

UNIT TRIPPING REPORT

DT: 21.08.2020

UNIT No: 1 & 2**STATION: NTPL, TUTICORIN****OUTAGE: NO.52****REPORT NO: 52**

SL.No	DESCRIPTION	UNIT-1	UNIT-2
1	Date of tripping :	10.08.2020	10.08.2020
2	Time of tripping :	01.28.03.873	01.28.04
3	Status before tripping :		
a)	Unit load (MW) :	280	282
b)	Mills in service :	A,C,D,F,G	A,B,D,E,G
c)	Boiler feed pumps in service :	B&C	B&C
d)	CEPs in service :	A&B	A&B
e)	ID fans in service :	A&B	A&B
f)	FD fans in service :	A&B	A&B
g)	PA fans in service :	A&B	A&B
h)	CWP in service :	A&B	A&B
4	First Up protection acted :	PROTECTION TRIP	PROTECTION TRIP
5	Similar occurrences in the Financial Year :	NIL	NIL
6	Other relays/protection acted:	DEATAIL ENCLOSED	
7	Supporting documents attached :	YES	
8	Any operation done prior to tripping :	NIL	NIL

9 Analysis of tripping :

Both Units got tripped on Class A protection and following Indications were observed on GRP Relays.

Unit 1. 87 GT- GT Differential Relay

1. Supply Fail 2. Oil Temp trip 3. PRV Trip(B) 4. OCTC operated (R,Y,B)

Unit 1. 87 OA-Overall Differential Relay

1. GT- LV WTI TRIP

2. GT- HV WTI TRIP

3. 1R,1Y,1B- BUCHHOLZ TRIP

Unit 1. UT-1A O/C and E/F Relay

1. HV WTI TRIP, 2. LV WTI TRIP, 3. BUCHHOLZ TRIP, 4. PRV1 OPTD

Unit 1. UT-1B O/C and E/F Relay

1. HV WTI TRIP, 2. LV WTI TRIP, 3. BUCHHOLZ TRIP, 4. PRV1 OPTD

Unit 2. 87 GT- GT Differential Relay

1. Oil Temp trip 2. PRV Trip(Bph) 3. OCTC operated (R,Y,B)

Unit 2. 87 OA-Overall Differential Relay

GT -HV WTI TRIP

Unit 2. UT-2A O/C and E/F Relay

1. HV WTI TRIP, 2. LV WTI TRIP, 3. BUCHHOLZ TRIP, 4. PRV1 OPTD

Unit 2. UT-2B O/C and E/F Relay

1. HV WTI TRIP, 2. LV WTI TRIP, 3. BUCHHOLZ TRIP, 4. PRV1 OPTD

NOTE: From the relay recordings, it is observed that the relay binary inputs for transformer protections viz Buchholtz, PRV,WTI,OTI etc have chattered so many times with a gap of 2-10 ms and ultimately tripping both the Units on Class A and Class C protection without any actual external input from the field to the Numerical Relay

The following transformers also got tripped during this period.

Unit 1. ESP LT MSB Transformers (08 Nos)

1. IN 308-WTI Trip, 2. IN 401 - Prot Trip LT side relay

Unit 2. ESP LT MSB Transformers (08 Nos)

1. IN 308-WTI Trip, 2. IN 401 - Prot Trip from LT side relay

Unit 1. Unit Auxiliary Transformer - UAT 1CA01

1. LV WTI TRIP, 2. OTI TRIP, 3. PRV TRIP

ODCT01 FOPH Transformer

1. WTI TRIP

Unit Service Transformer - 2DAT01

1. Transformer Door open Trip, 2. Prot Trip from LT side relay

Lighting Transformer - ODDT02

1. Transformer Door open, 2. Prot Trip from LT side relay

NOTE: From the relay recordings, it is observed that the relay binary inputs for transformer protections viz Buchholz, PRV,WTI,OTI etc have chattered so many times with a gap of 2-10 ms and ultimately tripping the transformers. Further their respective LT side breakers have tripped on interlock.

10 Root cause / Findings :

1. Immediately after this incident of tripping, DC negative earth fault was persisting (-20 V instead of -110 V). Hence it is suspected that DC side supply disturbance could have caused this false tripping. The DC supply disturbance could have been created by double earth fault, one negative E/F which was persisting and another positive E/F which might be transient in nature. This DC supply disturbance could have initiated the chattering in relay Binary contacts of all transformer protection relays and resulted in tripping of both Unit's GTs, UTs and the other transformers.

2. As the negative side E/F was persisting, the clearance could not be given for bringing back the Units. The negative E/F was traced by switching off the DC out going feeders from 220V DCDB panels 1FA and 2FA for all 11KV, 3.3KV and 0.4KV switch gear panels after taking all necessary precautions to avoid the tripping of running critical loads (one by one). The Negative Earth fault was found in Unit-2 DG PCC - 2DF with an improvement of 30 volts. Further it was traced & located the earth fault inside the Ethernet switch. Though initially a improvement of 30 V was only noticed in negative side, on disconnection of Ethernet switch the negative voltage improved to the normal level of -110 volts. The Ethernet switch is provided to collect the datas like Breaker ON/OFF status, current, voltage, power, energy from SEL relay to EMS (Energy Management System).

3. Even though the actual negative side earth fault was in Unit-2 DC source, both units got tripped due to mixing of DC sources of Unit 1&2. The light up clearance could not be given for Both Units due to persisting earth fault in both Units DC systems. All the Unit and Station switchgear panels requirement of control & protection DC supply is fed from two different sources as Source -1 and Source-2.

4. For Unit switchgears, Source -1 and 2 are from its own DC buses. For Station switchgears, one DC Source is from Unit-1 DC bus and another DC source is from Unit-2 DC bus as there is no separate Station battery DC system. In all HT switchgears two DC sources are fed through Diode logic and all LT switchgears are fed through contactor logics to ensure continuous control & protection supply

5. The mixing of DC sources at LT switchgears will not be there as it is based on Contactor logics. There are possibilities of DC sources mixing at HT switchgears due to the failure of diodes.

11 **Remedial measures taken:**

1. The DC power supply sources were removed for all Ethernet switches in LT switchgear panels.

12	Time/Date of boiler light up and synchronization		
		<u>U-1</u>	<u>U-2</u>
a)	Lighted up at :	04:30Hrs on 10.08.2020	11:25Hrs on 10.08.2020
b)	Synchronized at :	12:26Hrs on 10.08.2020	14:49Hrs on 10.08.2020
13	Delay for light up :	Earth Fault tracing	Earth Fault tracing & problem in oil burners

14 **Recommendation/Action plan :**

The following action plan/ modifications are recommended for improvement of the system and to avoid the spurious trippings due to DC Earth Fault.

1. The DC sources of 11 KV Station buses which are fed from ST1 and ST2 are to be modified as mentioned below. A few more other common loads' DC sources are to be provided from any one of Unit Dc sources.

NAME OF THE BUS	DC SOURCE-1	DC SOURCE-2
Station Bus 0BA	From Section-A of 1FA	From Section-B of 1FA
Station Bus 0BB	From Section-A of 1FA	From Section-B of 1FA
Station Bus 0BC	From Section-A of 2FA	From Section-B of 2FA
Station Bus 0BD	From Section-A of 2FA	From Section-B of 2FA

2. It is proposed to monitor the healthiness of Unit DC sources through DCS. It will be for monitoring purpose only.

3. The chattering of binary inputs was discussed with the GRP relays manufacturer M/s.Siemes and HT relay manufacturer M/s.SEL. They have concluded that this Binary input chattering might be because of DC earth fault happened at that time. They have also suggested to keep filter time settings as 15 msec of Chatter blocking & filter settings of binary inputs for external trip signals. They have also suggested to configure external inputs for DR & Trip log which will be helpful in future analysis. Hence it is to be studied and implemented in all Binary inputs of Transformer protection relays. For GTs & UTs, this could be done online with all due precautions to avoid spurious trippings or it could be done at the time of next opportunity of Unit shutdown. For the other transformers, it could be done one by one either by availing LC / during shutdown.

15 **Any specific learnings :**

The DC system is to be ensured of Earth fault free. Whenever earthfault comes, the same is to be traced and attended so as to avoid spurious trippings at the time second earth fault. The online DC earth fault tracing system is also to be strengthened.



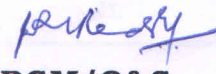
CM/Elect/OS



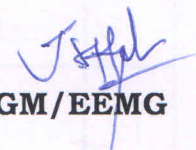
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