Full Load Rejection Transient Analysis For Lungmen ABWR Plant

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ABSTRACT

Among Taipower''s four nuclear power plants, the twin-unit Lungmen plant is the one of ABWR(Advanced Boiling Water Reactor) type, which is currently being under construction and detailed design and has the largest installation capacity of 1350MW for each unit. Considering the more and more restrictive requirement coming from the social environment, it is necessary to assess and verify the safety and reliability for some important design feature using various methods. One of those important design features is the Full Load Rejection Capability. This study employs the RETRAN-02 code to perform the transient analysis for the full load rejection event from two aspects, one is conservative analysis and the other one is realistic analysis. Transient response of important thermal-hydraulic parameters such as reactor pressure, core flow, reactor water level, main steam flow, and feedwater flow are assessed quantitatively. The analytical results are then used as the basis to proceed the further sensitivity study for the consideration of potential design deviation or design change. For the aspect of conservative safety analysis, the results show that all the transient responses of core thermal-hydraulic parameters can be predicted in a good and reasonable way. However, further analysis is needed to evaluate the impact on the fuel thermal limit parameter in the future. Also, after reviewing the results of realistic analysis, it is expected that the Full Load Rejection Capability can be demonstrated successfully during the power test which will be performed prior to commercial operation. The reactor will not be scrammed directly or indirectly due to the low water level or main steam high flow signal, which will then further validate the reliability of the design feature. This study also investigates phenomena of pressure wave transmission due to the fast closure of turbine control valve and it is thought there is still much space for improving the analysis model, for example, to model the turbine and condenser using control volumes instead of negative fill junctions. In addition, this study indicate that the current version of RETRAN-02 does not have the capability to model the Select Control Rod Run In (SCRRI) design feature and it is suggested that this code be developed furthermore in the future to have this capability.

Keywords : 無

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