
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.: 326-8408
SRP Section: 04.04 – Thermal and Hydraulic Design
Application Section: 4.4.2.4
Date of RAI Issue: 12/03/2015

Question No. 04.04-4

Title 10 of the Code of Federal Regulations, Part 50, Appendix A, Criterion 10 (Reactor Design) requires that the reactor core and associated coolant, control, and protection systems shall be designed with appropriate margin to assure that specified acceptable fuel design limits are not exceeded during any condition of normal operation, including the effects of anticipated operational occurrences.

The approved version of the TORC code required a simplified representation of the core due to limitations on number of channels. Further simplification was necessary to represent the hot channel. More recent analytical methods do not have this limitation. Have the TORC and CETOP codes been modified to eliminate the limitation on number of channels? If so, provide a description of the modifications. If not, explain how this limitation has been addressed in the analyses. Additionally, demonstrate that the use of the simplified model is conservative for this specific design application (e.g., comparisons to more recent methods, such as RELAP5 – which staff notes is being used to analyze large break loss-of-coolant accidents and anticipated transients without scram).

Response

The detailed thermal-hydraulic TORC code is described in Topical Report CENPD-161-P-A. Over the years the TORC code has been modified. Software upgrades were made to the TORC code to increase the dimensional array capacity for the maximum number of channels allowed in the core model. But, the code modifications do not change the methodology or formulations described in CENPD-161-P-A.

The CETOP thermal-hydraulic code is the simplified representation of the TORC model, based on the model simplification method described in CENPD-206-P-A. The limitation on number of channels of the CETOP code is the same as that for U.S. plant applications (e.g., CEN-214(A)-NP).

The simplified CETOP model of the plant is demonstrated to be conservative with respect to the detailed thermal-hydraulic TORC model by performing a set of parametric studies which determine the value of the CETOP adjustment factor that ensures the CETOP results are conservative with respect to the TORC results as shown in section 5 of CEN-214(A)-NP. This process evaluates the thermal margin calculated by each code starting from the same initial conditions and develops the adjustment factor which ensures the simplified model is conservative with respect to the detailed model.

Impact on DCD

There is no impact on DCD.

Impact on PRA

There is no impact on PRA.

Impact on Technical Specifications

There is no impact on Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environment Report.