

Report on Power failure at 0738 hours dated 3rd Feb 2015

Turbo Generator Set 2 tripped while running in parallel with State grid at 0738 hrs on 3rd Feb 2015. DAP PAP & SAP plants were running at full load. TG #2 was running at 42 MW and grid at 2.7 MW. All tripping parameters of TG were within normal range. Following were the observation related with TG tripping occurrence.

1. TG 2 was rolled on 29th Jan 15 in presence of Siemens and ABB engineer to resolve the Load hunting problem, which was observed during TG running condition in past. The trip conditions of the turbine i.e. Lube oil, Axial shift, Low Condenser vacuum (condenser pressure high), Over speed and Inlet steam Temp was tested on 28th and 29th Jan 2015 during TG2 rolling. TG2 was taken on full load on 29th Jan 15 in presences of Sri Manjunath, ABB Bangalore, an AVR expert, Sri Amit Thakur, Alsthom Noida and Sri Kalyan Reddy Alsthom Baroda and was running normal since then.
2. TG-2 was running parallel in synchronized condition with grid at 42.62 MW on TG-2 and 2.7 MW Import from Grid I/C-1 at 07:26:20 AM (as per P.L.C record)
3. TG-2 Tripped at 07:26:22AM with the command indicated in R.E.G Relay as DCS TRIP with subsequent log of events as below.
 - Trip-DCS
 - Class-A Trip
 - Class-B Trip
 - GENERATOR BREAKER (52-2) Trip
4. The sequence of the event was confirmed by the signal by actuating Trip DCS, Class A trip, Class B trip and Gen 52 open Gen CB closed at 06.30.36.395 , 06.30.36.399, 06.30.36.399, 06.30.36.523 and 06.30.36.525 respectively . The timing, recorded was not matching with actual timing. (Copy of printout of sequence and load variation is attached as Annex 1.1, 1.2 & 1.3)

5. Eventually entire load of TG-2 (43.4 MW) was shifted to Line-1 (Grid-1) Unit. Subsequently Grid-1 failed due to Overloading as confirmed by the Paradeep Garh S/S authorities. The Grid Islanding Relay P-341 operated in Vector Shift as well as Under Voltage causing isolation of Grid-1 Breaker.

6. From the Sequence of Events (SOE) list in DCS (copy attached) at 07:38:15:520 Hrs "Generator Trip Command to Electrical from DCS" was generated followed by Generator Protection Trip feedback.

The output "Generator Trip Command to Electrical from DCS" is logically designed in DCS to be generated due to any of the following input conditions. (Copy of the logic drawings attached)

- a. Over speed limit exceeded
- b. Axial shift high
- c. Condenser pressure high
- d. Emergency Stop Valve (ESV) feedback
- e. Feedback of two Regulating valves
- f. Reverse Power
- g. Generator Breaker open

Out of the above, conditions (i) to (v) are generated from DCS and conditions (vi) an (vii) are inputs obtained from Electrical Control Panel. None of the above trips were recorded in the SOE prior to signal "Generator Trip Command to Electrical from DCS". Logics and SOE Logging is attached as Annex 2.1 & 2.2, & 23.

7. All the above conditions are configured for display along with time-stamping in the SOE list as well as Alarm List.

Signal "Generator Trip Command to Electrical from DCS" is always preceded by any one or more of the above mentioned conditions. In this tripping, none of the conditions have been logged either in the SOE List or in the Alarm List.

8. From the DCS record it is proved that the Generator load shifted from 2.7 MW to 43 MW after getting Gen breaker opened and there was no reverse power flow during tripping.

Action taken:

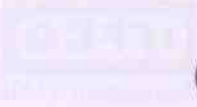
- a. Each of the conditions for trip simulated. The display of trip conditions was checked in SOE List and Alarm List.
- b. Mastership of the redundant Controller for TG-2 Node in the DCS was switched over.
- c. SIEMENS representative was called to site immediately for further investigation of the cause for tripping. Activities carried out by SIEMENS detailed in the attached scanned copy of MOM (Annex- 3.0).
- d. Back up of all events and system status at the time of tripping has been handed over to SIEMENS for further analysis at their end.
- e. Time synchronisation was carried out between all Controllers and HMI Stations of the DCS as well as the R. E. G. Relays of both the Turbines.

Finding:

Since event recorder has not stamped any particular event prior to DCS trip signal, exact reason for tripping TG2 could not be established even after involving representative of M/s SIEMENS, however details has been handed over to SIEMENS for further investigation at their HO.

Recommendation/ Action proposed

- (i) Timing of the LMS panel shall be corrected later on in presence of the Siemens representative.
- (ii) Regular monitoring of Network time protocol
- (iii) Up gradation of DCS system as a part of AMC activities during ATR 2015.



- (iv) M/s SIEMENS recommended to upgrade the workstation with Window-7, since the support on the XP operation has been discontinued from Microsoft.


(G R Baranwal)