EASTERN REGIONAL POWER COMMITTEE

MINUTES OF 29th PROTECTION SUB-COMMITTEE MEETING HELD AT ERPC, KOLKATA ON 20.03.2015 (FRIDAY) AT 11:00 HOURS

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

Member Secretary, ERPC chaired the meeting and welcomed the participants. GM, ERLDC informed that all the protection related information is to be communicated to ***erldcprotection@gmail.com***.

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

PART – A

ITEM NO. A.1: Confirmation of minutes of 28th Protection sub-Committee Meeting held on 25th February, 2015 at ERPC, Kolkata.

The minutes of 28th Protection Sub-Committee meeting held on 25.02.15 circulated vide letter dated 11.03.15.

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 FEBRUARY 2015.

ITEM NO. B.1: Disturbance in OPTCL system on 10/02/15 at 16:11hrs & 16:24hrs.

At 16:11hrs, as reported by ER-II, 400kV Rengali-Indrāvati (PG) tripped from Rengali end on spurious tripping during NTAMC work. Consequently, HVDC power was being ramped down from around 800MW to 600MW (with 300MW per pole) on request of ERLDC. Just before achieving 600MW power order, at 16:24hrs, 400kV Jeypore-Bolangir line tripped on O/V Stg-1 operation at Jeypore end only. The system was remaining stably integrated upto this point. Subsequently a fault was initiated in 220kV OPTCL Grid due to snapping of pipe connecting R-Ø isolator of 220kV Meeramundali-Bhanjanagar line-II at Meramundali end which led to tripping of

220kV Meramundali-Bhanjanagar D/C,
220kV Theruvali-Bhanjanagar D/C,
220kv Theruvali-Laxmipur-Jeynagar D/C section,
200kv Theruvali-Narendrapur(one ckt) ,
220kV Narendrapur-Mendhasal and several other 220/132kV lines in Odisha Grid.

Due to the above trippings, South Odisha got isolated along with Balimela/Indravati HEP units and there was a heavy dip in voltage at Jeypore 400kV Bus. Consequently, HVDC Pole-2 tripped

immediately on 'DC voltage low'. Heavy fluctuations in voltage and frequency were observed at Jeypore bus. Subsequently, HVDC Pole-1 tripped due to low voltage at Gazuwaka followed by tripping of 400 Jeypore-Gazuwaka-D/C on O/V Stage-2 and 400 Jeypore-Indrāvati on O/V Stage-1 operation. Subsequently the above island disintegrated further into two separate islands comprising of Balimela and Indravati HEPs and both the island ultimately collapsed leading to total collapse of South Odisha system.

Specifically, the following lines tripped:

- 400kV Jeypore- Indrāvati (PG)
- 400kV Indrāvati (PG)- Indrāvati(GR)
- 220kV Jeypore- Jaynagar-D/C
- 220kV Jaynagar-Balimela-D/C
- 220kV Jaynagar-Upper Kolab-D/C
- 220kV Jaynagar-Laxmipur-Theruvali-D/C
- 220kV Theruvali- Indrāvati (GR)-I,II,IV
- 220kV Theruvali- Narendrapur D/C
- 220kV Bhanjanagar-Meramundali-D/C
- 220kV Bhanjanagar-Mendhasal
- 220kV Narendrapur-Mendhasal-I

Report received from OPTCL end is enclosed in **Annexure-B.1**.

OPTCL may explain.

Deliberation in the meeting

During deliberation it was under stood that, after tripping of 400kV Rengali-Indravati S/C and subsequent ramping down of HVDC power to 600 MW, the system remained stably connected and was feeding power to HVDC Gazuwaka. It was observed that, even after tripping of 400kV Jeypore-Bolangir, the voltage at Jeypore dropped to the range of 380kV to 390kV and power to South Odisha as well as to SR (through HVDC Gazuwaka) continued to be fed through OPTCL system. As observed from the relay data presented by OPTCL during the meeting, the current through both the 220kV Meramundali-Bhanjanagar circuit rose to more than 800A. This led to snapping of pipe connecting R-Ø isolator of 220kV Meramundali-Bhanjanagar-II at Meramundali end. However, 220kV Mendhasal-Bhanjanagar continued to remain in service and cater Bhanjanagar load. It appears that due to delayed clearance of the fault, 220kV Meeramundali-Bhanjanagar D/C, 220 kV Bhanjanagar-Theruvali D/C, also got tripped. In the absence of DR plots of the concerned lines, it was not possible to analyze further. At the same time, tripping of 220kV Theruvali-Narendrapur, 220kV Narendrapur-Mendhasal and 220kV Theruvali-Laxmipur-Jeynagar D/C also seen. Thus, due to the above un-coordinated trippings, an island was formed comprising Indrāvati HEP and Balimela generation, with reduced adjoining loads and HVDC Gazuwaka with power order of 50/60MW. The above island further disintegrated into two separate islands and both the islands collapsed on hand-tripping of Balimela/Indravati units(after) leading to total power outage in the areas south to Bhanjanagar and Mendhasal.

After detailed discussion, PCC suggested the following:

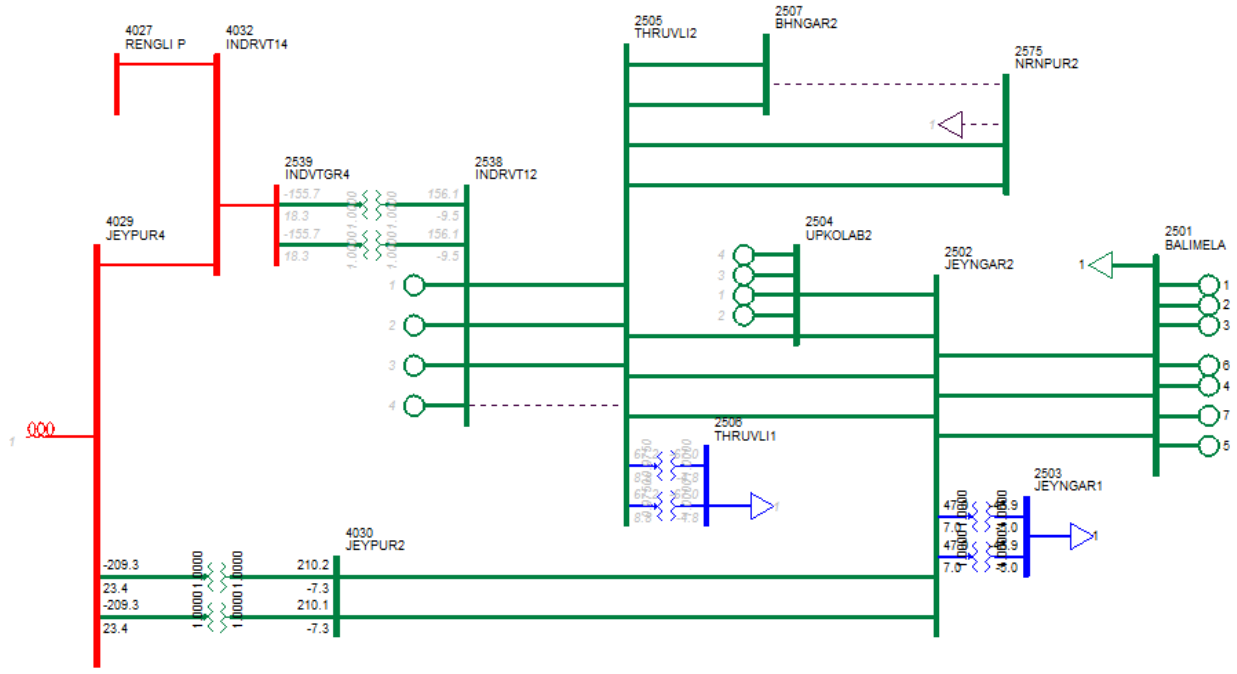
- *No code was issued in respect of NTAMC work being carried out at Rengali (due to which spurious tripping occurred from Rengali end). Expediting closing of Rengali-Indravati 400kV S/C could have avoided the subsequent tripping of the lines. Powergrid is advised to ensure that, such incidents should not reoccur in future.*
- *O/V tripping of 400kV Jeypore-Bolangir from Jeypore end only needs to be analyzed considering that O/V was not shown in the DR channels and that no DT was sent to Bolangir (as the line remained charged from Bolangir end).*

- *Un-coordinated trippings of lines from Bhanjanagar, Theruvali, Mendhasal, Meramundali, Jaynagar and Narendrapur were also observed on occurrence of fault at Meramundali. A through audit of protection systems at the above substations of OPTCL needs to be carried out.*
- *From DR obtained from Jeypore and report from GRIDCO, it can be observed that, there was a voltage unbalance. Reasons for the same needs to be investigated.*
- *Installation of 125MVAR Bus reactor at Jeypore needs to be expedited.*
- *As already discussed earlier, the conditions for run-back of HVDC Gajuwaka power order need reviewing.*

ITEM NO. B.2: Disturbance at 200kV Jaynagar (OPTCL system) on 20/02/15 at 14:10 hrs.

At 14:10hrs, LV side B-Ø CT of 220/132kV, 160MVA Autotransformer-I (idle charged from HV side) at Jaynagar burst causing tripping of following lines and ICTs:

- 220kV Jaynagar-Jeypore-D/C
- 220kV Jaynagar-Balimela-I & III
- 220kV Jaynagar-Upper Kolab-D/C
- 220kV Jaynagar-Laxmipur-D/C
- 220KV Upper Kolab-Theruvali
- 132kV Jaynagar-Machhkund (tripped from Jaynagar end only)
- 220/132kV, 160MVA Auto transformer-I
- 220/132kV, 100MVA Auto transformer-II



OPTCL may explain the following:

- R-Phase tripping at 132kV side of 100MVA ATR-II needs to be explained.
- Tripping of 220kV feeders from Jeynagar end.
- Tripping of 220KV Upper Kolab-Theruvali

Deliberation in the meeting

OPTCL informed that LV side B-Ø CT of 220/132kV, 160MVA Autotransformer-I (idle charged from HV side) at Jaynagar was busted and simultaneously the cable trench caught fire. The fire brigade was called to control the fire and all the feeders at 220kV Jeynagar S/s were hand tripped for the safety of the substation.

ERLDC informed that no report was received from OPTCL.

PCC took serious note and advised OPTCL to send the report after the incidence otherwise it is difficult analyze the tripping incidence.

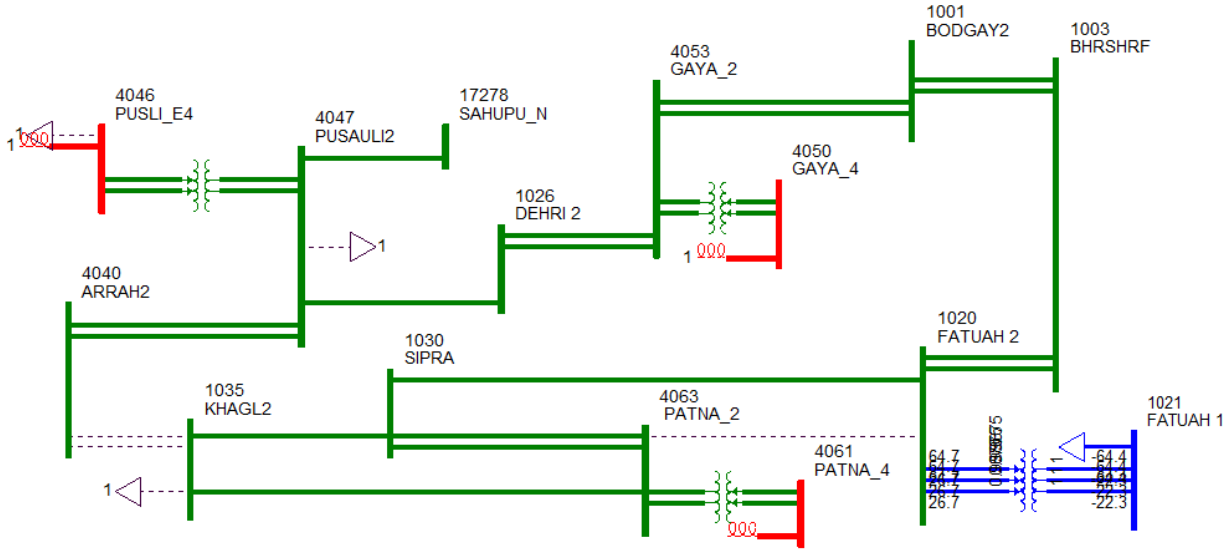
PCC also advised OPTCL give a detailed report to ERPC/ERLDC on this incidence within a week.

OPTCL agreed.

ITEM NO. B.3: Total power failure at 220kV Fatuha S/s (BSPTCL system) on 25/02/15 at 18:18hrs

At 18:18hrs, total power failure occurred at 220kV Fatuha S/s due to bursting of 220kV side Y and B-Ø CT of 220/132kV, 100 MVA ICT-III at Fatuha. Power supply got interrupted some parts of Patna town and traction supply at Khusrupur. Following lines tripped:

- 220kV Patna-Fatuha (Tripped from Patna end)
- 220kV Fatuha-Sipara (Details not available)



It appears that the sequence of events were initiated due to bursting of 220kV side Y and B-Ø CT of 220/132kV, 100 MVA ICT-III at Fatuha. It is inferred that due to delayed clearance of the said fault all other lines incoming/outgoing from Fatuha are tripped. Detail report from BSPTCL is yet to be received.

BSPTCL may explain.

Deliberation in the meeting

BSPTCL explained that since bus differential protection was not installed at 220kV Fatua S/s, the fault got cleared from remote ends (220kV Patna-Fatuha S/C line got tripped from Patna end and 220kV Fatuha-Sipara S/C line got tripped from Sipara end).

BSPTCL informed that 220kV Fatua-Biharshariff D/C line was idle charged from Fatua end.

PCC felt that the tripping was in order however, PCC advised BSPTCL to install bus differential protection at 220kV Fatua S/s.

BSPTCL agreed.

ITEM NO. B.4: Total power failure at 220kV Chandil S/s (JUSNL system) on 15/02/15 at 13:25 hrs.

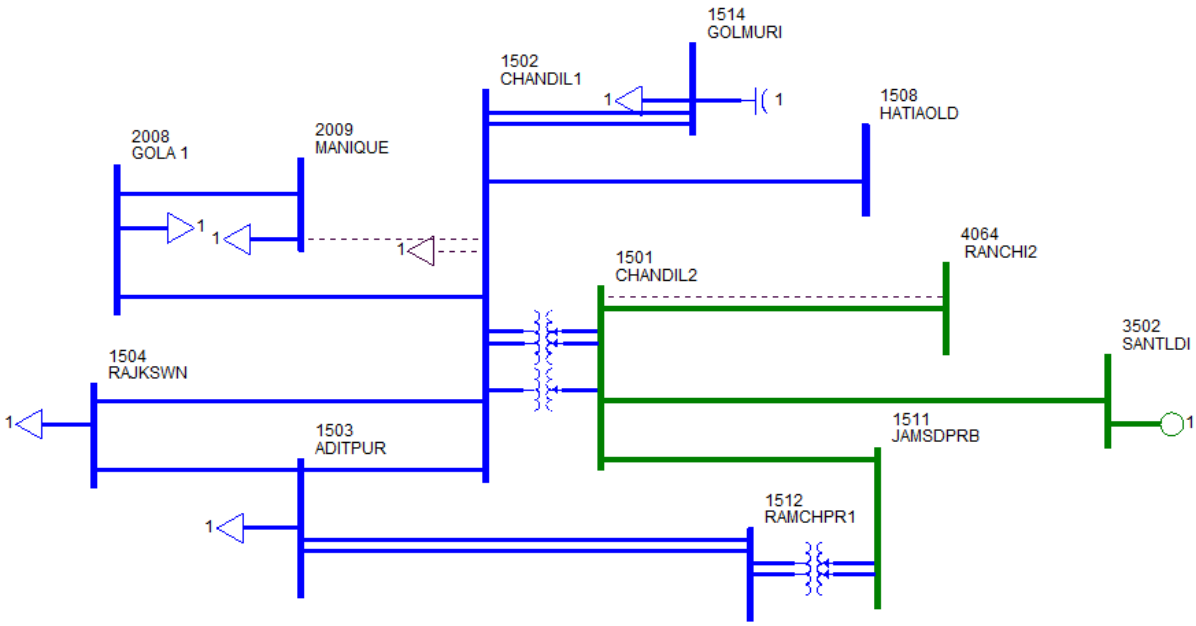
At 13:25 hrs, SLG fault (B Ph-G) occurred close to Santaldih TPS, in 220kV Chandil-Santaldih S/C line and subsequently all lines at Chandil tripped due to non-clearance of above fault from Chandil end. This resulted in total power failure occurred at 220kV Chandil S/S.

Following elements tripped:

- 220kV Chandil-Santaldih S/C (tripped from Santaldih end only)
- 220kV Chandil-Ranchi S/C (tripped from Chandil end only)
- 220kV Chandil-Ramchandrapur S/C (tripped from Ramchandrapur end only on E/F,O/C)
- 132KV Chandil-Adityapur (tripped from Adityapur end with relay indication Power swing,Tripping relay type VAJ, E/F)

JUSNL may explain the following:

- Non-operation of protection system of 220kV Chandil-Santaldih S/C from Chandil end
- Tripping of 132kV Chandil-Adityapur tripped from Adityapur end.



Deliberation in the meeting

JUSNL explained that the fault was not detected by Chandil end relay, because of incorrect CT polarity connection in B-phase CT. JUSNL reported that the CT polarity has been changed.

Regarding tripping of 220kV Chandil-Ramchandrapur S/C from Ramchandrapur end JUSNL informed that it is a mal-operation of old EM relays and the relays will be replaced with numerical relays.

PCC advised JUSNL to analyze the tripping of 220kV Chandil-Ranchi S/C line from Chandil end and report within a week.

JUSNL agreed.

ITEM NO. B.5: Total power failure at 220kV Chandil S/s (JUSNL system) on 17/02/15 at 20:13 hrs

At 20:13 hrs, total power failure occurred at 220kV Chandil S/S due to bursting of B-Ph CVT of 220kV Chandil- Ranchi (PG) line at Chandil end resulting into fire at switchyard and subsequently all lines at Chandil S/S tripped. Following elements tripped:

Sl. No.	**Name of Line**	**Local end**	**Remote End**	**Remarks**
1	220 KV Chandil- Ranchi	B Ø Ground, Zone I, 2.14 K.M	B Ø Ground fault current 2 KA, Zone I, 90 K.M ,	**The fault should be identified in Zone II from Ranchi end, PGCIL may explain.**
2	220 KV Chandil-STPS	B Ø Ground, Zone I, Contact multiplier for distance protection 21XR,21XY,21XB	No Tripping	**JUSNL may explain the tripping from Chandil end.**
3	220 KV Chandil-Ramchandrapur(RCP)	Zone II, Tripping AUX relay 86AX	Zone III, 186X	**JUSNL may explain the tripping from Chandil end.**
4	132KV Chandil-Hatia	Trip Ckt supervision relay for TC1(BØ),295BØ	Directional Impedance 30A,30B, ZONE TIME RELAY 30g, 30 H.	**JUSNL may explain**
5.	132 KV RCP- Adityapur Ckt-I	O/C Power swing, tripping relay type VAA	No tripping	**JUSNL may explain**
6.	132 KV RCP- Adityapur Ckt-II	O/C Power swing, tripping relay type VAA	No Tripping	**JUSNL may explain**

JUSNL and Powergrid may explain.

Deliberation in the meeting

JUSNL explained that due to reverse CT polarity in B-ph at Chandil end the 220 KV Chandil-STPS line got tripped from Chandil end and the same has been rectified.

Regarding tripping of 132KV Chandil-Hatia JUSNL informed that it is a mal-operation of old EM relays and the relays will be replaced with numerical relays.

Since Chandil source was not available the total load was shifted to 132 KV RCP- Adityapur line and the line got tripped on O/C.

ITEM NO. B.6: Total power failure at 220kV Chandil S/s (JUSNL system) on 18/02/15 at 12:26 hrs.

At 12:26 hrs, SLG fault (B Ph-G) occurred in 220kV Chandil-Santaldih S/C line and subsequently all lines at Chandil tripped due to non-clearance of above fault from Chandil end. This resulted in total power failure occurred at 220kV Chandil S/s. Following elements tripped:

- 220kV Chandil-Santaldih S/C (tripped from Santaldih end only)
- 220kV Chandil-Ramchandrapur S/C (tripped from Ramchandrapur end only)
- 132kV Ramchandrapur- Adityapur D/C
- 132 KV Adityapur –RKSN (tripped from RKSN end)

- 132KV Chandil-RKSN (tripped from RKSN end)
- 132KV Chandil-Adityapur (tripped from Adityapur end)

Sl. No.	Name of Line	Local end	Remote End	Remarks
1	220 KV Chandil-STPS	No Tripping	Zone II,B Ø 80 Km	**JSUNL may explain the non-operation of protection system at Chandil end.**
2	220 KV Chandil-Ramchandrapur(RCP)	No Tripping	Zone III, Master trip 186 X	**Tripping was in order**
3	132KV Chandil-Adityapur	No Tripping	F/F,O/C, 86 relay	**220/132kV ICT should trip before the line, otherwise tripping was in order JUSNL may explain.**
4	132KV Chandil-RKSN	No Tripping	Active Group I, Start phase ABCN, Trip phase ABC, Start element Distance, Overcurrent start I>123, Earth fault start IN 1 & 2, Distance trip Z II	**JUSNL may explain.**
5.	132 KV Adityapur- RKSN			**JUSNL may place the tripping details and explain.**
6.	132 KV RCP- ADPR CKT I&II			**JUSNL may place the tripping details and explain.**

JUSNL informed that following remedial actions have been taken,

1) C.T. polarity of STPS feeder was found wrong and the same has been corrected.
2) Zone II time settings have been changed to 150ms from 300ms on carrier trip is not available.
3) Earthing system has been checked
4) Concerned GM cum CE of Transmission Zone-III, has been requested to complete the following works on priority basis:

   (a) Replacement of damaged/defective J.B. of C.T. &P.T.

   (b) Replacement/proper routing of cables.

   (c) Proper Sealing of gaps/holes of junctions Box and control panels .

   (d) Maintenance of equipments of GSS religiously and Tan Delta of CT/PT to avoid failure of equipments in GSS.

   (e) Again rechecking of all cables and wiring, CT polarity. etc. to avoid malfunction of relays.

   (f) Checking of Earth resistance of structure, Panels and installed equipments.

(g) Provision of PLCC carrier trip and two group protection (Main I &II) of different make relay.

Above matters have already been discussed in special meeting in office Chamber of MD/JUSNL held on 05/02/2015 with all Zone's GMs and MD has directed all concerned GM of all Zone of JUSNL for immediate compliance.

JUSNL may explain.

Deliberation in the meeting

Already discussed in Item No. B.6.

ITEM NO. B.7: Proposal for review and modification of Chuzachen SPS---Chuzachen

Chuzachen vide letter dated 23.02.2015 requested for review and modification of Chuzachen SPS. Details are enclosed in **Annexure-B.7**.

Chuzachen may explain and members may discuss.

Deliberation in the meeting

Chuzachen explained that the SPS scheme was implemented in 2013 when there was no sufficient evacuation path in North Bengal and Sikkim area. Thereafter, reliability of power had been augmented with additional evacuation path through 400kV system after commissioning of 400kV Rangpo pooling station in 2014.

Chuzachen opined that since sufficient evacuation path is available and no major disturbance/blackout has been observed in 2014, the few conditions of SPS scheme may be waivered (details are available in **Annexure-B.7**).

OCC agreed to the Chuzachen proposal and waivered the tripping of one Chuzachen Unit from SPS on following contingencies:

- *Tripping of 132kV RANGIT – RAMMAM Line CB at Rangit End*
- *Tripping of 132kV RANGIT – KURSEONG Line CB at Rangit End*

However, OCC felt that N-2 contingency may occur in North Bengal and Sikkim area and OCC decided to continue the SPS with following conditions:

- *POWER FLOW > 70 MW OR LINE CURRENT > 320 A in RANGIT-RAMMAM Feeder*
- *POWER FLOW > 70 MW OR LINE CURRENT > 320 A in RANGIT-KURSEONG Feeder*
- *POWER FLOW > 75 MW in CHUZACHEN –MELLI Feeder*

During deliberation, Chuzachen and NHPC informed that 100% reliability of PLCC system is not being observed after commissioning of 400kV Rangpo S/s. ERLDC is also pointed that NHPC Theesta data is reporting intermittent.

PCC advised Powergrid to look into the matter and resolve at the earliest.

Powergrid agreed.

ITEM NO. B.8: Tripping incidences in the month of February, 2015

Other tripping incidences occurred in the month of February, 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.8**

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: 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.

In case the above action fails to yield results, OPTCL was advised to consider 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.

In 28th PCC, OPTCL updated that bus CVT at 400kV Meramundali S/s had been checked and the results were found satisfactory. OPTCL confirmed that the idle charged 400kV Meramundali-IbTPS D/C lines are now charged at 220kV.

With the help of SCADA output of 400kV Meramundali bus voltage on 2.1.2015 at 05:40hrs and 6:01 hrs ERLDC explained, 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.

After detailed deliberation, it was concluded that over voltage at Meramundali S/s was due to more MVAR injection by 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.

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.

OPTCL may update.

Deliberation in the meeting

OPTCL informed that LA has been arranged and the 80 MVAR bus reactor at Meramundali S/s will be charged within 2 days.

ITEM NO. C.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

In 28th PCC, 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.

OPTCL and Powergrid may update.

Deliberation in the meeting

OPTCL informed that they have decided to change the highest settings of ICTs from 400 % to 600 % and they will change the settings within five days.

Powergrid has submitted the report wherein it was informed that tie CT of 400kV Talcher and ICT-II dia was failed at 765kV Angul S/s. As a result, 400kV Bolangir-Angul was tripped from Bolangir end and sent a carrier signal to Angul end. Since the distance protection has been kept in PUT mode it seems that relay at Bolangir end operated in Z-I and relay at Angul end did not operate as the fault was in reverse direction.

Since Bolangir-Angul line is a long line got opened at Bolangir end only, the voltage was increased and simultaneously the over voltage relay at Bolangir operated and sent a direct trip signal to Angul.

The fault at Angul end got cleared after the SF6 gas of CT leaked out and sending a lockout signal to adjacent CB.

The 400kV Angul-JITPL-II was tripped on over voltage is a spurious tripping generated by REL 670. The issue has been taken up with ABB.

ITEM NO. C.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.

In 28th PCC, 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.

Powergrid and NTPC may update.

Deliberation in the meeting

Powergrid informed that PLCC system has been checked and found healthy. Powergrid explained that initiation of DT was observed during temporary earth fault in DC system.

ITEM NO. C.4: 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.

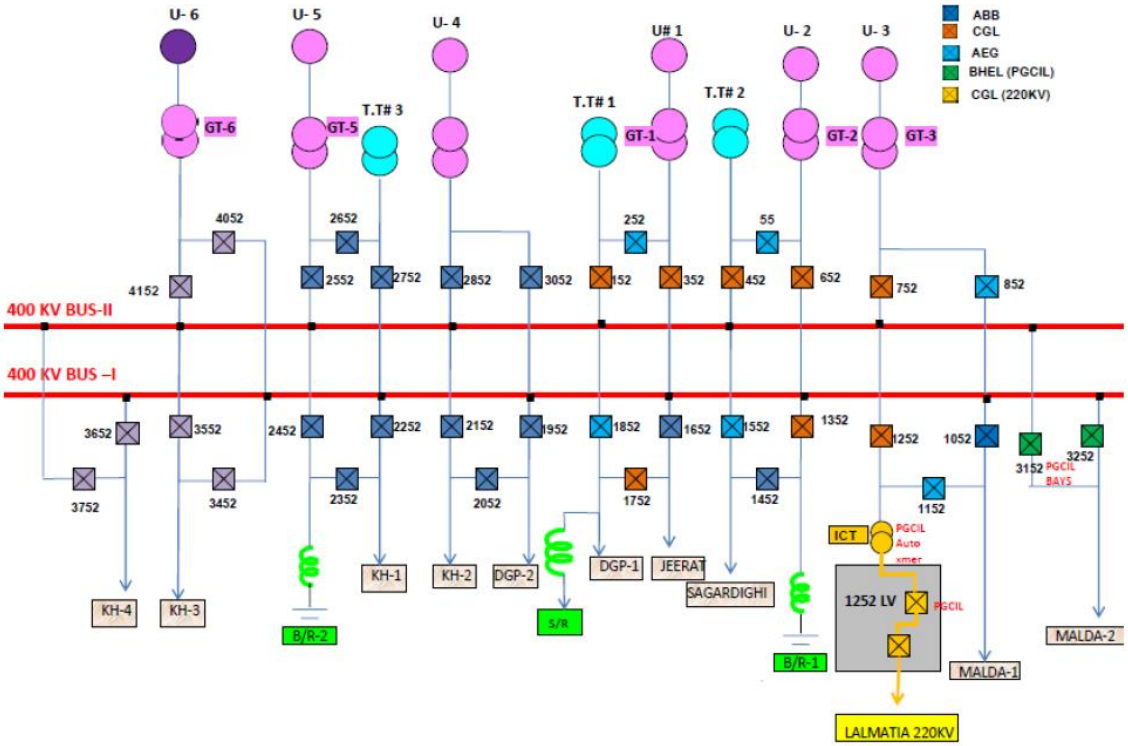
CESC may update.

Deliberation in the meeting

CESC informed that PRDC was advised for PSS tuning of all Budge-Budge units to minimize the oscillations during light load periods. CESC informed that the grid synchronization point has been shifted to Kasba from 4th March 2015 and no oscillations were observed in the system with the increase in summer load.

PCC agreed to convene a separate meeting on April, 2015 to discuss the PSS turning issue of Budge-Budge units.

ITEM NO. C.5: 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 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.

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 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 the CB will be charged by tomorrow.*
c) FSTPP-KhSTPP-IV Tie bay : *Work has been completed but not charged. NTPC informed that they required shutdown for charging the Tie bay. OCC advised NTPC to charge the Tie bay in coordination with ERLDC.*

ITEM NO. C.6: Disturbance at OPTCL on 26th August 2014

In 28th 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 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.

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 new CVT has been arranged and it will be installed by end of March, 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 3-4 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 EL has been received at site and they will implement soon.*
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 and Powergrid agreed 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.7: Disturbance at FSTPP on 28th August 2014.

In 28th 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. --- 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.

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 and Powergrid informed that the CB will be charged by tomorrow.*
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 in February, 2015.*

ITEM NO. C.8: Members may update the following:

1. In 28th PCC, 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.

WBSETCL may update the present status.

Deliberation in the meeting

WBSETCL informed that the scheme will be implemented in schedule.

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

In 28th PCC, BSPTCL informed that the reconductoring work is near completion and main

protection relay will be installed by March, 2015.

BSPTCL may update.

Deliberation in the meeting

BSPTCL informed that the re-conductoring work is near completion and main protection relay will be installed by end of March, 2015.

3. *In 28th PCC, JUSNL 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.

- JUSNL 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.

JUSNL may update.

Deliberation in the meeting

JUSNL updated 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 April, 2015.*

- *JUSNL 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 material yet to be received for installation of relays at rest of the 8 feeders.*

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

a) 220 kV Theruvali S/s

- 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.

Deliberation in the meeting

OPTCL informed that,

- *All electromagnetic Over Current & Earth fault relays at 220 kV Theruvali S/s have been replaced except two relays of Autotransformer-I &II, expected to be completed by March, 2015.*
- *The new 220 kV bus bar protection 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. The scheme will be put in service by end of March, 2015.

Deliberation in the meeting

OPTCL informed that the bus bar protection scheme will be put in service by end of April, 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

OPTCL informed work will be completed as per schedule.

d) 220kV Rengali and Barkote S/s

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

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

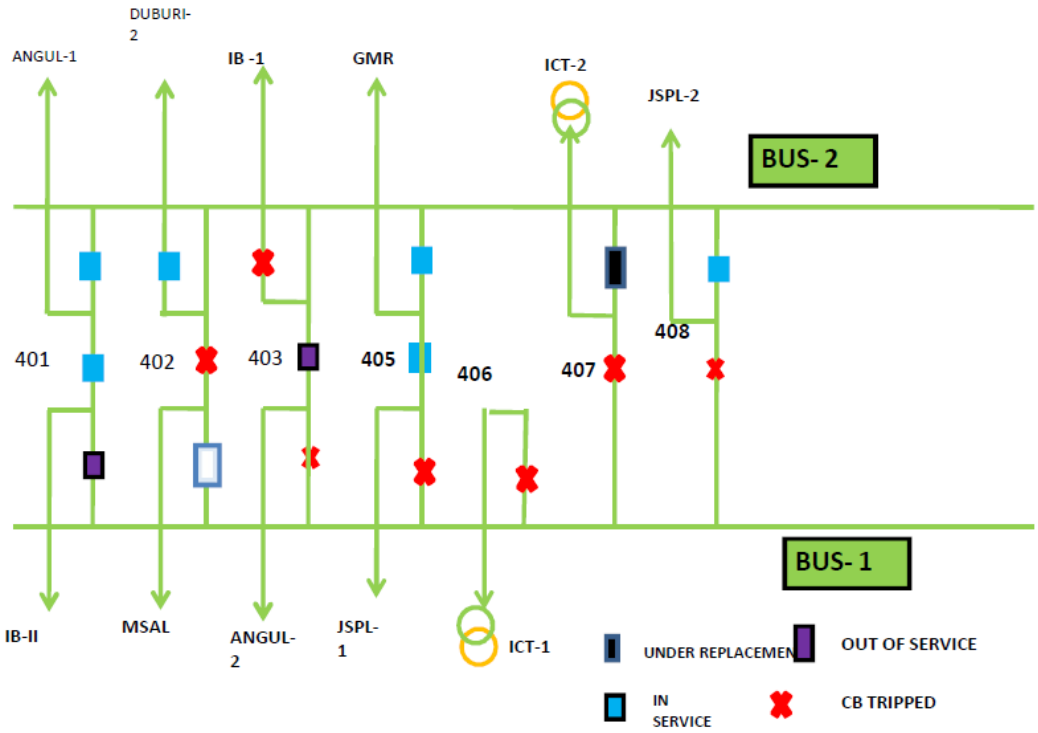
Deliberation in the meeting

OPTCL updated the status as follows:

- *Replacement of Electromagnetic O/C & E/F relays with numerical relays at 220kV Barkote S/s has been completed.*

- *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 (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.

Deliberation in the meeting

OPTCL updated the status as follows:

- *Replacement of BUS-I CB of 401 diameter (IbTPS-II) has been completed.*
- *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.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 28th PCC meeting is circulated in the meeting.

BSPTCL may update.

Deliberation in the meeting

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

ITEM NO. C.10: 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.

In 28th PCC, 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.

Accordingly, the meeting is scheduled to be held on 10th April, 2015. All constituents are requested to submit the zone settings as per revised by 30th March, 2015.

Members may note.

Deliberation in the meeting

PCC advised all the constituents to submit the zone settings as per revised settings by 30th March 2015.

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.

ITEM NO. C.11: 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.

In 28th PCC, members advised all constituents to send the data as per format available in ERPC website by 16th March, 2015.

Members may note.

Deliberation in the meeting

Constituents opined that collecting data from sub-station would take time and mean while the Protection Audit may be started.

PCC decided to start the Protection Audit from May, 2015 as per the check list. The check list will be available at ERPC website.

ITEM NO. C.12: Proposal for review of PDO conditions for HVDC Gajuwaka Poles, in view of repeated tripping of lines in S. Odisha

In 28th PCC, 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.

OPTCL may place their views.

Deliberation in the meeting

OPTCL agreed to the proposal.

OCC decided that the issue is to be discussed with Powergrid HVDC engineers for implementation of the proposal.

ITEM NO. C.13: ANY OTHER ITEM.

****