

GOVERNMENT OF INDIA  
CENTRAL ELECTRICITY AUTHORITY  
EASTERN REGIONAL ELECTRICITY BOARD  
14, GOLF CLUB ROAD, TOLLYGUNGE  
KOLKATA - 700 033

**MINUTES OF THE PROTECTION COMMITTEE MEETING HELD  
JOINTLY WITH 353<sup>rd</sup> OCC MEETING ON 30.08.05 ( TUESDAY )  
AT EREB, KOLKATA**

**The list of participants is enclosed at annexure-I.**

**While welcoming the participants to the meeting, Member Secretary I/C pointed out that this protection meeting was long overdue. He expressed satisfaction that there was no major grid disturbance in ER during this period. He mentioned that since January 2005, the disturbances which were discussed in the monthly OCC meetings but the causes could not be explained satisfactorily, are placed for discussion in this Protection Committee meeting. He then requested Shri B. Sarkhel, Executive Engineer, EREB to take up the agenda points for discussion.**

***ITEM NO.1 . RELAY COORDINATION OF NEW INTERSTATE LINES / STATE LINES IN ADJACENT SECTION OF INTERSTATE LINES***

In view of multiplicity of organisations involving any new/existing interstate line and its preceding two sections, it is desired that before going to make any change in the setting of the relays, respective organisation should coordinate between themselves and inform ERLDC in a joint report. In case any setting cannot be mutually agreed to, the same may be referred to Protection Committee of EREB for deliberation and consensus opinion.

At present major trippings are reported by respective SLDCs to ERLDC / EREB, the relay indication/flags on operation of main and backup protection are not sometimes provided by the SLDCs. Perhaps these are not available with the SLDCs also. It is requested that protection committee members of the constituent state may please send the relay indication/flag details and furnish their views regarding correctness of operation, otherwise of the respective relays, for taking up matter in Protection Committee on exceptions only.

Members may please discuss.

## **DELIBERATION IN THE PCC**

The issue was discussed in detail and members agreed on the following decisions regarding Protection co-ordination of the inter-state lines when the same is being made LILO at new sub station and in case of addition of new inter-state transmission lines :

- **Respective utility constituents would co-ordinate the relay settings with other end, and subsequently intimate to ERLDC/ EREB for record.**
- **The detail report including relay indication/flag details should be exchanged between both ends and informed immediately to the concerned SLDCs/RLDC in case of tripping of any inter-state/critical transmission elements.**
- **Protection Committee members of the constituent system would interact with SLDC on the relay operation in case of tripping of the line/elements and in case of any mis-coordination of relay, the same may be referred to the Protection Committee of EREB for further analysis, discussion and remedial measures.**

### ***ITEM NO.2. DISCUSSION ON THE SPECIFIC INCIDENTS***

#### **A) TOTAL POWER FAILURE AT BODHGAYA, GAYA, SONENAGAR ETC. ON 07.02.05 AND 06.08.2005**

At 00:16 Hrs of 07/02/05 all three 150 MVA ICTs at Bodhgaya tripped causing disruption of power in Bodhgaya , Gaya, Patna(part), Sonenagar, Rafigunj, Garwah. It is gathered from BSEB that 132kV B'gaya-Gaya IIIrd ckt. tripped from Gaya end with master trip relay indication. The remaining three circuits of 132kV Bodhgaya- Gaya along with 150MVA, 220/132kV ICTs no.1,2&4 tripped simultaneously resulting in total power failure at Bodhgaya, Gaya, Patna(part), Sonenagar, Rafiganj, Garwa sub-stations. However, none of the 220 kV lines emanating from Bodhgaya substation tripped. Due to this incident, there was wide spread disruption of power supply in major sub-stations of Bihar.

Sonenagar availed power from NR (Rihand) from 00:25 Hrs to 00:58hrs. ICT 1,2&4 of Bodhgaya were normalised at 00:21 onwards. BSEB system was reportedly normalised at 01:15 hrs.

Similarly on 06.08.05 hrs. at 1754 hrs both 150 MVA ICTs at Bodhgaya tripped causing total disruption of power supply at Bodhgaya, Gaya, Rafi ganj, Sonenagar, Garwah, Jehanabad and Patna(part). Power supply to traction was also affected and NR power was availed. The system was normalised at 1840hrs.

BSEB is requested to Intimate the reason of tripping along with the pre-disturbance power flow details. Reasons for tripping of the other circuits and the ICTs may please also be deliberated.

### **DELIBERATION IN THE PCC**

**BSEB representative intimated that there was a fault in 132kV Bodhgaya- Gaya circuit-III which did not trip from Bodhgaya end and the fault continued to persist feeding from the auto transformers. However delayed operation of the master trip relay of the said line from Gaya end could not isolate the faulty section. The fault could be finally cleared by tripping of all the three 220/132 kV transformers at Bodhgaya on back-up over-current & earth fault relays. However, on query from members BSEB representative could not explain why the line did not trip from Bodhgaya end. BSEB was requested to enquire and report.**

### **B) TOTAL POWER FAILURE AT MEJIA TPS ON 21.02.05**

At 0055 Hrs. of 21-02-05 all running units of Mejia (unit # 1,2,3 & 4) tripped reportedly due to B phase CT bursting of 220kV Mejia-DTPS line (L-221).

As reported by DVC, all the four running units of Mejia, generating around 750 MW, tripped due to failure of auxiliary to the generating units consequent to B-phase CT failure in 220kV Mejia-DTPS line. In the 348<sup>th</sup> OCC meeting , the incident was discussed and ERLDC opined that auxiliary supply to the generating units should not be failed in case of tripping of a line from that power station due to fault. DVC agreed to examine and submit the report for discussion.

DVC may please intimate the remedial measures taken to prevent such recurrences.

### **DELIBERATION IN THE PCC**

**DVC representative informed that bursting of the CT created a fault in 220 kV bus-I of Mejia TPS and differential protection for this bus operated leading to tripping of running units I & III. As both the auxiliary transformers for supplying auxiliary power to all the units were being fed from this bus, units II & IV also tripped on failure of auxiliary supply.**

**Members opined that DVC should take appropriate measures to feed the auxiliary supply to the units from separate buses so that such incidences are avoided in the future. DVC representative agreed to examine and implement the proposal.**

### **C. DISTURBANCE IN NORTH BENGAL SYSTEM ASSOCIATED WITH RANGIT HPS & SILIGURI S/S OF POWERGRID ON 14.03.05**

At 0303 Hrs of 14 -03-05, 100 MVA 220/132kV ICT at Siliguri 220kV sub-station tripped along with 132kV Siliguri I and II of WBSEB, 132kV Siliguri-Rangit & 132kV Rangit-Rammam lines. The ICT was charged at 0445 Hrs and Rangit HEP generation was normalised at 0613 Hrs.

As per details obtained from POWERGRID, 1X100 MVA, 220/132 kV ICT at Siliguri tripped due to over flux relay operation (voltage indicated 247 kV) and 132 kV Siliguri-Rangit line tripped from Siliguri end on distance protection, zone-II and from Rangit end zone-I.

Report from WBSEB brings out that 160 MVA, 220/132 kV ICT at NJP s/s of WBSEB also tripped at the same time (2<sup>nd</sup> ICT at NJP was under S/D since 3 / 4 days) resulting in total failure of power at 132 kV NBU, Moinaguri s/s and TCF. Rammam, Rangit units were isolated and tripped. However no tripping indications received from NBU and Mainaguri s/s. 132 kV Siliguri - Rangit line remained under breakdown from 03:03 Hrs to 20:37 Hrs on 14-3-05.

Reasons for tripping of ICT in WBSEB S/S, 132kV Rangit - Rammam line, together with relay indications may please be furnished by WBSEB. Members may please deliberate and analyze the incident, substantiating with the antecedent conditions.

#### **DELIBERATION IN THE PCC**

**After detailed deliberation members explained that a fault near to Rangit HPS in 132kV Rangit-Siliguri line caused tripping of the line on distance protection from both ends. The operator at Rangit HPS on apprehension of loss of evacuation path, hand-tripped the units and 66kv Rangit-Melli line as 132 kV Rangit-Melli line was under shutdown. However, the tripping of 132kV Rangit-Rammam line could not be explained.**

**Powergrid representative informed that due to disturbance in North Bengal associated with Rangit HPS, 220kV bus voltage at Siliguri which was persisting high due to light load condition suddenly jumped upto 247 kV at the frequency of 49.54Hz leading to over-fluxing relay operation of the lone 100MVA ICT at Siliguri S/S.**

**WBSEB representative could not explain the reason of tripping of the 160 MVA, 220/132kV ICT which was in service at their New Jalpaiguri S/S for want of adequate information.**

**With the above trippings total power failure took place in North Bengal system involving RHPS and Powergrid S/S. Members requested WBSEB to furnish detail information of all the trippings of their system for further analysis.**

**D. DISTURBANCES IN NORTH BENGAL/CTS SYSTEM ON 03.04.05, 04.04.05 AND 09.04.05**

Disturbance on 03.04.04 & 04.04.05

On 03.04.05 at 20.46 Hrs. 132 kV Siliguri-Rangit alongwith 132 kV Rammam-NBU feeders tripped on following indications :

Siliguri-Rangit:

Rangit end: Distance protection Zone-I, Phase-C

Siliguri End: Distance protection Ph-C, 186A, 186B

Rammam-NBU

Rammam end: Dist. Protection, Zone-I, RYB, 186

66 kV Rangit-Melli was already under outage from 18.34 Hrs. on operation of distance protection Zone-1, Ph-C (normalised at 00.00 hrs. of 04.04.05). Due to non-availability of evacuation path, all the running units of Rangit tripped / manually desynchronized. Subsequently, 132kV Siliguri - Rangit line was charged several times from Siliguri end but the line repeatedly tripped after holding for short durations. Finally 132kV Rangit-Rammam line was charged at 01:25 hrs of 04.04.05 from Rammam end and closed at Rangit end at 01:35 hrs. U#2 of RHEP synchronized at 01:45 hrs. 132kV Siliguri – Rangit line could be restored at 13:20 hrs of 04.04.05.

Again at 14:30 hrs of 04.04.05, 66kV Rangit-Melli line tripped reportedly due to de-capping of conductor close to RHPS switchyard. At 14.48 Hrs. 132kV Rangit-Siliguri line tripped on Distance protection Zone-2 Phase-C (Rangit end). At around the same time Rammam-NBU feeder tripped with Distance protection Zone-I, RYB PH, 186 & 195 relays. The running unit #2 of RHPS tripped, due to loss of evacuation path. At 14:52 hrs, 132kV Siliguri(PG)-NBU(WBSEB) feeders I & II tripped from both ends reportedly due to de-capping of earth wire of feeder-I. 132kV Siliguri-Rangit was charged at 15:04 hrs and synchronized at Rangit end at 15:07 hrs. Generation at RHPS resumed from 15:10 hrs.

WBSEB and NHPC may please apprise the house their observations. WBSEB is further requested to substantiate their findings with relay indications obtained at their ends. Members of

protection committee may please analyze the occurrences and deliberate on preventive measures to be taken for preventing such incidences in future.

#### **Disturbance on 09.04.05**

On 09.04.05 at 22:13 Hrs. all lines emanating from Rangit tripped leading to loss of evacuation path and tripping of RHPS #2. Relay indications obtained at Rangit end are as follows:

132kV Siliguri – Rangit line – Zone-I, Ph A,B,C  
132kV Rangit – Melli line - Distance Prot Ph-A,C  
66kV Rangit – Melli line – Distance Prot, Ph-A,B  
132kV Rangit – Rammam line – No indications

It is gathered that the prevailing weather was stormy associated with lightning and thunder.

NHPC, WBSEB and Sikkim may furnish their observations. Members may please deliberate on the reasons responsible for such multiple line outages and measures that can be taken to avoid such occurrences in future.

#### **DELIBERATION IN THE PCC**

**On 03.04.05, 132kV Rangit-Siliguri line tripped on distance protection from both ends and 132kV Rammam–NBU line probably due to power swing.**

**RHPS/NHPC representative intimated that a three phase fault in 132kV Rangit-Siliguri line occurred on 04.04.05 due to de-capping of disc insulators and subsequently 66kV Rangit-Melli line tripped due to short circuit caused by falling of tree branch near to Rangit HPS which was found out after patrolling.**

**On 09.04.05, all the line emanating from Rangit HPS including 132kV Rangit-Siliguri line again tripped on three phase fault from Rangit end due to severe storm and lightning but Powergrid representative mentioned that there was no tripping from the Siliguri end.**

**As there was no detail information available from the constituents, members preferred to analyse the incident in the next Protection Committee meeting, provided relevant information from the constituents are made available.**

#### **E. POWER SUPPLY INTERRUPTION TO MERAMUNDALI, CHANDAKA, BHANJANAGAR AND DUBURI COMMAND AREA ON 16.05.05 AT 19:03 HRS**

Report received from GRIDCO is enclosed in **Annexure-II.**

Members may please discuss.

## **DELIBERATION IN THE PCC**

After detail deliberation on the report submitted by GRIDCO, members expressed concern over the system disturbance on 16.05.05 in and around NALCO, TTPS, Duburi and other areas of Orissa due to mismatch of associated protection co-ordination. The tripping of 220kV Rengali-NALCO line with a power flow of 220 MW from NALCO end aggravated the problem of voltage dip at NALCO and led to isolation from ER grid and subsequent tripping of all its running units. The reason of tripping of 220kV Joda-Jamshedpur line with a power flow of 186 MW was also discussed.

On the query of members, it was observed that 220kV NALCO-Rengali line has overcurrent relay setting with non-directional feature at NALCO end, present mode of islanding (under voltage protection) of NALCO system from ER grid at 185kV and existing over-current relay setting at 180 MW power flow for 220 kV Joda-Jamshedpur line at Jamshedpur end. Members opined that the disturbance could have been avoided if the over-current relay at NALCO had directional feature. So the members recommended to adopt the followings.

- a) The over-current relay of 220 kV NALCO-Rengali line at NALCO end should be provided with directional feature immediately.
- b) The existing islanding scheme of NALCO system from ER grid should be considered at 195 kV by NALCO.
- c) The over-current relay setting of 220 kV Joda-Jamshedpur line should be raised from present setting of 180 MW to 225 MW immediately.

Both NALCO and DVC representatives agreed to implement and revert back.

## **F. BUS FAULT AT FSTPS ON 09.06.05**

At 01:39 Hrs of 09/06/05 B-ph CT of 400 KV FSTPP-Durgapur I main Bay failed and caught fire. Bus II tripped on Bus differential protection. All running units survived on Bus I. 400 KV FSTPP- Durgapur line II tripped due to operation of LZ96. 400KV FSTPS-Jeerat II tripped as it was charged from Bus II only. 400 KV FSTPS –KhSTPS line II tripped as it was on Bus II with tie element FSTPS-Durgapur II which also tripped. Bus II was charged at 02:20 Hrs and all lines were taken into service except 400KV Farakka-Durgapur I which was finally normalized at 16:56 Hrs of 11/06/05 .

FSTPS is requested to elaborate the antecedent and post-disturbance conditions, indicating power flows through all the outgoing lines, any constraints as well as special observations, if any. Members of the committee may please deliberate on the correctness of the trippings.

### **DELIBERATION IN THE PCC**

**FSTPP representative informed that B-phase CT of Farakka-Durgapur line-I got damaged due to fire and bus-differential relay operated for which 400kV bus-I and bus-II separated out. All the running units survived on bus-I while Farakka-Durgapur line-II tripped due to operation of LZ 96 and Farakka-Kahelgaon line-II which was on bus-II. He also added that the operation of LZ-96 relay was due to its non-directional feature.**

**FSTPS representative was requested to submit more details for further analysis by ERLDC/EREB.**

### **G. DISTURBANCE AT FSTPP AND ISOLATION OF ER-NER GRID ON 22.06.05 AT 07:02 HRS**

At 07:02 Hrs all 400KV lines from FSTPS (other than 400KV FSTPP-Malda I) tripped due to bursting of B Ph-Tie Bay CT of 400KV FSTPP-Durgapur II and 400KV FSTPS-KhSTPS II line leading to tripping of Bus II on Bus fault. FSTPS with its three units got isolated from ER grid and remained synchronized with NER and Chukha transmission system.

1. Date of Occurrence :- 22.06.05
2. Time of Occurrence :- 07:02 Hrs
3. Pre-disturbance position :- All five units (3x200MW+2x500MW) at FSTPS were in service alongwith all 400KV lines with 1150 MW total generation.
- 4: Post-Disturbance position: As reported by FSTPS, all transmission lines from FSTPS except 400kV FSTPS-Malda -I, FSTPS-Jeerat - I and 220kV FSTPS – Lalmatia tripped immediately on bursting of CT. Differential protection of Bus-II operated. FSTPS generation came down to 480 MW. Due to isolation of FSTPS from ER grid, ER system frequency came down from 49.5 Hz to 48.55 Hz. Three running units at FSTPS

alongwith CHPC & CTS system got isolated from ER grid due to the above trippings and survived by remaining synchronized with NER(FSTPP units remained synchronized with NER system via the only available 400Kv FSTPS-Malda I). CTS/NER system frequency rose to around 53.5 Hz and CHPC had to reduce generation while NER reported loss of generation.

Report from FSTPS indicating the detail sequence of events is enclosed in **Annexure-III**. As bus-II differential protection operated, all other lines and units should have continued to operate on bus-I. WBSEB may please intimate the reason of tripping of 400kV FSTPS-Jeerat line on over-voltage.

Members may please deliberate.

### **DELIBERATION IN THE PCC**

**The event was described by ERLDC but it could not be established from which end the direct trip signal of 400kV FSTPP-Jeerat line-I had originated. Both FSTPP and WBSEB agreed to re-examine the incident in details as available with them and revert back within a month.**

### **H. TRIPPING OF TALCHER - KOLAR DOUBLE POLE ON 13.06.05**

At 18:12 Hrs of 13.06.05 both poles of Talcher-Kolar HVDC carrying 930 MW tripped on DC wave front protection and under voltage protection due to a transient DC line fault. Fault locator triggered at Kolar end with distance of 527 Km from Kolar. Before tripping of the poles, ER-WR-NER frequency was 50 Hz and after tripping the same rose to 50.6 Hz. Pole I was deblocked at 18:35 Hrs and Pole II at 18:40 Hrs. TSTP Stage-II generation reduced consequent to Bi-pole tripping.

TSTPS may apprise the house details of the generation reduction that occurred in Stage-II.

Again on 22.08.05 single pole tripping reportedly occurred in the HVDC Talcher-Kolar link for which power flow through it reduced to 150 MW on ground return mode.

TSTPS may please inform the latest status regarding the commissioning of new relays for revised inter-tripping schemes as approved by CEA for Talcher stage-II.

## **DELIBERATION IN THE PCC**

Powergrid representative explained the incident in detail. After deliberation it was opined that the tripping was found to be in order.

As no representative from TSTPS was present in the meeting, the information regarding generation reduction at Talcher stage-II units and implementation of new units were not available.

NTPC was requested to submit the detail.

### **I. BUS FAULT AT JEERAT SUBSTATION ON 30.06.05**

Report obtained from WBSEB annexed - IV

Members may please deliberate

## **DELIBERATION IN THE PCC**

WBSEB representative informed that the bus differential protection at Jeerat 220kV was not available at that time. So, all the inter-connected lines/ICTs tripped after bursting of R-phase 220kV bus-II PT at Jeerat S/S.

The incident was discussed in detail and members expressed concern over the impact of power failure both at Jeerat 220kV S/S and Bandel 132kV TPS. However on analysis it was found that the tripping was in order. Members requested WBSEB to devise a suitable scheme to separate out Bandel TPS from Jeerat S/S such that Bandel TPS can survive with its load in case of any such disturbances.

### **J. DISTURBANCE AT 220 KV HOWRAH SUB STATION OF WBSEB AND ISOLATION OF CESC ON 13.07.2005**

On 13.07.2005 at 16:48 Hours 220 kV Kolaghat-Howrah D/C along with 132 kV Howrah-CESC feeders tripped. CESC system got isolated from ER grid due to tripping of all the three feeders from Howrah end.

WBSEB informed that the incident on 13.7.05 occurred due to transient line fault in one of the 220 kV Kolaghat – Howrah D/C lines. Due to the above tripping, CESC system got islanded from Howrah point when two nos. of CESC feeders from Howrah s/s tripped with relay indication of earth fault and the remaining circuit (3<sup>rd</sup>) tripped due to Overload relay operation. This resulted in interruption of essential loads of CSEC and restoration of the same took half an hour time. After the incident, the suspected line was checked up by WBSEB and nothing abnormal was found out. But, similar nature of incident again took place on 20.07.2005 and when attended it was found out that delayed opening of R-pole CB of 220 kV Kolaghat – Howrah Line – I was the main source of

above spurious signal. It has been reported by WBSEB that action has been initiated to rectify the problem.

WBSEB may please intimate whether the trippings are in order and subsequent remedial measures taken there-of.

### **DELIBERATION IN THE PCC**

**WBSEB representative informed that a transient fault in 220kV Kolaghat-Howrah line-I, was not cleared immediately and due to delayed opening of circuit breaker of the line at Howrah S/S caused the fault to persist. This has resulted in reverse power flow from CESC system leading to tripping of CESC feeders, one on earth fault and other two feeders on over-load relay operation. CESC representative informed that the essential loads of their system were restored within 7 minutes.**

### **K. ISOLATION OF NER GRID FROM THE COMBINED ER-WR GRID ON 13.07.2005**

400 kV New Siliguri – Bongaigaon line II was under ‘off’ condition since 07.07.05 to control over voltage as per ERLDC instruction. On 13.07.05 at about 04:47 Hrs, 400 kV New Siliguri – Bongaigaon Line-I tripped from Bongaigaon end on over voltage protection and Siliguri end breaker tripped on Direct trip receipt. However, some disturbance reportedly took place in NER prior to the incident. As a result, only a part of NER remained connected radially with ER grid through Birpara- Salakati 220kV line, while major part of NER isolated from ER-WR grid. While attempting to close the line from Bongaigaon end it tripped on over voltage protection and later on the relay was found to be defective and the same was replaced accordingly. NER system synchronized with ER at 08:05 hrs. However, the same line again tripped at 12:14 hrs on receipt of direct trip signal at Binaguri. ER-NER grid finally synchronized at 13:12 hrs.

On inspection it was found that whenever there was any isolator switching operation at Bongaigaon, a spurious signal was generated. On 14.7.05 at 1852 hrs the line again tripped on over voltage on the receipt of direct trip signal at Binaguri from Bongaigaon end and the line was restored at 20:10 hrs.

As per information received from Powergrid (NER), no over voltage relay operated on 13.7.05 and 14.7.05 at 1212hrs and 1852hrs respectively at Bongaigaon end and the line tripped due to PLCC mal-operation at New Siliguri end. In this connection, end to end PLCC testing was organised by Powergrid on 20.7.05. During testing of PLCC, 14 dB signal loss was observed between two ends which could be the cause of generation of spurious tripping signal, being received at Siliguri end.

Members may note.

## **DELIBERATION IN THE PCC**

Powergrid representative explained the above incident in detail, and in the 353<sup>rd</sup> OCC meeting, Powergrid representative also informed about the actions taken for replacement of the faulty LMU with a new one at Bongaigaon end.

### **ITEM NO 3. COMPLIANCE OF THE RECOMMENDATIONS OF JOINT TESTING TEAM BY BSEB & JSEB**

The issue of rectification of protection system in BSEB & JSEB at Biharshariff & Jamshedpur s/s was discussed in previous OCC/ TCC/ERE Board meetings. BSEB & JSEB representatives intimated in the 349<sup>th</sup> OCC meeting that installation of new relays, cabling etc, for improvement of the protection system in their respective substations would be shortly taken up and expected to be completed within one month in the presence of manufacturer/supplier ie. M/s ALSTOM.

It is also gathered from BSEB that the installation programme of bus bar differential relay is in progress and is expected to be commissioned shortly. Meanwhile, the 315MVA auto transformers at Biharshariff s/s of POWERGRID tripped again on 05.05.05 and 29.05.05 respectively due to fault in 132kV/33kV lines from Biharshariff s/s of BSEB.

BSEB may please intimate the latest status regarding implementation of the recommendation of the committee. JSEB may also intimate the actions taken for Ramchandrapur S/S to improve the adequate protection and relay co-ordination

Members may please deliberate.

## **DELIBERATION IN THE PCC**

**BSEB representative informed that actions had already been taken up to improve upon the protective system both for Biharshariff and Bodhgaya 220kV S/S. However, some more spares are yet to be received from the supplier. He also assured that the work would be completed by December 2005.**

*The meeting ended with vote of thanks to the chair.*

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