pole A/R and not for 3 phase A/R.
   - Since RGPPL is connected to more than one S/S of the rest of the system (i.e. it is connected to New Koyna & Nagothane S/Ss) and it is very rare that RGPPL is connected to the system with single line (i.e. either New Koyna or Nagothane) and A/R is to be attempted in such condition.
   - In case of even single line connection to the rest of the system, other two phases of the line is already in synchronism with the system in case of an A/R attempt.

     RGPPL representative informed that in case of a 1-ph A/R, though there is no need of phase sequence and slip verification, however it has been observed that there is a substantial power angle difference between the RGGPL & adjacent bus as has been observed on some occasions.

Committee felt that voltage synchronization function in the A/R in case of a 1-phase A/R may not be required. RGPPL may implement logic for voltage built up check at RGPPL to ascertain a successful A/R at remote end. The large angular separation may be during the low generation at RGPPL which may be a rare condition.

7.3) Status of Auto recloser of 220 kV Malanpur-Auraiya and 220 kV Mehgaon-Auraiya (WRLDC item)

Due to the non-availability of phase segregated LBB relay at Auraiya end, A/R of Malanpur and Mehgaon lines were kept off at Auraiya and MPPTCL ends from September 2016.

As per letter dated 26.03.19 from MPPTCL to NTPC Auraiya, MPPTCL has made request to Auraiya authority to procure the LBB relay as per their requirement and the cost in this regard shall be paid by MPPTCL. As per mail dated 08-04-2019, MPPTCL informed that 'Auraiya has procured the LBB relay and the same is being commissioned shortly'.

MOM of the meeting between MPPTCL and Auraiya regarding this issue and letter given by MPPTCL to NTPC Auraiya are enclosed as **Annexure-7.3.**

In the 137th PCM it was decided that NTPC & MPPTCL would resolve the issue mutually.

In the 138th PCM NTPC representative informed that by Dec-19 end or 1st week of Jan-20 the relay will be installed.

139th PCM Discussions:

NTPC representative informed that the relay has been procured and will be commissioned in Feb 2020.

Committee noted.

ITEM NO. 8: Details of Protection Audit and Implemented Defense Mechanism –Reg (NPC Item).

8.1) National Power Committee Division (NPC) / CEA vide letter dated 10.09.2018 informed that a meeting was taken by Hon'ble MoSP (IC) on 20.08.2018 to discuss the draft National Electricity Plan. During the discussions CEA has been asked to prepare report and presentations covering aspects of grid reliability and security, especially with respect to grid failure and remedial measures including mechanisms such as is-landing schemes,SPS,UFR,Third Part Protection Audit etc. NPC/CEA vide letter dated 10.09.2018 requested WRPC**,** the details in prescribed formats on the following may please be furnished

i. Protection Audit Carried out so far and its observations
ii. Islanding scheme implemented in the region.
iii. SPS implemented in the region.
iv. Status of implementation of AUFLS in the region .
v. Status of implementation of df/dt relays & its settings in the region.

WRPC vide mail dated 12.10.2018 and dated 26.10.2018 requested MSETCL, MPPTCL,CSPTCL, GETCO, Goa Electricity Department (GED), DD, PGCIL, NTPC and DNH to furnish the information sought by NPC vide letter dated 10.09.2018 to WRPC at the earliest. However, information was not received from constituents except WRLDC and MSETCL.

The details sought by NPC have been received from WRLDC, MSETCL and PGCIL. In the 138th PCM Committee requested MPPTCL, CSPTCL, GETCO, GED,DD,DNH & NTPC to submit the data immediately.

MPPTCL, CSPTCL, GETCO, GED,DD,DNH & NTPC may please submit the data before the PCM.

139th PCM Discussions:

Committee requested MPPTCL, CSPTCL, GETCO, GED,DD,DNH & NTPC to submit the data immediately.

ITEM NO. 9: Enquiry Committee recommendations-(NPC Item).

9.1)NPC, CEA vide letter no 7/GSC/NPC/CEA/2019/87-93 dated 16.01.2019 requested to submit the updated status of implementation of Enquiry Committee recommendations. All the constituents are requested to update information and submit the updated information (**in excel format**) to WRPC **(annexure 9.1)**, so that the same can be furnished to NPC, CEA. WRPC, vide mail dated 25.01.2019 (prc-wrpc@nic.in) requested the constituents to submit the updated status of implementation of Enquiry Committee recommendations at the earliest to WRPC.

In the 135th, 136th, 137th & 138th PCMs the Committee requested Chattisgarh, Goa, DD & DNH to submit the data. However the same has not been received so far.

139th PCM Discussions:

Committee requested Chattisgarh, Goa, DD & DNH to submit the data immediately.

ITEM NO. 10:- Recommendations of M/s PLI. Canada-NPC Item.

10.1.) Ministry of Power, Government of India constituted a "Taskforce on Power System Analysis under Contingencies" in December 2012 as a follow-up of the recommendations of Enquiry Committee under Chairperson, Central Electricity Authority (CEA) on Grid Disturbances of 2012 in Indian Grid.
The Taskforce broadly made recommendations regarding analysis of the network behavior under normal as well as contingency scenarios, review of the philosophy of operation of protection relays, review of islanding schemes, review of tuning of power electronic controlled devices, review of relay coordination and technological options to improve the performance of the grid. The Taskforce further recommended the appointment of consultants for the above.
To fulfill part of the above recommendations, Powertech Labs, Inc. (PLI) was contracted to perform the following tasks:

Task I:	Examination and recommendation of methodology for optimum calculation of transfer capability in the planning and the operational horizons.
Task II:	Calculation of transfer capability for the entire country.
Task III:	Guidelines for developing and implementing system protection schemes and islanding schemes, and review of existing schemes.
Task IV:	Operational planning and long term planning for the secure and efficient operation of the grid.
Task V:	Suitable suggestions in the Regulatory framework to ensure secure and efficient grid operation.

Task VI:	Review of the tuning of all power electronic devices and suggesting retuning of setting of these devices, as per "Taskforce Report on Power System Analysis".

A meeting of officials from CEA,CERC,CTU and NLDC was held on 22.03.2019 in the O/o Chief Engineer (NPC) for finalization of action plan of all the recommendations in the report of the Tasks I to VI of the M/s Powertech Labs Inc. Canada under Package B (Review Transmission System Transfer Capability and Review of Operational and Long Term Planning). During the meeting action plan of the recommendations of Tasks were finalized.
NPC vide letter dated 15.05.2019 forwarded the finalized action plan of the recommendations of Tasks and the same is enclosed as **Annexure 10.1**.
The recommendations that are required to be implemented by RPCs has been highlighted by adding extra columns in the recommendation sheets of PLI and is enclosed at **Annexure 10.2.**

In the 138th PCM, WRLDC representative informed that they would look into it.

139th PCM Discussions:

Committee suggested that it being a studies requirement involving STUs, SLDCs & WRLDC, the above issues be discussed in the Study Committee by involving STUs in the Study Committee of WR.

ITEM NO. 11: Certificate for Healthiness of Batteries

11.1) Background:

As per the MoP direction given in pursuant to recommendations of the Enquiry Committee (NEW grid disturbance on 30th & 31st July, 2012), RPCs are required to obtain from their respective Constituents the monthly certificate for healthiness of batteries, installed at 220 KV and above voltage level Substations (for power supply to Relays, RTUs and PLCC equipment) and furnish the same to CEA/MoP.
With reference to above, the Constituents are requested to submit the certificate on healthiness of batteries on monthly basis (i.e. status for a month shall be sent by the 7th day of the following month) to WRPC Secretariat.
The certificates have been received from KSK Mahanadi, TRN Energy, GSECL/GETCO, MSETCL, TATA Power, Essar Power, Rinfra, NCA, SKS, CGPL, PGCIL WR#2, LANCO, Jaypee Nigrie, NSPCL, GSEL, MCCPL.
In the 138th PCM, Constituents other than above were requested to submit the certificates on regular basis.

139th PCM Discussions:

Committee noted the above and requested all the remaining utilities to submit the data.

ITEM NO. 12: Third-Party Protection Audit Teams (TPPAT).

12.1) The issue of "Formation of Third-Party Protection Audit Teams(TPPAT) for carrying out third party protection audit in WR" was discussed in the 37th WRPC meeting held on 18.12.2018 and it was agreed to form protection audit teams in WR for carrying out the protection audit of S/Ss in WR and it was agreed to form protection audit teams in WR for carrying out the protection audit of S/Ss in WR

as tabulated in **Annexure 12**.

12.2) In the 138th PCM, follow up on the matter was taken up and Members from utilities participating in the protection audit teams raised queries on number of days the engineers are required to be spared, expenses towards travel and stay for the protection audit and how many S/Ss are required by each team. MS WRPC proposed that auditors should be empanelled, and chosen from engineers in the utility. Teams could be formed by choosing experienced retired testing engineers also who shall be compensated by appropriate compensation.

Committee discussed the above suggestions and proposed the following;

(i) Audit shall be done strictly adhering to Ramakrishna Committee recommendations.

(ii) Engineers from utility who are having at least 8 years experience in testing can be nominated for auditors.

(iii) Audit to be done by a panel consisting a team of 3 engineers, with at least one in-service engineer.

(iv) All details of such panel members shall be made available to WRPC.

(v) **Auditing is proposed to be facilitated through WRPC web-portal**.

(vi) Auditors shall submit report to utility and WRPC in the prescribed Performa within 15 days of completion of audit.

(vii) Audit shall be completed as per following time lines;
   a) For S/S having 10 or less than 10 bays audit period is 2days.
   b) For S/S having 10 or more than 10 bays audit period is 3 to 4 days.

(viii) Retired empanelled audit engineers be paid a honorarium of Rs. 5,000/- per day by the utility whose protection audit is to be carried out.

(ix) In-service testing engineers be paid a honorarium of Rs 5,000/- per day by the utility whose protection audit is to be carried out.

(x) Travelling and stay expenses of the team members will be borne by the Utility whose protection audit is to be carried out.

(xi) Utility whose protection audit is to be carried out shall pay an additional fee of amount Rs 30,000/- per audit, to the Utility whose in-service engineers have been utilized for the protection audit.

(xii) The above proposal could be put up in the WRPC meeting for its approval and further decision.

12.3) In the 39th WRPC meeting following was decided:

(a) The TPPA can also be got done through other agencies/auditors. However it should be done strictly as per the Ramakrishna Task Force recommendations and the proof/report of the same shall be made available to WRPC.

(b) The TPPA shall be carried out through empanelled retired testing engineers who are trained and have worked in the field of SLDcs and regulatory sector, including the in-service engineers.

(c) The State agencies shall float Expression of Interest (EoI) for empanelment of retired engineers.

(d) A web portal would be developed by WRPC through which the information regarding the empanelled retired testing engineers would be available and utilities would be able to place their reuest through this portal. Till the web portal is developed utilities can continue the existing practice.

(e) Charging of 30,000/- at (xi) of the 138th PCM recommendations be removed. Utilities can directly pay honorarium to the engaged engineers as given at (ix) recommendation of PCM.

139th PCM Discussions:

The above agenda position and decision of 39th WRPC was briefly informed.
It was requested that the EoI fro empanelment of retired and in service engineers of WR utilities be obtained by all the Utilities and the details of the empanelled auditors such as name, organization served/in-service, designation (present-if in service or at the time of retirement) nature of experience (field of work), no of years of experience and contact details (mobile number & email ID) may be submitted to WRPC.
Committee requested all the utilities to expedite the above and initiate the process immediately. The data may please be submitted within a month.

ITEM NO. 13:- Mock Testing of Local and Wide area System Protection Schemes (SPS) in Western Region

Background:

The details of local SPS are as follows: -

1. CGPL SPS
2. Sasan SPS
3. JPL Stage 1 & 2 SPS
4. Essar Mahan SPS
5. Sipat SPS
6. 220 kV Vapi-Kharadpada
7. APL Mundra SPS
8. APL Tiroda SPS
9. Mouda SPS
10. High Frequency SPS (tripping of Korba Unit 7 , Vindhyachal Unit 7, CGPL Unit 40)

Details of Inter-regional SPS Schemes (Wide Area) are as follows:

11. Agra-Gwalior SPS at Gwalior end.
12. HVDC Mundra Mohindergarh SPS

- In the 129th PCM it was decided that mock testing of the local SPS can be done without much coordination and therefore WRLDC may prepare a schedule for mock testing of local SPS and carry out the mock testing as per the schedule in coordination with the generators concerned. The Wide Area SPS requires coordination among the inter region, therefore these shall be scheduled in consultation with the NLDC and respective RLDCs.
- It was decided that wherever the SPS has operated successfully in the recent past, it would not be required to carry out the mock testing of SPS.

Updates:

1. The updated status of recent successful operation of SPS received from WRLDC is enclosed at **Annexure-13.1 (A).**
2. Schedule of mock testing of SPS along with SPS operations (2016-19) as received from WRLDC is enclosed at **Annexure-13.1 (B).**

13.2) Revision of SPS implemented at JPL:

The SPS for safe evacuation of generation at JPL was implement in Sept 2011 and later on reviewed in April 2015. It was formulated for N-1-1 stability of JPL Stage-I (4X250 MW+2X135 MW) and JPL Stage-II(4X600 MW) TPS.
The implemented scheme is as follows:
If Generation at JPL Stage-I (4 * 250), JPL Stage-II (2X600 MW) & DCPP (2 * 135 MW) in service, Net Generation 2180 MW.

1. One circuit of 400 kV JPL-Raipur line and 400 kV JPL Stage-I to JPL Stage-II inter connector or One of the line is out of service and other circuit trips:
   Ex Bus Generation at JPL Stage-1 to be brought to 590 MW (Trip one unit of 250 MW & 2-Unit of 135 MW along with 60 MW of Generation reduction in 3-4 Minutes.)
2. Tripping of 765 kV Tamnar-Kotra D/c lines or One circuit on outage and other line trips: a. Trip one unit of 600 MW and immediate backing down other unit such that Ex Bus generation of JPL Stage-I + JPL Stage-II should not exceed 1160 MW.

WRLDC vide email have informed that M/S JPL has requested for revision of SPS after commissioning of 765 kV Tamnar-Kotra-D/C lines. TRN Energy (2X300 MW) is connected to 400 kV Tamnar PS and is evacuating through 765 kV Tamnar-Kotra-D/C lines. Therefore, in case of N-1-1 contingency i.e., tripping of 765 kV Tamnar-Kotra-D/C lines, TRN Energy also has to be included in SPS along with JPL.

In the 137th PCM, Committee observed that since the representatives of TRN & Jindal power are not present in the meeting, it would be discussed in special meeting/next PCM
In the 138th PCM, Committee decided that WRLDC will carry out studies and the same can be put up in the PCM.

139th PCM Discussions:

WRLDC briefly explained the studies carried out by them. The revised generation backing down quantum's by the generators are as given below;

Committee noted the above and felt that WRPC would inform the generation backing down quantum for implementation to M/s TRN.

ITEM NO. 14:- WRLDC Tripping report portal

14.1) Indian Electricity Grid Code (IEGC),2010 part 5, operating code, clause 5.2 (r) stipulated the timeline for submission of grid incident reports to WRLDC and WRPC which is as follows:

"All the users, STU/SLDC and CTU shall send information/data including disturbance recorded/sequential event recorder output to RLDC within (24 hours) for the purpose of analysis of any grid disturbance/event. No user, SLDC/STU or CTU shall block any data/information required by the RLDC and RPC for maintaining reliability and security of the grid and for analysis of the event."
CEA (Grid standards) regulations, 2010 clause 15. (3) Stipulated the timeline for submission of grid incident reports to WRLDC and WRPC which is as follows:
"All operational data, including disturbance recorder and event logger reports, for analysing the grid incidents and grid disturbance and any other data which in its view can be of help for analysing grid incident or grid disturbance shall be furnished

by all the Entities within twenty four hours to the Regional Load Despatch Centre and concerned Regional Power Committee."

WRLDC tripping portal was operationalized from 01-06-2019 for uploading FIR, DR/EL and other details related to the tripping.

User IDs and password were issued to utilities to upload the tripping details in the following link.

http://103.7.130.115/Trippingnew//Account/Login.aspx

As per IEGC 54.2(r), utilities need to submit the data within 24 hours of the event.

In the 137th PCM, all Utilities are requested to use the WRLDC tripping portal and submit the data through the same. However, it is found that utilities are not uploading the data on the above link.

In the 138th PCM, Committee observed that the utilities are not up loading the data on the WRLDC portal and requested all the Utilities to upload the data on the above link.

139th PCM Discussions:

WRLDC representative informed that MPPTCL is not uploading the data on the above portal.

Committee noted that MPPTCL representative was not present for the meeting and WRLDC/WRPC would take up the issue separately with MPPTCL .

ITEM NO. 15) Review of protection settings in Goa system and requirement of Protection audit:

WRLDC vide letter dated 04.10.2019 (enclosed at **Annexure 15**) have informed that the following grid events occurred in Goa system from June-Aug'19.

1. Grid disturbance on 13th June'19 causing load loss of 67MW and blackout in Xeldem s/s.
2. Grid disturbance on 29th July'19 causing load loss of 200MW and blackout in Xeldem s/s.
3. Grid incidence on 13th Aug'19 causing 110MW of load loss.
4. Grid incidence on 15th Aug'19 tripping many elements in Goa system.

Due to non-operation/incorrect operation of protection system, the security of Goa system was affected frequently causing blackout and load interruptions, which requires immediate remedial action. It is observed that Goa has not submitted any DR /EL and detailed report for any of the tripping/events. It is reported from site that there is no facility to download DR/EL in substations which is a major non-compliance of the IEGC and CEA grid standard regulations.

WRLDC letter to Chief Engineer Goa via letter dated 01/10/2019 mentioning the protection related issues, urgent need to review the settings and requirement of third-party Protection Audit of Goa substations is enclosed in Annex-I

139th PCM Discussions:

MSETCL representative informed that there are relay setting issues with the Mahalaxmi-Amona line and the settings are required to be modified, the same was informed to GED representative in the 2nd Maharashtra SGRC meeting but GED is not responding.

WRPC secretariat stated that if GED is not responding, MSETCL may take a lead and help GED in implementing the revised setting.

Committee noted that GED representative is not present and agreed to above

ITEM No. 16) Non-operation of A/r at 400kV Vindhyachal Power Station:

WRLDC vide letter dated 04.10.2019 (enclosed at **Annexure 16**) have informed that for single phase fault on transmission lines connected to 400kV Vindhyachal s/s, it was observed that A/r has not operated successfully at Vindhyachal end where as it was successful at remote ends. NTPC Vindhyachal may explain the reason for non-operation of A/r at Vindhyachal end for the following trippings:

a) 400kV Vindhyachal -Satna-3 tripped on Y-phase fault on 24-07-19 @ 00:39:48Hrs. A/r was successful at Satna end but not at Vindhyachal end. The line was restored at 01:09Hrs
b) 400kV Vindhyachal -Satna-2 tripped on Y-phase fault on 2-09-19 @ 14:43:48Hrs. A/r successful at Satna end but not at Vindhyachal end. The line was restored at 15:33Hrs.
c) 400kV Vindhyachal -Jabalpur-1 tripped on B-phase fault @ 16:42:51Hrs. A/r successful at Jabalpur end but not at Vindhyachal end. The line was restored at 17:28Hrs.

In the 138th PCM, NTPC representative informed he would update on the above.

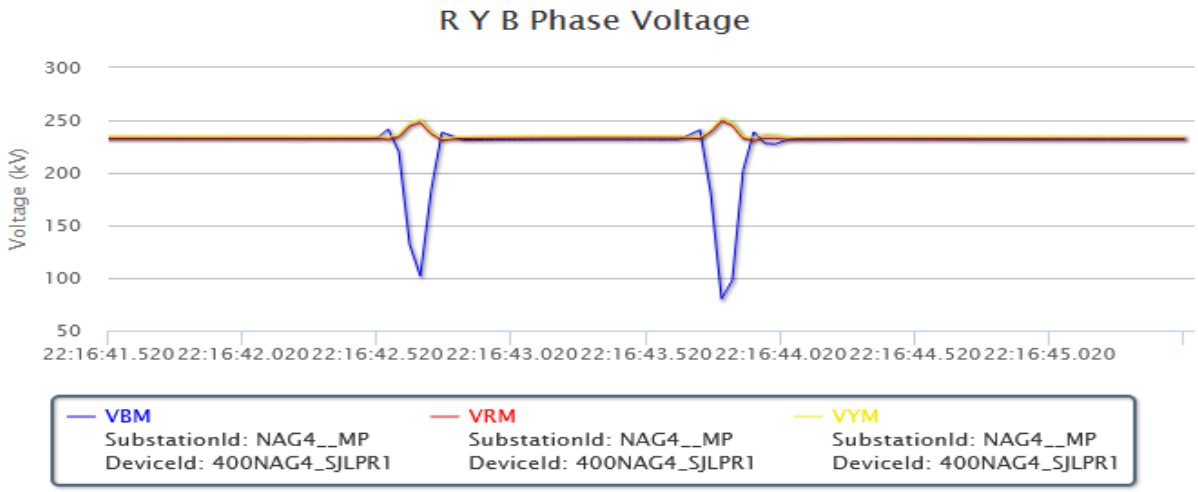
139th PCM Discussions:

NTPC representative as regards to a) above informed that the A/R was checked and is working satisfactorily. As regards to point b) the line was 400kV Vindhyachal -Satna-4 and recent trippings has shown that the A/R has been successful. There was wiring issue for point c) and the same has been attended **.**

Committee noted

ITEM NO. 17) Zone 2 tripping of 400 kV Badnawar-Nagda 1&2 on 12 th November 2019 at 22:16 Hrs:

400 kV Badnawar-Nagda 1&2 tripped on Zone 2 protection operation at Badnawar end during the fault on 400 kV Nagda-Dehgam 1 (B-phase LA blast at Nagda end) on 12-11-2019 at 22:16 Hrs. As the fault was cleared immediately within 80 ms, Zone 2 tripping from Badnawar end was undesirable. The Voltage plot from Nagda (MP) PMU is given below.



MPPTCL may kindly clarify the reason for the tripping of 400 kV Badnawar-Nagda D/C.

139th PCM Discussions:

Committee observed that since MPPTCL representative is not present for the meeting the issue may be taken up in next PCM.

ITEM NO. 18) Standardization in Configuration of Disturbance recording equipment.

DR and EL are the predominant data for analyzing a grid event. WRLDC is analysing grid events with the help of SCADA & PMU data in addition to the DR and EL submitted by the utilities.

The following were the observations in DR while analyzing past events,

1. Channels not configured properly
2. Sampling frequency not selected properly
3. Length of recording is very less
4. Time synchronization issues

Standardization of the DR/EL across all utilities will help in capturing and understanding of the event properly.

For Disturbance Recorder following points may be standardized:

- Record Length
- Triggers
- Sampling Rates
- Digital and Analog channels

The same was deliberated in 79th PCC at ERPC and the recommendations for configuration are enclosed as **annexure 18**.

139th PCM Discussions:

WRPC secretariat informed that the configuration as regards to triggering of DRs has long (2006) been decided. Further as long as analog triggering is concerned an auto DR download facility is required at the S/Ss or else the DRs of the useful events will be lost due to many events getting recorded.

A standard configuration followed in PGCIL/MSETCL/GETCO in line with WR PCM decisions is enclosed at **Annexure18.**

Committee noted the above and it was decided the final standard configuration of DRs be decided in the next PCM.

ITEM NO. 19: Frequent operation of Neutral Displacement Relay (NDR) provided on the tertiary winding of the ICTs (Any Other Item)

MSETCL vide email have informed that they are facing lot of issues due to frequent operation of Neutral Displacement Relay (NDR) provided on the tertiary winding of the ICTs, in their system.
MSETCL have informed the following and requested Commiittee to deliberate on the same;

Presently in our system, for numbers of 220/132KV, 220/110 KV, 220/100 KV ICT's tertiary winding comes out as "Open Delta". We short it outside (externally) and connect it to earth from one point through solidly grounded system. Such connection does not affect the system from 220KV or 132 KV, 110 KV, 100 KV side and we are not considering this situation as fault.

Basically NDR operation is based on creation of 'open delta voltage' due to by passing of one of PT. In rainy season due to tracking or O/P voltage problem of PT or secondary cables problem i.e. created voltage disturbance on tertiary side. It may also happen due to phase to earth LA failure.

In our system NDR is provided on 400 KV & above voltage level ICTs. To detect tertiary side Earth faults. Tertiary winding is being connected in closed delta, one phase i.e. one point of close delta grounding does not affect the system of 400 KV or 220 KV side of ICT (i.e. Power Circuit).

In rainy season (first rain) same thing happens in case of 400 kV ICTs. This is due to by passing of one of the PTs provided on tertiary side due to tracking or O/P voltage problem or due to PT neutral earthing or secondary side cable problems, voltage operated NDR operates due to creations of open delta voltage. This will also happen when one of the LAs provided between phase- earth becomes defective or PT neutral grounding problem. But 400 KV & 220 KV system will not get affected i.e. there is no current disturbance or voltage disturbance on 400 KV & 220 KV Side.

But when two LAs or two PTs between phases to earth simultaneously becomes defective or LA provided across the tertiary winding becomes defective, then it creates a power disturbance / fault on tertiary side and it will definitely reflected on 400 KV & 220 KV side. This fault will be cleared by differential relay operation instantaneously and not cleared by NDR relay having time delay 4.5 sec with 30 volt setting.
NDR setting adopted recently are-
Open delta Voltage – 12.5 V, 1 sec. delay – Alarm
30 V, 4.5 sec. delay – Trip
If we consider the NDR operation as fault and adopting setting as above with intentional time delay of 4.5 seconds for tripping, we have to review our protection philosophy to save our valuable assets such as ICTs.
Hence NDR operation should be kept 'ON' for Alarm mode only. But if alarm persists, we have to confirm the healthiness of tertiary circuit elements i.e. PTs, LAs, PT secondary circuit etc.

139th PCM Discussions:
Members deliberated on the issues faced.
PGCIL informed that tertiary winding in their system is loaded to feed the auxiliary

power requirement of the substation. The NDR in their system is kept in alarm mode only.

GETCO representative informed that they have stopped ordering ICTs with tertiary winding. Whenever there is tertiary winding the NDR provided is kept in alarm and trip mode.

It was informed that the NDR is provided on the open delta formation of PT secondary of the tertiary winding of the ICT. The NDR is provided to detect the voltage imbalance, since this the available principle to detect the earth faults in delta and ungrounded star systems. The voltage imbalance is an indication of earth fault in the delta side. These type of faults do not reflect in the primary side and therefore can not be detected by differential protection. However in case of tracking in the rainy season and leakage in the PT secondary side the imbalance voltage appears across PT secondary. The tertiary winding is closest to the core and any undetected fault in the tertiary winding, fed for a prolonged period, may damage the ICT. Though the tertiary winding is a lowest voltage winding and less prone to fault, it would not be appropriate to keep the tertiary winding unprotected. However the sensitivity of the NDR trip can be increased/decreased by taking into account the seasons (i.e the trip open delta voltage may be increased in rainy season). However this may lead to loss of sensitivity of the NDR protection.

It would be a good idea if the ground/body clearance of the delta point of the tertiary winding brought outside the tank/body be increased. The insulation level of the bushing of the delta point brought out can be one level higher than the nominal voltage of the tertiary winding (i.e. if the tertiary winding nominal voltage is 22kV, the insulation of the bushing of tertiary delta be kept at 33kV). By providing adequate insulation the leakage problems can be addressed. Also regular checking/testing of PT will bring out the normal imbalances due to PT ageing and these can be taken care in adopting the settings of NDR.

Therefore in general it was felt that the insulation of the tertiary bushing be enhanced to avoid un wanted trippings of ICTs.

ITEM NO. 20: Date and venue of the next meeting

It was decided that the next PCM (140th PCM) would be held in the month of March 2020 (last week) or April 2020 first week.