EASTERN REGIONAL POWER COMMITTEE

MINUTES OF 28th PROTECTION SUB-COMMITTEE MEETING HELD AT ERPC, KOLKATA ON 25.02.2015 (WEDNESDAY) AT 11:00 HOURS

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

Member Secretary, ERPC chaired the meeting and welcomed the participants.

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

PART – A

ITEM NO. A.1: Confirmation of minutes of 27th Protection sub-Committee Meeting held on 21st January, 2015 at ERPC, Kolkata.

The minutes of 27th Protection Sub-Committee meeting held on 21.01.15 circulated vide letter dated 06.02.15.

No comments have been received from any constituent.

The minutes of the above meetings may be confirmed.

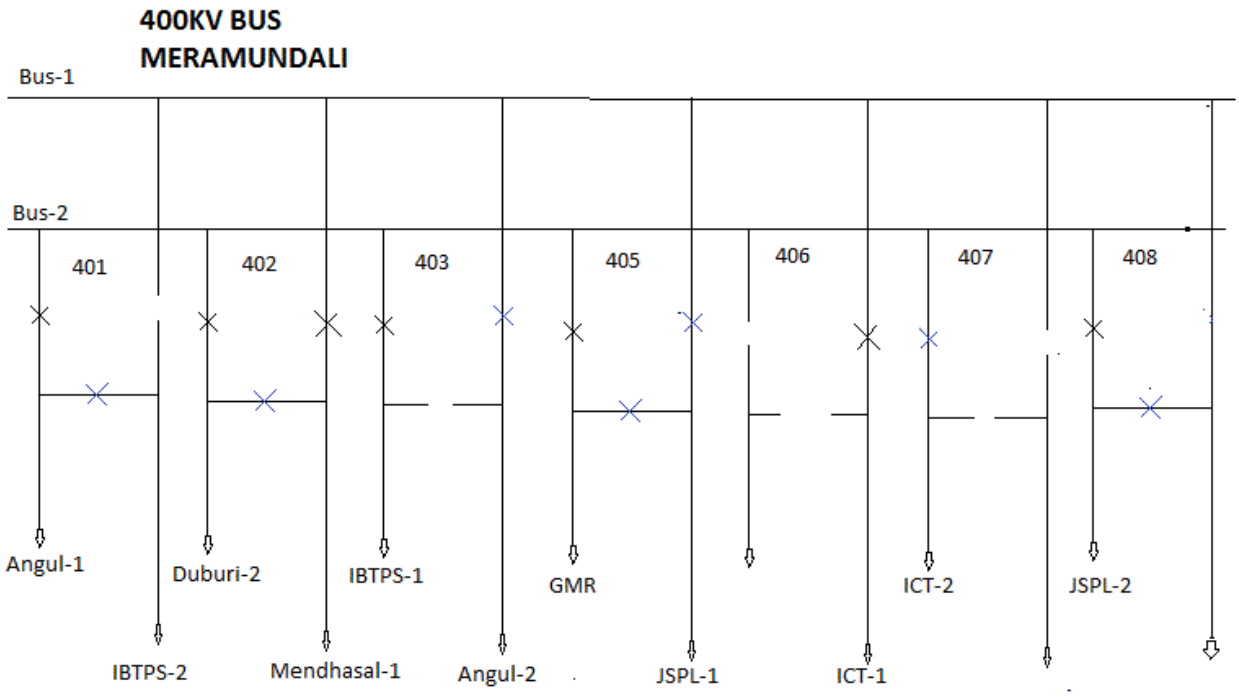
Deliberation in the meeting

Members confirmed the above minutes.

PART – B

ANALYSIS & DISCUSSION ON GRID INCIDENCES WHICH OCCURRED IN CTU/STU SYSTEMS DURING JANUARY, 2015.

ITEM NO. B.1: Disturbance at 400/220 kV Meramundali S/S of OPTCL on 02.01.15 at 05:40hrs & 06:04 hrs.



At 05:40 hrs, 400kV Meramundali-Angul-I&II, Meramundali-IbTPS I & II, Meramundali-New Dubri-II tripped on over voltage at Meramundali S/s. Simultaneously, 220kV Kaniha line II and Bhushan line I tripped.

At 06:04hrs 400kV JSPL line-I&II and 400kV Kaniha also tripped at Meramundali S/s on over voltage. Voltage at Meramundali S/s was observed to be more than 440kV.

OPTCL may explain.

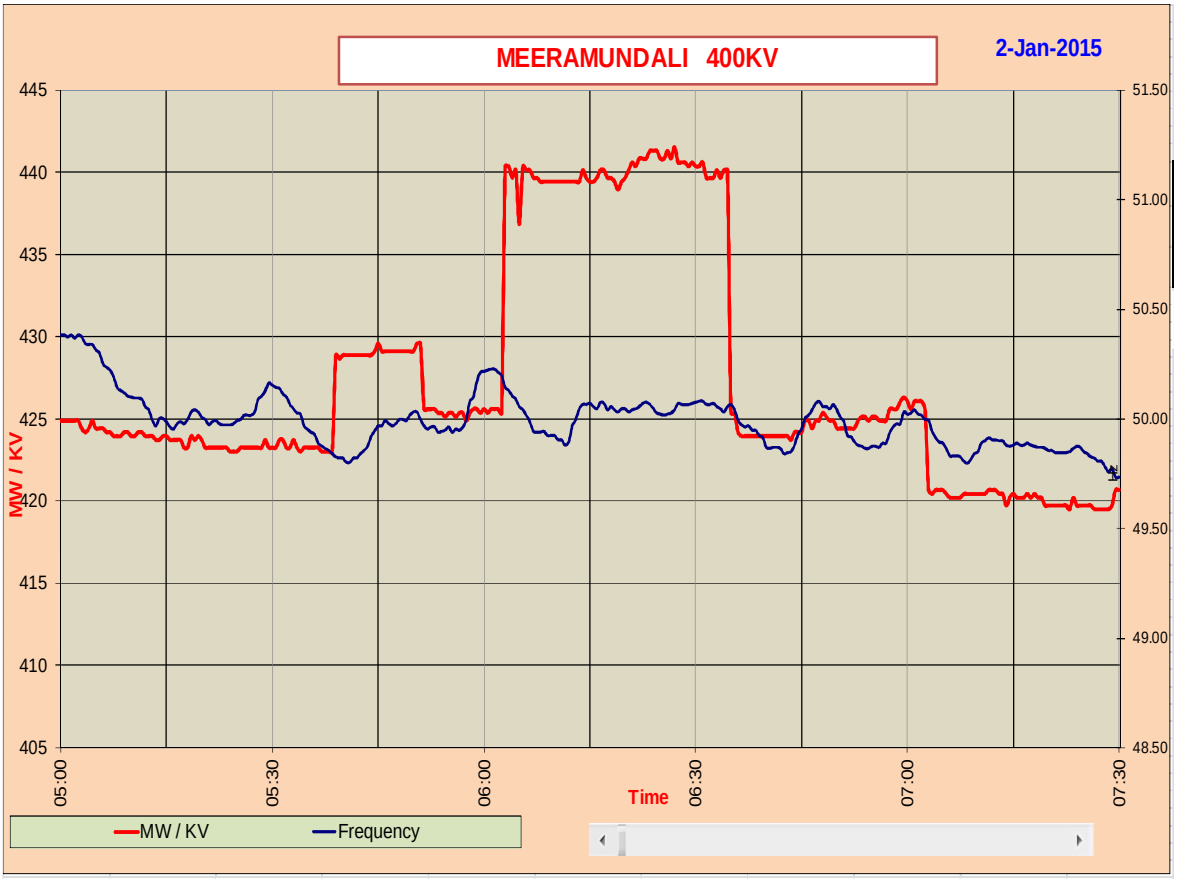
Deliberation in the meeting

OPTCL explained the tripping incidence with a presentation. Presentation is enclosed in ***Annexure-B.1****.*

OPTCL has shown the day wise voltage profile during January, 2015 and explained that 400kV Meramundali is continuously experiencing severe over voltage problem which caused several tripping of the lines on overvoltage. The relay indication for tripping of 220kV Meramundali-Kaniha line-II on broken conductor was reportedly due to malfunction of relay. It has been informed that the old relay will be replaced with new Micom P442 and presently, the broken conductor feature of the relay has been kept on alarm mode. The tripping report of 220kV Meramundali-Bhushan line-I could not be obtained.

On query, OPTCL updated that bus CVT at 400kV Meramundali S/s had been checked in the mean time and the results were found to be satisfactory. The idle charged 400kV Meramundali-IbTPS D/C lines are now charged at 220kV.

ERLDC explained with the help of SCADA output of 400kV Meramundali bus voltage on 2.1.2015 at 05:40hrs and 6:01 hrs, that there was sudden rise of voltage at Meramundali S/s. Moreover, at 06:01hrs the voltage shot up from 425kV to 440kV and sustained at that level up to 06:34 Hrs.



SCADA voltage and frequency output on 02.01.2015 between 5AM to 7:30AM

After detailed deliberation on the incidence, it was concluded that over voltage at Meramundali S/s was due to more MVAR injection of the associated 400kV lines (both operational/idle charged) and only 400kV Meramundali-Angul line-I&II is the only sink of reactive power.

PCC advised OPTCL to take the following actions to minimize the impact of over voltage:

- *Investigate the reason for such sudden rise in voltage and also to carry out MVAR flow study at 400kV Meramundali S/s during over voltage scenario/condition.*
- *Shift the idle charged 400 kV Meramundali-New Dubri line from Meramundali end to other source or lower voltage level for overvoltage relief.*
- *Set the pickup to drop up ratio of overvoltage relay setting at more than 98%.*
- *Voltage grading should be done for over voltage settings for all the lines of Meramundali S/s.*
- *The 80 MVAR line reactor of 400kV Meramundali-Jeypore line (Presently with Meramundali-Angul line-I of Powergrid) which was out of service for long due to non-availability of 400kV LA and other problems, should be charged immediately.*
- *The 50MVAR line reactor of 400kV Meramundali-IbTPS line-II shall be connected as a bus reactor.*
- *The 50MVAR line reactor of 400kV Meramundali-IbTPS line-I shall also be connected as bus reactor after necessary rectification of LA & PT selection switch.*
- *Main CB of 400kV Meramundali-Mendasal line shall be commissioned expeditiously.*

OPTCL agreed.

PCC advised Talcher, NTPC to check the PLCC system since DT signal was not received from Meramundali end on tripping of 400kV Meramundali-TSTPS line. NTPC agreed to report.

In case of continuous overvoltage condition at Meramundali S/s reported by SLDC, OPTCL, ERLDC will explore to resort to S/C operation of 400kV D/C lines around neighboring Sub-stations if line loading is within safe limits particularly during lean hours of the day.

ITEM NO. B.2: Disturbance at 400kV Meramundali and 765/400kV Angul S/s on 20.01.15 at 11:20 hrs

At 11:20hrs the following lines are tripped from Meramundali S/s,

- 400kV Meramundali-Angul-I tripped on B-ph, E/F, distance 13.3 km
- Meramundali-IbTPS line-I tripped at Meramundali S/s on O/V
- 220kV Meramundali-Kaniha line-II tripped only from Meramundali end
- 220kV ICT-I&II tripped on O/C, E/F

OPTCL may explain.

Deliberation in the meeting

OPTCL informed that 400kV Meramundali-Angul-I tripped on distance protection with relay indication B-ph, E/F, distance 13.3 km. Subsequently, on physical inspection they did not found any fault in the line.

After the tripping of 400kV Meramundali-Angul line-I which is the only sink of reactive power, there was voltage rise at Meramundali S/s and 400kV Meramundali-IbTPS line-I got tripped on over voltage. The relay indication for tripping of 220kV Meramundali-Kaniha line-II on broken conductor was reportedly due to malfunction of relay. It has been informed that the old relay will be replaced with new Micom P442 and presently, the broken conductor feature of the relay has been kept on alarm mode.

The tripping of 400/220kV, 315MVA ICT-I and ICT-II from LV side on O/C, E/F, OPTCL submitted that the high current set value was at lower end (ICT-I at 2.63kA & ICT-II at 2.65kA at 220kV). The high current set value is now under review.

Powergrid informed in the meeting that B-ph CT failure was occurred at tie breaker of 765/400kV Angul S/s at that instant.

Since B-ph CT failure was occurred at Angul S/s, 400kV Meramundali-Angul line-I should have tripped on zone 2 distance protection from Meramundali end. Accordingly, PCC advised OPTCL to review the distance relay settings of 400kV Meramundali-Angul-I.

On enquiry about non-clearance of fault from Angul end, Powergrid informed that on that day 400 kV Angul- Bolangir was tripped on DT received from Bolangir S/S which was due to reverse CT ratio and the same was rectified thereafter.

Since Powergrid is not submitting the tripping report to ERLDC/ERPC, Powergrid was requested to submit a detailed report within a week and it was decided to discuss further the tripping incidence in next PCC meeting.

ITEM NO. B.3: Tripping of 400 kV FSTPP-Malda-II on 04/01/2015 at 11:47 Hrs.

It has been reported that 400 kV FSTPP-Malda –II tripped from Malda end at 11:47 hrs of 04/01/2015 on DT received at Malda. The said line did not trip from FSTPP end as reported by FSTPP.

Powergrid and NTPC may explain.

Deliberation in the meeting

Powergrid informed that DT was received at Malda end from FSTPP while NTPC confirmed that no relay was operated from FSTPP end.

Powergrid therefore informed that the reason behind initiation of DT from FSTPP end is still under investigation.

ERLDC informed they have written letter to Powergrid ER-II and FSTPP, NTPC on 5th January, 2015 but reply is still awaited.

PCC took serious note of not taking action by Powergrid in time and advised Powergrid to check the PLCC system installed at FSTPP, NTPC immediately and report to ERPC and ERLDC.

Powergrid agreed.

ITEM NO. B.4: Tripping incidences in the month of January, 2015

Other tripping incidences occurred in the month of January, 2015 which needs explanation from constituents of either of the end. Details are circulated in the meeting.

Members may discuss.

Deliberation in the meeting

Members explained the tripping incidences. Details are enclosed in **Annexure-B.4.**

ITEM NO. B.5: Submission of Grid incidence reports

It has been observed that grid incidence reports though being submitted in the prescribed format are not furnished properly as they are not accompanied by relay indications or supported by proper analysis and are without DR/EL printouts. Also, in case of disturbances, ERLDC is issuing messages asking for DR/EL printouts with full relay indications, and such data are sometimes not received properly or are time delayed.

In 29th TCC Meeting, ERLDC informed that in the absence of DR and EL output files the analysis of tripping incidences becomes very difficult and thereby PCC fails to give proper recommendation.

TCC advised all constituents to submit the DR and EL output files during tripping incidences to facilitate proper analysis without failures.

The list of disturbances that occurred in the month of January, 2015 along the details received from the constituents is attached at **Annexure-B.5**.

Constituents are requested to note that they should take necessary action in future to furnish the complete data including DR/EL/tripping analysis, within the stipulated time.

Deliberation in the meeting

PCC once again advised all constituents to comply within stipulated time. All constituents agreed.

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: Disturbance at 400 kV Meramundali & Mendhasal S/S on 05.12.14 at 14:01 hrs & 19:05 hrs.

1. Disturbance at 400 kV Meramundali S/S on 05.12.14 at 14:01 hrs.

In 27th PCC meeting, PCC advised OPTCL to carry out the following actions and place the outcome in the ensuing 29th TCC Meeting to be held on 13.02.2015:

- Investigate the tripping incident with the relay manufacturer on delayed fault detection by the distance protection, which was supposed to detect in zone 1.
- Check all the protection elements pertaining to 400KV Meramundali-Angul line-II
- Implement Main-I & Main-II relays of different manufacturers for distance protection of 400kV lines at Meramundali S/s.

GMR end tripping details are not available and GMR representative was not available for discussion. Relays settings of 400 kV GMR-Meramundali and GMR-Talcher at GMR end needs to be checked and corrected.

In 29th TCC Meeting, OPTCL informed that,

i. They already communicated the issue of delayed fault detection by the distance protection to relay manufacturer. Manufacturers' views awaited.
ii. All the protection elements pertaining to 400KV Meramundali-Angul line-II have been checked and the report has been submitted to ERPC Secretariat.
iii. Implementation of Main-I & Main-II relays of different manufacturers for distance protection of 400kV lines at Meramundali S/s will take around one and half year.

ERPC Secretariat informed that since 2009 several recommendations have been given to OPTCL for improvement of the protection system in and around Meramundali. However, OPTCL failed to implement most of the recommendations.

OPTCL informed that they engaged CPRI for protection audit of four of their sub-stations.

After deliberation, TCC felt that further course of action will be decided after receiving the recommendations of CPRI.

OPTCL may update.

2. Tripping of 400 kV Meramundali-Mendhasal S/C line on 05.12.14 at 19:05hrs.

In 27th PCC, OPTCL explained that consequent upon B-ph, LA burst out, 400kV Meramundali-Mendhasal S/c line tripped from both ends. This tripping was in order, but 400/220kV, 315MVA ICT-I and ICT-II tripped from LV side on O/C, E/F. OPTCL has submitted the O/C relay settings of both the ICTs and informed that OPTCL is reviewing the high current set value.

Relay Element	400kV side	220kV side
CT Ratio	1000/1A	1200/1A
I>>	5A , TD-O	6A , TD-O
I>	3A,TD-0.3S	5A,TD-0.3S
Ip	0.5A, TM- 0.30	0.7A, TM- 0.25
IN >>	4A , TD-O	5A , TD-O
IN >	2A,TD-0.3S	2A,TD-0.3S
IpN	0.2A, TM- 0.35	0.2A, TM- 0.30

PCC felt that frequent tripping incidences are being occurred in OPTCL system because of bursting of LA, OPTCL should check the healthiness of LAs by injecting 3rd harmonic resistive current periodically.

On sharing the experiences with the constituents, Powergrid informed that they generally carry out this testing on pre and post monsoon season when the chance of moisture ingress is high and with this, they are able to identify the defective LAs.

Since OPTCL did not have such testing kit at present, Powergrid-Odisha projects was requested to extend help to OPTCL by providing the test kit to measure the condition of LAs at Meramundali. OPTCL was advised to submit the report in the ensuing 29th TCC Meeting to be held on 13.02.2015.

OPTCL agreed.

GMR end tripping details are not available and GMR representative was not available for discussion.

In 29th TCC, OPTCL informed that, all LAs have been tested with help of Powergrid and the results are satisfactory. The results have already been submitted to ERPC Secretariat.

During preliminary study, it appeared that the ground resistance which is supposed to be less than 1 ohm is more than that.

After deliberation, TCC felt that further course of action will be decided after receiving the recommendations of CPRI.

OPTCL may update.

ITEM NO. C.2: Disturbance at 400kV Meramundali S/S on 06.12.14 at 17:47 hrs

At 17:47hrs, B-Ø LA of 400kV Meramundali-Angul-II line blasted at Meramundali end causing tripping of following elements:

- 400kV Meramundali-Angul-II (B-Ø, ib-19.77kA at Meramundali, DT received at Angul end)
- 400kV Meramundali-Mendhasal (Reverse zone, E//F at Meramundali, DT received at Mendhasal)
- 400/220kV, 315MVA ICT-I & II at Meramundali (tripped from 220kV side, B-Ø, O/C, 4.69kA)
- 400kV GMR-Meramundali (MICOM P442: start ph B, trip ph RYB, O/C (instantaneous), If=9kA at GMR end, Meramundali end did not trip)
- 400kV GMR-Talcher (MICOM P442: start ph ABC, O/V stg-1 at GMR end, Talcher end did not trip)
- GMR Unit-1 and 2(2X350 MW)
- 400kV Bolangir-Angul (DT received at Bolangir end but Angul end did not trip)

OPTCL, Powergrid and GMR may deliberate on following points:

i. The fault in 400kV Meramundali-Angul-II was not detected from Angul end, only received a DT signal from Meramundali.
ii. Tripping of both ICTs from LV side of Meramundali also needs to be explained.
iii. Since the PMU plot shows the fault clearance time was around 80ms, OPTCL may explain the tripping of 400kV Meramundali-Mendhasal line in reverse zone. OPTCL may place reverse zone settings.
iv. OPTCL may explain the tripping incidence with DR, EL and relay flags.
v. Relays settings of 400 kV GMR-Meramundali and GMR-Talcher at GMR end needs to be checked and reviewed.
vi. Bolangir end has received the DT but Angul end did not trip needs to be investigated.
vii. OPTCL may place the latest status on commissioning of remaining breakers at Meramundali for a stronger coupling of 400kV Bus-I & II.

In 29th TCC, it was felt that further course of action will be decided after receiving the recommendations of CPRI.

OPTCL may update.

ITEM NO. C.3: Disturbance at 400kV Meramundali S/S on 17.12.14 at 16:43 hrs

At 16:43hrs, R-Ø LA of 400kV Meramundali-IBTPS-I reactor burst at Meramundali S/s casing tripping of following elements:

- 400kV Meramundali-IBTPS-I line tripped on R-Ø, E/F, Z-1 at Meeramundali.
- 400kV Meramundali-Mendhasal ckt tripped on R-Y-B-Ø relay indication.
- 400kV GMR-Meramundali ckt tripped from GMR end on R-Ø, E/F.

OPTCL and GMR may deliberate on following points:

i. OPTCL may place DR output of 400kV Meramundali-IBTPS-I line tripping and the details of Meramundali end fault clearance time.
ii. OPTCL may explain the tripping of 400kV Meramundali-Mendhasal ckt along with DR output.
iii. OPTCL may place all the relay settings of 400kV Meramundali-Mendhasal line at Meramundali end.
iv. Relays settings of 400 kV GMR-Meramundali needs to be checked and reviewed.

In 29th TCC, it was felt that further course of action will be decided after receiving the recommendations of CPRI.

OPTCL may update.

Deliberation in the meeting

For Item no. C.1, C.2 and C.3, OPTCL informed that schedule of Protection Audit is yet to be confirmed by CPRI.

PCC noted.

ITEM NO. C.4: Repeated tripping of lines from Meramundali end on over-voltage

In 27th PCC, OPTCL was advised to explore the possibilities of charging idle charged lines from other end instead of charging from Meramundli end or at suitable voltage level so that the over voltage tripping problem at 400kV Meramundali S/s could be minimized.

Even after the above action does not yield results, OPTCL may consider to do the grading in over voltage settings, so that idle charged lines will trip first and provide relief for over voltage.

OPTCL agreed.

Thereafter, ERLDC informed that on 2nd January, 2015 sudden rise in voltage (440kV) had been observed at 400kV Meramundali S/s and it was remained for about 30 min.

PCC advised OPTCL to examine the reason behind such high voltage, and check the output of bus CVT in particular and report. OPTCL may also consider to employ numerical relay for over voltage protection which has pickup to drop off ratio above 95%.

OPTCL agreed.

OPTCL may update.

Deliberation in the meeting

The issue was already discussed under Item no. B.1.

ITEM NO. C.5: Oscillations observed in CESC system at early hours of 06/01/15

In 27th PCC, CESC informed that from 1st January, 2015 mostly during lean hours they have observed significant active power flow fluctuations in MW (but not in MVAR). On 6th January, 2015 the oscillations were so severe fluctuations of power flow remained in the ranges of about 130 MW to 150 MW. Finding no other alternatives, they had changed the grid synchronizing point from 132kV Kasba S/s to Howrah S/s and thereafter the situation got stabilized. At present, they are not observing any oscillations.

CESC also informed that they had already engaged PRDC to investigate the problem and PRDC agreed to give the report within one month.

CESC, SLDC was advised to continue their grid synchronizing point at Howrah S/s until they get report from PRDC.

ERLDC informed that they observed sudden spikes in MVAR flow of CHMKR-I & II lines on 6th January, 2015 at around 00:01 hrs and shown the SCADA output.

PCC advised CESC to look into it. CESC agreed.

CESC may update.

Deliberation in the meeting

CESC informed that they will update the status in tomorrow's OCC meeting.

ITEM NO. C.6: Oscillations in and around Talcher

In 27th PCC, NTPC has submitted a report, wherein it was mentioned that oscillations are significant in MVAR flow and however, no abnormality has been seen in NTPC Talcher machines. The reactive power control of HVDC system might be the reason.

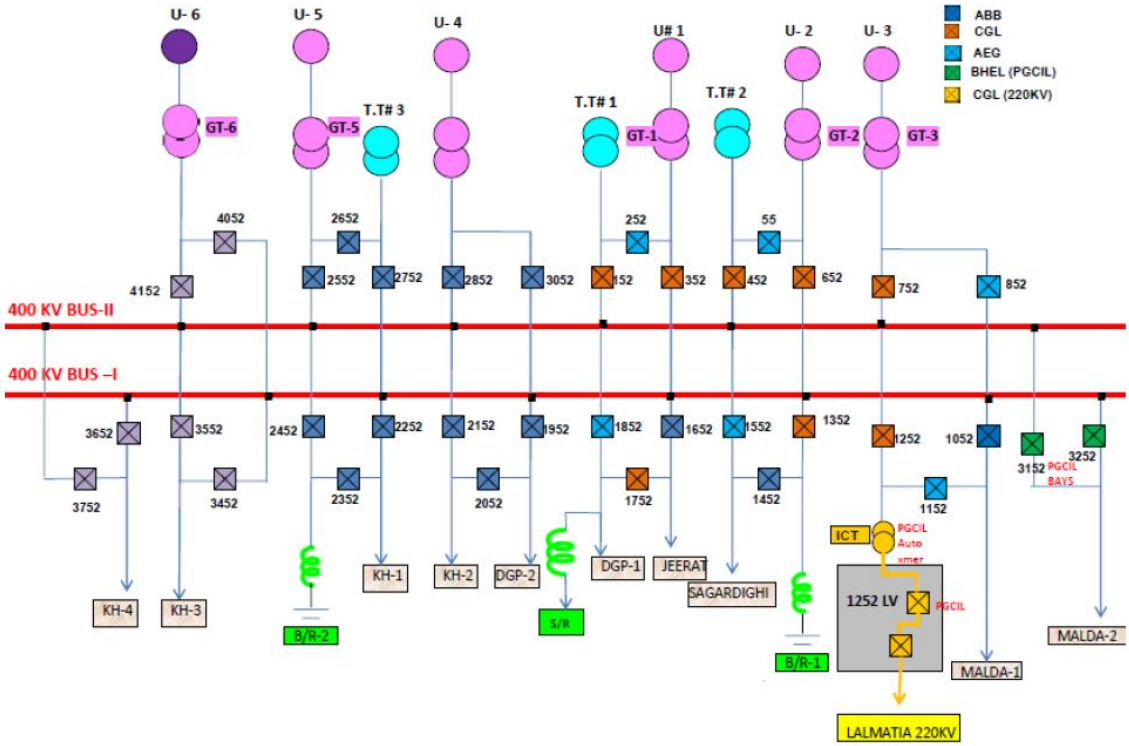
Powergrid agreed to look into it.

ERLDC and Powergrid may update.

Deliberation in the meeting

After getting the information from ERLDC and Powergrid, PCC felt that exact reason could not be ascertained.

ITEM NO. C.7: Disturbance in FSTPP, NTPC and JSEB system on 06.11.2014



In 27th PCC, NTPC Farakka confirmed from PLCC counter reading that DT signal was sent to Kahalgaon end. However, they will test the PLCC system during opportunity shutdown.

On commissioning of remaining 400kV CBs at FSTPP, NTPC informed their action plan as follows:

a) Main bay of FSTPP-Sagardighi at FSTPP end : *Will be completed by January, 2015*
b) Bay connecting FSTPP-Malda-II to Bus-II which is under outage since disturbance at FSTPP on 28/08/14 (Bay connecting to Bus-I in service).: *Will be brought into service in 1st week of February, 2015*
c) FSTPP-KhSTPP-IV Tie bay : *Will be done in February, 2015.*

NTPC may update.

Deliberation in the meeting

FSTPP, NTPC informed the status of remaining 400kV CBs at 400kV FSTPP S/s as follows:

a) Main bay of 400kV FSTPP-Sagardighi at FSTPP end : *Completed*
b) Bay connecting FSTPP-Malda-II to Bus-II which is under outage since disturbance at FSTPP on 28/08/14 (Bay connecting to Bus-I in service).: *Work has been completed but not charged. NTPC informed that PGCIL is yet to give clearance for charging. PCC advised NTPC and Powergrid to coordinate and charge the CB.*
c) FSTPP-KhSTPP-IV Tie bay : *Work has been completed but not charged. PCC advised NTPC and Powergrid to coordinate and charge the tie.*

ITEM NO. C.8: Disturbance at OPTCL on 26th August 2014

In 27th PCC, members updated the 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 -----OHPC informed that they agreed to change the defective Y ph CVT by February, 2015.
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 informed that they will implement the O/V settings in numerical relay (Micom-P442 relay) by February, 2015 and they will keep the existing EM O/V relay as alarm.

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. --- OHPC informed that they are in the process of tendering. PGCIL informed that they will implement in numerical relays and EL.
4. Exploring possibility of incorporating Transient Fault Recorders for the FSCs at Jeypur, for analysis of incidents. ----- PGCIL informed that they will implement in numerical relays and EL.
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.---- OHPC informed that they will resolve the issue bilaterally before 1st week of February, 2015, if not resolved the point may be taken up to TCC forum.
6. Reviewing over-current protection settings in 220kV lines of OPTCL—It was decided that ERPC and ERLDC will examine the settings and report in next week.

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

OPTCL, OHPC & Powergrid may update.

Deliberation in the meeting

Members updated the 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 -----*OHPC informed that they agreed to change the defective Y ph CVT by end of February, 2015.*
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 informed that after replacement of defective CVT, they will implement the O/V settings in numerical relay (Micom-P442 relay) and they will keep the existing EM O/V relay as alarm.*
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. --- *OHPC informed that EL is in service, for time synchronization of DR they are in the process of tendering of GPS and it may take 2-3 months to complete the work. However, they informed that presently the numerical relays are being time synchronized with the help of local time stamping. PGCIL informed that they will implement in numerical relays and EL.*
4. Exploring possibility of incorporating Transient Fault Recorders for the FSCs at Jeypur, for analysis of incidents. ----- *PGCIL agreed to implement in numerical relays and EL.*
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.---- *OHPC informed that a Meeting was called on 3rd March, 2015 to resolve the issue bilaterally.*
6. Reviewing over-current protection settings in 220kV lines of OPTCL—*ERPC and ERLDC confirmed that the settings provided are in order.*

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

ITEM NO. C.9: ERPC recommendations on repeated trippings at 132 kV Purnea (BSPTCL) S/S

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 25th PCC, PCC advised BSPTCL to submit the latest implementation status on ERPC recommendations on monthly basis. BSPTCL agreed.

Latest status updated in 29th TCC meeting is circulated in the meeting.

BSPTCL may update.

Deliberation in the meeting

BSPTCL updated the latest status, which is enclosed at **Annexure-C.9**.

ITEM NO. C.10: Disturbance at FSTPP on 28th August 2014.

In 27th PCC, 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. --- CB connector problem will be rectified in first week of February, 2015. Thereafter, the CB will be in service.
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 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. — NTPC agreed to extend the trip contacts to Powergrid soon.
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. WBSETCL was advised to exchange the information on relay settings.
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 in first week of February, 2015.

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. --- *NTPC informed that CB connector has been installed and CB is ready for charging however PGCIL has not given clearance to charge the CB. PCC advised NTPC and Powergrid to coordinate and charge the CB immediately.*
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 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. — *NTPC informed that the trip contacts have been extended. It was informed that LBB has been duplicated at 400kV Farakka S/s..*
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)---*Protection data exchanged and Time coordination has been done.*
6. Occurrence of Over-voltage Stage-I subsequently. (Action : Powergrid)---*New CVT has been installed during February, 2015.*

ITEM NO. C.11: Members may update the following:

1. In 27th 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 6 nos CTs are required for bus coupler for bus bar protection. However, the 220 kV two main bus system will be made operational at Bidhannagar S/s within March, 2015.

2. In 29th TCC Meeting, BSPTCL informed that the main protection relay at Kahalgaon S/s (BSPTCL) will be installed by February, 2015.

BSPTCL may update.

Deliberation in the meeting

BSPTCL informed that the reconductoring work is near completion and main protection relay will be installed by March, 2015.

3. In 27th PCC, JSEB informed that,

- For replacement of old EM relays with Micom P442 in 132kV Chandil-Hatia-I line, the work order has been awarded to M/s Areva and the relay is yet to be received.

- JSEB informed that work has been awarded to M/S Areva for supply, retrofitting, testing and commissioning of Micom relays in 33kV feeders at Jamshedpur. New relays have been installed in 8 feeders and the installation of relays for rest of the feeders will be completed by 31st January, 2015.

JSEB may update.

Deliberation in the meeting

JSEB informed that,

- *For replacement of old EM relays with Micom P442 in 132kV Chandil-Hatia-I line, the relay is available at site and it will be installed by March, 2015.*

- *JSEB informed that work has been awarded to M/S Areva for supply, retrofitting, testing and commissioning of Micom relays in 33kV feeders at Jamshedpur. New relays have been installed in 8 feeders and the installation of relays for rest of the 8 feeders will be completed by 31st March, 2015.*

4. OPTCL may please update the latest status on following substations:

a) 220 kV Theruvali S/s

- Some relays at 220 kV Theruvali S/s were already replaced and rest will also be replaced by end of December, 2014. Seven Nos. electromagnetic Over Current & Earth fault relays at 220 kV Theruvali S/s have been replaced. Six are under replacement ,expected to be completed by 2nd week of January.
- The new 220 kV bus bar protection has been installed at Theruvali but the same could not put in service because of some defective components. Replacement of defective components is in progress by M/s Siemens. The scheme will be put in service by end of January, 2015.

Deliberation in the meeting

- *Seven Nos. electromagnetic Over Current & Earth fault relays at 220 kV Theruvali S/s have been replaced. Six are under replacement, expected to be completed by March, 2015.*
- *The new 220 kV bus bar protection has been installed at Theruvali but the same could not put in service because of some defective components. Replacement of defective components is in progress by M/s Siemens. The scheme will be put in service by end of March, 2015.*

b) 220kV Budhipadar S/s

- The new 220 kV bus bar protection at Budhipadar S/s has been completed, but due to some defective relays, the commissioning could not be completed. M/s. Siemens is replacing the defective relays.

Deliberation in the meeting

- *The new 220 kV bus bar protection at Budhipadar S/s has been completed, but due to some defective relays, the commissioning could not be completed. M/s. Siemens is replacing the defective relays. The scheme will be put in service by end of March, 2015.*

c) 400/220 kV Mendhasal S/s

- In line with advice from 24th PCC carrying out testing of all the relays at Mendhasal S/s and reviewing the resistive reach settings are in progress and would be completed by Mar, 2015.
- 26th PCC advised OPTCL to install the PLCC system to enable inter tripping.: OPTCL informed that intertripping scheme will be implemented after installation of fiber optic cable.

Deliberation in the meeting

- *In line with advice from 24th PCC carrying out testing of all the relays at Mendhasal S/s and reviewing the resistive reach settings are in progress and would be completed by Mar, 2015.*
- *26th PCC advised OPTCL to install the PLCC system to enable inter tripping.: OPTCL informed that intertripping scheme will be implemented after installation of fiber optic cable.*

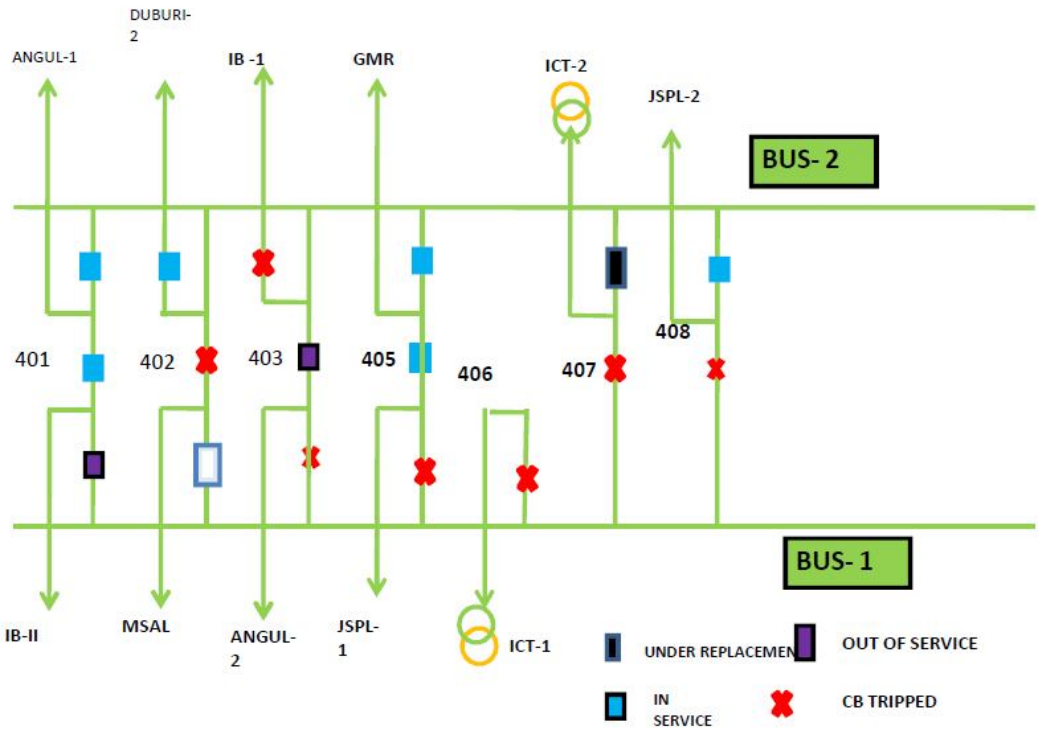
d) 220kV Rengali and Barkote S/s

- Replacement of Electromagnetic O/C & E/F relays with numerical relays at 220kV Rengali S/Y and Barkote S/s would be completed by January 15.

Deliberation in the meeting

- *Four feeders at Rengali S/s are replaced with numerical relays and the installation of other 2 feeders would be completed by March, 2015.*

e) 400kV Meramundali S/s



- Replacement of BUS-I CB of 401 diameter (Ib-II) is in progress and expected to be commissioned by 30th January'2015.
- Replacement of 220kV CB Auto-II is in progress and expected to be commissioned by 30th January 2015.

- Installation and testing of 220kV Bus bar protection for Meramundali has been completed, expected to be in service by January, 2015.
- 26th PCC advised to check the healthiness of CT and enable CT supervision for all CTs: OPTCL informed that work is in progress.

Deliberation in the meeting

- *Replacement of BUS-I CB of 401 diameter (IbTPS-II) is in progress and expected to be commissioned by March'2015.*
- *Replacement of 220kV CB Auto-II is in progress and expected to be commissioned by March'2015.*
- *Installation and testing of 220kV Bus bar protection for Meramundali has been completed, expected to be in service by March' 2015.*
- *26th PCC advised to check the healthiness of CT and enable CT supervision for all CTs: OPTCL informed that work is in progress and expected by end of March, 2015.*

ITEM NO. C.12: PROTECTION PHILOSOPHY OF EASTERN REGION

A special meeting was held on 30.12.2014 to review the zone settings based on CEA recommendations at ERPC, Kolkata. After detailed deliberation, members decided the zone settings of distance protection as follows:

Sl. No.	Zone	Direction	Protected Line Reach Settings	Time Settings (in Seconds)	Remarks
1	Zone-1	Forward	80%	Instantaneous (0)	As per CEA
2a	Zone-2 (for 400 kV and above)	Forward	For single ckt- 120 % of the protected line	0.35	As per CEA
			For double ckt- 150 % of the protected line	0.5 to 0.6 - if Z2 reach overreaches the 50% of the shortest line ; 0.35- otherwise	As per CEA
2b	Zone-2 (for 220 kV and below)	Forward	120 % of the protected line or 100% of the protected line + 50% of the adjacent shortest line	0.35	As per CEA with minor changes
3	Zone-3	Forward	120 % of the (Protected line + Next longest line)	0.8 - 1.0	As per CEA
4	Zone-4	Reverse	10%- for long lines (for line length of 100 km and above) 20%- for shot lines (for line length of less than 100 km)	0.5- if Z4 reach overreaches the 50 % of reverse shortest line; 0.35- otherwise	As per CEA

In 27th PCC, Members raised the issue regarding finalizing settings of the Directional Earth Fault (DEF) and Back up O/C.

The house was informed that a separate meeting would be held after 29th TCC Meeting for finalization of the protection settings. Mean while constituents were advised to send their views on revised settings.

Constituents agreed.

No comments received so far.

However, a special meeting for finalization of zone settings as per the revised protection philosophy will be held in the month of March, 2015. All constituents are requested to submit their revised settings to ERPC latest by 16th March, 2015.

Members may note.

Deliberation in the meeting

Powergrid informed that the revised settings will be discussed at their Engineering Wing in a separate meeting scheduled to be held in March, 2015. Powergrid informed that they will communicate their views.

It was decided that a Special meeting for finalization of Zone settings as per the revised protection philosophy will be held in the month of April, 2015.

ITEM NO. C.13: Third Party Protection Audit Format

The format for data collection as per the recommendations of Task Force to initiate 2nd Third Party Protection Audit was made available in ERPC website and also circulated to constituents by letter vide dated 20.02.2015. All constituents are requested to send the requisite information by 16th March, 2015. The further course of action for 2nd Third Party Protection Audit will be initiated after receiving the data.

Members may note.

Deliberation in the meeting

PCC advised all constituents to send the data as per format available in ERPC website by 16th March, 2015.

All constituents agreed.

ITEM NO. C.14: ANY OTHER ITEM.

1. **Proposal for review of PDO conditions for HVDC Gajuwaka Poles, in view of repeated tripping of lines in S. Odisha**

Deliberation in the meeting

In view of repeated trippings of EHV lines causing major disturbance in South Odisha for the past six months, ERLDC proposed to review the PDO conditions for Gazuwaka HVDC back to back poles to meet the eventualities arising out of the consequences. The existing & proposed PDO conditions were presented by ERLDC. While appreciating the consideration of various contingencies over the years experience of major disturbances in South Odisha, PCC felt that power flow limits suggested are purely operational matters. If the power flow limits are approved in OCC meeting, the PDO conditions will be reviewed in next PCC meeting. The constituent members requested to provide the proposals in the MoM to study and offer opinions/feedback in next PCC meeting. ERLDC agreed to the suggestion. The comparative PDO conditions is enclosed at **Annexure-C.14**.

2. Presentation on Testing and Metering equipment.

Deliberation in the meeting

YKOGAWA representative has delivered a presentation on following equipment:

- *Clamp-on tester*
- *Digital Multimeter*
- *AC Power source*

Members noted.

The meeting ended with vote of thanks to the chair.

****

Annexure - A

Participants in 28th PCC Meeting

Venue: ERPC Conference Room Time: 11:00 hrs Date: 25.02.15 (Wednesday)

Sl No	Name	Designation	Organization	Contact Number	Email	Signature
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16	B.B. Bhi	Dy. Mgr	ERLDC	9432351836	bitthucat@gmail.com	[signature]
17	T R Mohapatra	Dy Mgr.	ERLDC	9433041873		[signature]
18	[illegible]	Sr. Engr.	PTC [illegible]	9433013580	[illegible]@gmail.com	[signature]
19	Neeraj Yadav	Dy. manager	JITPL	9937297097	power_sales@jindalgroup.com	[signature]
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"Coming together is a beginning, staying together is progress, and working together is success." –Henry Ford

Participants in 28th PCC Meeting

Venue: ERPC Conference Room Time: 11:00 hrs Date: 25.02.15 (Wednesday)

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23	N. Khan	L O	GRIDCO	9433035431		
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37	Sabarish Menon	Product Expert	Yokogawa India Ltd	9891254091	sabarish.menon@in.yokogawa.com	
38						
39						
40						

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

Annexure-B.1

Disturbance at 400KV Meramundali on 02.01.15 at 5.40 & 6.04hrs

- **02.01.2015 at 05.40 Hrs.**
- 400kV Angul-I tripped on Overvoltage at Meramundali end.
- 400kV Angul-II tripped on Overvoltage at both end.
- 220kV Kaniha-II tripped on broken conductor.
- **02.01.2015 at 06.04 Hrs.**
- 400kV RSTPS-I tripped on Overvoltage at Meramundali end.
- 400kV JSPL-I tripped on Overvoltage at Meramundali end.
- 400kV JSPL-II tripped on Overvoltage at Meramundali end.

Disturbance at 400KV Meramundali on 20.01.15 at 11.20hrs

- 400kV Angul-I tripped on Distance Protection at Meramundali end. B phase to Earth , Zone-1. distance 13.3kM.
- 400kV IB-I tripped on Overvoltage.
- ICT -1 & 2 Tripped on high set earth fault . Fault current 2.63kA & 2.65kA respectively.

Meramundali 400kV Bus Voltage January'2015

Date	400KV Bus Voltage			
	MAX in KV	TIME	MIN in KV	TIME
01 January 2015	427.86	22:45:00	422.55	10:15:00
02 January 2015	436.58	06:15:00	420.07	08:15:00
03 January 2015	426.48	02:30:00	419.89	18:30:00
04 January 2015	425.90	02:30:00	419.89	18:00:00
05 January 2015	426.01	03:00:00	417.64	18:30:00
06 January 2015	426.53	03:30:00	418.57	18:15:00
07 January 2015	426.82	02:45:00	420.88	18:00:00
08 January 2015	426.25	05:00:00	420.59	18:30:00
09 January 2015	425.96	02:45:00	419.03	18:45:00
10 January 2015	425.32	02:00:00	419.89	18:00:00
11 January 2015	426.59	23:45:00	419.32	18:15:00
12 January 2015	427.00	03:30:00	419.14	18:00:00
13 January 2015	426.01	02:15:00	419.14	17:45:00
14 January 2015	426.07	02:00:00	417.82	18:00:00
15 January 2015	425.15	02:00:00	419.55	18:15:00
16 January 2015	425.21	02:45:00	419.32	19:00:00
17 January 2015	425.15	01:00:00	419.89	18:30:00
18 January 2015	425.44	23:30:00	418.28	18:30:00
19 January 2015	428.15	23:15:00	420.76	09:00:00
20 January 2015	428.50	03:15:00	419.20	11:30:00
21 January 2015	429.42	23:30:00	422.72	18:45:00
22 January 2015	429.94	02:30:00	421.63	17:30:00
23 January 2015	426.76	03:15:00	419.89	18:30:00
24 January 2015	426.71	22:15:00	420.99	18:30:00
25 January 2015	427.63	22:45:00	422.03	18:15:00
26 January 2015	427.52	23:45:00	422.49	18:15:00
27 January 2015	427.92	02:45:00	421.11	18:30:00
28 January 2015	427.46	03:00:00	419.72	18:00:00
29 January 2015	426.65	23:45:00	420.41	16:30:00
30 January 2015	427.23	02:45:00	420.99	18:15:00
31 January 2015	427.34	04:45:00	422.55	18:15:00

Annexure-B4

List of intra regional transmission lines (220 kV & above) which tripped in Jan'15

S.NO	LINE NAME	TRIP DATE	TRIP TIME	Type of Fault	Fault Clearance time in msec (As Per PMU)	Auto Recloser Operated for L-G Fault	DR/EL received within 24 Hrs (Y/N)	Deliberation in the meeting
1	400 KV SUBHASGRAM-HALDIA- II	02.01.15	08:59	LG (B-N)	pmu data not available	pmu data not available	No	*Autorecloser was successful at Haldia end but the same was not initiated at Subhasgram end. PCC advised Powergrid to give a report after invistigation.*
2	400 KV PURNEA-MUZAFARPUR -II	03.01.15	02:45	LG (R-N)	<100	Successful Autoreclosed	No	*Members noted.*
3	400 KV KAHALGAON-BANKA-I	03.01.15	09:40	Not Applicable	Not Applicable	Not Applicable	No	*DT recieved from Kahalgaon end while opening tie CB for maintanance. PCC advised to check the PLCC wiring. NTPC and Powergrid agreed to check in next opportunity shutdown.*
4	400 kV JEERAT SUBHASHGRAM	03.01.15	17:03	LLG, R-Y-N, Z-1, 47.8kM from Jeerat	<100	Not Applicable	No	*Powergrid informed that the incident was happend during OPGW installation.*
5	400 KV FARAKKA - MALDA II	04.01.15	11:47	Not Applicable	Not Applicable	Not Applicable	No	*Already discussed in Item no. B.3*
6	400 KV PATNA - BARH -III	07.01.15	15:28	Not Applicable	Not Applicable	Not Applicable	No	*Powergrid informed that autoreclosure was unsuccessful at Patna end due to PLCC Mal-operation. Rectification is in progress.*
7	400 KV MUZAFFARPUR - BIHARSHARIF-I	08.01.15	15:43	LG B-N, 3.3kA, 100kM from BSF	<100	unsucessful autoreclosure operation found in pmu	No	*Powergrid reported that the incident has occured during OPGW installation. Since it was a permanent fault the autoreclosure was unsuccessful.*
8	400KV MERAMUNDALI-ANGUL- I & II	11.01.15	13:05	O/V AT MERAMANDLI	Not Applicable	Not Applicable	No	*DT recieved at 400kV Angul S/s.*
9	400 KV ANGUL - MERAMANDLI - I	12.01.14	09:21	O/V AT MERAMANDLI	Not Applicable	Not Applicable	No	*DT recieved at 400kV Angul S/s.*
10	400 KV KAHALGAON-BARH-2	13.01.15	17:41	Not Applicable	Not Applicable	Not Applicable	No	*T differential protection was operated due to old CTs, the problem has been resolved.*
11	400 KV ROURKELA-TALCHER -2	15.01.15	16:04	Not Applicable	Not Applicable	Not Applicable	No	*DT received at TSTPP due to DC earth fault*
12	400KV ANGUL-MERAMUNDALI- II	19.01.15	17:37	LG	<100	Not Applicable	No	*Issue was already discussed in Item B.2*
13	400KV ANGUL- BOLANGIR S/C					Not Applicable	No	
14	400KV DURGAPUR- SAGARDIGHI- I	20.01.15	16:25	LG	<100	unsucessful autoreclosure operation found in pmu	No	*Line tripped on over voltage. DT not recieved at Sagardighi end. Powergrid was advised to coordinate for checking and report in next OCC.*

Annexure-B4

S.NO	LINE NAME	TRIP DATE	TRIP TIME	Type of Fault	Fault Clearance time in msec (As Per PMU)	Auto Recloser Operated for L-G Fault	DR/EL received within 24 Hrs (Y/N)	Deliberation in the meeting
15	400KV TALCHER- ROURKELA-II	22.01.15	11:31	Not Applicable	pmu data not available	Not Applicable	No	*DT received at TSTPP due to DC earth fault*
16	400KV ROURKELA- CHAIBASA-I	23.01.15	11:12	Not Applicable	pmu data not available	Not Applicable	No	*Bucholz Trip of NGR at Rourkela, needs to be invistigated.*
17	400KV ROURKELA- JHARSUGUDA-II							
18	400 KV PURNEA-MUZAFARPUR -II	28.01.15	11:01	Not Applicable	Not Applicable	Not Applicable	No	*PLCC Mal-operation during checking of NTAMC work.*
19	400 KV BARIPADA- TISCO	31.01.15	07:46	Not Applicable	Not found in pmu	Not found in pmu	No	*PLCC problem at TISCO, Powergrid was advised to coordinate and inform.*
20	220 KV TENUGHAT - PATRATU	04.01.15	07:45	LG, B-Ph E/F	80 (as per JSEB report)	Not Applicable	No	*JUSNL informed that fault was near to PTPS but not cleared from PTPS end that leads to tripping of ICTs at PTPS and Hatia D/C line. At TVNL end, the fault was cleared in zone 2.*
21	220 KV RENGALI(PG)-RENGALI(GRIDCO)- I & II	08.01.15	08:53	LG	<160	Not Applicable	No	*Y-PHASE LA BLAST OF 220KV RENGALI-RENGALI-I AT RENGAL I(GRIDCO)*
22	220 KV PATNA-KHAGUAL	18.01.15	08:23	LG	<160	Not Applicable	No	*Trpped on B-N fault.*

Annexure-B5

Status of Disturbance Reporting- Jan,2015

Sl no	Disturbance	Date	Time	Agencies involved	Report in format		DR/EL/Tripping analysis		Remarks
					Y/N	DATE	Y/N	DATE	
1	Various 400kV lines emanating from Meramundali tripped simultaneously due to occurrence of over voltage at Meramundali.	02/01/2015	05:40 & 06:04hrs	ER-II (Odisha project)	N		N		No report obtained from GRIDCO and ER-II
				GRIDCO	N		N		
2	Due to failure of B-Ø CT of 400kV Angul-Meramundali-I at Angul various 400kV lines from Angul tripped.	20/01/2015	11:23hrs	ER-II (Odisha project)	N		N		No report obtained from GRIDCO and ER-II
				GRIDCO	N		N		

Annexure-C9

ERPC recommendations:

S.No.	Recommendations:	Latest status
i	CT Secondary cables of all the 132KV Bays are to be replaced by 2.5 sq mm 4 core Multi-stranded Armoured cables with proper terminations at CT Base Terminal Box, CTJB and Panel end.	Work will be completed by March, 2015
ii	The CTJB of all the 132KV Bays are to be replaced by proper CTJB having approved specifications. The terminal Blocks of the CTJB should be stud type which comes along with the CTJB. The Cables should be brought inside the CTJB with proper GLANDS and dressing. The CTJB should be EARHTED through 4mm Flat Earthing strips duly connected to the earthing mesh in the switchyard . The same is also applicable for 132KV Bus PTJB	Completed.
iii	Earth Resistance of all the structures of the 132KV Switchyard (i.e. CT Structure, Breaker Structure, Isolator Structure, Gantry, Bus Support Structures, PT structures, etc.) should be measured and it should be brought down within 1(one) ohms wherever applicable.	completed (earth resistance bellow 0.5 ohm)
iv	TAN DELTA Measurements of all the 132KV CT's are to be carried out. The TAN DELTA value should be within **2%** (C.P.R.I recommended limit for 132 kV C.T, whereas some utilities prefers 1% also) and if any value exceeds this, or an increasing pattern is observed on subsequent measurements, and if any value exceeds this, then the particular CT has to be replaced by a healthy CT.	Completed, Out of 8 CTs two CTs in Saharsa bay have been replaced with new CTs.
v	132KV CT Specifications are to be standardised for 132KV Lines and transformers for the whole BSPTCL system in order to reduce human error during Installation and Commissioning. This type of varied CT's having different Core Classifications is not advisable to be used in the Protection System. This will in turn reduce the margin of error during commissioning process as well as reduce the INVENTORY for Spares.	In process
vi	Presently the CT Ratio of all the 132KV CT's are to be checked for its ratio and Polarity. Thereafter, the Protection and the Metering Cores are to be identified which will be used for Distance, Backup and Metering Purpose for all the Three Phases. Accordingly, the Connections in the CTJB and thereafter the terminations to the Panel end are to be completed. For a Guideline, the PS class Cores having a saturation of around 1400Volts may be used for Distance Protection, another PS class core or 5P cores can be used for Back-Up Directional Protection (using one PS core for one Phase and 5P core for the other 2 phases having different magnetising characteristics should always be discouraged for High impedance type protections mainly for transformer/ feeders), and the 0.2 or 1.0 Class core should be used for metering.	Completed
vii	Retrofitting of Protection Relays were carried out in different 132KV Lines. There are no approved drawings available for the retrofitted panels and the Installation of some of the New Relay with the individual panel wiring along with the terminations were not done in a proper fashion. From the quality of dressing and terminations, it clearly signifies that there was absolutely no supervision by any BSPTCL authority when the VENDOR was carrying out the work of installation and commissioning. The dressings of the wires along with the terminations are to be completed for all the panels where New Relays have been installed.	Completed
viii	The committee also felt that the drawing and documentation was very poor on the Substation Side as well as the MRT side of BSPTCL. Not a single Control and Protection Drawing for 132KV bays were available at the S/Stn end by which a person can work and rectify faults in different circuits.	As the panel are of very old and obsolete, their drawings may not be available. Now we are going to maintain the updated drawings.
ix	The work specified in item 3 and 4 under ANALYSIS part are to be completed immediately. Till completion, the existing setting at 132 kV Purnea (PGCIL) end should continue.	work completed

Annexure-C.14

Review of PDO conditions of HVDC Gajuwaka

Background

- Power order modulated by NLDC as per security requirements of the National Grid
- Varies widely depending upon network scenario in SR , WR and ER
- Short circuit capacity of Gajuwaka (East) also varies depending on
  - Number of generators synchronised in South Odisha
  - Number of 400kV & 220kV interconnections available from Jeypore / Gajuwaka with the rest of ER grid

Background

- Consequent to LILO of 400kV Meramundali-Jeypore S/C at Angul and Bolangir, outage of any section of this path leads to loss of one 400kV interconnection of Jeypore 400kV (reduction of fault level)
- Performance of line commutated HVDC converters is highly sensitive to the short-circuit level on the AC side
- Based on experience gathered during the last few disturbances in South Odisha, (26/8/14, 10/02/15, 23/02/15) it is felt that the run-back (PDO) conditions need review
- The changes proposed, need extensive deliberation / analysis before taking up with Southern Region for final implementation

EXISTING

PDO	Contingency	DC Powerlimit / Action
PDO-2	East Bus AC U/V Relay set at Vs – 87.5 V or 318 kV (on 400 kV side on any phase- phase)	500 MW

PROPOSED

PDO	Contingency	DC Powerlimit / Action
PDO-2	East Bus AC U/V Relay set at Vs – 101.75 V or 370 kV on 400kV side (any phase- phase)	500 MW
NEW PDO 1	East Bus AC U/V Relay set at Vs – 99 V or 360 kV on 400kV side (any phase- phase)	300 MW

EXISTING

PDO	Contingency	Action
PDO-4	Tripping of • Jeypore –Indravati 400kV S/C or • Jeypore-meramundali 400kV S/C or • One ckt of Jeypore-Gazuwaka 400kV D/C • Both 400/220kV Jeypore ICTs or • Jeypore-Jeynagar 220kV D/C	500 MW

PROPOSED

PDO	Contingency	Action
PDO-4	Tripping of • Jeypore –Indravati 400kV S/C or • Rengali – Indravati 400kV S/C or • Angul – Bolangir 400kV S/C or • Bolangir – Jeypore 400kV S/C or • One ckt of Jeypore-Gazuwaka 400kV D/C or • One or both of the Jeypore 400/220kV ICTs or • One or both ckts of Jeypore-Jeynagar 220kV	350 MW

EXISTING

PDO	Contingency	Action
PDO-5	East Bus frequency at 49.0 Hz and below. Rate of fall of frequency df/dt – 0.3 Hz./sec	150 MW
PDO-6	Overload Trip contact of Gajuwaka S/s ICT on southern side	250 MW

PROPOSED

PDO	Contingency	Action
PDO-5	East Bus frequency at 49.0 Hz and below. Rate of fall of frequency df/dt – 0.3 Hz./sec	150 MW
PDO-6	Overload Trip contact of Gajuwaka S/s ICT on southern side	250 MW
NEW PDO-2	Tripping of • (Indravati-Jeypur S/C) && (Bolangir-Jeypur S/C) simultaneously or one after the other • Indravati-Jeypur S/C & Angul-Bolangir S/C simultaneously or one after the other	200 MW

EXISTING

PDO	Contingency	Action
NIL	NIL	NIL

PROPOSED

PDO	Contingency	Action
NEW PDO-2 (cont)	Tripping of • Bolangir-Jeypur S/C & Rengali-Indravati S/C simultaneously or one after the other • Angul-Bolangir S/C & Rengali-Indravati S/C simultaneously or one after the other	200 MW
NEW PDO-3	Tripping of • (Jeypore –Indravati 400kV S/C) && (one or both ckts of 220kV Jeynagar-Jeypore line)	300 MW

EXISTING

PDO	Contingency	Action
NIL	NIL	NIL

PROPOSED

PDO	Contingency	Action
NEW PDO-3 (cont)	• Jeypore –Indravati 400kV S/C && one or both the 400/220kV ICTs at Jeypore • Rengali – Indravati 400kV S/C && one or both the 400/220kV ICTs at Jeypore • Rengali – Indravati 400kV S/C && one or both ckts of 220kV Jeynagar-Jeypore line	300 MW

EXISTING

PDO	Contingency	Action
NIL	NIL	NIL

PROPOSED

PDO	Contingency	Action
NEW PDO-3 (cont)	• Bolangir-Jeypore 400kV S/C && one or both the ckts of 220kV Jeynagar-Jeypore line • Bolangir – Jeypore 400kV S/C && one or both the 400/220kV ICTs at Jeypore • Angul-Bolangir 400kV S/C && one or both the ckts of 220kV Jeynagar-Jeypore line • Angul-Bolangir 400kV S/C && one or both the 400/220kV ICTs at Jeypore	300 MW

EXISTING

PDO	Contingency	Action
NIL	NIL	NIL

PROPOSED

PDO	Contingency	Action
NEW PDO-4	(HVDC Gajuwaka power < 600MW) && (Jeypore Bus voltage > 435kV)	Trip one preselected ckt of 400kV Jeypore-Gazuwaka D/C with 5 sec delay