Report on Enquiry about Flashover of
NTPL ASH HANDLING SWITCHGEAR

Dt:21-10-2017

Sub: NTPL – Flash over and fire in the LT switchgear panels of compressor room 1 of Ash handling system – Enquiry committee report submitted– Reg.

Ref: Dir. (Power) /302 -102 /222 /17 dated 16-10-2017

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An enquiry committee with the following members was constituted by Director (Power) vide reference cited.

Sl. No.	Name Shri.	Designation	CPF No.	Unit
1.	M.Sampath	DGM (E.M.)	26509	TPS-I
2.	G.Saleem	DGM (Elec)	30047	TPS-II Expn
3.	M.Karuppiah	CM/Safety	36047	NTPL

The enquiry committee had visited NTPL between 19-10-2017 evening to 21-10-2017 to conduct an enquiry on the flash over and fire occurred on the early morning of 16-10-2017, in the LT switchgear panels of Ash handling system of Unit 1 of NTPL.

The enquiry committee and visited the following areas:

a. LT switchgear panels of Ash handling system of Unit 1.
b. LT switchgear panels of Ash handling system of Unit 2.
c. PLC control room of Ash handling system
d. Unit control room

Observations:

A) LT switchgear panels of Ash handling system of Unit 1:

It was observed that the civil construction activities was not fully completed. The LT switchgear room was located at 12 m level. There were several openings and adjacent to the building a coal conveyor from coal yard to unit bunkers was running parallel to the building. Heavy ash and coal dust deposition was observed at all levels of the building and on the panels.

The LT switchgear panels of Ash handling system of Unit 1consisis of 2 Incomers fed from Two numbers of 2000KVA - 11/0.433KV transformers and one bus coupler. The panel provides supply to vacuum pumps, Instrument air compressors, conveying compressors, Air driers etc. In all there are 20 panels of which 6 panels (Panels 7, 8, 9 and 17, 18 and 19) are Double front type having feeders on both the sides. It was observed that from panel 7 to panel 17 had got fired and damaged. Panels 8, 9 and 10 have got damaged severely .The initiation of fire or fault may have occurred in these three panels. The bus coupler Breaker in panel 10 was in off condition.

Restoration:

Restoration of the critical equipments like vacuum pumps and compressors were carried out by rerouting of the cables from the healthy panels and from alternate sources. Unit 1 was brought back into service on 17-10-2017.

Root Cause Analysis:

On enquiry with the PLC operation Engineers & workmen(Contract), both Incomers I and II were in service with the bus coupler in open condition. Vacuum pumps A1, B2, C2 and E2, IAC 1 and 2 and CAC 1, 2 and 3 and some minor loads were in service. The PLC board Engineers stated that at around 05.10 AM they have observed "some flickering in the lights, jolting of the building and blasting noise, finally all the lights went off, observed fire with heavy smoke in the switchgear room, they came down from the building and informed the matter to the Main control room." The fire was put off by Fire personnel and the available staff. Unit control room Engineers stated that the 11 KV breaker of Incomer II was found tripped on protection and Incomer I was hand tripped as the CT terminals of Incomer 1 and the and the control terminals were burned.

Analysis of the protection relays:

The DC supply to the LT switchgear panels were distributed from the bus coupler panel. As the bus coupler panel was severely damaged, dc supply to the complete switchgear was cut off and hence no tripping could occur at the LT panels.

On interaction with the MRT staff and the analysis of the event log of Numerical relays at the 11 KV panels of Incomers I and II indicate the both of the relays sensed the fault at the same time i.e. 05:09: 57 Hrs. The current sensed by the numerical relay of Incomer II was varying between 785 A and 222 Amps. The corresponding fault current at the LT switchgear was varying between19.94 KA and 5639A. The relay and Incomer II got tripped at 05:10:10 hrs following IDMT characteristics.

The current sensed by the numerical relay of Incomer I was varying between 607A to 59Amps. The corresponding fault current at the LT switchgear was varying between 15.42 KA and 1498 A. But the 11 KV panel of Incomer I did not trip as the CT and control circuits got burnt at the 11KV panel of Incomer I. The 11 KV panel of Incomer I was hand tripped at 05:18:11 Hrs.

The fault got initiated at 05:09:57 Hrs and cleared at 05:18:11 Hrs. However as per the report of the fire crew, the fire was completely quenched at about 07.00 Hrs. The sustenance and spread of fire may be due to the coal and ash dust accumulated over and inside the panels. The analysis of the dust collected from the top of the panels shows the combustible material as 19%. No residues of rodents or bad odor was observed in the panels.

LT switchgear panels of Ash handling system of Unit 2:

During the enquiry, on 20-10-2017 at around 14.30 Hrs fire was reported at the LT switchgear panels of Ash handling system of Unit 2. The fire was quenched immediately. On observing the panel, it was noted that the vertical droppers of all the three phases in panel 9F1 got melted and cut. A big hole at the metallic barrier plate just behind these vertical droppers were observed. The vertical droppers do not have any insulating sleeve or insulating paint. The clearance between the droppers and the

plate behind the droppers also seem to be barely sufficient. At a few other locations also, like bus bar joints at the shipping sections and at the cable chambers of breaker panels the clearances seem to be barely sufficient.

With this vital observation from Unit II, LT switchgear panels of Unit 1 was again checked. It was observed that the vertical droppers of all the three phases were completely burnt in panel 9F. Hence the root cause may be the uninsulated vertical droppers and the barely adequate clearance between the vertical droppers and the metallic barrier plate behind these droppers in the double front panels.

In fine,It can be stated that the root cause for the fault may be the inadequacy in the design. But the sustenance and spread of fire may be due to the accumulation of coal and ash dust over and inside the panels and the free air flow.

Recommendations:

1. The vertical droppers and the metallic barrier plate is to be insulated by applying suitable electrical insulating paint.
2. The protruding bolts at the bus bar joints at the shipping sections shall be provided with insulating cap.
3. The rear door of cable chambers in the breaker panels shall also be painted with suitable electrical insulating paint.
4. Two DC sources shall be provided at the two ends of the panel with auto change over facility.
5. The relay coordination and settings shall be suitably reviewed and corrected.
6. All the above recommendations shall be applied to other LT switch boards based on the requirement.
7. The proper functioning of Fire alarm system and alarm at the local control room is to be ensured.
8. Due to the prevailing environmental conditions of NTPL, the preventive maintenance schedule of breakers and bus basr shall be increased with proper check list.
9. The civil and allied works like closing of windows and doors, flooring in the Switchgear room and control room etc has to be expedited.
10. Provision of proper exhaust and ventilation system may be explored.
11. Proper logging of events and recording of parameters at appropriate intervals shall be ensured.

(M.Sampath) (G.Saleem) (M.Karuppiah)

Submitted to Director (Power)

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