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उत्तर क्षेत्रीय विद्युत समिति
Northern Regional Power Committee
-18ए110016 - दिल्ली नई सराय कटवारिया ,मार्ग सिंह जीत शहीद ,
18-A, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110016

NRPC/OPR/105/11/2014

दिनांक 03.01.2014

To,

1. Director (Tech), RVPNL, Jaipur Fax – 0141-2740794
2. Director (O), POWERGRID, Fax – 0124 – 2578315
3. Executive Director, POWERGRID, NR-I, New Delhi
4. General Manager, NRLDC, New Delhi

Subject: Minutes of the meeting held at NRPC on 23rd December, 2013 on tripping of HVDC bi-pole due to failure of aux. supply at Bhiwadi

Sir,

A meeting was held on 30th December, 2013 on the above subject. Minutes of the aforesaid meeting is enclosed.

Encl: As above

Yours faithfully,
Sd/-

Member Secretary

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

Minutes of the meeting held at NRPC on 23rd December, 2013 on tripping of HVDC bi-pole due to failure of aux. supply at Bhiwadi

HVDC Balia-Bhiwadi bipole had tripped at about 6:24 on 21.12.2013 reportedly due to auxiliary supply failure consequent to tripping of Bhiwad- Khushkhera D/C line. Circuit no -1 of Bhiwad- Khushkhera line had also tripped on 18.12.2013 and 20.12.2013. A meeting was held at NRPC, New Delhi on 23.12.2013 to analyze the reasons for the same. List of participants is attached at Annex.

2. Based on discussions in the meeting and information submitted by RVPNL and POWERGRID, following sequence of events and reasons for failure were established and recommendations were finalized:

3. **Sequence of events**

3.1 **18-Dec-13**: At 07:31:34 Hrs, 220kV Bhiwadi-Khushkhera Ckt-1 had tripped from Bhiwadi end. At 07:31:34:342 Hrs fault appeared on "B" phase (Ph-N) and before auto-reclosure fault was seen in "y" phase also, resulting in tripping of line from Bhiwadi(PG) end after 690 msec (of the first fault). The fault was cleared at Khushkhera by Back-up earth fault relay. The 132 KV Chopanki- Khushkhera line crosses the above line between tower location no. 243 and 244 of the later line. The fault was created due to breaking of earth wire of 132 KV line, which fell on the 220 kV line.

3.2 **20-Dec-13**: At 03:26:01 Hrs, 220kV Bhiwadi-Khushkhera Ckt-1 tripped from Bhiwadi end. At 03:26:01:753 Hrs, "Y" phase tripped on Ph-N fault. After dead time of 1 sec, auto re-close was attempted but fault was persistent and hence line from Bhiwadi(PG) end tripped. This fault was also created by breaking of earth wire of 132 KV line, which fell on the 220 kV line. In this case also the fault was cleared at Khushkhera by back-up earth fault relay.

3.3 **21-Dec-13**: At 06:24:48 Hrs, 220kV Bhiwadi-Khushkhera Ckt-1 , 220kV Bhiwadi-Khushkhera Ckt-2, ICT-1 & ICT-2 tripped from Bhiwadi end. The fault in this case was created due to failure of insulator string of the 220kV Bhiwadi-Khushkhera Ckt-1. No protection at Kushkhera end operated and Zone-1 operated on R-N fault at Bhiwadi end at 06:24:48:454 Hrs. This was followed by opening of this circuit from Bhiwadi end at 06:24:48:468 Hrs. Since the circuit-1 remained connected at Khushkhera end, the fault was fed through circuit -2. This fault current was fed through ICTs at Bhiwadi and hence back up Over-current and earth-fault relay operated causing opening of main and tie Circuit Breakers at 06:24:49:369 Hrs (ICT-2) and 06:24:49:372 Hrs (ICT-1). ICT-3 was still in operation and at 06:24:49:633 Hrs, Zone-4 (back-up forward zone) operated at Bhiwadi in 220kV Khushkhera Ckt-2. The supply to HVDC system is fed from the

33KV tertiary of ICT 1 and ICT-2. Due to tripping of these ICTs, the auxiliary supply for HVDC bi-pole interrupted which resulted into outage of HVDC pole.

4. Factors leading to failure of auxiliary Supply

4.1 Physical damage to insulators and earth wire due to mine blasting: RVPNL has reported that the location of the failure of insulator strings and breaking of the earth wire is situated in the mining area. The insulators and earth wire got damaged due to blasting in mines.

4.2 Chemical deposition: Also, a chemical factory (SRF) is situated in the vicinity and deposition of chemicals might have also contributed towards the failure of strings.

4.3 Failure of protection system at Khushkhera: It is seen that on 18th and 20th December 2013, Main-I and Main-II protection at Khushkhera sub-station of RVPNL did not operate. On both the days, back up earth fault protection operated at Khushkhera. On 21st December 2013, even back up protection at Khushkhera did not operate and fault was cleared by protection system of transformers at Bhiwadi.

4.4 Non-switch-over to DG at Bhiwadi for aux supply to HVDC bipole: As the fault on the 220KV RRVPNL line could not be cleared in time, it created a persistent voltage dip in ICTs tertiary output. The pump motors which were feeding the cooling system, slowed down due to persistent dip in voltage and Bi-pole tripped on low water flow in the valve cooling system. No volt relay provided for change over to DG set acted only after tripping of ICTs as the voltage dip was persistent in the Aux System.

5. Recommendations

5.1 Replacement of porcelain insulators with polymer insulators on 220kV Bhiwadi-Khushkhera D/C line: In view of the reported chemical pollution and dust pollution in the vicinity of the line, the porcelain insulators on 220kV Bhiwadi-Khushkhera D/C line should be replaced with polymer insulators.

(Action: RVPNL, Time frame: 6 months)

5.2 Ensuring reliable protection system at Khushkhera sub-station: The protection system should be made functional on priority. It was confirmed by RVPN that backup protection at Kushkhera has been set right. Later, it was confirmed that issues in Main-I and Main-II protection had been sorted out on 24.12.2013 and the protection was checked. RVPN should periodically test operation of protection system at Kushkhera. Further, Main-I and Main-II protection are based on relay of same make and to ensure reliability RVPN should change one of the Main distance protections to other make.

(Action: RVPNL, Time frame: 6 months)

5.3 Exploring option of switch-over to DG supply for auxiliary supply to HVDC bipole in case of low voltage in tertiary voltage of transformers at Bhiwadi: Presently, switch-over to DG set for auxiliary supply takes place only when no voltage is detected in tertiary output of the ICTs at Bhiwadi. POWERGRID may explore possibility of switch-over to DG set in case voltages low enough to affect cooling system are observed in tertiary of the ICTs.

(Action: POWERGRID, Time frame: 2 months)

List of Participants

1. Shri P.S.Mhaske, SE (C), NRPC
2. Shri Ajay Talegaonkar, SE(O), NRPC
3. Shri Naresh Kumar, EE (O), NRPC
4. Shri P.N. Dixit, GM (O&M) NR-1, POWERGRID
5. Shri M.S. Hada, Dy. Manager (O&M), NR-1, POWRGRID
6. Shri L.N. Nimawat, Chief Engineer, (PPM), RVPNL
7. Shri Rajiv Porwal, Chief Manager, NRLDC
8. Shri Nitin Yadav, Engineer, NRLDC