Development of Steam Turbine and Steam & Feed water system of AHWR

For 300 MWe AHWR, Conceptual Design of Turbine and associated Steam and Feed water cycle have been developed through an MoU with M/s BHEL. Steam and Feed water system consists of two turbine modules (High pressure and Low pressure), moisture separator cum reheaters (MSR), condenser, condensate extraction pumps (CEP), condensate and feed water heaters (FWH), deaerator, feed water pumps and steam jet air ejectors. The heat balance diagrams for full power and partial power operating conditions have been prepared. The Turbine, Generator and their auxiliaries (like lube oil system, gland seal system, hydrogen cooling system, etc.) have been designed. Provision for desalination steam extraction from HP turbine is provided.

The control philosophy for steam & feed water cycle equipment has been arrived. This includes critical controls like steam drum pressure control, steam drum level control and electro-hydraulic control of turbine (Turbine governing system). Other conventional C&I like gland seal steam pressure control, turbine protection system and turbine supervisory system etc. have been worked out. Operational logics for feed water pumps, condensate extraction pumps depending on power level, deaerator level and steam drum level have also been worked out.

The design of HP turbine and feed water pumps are customized for AHWR requirements. Various analyses have been performed like thermal and structural analysis of HP turbine (Ref. Fig. 1 and 2), bolting stress analysis for HP turbine parting planes, pressure drop analysis for HP turbine inlet and outlet nozzles, TG rotor dynamic analysis and feed water pump support seismic analysis and rotor dynamic analysis. The turbine over-speeding transient due to gross load rejection has also been analysed. Sizing of MSRs, FWH, Condenser and deaerator has been performed.

Write-up on various equipment and sub-systems of Steam & feed water system has been prepared along with P&IDs, datasheets, GADs and analysis reports. Layout of piping and equipment in Turbine building has also been worked out and drawings have been produced.

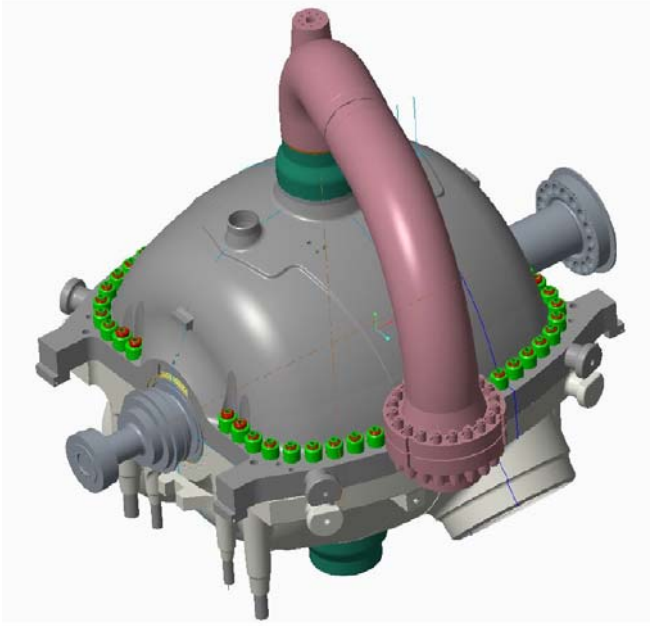

Figure 1 Isometric view of HP Turbine Module

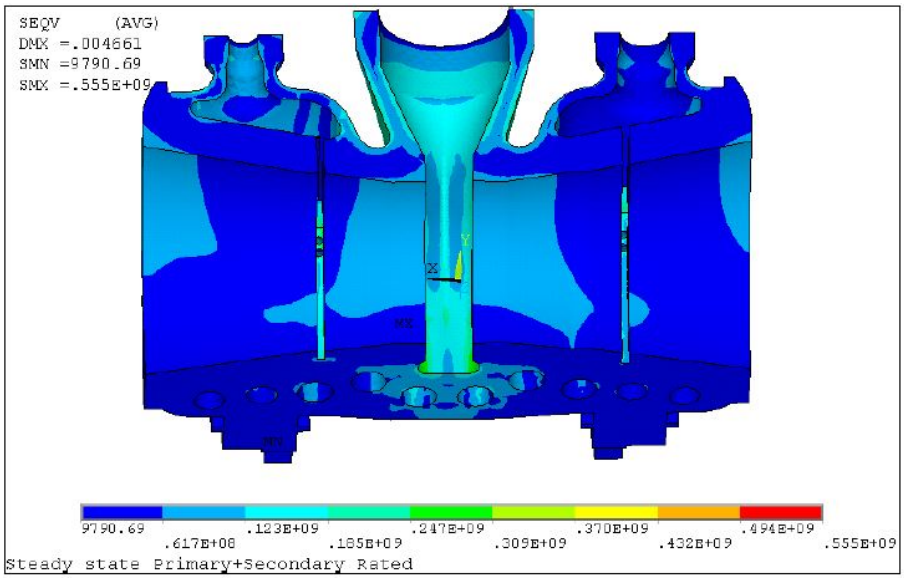

Figure 2 Von-mises stress distribution in HP inner casing due to primary + secondary loads