

Abstract

IHEP- Purchase of 48 MVA,11/220/√3kV, single phase Generator Transformers (GTs) with Nitrogen Injection based Fire Prevention System for replacing the 1974-75 make GTs – RLA study – Sanction Accorded– Orders issued.

Corporate Office (SBU-G/E)

B.O .(FTD) No. 562 /2020 (No. DGE/G3/IHEP/GT/2020-21 Thiruvananthapuram

dated: 07 -09-2020

- Read:-
1. Minutes of the Meeting convened by the Chief Engineer (Generation & PED) dated 15.05.2020 and the meeting conducted by the Director (Gen & SCM) on 27 /07 /2020.
 2. Letter No.CEG/AEE1/Idukki HEP/48MVA New GT/2020-21/770 dated 13-08-2020 of the Chief Engineer (Generation & PED, Moolamattom and the enclosed estimate.
 3. Note No.DGE/ G3/IHEP/GT /2020-21 dated 24-08-2020 of the Director (GE & SCM) (Agenda Item 60/8/2020)

ORDER

The Idukki HEP is the largest Hydro Electric Power Generating Station in Kerala, with a total installed capacity of 780 MW (6x130 MW), commissioned in two stages, during 1976 & 1986. The first stage machines along with its Generator Transformers have covered a life span of more than 35 years and hence Renovation & Modernization works (R&M) are being carried out by the OEM, M/s GE power India Limited as per the CEA regulations and based on the RLA study conducted by CPRI, Bangalore.

It is reported that the Generator Transformers of Idukki HEP have a rating of 48 MVA,11/220/√3kV, single phase. The 1974-75 TELK make Generator Transformers of stage -1 units have already been completed 44 years of continuous service. There are ten such GTs at IHEP, out of these nine numbers were installed in Unit #1, #2 & #3 machines during the commissioning and the remaining one is currently in service in Unit#5 (A-phase). Out of these ten GTs, four numbers were replaced with spare reconditioned GT / new GT ,during the course of time because of failure or decreasing trend in the insulation resistance values and increase in tan-delta values.

The Residual Life Analysis (RLA) study of the stage-1 Generator Transformers were conducted by CPRI, Bangalore during the period 2012 to 2014 and at that time the GTs were healthy as per the test report . As per ANSI / IEEE basic loading conditions (ANSI C57.96), Power Transformers normal life expectancy is about 20 to 30 years. Also the total losses in Power Transformers shall be limited to 0.5% of its capacity for efficient operation as per latest CEA guidelines which cannot be expected from these 44 years old GTs. Based on the factory test report, the refurbished GTs at IHEP had more than the CEA recommended loss values. There are safety issues also for using old transformers in Underground Stations like Idukki.

The existing 1974-75 make Stage-1 GTs at IHEP had already completed more than 44 years of service and there are symptoms of insulation degradation and increasing trend in the thermal gas contents which were observed in the recent oil DGA test result of Generator transformers of Unit #1. Even though all the test results were found satisfactory and well within the limits, at the time of a severe external fault or an internal fault, there would be a possibility for transformer failure.

Out of the 18 nos. of GTs in service at IHEP, 6nos. are to be replaced due the aforesaid reasons and deterioration. Apart from that there are three more spare GTs available (One is healthy Crompton make - suitable for replacement in Unit#4 only. Among the remaining two numbers, one is kept for survey reporting and the other is kept for refurbishment- awaiting Board sanction). The GTs have a direct impact on the safety of the power station and each Transformer is filled with around 17,500 litres of oil as dielectric media, any fire or explosion should lead to heavy disaster followed with heavy smoke and dense fumes, interrupting power generation from IHEP. Being an underground power station, the devastating effect of such incident would be unpredictable. Therefore ,it is proposed to incorporate Nitrogen Injection based Transformer Fire Prevention System (As per CEA regulation, 2010) in the 48MVA, single phase Generator Transformer. It is reported that the proposed Transformer Explosion and Fire Prevention System / Transformer Protector (TP) for 48MVA, 11/220/ 3kV single phase Generator Transformer (GTs) is activated within 0.5 to 20 milliseconds, by the first dynamic pressure peak of the shock wave, avoiding transformer explosions before static pressure increases, as per recommendation of NFPA,850-2015 standard.

The proposed TP system will be able to effectively protect all kinds of transformers and avoid a fire hazard. The TP is the perfect solution to protect all oil filled transformers and reactors along with the associated On-load/Off-load tap Changer and Oil filled cable boxes. By considering the ageing factor of above GTs, the possibility of internal electrical failures and subsequent occurrence of explosion/fire hazards cannot be neglected.

Compared to the conventional Fire Prevention System currently available in the existing GTs at IHEP, the proposed Transformer explosion and Fire Prevention System / Transformer Protector is fast acting type with an activation time within 20 milliseconds as similar to the operating time required for modern numerical relays which can effectively prevent transformer explosions/blasting during internal electrical short-circuits. Moreover, in the report submitted by a seven member committee constituted as per B.O.(FTD) No: 86/2020[DGE/G3/IHEP/Accident/2019-20] Thiruvananthapuram Dtd 07.02.2020, and in the report submitted by the Four member committee constituted as per order No CEG/AEE-6/IHEP/Accident/2019-20/1730 on 27.01.2020, both have recommended for Nitrogen Injection Fire Protection system for Power Transformers at IHEP.

Considering the above, the Chief Engineer(Generation & PED), Moolamattom, as per letter read as (2) has forwarded the estimate amounting Rs.26,00,00,000/- (Rupees Twenty Six Crore Only) and requested Administrative Sanction for the GT procurement.

In this regard, considering the deterioration and ageing of GTs and the expected consequences on any failure of any of the Generator Transformers at IHEP, the proposed replacement suggested is indispensable. But, the RLA study conducted for the R&M of first stage machines has not included the GT and the decision for GT replacement has been taken only based on the departmental routing testing & analysis results. Therefore, as per note read (3) above, it is recommended to have an RLA study of the GTs proposed for replacement, through a competent agency, before arriving at a decision for GT procurement.

Having considered the recommendation in the note read (3) above, the Full Time Directors meeting held on 26-08-2020, resolved to authorize the Chief Engineer(Generation & PED), Moolamattom for conducting RLA study on the Generator Transformers proposed for replacement at IHEP, by engaging a competent agency.

Orders are issued accordingly.

By Order of the Full Time Directors,

Sd/-
(LEKHA.G)
Company Secretary
(In -charge.)

To:

1. The Chief Engineer (Generation & PED), Moolamattom.
2. The Deputy Chief Engineer, Generation Circle, Moolamattom

Copy to:

The Chief Internal Auditor,
The TA to CMD/D(F)/D(GE&SCM)/ D(TSO&S)/ D(DIT&HRM)/D(GC)/D(C&P)
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Forwarded / By Order
Asst. Executive Engineer

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Date, 08.09.2020