

EASTERN REGIONAL POWER COMMITTEE

MINUTES OF 26th PROTECTION SUB-COMMITTEE MEETING HELD AT ERPC, KOLKATA ON 22.12.2014 (MONDAY) AT 11:00 HOURS

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

Member Secretary (I/C), ERPC chaired the meeting and welcomed the participants. He informed that a web based protection system database is approved in a special meeting held at ERPC, Kolkata on 17th December, 2014 for further referral to TCC/ERPC.

Thereafter, he requested SE (PS), ERPC to take up the agenda points in seriatim.

PART – A

ITEM NO. A.1: Confirmation of minutes of 25th Protection sub-Committee Meeting held on 24th November, 2014 at ERPC, Kolkata.

The minutes of 25th Protection Sub-Committee meeting held on 24.11.14 circulated vide letter dated 11.12.14.

No comments have been received from any constituent.

The minutes of the above meetings may be confirmed.

Deliberation in the meeting

Members confirmed the minutes of 25th PCC meeting.

PART – B

ANALYSIS & DISCUSSION ON GRID INCIDENCES WHICH OCCURRED IN CTU/STU SYSTEMS DURING NOVEMBER, 2014.

(The detailed report was highlighted by ERLDC/respective constituents)

ITEM NO. B.1: Disturbance in FSTPP, NTPC and JSEB system on 06.11.2014

At 17:28hrs, due to malfunctioning of BFR element i.r.to main CB of 400kV FSTPP-KhSTPS-II at Farakka S/s, following lines tripped.

- 220kV Farakka-Lalmatia (Tripped from Farakka end)
- 400kV Farakka-Malda-II (Tripped from both ends)
- 400kV Farakka-Kahalgaon-III (Tripped from Kahalgaon end)
- 132kV Kahalgaon (NTPC)-Lalmatia (Tripped from Kahalgaon end)

As a result 220KV Lalmatia S/s became dead.

Analysis of events:

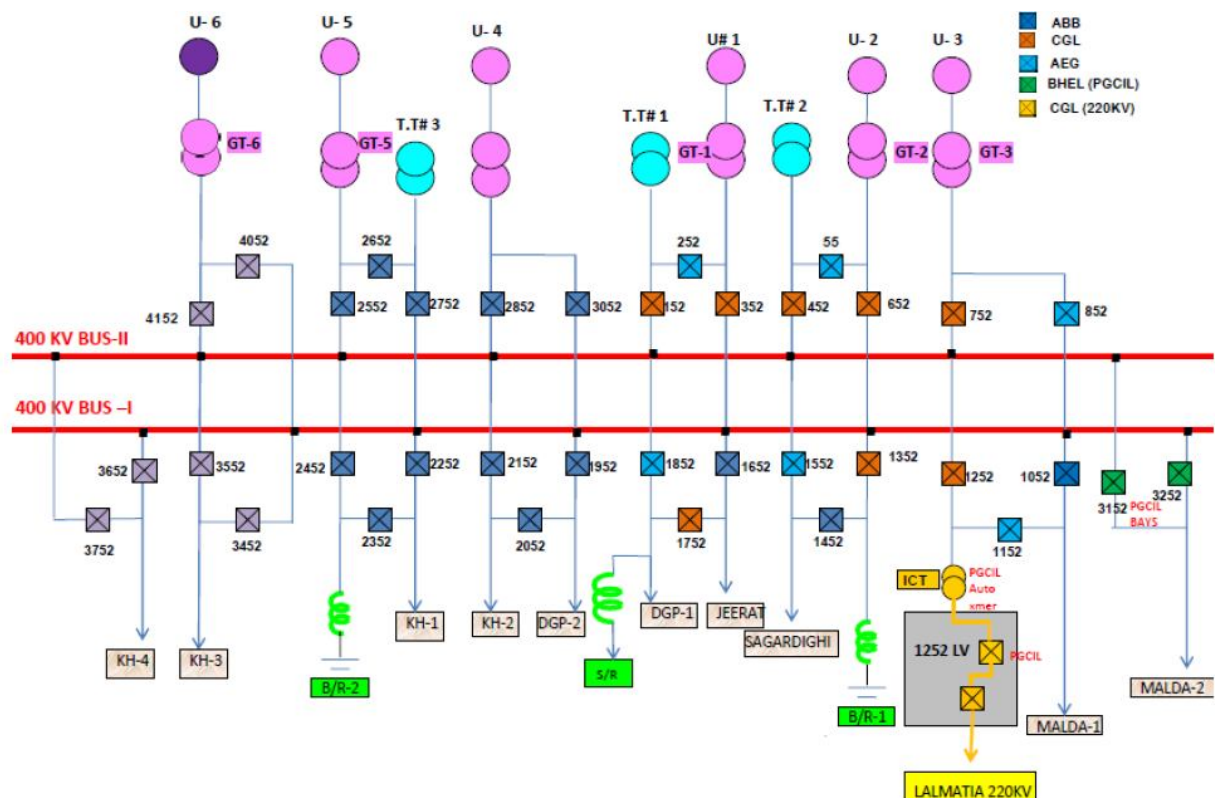
It appears that sequence of events were initiated due to malfunctioning of BFR element for the main breaker of 400kV Farakka-Kahalgaon-II at Farakka which was under shutdown and connected to Bus-II at Farakka S/s. Due to actuation of BFR, all the main breakers connected to 400kV Bus-II at Farakka S/s tripped. As the tie breaker of 400/220kV ICT and 400kV Farakka-Malda-I had already been kept out of service prior to the tripping due to breaker replacement work,

the 400/220kV ICT connected to Bus-II also tripped. With the tripping of above ICT the entire loads comprising of Lalmatia, Dumka became radial on Kahalgaon (NTPC) and consequently 132kV Kahalgaon (NTPC)-Lalmatia tripped on O/C leading to total power failure at Lalmatia with the 220kV bus becoming dead.

In the absence of main CB, 400kV FSTPS-Malda-II which was connected to Main Bus-II through tie CB also tripped and in order. However, tripping of 400kV Farakka-Kahalgaon-III from Kahalgaon end on receipt of DT from FSTPP end needs to be explained.

Discrepancies observed and Remedial Measures/Suggestions:

- Mal operation of BFR at FSTPP end needs to be investigated.
- DT reception at Kahalgaon end for 400kV Farakka-Kahalgaon-III line needs to be explained.
- It is to be noted that 400kV FSTPS-Malda-II is a vital link between ER-NR and ER-NER when low hydro situation prevails in winter season and prolonged outage of Main CB of the said ckt is a serious concern for the safety and security of the Grid. Hence ER-II requested to expedite the commissioning work of main CB at Farakka.
- NTPC Farakka is advised to expedite the commissioning of remaining un-commissioned breakers at FSTPP for a stronger coupling of 400kV Bus-I & II.



NTPC and JSEB may elaborate.

Deliberation in the meeting

NTPC informed that 400kV FSTPP-KhSTPS-II, main CB BFR element timer had activated and tripped all the main breakers connected to 400kV Bus-II at Farakka S/s.

NTPC explained with presentation that on inspection the BFR element was found short which activated the timer circuit. Thereafter, the contact has been replaced with new one and they are planning to replace the existing BFR with numerical relay. Presentation is enclosed at **Annexure-B1**.

Regarding tripping of 400kV Farakka-Kahalgaon-III from Kahalgaon end, NTPC Kahalgaon informed that they received DT from Farakka end and also confirmed from PLCC counter reading.

Minutes of 26th PCC meeting

PCC advised NTPC Farakka to check the PLCC counter and find out the reason for sending DT.

PCC also advised to expedite the commissioning of remaining un-commissioned breakers at FSTPP for a stronger coupling of 400kV Bus-I & II and update the status in next PCC meeting.

ITEM NO. B.2: OPTCL System

1. Disturbance at 400 kV Meramundali S/S on 08.11.14.

At 23:20hrs, LBB mal operated at Meramundali Bus-I and following elements tripped,

- 400kV Meramundali-IBTPS-I (idle charged from Meramundali end)
- 400kV Meramundali-Mendhasal (tripped at both ends)
- 400/220kV ICT-I at Meramundali
- 400/220kV ICT-II at Meramundali
- 400kV Meramundali-Angul-II (tripped at Meramundali end)

Analysis of events:

As per report received from OPTCL, the sequence of events were initiated due to occurrence of fault in 400kV Meramundali-IBTPS-I (idle charged at Meramundali) line. It was reported that for the above line, breaker failure pickup was observed. The said line was connected with 400kV Main Bus-II. However, tripping of all breakers from Bus-I was reported, which could not be explained by OPTCL. Also, fault clearance time of 80ms was observed as per PMU data. As LBB operates generally with a time delay of 200ms, the reporting of LBB operation and instantaneous fault clearing could not be explained. Also, tie CB of 400kV Meeramundali-Mendhasal (main CB dismantled) line also tripped which is not in order. Due to the serious nature of anomalies detected it is not possible to bring the report to a logical conclusion and the events need further reporting from OPTCL with EL/DR outputs.

Discrepancies observed and Remedial Measures/Suggestions:

- LBB operation for 400kV Bus-I when LBB should operate for 400kV Bus-II is a serious anomaly and needs to be investigated.
- Also, as the PMU has detected fault clearance time of 80ms, LBB operation timer at Meramundali needs to be corrected for delay as per standards.
- LBB operation of tie CB of 400kV Meeramundali-Mendhasal (as main CB is dismantled) is not in order. Also, non-opening of main CB of Anugul-Meramundali-I connected to Bus-II could not be explained. Hence, selection of breakers for LBB needs to be audited/verified as no logic w.r.t the tripping could be detected and it is possible that wiring/selection of breakers for LBB operation were not in order.
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- PMU plots depict initially a R-B phase fault and subsequently a B-Phase fault after 1sec which needs to be explained.
- In the last PCC meeting, it was decided to review the protection settings of the lines being kept idle charged from Meramundali end and modify them to ensure instantaneous tripping irrespective of the zone of the fault. OPTCL may furnish the status i.r.o above.
- OPTCL is advised to expedite the commissioning of remaining un-commissioned breakers at Meramundali for a stronger coupling of 400kV Bus-I & II.

OPTCL may elaborate.

Deliberation in the meeting

*OPTCL has delivered a presentation, which is enclosed at **Annexure-B2.1**.*

OPTCL explained that fault was in Meramundali-IbTPS line-I and the CB at Meramundali has cleared the fault in 80msec. However, the fault was extended to Bus-I via Dia 408 and 405 and the busbar protection had tripped all the lines connected to Bus-1.

Subsequent to outage of load at Meramundali end, the voltage raised at 400kV Mendhasal S/s and causes the PICK UP of Over Voltage relay at Mendhasal end. But, DROP OUT voltage being LOW (Confirmed after the testing of the relay), this relay at Mendhasal end issued TRIP COMMAND and Mendhasal feeder at Meramundali end tripped on DTT.

OPTCL informed that they are suspecting defect in one of the CTs of the bus bar protection.

PCC advised to check the healthiness of CT and enable CT supervision for all CTs. OPTCL agreed.

2. Disturbance at 400kV Mendhasal S/S on 29.11.14 at 15:27 hrs

Various 220kV and 400kV lines tripped due to blasting of Y-Ø LA of 220kV Mendhasal-Chandaka-IV at Mendhasal.

OPTCL may elaborate.

Deliberation in the meeting

OPTCL explained the tripping incidence with a presentation given at **Annexure-B2.2**. There was fault in Y-ph LA of 220kV Mendhasal-Chandaka -4 at Mendhasal S/s and the Distance Protection has cleared the fault in Zone 1 at Mendhasal end. Fault being on Zone2 from Chandaka end, Distance Relay had tripped on Zone 2 with time delay of 487 mSec. Because of delay in clearance of fault at Chandaka end of line-4, the O/C E/F protection of Mendhasal-Chandaka line-1, 2 and 3 were tripped from Mendhasal end.

It resulted in outage of approx 190 MW load causes OV actuation of 400 KV Mendhasal-Meramundali line and tripped after 4998 mSec. (Concluded from testing, The relay picks up 70.04 V, drops out at 66.52 V). On the day of disturbance, the relay had been picked up at 82.2 Volt and remained with voltage of 68.2V till the elapse of setting value.

On enquiry of the relay settings at Chandaka S/s, OPTCL informed that they have changed the zone 2 timing of distance protection to 0.3 s and time setting of OC/EF at Mendhasal have been changed from 0.1 to 0.25 dial (More than Z2 setting of 300mSec.) after the incident. The OV setting on 400Kv Mendhasal-Meramundali line at Mendhasal end had been changed from 70V to 72 V(Relay tested and found with drop out of 95% of nominal).

PCC advised OPTCL to install the PLCC system to enable inter tripping. OPTCL agreed.

ITEM NO. B.3: Disturbance at 400 kV Bakreswar S/S on 07.11.14

Various 400kV lines and units at Bakreswar TPS tripped due to rupturing of Y-Ø LA in 400kV bus reactor bay.

WBPDCCL may elaborate.

Deliberation in the meeting

WBPDCCL explained that the disturbance occurred due to Y-ph LA bursting at 400kV bus reactor bay. The reactor differential protection did not operate due to some problem in CT but the backup impedance protection has cleared the fault in 1 sec. Since backup impedance protection took longer time to isolate the fault, the lines from remote ends got tripped and isolated the fault.

PCC felt that time setting provided in backup impedance relay (1 sec) which is very high and Minutes of 26th PCC meeting

advised to reduce the time setting. WBPDCCL informed that time setting has been reduced to 0.15 sec.

ITEM NO. B.4: Total power failure at 400kV Mejia-B S/s on 28.11.14.

Total power failure occurred at Mejia-B TPS due to mal operation of LBB relay at Mejia-B i.r.to 400kV Mejia-B -Maithon-III.

DVC may explain.

Deliberation in the meeting

DVC explained that this incidence was happened while carrying out Tan δ testing of CT. The secondary side CT was grounded for the testing and CT connections were not removed from terminal box. As a result, circulating current was generated and activated the CT mismatch circuit of differential protection.

ITEM NO. B.5: Tripping incidences in the month of November, 2014

Other tripping incidences occurred in the month of November, 2014 which needs explanation from constituents of either of the end is circulated in the meeting.

Members may discuss.

Deliberation in the meeting

Respective constituent members explained the tripping incidence. Updated list is enclosed in Annexure-I.

PART- C

FOLLOW-UP OF DECISIONS OF THE PREVIOUS PROTECTION SUB-COMMITTEE MEETING(S)

(The status on the follow up actions is to be furnished by respective constituents)

ITEM NO. C.1: OPTCL System

1. Disturbance at 220 kV Rengali S/S on 07.10.14.

At 13:01hrs all the 220kV feeders emanating from 220kV Rengali S/Y were tripped.

Details are given as follows:

- 220kV Rengali S/Y-Barkote line tripped from Rengali S/Y on D/P but did not trip from Barkote end.
- 220kV Rengali S/Y- Rengali PH line-II tripped from both ends with relay indication Overcurrent E/F at 220kV Rengali S/Y and E/F at 220kV Rengali PH
- 220kV Rengali S/Y- Rengali PH line-I tripped from both ends with relay indication Overcurrent E/F at 220kV Rengali S/Y and E/F at 220kV Rengali PH
- 220kV Rengali S/Y- Rengali PG line-I tripped from Rengali S/Y on pilot wire protection.

In 25th PCC, OPTCL informed that they suspected the fault in 220kV Barkote line. However, no fault was detected during line patrolling. It may be of transient nature. The delayed fault clearance by DP relay EPAC 3000 at Barkote end caused feeder tripping from remote end. The delayed tripping of EPAC 3000 DP relay is attributed to defective neutral wire of the relay.

Tripping of Pilot wire protection on through fault at Rengali-OPTCL end may be due to defective pilot wire.

OPTCL reported that, EPAC 3000 DP relay at Barkote and Pilot wire protection HORM -4 for PGCIL-1 & 2 feeder will be tested in the first week of December'14

All electromagnetic Over Current & Earth fault Relays will be replaced by January'15.

OPTCL may update.

Deliberation in the meeting

OPTCL informed that,

- i. The EPAC 3000 distance relay for 220kV Barkote feeder was tested and the relay characteristic was found normal.*
- ii. The pilot wire protection for 220kV PGCIL feeder I & II (HORM-4) could not be tested due to non-availability of line shutdown.*
- iii. Replacement of Electromagnetic O/C & E/F relays with numerical relays would be completed as per schedule i.e. January 15.*

2. Repeated tripping of 400 kV GMR-Meeramundali line from GMR end.

It has been observed that 400kV GMR-Meeramundali line is getting tripped from GMR end only on several occasions. PCC advised both GMR and OPTCL to review the protection settings at GMR.

In 25th PCC, GMR informed that revised settings have been implemented on 8th November, 2014 in coordination with OPTCL and no tripping were reported thereafter.

PCC advised GMR to examine the relay settings of 400kV GMR-TSTPP line in coordination with NTPC and report.

Further, PCC advised GMR to review their protection settings after the commissioning of their dedicated ATS and submit the new settings.

GMR may update.

Deliberation in the meeting

GMR representative was not available for discussion. ERPC Secretariat will write to GMR to provide the protection setting details of dedicated ATS (i.e. 400kV GMR-Angul line) at GMR end.

3. Disturbance at 400 kV Angul S/s & 400/220 kV Meramundali S/S on 14.09.14.

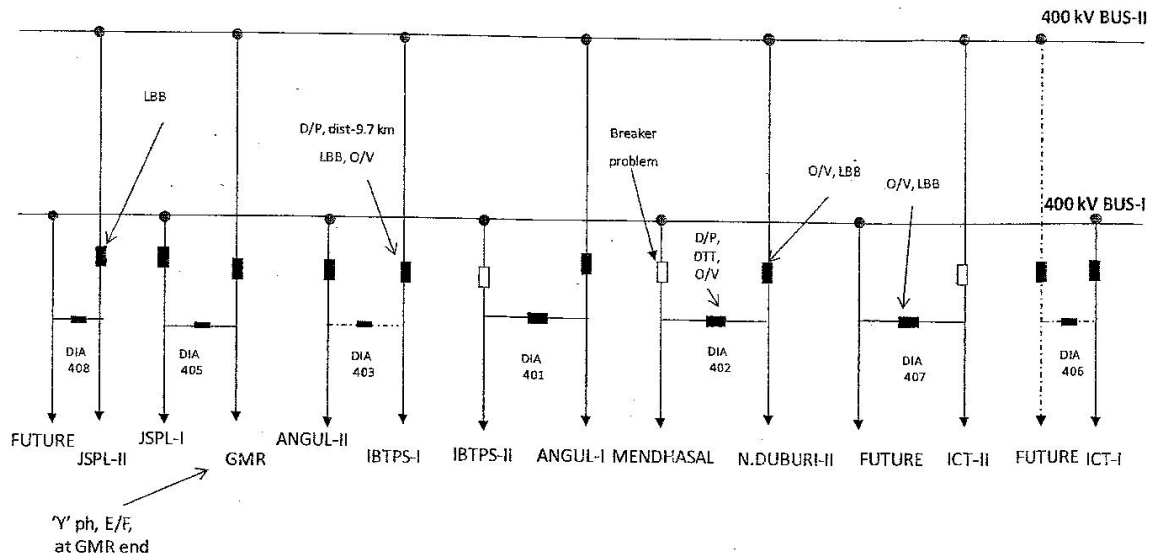
At 18:41hrs, 400kV Angul-TSTPP tripped due to a transient fault wherein Autoreclose did not successfully operate at Anugul end. Subsequently, at 18:55hrs, due to suspected fault in 400kV Meramundali-IBTPS-I which was idle charged from Meramundali end which was not timely cleared at Meramundali end, LBB operated at Meramundali and Bus-II at Meramundali became dead. 400kV Angul-Bolangir also tripped and 400kV Bus at Angul became dead.

Following elements tripped:

- 400kV Angul-TSTPP (Tripped at Angul end)
- 400kV Angul-Bolangir (Tripped at Bolangir end)
- 400kV Meramundali-IBTPS-I (idle charged) (Tripped at Meramundali end)

- 400 kV Meramundali-Duburi Ckt-II (idle charged from Meramundali end) (Tripped at Meramundali end)
- 400kV Meramundali-Mendhasal (Tripped at Meramundali end)
- 400 kV Meramundali-GMR (Tripped at GMR end)
- 400 kV ICT-II at Meramundali (Tripped at Meramundali end)
- 400 kV Meramundali-JSPL Ckt-II (Tripped at Meramundali end)
- 400 kV Meramundali-Angul Ckt-I (Tripped at both ends)

MERAMUNDALI S/S 14.09.2014 AT 18:55 Hrs



Analysis of events:

It appears that, there were two separate events occurring at 18:41hrs and at 18:55hrs. At 18:41hrs 400kV Angul-TSTPP tripped from Angul end on R-N fault. At TSTPP end Auto reclosure operated successfully indicating that the fault was transient in nature, but at Angul end Auto reclosure got blocked which needs to be investigated.

Subsequently, at 18:55hrs, 400kV Meeramundali-IBTPS-I (idle charged from Meramundali end) tripped on Y-N fault. However as reported by OPTCL, due to suspected delayed tripping of 400kV Meeramundali-IBTPS-I from Meeramundali end, LBB got actuated at Meramundali end. Hence, all the elements connected to 400kV Bus-II of Meramundali tripped. However, the breaker connected to Bus-II of 400kV Meramundali-GMR at Meramundali end tripped from remote end only which needs to be investigated. Also, presently the main CB of 400kV Meeramundali-Mendhasal was not in service and said line was charged through the tie CB of 400 kV Meeramundali-Duburi Ckt-II which was connected to Main Bus-II. Hence, though the line tripped on operation of LBB, the tie breaker observed the fault and tripped on DP. Thus, tripping of 400 kV Meeramundali-Duburi Ckt-II (idle charged from Meramundali end) on LBB, led to outage of 400kV Meeramundali-Mendhasal also. Relays at Angul end of 400kV Anugul-Meramundali-I had also picked up detecting Y-N fault beyond Z-3 due to delayed opening of breaker of 400kV Meramundali-IBTPS-I at Meeramundali end but the relays did not trip. This is suspected to be a maloperation at Anugul end. Hence, finally the fault was cleared from Bolangir end with DT was sent to Angul. It is suspected that JSPL units might have tripped due to the above incident. Hence, now, only two lines and one ICT viz. 400 kV Meeramundali-JSPL Ckt-I, 400 kV Meeramundali-Angul Ckt-II and 400/220kV ICT-I remained connected with Bus-I at Meeramundali. It is suspected that ICT-I had also tripped and with JSPL-Meramundali-I tripping, there was no source/evacuation path from Meramundali Bus-I and 400kV Anugul-Meramundali-II went under floating condition. Subsequently, the line tripped on receipt of DT at 19:05Hrs from Meramundali end on suspected hand tripping of the idle line from Meramundali end.

Remedial Measures/Suggestions:

- The fault persistence time of 280ms is a violation of CEA (Grid Standards) Regulations, 2010. As per Cl.3 (e) regarding 'Standards for Operation and Maintenance of Transmission Lines', the maximum fault clearance time for 400kV Transmission system is 100ms.
- Failure in tripping of 400kV Meeramundali-GMR from Meramundali end on operation of LBB (though other lines connected to Bus-II tripped) needs to be checked. The line tripped from GMR end only even after LBB actuation and the same needs to be investigated.
- Failure in tripping of 400kV Meramundali-Anugul-I from Meramundali end on operation of LBB(though other lines connected to Bus-II tripped) needs to be checked. Also failure in clearing the fault from Anugul end also needs to be investigated (relays at Anugul end had only picked up).
- OPTCL is requested to expedite commissioning of the pending main/tie breakers presently not in service at Meramundali to enable stronger coupling of Bus-I & II at Meramundali.
- Blocking of Auto reclose at Angul end though the same was successful at TSTPP end needs to be investigated.
- Tripping of 400/220kV ICT-I and 400kV JSPL-Meramundali-I needs to be confirmed and corroborated.

In 24th PCC, OPTCL informed that due to some problem in trip circuit there was delayed clearance of fault in the idle charged 400kV Meramundali-IBTPS-I line which activated the LBB at Meramundali S/s and all the elements connected to Bus-II tripped.

PCC advised OPTCL to review the zone settings time to time for under construction lines which were idle charged and the entire line should be covered in zone-1.

PCC advised OPTCL to submit the complete plan of CB replacing and bus-bar protection installation at Meramundali S/s. OPTCL agreed.

The tripping at Angul S/s cannot be analyzed due to non-representation of Odisha-Powergrid.

Powergrid-Odisha may explain.

Deliberation in the meeting

It was informed that R-N fault was observed at Angul end. OPTCL updated the status as follows,

- The zone 2 setting of Distance relays for under construction lines was made zero.*
- The 400kV CB for BUS –II of 407 diameter (ICT-II) was commissioned on 30.11.2014*
- The 400kV CB for BUS –I of 402 diameter (Mendhasal) installation completed expected to be commissioned by 4th week of December, 2014.*
- The 403 Dia tie CB overhauling would be completed by 30.11.2014.*
- The installation of BUS-I CB of 401 diameter (Ib-II) is in progress and expected to be commissioned by 15th January'2015.*
- 220kV Bus bar protection for Meramundali Grid is in progress, expected to be completed by 31st December'2014.*

4. Disturbance at OPTCL on 26th August 2014

At 23:08hrs of 26th August 2014, 400kV Indravati(PG)-Indravati(O) tripped on overvoltage (Stg-1) from PGCIL end and 400/220kV ICT –I & II at Indravati PH tripped with over flux relay indication (as per information received from OPTCL). Further, 400kV Indravati(PG)-Jeypur(PG) S/C line tripped on inst. Over-current protection from Jeypur(PG) end only. Subsequently 220kV Jayanagar –Jeypore D/C tripped at Jayanagar on actuation of over current relay indication and 220kV Theruvali-Bhanjanagar D/C tripped due to R-ph fault. Indravati, U. Kolab and Balimela hydro stations got islanded with loads of Theruvali and Jeypur complexes. All the running units of Balimela (except #4, #7 and #8), Indravati and U.Kolab tripped . Thus 220kV bus at Jayanagar became dead. And also due to tripping of 220kV Theruvali-Bhanjanagar D/c from both end Theruvali S/S became dead.

Following lines/elements tripped:

1. 400/220kV ICT –I &II at Indravati PH tripped
2. 400kV Jeypore-Indravati 220kV Jayanagar-Jeypore D/C
3. 220kV Theruvali-Bhanjnagar D/C
4. 220kV Jayanagar-U.Kolab D/C
5. 220kV Theruvali-U.Kolab
6. U.Kolab U# I,II,III & IV
7. Balimela U# III, V,VI

Due to this disturbance around 800 MW of load loss and 1200 MW of generation loss occurred in Odisha sytem.

Subsequently, a special meeting was convened on 4th September, 2014 to analyze the incident.

OPTCL explained that at 23:08 hrs, 400kV Indravati(PG)-Indravati(OHPC) S/C line was tripped from Indravati(PG) end on over-voltage (Stg-1) protection, followed by 400kV Jeypur(PG)-Indravati(PG) S/C line from Jeypur end on earth fault. At 23.09 Hrs. ICT 1 & 2 of Indravati Power House tripped on over fluxing relay operation. Thereafter 220kV Jeypur(PG)-Jaynagar(OPTCL) D/C line tripped from OPTCL end. The load flow in each of above circuits to Jeypore PG was 200MW prior to disturbance. As 400kV link to Jeypore PG from Indravati Power house had tripped earlier, heavy load demand in the area caused tripping of 220kV lines on over current.

The 220kV Therubali – Bhanjanagar ckt.1 & 2 tripped on DP relay operation at both end. The relay indication was Zone-1, 3 phase fault. The cause of above tripping may be attributed to heavy power swing due to high imbalance in load and generation in the loop. The 220kV Narendrapur - Mendhasal circuit tripped at Narendrapur on operation of directional over current. Due to heavy load throw on isolation of PGCIL system and Therubali– Bhanjanagr link, over voltage condition may have experienced.

The 220kV lines from Upper Kolab tripped on over voltage, and all the Generator of the power house tripped on over speed. All the Generator of Indravati power house tripped. The units 3,5 & 6 of Balimela Power house isolated from the Grid and #4,7 & 8 were tripped.

The issue was placed in 28th TCC meeting.

In 28th TCC, OPTCL, OHPC and Powergrid informed that detail analysis of this type of disturbances need some more time. TCC advised OPTCL, OHPC and Powergrid to place the details in next PCC Meeting for further detail deliberation.

In 23rd PCC, during deliberation the reason behind sudden rise of voltage at 400kV Indravati (PG) S/s could not be ascertained.

After detailed deliberation, PCC felt a committee should be formed for detail analysis of this incidence. Accordingly, a committee of comprising of the following members was constituted:

1. Shri M. R. Mohanthy, Sr. GM, SLDC, OPTCL
2. Shri S. Nayak, AGM, NTPC
3. Shri S. Roy, SE (Testing) , WBSETCL, Kolkata
4. Shri J. Dutta, SE, CTC, DVC, Maithon
5. Shri S. Banerjee, CM, ERLDC,Kolkata
6. Shri A. Sen Sarma, DGM,CC, Powergrid
7. Shri B.Sarkhel, SE(PS),ERPC,Kolkata - Convenor

PCC advised OPTCL, OHPC & Powergrid to send reports on the disturbance from their respective ends along with DR, EL, relay flags and SLD to ERPC Secretariat. PCC also suggested to include recommendations in the report. Accordingly, the committee will study and decide the further course of action.

In 24th PCC, ERLDC informed that they have shared the available information with committee members. However, PCC felt that Powergrid and OHPC should send point wise details along with DR and EL flags.

Thereafter, a special meeting was held at ERPC, Kolkata on 30th October, 2014 for detail analysis of the incidence. Minutes of the meeting are circulated in the meeting.

In 25th PCC, members updated status as follows:

1. Testing of CVTs of 400kV Indravati(PG) – Indravati(OHPC) S/C line installed at both ends, for proper output and satisfactory performance. If required, erroneous CVT to be replaced with a new one -----*Committee submitted the line CVT output results in the meeting. PCC opined that the CVT output of each phase results not in order and felt the CVT needed to be changed. OHPC expressed the reservation to change the CVT based on one such test result.*
2. Making numerical over-voltage protection to ensure desired drop-off to pick-up ratio (above 0.95) be available at PGCIL and OHPC 400kV S/Stns, in place of existing VTU-31 (EE make) electromechanical relay and reviewing their setting based on observed CVT outputs ----- *OHPC agreed to implement the O/V settings in numerical relays (Micom-P442 relay).*
3. Ensuring that DR is triggered whenever any protection operates and corresponding event log is telemetered to ERLDC with GPS synchronized time stamping.-----*PCC felt Disturbance Recorder is essential for 400kV system and advised concern utilities (OHPC & Powergrid) to implement the same.*
4. Exploring possibility of incorporating Transient Fault Recorders for the FSCs at Jeypur, for analysis of incidents. ----- *Powergrid ER-II (Odisha Projects) representative was not available for discussion.*
5. The two 400/220kV ICTs at UIHEP are owned and maintained by different utilities viz. OHPC and PGCIL. For proper maintenance coordination and ease of access it is suggested that O&M of both the ICTs should be done by a single utility.----*PCC advised OHPC and Powergrid to resolve the issue bilaterally. If not resolved PCC may recommend to bring the issue in TCC forum.*
6. Reviewing over-current protection settings in 220kV lines of OPTCL—*OPTCL confirmed submission of such relay settings. It was decided that ERPC and ERLDC will examine the settings and report in next PCC.*

PCC felt Powergrid ER-II (Odisha Projects) was not responding to meetings of various forums and requested Member Secretary, ERPC to write a letter to ED, Powergrid ER-II (Odisha Projects) citing difficulties for the implementation of various decisions.

Subsequently, ERPC Secretariat has written a letter to ED (Odisha Projects), Powergrid vide letter dated 26.11.2014 but the response is still awaited.

OPTCL, OHPC & Powergrid may update.

Deliberation in the meeting

Members updated status as follows:

1. Testing of CVTs of 400kV Indravati(PG) – Indravati(OHPC) S/C line installed at both ends, for proper output and satisfactory performance. If required, erroneous CVT to be replaced with a new one -----*On the request of previous PCC meeting, OHPC finally agreed to change CVT.*
2. Making numerical over-voltage protection to ensure desired drop-off to pick-up ratio (above 0.95) be available at PGCIL and OHPC 400kV S/Stns, in place of existing VTU-31 (EE make) electromechanical relay and reviewing their setting based on observed CVT outputs ----- *OHPC agreed to implement the O/V settings in numerical relays (Micom-P442 relay).*
3. Ensuring that DR is triggered whenever any protection operates and corresponding event

log is telemetered to ERLDC with GPS synchronized time stamping.-----PCC felt Disturbance Recorder is essential for 400kV system and advised concern utilities (OHPC & Powergrid) to implement the same.

4. Exploring possibility of incorporating Transient Fault Recorders for the FSCs at Jeypur, for analysis of incidents. ----- Powergrid ER-II (Odisha Projects) representative was not available for discussion.
5. The two 400/220kV ICTs at UIHEP are owned and maintained by different utilities viz. OHPC and PGCIL. For proper maintenance coordination and ease of access it is suggested that O&M of both the ICTs should be done by a single utility.-----PCC advised OHPC and Powergrid to resolve the issue bilaterally. If not resolved PCC may recommend to bring the issue in TCC forum.
6. Reviewing over-current protection settings in 220kV lines of OPTCL—OPTCL confirmed submission of such relay settings. It was decided that ERPC and ERLDC will examine the settings and report in next PCC.

PCC advised to complete the above action plans at the earliest.

5. Disturbance in OPTCL and DVC system at 17:15 hrs on 12th July, 2014.

As per report from OPTCL, due to staggered tripping of lines from TTPS end (initiated at 16:52Hrs) including both 220/132kV ICTs at TTPS, all the running units of TTPS (viz. Units#1,2,3,4 running on 132kV side) tripped ultimately at 17:04Hrs. Weather was reported to be of inclement condition at the time of trippings. The Units#5 & 6 connected to 220kV Bus at TTPS were out of bar prior to the incident. Consequent to the trippings, Joda remained connected to two sources only, viz. 220kV Joda-Ramchandrapur and 220kV Joda-Jindal-Jamshedpur. 220kV Joda-Ramchandrapur tripped at 17:15hrs on O/C which appears to be a relay mal-operation and needs to be investigated. Due to the above trippings, direction of power flow through 220kV Joda-Jindal-Jamshedpur reversed as Joda S/S became radial on DVC system resulting in heavy drawal from DVC system. Due to such heavy drawal by Joda, 132kV Barhi-Koderma D/c tripped on O/C resulting in islanding of Bokaro-B TPS. The island formed being heavily deficit in generation vis-a-vis load, suffered low voltage and collapsed on Load generation imbalance. Thus 2x210MW units at Bokaro'B' tripped consequent to tripping of 132kV Barhi-Koderma D/C. The Following elements tripped:

- i. 220kV Meramundali-TTPS-II (Tripped from Meramundali end)
- ii. 220kV Meramundali-Bhanjanagar-I (Tripped from Meramundali end)
- iii. 132kV TTPS-Duburi-I (Tripped from both ends)
- iv. 160 MVA, 220/132kV ATR-II at TTPS
- v. 160 MVA, 220/132kV ATR-I at TTPS
- vi. 220kV Meramundali-TTPS-I (Tripped from Meramundali end)
- vii. 60 MW TTPS Units-1, 2, 3 and 4
- viii. 220kV Joda-Ramchandrapur (Tripped from Ramchandrapur end)
- ix. 132kV Barhi-Koderma-D/C (Tripped from Koderma end)
- x. 2*210 MW Unit-2 and 3 at BTPS

After detailed deliberation 22nd PCC felt that the incidence could not be analyzed unless the detailed tripping reports are received from all the substations involved. PCC took serious note of non- submission of detailed tripping report by NTPC, TTPS end and advised NTPC to place the details in 100th OCC meeting scheduled to be held on 22nd August, 2014 for detailed deliberations. OPTCL was also advised to inquire about any tripping report from 220 kV TTPS-NALCO-Rengali line or 220 kV TTPS for further investigation. The tripping incident will be again discussed after compiling reports received from all concerned.

Subsequently, a special meeting was convened on 4th September, 2014 to analyze the incident. TTPS (NTPC) explained that, at 16:50hrs there was a R phase to ground fault in 132kV Duburi-TTPS line-1 and the fault has been cleared from both ends. Simultaneously 132kV Duburi-TTPS line-2 tripped from Duburi end and autoreclosure of TTPS end was successfully operated load flow is zero. But at the same time ICT-2 at TTPS was tripped on Neutral Directional O/C and 220kV TTPS-Meramundali-2 was tripped from Meramundali end.

Thereafter, at 16:58hrs 220kV Meramundali-TTPS-1 was tripped from Meramundali end on O/C and ICT-1 at TTPS tripped because of OLTC diverter switch Explosion vent R-ph rapture. Therefore, TTPS completely got isolated from the grid, at 17:01 hrs TTPS units 2, 3, 4 got tripped on over speed and unit 1 got tripped on Drum Level Hi protection.

After detailed deliberation, PCC advised TTPS (NTPC) and OPTCL to clarify the following points:

- Full relay indications from OPTCL/TTPS (NTPC) not yet obtained. Specifically tripping of 220kV TTPS-Meramundali-II and 220kV Meramundali-Bhanjanagar-I from one end only, needs to be explained.
- O/C operation of 220kV Ramchandrapur-Joda needs to be checked.
- Over-current settings of 132kV Barhi-Koderma D/c need to be checked.
- Tripping of 132kV Barhi-Biharshariff needs to be corroborated.
- Tripping of 220kv TTPS-TSTPP, TTPS-Rengali to be cross-checked for occurrence and relay indications.
- Relays at TTPS/Meramundali need to be checked/audited.
- W.r.t the fault at 17:01hrs, the fault persistence time of 560ms is a violation of CEA (Grid Standards) Regulations, 2010. As per Cl.3 e) regarding 'Standards for Operation and Maintenance of Transmission Lines', maximum fault clearance time for 220/132kV Transmission system is 160ms.

In 23rd PCC, NTPC has given the following clarification:

- Regarding tripping of 220kV TSTPP-TTPS line from TSTPP end, the circuit breaker was in closed condition but TTPS end breaker got opened without any relay indication.
- Testing of Protection relay of Auto Transformer 1 & 2 will be done on available opportunity.
- Line breaker of 220kV TTPS-Rengali line was tripped from Rengali end on O/C. TTPS end breaker was in closed condition.

OPTCL was advised to give their clarification by written communication.

In 24th PCC, NTPC informed that, protection relay of Auto Transformer 1 has been tested and found satisfactory. & Protection relay of Auto Transformer 2 will be tested on available opportunity.

PCC advised OPTCL to give their clarifications in written communication. OPTCL agreed.

In 25th PCC, NTPC informed that testing of CBs have been done and found OK.

Regarding tripping of 220kV TTPS-Rengali line CB at Rengali end on O/C, PCC advised OPTCL to submit the details of tripping details along with O/C relay settings and MW flow.

OPTCL agreed.

OPTCL may update.

Deliberation in the meeting

As decided in previous PCC, OPTCL has submitted the report where in the O/C relay setting of 220kV TTPS-Meramundali line 1 & 2 at Meramundali end was follows:

CTR : 600/1A

Over Current Relay Settings: Plug Setting – 100%(IDMT , Normal Inverse), TSM – 0.3, High Set : 2x4x1=8A

*Earth Fault Relay Setting : Plug Setting – 20%(IDMT , Normal Inverse), TSM – 0.35
Relay detail: Electromagnetic, Easun Reyrolle Make, TJM-12.*

*The O/C settings of Rengali PH (OHPC) - TTPS 220kV line at Rengali end was as follows:
CTR : 800/1A*

*Over Current Relay Settings: Plug Setting– 100% (IDMT , Normal Inverse), TSM – 0.1
Earth Fault Relay Settings : Plug Setting– 10% (IDMT , Normal Inverse), TSM – 0.1*

Since the reason of opening of line CB of 220kV TSTPP-TTPS line at TSTPP end could not be ascertained and the details from 220kV Jindal S/s was not available, the finding remained in conclusive.

ITEM NO. C.2: Tripping of 132 kV Kahalgaon-Lalmatia line on 01.10.14 & 11.10.14

At 10:40hrs on 01.10.2014, 132KV Kahalgaon-Lalmatia line on distance protection at NTPC Kahalgaon end with relay indication Y&B phase, distance 70 km.

In 25th PCC meeting, it was informed that, at 10:40hrs on 01.10.2014, fault was initiated in 220KV Farakka-Lalmatia line and Lalmatia end failed to isolate the fault. Hence, the fault was cleared from 132kV Kahalgaon end on backup O/C protection.

PCC advised NTPC to send a report stating the details thereof. NTPC agreed.

NTPC may update.

Deliberation in the meeting

NTPC informed that Lalmatia end was tripped at 10:40hrs on 01.10.2014.

ITEM NO. C.3: T-connection in 132kV Lalmatia-Kahalgaon line

During deliberation in 25th PCC meeting, it was informed that a T-connection was made in 132kV Lalmatia-Kahalgaon line at Tower no. 9 from Lalmatia end and drawing the power from 3rd May, 2014.

PCC advised JSEB to check and remove the T-connection immediately in order to maintain protection coordination of the important line like 132kV Lalmatia-Kahalgaon S/C.

JUSNL may update.

Deliberation in the meeting

PCC took serious note on T connection which was made without any prior permission from ERPC forum. However, a report from JUSNL has been received justifying the Jumper connection to meet the maximum loads in the Lalmatia areas.

PCC decided to convene a separate meeting on 12th January, 2015 for detail deliberation on this issue and advised NTPC, DVC, Bihar and JSEB to attend the meeting.

Respective constituents agreed.

ITEM NO. C.4: Bihar System

1. Tripping at 220 kV Biharsharif (BSPTCL) S/S at 12:26 hrs on 20/08/14.

At 12:26hrs, 220kV Tenughat-Biharsarif line tripped on earth fault from both the ends. At the same Minutes of 26th PCC meeting

time all the three 400/220kV, 315MVA ICTs at Biharsariff (PG) tripped on back up O/C protection leading to total power failure at 220kV Biharsariff (BSEB) S/s. 220kV Biharsariff-Bodhgaya-D/C also tripped.

It appears that sequences of events were initiated due to Y-Ø earth fault occurred in 220kV Tenughat-Biharsariff line. However there was a delayed clearance of the said fault from Biharsariff (BSPHCL) end (PMU plot of Sasaram shows that the fault was getting cleared in 1400ms) due to which all the three 400/220kV, 315MVA ICTs tripped from Biharsariff(PG) end on backup O/C protection from HV side. 220kV Biharshariff-Bodhgaya-D/C (idle charged from Biharshariff) also tripped at the same time as reported by BSPHCL. As the Biharsariff (BSPHCL) had no other source to feed the downstream load, total power failure occurred at Biharshariff (BSPHCL) end.

Remedial Measures/Suggestions:

Delayed clearance of faults from Biharshariff (BSPHCL) end for 220kV Tenughat-Biharshariff line needs to be checked.

BSPTCL explained that the fault was detected in zone 1 of 220 kV Tenughat- Biharsharif line from Biharsharif end but CB operation might have delayed the fault clearance. BSPTCL informed that they are facing DC supply problem, which may cause delayed CB operation. They reported that DC cable flashing was also observed behind the control panels and same was rectified.

PCC advised BSPTCL for thorough checking of DC supply system and submit the status report to ERLDC/ERPC Secretariat within ten (10) days. BSPTCL agreed.

In 23rd PCC, while enquiring about simultaneous 3x315 MVA ICT tripping at Biharsharif S/s, Powergrid informed that the DR plots indicated the fault was isolated by ICTs in 600 msec. However, ERLDC mentioned that PMU plots obtained from Sasaram S/s showed the total fault duration of 1.4sec.

It could not be concluded the reason behind such long duration of fault isolation. It was opined that DR plots at TVNL end may highlight additional information in this respect. Accordingly, PCC advised JSEB to collect the DR files on 20.08.2014 from TVNL and submit soon to ERLDC/ERPC. JSEB agreed.

In 24th PCC, BSPTCL informed that they have tested the DC supply output and reported that 5V negative voltage was observed. They are planning to shift the Panels to new control room which is at higher level from the ground.

On submitting the DR files from TVNL end, JSEB agreed to send within a week.

In 25th PCC, JSEB has submitted the DR files of TVNL end.

PCC decided to study the report and report the outcome in next PCC.

ERLDC may update.

Deliberation in the meeting

The report has been submitted by BSPTCL and will be discussed in next PCC.

2. ERPC recommendations on repeated trippings at 132 kV Purnea (BSPTCL) S/S

In 21st PCC, in view of repeated uncoordinated tripping from 220 kV Purnea S/s (PGCIL) due to various line faults in BSPTCL downstream system, it was decided that ERPC team comprises of ERPC, ERLDC, Powergrid, WBSETCL, DVC and BSPTCL members will visit for Audit/testing of relays in neighboring substations in around 220 kV Purnea S/s to review the protection philosophy in 1st week of August, 2014.

Accordingly, ERPC team members visited the 132kV Purnea(PG), 132kV Purnea(BSPTCL) and 132kV Forbesganj S/s from 11-08-2014 to 13-08-2014.

In 22nd PCC, ERPC team presented the audit report of the 132 kV Purnea & adjoining sub-stations and highlighted the list of deficiencies in the protective system installed at there. The recommendation for remedial measures for those sub-stations is also presented.

After detailed deliberations PCC advised BSPTCL to comply all the recommendations at the earliest. BSPTCL agreed to comply the recommendations as pointed by the ERPC team within a month.

BSPTCL was also advised to carry out Tan-Delta ($\tan\delta$) and thermo vision tests for all CTs.

In 28th TCC, Audit team has presented their observations and recommendations of 132kV Purnea and Forbesgunj (BSPTCL). During presentation three types of recommendations (short term, medium term and long term) were given.

TCC advised BSPTCL to implement the short term and medium term recommendations within 2/3 months time and to place the roadmap for implementation of all the recommendations to ERPC Secretariat at the earliest.

In 24th PCC, BSPTCL has submitted the action plan. PCC advised BSPTCL to give the details of last month trippings in around Purnea BSPTCL system along with details to assess the improvement after incorporating ERPC recommendations.

In 25th PCC, BSPTCL has submitted the details of tripping incidences happened in the last few month, which was circulated in the meeting.

PCC advised BSPTCL to submit the latest implementation status on ERPC recommendations on monthly basis.

BSPTCL agreed.

BSPTCL may update.

Deliberation in the meeting

BSPTCL has submitted the Tan δ testing report.

PCC advised to replace the CTs whose Tan δ is more than acceptable limits.

ITEM NO. C.5: Disturbance at FSTPP on 28th August 2014.

On 28th August, 2014 at around 11:13hrs, earth fault was suspected to have occurred in B-Ø of 400 kV FSTPP-Malda-II due to which all the running units of FSTPP along with all incoming/outgoing feeders tripped. Power supply to Bangladesh at HVDC Bheramara also got affected.

After detailed deliberation, PCC in its special meeting on 4th September, 2014 advised Powergrid and NTPC Farakka to give the action plan.

Accordingly, observations, NTPC & Powergrid have given the following action plan in 24th PCC meeting:

NTPC & Powergrid updated the status as follows:

1. Non-clearance of fault at FSTPP end for 400kV FSTPP-Malda-II. (Action : NTPC & Powergrid) --- Tie CB -3252 (BHEL make) has been tested and found in order but it was suspected the CB operation was sluggish. The existing CB will be replaced.

2. DR plots of 400kV FSTPP-Malda-II at FSTPP end (not GPS synchronized) (triggered at 11:06:28:291) depict that opening of 3-ph Tie breakers started at 11:06:28:332 and Main breakers at 11:06:28:333. However opening of the breakers are not confirmed in the DR channels and fault current through B-phase persists even after around 1000ms. It appears that FSTPP end breaker did not open. Powergrid may give a detailed report regarding testing carried out, problems detected and the rectification activities carried out for the main/tie breakers and the associated relays. (Action : Powergrid) --- *The relays LZ and REL relays have been replaced with new Micom and Siprotec relays.*
3. LBB for 400kV FSTPP-Malda-II connected to Bus-I did not operate. (Action : Powergrid)—*Current elements were not functional the same have been replaced. Duplication of LBB scheme is also in progress.*
4. Non-opening of Behrampore end breakers due to which Directional E/F was triggered at Jeerat end. (Action : Powergrid)--- *Investigation is in progress.*
5. The tripping of 315MVA ICT-III at Malda on backup O/C and that of 132kV Malda(PG)-Malda from Malda(WB) end. (Action : Powergrid)----
6. Occurrence of Over-voltage Stage-I subsequently. (Action : Powergrid)

NTPC and Powergrid may update the status.

Deliberation in the meeting

NTPC & Powergrid updated the status as follows:

1. Non-clearance of fault at FSTPP end for 400kV FSTPP-Malda-II. (Action : NTPC & Powergrid) --- *Tie CB -3252 (BHEL make) has been tested and found B-ph interrupter defective. The B-ph interrupter has been replaced.*
2. DR plots of 400kV FSTPP-Malda-II at FSTPP end (not GPS synchronized) (triggered at 11:06:28:291) depict that opening of 3-ph Tie breakers started at 11:06:28:332 and Main breakers at 11:06:28:333. However opening of the breakers are not confirmed in the DR channels and fault current through B-phase persists even after around 1000ms. It appears that FSTPP end breaker did not open. Powergrid may give a detailed report regarding testing carried out, problems detected and the rectification activities carried out for the main/tie breakers and the associated relays. (Action : Powergrid) --- *The relays LZ and REL relays have been replaced with new Micom and Siprotec relays.*
3. LBB for 400kV FSTPP-Malda-II connected to Bus-I did not operate. (Action : Powergrid)—*Current elements were not functional the same have been replaced. Duplication of LBB scheme will be completed by Jan, 2015.*
4. Non-opening of Behrampore end breakers due to which Directional E/F was triggered at Jeerat end. (Action : Powergrid)--- *Directional E/F settings have been revised at Behrampore as PMS=0.1, TMS=0.7 and at Jeerat as PMS=0.2 and TMS=0.85.*
5. The tripping of 315MVA ICT-III at Malda on backup O/C and that of 132kV Malda(PG)-Malda from Malda(WB) end. (Action : Powergrid)---- *Time coordination would be done by Jan, 2015.*
6. Occurrence of Over-voltage Stage-I subsequently. (Action : Powergrid)---*New CVT has reached the site and it will be installed during next opportunity shutdown.*

The progress of the action plans by the utilities will be reviewed in next PCC meeting.

ITEM NO. C.6: Efficient Evacuation of Power from 2x210 MW Tenughat TPS, Lalpania—TVNL

Arrangement for evacuation of power from Tenughat TPC is through the following two transmission lines:

- 1) Tenughat TPS to Bihar Sharif(BSEB) S/S through 400 KV Single Circuit line.

2) Tenughat TPS to Patraru TPS through 400 KV Single Circuit line.

Both lines are operating at 220 kV due to non readiness of 400 K V S/S at terminating ends.

In 27th TCC, TVNL informed that, at TVNL end the up gradation to 400 kV level is in process. Accordingly, TCC also advised JSEB to deposit the requisite amount to Powergrid for up gradation/termination work entrusted to Powergrid for operation of the line at rated voltage. This will facilitate Tenughat-Biharshariff line to be operated at 400 kV and stability of the TVNL units.

In 21st PCC, TVNL informed that 2x250 MVA ICT is already available at TVNL and the erection work is in progress. TVNL reported that work will be completed by December, 2014 at TVNL end.

Powergrid informed that, up gradation related works at 400 kV Biharshariff S/s has now stalled due to some payment issues with JSEB. However, it is expected to complete the work by December, 2014, if in the mean time payment issues get settled at earliest.

In 28th TCC Powergrid informed that payment of around 4.58 cr. is pending from JSEB and the completion of the work would take 3 months from date of payment.

JSEB informed that the payment has been delayed due to some fund constraints and it would be released shortly in 2-3 instalments starting from November, 2014.

During deliberation ERLDC expressed that conversion of 220kV Tenughat-Biharshariff line to 400kV level may not bring the total stability of Tenughat Power Station. Status of construction for 400kV Tenughat-New Ranchi D/C line and 220kV Tenughat-Govindpur-Dumka line under Powergrid consultancy were enquired. It was informed that 400kV line is under scope of Powergrid under deposit work of Jharkhand strengthening scheme for which around 450 Cr. Jharkhand has to deposit. Representative from Jharkhand informed that 220kV line is not under scope of Powergrid consultancy. TCC however advised Jharkhand and CTU to deliberate on this in lower forum of ERPC.

In 25th PCC, JSEB informed that JUSNL has already given the requisition to Energy Department (GoJ), expected to divert the fund by 15th December, 2014 for conversion of 220kV Tenughat-Biharshariff line to 400kV level.

TVNL, JSEB, Powergrid may update.

Deliberation in the meeting

JSEB informed that the payment will be released by 31st December, 2014.

ITEM NO. C.7: Members may update the following:

1. In 25th PCC, WBSETCL informed that 220 kV two main bus system will be made operational at Bidhannagar S/s by Feb, 2015.

WBSETCL may update the present status.

Deliberation in the meeting

WBSETCL informed that 220 kV two main bus system will be made operational at Bidhannagar S/s by Feb, 2015.

2. In 19th PCC after deliberation on Trippings of 220 kV lines from Hatia S/s on 24.03.14 & Disturbance in Adityapur area of JSEB on 17/03/14, JSEB was advised to thoroughly check the relay settings and coordination of relays at 132kV and 220kV S/s for satisfactory performance and report the findings to ERPC Secretariat within 15 days.

In 25th PCC, JSEB informed that

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- All relays of 220kV and 132kV at Hatia S/s have been tested and reviewed by M/S Areva in the month of July, 2014
- Replacement of old EM relays with Micom P442 in 132kV Hatia-I to Chandil line is in progress by M/s Areva and it would complete by 15th December, 2014.
- At 132/33kV Adityapur GSS, all 132kV line relays are retrofitted with Micom P441 relays and commissioned by M/s Areva on 31st March, 2014.
- JSEB informed that work has been awarded to M/S Areva for supply, retrofitting, testing and commissioning of Micom relays in 33kV feeders. The work will be completed by 15th December, 2014.

JSEB may update.

Deliberation in the meeting

JSEB updated the status as follows:

- *Replacement of old EM relays with Micom P442 in 132kV Chandil-Hatia-I line is in progress by M/s Areva and it would complete by 31st December, 2014.*
 - *JSEB informed that work has been awarded to M/S Areva for supply, retrofitting, testing and commissioning of Micom relays in 33kV feeders. The work will be completed by 31st December, 2014.*
3. In 23rd PCC, JSEB informed that the relays at 220kV Chandil S/s have been tested and agreed to give the report to ERPC Secretariat.

JSEB may update the status.

Deliberation in the meeting

JSEB informed that they will submit the testing report in next PCC meeting.

4. In 25th PCC, OPTCL informed that
- Some relays at 220 kV Theruvali S/s were already replaced and rest will also be replaced by December, 2014.
 - The new 220 kV bus bar protection at Meramundali, Theruvali and Budhipadar S/s will be put in service by December, 2014.
 - During deliberation on tripping of all lines at 400/220 kV Mendhasal S/s on 10.09.14, 24th PCC advised OPTCL to carry out testing of all the relays at Mendhasal S/s and also to review the resistive reach settings.---In progress and will be completed by Mar, 2015.
 - During deliberation on disturbance at 400/220 kV Meramundali S/S on 13.09.14, OPTCL informed that 400kV Meramundali-Mendhasal line was on tie-breaker and the main breaker is under replacement.—It will be completed by 30th November, 2014.

OPTCL may please update.

Deliberation in the meeting

OPTCL updated the latest status as follows:

- *Some relays at 220 kV Theruvali S/s were already replaced and rest will also be replaced by end of December, 2014.*
- *The new 220 kV bus bar protection at Meramundali, Theruvali and Budhipadar S/s will be put in service by end of December, 2014.*
- *During deliberation on tripping of all lines at 400/220 kV Mendhasal S/s on 10.09.14, 24th PCC advised OPTCL to carry out testing of all the relays at Mendhasal S/s and also to review the resistive reach settings.---In progress and will be completed by Mar, 2015.*

- During deliberation on disturbance at 400/220 kV Meramundali S/S on 13.09.14, OPTCL informed that 400kV Meramundali-Mendhasal line was on tie-breaker and the main breaker is under replacement.—*It will be commissioned by 31st December, 2014.*

ITEM NO. C.8: PROTECTION PHILOSOPHY OF EASTERN REGION

In the Special meetings on “Protection Co-ordination of JSEB System and its neighbouring utilities” held on 12.11.13, 05.12.13 & 28.01.14 the protection philosophy for Eastern Region was agreed as given below:

Sl. No.	Zone	Direction	Protected Line Reach Settings	Time Settings
1	Zone-1	Forward	80%	Instantaneous
2	Zone-2	Forward	120%	300 milliseconds
	Zone-2 (for 220kV and below)	Forward	120 % of the protected line or 100% of the protected line + 50% of the adjacent shortest line (whichever is less)	300 milliseconds
3	Zone-3	Forward	100 % of the protected line + Z_a	1.0 Sec
4	Zone-4	Reverse	20%	1.2 Sec

Where, Z_a = Impedance of 100% of the adjacent longest line or 90 % of the Transformer impedance (whichever is less).

In 19th PCC, all the constituents were requested to adopt the same philosophy for their inter as well as intra state lines for better protection co-ordination of their systems and Eastern Regional system as a whole. Implementation of this philosophy may also be extended for BSPTCL, DVC and West Bengal systems.

A special meeting was convened to review the zone settings of BSPTCL, DVC and West Bengal systems on 06.08.14. The zone settings as updated by the constituents (till date) are circulated in the meeting. Concerned members are requested to confirm the given settings and also update the bold and blank fields.

The updated zone settings of the various lines are available at ERPC website. PCC advised all constituents to update the settings at their end. Thereafter, a separate meeting will be convened to discuss the implementation of zone settings recommended by the Special Task Force.

A special meeting is scheduled to be convened on 30.12.2014 to review the zone settings based on CEA recommendations at ERPC, Kolkata.

Members may update.

Deliberation in the meeting

The house was informed that a special meeting is scheduled on 30.12.2014 to review the zone settings based on CEA recommendations at ERPC, Kolkata.

Members noted.

ITEM NO. C.9: Oscillations in and around Talcher

In 25th PCC, ERLDC informed that recently oscillations observed in and around Talcher STPS with a frequency of 0.2 Hz. Since the control systems of generator AVR, Governor, HVDC converter etc. have the potential to trigger the oscillations it was requested to submit the following:

- Whether any functional abnormality was observed or set point re-tuning done for the AVR/PSS or governor control loop of Talcher or GMR units.

- Whether any abnormal performance was observed or control loop re-tuning done for HVDC system at Talcher.

PCC advised concern constituents to submit the information immediately.

Thereafter, ERLDC informed that subsequent to the voltage oscillations on 13th and 14th November, 2014, three more such incidents were observed on 29th and 30th November. The power variations in various 400kV lines as recorded by PMUs in ER, have been analysed for each of these instances using the Power Swing Recognition (PSR) application of Siemens PDP installed at ERLDC and the results are summarized in the table given below:

Date	Time (Hrs.)	Talcher Voltage amplitude (peak-peak)	DOE found in PSR*	Frequency of Dominant mode ** (Hz) found in PSR	Damping Ratio
13/11/14	16:01	0.75 kV	6	0.2	-0.1
13/11/14	18:01	0.75 kV	6	0.2	-0.05
14/11/14	14:04	1 KV	6	0.2	0.0
14/11/14	16:02	1 KV	Not found	Not found	
29/11/14	17:50	0.75 kV	6	0.4	-0.01
30/11/14	08:57	Very less	6	0.5-0.6	0.02
30/11/14	17:28	0.25 KV	Not found	Not found	

* DOE(Degree Of Exposure) denotes the potential hazard of a swing event, based on its amplitude and damping, on an 11-point scale

** Mostly observed in Talcher-Rourkella mode

From the summary of analysis it may be seen that the dominant mode in most of the occasions has a frequency of 0.2 Hz. In this connection it is stated that the amplitude and damping of the dominant mode are sensitive to the AVR/PSS and governor controller parameters of nearby generators as well FACTS controllers. With proper tuning of these parameters, damping of the oscillations can be enhanced (so that they decay out rapidly) and amplitude of the dominant mode can also be attenuated.

While the issue is also being pursued with HVDC Talcher and GMR TPS, in view of repeated instances of oscillations, Talcher STPS is requested to kindly get the PSS and governor parameters of their units tested and if required, re-tuned by OEM, so that such low frequency oscillations can be effectively suppressed.

ERLDC may update.

Deliberation in the meeting

ERLDC informed that they have received communication from GMR and yet to receive the relevant information from HVDC and TSTPS stations.

TSTPS, NTPC informed that they have analyzed the oscillations for 13th and 14th November, 2014 and agreed to send the report. TSTPS, NTPC asked for PMU plots of 29th and 30th November, 2014 to analyze the oscillations. ERLDC agreed to share.

ITEM NO. C.10: ANY OTHER ITEM.

Meeting ended with vote of thanks to the chair.

Participants in 26th PCC Meeting

Venue: ERPC Conference Room

Time: 11:00 hrs

Date: 22.12.14 (Monday)

Sl No	Name	Designation	Organization	Contact Number	Email	Signature
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"Coming together is a beginning, staying together is progress, and working together is success." - Henry Ford

Participants in 26th PCC Meeting

Venue: ERPC Conference Room

Time: 11:00 hrs

Date: 22.12.14 (Monday)

Sl No	Name	Designation	Organization	Contact Number	Email	Signature
21	M. Baran	DLECT	CHSC	963312182	msnik.baswe@gmail.com	Baran
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32	D. K. Bauri	EE	ERPC	9883617236	eeep.erpc.gov.in	D.K.
33	B. SARKHEL	SE(PS)	ERPC	943306529		B.S.
34	JOYDEB BANDYOPADHYAY	SE(PS)	"			J.B.
35	G. P. Das	AEE	ERPC	9547891553	esecb-ee@gmail.com	G.P.
36	V. Kalyanaswami	EE	ERPC	2421015		V.K.
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40	PRABIR HALDAR	DGM (OS)	WBPDCL	8336903685	pheldar@wbpdcl.co.in	P.H.

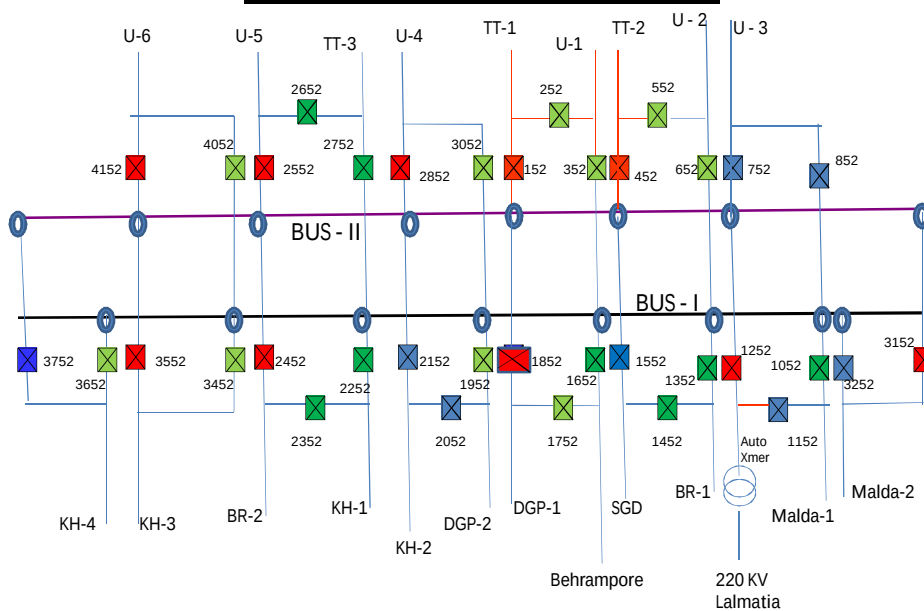
"Coming together is a beginning, staying together is progress, and working together is success." -Henry Ford

Annexure-B.1

**TRIPPING OF 400KV BUS-II
ON 06/11/2014 AT 17:30HRS DUE TO MALFUNCTIONING
OF BFR ELEMENT RXTCB1 OF BREAKER NO. 2152**

1

BUS CONFIGURATION



2

PRE CONDITION...

The following breakers were under shutdown prior to this incident:

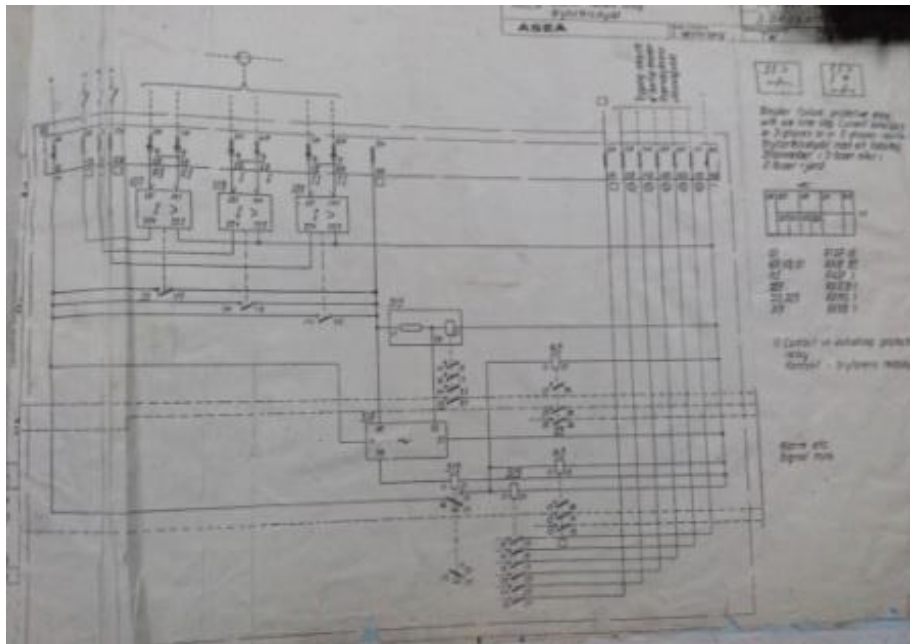
- 1152- For breaker replacement
- 1552- Under PTW
- 3252- Under PTW
- 2052- Relay retrofitting job
- 2152- Relay retrofitting job
- 752- Unit-3 shutdown
- 852- Unit-3 shutdown

3

INCIDENT

400KV Bus-II tripped on 06/11/2014 at 17:30hrs due to malfunction of BFR element RXTCB1 of CB2152. Relay 307 (RXTCB1) relay is an DC surge filter unit and its output contact was operated without any input DC at its terminal no. 18 as per attached BFR scheme. The output contact (terminal no. 28) is being used for operation of timer unit 319 and output contact of this timer is used for energisation of BUS-II trip relay.

4



5

Consequences

As a result of Bus-II tripping the following breakers opened at NTPC Farakka:
152, 452, 1252, 1852, 2452, 3552, 4152, 2552, 2852 & 3152

The following lines had tripped because of:
220kV Farakka-Lalmatia line (Since 1252 tripped & 1152 was already open)
400kV Farakka-Malda line-2 (Since 3152 tripped and 3252 was already open)
400kV Farakka-Kahalgaon line-3 breaker opened at Kahalgaon end.

400kV Bus-II was taken in service at 17:49

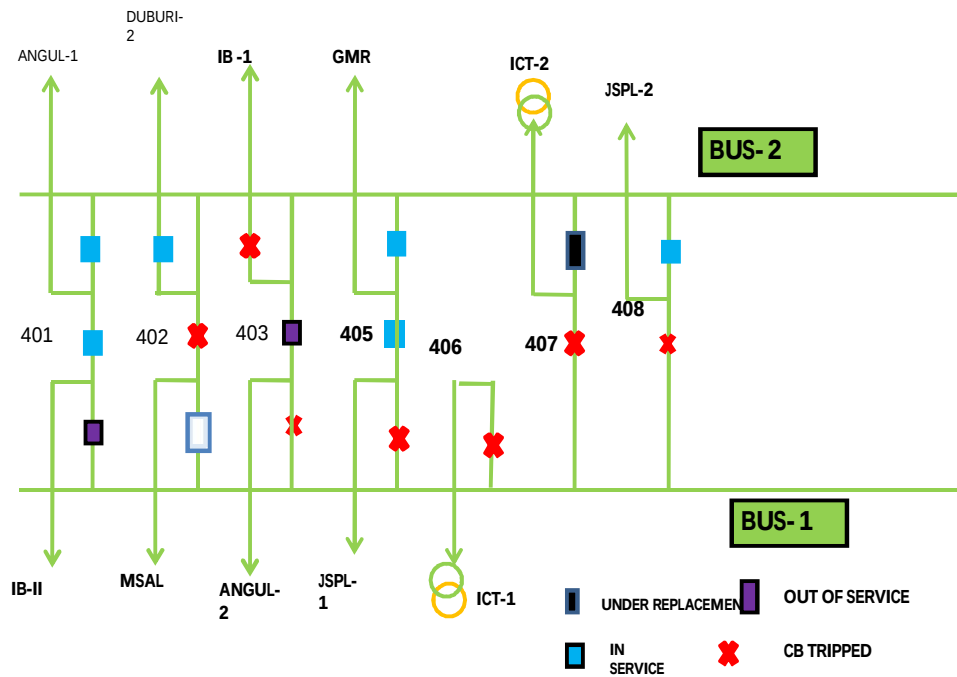
6

Annexure-B2.1**ANALYSIS OF SYSTEM DISTURBANCE ON
08.11.14 AT MERAMUNDALI GRID**

P.K.PATTANAIK
OPTCL, BHUBANESWAR

STATUS OF 400 KV DIA (BREAKERS)

Diameter	Bus I	Bus II	DIA Status
401	Ib -II Idle Charge	Angul-1	52A Not in CKT
402	Mendhasal	Duburi-2 Idle Charge	52A under replacement
403	Angul-2	Ib –I (Idle)	52T not in ckt.
405	JSPL-I	GMR	OK
406	ICT-I	SPARE	52B, 52T not functioning.
407	SPARE	ICT-2	52A bypassed. 52B under replacement
408	SPARE	JSPL-II	52A bypassed.



Fault Report: 08.11.2014: 23:20 Hrs

- 1 400kV IB - I tripped (Zone-1. B phase E/F, distance 34.4kM)**
- 2 400kV Mendhasal 52T tripped on DTT (Overvoltage trip at Mendhasal.)**
- 3 400kV Angul-II -52A Tripped on 96 relay operation (Busbar)**
- 4 400kVJSPL-I 52A tripped on 96 relay operation (Busbar)**
- 5 400kV GMR Tripped at GMR end On O/C & E/F protection.**
- 6 400kV ICT-I 52A tripped on 96 relay operation (Busbar)**
- 7 400kV ICT-II 52A tripped on 96 relay operation (Busbar)**
- 8 400kVJSPL-II 52T Tripped on 96 relay operation (Busbar)**

400 KV TRIPPING DETAILS AT MERAMUNDALI

SL	FEEDERS	RELAY	REMARKS
1.	IB-1 Idle charged	B-N Trip , Zone-1	Tripping on Zone-1, with distance 34.4 KMs The DR of Siemens 7SA552 of 400kV IB-1 attached (Successful clearance of Fault)
2.	JSPL -52T	Tripped on Bus bar Protn	MAL-OPERATION relay due to suspected defect in bus bar element of 408 tie CT, BUS BAR Actuated (As confirmed from the differential current availability in the system during NORMAL Condition).
3.	Angul-2, JSPL-1, ICT-1/2	96 – Bus Bar	The 400kV Bus bar 7SS60 (SIEMENS). As the BUS-I is directly connected to Tie CB of 408 Dia being assigned with Bus-I bus bar protection and causes tripping all BUS-1 Breakers
4	Mendhasal	DTT	During fault condition and outage of load at Meramundali end, the healthy phase voltages raised and causes the PICK UP of Over Voltage relay at Mendhasal end. But DROP OUT voltage being LOW(Confirmed from the testing of the relay), this relay AT Mendhasal end issued TRIP COMMAND and on DTT, Mendhasal fdr at Meramundali end tripped.
5.	GMR at GMR end	OC/EF On HSet	Because of LOW setting of Hset at GMR end, Feeder tripped at GMR end

REMEDIAL MEASURES AFTER THE DISTURBANCE

1. 408 TIE is kept out of service .
2. Works on Progress for completion of 408 DIA for connectivity to GMR and shifting of BUS-1 Protection from Bus -1 CT and cross CT of Tie with rectification of problem)
3. BUS – 2 CB (SIEMENS) of 407 dia commissioned on 30.11.2014.
4. 403 Tie CB (BHEL) has been rectified and taken into service from 30.11.2014
5. BUS – 1 CB (SIEMENS) of 402 dia expected to be commissioned by 26.12.2014
6. Back up Relay at GMR end advised to be blocked with Hset of EF element or to set higher in co-ordination to Zone-2/3 Value.
7. The setting of Over Voltage feature at Mendhasal end kept at 72 Volt after testing of the relay.

Annexure-B2.2

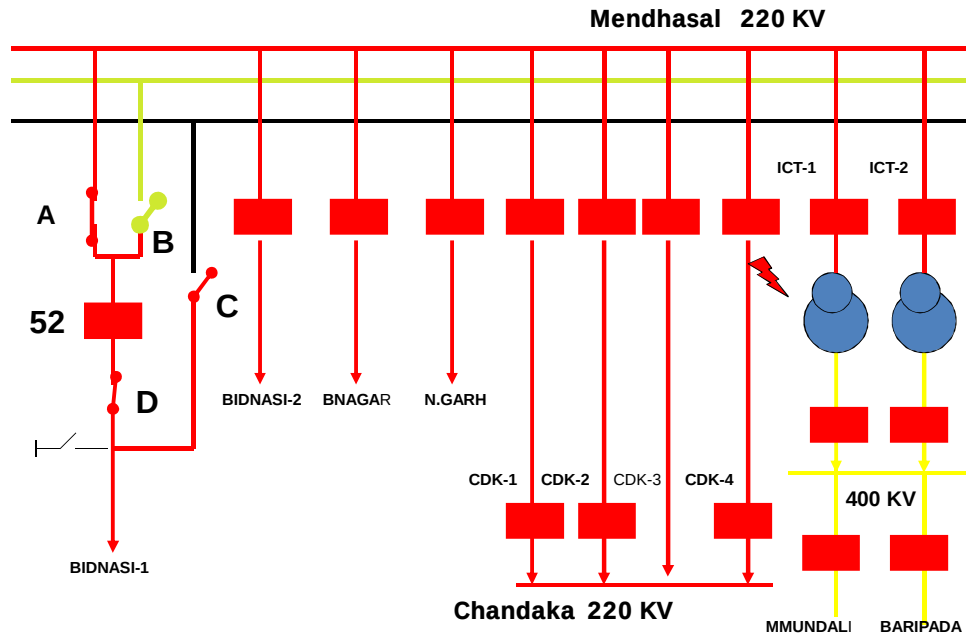
**ANALYSIS OF SYSTEM DISTURBANCE ON
29.11.14 AT MENDHASAL GRID**

P.K.PATTANAIK
OPTCL, BHUBANESWAR

**SYSTEM DISTURBANCE ON
29.11.14 at 15.26 HRS.**

INCIDENT :- On dated 29th Nov-2014 , 220KV Y-phase LA of Chandaka CKT-4 Feeder at Mendhsal end failed causing the trip of all the the 4nos of 220KV Chandaka Lines and power supply interruption to Chandaka Grid.

MENDHASAL SYSTEM



TRIPPING DETAILS AT MENDHASAL

SL	FEEDERS	RELAY	REMARKS
1.	CDK-1	O/C, E/F	IL1-0.68KA, IL2-2.01KA , IL3-0.35KA, Time (396msec)
2.	CDK-2	O/C, E/F	IL1-0.68KA, IL2-2.03KA , IL3-0.35KA, Time (385msec)
3.	CDK-3	O/C & E/F	IL1-0.36KA, IL2- 2.34 KA , IL3-0.628 KA, IN= 3.22 KA (SIGRA), Time (212 msec)
4	CDK-4	DP-1/2	IL1-0.37KA, IL2-10.81KA , IL3-0.17KA (Zone1, CSS, Loop L2E, Distance- 0.1KM (0.4%)).
5.	MMUNDALI	OV	IL1-0.20KA, IL2-0.20 KA, IL3-0.19KA (4998mSec) SIGRA :- V1E= 82.2 Volt remained for 22mSec, drop to 68.2V, remained beyond 1 sec. (value set at 70 Volt, Time 5 Sec) , V2E = 68.3 V(Max), 33.5 V during fault (Min), V3E = 68.3 V (Max), 58.5 V during fault (Min)

TRIPPING DETAILS AT REMOTE CHANDAKA

SL	FEEDERS	RELAY	REMARKS
1.	MSAL-4	DP-1/2	Zone 2 loop L2-E at 20.1 Km(101%), IL1= 0.01 KA, IL2= 4.76 KA, IL3= 0.01 KA at 487 mSec.

ANALYSIS OF THE DISTURBANCE

1. Fault on LA of Chandaka -4, DP actuated on Zone 1 at Mendhasal end with sending of Carrier signal to Chandaka. Fault being on Zone2, Chandaka end DP tripped on **Zone 2 with time delay of 487 mSec.**
2. This Delay tripping of DP at Chandaka end of line-4, the other relays tripped at Mendhasal end.
[O/C , E/F tripping for Chandaka 1,2,3 (Setting OC – 1.0, 0.1S, EF- 0.2, 0.1S) tripped at **212mS of Line3, 396mS/385mS for Line 1/2.**]
3. Now outage of approx 190 MW load, results OV actuation of 400 Kv Meramundali line after 4998 mSec. (Concluded from testing. The relay picks up 70.04 V, drops out at 66.52 V. On the day of disturbance the relay had been picked up at 82.2 Volt and remained with voltage of 68.2V till the elapse of setting value, for which the trip command was issued and line was tripped at Mendhasal end with DTT for remote end Trip).

REMEDIAL MEASURES AFTER THE DISTURBANCE

1. All the relays tested, time setting of OC/EF at Mendhasal changed from 0.1 to 0.25 dial (More than Z2 setting of 300mSec.)
2. OV setting on 400Kv Meramundali at Mendhsal end changed from 70V to 72 V(Relay tested and found with drop out of 95% of nominal).

Annexure-I

S.No	Date	Time	Line(s) tripped	Fault clearance time (PMU)	Reason	A/R Status FROM	A/R Status (TO)	Relay indications (Local End)	Relay indications (Remote End)	Observations / queries based on PMU	Deliberation in the meeting
1	01/11/14	08:34	400kV KOLAGHAT - KHARAGPUR S/C	< 100	B-N Fault			B-N Fault	NA	Low Voltage dip within 400 ms	Auto reclosure succesfull at Kharagpur end. No information at KTPP end WBPDCI agreed to send.
2	02/11/14	09:10	220kV BUDDHIPADAR - RAIGARH	-	TRIPPED FROM BUDDHIPADAR ONLY ON O/C			O/C	NA	220kV Budhipadar-Katapalli D/C & 220kV Budhipadar-Korba-II were under shutdown	The plug setting at Raigarh and Tarkera-I & II has been enhanced to 125% from 100%.
3	02/11/14	10:50	220kV BUDDHIPADAR - RAIGARH	-	TRIPPED FROM BUDDHIPADAR ONLY ON O/C			O/C	NA	220kV Budhipadar-Katapalli D/C & 220kV Budhipadar-Korba-II were under shutdown	
4	02/11/14	13:51	220kV BUDDHIPADAR - RAIGARH	-	TRIPPED FROM BUDDHIPADAR ONLY ON O/C			O/C	NA	220kV Budhipadar-Katapalli D/C & 220kV Budhipadar-Korba-II were under shutdown	
5	04/11/14	12:37	400kV JEYPORE - BOLANGIR	<100	R-N FAULT	Successfully Operated	Unoperated	R-N FAULT	NA	SUCCESSFUL AUTO RECLOSE AT JEYPORE ONLY	Autoreclosure at Bolangir end is checked and found OK
6	05/11/14	00:12	400kV BARH -KAHALGAON-I	<100	Y-N FAULT			E/F F/L 49 km			After AR operation the fault was persisted and converted into 3-phase fault.
7	05/11/14	12:47	400kV GMR-MERAMUNDALI		TRIPPED AT GMR END ONLY			TRIPPED AT GMR END ONLY	NOT TRIPPED		
8	05/11/14	12:44	400kV ANGUL-BOLANGIR	<100							PG-Odisha to submit the report
9	06/11/14	11:24	400kV GMR-MERAMUNDALI	< 100MS	R-N	Unoperated		Z-1	DID NOT TRIP		No tripping
10	06/11/14	11:24	400kV ANGUL-BOLANGIR S/C	< 100MS	B-N	Unsuccessfully Operated	Unoperated	B-N, 6.6 kA F/C, F/L 82 km from Angul	B-N, 0.81 kA F/C, F/L85 km from Bolangir	As fault is on Z-1 from both side , so A/R should operated from both end	Bolangir end fault location was not correct, need shutdown for thorough checking.
11	06/11/14	12:26	400kV GMR-MERAMUNDALI	< 100MS		Unoperated		Z-1	DID NOT TRIP		
12	06/11/14	12:26	400kV ANGUL-BOLANGIR S/C	< 100MS	B-N	Successfully Operated	Unoperated	B-N, 3.15 kA F/C, F/L 44 from Angul	B-N, 0.81 kA F/C, F/L 82.5 kM from Bolangir	A/R operated succesfully from Angul end but subsequently tripped due to 2nd fault occurred within recliam time. And also from Talcher PMU it has shown.	
13	07/11/14	11:44	400kV ROURKELLA-JAMSHEDPUR II	< 100MS	MAL OPERATION OF NGR - BUCHOLTZ RELAY AT RKL	Unoperated	Unoperated	NA	NA		Line reactor was opened
14	12/11/14	10:09	400kV Raigarh - Ind Bharat	<100MS	R-B Fault	Not Applicable	Not Applicable			Line tripped while first time charging at Raigarh. No code is taken from ERLDC	All switcting actions should take code from ERLDC
15	21/11/14	13:48	220kV Santaldih-Chandil		tripped at chandil end			did not trip	master trip 86	no dip observed at any place.it seems relay maloperation	
16	21/11/14	16:06	220kV Chandil-Ranchi		tripped at chandil end			master trip relay 86	did not trip	1kv dip in all 3phases	
17	21/11/14	16:06	220kV Chandil-Santaldih		tripped at chandil end			master trip relay 86	did not trip	1kv dip in all 3phases	
18	22/11/14	13:15	220kV Chandil-Ranchi	> 300 ms					B-N FAULT, DP	Approx. 3kv Dip in all 3-Ph voltage.	
19	28/11/14	17:55	400kV BARIPADA-TISCO	NA	DT RECEIVED AT TISCO			DID NOT TIP	DT RECEIVED	NO VOLTAGE DIP OBSERVED AT ANY PMU	No report recieved from Baripada