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भारत सरकार
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-18ए, श.जीत सिंह मार्ग, कटवारिया सराय ,
नई दिल्ली 110016 -
Government of India
Northern Regional Power Committee
18-A, S. Jeet Singh Marg, Katwaria Sarai,
New Delhi-110016

No. NRPC/OPR/105/11/2013/

Date:06.03.2014

To,

1. Chief Engineer (SLDC), PSTCL, Fax – 0175-2365340
2. Engineer-in- Chief (PPRR), Fax- 0175-2308698.
3. Member (Power), BBMB, Fax-0172-2549548
4. General Manager, NRLDC, New Delhi

Sub: Multiple tripping at Lehra-Mohahbat TPS on 18.12.2014-reg

Sir,

A meeting was held on 24th December, 2013 at NRPC, New Delhi to discuss the multiple tripping at Lehra-Mohahbat TPS on 18.12.2014. Thereafter, the issue was also discussed in the 25th meeting of the Protection Sub-Committee held on 12.02.2014. Based on the discussions in the aforesaid meetings, a report containing the analysis of the tripping and recommendations to avoid recurrence is enclosed for necessary action.

Yours faithfully,

Sd/-
SE (O), NRPC

Encl: As above

Copy for information to: Member (GO&D), CEA, New Delhi

Copy to: 1. H.C.Kamboj, Dy. C.E., PSPCL
2. S.S. Sidhu, ASE, PSPCL

Analysis of multiple tripping at Lehra-Mohabat TPS on 18.12.2013.

Three events of multiple element tripping had occurred at Guru Hargobind Thermal Plant (GHTP), Lehra Mohabat on 18th December at 02:48 hrs., 03:37 hrs. and 23:34 hrs. To discuss and analyze these tripping and to suggest the remedial measures, a meeting was held on 24th December, 2013 at NRPC, New Delhi. The list of participants is attached at Annex- I.

2. Based on the information submitted by PSPCL, PSTCL and SLDC Punjab and discussions in this meeting and thereafter in the 25th Protection Sub-committee meeting held on 12.02.2014, reasons for failure and recommendations have been finalized as given below.

3. Sequence of events on 18th December 2013

3.1 At 02:50 Hrs:

At 02:50:48 hrs., 220 kV GHTP-Barnala(BBMB)-1 line tripped from GHTP Lehra-Mohabat end in Zone-3 of distance protection. It was informed that there was a fault on 220 kV Barnala-Sangrur-1. But the fault could not be cleared at 220 kV Barnala sub-station. BBMB could not confirm, whether there was a mal-operation of relay or a problem in the breaker. DR and EL are not available at 220 kV Barnala sub-station of BBMB. Further, prior to the operation of Zone-3 distance protection, Unit # 4 of the station had tripped on Generator Back up Overcurrent protection. It was suspected that time setting of Generator Back up Overcurrent protection of Unit # 4 was lower than Zone-3 distance protection.

3.2 **At 03:37 hrs:** At 03:37:40 hrs., 220 kV GHTP-Barnala-2 tripped in Zone-1 of distance protection due to failure of Red Phase Wave Trap. This led to the under voltage in the system, which led to tripping of the auxiliaries of Unit-2 and eventually to tripping of unit-2. Further, Unit-1 tripped on Generator Reverse Power protection. PSPCL had informed that breaker of 220 kV GHTP-Barnala-2 had failed to open during the incident, which had led to unit tripping.

3.3 **At 23:43 hrs:** At 23:43:10 hrs, complete supply of 220 kV station failed as Bus section-1 tripped on Y-phase overcurrent. It was informed that it was a foggy night and several porcelain insulators had failed due to flashover. All 220 kV lines of the stations had tripped from remote end. It was informed by PSPCL that Bus Bar protection blocking push button might have been pressed by the operator inadvertently. Due to disabling of Bus Bar protection, the lines tripped from other end. Further, a cement factory is working just in the neighborhood of the GHTP. Due to direction of wind, porcelain insulators in switchyard have large ash deposit. This has been resulting into higher failure rate of insulators in foggy winter time. PSPCL informed that they have tried various methods to clean them up but without much success.

4. Reasons for tripping

4.1 Conventional Insulators in switchyard: Rate of failure of porcelain insulator is high in polluted environment. A decision was taken in the meeting taken by Chairperson, CEA on 30.04.2008 that conventional insulators should be replaced with Polymer insulators in polluted areas. BBMB at its Panipat sub-station has successfully used Silicon grease coating on insulators to avoid fog related flashovers. It is observed that PSPCL has not taken the preventive action to avoid the tripping due to flashover.

4.2 Human error: On 18-Dec-2013 at 23:43 hrs. inadvertent blocking of Bus Bar protection due to pressing of push button by the operator, seems to have led to tripping of the units.

4.3 Non-operation/delayed operation of breakers: Circuit Breakers at GHTP are quite old and it appears that their maintenance was not being carried out regularly. Unit tripping at 3.37 hrs. would not have taken place, if circuit breaker had opened successfully.

4.4 Non-availability of Numerical relays and DR & EL at Barnala(BBMB) sub-station: Due to non-availability of DR and EL at 220 kV Barnala(BBMB) sub-station, the reason and timing of the events at Barnala could not be ascertained. Further, it is still not clear whether the relay had not operated at Barnala or Breaker of 220 kV Barnala-Sangrur-1 did not operate correctly.

4.5 Correct relay setting: On 18-Dec-2013 at 02:50:48 hrs., the Unit-4 tripped on Generator Back up Overcurrent protection, even prior to operation of Zone-3 distance protection for line. The timing of Generator Back up Overcurrent protection should have been more than Zone-3 timing.

5. Recommendations

5.1 There is need to review setting of Back up Neutral over Current protection setting for all the units. PSPCL vide e-mail dated 13.01.2014 has informed that the setting of the Generator Back up Overcurrent protection had been revised and time delay for the same is greater than the time delay in Zone-3 of distance protection.

(Already complied by PSPCL)

5.2 PSPCL should also review the under voltage trip setting of auxiliaries and look into the option of giving a time delay in the tripping of auxiliaries.

(Action: PSPCL, Time frame: 01 week)

5.3 Initial trigger for most of the incidents was fault on one of the emanating transmission lines and flashover on the insulators in switchyard. These faults were attributable to fog related flashovers. In view of the proximity to cement industry,

conventional insulators need to be changed with Polymer insulators or method like application of silicon grease on conventional insulators needs to be taken up. Until insulators are replaced, regular cleaning should be done.

(Action: PSPCL, Time frame: 06 months)

- 5.4 Breaker of 220kV GHTP-Barnala Circuit-2 (PSTCL) had opened with delay / failed to open and PSPCL should check the breaker thoroughly and if required, should carry out the over hauling of the breakers.

(Action: PSPCL, Time frame: 01 month)

- 5.5 Proper written procedure should be developed and adhered to while carrying out operation and maintenance. The manpower deputed at the generating station should be properly trained and technically suitable to carry out the work assigned. To improve the quality of manpower, they should be trained periodically.

(Action: PSPCL, Time frame: continuous activity)

- 5.6 Numerical relays and DR/EL are not available at 220 kV Barnala sub-station of BBMB. CEA's Connectivity Standards mandate Numerical relays for distance protection. Such relays also offer inbuilt disturbance recording facility. Therefore, distance protection should be implemented only through numerical relays.

(Action: BBMB, Time frame:06 months)

List of Participants in the meeting held on 24.12.2013

S/Shri

1. P.S.Mhaske, MS (I/C), NRPC
2. Naresh Kumar, EE (O), NRPC
3. Rajiv Porwal, Ch. Mgr. (SO-II),
4. H.C.Kamboj, Dy. C.E., PSPCL
5. S.S. Sidhu, ASE, PSPCL
6. Akshay Garg, Sr., XEN, SLDC, Punjab
7. Nitin Yadav,, Engg., NRLDC