EASTERN REGIONAL POWER COMMITTEE:: KOLKATA

MINUTES OF 18th PROTECTION SUB-COMMITTEE MEETING HELD AT ERPC, KOLKATA ON 11.09.2013 (WEDNESDAY) AT 11:00 HOURS

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

Member Secretary I/C 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 THE MINUTES OF 17th PROTECTION SUB-COMMITTEE MEETING

The minutes of 17th Protection Sub-Committee meeting held on **21.08.2013** were circulated vide letter no. ERPC/SE (PS)/ PROTECTION/ 2013/ dated 04.09.2013 and also made available at ERPC website: www.eastrpc.org.

No comments have been received from any constituent.

However, the following points have been inadvertently not placed in the minutes:

"ITEM NO.C.2 : Review of Special Protection Scheme of Talcher Stage-II of NTPC- NTPC point

The issue was raised by NTPC in the 87th OCC meeting held on 20.08.2013 and referred to PCC scheduled to be held on 21.08.2013 for further deliberation.

NTPC requested to consider reviewing of the existing SPS for unit(s) tripping of Talcher Stage-II in case of single/double pole outages of Talcher-Kolar HVDC line, which is not at all attributed to Talcher, NTPC.

On the issue PCC opined that as the existing SPS was approved by CEA [the then Member (PS), CEA recommended its implementation] and is continuing satisfactorily since 2007, NTPC may take up the issue with CEA for any modification etc. of the existing scheme or otherwise in view of the present grid condition."

The minutes of the above meeting may be confirmed with the above modification.

Deliberation in the meeting

Members confirmed the minutes of the 17th Protection sub-Committee meeting with the above amendments (item no. C.2).

PART- B

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. B.1: TRIPPING INCIDENCES INVOLVING RAMMAM, RANGIT, CHUZACHEN & SIKKIM SYSTEM

In line with decision taken in 16th PCC, since no tripping occurred after 24-07-13, Chuzachen was allowed to increase generation by another 10 MW i.e. to 85 MW (interim) from 02-08-13.

ERLDC informed that, several trippings have been reported from 3rd to 14th August, 2013 which caused total power failure at Rangit, Rammam, Melli, Gangtok, Lebong (Darjeeling) and Siliguri complex. ERLDC pointed that, even with SPS operation at Chuzachen on 11th August, 2013 island did not survive.

To review the situation, a separate meeting was held at ERPC, Kolkata on 16-08-2013 wherein it was decided that, Chuzachen HPS should be restricted to maximum generation of 50 MW.

ERLDC informed that, no cascade tripping of the lines have been reported after Chuzachen generation was restricted to 50 MW.

ERLDC informed that, a team of ERLDC and Powergrid inspecting the sub-stations in Rangit, Rammam, Melli, Gangtok, Lebong (Darjeeling) and Siliguri complex to access the protection deficiencies and report will be submitted in next PCC meeting.

ERLDC also informed that, they are working on modification of SPS for survival of the system at all possible conditions. PCC advised ERLDC to place the same in next protection meeting.

Members enquired about LBB tripping at 132 kV Siliguri S/s. Powergrid replied that, trip coil was getting burned due to incorrect implementation of the scheme and the same has been rectified.

ERPC vide mail dated 30.08.2013 had circulated the concerned utility for implementing the recommendation as suggested by the team which have inspecting the sub-stations in Rangit, Rammam, Melli, Gangtok, Lebong (Darjeeling) and Siliguri complex. The status of implementation of the recommendations of the committee constituted to look into the deficiencies in protection system in Sikkim, N. Bengal, and power stations at Rangit, Chuzachen and Rammam is enclosed at **Annexure- B.1(1).** Constituents vide mail from MS, ERPC and vide fax by GM, ERLDC were requested to give their feedback.

Concerned members may please update.

Further, ERLDC has proposed a scheme for Strengthening of existing Chuzachen SPS which is enclosed at **Annexure- B.1 (2**).

Powergrid and ERLDC may please intimate the present status.

Deliberation in the meeting

*PCC reviewed the status of implementation of the reports recommended by the team. The latest status as reviewed in PCC is enclosed at **Annexure B.1(1)**.*

*Further, PCC advised WBSETCL (including WBSEDCL for Rammam HPS), NHPC, CTU and CHUZACHEN to implement the recommendations with mutual interactions by 14th September and to send compliance report to ERPC/ERLDC. Distance relay reach settings, Directional over Current and Directional Earth Fault settings received from PGCIL are enclosed at **Annexure B.1A***

PCC also advised Chuzachen to ensure consistent and uninterrupted availability of real time data to ERLDC.

*Thereafter, ERLDC presented the scheme for strengthening of existing Chuzachen SPS (enclosed at **Annexure- B.1(2)**). As per proposed (new) scheme both running units of Chuzachen should be tripped, in case of any eventuality in Sikkim & N. Bengal system.*

It was felt that the restriction in Chuzachen HPS generation during high hydro period is a huge loss and wastage of hydel resources on spilling. After detailed deliberation, PCC

considered to increase the generation of Chuzachen upto 70 MW subject to following additional conditions on compliance:

i) Both units of Chuzachen should be wired to trip on SPS scheme. The compliance reports of the implementation from the concerned utilities are received at ERPC/ERLDC.
ii) If there is any eventuality attributed in Sikkim and North Bengal System due to non-operation of SPS etc, Chuzahen generation will again be restricted to 50 MW.
iii) If there is delay in Commissioning of 400 kV Rangpo pooling S/s of Powergrid, the implemented SPS for Chuzachen may be reviewed in February, 2014 and action plan may be prepared jointly by Gati and CTU.

Further, PCC referred the issue to TCC for review in forthcoming TCC/ERPC meeting.

ITEM NO. B.2: Tripping of 220 kV Biharsharif-Fatua line from Bihariff S/s on 21.04.13

- Issue was discussed in the Special meeting on14.06.2013.
- It was reported that snapping of the Bottom conductor in between tower location No-103 & 104 of the 220KV Biharsharif – Fatuha Ckt.-II, resulted in total power failure at Biharsharif (BSPHCL) GSS. The line fault of 220KV Biharsharif – Fatuha Ckt.-II, operated the protection relays of all the 220KV incomer breaker of 315 MVA ICT-I, II & III at Biharsharif (BSPHC) end and that of the 220KV Biharsharif –Tenughat line at TenughatTPS end without tripping and isolating the faulty 220KV Biharsharif – Fatuha Ckt.-II itself at Biharsharif (BSPHCL) end.
- It was recommended that relay coordination of Fatuha, Biharsharif (BSPHCL), TenughatTPS and Biharsharif (PG) required to be carried out by BSPHCL in consultation with PGCIL and TenughatTPS and report.

During 16th PCC meeting, it was reported by BSPHCL that the Protection system at 220 kV Biharsharif substation had been checked and necessary rectification in wiring of relay control circuit has been carried out at Biharshariff S/s. The relay setting had also been checked. However, there was no information on compliance of previous recommendations by BSPHCL in respect of Fatuah S/s.

PCC decided that a committee comprising representatives from ERPC and POWERGRID would visit the substations –Fatuah (BSPHCL), Biharshariff (BSPHCL), Biharshariff (PG) and Tenughat TPS (JSEB) to assess the present status of the protection system and improvements required, if any.

In 17th PCC, BSPHCL informed that, in coordination with Powergrid zone-2 time settings at Fatuah (BSPHCL), Biharshariff (BSPHCL), Biharshariff (PG) and Tenughat TPS (JSEB) have been reduced from 400 msec to 50 msec.

BSPHCL also informed that, PLCC facility not available at these sub-stations for carrier protection. PCC advised BSPHCL to install PLCC immediately. BSPHCL agreed.

BSPHCL may please give the present status.

Deliberation in the meeting

BSPHCL informed that in coordination with Powergrid, zone-2 time settings of distance relay at Biharshariff S/s will be reduced to 200 msec. till PLCC is made available for carrier protection.

ITEM NO. B.3: SYSTEM DISTURBANCES IN WEST BENGAL

i. BIDHANNAGAR 220 KV SUB-STATION ON 12.05.13 AT 15:55 HRS

In the 16th PCC meeting, WBSETCL informed that it would take some more time to complete necessary rectification work at this sub-station so as to make both the 220 kV buses operational with arrangement for sectionalisation. The work is now expected to be completed by the end of December, 2013.

WBSETCL may please intimate the present status.

Deliberation in the meeting

WBSETCL informed that work is in progress as per schedule and will be completed within December, 2013.

ii. JEERAT 400KV SUB-STATION OF WBSETCL AND SUBSEQUENT POWER FAILURE AT 220 KV KASBA & OTHER SUBSTATIONS ON 21.05.13 AT 14:28 HRS.

- In order to prevent massive cascading effects of tripping WBSETCL considered to provide implementation of Special Protection Scheme to reduce the overloading of lines from Kasba sub-station. Further, WBSETCL implemented load rejection scheme at Subhasgram & Kasba 220kV sub-station.
- In addition to the above , carrier signal sent with reverse blocking Zone-IV and blocking of Zone-I for 100 msec with carrier receipt from other end have been made through for 220kV Subhasgram – Subhasgram (PGCIL) line I & II.
- In the 16th PCC meeting, it was informed that a separate meeting between WBSETCL and Powergrid, ER-II was held on 06.07.2013 to discuss the blocking scheme for 220 kV Subhasgram (PG) – Subhasgram (WB) D/C line. Outcome of the meeting is as follows:

    i) Only one PLCC link is available for both the circuits;
    ii) In order to prevent overreaching of the Zone – 1 distance protection at POWERGRID end, four (4) nos. of permissive signals are required for blocking the Zone – 1 protection;
    iii) Therefore, for faults in Zone – 2, no direct trip signal would be available to ensure instantaneous tripping from POWERGRID end;
    iv) ERTS – II is already in process of revising the settings of distance protection for this line;
    v) Necessary approval from Corporate Engineering, POWERGRID is expected;
    vi) Implementation of the revised scheme can be taken up by 15.08.2013.

The line being only 800 Mtr. long, WBSETCL will implement current differential protection at a later date with OPGW as communication media between the ends - WBSETCL informed.

In 17th PCC meeting, WBSETCL informed that, they are ready for the implementation of blocking scheme for 220 kV Subhasgram (PG) – Subhasgram (WB) D/C line. However, Powergrid informed that, the scheme is yet to be approved from their corporate office and expected to be approved within a week.

WBSETCL & Powergrid may update the status.

Deliberation in the meeting

Powergrid informed that their corporate has approved the proposed blocking scheme for 220 kV Subhasgram (PG) – Subhasgram (WB) D/C line. *However, in one of the present relays*

does not have option of Zone-1 blocking, they are consulting with the manufacturer. PCC advised Powergrid to resolve the problem in consultation with WBSETCL. Powergrid and WBSETCL agreed to implement the scheme by 30th September, 2013.

ITEM NO. B.4: IMPLEMENTATION OF REVISED UFRs BASED LOAD SHEDDING SCHEME (4 STAGES) IN THE CONSTITUENT SYSTEM

- In the 16th PCC meeting, it was informed that as per decision taken in the 2nd NPC meeting held on 16.07.2013, the total quantum of Under Frequency load shedding to be implemented in all four stages would be 3320 MW for Eastern Region. Accordingly, the total load quantum is divided among the constituents as per present proportionate which is as given below:

Control Area	Stage –I (49.2 Hz) (MW)	Stage –II (49.0 Hz) (MW)	Stage-III (48.8Hz) (MW)	Stage-IV(48.6Hz) (MW)	Total Relief by Control Area
Bihar	98	99	99	101	397
Jharkhand	61	62	61	62	246
DVC	134	135.5	136	137	542.5
Odisha	181.5	183.5	184	186	735
WB & CESC	345.5	350	350	354	1399.5
Total	**820**	**830**	**830**	**840**	**3320**

This was also discussed in the 87th OCC meeting on 23.07.2013 and agreed upon.

PCC members were requested to implement the revised quantum of Under Frequency load shedding in their respective systems as per the scheme (4 stages) finalised by NPC, within a month timeframe and inform the substation/feeder-wise load relief obtainable through Under Frequency load shedding, for both peak and other than peak conditions.

In 17th PCC meeting, PCC was apprised that Bihar had submitted the feeder wise details in 88th OCC meeting held on 20.8.13 and informed that, the revised scheme has been implemented in their control area with total load relief of 440 MW against 397 MW. CSEC also informed that the revised UFR load relief scheme has been implemented and submitted the feeder wise details. WBSETCL, JSEB also informed that the feeder wise details will be submitted soon. PCC requested all other constituents to implement the scheme immediately and give the feeder wise details to ERLDC/ERPC. Members agreed to give within a week.

Members may please intimate the present status.

Deliberation in the meeting

WBSEDCL informed that the 80% of the work related to revised scheme has already been implemented and it will be completed before Durga Puja i.e 10.09.2013.

DVC informed that installation of UFRs for the additional feeders which have been identified as per the revised scheme is under process and will be completed soon. OPTCL and JSEB have submitted the feeder wise detail and agreed to implement the scheme within one month.

All constituents agreed to complete the implementation process of revised scheme by 30th September, 2013.

ITEM NO. B.5: REVIEW OF ZONE-3 PHILOSOPHY

- In the 1st NPC meeting Powergrid informed that they had already reviewed and implemented revised Zone-3 settings for inter-state lines wherever required in the

country in coordination with STUs and generators. However, for the intra-state transmission lines, various data including existing Zone-3 settings had not been received by them. All RPCs were requested to advise STUs to furnish all such data to Director (O), Powergrid within three weeks.

- In the 2nd NPC meeting held on 16th July 2013, Powergrid informed that except for a few constituents in ER, the requisite data from most of the ER constituents has been received. The list of the transmission lines of the constituents which require zone-3 settings data was circulated.
- Powergrid also requested CEA /ERPC to forward the such requisite data to the following address urgently:

  AVS Ramesh, (Mob: 9560 890365), Manager (OS), Corporate Centre, POWERGRID,Gurgaon.

- NTPC has furnished the requisite data to ERPC.

Powergrid may please intimate the present status.

Deliberation in the meeting

DVC furnished the requisite information in the meeting. PCC requested other utilities to submit the relevant information to Powergrid. Members agreed.

ITEM NO. B.6: REMEDIAL MEASURES TAKEN BY JSEB FOR TESTING OF EXISTING RELAYS AT HATIA, RAMCHANDRAPUR & CHANDIL SUB-STATIONS AND INSTALLATION OF NEW RELAYS AT CHANDIL 220 KV SUB-STATIONS

JSEB in a communication dated 12.07.2013 intimated that the following remedial actions have been taken recently with the help of PGCIL:

i. On dt. 24.06.2013 and 25.06.2013 each and every relays of both 220/ 132kV and 132/33kV G/S/S of Hatia were checked and reset wherever required with time co-ordination.
ii. On dt. 26.06.2013 and 27.06.2013 each and every relays of 220/132kV Chandil and Ramchandrapur G/S/S were checked and reset wherever required with time co-ordination.
iii. Defective relays of 220kV Ramchandrapur-Chandil T/L at Chandil end were replaced and tested by Micom P430C relays.
iv. On dt. 02.07.13 SEL-311C distance protection relays of 220kV STPS and 220kV PGCIL(Ranchi) bays at Chandil end has been tested and co-ordinated by application engineer of M/s Easun Re-rolley Ltd. Hosur (Bangalore) and found okay.
v. In the first week of July, 2013 Micom P442 distance protection relays has been retrofitted in the 132kV Lalmatia-Dumka-I. Lalmatia-Kahalgon(NTPC) Lalmatia – Sabour (BSEB) line and tested, result found satisfactory.

After carrying out the above work, JSEB informed that the cases of un-coordinated trippings of lines as well as units are not repeating. However, the status is being observed for further course of action.

In the 16th PCC meeting, JSEB representative informed that with the assistance from POWERGRID, the time delay for Zone – 2 distance protection of all 220 KV and 132 KV lines emanating from Chandil, Hatia and Ramchandrapur have been reduced to 150 ms from 400 ms. Since then, indiscriminate tripping of lines on faults has reduced. Further, as single phase auto reclose facility is not present in their 220 kV lines, 3-phase tripping on single phase fault has been ensured with the help of manufacturer.

JSEB also informed that in the first week of July, 2013 Micom P442 distance protection relays has been retrofitted in the 132kV Lalmatia-Dumka-I. Lalmatia-Kahalgon(NTPC), Lalmatia –Sabour

(BSEB) lines, which was pending since long. The relays were tested and result found satisfactory. However, there were further uncoordinated trippings occurred during July /August, 2013.

During 17th PCC meeting, members enquired about the status of recommendations given by ERPC inspection team. JSEB informed that, most of the observations were complied and agreed to give the latest status within a week.

JSEB may please intimate the present status.

Deliberation in the meeting

JSEB informed that most of the works as per recommendation of the committees were implemented and the status of following pending works are as under:

- *Patratu TPS: Alstom has been contacted for PLCC related works. BHEL has been contacted to look into the matter of replacement of two CB in PTPS with adequate single CB.*
- *Chandil S/S:*
  1. *The relay setting of 220 kV Chandil-Santaldih line was reviewed by ABB and settings rectified on 03.09.2013.*
  2. *Some additional works are yet to be completed at Chandil to make LBB protection functional.*
  3. *Action initiated for procurement and installation of synchroscope at Chandil S/S*

- *Ramchandrapur S/s: Bus-bar protection will be implemented by 30th September, 2013.*
- *Hatia S/s: Regarding PLCC, work identification is in process.*

ITEM NO. B.7: REPEATED TRIPPING OF 220KV STPS-CHANDIL AT CHANDIL END ONLY –ERLDC

It has been observed that 220kV STPS-Chandil line is tripping repeatedly from Chandil end only with no tripping from STPS end. The indication at Chandil end is not being furnished properly. As the above line is an important evacuation path for STPS, it is necessary that operation of relays be checked and if detected to be mal-tripping, the problems needs to be rectified. Patrolling of the line has been carried out in the past but no faults have been detected.

The following points are hence to be clarified/action to be taken w.r.t incident:

a) In case of trippings of the line, the relay indications clearly indicating the type of fault, zone, fault current may be indicated to enable taking a safe charging attempt.
b) A thorough audit and testing of relays at Chandil end for 220kV STPS-Chandil need to be carried out.
c) JSEB may explain regarding the difficulties faced in synchronizing the line at Chandil end(if any) i.r.o non-availability of synchroscope, etc for safe synchronization of the line.
d) In past incidents of disturbances it has been observed that due to fault in reverse zone of Chandil for 220kv Chandil-STPS line(viz. 132kv side or 220kv Ranchi-Chandil), the Chandil end breaker of 220kV STPS-Chandil is tripping. The D.P. settings of the line hence needs to be checked w.r.t to reverse zone settings and corrected.

In 17th PCC meeting, JSEB informed that, line relay of 220 kV Chandil-Santaldih at Chandil end is malfunctioning. Rectification of the same is in process.

PCC advised JSEB to check Over Current relay settings and directional earth fault relay settings to compare with direction of the current during tripping incidences for identification of relay maloperation.

On query JSEB informed that, Synchroscope is not available at Chandil S/s. PCC advised JSEB to install Synchroscope immediately. JSEB agreed.

JSEB may please intimate the present status.

Deliberation in the meeting

JSEB informed that the relay setting of 220 kV Chandil-Santaldih S/c line was reviewed by ABB and settings rectified on 03.09.2013. Action has been initiated for installation of synchroscope at Chandil S/S. PCC advised to exchange the distance relay settings of both ends I.e at Santaldih and Chandil S/s for proper coordination.

ITEM NO. B.8: Tripping of 100MVA ICTs at Purnea & Purnea-Purnea(PG) lines on 06.07.2013 at 20:49 Hrs

At 20:49hrs of 06/07/13, due to fault in downstream system of BSPHCL, 132kV Purnea (PG)-Purnea(BSPHCL)-II & III tripped on earth fault & O/C relay operation at Purnea(PG) end. However no tripping was reported at Purnea (BSPHCL) end. 132kV Purnea(PG)-Purnea(BSPHCL)-I did not trip and it was later detected that Y-Ø CVT fuse of 132kV Purnea (PG)-Purnea (BSPHCL)-I at Purnea (PG) was blown. Due to Y-Ph CVT fuse failure, 132kV Purnea(PG)-Purnea(BSPHCL)-I did not trip and consequently all three 100MVA ICTs at Purnea (PG) end tripped on Directional O/C & E/F operation and cleared the fault. 132kV Purnea (PG) – Kishanganj and 132kV Purnea (PG)-Purnea (BSPHCL)-I were later hand tripped from both the sides as per normal practice.

In the 16th PCC meeting, POWERGRID ERTS – I representative, informed that Purnea(PG) – Purnea(BSPTCL) 132 kV D/C line is protected only by directional Over-Current Relay from POWERGRID end. On 06.07.2013, there was a fault in 132 kV Purnea – Khagaria line which could not be cleared from BSPTCL end as MICOM relay installed at BSPTCL sub-station did not operate. Further, due to failure of PT fuse at POWERGRID end of 132 kV Purnea(PG) – Purnea(BSPTCL) ckt-1, the Directional Over-Current relay at POWERGRID end also failed to pick up. As a result the fault was cleared by operation of back up Over-Current and Earth Fault relay of the 220 / 132 kV ATRs at Purnea (PG) end. Members felt that since static Directional Over-Current Relay is the primary protection available at POWERGRID end, provision should be made for PT fuse supervision immediately.

Members further suggested that Purnea(PG) – Purnea(BSPTCL) line being a short line (around 1 Km.), the line should be protected using numerical relay with differential protection as the main and distance protection as back up protection.

PCC recommended immediate interaction between BSPTCL & Powergrid for relay coordination at the site.

In 17th PCC meeting, BSPTCL & Powergrid informed that zone-II time settings of line relays have been reduced to 50 msec to have proper time coordination with adjacent transmission lines. BSPTCL also informed that, protection relays of 132 kV lines emanating from Purnea (BSPTCL) have been replaced with numerical relays Micom P442.

PCC advised BSPHCL and Powergrid to implement differential protection and report the status before PCC.

BSPTCL & Powergrid may give the present status.

Deliberation in the meeting

Powergrid informed that retrofitting of pilot wire protection have been agreed to in 88th OCC meeting and same has been *recommended by Commercial Committee to TCC for undertaking the project at an estimated cost of Rs. 60 lakhs.*

Further, Powergrid opined that in order to improve reliability of 132 kV system of Purnea s/s, existing 132 kV Bus arrangement including switchgear need to be upgraded to Double Main and transfer bus Scheme.

In view of the importance of Purnea S/S, PCC advised Powergrid to put up a proposal in ensuing TCC for modification of 132kV Bus arrangement along with switchgear at 220/132kV Purnea substation of POWERGRID in line with the similar proposal of 220/132 kV Siliguri S/S.

ITEM NO. B.9: Oscillation triggered at Jamshedpur by APNRL unit

In the 16th PCC meeting, ERLDC informed that severe power oscillation had been recorded by the PMU at Jamshedpur 400 kV sub-station on 07.07.2013, when Turbine Control valve of APNRL Unit 1 reportedly started hunting due to mal-functioning of the Unit Output Transducers. APNRL subsequently assured that the problem has been rectified by them, but similar incident again occurred on 23.07.2013. Members unanimously agreed that Oscillation in 400 kV power system networks is detrimental to the security of the grid as a whole and requested APNRL to take immediate steps for preventing its recurrence.

In 17th PCC meeting, APRNL representative is not available in the meeting. PCC advised to send one more reminder to APRNL regarding remedial action taken.

APRNL may give the remedial measures taken.

Deliberation in the meeting

PCC advised ERPC Secretariat to send a reminder to APNRL.

ITEM NO. B.10: Tripping at 132kV MTPS-Motihari line at 11:58 on 04-08-2013.

On 04/08/13 at 11:58 hrs, jumper snapping occurred in 132kV MTPS-Motihari ckt at MTPS in BSPTCL system (as reported by BSPTCL) due to which 400/220kV, 315MVA ICT-I at Muzaffarpur (PG) tripped on actuation of Dir. O/C & E/F protection. 220kV Muzaffarpur (PG)-Hajipur-I also tripped at the same time. Since 315MVA ICT-II at Muzaffarpur (PG) was already under shutdown, tripping of ICT-I led to 235MW load loss in north Bihar area (including 25 MW export to Nepal). The detail report from BSTCL is awaited.

The following points are required for deliberation and analysis:

a. The reasons for non-clearance of fault downstream in 132kV BSPHCL side need to be explained.
b. Powergrid needs to explain the tripping of 315MVA ICT at Muzzaffarpur before operation of 220kV side distance protection at Muzzaffarpur. The B/U O/C operation time of 3.512 secs as mentioned by Powergrid needs to be verified w.r.t the relay characteristics.
c. Proper coordination of 220kV side DP relays with 315MVA ICT backup O/C settings need to audited to ensure no mal operation.

In 17th PCC meting, Powergrid informed that, backup O/C relay operated correctly. BSPHCL suspecting problem in PLCC and rectification of the same is in progress.

BSPHCL may please give the present status.

Deliberation in the meeting

BSHPCL informed that the above incident happened at Muzaffarpur (Kanti) TPS switchyard due to jumper snapping just after the isolator. It was further added that existing relays at Kanti TPS as

well as Motihari end of 132 kV Kanti-Motihari line are very old and electromechanical type relays. While BSPHCL is in the process of relay retrofitting at Motihari end, the same is also needed for Kanti TPS end.

PCC requested BSHPCL and NTPC to take up the matter with Kanti TPS for replacement of their existing 132 kV and 220 kV relays with numerical relays and proper protection co-ordination with other ends. BSPHCL and NTPC agreed to the proposal.

PART – C

ITEM NO. C.1: ANALYSIS & DISCUSSION ON GRID INCIDENCES WHICH OCCURRED IN CTU / STU SYSTEMS DURING JULY, AUGUST & SEPTEMBER, 2013

C.1.1 Orissa System

A. Multiple trippings of lines at 220 kV Theruvali S/S in OPTCL system on 30.07.2013

- At 23:59hrs on 30.07.2013, transient earth fault occurred in 220kV Theruvali-U.Kolab Ckt (low ground clearance due to growth of bamboo trees) due to which various 220kV feeders & Auto transformers tripped at Theruvali & at Remote s/s also.
- Around 80MW load loss occurred at Theruvali area due to tripping of both 100MVA ICTs. No generation loss was reported by OPTCL.

Details:-

- It appears that the sequence of events was initiated due to fault in 220kV Theruvali-U.Kolab Ckt (low ground clearance on growth of bamboo trees) on transient earth fault. However, there appears to a delayed opening of CB of the said ckt at Theruvali end (as reported by OPTCL).
- OPTCL also reported that the LBB scheme at Theruvali end is not functional and as a result tripping of feeders on LBB did not occur.
- Some of the outgoing lines tripped from Theruvali end possibly on reverse zone protection, while the remaining feeders tripped from remote ends.
- Thus Theruvali-Indravati-II and Theruvali-Narendrapur-I & II tripped from remote ends (Indravati/Narendrapur) on Zone-III.
- Also, OPTCL has reported that DP relay in Indravati-Theruvali-IV is not available but only backup O/C E/F relay is available and considering directional element the same did not trip at Theruvali end. Hence the said ckt tripped from Indrāvati end only.
- The detailed report from OPTCL is awaited.
- **The following points are required for deliberation and analysis:**
  a) Complete relay indications with DR/EL printouts wherever available
  b) Details of Main-I & II relays and backup relays and their settings
  c) Non-operation of LBB at Theruvali end needs to be explained by OPTCL.
  d) Reverse zone settings for the outgoing lines from Theruvali end needs to be furnished to check whether the trippings from Theruvali have occurred properly.
  e) Tripping of ICTs due to fault in 220kv outgoing lines needs to be explained by OPTCL.

In 17th PCC meeting, the issue could not be discussed as OPTCL representative was not present.

OPTCL may please explain the remedial measures taken.

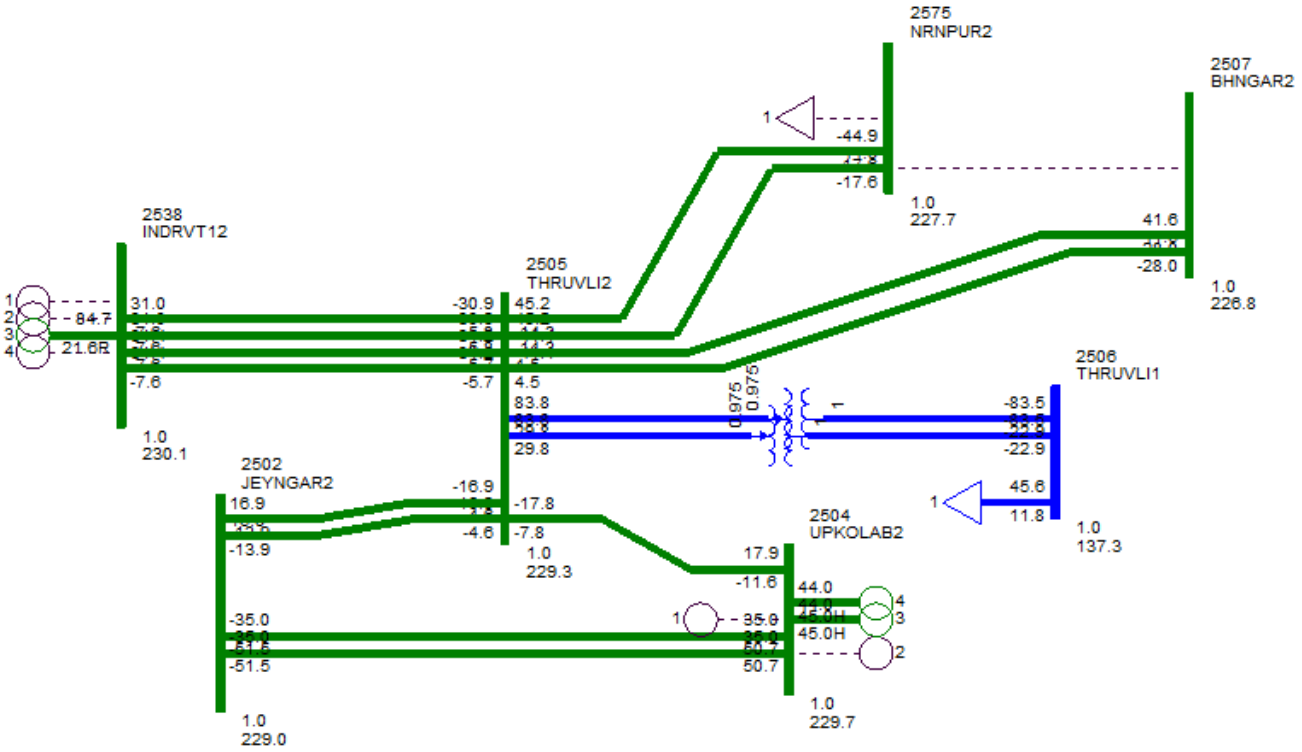


Figure- C.1.1 (A): Theruvali, OTPCL

Deliberation in the meeting

The issue could not be discussed due to non participation of OPTCL. It was proposed to take up the matter of non-participation of OPTCL in PCC meetings with their higher Authorities.

B. Tripping at OPTCL (Meeramundali, Duburi, Dhenkanal, Chainpal, Bhanjanagar, Kendrapara) on 02/08/13 at 18:25hrs

- At 18:25hrs, bus fault occurred at 220kV side of Meeramundali s/s when discharge attempt was taken at 'B'-Ø breaker bus side pad clamp of 220kV Meeramundali-Kaniha Ckt-I, when bus isolator was in closed condition.
- All 220kV lines & some 400kV ckt including 400/220kV & 220/132kV ICTs at Meeramundali tripped. The lists of tripped element are as follows.

220kV Meeramundali-TTPS Ckt-I & II 220 kV Meeramundali-NALCO Ckt-I & II 315MVA ICT-I & II at Meeramundali 100MVA Auto-I & II at Meeramundali 400kV Meeramundali- Angul	400kV Meeramundali- GMR 220kV Meeramundali-Bhanjanagar Ckt-II 220kV bus coupler 220kV Meeramundali-Duburi-I & II 220kV Meeramundali-BSSL Ckt-I & II

- At 18:35hrs, all 132kV Ckt hand tripped as per normal practice.

Detail:-

- It appears that an inadvertent attempt was taken by a workman to discharge a live section ('B'-Ø breaker bus side pad clamp of 220kV Meeramundali-Kaniha Ckt-I [connected to Bus-II]) and consequent bus fault occurred at Meeramundali as reported by OPTCL.
- Most of the 220kV Ckts tripped on B-Ø, O/C & E/F except 220kV Meeramundali-Bhanjanagar Ckt-II possibly due to delayed opening of bus coupler CB.
- O/V relay triggered in 400kV Meeramundali- Angul line may be due to loss load.

In 17th PCC meeting, the issue could not be discussed as OPTCL representative was not present.

OPTCL may please explain the remedial measures taken.

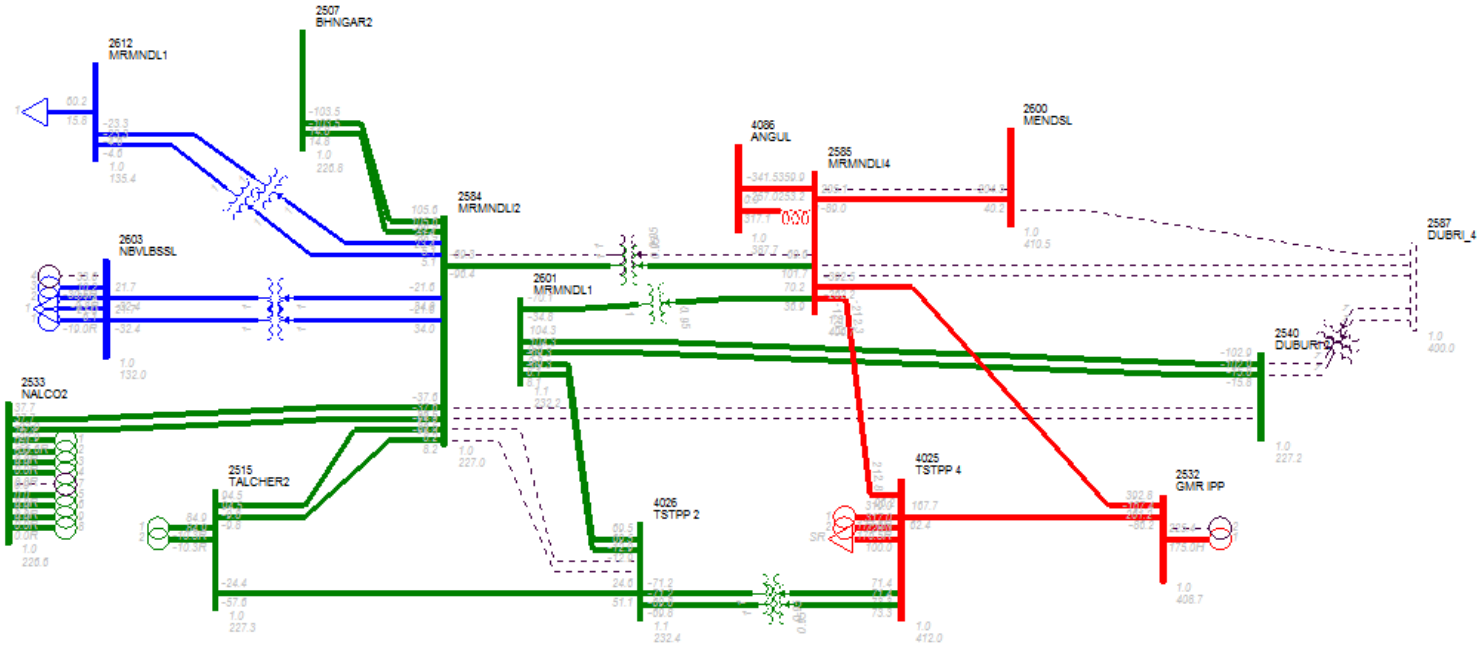


Figure-C.1.1(B): OPTCL System

Deliberation in the meeting

The issue could not be discussed due to non participation of OPTCL. It was proposed to take up the matter of non-participation of OPTCL in PCC meetings with their higher Authorities.

C.1.2 Bihar System

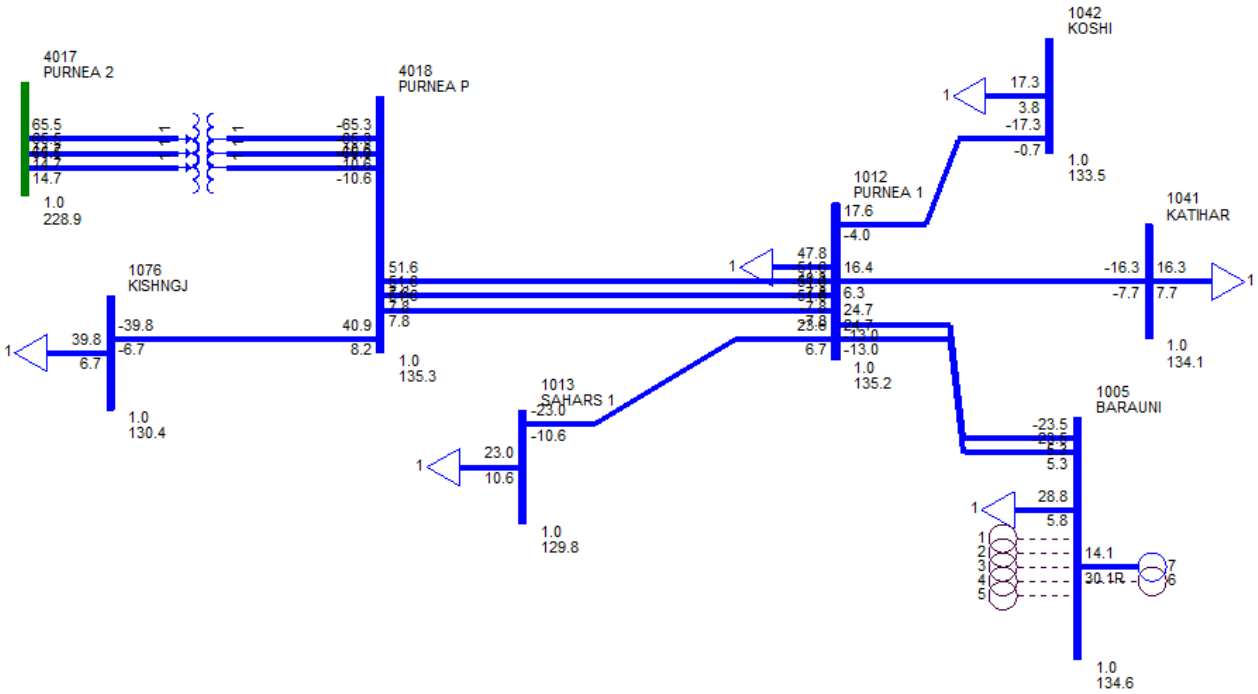


Figure- C.1.2: Bihar System

A. Disturbance of BSPHCL system on 10/08/13

- At around 21:16hrs, jumper of 132kV Naugachia bay snapped at Purnea (BSPHCL) due to which following ckts tripped.

  a) 132kV Purnea (PG)-Purnea (BSPHCL)-T/C
  b) 132kV Purnea (PG)-Kishanganj
  c) 132kV Purnea (BSPHCL)-Naugachia

Details:-

- It appears that the sequence of events was initiated due to jumper snapping of 132kV Naugachia bay in Purnea (BSPHCL) system.
- However, due to delayed clearance from Purnea (BSPHCL) side, the Purnea(PG)-Purnea(BSPHCL) T/C from Purnea(PG) tripped on actuation of Dir. O/C & E/F relay.
- 132kV Purnea (PG)-Kishanganj line also tripped from PG end on back up E/F protection, as Kishangnj is also connected to Purnea(BSPHCL) through Phorbisganj.

B. Disturbance of BSPHCL system on 13/08/13

- At around 11:35hrs, due to fault in downstream of Purnea (BSPHCL) system, 132kV Purnea (PG)-Purnea (BSPHCL)-T/C tripped on Dir. O/C & E/F from Purnea (PG) side only.

Details:-

- It appears that the sequence of events was initiated due to fault in downstream of Purnea (BSPHCL) system.
- However, due to delayed clearance from Purnea (BSPHCL) side, the Purnea (PG)-Purnea (BSPHCL) T/C from Purnea(PG) tripped on actuation of Dir. O/C & E/F relay.

BSPHCL may kindly apprise action taken for rectification of their line protections at Purnea, Phorbisganj etc. 132 kV S/Stns and coordination of their settings with PG end protection.

Deliberation in the meeting

BSPHCL informed that Zone-II settings of all the distance relays at Purnea S/s have been revised to 50 msec. and back-up protection has also been provided.

C.1.3 Sikkim System

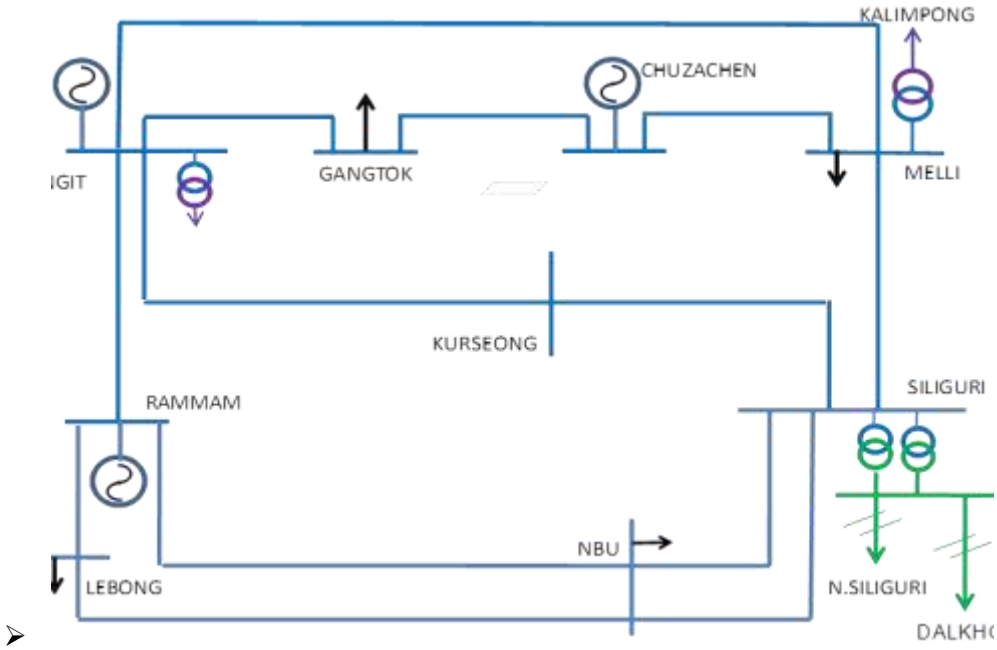
A. Sikkim System on 14/08/13

- 132 kV Rangit-Kurseong and NBU-Lebong lines were under breakdown.
- At 15:12hrs, flash over of line CT of 132kV Rammam-Lebong line occurred at Rammam end (as reported by WBSETCL) & following elements including all the lines emanating from Rammam HPS tripped.

  a) 132kV Rangit-Rammam tripped from Rangit with R-Y-N, Z-3 relay indication
  b) 132kV Rangit- Melli from Rangit end
  c) 132kV Siliguri- Melli from Melli end
  d) Chuzachen unit# 1 & 2
  e) Rangit unit#1, 2, 3

f) Rammam Unit # 1, 2, 3 & 4

- SPS at Chuzachen did not operate, as reported by Chuzachen.



- **Figure-C.1.3: Sikkim System**

Observations:-

- The fault was likely to operate the bus-bar differential protection at Rammam HPS.
- Distance relay at Rangit appears to have over-reached, Zone-3 time setting needs to be properly coordinated with adjacent relay operation times.

NHPC and Sikkim may clarify whether Rangit-Melli and Melli-Siliguri lines tripped on overcurrent from Rangit and Melli ends respectively.

WBSETCL may apprise whether Rammam-NBU or any other line beyond NBU tripped.

Deliberation in the meeting

The issue discussed under Item No. B.1.

B. Sikkim system on 19/08/13

- At 03:03hrs, 132kV Rangit-Kurseong ckt tripped on Dir. O/C & E/F, Z-2 indication about 57kM from Rangit end.
- At the same time, 132kV Kurseong-Silliguri and 132kV Siliguri-Melli tripped on Zone-I fault from Siliguri end.
- Chuzachen unit-1 also tripped at the same time on operation of SPS due to breaker opening of 132kV Rangit-Rammam at Rangit end.
- Subsequently, at 03:11hrs, Unit-2 of Chuzachen tripped on operation of Back Energization (27/50) relay.

Observations:-

- It appears that the sequence of events was initiated due to tripping of 132kV Rangit-Kurseong on Dir. O/C & E/F.
- Also, simultaneous tripping of 132kV Kurseong-Silliguri and 132kV Siliguri-Melli could have been caused due to a lightning strike on the D/C tower.
- It needs to be noted that due to lower generation at Chuzachen(on generation restriction of 50MW imposed), the system remained stably connected to the grid through 132kV Rangit-Rammam and Gangtok loads was not affected.
- Rangit/Rammam units also did not trip.

C. Sikkim system on 20/08/13

- At 18:54 hrs 132kV Rangit- Ramam tripped on R-B, Z-3 fault, 72.78 km from Rangit end along with unit –I of Rangit (20 MW) as reported.
- At the same time 132kV Ramam- Lebong and 132 Kv Ramam-NBU tripped from Ramam end.
- Unit –I of Chuzachen also (generation was 05 MW) tripped due to SPS operation at Chuzachen.

Deliberation in the meeting

The issue discussed under Item No. B.1.

C.1.4 Sikkim, N. Bengal, Ramam, Rangit and Chuzachen System

- The disturbance occurred at 01:05 hrs on 01.09.13.
- PMU plots obtained from Farakka STPS indicate that there were two distinct incidents of fault occurrence.
- Comparing the voltage dip times with the SOE record dumped at ERLDC SCADA, it appears that the first instance of fault originated in the 132kV system of WBSETCL, while the second probably existed in 220kV Siliguri(PG) - Binaguri D/C line.

01:04:35 Hrs.-

- 132kV Siliguri(WB)-NJP(WB)-1 tripped reportedly on distance protection from NJP(WB) end and both distance and earth fault protection from Siliguri(WB) end.
- However, tripping of 132kV Siliguri(WB)-NJP(WB)-2 from Siliguri(WB) end, as reported by WBSETCL, has not been recorded by SOE dumped at ERLDC.
- Almost at the same time, 132kV Rammam – NBU line tripped on Zone-1 distance protection from Rammam end but there was no tripping from NBU end.
- This was followed by tripping of 132kV TCF-I – NBU line from TCF end and 132kV Siliguri(PG)-NBU ckt 2 from Siliguri(PG) end on Zone-3 distance protection.
- Further, WBSETCL has reported tripping of 132kV TCF-I – NJP(WB) line on distance protection Zone-1 from TCF end only and 132kV Siliguri(WB)-NBU also on distance protection Zone-1, from Siliguri end only, which have not been recorded in the SOE file.
- The analog data records obtained from ERLDC SCADA, however, show that the power flow through these lines indeed became NIL.

01:05:45 Hrs. -

- 132 KV Siliguri(PG)-NBU-1 tripped only from Siliguri(PG) end on Zone-3 distance protection as well as directional earth fault protection. Thus NBU lost its connectivity with Siliguri(PG) and rest of WBSETCL system at 132kV (except Lebong).
- Almost simultaneously, 220kV Siliguri(PG) – Binaguri D/C as well as 400/220kV ICT-1& 2 at Binaguri tripped, as observed from SOE record as well as SCADA analog data.
- Also, with tripping of 220kV Siliguri(PG)-Binaguri D/C, the system comprising Chuzachen, Rangit, and Rammam power stations with load of NBU, Lebong, Kurseong, Siliguri(WB) and Sikkim load got islanded from the rest of the grid with around 80MW load and 160 MW generation.
- The resulting surplus led to shooting up of frequency upto 54.3 Hz (Rammam frequency). Rammam and Rangit units probably tripped on over speed.
- Chuzachen experienced hunting of frequency and during the oscillations, its unit-1 tripped on under-frequency.
- Oscillations of Rammam bus frequency have also been distinctly observed in SCADA analog plots which lasted for about 7 minutes.
- The plots of Chuzachen generation as well as line flows from this station indicate that part of the island survived for around 13 minutes after which Chuzachen unit-1 pulled out.

Observations:-

- From the available relay indications it is observed that all 132kV lines connected to Siliguri(WB) had tripped on distance protection.
- Except 132kV Siliguri(WB)-NJP(WB)-1, no other line tripped from the remote end.
- Moreover, location of the fault (Zone-1 / Zone-2 / Zone-3) from Siliguri(WB) and phases involved for NJP(WB)-1 and NJP(WB)-2 lines is also not mentioned in the relay indications.
- Further, both Siliguri(WB)-NBU and Rammam-NBU detected fault involving phases Y and B, from Siliguri(WB) and Rammam end respectively in Zone-1, looking towards NBU. But from NBU end there was no tripping.
- The 132kV line between TCF PS-1 and PS-3 tripped from both ends on Zone-1 fault, involving phases Y and B.
- However, from the indication of distance protection at 132kV Siliguri(PG) end for NBU-1 and NBU-2 lines it may be inferred that there was some fault within WBSETCL system, beyond NBU, clearance of which got delayed or which the concerned primary protection failed to clear, leading to operation of Zone-3 distance protection from Siliguri(PG) end.
- The relay indications obtained for WBSETCL lines also hint at the possibility of relay mal-operation in WBSETCL system, which could be due to improper coordination of reach and / or time setting.
- Also operation of earth fault relay together with distance protection for some of the lines indicate improper time coordination between distance and earth fault protections.
- In the absence of complete tripping information for each line such as location of fault, phases involved, fault current, DR output etc., it is difficult to carry out proper analysis of the incident.

Concerned members may update.

Deliberation in the meeting

The issue discussed under Item No. B.1.

C.1.5 Jharkhand System

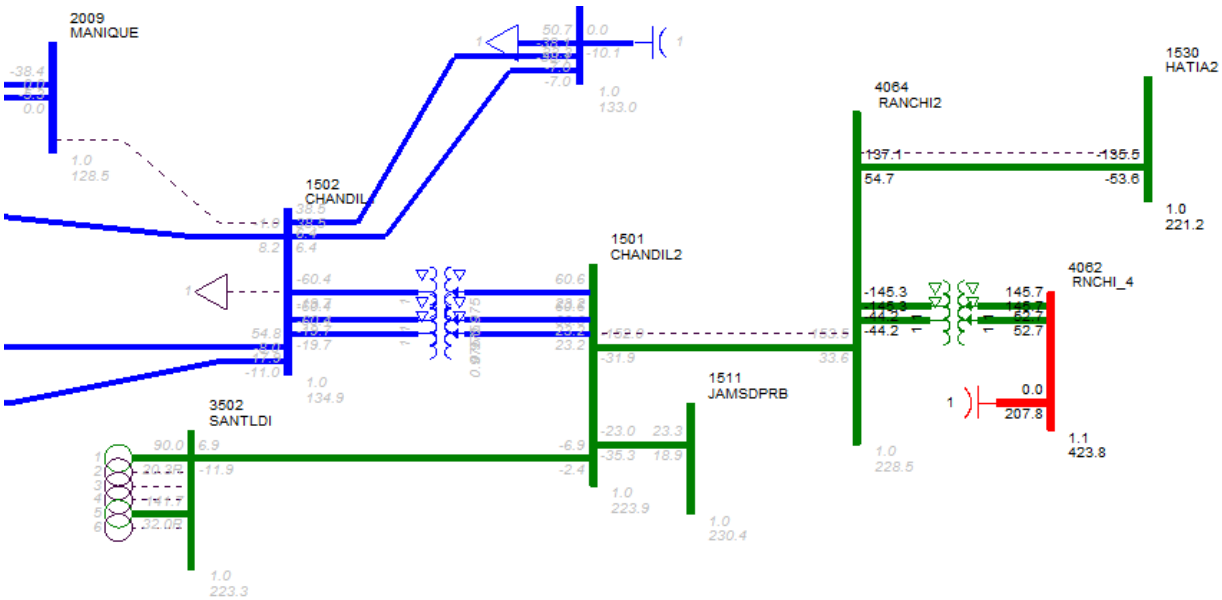


Figure-C.1.5: JSEB Chandil System

Tripping of all 220kv lines from Chandil on 02/09/13

- At 18:59hrs, B-Ø to ground fault occurred in 220kV Chandil-Ranchi ckt (as reported by JSEB) resulting in tripping of all 220kV outgoing lines from Chandil (132kV load was not distupted).
- Details of relay indications as obtained from JSEB/ER-I are depicted below:

Time	Sl No	Name of the Element	Relay indications(End1)	Relay indications(End2)
18:59	1	220kV Chandil-Ranchi	Chandil End B-Ø to ground, SOTF, DP relay 21xR,21xY,21xB, Master trip relay, Fd-69.71kM(LL=71kM), Ib-1.34kA, Ir-137A, Iy-587A	Ranchi end Did not trip. However, B-Ph pickup, Zone-5 (forward direction) was observed which reset in about 102ms.
	2	220kV Chandil-STPS	Chandil End R-Y-B-Ø, Z-1, E/F, master trip relay	STPS end Did not trip
	3	220kV Chandil-Ramchandrapur	Chandil End Z-3	Ramchandrapur End Z-3, VAJ 186

Details:-

- It appears that the B-Ø to ground transient fault occurred in 220kV Chandil-Ranchi at 69.71kM from Chandil(very near or within Ranchi S/S).
- Due to above fault, 220kV Chandil-Ramchandrapur tripped on Zone-III from both ends. Also 220kV STPS-Chandil tripped from Chandil end only.

- PMU plots of Ranchi(PG) S/S shows fault getting cleared in about 100ms.
- It was confirmed that the fault was of transient nature as all the three lines were normalized by 19:22 Hrs.

- **The following discrepancies need to be clarified w.r.t the incident:**

a) Tripping of 220kV STPS-Chandil due to fault in reverse zone needs to be clarified. It should be noted that the line did not trip from STPS end.
b) It appeared that the transient fault did not persist beyond 100ms as Ranchi(PG) end B-ph picked up and reset within 102ms from initiation (as per EL received from ER-I). However, the line tripped from Chandil end. JSEB has also not mentioned the Zone of the tripping. JSEB may explain the tripping corroborating the present Zone settings. The operation of SOTF relay may also be explained.
c) Tripping of 220kV STPS-Chandil at Chandil end only due to reverse zone fault needs to be explained.
d) Tripping of 220kV Ramchandrapur-Chandil from both ends on Zone-III appears to be a case of mal-operation as it appears that the fault did not persist beyond 100ms. Also, Zone-III operation from Chandil end needs to be explained as the fault was in reverse direction.

JSEB may please explain.

Deliberation in the meeting

JSEB informed that 220 kV STPS – Chandil line tripped due to incorrect relay setting, which have been found out and rectified with help of M/s. Alstom on 03.09.2013. Regarding tripping of 220 kV Ramchandrapur-Chandil line, the tripping is found to be in order.

- ER-I has indicated Zone-5 operation which is corroborated by the furnished DR/EL reports. From the furnished EL it appears that Zone-5 pick up occurred at 49ms from the trigger time(B-phase pickup) and got reset at 102ms from the trigger time. ER-I may explain the details of Zone-5 settings and probable reasons for starting of the same as the transient fault was very near or within Ranchi S/S.

Powergrid may deliberate.

Deliberation in the meeting

Powergrid informed that as per their DR prints out the fault current was found 1.4 kA, but voltage was around 116 kV which might have trigger Zone-5 to pick up with starter.

PCC advised JSEB to submit the DR prints out to ERLDC/Powergrid for further analysis. ERLDC/Powergrid and JSEB agreed to analyze the same.

Powergrid pressed for PLCC and auto-reclosure facilities on all the 220 kV lines in and around 400 kV Ranchi S/S in view of upcoming 765 kV system.

ITEM NO. C.2: REPORTING OF TRIPPING / DISTURBANCES

It has been observed that while some of the generating stations / SLDCs / STUs are sending trip reports as per the agreed format; others are not. Moreover, even if the report is sent as per format, most of the fields are left blank. For proper analysis of any disturbance, it is essential to submit the information complete in all respects.

A revised format for furnishing tripping details is prepared, wherein antecedent system conditions, protection system status etc. details have been included.

All regional entities of ER are requested to kindly furnish tripping information as per this revised format and ensure that all relevant fields are duly filled in.

Members may update.

Deliberation in the meeting

ERLDC informed that the format for reporting the tripping information has been modified for better reporting purpose. ERLDC presented the revised format and explained (Format is enclosed at ***Annexure C.2,*** *also made available at ERLDC website).*

PCC requested all constituents to report the grid incidence to ERLDC in revised formats along with necessary DR/EL printout within 24 hours of the incidence. All constituents agreed.

MPL and WBSETCL informed that Powergrid is not sharing the remote end relay indications, in case of tripping of lines/elements. PCC advised all constituents to exchange the relay indications with remote end Sub-stations for better analysis of the incidence.

ITEM NO. C.3: PROTECTION COORDINATION IN ODISHA NETWORK.

Widespread tripping of transmission elements / generators in and around the following locations had been observed in the past:

1. Jeynagar
2. Theruvali
3. Meramundali
4. Budhipadar

In the absence of complete supporting data such as time-synchronized DR and event logger record, fault locator reading etc. proper analysis of the incidents could not be done on several occasions. The possible reasons for such widespread tripping were suspected to be one or more of the following deficiencies in protection system, after subsequent deliberations in PCC and OCC meetings:

- Improper relay coordination
- Delayed operation of main / primary protection
- Non-operation of protection

Although protection audit has been carried out at many substations of OPTCL, it is suggested that the existing relay settings of lines and transformers at 220kV and above sub-stations along with other relevant details like healthiness of associated equipment, be tabulated as per the format and reviewed thoroughly by PCC members.

At present, due to high availability from hydro plants in south Odisha system (particularly at U.Kolab and Balimela HPS) loading of 220 kV Jeypore-Jaynagar D/C normally remains high. During peak hours when hydro generation is ramped up, it sometimes even crosses 150 MW each. In order to operate in a secured manner it is essential to assess the maximum permissible power flow through each line ,as per present relay setting, so that power flows can be properly monitored and controlled in real time and chances of cascade tripping is minimized.

Odisha is therefore requested to submit the present protection setting data as per the given format so that same can be reviewed.

Deliberation in the meeting

The issue could not be discussed due to non participation of OPTCL. It was proposed to take up the matter of non-participation of OPTCL in PCC meetings with their higher Authorities.

PCC decided to send a team for reviewing the protection scheme of Odisha system on the above locations.

ITEM NO. C.4: Repeated tripping of 400 kV KhSTPP-Barh D/C and 400 kV Barh-Patna-I & II with tripping initiated at NTPC, Barh end- NTPC, KhSTPP

On 04/09/13 and 07/09/13, as reported by NTPC, Barh, 400 kV busbar protection of Bus section -3 & 4 at NTPC, Barh end operated causing tripping of the following lines connected to the said bus sections:

a) 400 kV Barh-Patna 1& 2
b) 400 kV Barh- Kahalgaon 1 & 2

It needs to be noted the above lines from a part of the important intra-regional corridor for power transfer between ER & NR. However, inspite of repeated persuasions, no report from NTPC, Barh could be obtained in this regard.

NTPC may furnish the detailed report in regard and explain the tripping n detail.

Deliberation in the meeting

*The representative from NTPC, Barh explained both the trippings with presentation, which is enclosed at **Annexure C.4**.*

During the presentation it was understood that the first incidence happened due to changeover of DC supply to second source. It was informed that after switchover to second DC supply rebooting of all Numerical relay was done, which trigerred the tripping of all relays due to malfunction of output contact of CU.

PCC advised NTPC, Barh to implement the make-before-break scheme for DC supply system for un-interrupted DC supply during changeover. NTPC informed that the matter is under observation at their corporate office.

Further, Barh, NTPC informed that the following actions were taken to avoid future tripping:

- *Time Delay (500 ms) incorporated for Operating Coil of M1OX1 and M2OX2 after consulting with OS, NTPC.*

- *RL 6 output contact of CU1 was not actuating so RL 8 output contact configured for same.*
- *Revised Logic incorporated for Bus Bar (BB) Protection of Bus 3 & 4.*
- *Trueness of BB protection of BUS 3 & 4 was ensured.*
- *BUS 3 & 4 charged and again closing of dia. through Bay 38 and Bay 36 of GT4 Main and Tie was checked.*
- *Revised Logic for Bus Bar Protection of Bus 1 & 2 will be implemented in November, 2013.*
- *Incorporation of Diode coupling between two DC sources in consultation with CC, NTPC.*

Meeting ended with vote of thanks to the chair.

****

Annexure-A

Participants in 18th PCC Meeting

Venue: ERPC Conference Room, Kolkata   Time: 11:00 hrs   Date: 11.09.13 (Wednesday)

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

Participants in 18th PCC Meeting

Venue: ERPC Conference Room, Kolkata   Time: 11:00 hrs   Date: 11.09.13 (Wednesday)

Sl No	Name	Designation	Organization	Contact Number	Email	Signature
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27	V. Kalyanaram	EE	ERPC	2423??	—	[illegible]
28	Ganeswara Rao	AEE	ERPC			[illegible]
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31	Jiten Das	Chief MGR	POWERGRID	9431815708	RT_OS1@yahoo.com	[illegible]
32	S. K. Singh	CM (OS)	-do-	9434740005	[illegible]	[illegible]
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34	P K Gupta	AGM	-do-	9431821136	pkgupta05@ntpc.co.in	[illegible]
35	R. P. Singh	DGM	NTPC Patna	9431011366	rpsingh01@ntpc.co.in	[illegible]
36	S. K. Sur	AGM	NTPC/[illegible]	943784278?	sksur@ntpc.co.in	[illegible]
37	P K RAY	ACDE	POWERGRID CC	997139912?	pkray@powergridindia.com	[illegible]
38	A.V.S. RAMESH	MANAGER (OS)	POWERGRID CC	9560890365	RAMESH.AKKENAPRAGADA@POWERGRID.IN	[illegible]
39	Virendra Kumar	Mgr (OS)	POWERGRID	9434748239	virendrakumar@powergridindia.com	[illegible]
40	P. Harsha Vardhan	Engr. (OS)	POWERGRID	9434049232	02133@powergridindia.com	P. Harsha

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

ERPC::KOLKATA

ATTENDANCE SHEET

18th PCC Meeting

DATE: 11.09.2013 (Wednesday) TIME: 11:00HRS

VENUE: ERPC CONFERENCE HALL

Sl. No.	Organisation	Name & Designation	Contact Number	Email Id	Signature
41	ERLDC	S. Banerjee, CM	9433041823		
42	Gati Infra	N. Mandal AGM(E)	8016082299	niladri.mandal@gatiinfra.com	11/9/13
43	~~B. SARKHEL~~ ERPC	B - SARKHEL	9433065774		
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Annexure-B.1 (1)

Implementation of the recommendations of the committee constituted to look into the deficiencies in protection system in Sikkim, N. Bengal, and power stations at Rangit, Chuzachen and Rammam

Sl. No.	Observed deficiency	Remedial Measure	Status as on 11.09.13
	220/132 kV Siliguri (PG)		
1	Two trip coils are within the same assembly. This is a design issue.	Polarity of trip coils to be verified and corrected in all CGL make CBs. Issue to be taken up with CGL to provide independent assemblies for two trip coils.	Completed
2	Frequent flashover of insulators.	Dedicated earthing for shield wire to be provided for all 132 kV lines in high lightning prone areas. Circular dated 01.08.13 issued by ED (OS) Powergrid, Gurgaon to be implemented on top most priority.	Completed
	132 kV Melli S/S (Sikkim)		
1	132kV Rangit feeder provided with only Distance Protection Relay. Settings of Distance Protection Relay found inappropriate for line length of 32.5km.	Distance Protection Relay settings have been recalculated and implemented in coordination with officials of Melli S/S.	Powergrid informed settings changed.
2	Over-Current Protection feature of Distance Protection Relay set at 450A. No separate back-up protection is provided.	Separate Directional Over-Current & Earth Fault protective relay may be provided as back-up protection.	Could not be updated as Sikkim representative is not available in the meeting.
3	Station auxiliary DC system	Proper functioning to be ensured.	
4	GPS based time synchronization system not available	GPS based time-synchronization system to be installed and all relays to be time synchronized.	
5	DR and Event Logger not available	DR and Event Logger to be installed and time synchronized	
	132 kV Chuzachen HEP(Gati)		
1	Distance Protection Relay settings inadequate to cover high resistive faults.	Relay settings to be reviewed and forwarded to Chuzachen. The revised settings will be implemented by them on 3rd /4th Sep 2013 during the shutdown requested by them.	Complied
2	Directional Over-Current & Earth Fault protection feature of Distance Protection Relay for Melli line was found enabled whereas separate Directional Over-Current & Earth Fault relay is available.	Directional Over-Current & Earth Fault protection feature needs to be disabled in Distance Protection Relay. These features are to be configured in P-141 relay which is available for functioning in standalone mode	Complied
3	Over-Voltage Protection of Distance Protection Relay is enabled.	Requirement of Over Voltage protection feature may be reviewed. The setting as suggested will be implemented in the ensuing shutdown on 3rd /4th Sep 2013.	Complied
4	Switch On To Fault feature in Distance Protection Relay is disabled.	This feature may be enabled. The setting as suggested will be implemented in the ensuing shutdown on 3rd /4th Sep 2013.	Complied
5	Over Current protection is disabled in both Distance Protection Relays of Gangtok line.	Over Current and Earth Fault protection be enabled in P141 (over-current and earth-fault) relay. The setting as suggested will be implemented in the ensuing shutdown on 3rd /4th Sep 2013.	Complied
6	Power swing Blocking	Setting needs review. The setting as suggested will be implemented in the ensuing shutdown on 3rd /4th Sep 2013.	Complied

Sl. No.	Observed deficiency	Remedial Measure	Status as on 11.09.13
	Rangit HEP (NHPC)		
1	132kV Rangit-Rammam, 132kV Rangit-Melli and 132kV Rangit-Kurseong lines are provided with MiCom P442 (Numerical Relay) and Quadramho relay.	It is suggested to keep Quadramho out of service since it is less responsive to High resistive faults compared to Numerical Relay which has Quadrilateral characteristics.	Complied
2	Discrepancies were observed in the Resistive reach settings and other options set in the MiCom P442 relays (Distance Protection Relay) installed for 132kV Rangit-Rammam, 132kV Rangit-Melli and 132kV Rangit-Kurseong lines.	Settings to be reviewed by Protection Coordination Committee of ERPC for implementation in the relays of 132kV Rangit-Rammam, 132kV Rangit-Melli and 132kV Rangit-Kurseong lines. Reach settings of distance protection for all 132kV lines at Rangit end to be checked and properly coordinated so that over / under reaching is avoided.	NHPC agreed to complete by 13.09.2013
3	Power supply for SPS is provided from the AC supply available in the protection panel.	It is suggested to provide power supply for SPS from the station battery through a DC-to-DC Converter (220V to 24V) for reliability.	NHPC agreed to complete by 13.09.2013
4	Time synchronisation system was found 'hanging' because of which Relays are not time synchronised.	Necessary action to be taken to keep Time synchronisation system in order for effective post-fault analysis. All protective relays need to time be synchronized with the GPS clock.	Complied
	SPS scheme for Chuzachen		
1	Presently, SPS has been configured to trip Unit-1 at Chuzachen depending on certain conditions of Circuit Breaker status and power flow. This is irrespective of the power flow generated by Unit-1 (from 0 to 55MW). Trip of this unit may not provide desired relief to rest of the system.	In case of N-1 contingency, it is suggested to trip the Unit, which is generating at higher power level out of the 2 units. In case of N-2 contingency, both units may be tripped simultaneously. SPS needs a relook. ERLDC suggests that both the running units at Chuzachen be tripped for tripping of any of the following 132kV lines, till high hydro conditions persist : 1. Rangit – Rammam 2. Rangit – Kurseong 3. Siliguri – Melli 4. Siliguri – Kurseong 5. Rammam – NBU 6. Rammam – Lebong 7. NBU – Lebong For reliable detection of such conditions, CB status from both ends of concerned lines need to be made available at the input of the SPS. In addition, the present scheme of detecting more than 75 MW power flow through Chuzachen – Gangtok or Chuzachen – Melli line should send signal to trip both the units.	Wired to trip both the units of Chuzchen in SPS. The implementation of revised SPS will be reviewed in February, 2014.
2	Provision of Optic Fibre communication system for transmission of signal to Chuzachen.	Optic fibre communication is available between Siliguri and Gangtok without passing through the LILOed stations at Melli and Chuzachen. Further, there is no Optic fibre between Gangtok and Rangit as well. Provision of Optic fibre in the intermediate stations and upto Rangit will help in effective transmission of signal	The implementation will be reviewed in February, 2014.
	Rammam, Lebong, Kurseong, NBU Stations (WB)		
1	Relay settings, DR, Event Logger	Review of Relay settings to be carried out. Wherever time synchronization system, DR and Event Logger are not available / not functioning, to be installed / rectified and time synchronised.	Relay settings will be done by 14.09.13. DR, EL installation will take time

Annexure-B.1 (2)

Strengthening of Chuzachen SPS

In the last few incidences occurred in North Bengal and Sikkim system it was observed that during high hydro season even after implementation of SPS at Chuzachen all disturbance cannot be avoided. So a need for further strengthening of existing SPS is felt.

Revised Logic:-

During high hydro season, the surplus of the Rangit-Rammam-Chujachen system (considering say, 75 MW generation from Chujachen) may be even as high as or more than 100 MW (depending on way it gets separated following a contingency), **it is felt that both units of Chujachen should be tripped in case of outage of any of the following lines:**

1. Rangit-Rammam
2. Rangit-Kurseong
3. Siliguri-Melli
4. Siliguri-Kurseong
5. Rammam-NBU
6. Rammam-Lebong
7. NBU-Lebong

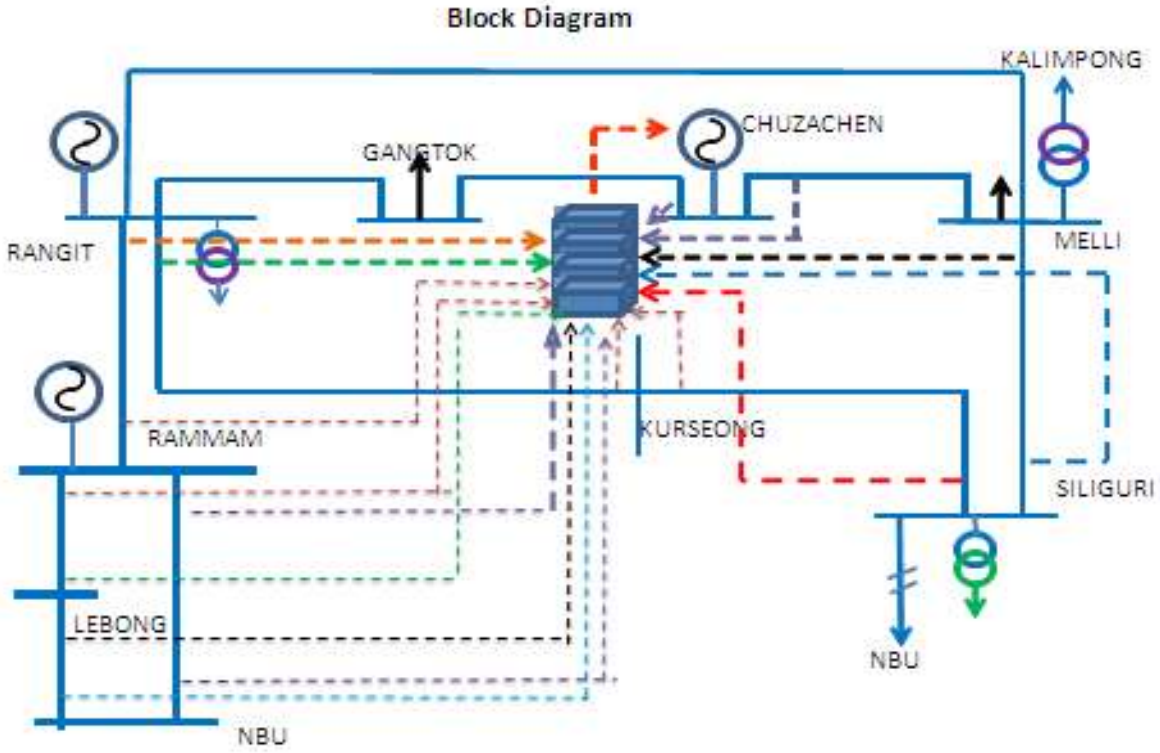
Additionally, the present arrangement of detecting rise of power flow through Chujachen-Gangtok or Chujachen-Melli should trip both the units. The block diagram of revised logic is shown in Annexure-I.

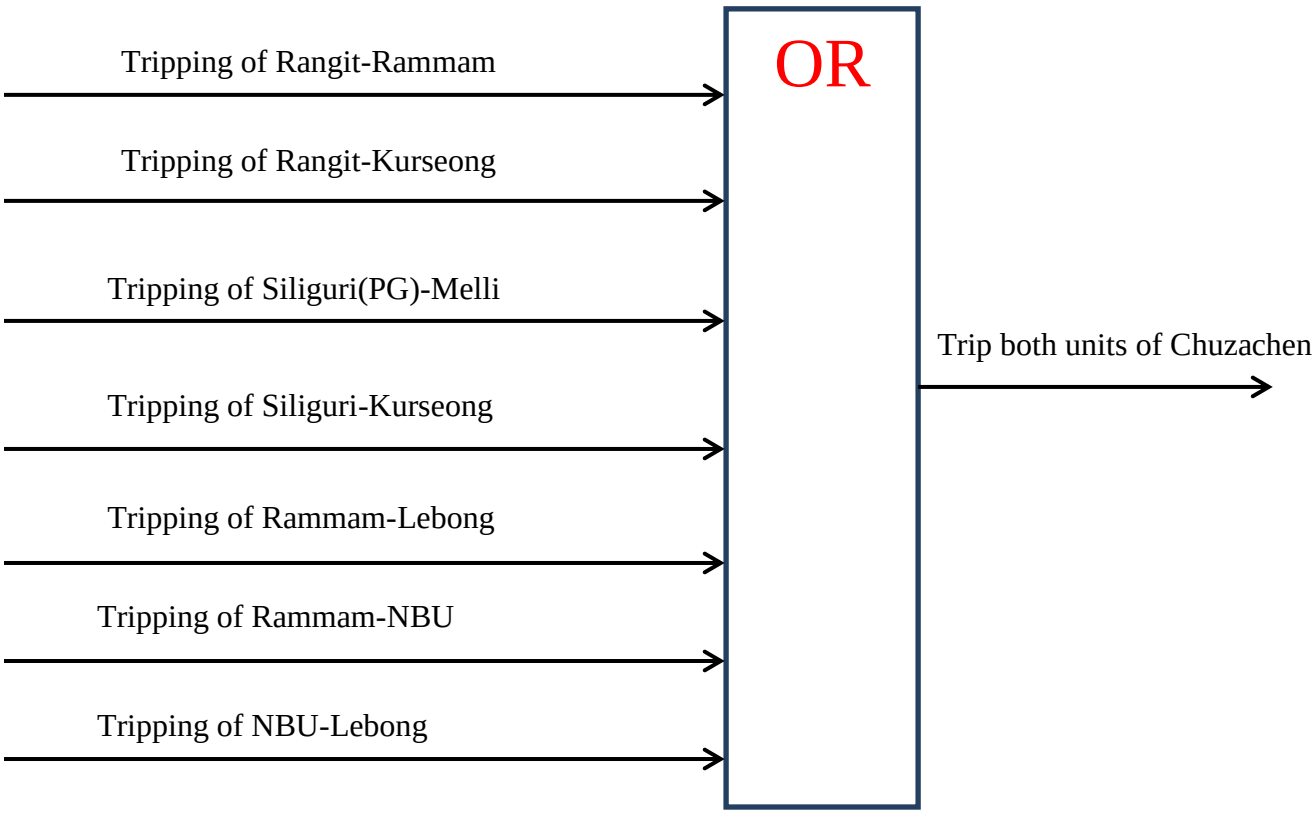
Communication:-

For detecting such condition in a foolproof manner, it is essential to have CB status and / or protection relay output from both ends of these lines as inputs to the SPS; which would be difficult and unreliable if implemented on the existing PLCC communication system. This in turn, calls for coverage of Siliguri, Kurseong, Rammam, Rangit, Lebong and NBU S/Stns under OPGW communication network from Gangtok and Melli, so that the SPS inputs can be reliably made available at the PLCC panel of Gangtok and Melli, which are just adjacent to Chujachen HPS.

This arrangement has to be continued till generation of Rangit and Rammam reduces significantly due to reduction of inflow, when the SPS may be further reviewed.

Annexure-I


Block Diagram
KALIMPONG
CHUZACHEN
GANGTOK
RANGIT
MELLI
RAMMAM
KURSEONG
SILIGURI
LEBONG
NBU
NBU


Tripping of Rangit-Rammam
Tripping of Rangit-Kurseong
Tripping of Siliguri(PG)-Melli
Tripping of Siliguri-Kurseong
Tripping of Rammam-Lebong
Tripping of Rammam-NBU
Tripping of NBU-Lebong
OR
Trip both units of Chuzachen

REACH SETTINGS SUMMARY

Sl. No	Substation	Line Name	Line Length (in km)	Relay details with Make & Model	CTR	Z1	tz1	Z2	tz2	Z3	tz3	z4 (rev)	tz4	Remarks
1	NBU	132KV NBU-PG 1 (D/C)	8.9	REL 100, no back up	600/1	80%	0	150%	0.3	1349%	1	20%	1.1	
2	NBU	132KV NBU-PG 2 (D/C)	8.9	MiCOMP442, No back up	600/1	80%	0	150%	0.3	1349%	1	20%	1.1	
3	NBU	132KV NBU-Siliguri (WBSETCL) (S/C)	10	REL 670, REX 521	600/1	80%	0	120%	0.3	256%	1	20%	1.1	
4	NBU	132KV NBU-TCF (S/C)	17	MiCOMP442, No back up	300/1	80%	0	120%	0.4	310%	1	20%	1.1	
5	NBU	132KV NBU-LEBONG (DARJEELING) (S/C)	63.9	MiCOMP442, No back up	600/1	80%	0	120%	0.5	151%	1	20%	1.1	
6	NBU	132KV NBU-RAMMAM (S/C)	69.6	REL 100, no back up	600/1	80%	0	120%	0.3	159%	1	20%	1.1	
7	LEBONG (DARJEELING)	132KV LEBONG-NBU (S/C)	63.9	THR, No back up	600/1	80%	0	120%	0.5	161%	1	20%	1.1	
8	LEBONG (DARJEELING)	132KV LEBONG-Rammam (S/C)	19.6	MiCOMP442, No back up	600/1	80%	0	120%	0.5	500%	1	20%	1.1	
9	RAMMAM	132KV RAMMAM-NBU (S/C)	69.6	QUADRAMHO, No Back up	600/1	80%	0	120%	0.5	148%	1	20%	1.1	
10	RAMMAM	132KV RAMMAM-DARJEELING	19.6	QUADRAMHO, No Back up	600/1	80%	0	120%	0.5	491%	1	20%	1.1	
11	RAMMAM	132KV RAMMAM-RANGIT	27	SEL311C, No Back up	600/1	80%	0	120%	0.3	434%	1	20%	1.1	
12	KURSEONG	132KV KURSEONG-SILIGURI	37.877	REL 670, REX 521	600/1	80%	0	120%	0.5	393%	1	20%	1.1	
13	KURSEONG	132KV KURSEONG-RANGIT	68.07	REL 670, REX 521	600/1	80%	0	120%	0.5	232%	1	20%	1.1	

Note: As regards, Sl.No.7 and 11, Backup O/C & E/F Relay to be provided at Lebong for Lebong-NBU and at Rammam for Rammam-Rangit feeder as the same is not available.

DIRECTIONAL OVER CURRENT SETTINGS							PROPOSED O/C SETTINGS				
Sl. No	**Substation**	**Line Name**	**Line Length (in km)**	**CTR**	**CTR**	**PTR**	**Istart**	**Ict Sec**	**Plug setting**	**Trip time in sec. (tz3 + 100 ms)**	**TMS**
1	NBU	132KV NBU-PG 1 (D/C)	8.9	600/1	600	1200	600	600	**1**	1.1	**0.3**
2	NBU	132KV NBU-PG 2 (D/C)	8.9	600/1	600	1200	600	600	**1**	1.1	**0.3**
3	NBU	132KV NBU-Siliguri (WBSETCL) (S/C)	10	600/1	600	1200	600	600	**1**	1.1	**0.2**
4	NBU	132KV NBU-TCF (S/C)	17	300/1	300	1200	600	300	**2**	1.1	**0.2**
5	NBU	132KV NBU-LEBONG (DARJEELING) (S/C)	63.9	600/1	600	1200	600	600	**1**	1.1	**0.2**
6	NBU	132KV NBU-RAMMAM (S/C)	69.6	600/1	600	1200	600	600	**1**	1.1	**0.2**
7	LEBONG (DARJEELING)	132KV LEBONG-NBU (S/C)	63.9	600/1	600	1200	600	600	**1**	1.1	**0.2**
8	LEBONG (DARJEELING)	132KV LEBONG-Rammam (S/C)	19.6	600/1	600	1200	600	600	**1**	1.1	**0.1**

DIRECTIONAL EARTH FAULT SETTINGS

PROPOSED E/F SETTINGS

Sl. No	Substation	Line Name	Line Length (in km)	CTR	CTR	PTR	CTR / PTR	Conductor	Ict Sec	Plug setting	Istart	Itrip = 20 X I start	Trip time in sec. (tz3 + 100 ms)	TMS (20 times Istart)
1	NBU	132KV NBU-PG 1 (D/C)	8.9	600/1	600	1200	0.5	Single Panther	600	**0.1**	60	1200	1.1	**0.5**
2	NBU	132KV NBU-PG 2 (D/C)	8.9	600/1	600	1200	0.5	Single Panther	600	**0.1**	60	1200	1.1	**0.5**
3	NBU	132KV NBU-Siliguri (WBSETCL) (S/C)	10	600/1	600	1200	0.5	Single Panther	600	**0.1**	60	1200	1.1	**0.5**
4	NBU	132KV NBU-TCF (S/C)	17	300/1	300	1200	0.25	Single Panther	300	**0.2**	60	1200	1.1	**0.5**
5	NBU	132KV NBU-LEBONG (DARJEELING) (S/C)	63.9	600/1	600	1200	0.5	Single Panther	600	**0.1**	60	1200	1.1	**0.5**
6	NBU	132KV NBU-RAMMAM (S/C)	69.6	600/1	600	1200	0.5	Single Panther	600	**0.1**	60	1200	1.1	**0.5**
7	LEBONG (DARJEELING)	132KV LEBONG-NBU (S/C)	63.9	600/1	600	1200	0.5	Single Panther	600	**0.1**	60	1200	1.1	**0.5**
8	LEBONG (DARJEELING)	132KV LEBONG-Rammam (S/C)	19.6	600/1	600	1200	0.5	Single Panther	600	**0.1**	60	1200	1.1	**0.5**
9	RAMMAM	132KV RAMMAM-NBU (S/C)	69.6	600/1	600	1200	0.5	Single Panther	600	**0.1**	60	1200	1.1	**0.5**
10	RAMMAM	132KV RAMMAM-DARJEELING	19.6	600/1	600	1200	0.5	Single Panther	600	**0.1**	60	1200	1.1	**0.5**
11	RAMMAM	132KV RAMMAM-RANGIT	27	600/1	600	1200	0.5	Single Panther	600	**0.1**	60	1200	1.1	**0.5**
12	KURSEONG	132KV KURSEONG-SILIGURI	37.877	600/1	600	1200	0.5	Single Panther	600	**0.1**	60	1200	1.1	**0.5**
13	KURSEONG	132KV KURSEONG-RANGIT	68.07	600/1	600	1200	0.5	Single Panther	600	**0.1**	60	1200	1.1	**0.5**

Annexure-C.2

FORMAT FOR REPORTING SYSTEM DISTURBANCES
(Detailed Report)

OCCURRENCE REPORT

(1) Date & Time of Occurrence

(2) Name of the Sub Station / Generating Station

(3) Details of Occurrence

(4) Connection arrangement of lines and other equipment (Attach SLD of the sub-station / power station indicating status of all CBs and isolators of lines / ATRs / Reactors/ Generators connected to the busbars)

ALTERNATIVELY

At the time of occurrence the disposition of the feeders was as below
(for 1-Main / 2-Main + 1 Transfer Scheme)

Main Bus 1	**Main Bus 2**

MAIN BUS COUPLER BREAKER WAS "ON" /"OFF"

Line / Transformer on Transfer Bus (if any):

For one and half breaker scheme

	Feeder I	Feeder II	Tie-breaker (On/Off
Diameter 1			
Diameter 2			
Diameter 3			
……			

(5) Antecedent conditions

Bus-1	**kV**	**Hz**
Bus-2	**kV**	**Hz**
Line-1	**MW(export+ / import-)**	**MVAR(export+ / import -)**
Line-2	**MW(export+ / import-)**	**MVAR(export+ / import -)**
…		
ATR-1	**MW(export+ / import-)**	**MVAR(export+ / import -)**
ATR-2	**MW(export+ / import-)**	**MVAR(export+ / import -)**
….		
Unit-1 (at GT primary)	**MW(export+ / import-)**	**MVAR(export+ / import -)**
Unit-2 (at GT primary)	**MW(export+ / import-)**	**MVAR(export+ / import -)**
…..		

Weather conditions – Normal / Stormy / Rainy / Lightning strikes going on

(6) Location and nature of Fault

Line	Fault Locator Reading	Fault Current

(7) Sequence of Trippings

Time (hh mm ss)	Event

(8) Protection out of service (if any)

Line / Transformer / Generator / Reactor	Protection out of service	Reasons

(9) Relays / DR / EL NOT time-synchronized with GPS prior to the tripping

(10) Relay Indication for Faulted Line/Bus

(A)			
Sl. No.	Name of Bay / Line	Local End Relay type And Indications	Remote End Relay type And Indications
1.			
2.			
3.			
…	……	……	……

(11) Relay indication for Generating Units / Transformers / Reactors / FSC etc.

Unit / ATR	Relay Indication
Unit #1	
Unit #2	
……	
ATR #1	
ATR #2	
……..	

(12) PLCC counter readings

	Local end		Remote end	
	Before	After	Before	After
CH I				
CH II				

(13) Analysis and Conclusion (with explanation and inference drawn from DR, EL and PLCC readings)

(14) Restoration details

Sl.No.	Line / ATR / Unit	Outage	Restoration	Duration

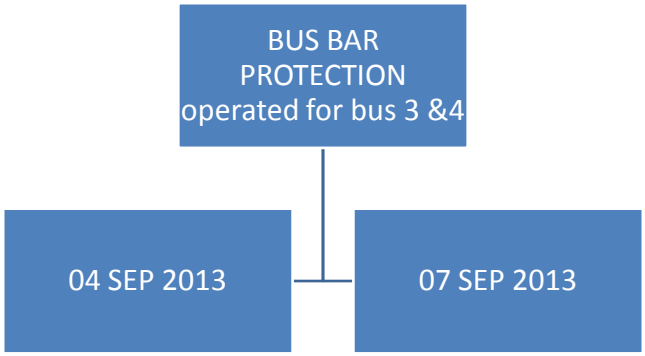
(15) Remedial Measures taken / Lesson Learnt

Enclosure ::-

1) **Schematic Diagram showing position of (ON/OFF) breakers, Isolators and Relay Indications.**
2) **DR Charts.**
3) **Event Logger outputs.**

Annexure-C.4

OPERATION OF BUS BAR PROTECTION for 400 kV BUS 3 & 4 AT NTPC BARH

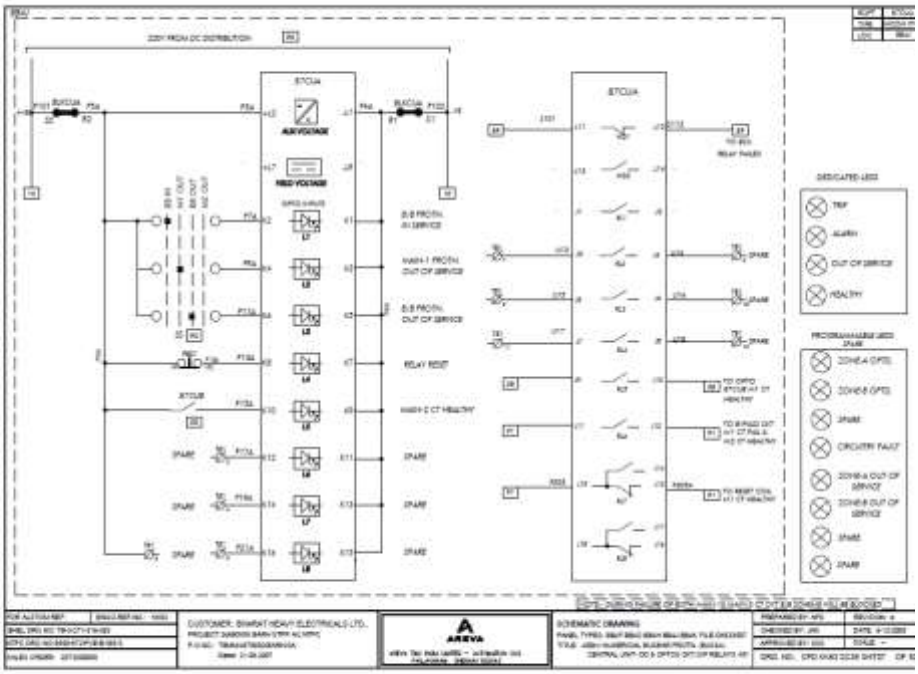


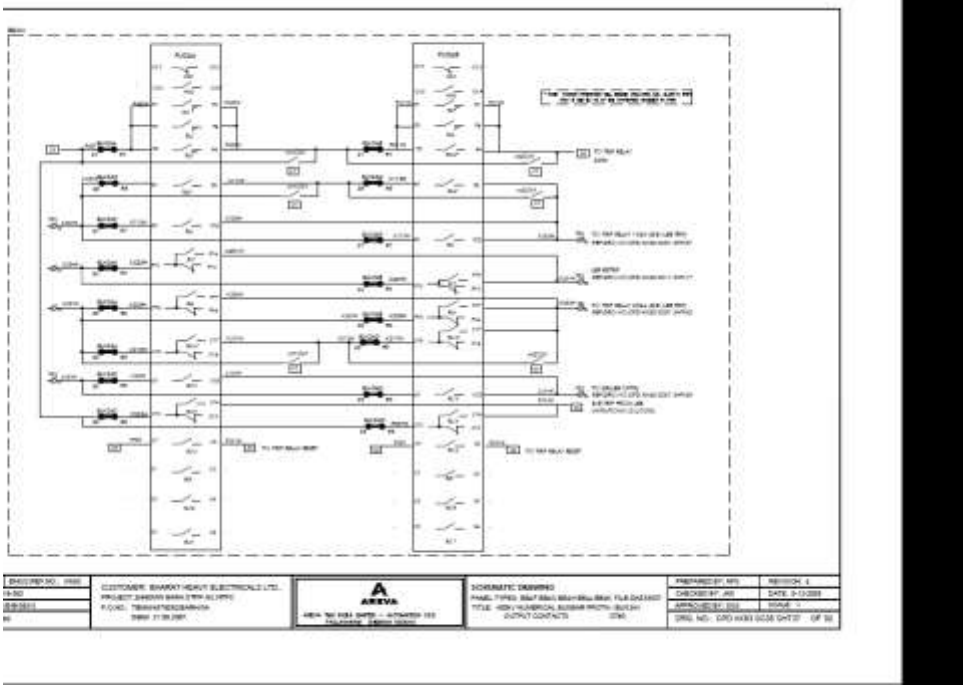
04 SEP 2013

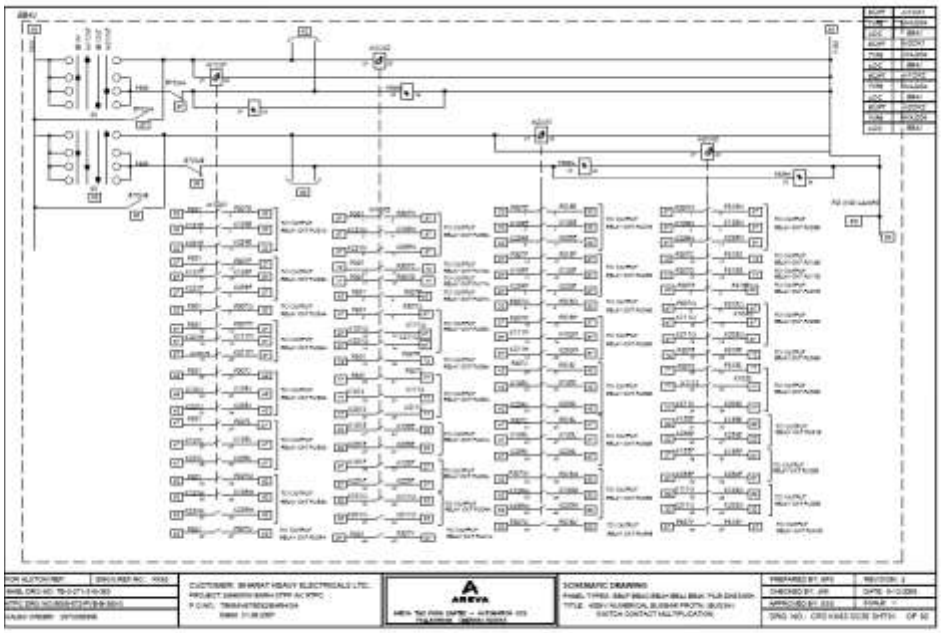
- Problem in switchyard 220 volt DC Battery charge 2
- 220 V DCDB Section-2 charged from Bus coupler
- Rebooting of Numerical Relay (All CU and PU) of BB Protection of Bus 3 & 4 observed
- These triggered operation of all 96 for PU of each Bay due to actuation of M10X1 and M20X2 which led to Tripping of CBs connected to Bus 3 & 4
- DR not actuated for CU 1 & CU2

07 SEP 2013

- Closing of dia. Through Bay 38 and Bay 36 of GT4 Main and Tie keeping GT side bay isolator and T isolator open.
- Circuitry fault detected by both CU1 & CU2 of Bus 3 & 4 simultaneously
- Operation of both M10X1 and M20X2 Relays.
- These led to operation of 96 Relay of all Bay which directly tripped the Ckt Brkrs.







Action taken on 07.09.2013

- Time Delay (500 ms) incorporated for Operating Coil of M1OX1 and M2OX2 after consulting NTPC OS.
- RL 6 output contact of CU1 was not actuating so RL 8 output contact configured for same.
- Revised Logic incorporated for Bus Bar Protection of Bus 3 & 4.
- Trueness of BB protection of BUS 3 & 4 was ensured.
- BUS 3 & 4 charged and again Closing of dia. Through Bay 38 and Bay 36 of GT4 Main and Tie was checked.
- Revised Logic for Bus Bar Protection of Bus 1 & 2 will be implemented in NOV-2013.
- Incorporation of Diode Coupling between two DC sources on consulting CC.