

WESTINGHOUSE ELECTRIC COMPANY

REQUEST FOR ADDITIONAL INFORMATION FOR WCAP-16500-P-A, SUPPLEMENT 2,

“EVOLUTIONARY DESIGN CHANGES TO CE [COMBUSTION ENGINEERING] 16X16

NEXT GENERATION FUEL AND METHOD FOR ADDRESSING THE EFFECTS OF

END-OF-LIFE PROPERTIES ON SEISMIC AND LOSS OF COOLANT ACCIDENT

ANALYSES” (PROPRIETARY/NON-PROPRIETARY)

PROJECT NO. 700

By letter dated November 12, 2014 (Reference 1), Westinghouse Electric Company (Westinghouse) submitted for U.S. Nuclear Regulatory Commission (NRC) staff review of Topical Report (TR) WCAP-16500-P-A, Supplement 2, “Evolutionary Design Changes to CE 16X16 Next Generation Fuel and Method for Addressing the Effects of End-of-Life Properties on Seismic and Loss of Coolant Accident Analyses,” (Proprietary/Non-proprietary). This supplement describes three evolutionary design changes to mid and intermediate flow-mixing (IFM) spacer grids. Additionally, this TR describes an approach to address NRC Information Notice 2012-09, “Irradiation Effects on Fuel Assembly Spacer Grid Crush Strength” (Reference 2). The NRC staff has reviewed the above mentioned document and has determined that additional information is required to complete the review.

RAI 1. VIPER Loop Testing

Provide justification that the VIPER loop test conditions (e.g. temperature, flow rate, water density, test duration) are representative of those that an assembly would experience in a typical reactor. Also, provide support for the conclusion that double dimple cells do not decrease the Grid to Rod Fretting (GTRF) margin in the outermost inner grid strap locations.

RAI 2. Combined Effects on Grid to Rod Fretting Margin

WCAP-16500-P-A, Supplement 2, states that the decrease in GTRF margin from [] is “mitigated” by the increase in GTRF margin from the Modified Outer Strap (MOS).

- a. What is the net effect of both changes on the GTRF margin?
- b. If a net decrease in GTRF margin is present, how will this decrease affect safety analyses and compliance with design criteria?

RAI 3. IFM Grid Fabrication

WCAP16500-P-A, Supplement 2, TR states that [] will only be used with concurrent use of the MOS. The lack of springs in the design of IFM spacer grids implies that the MOS will not be applicable to IFM grids.

- a. Will the IFM grids therefore continue to be []?
- b. If [LS] is to be used for IFM grids, how will [] affect safety analyses and compliance with design criteria?

RAI 4. Radial Growth Effects on Gap Size Determination

Will the determination of gap size for simulated end-of-life (EOL) grids account for []? If not, describe the method for EOL gap size determination and why that method is bounding.

RAI 5. Grid Strength and Stiffness Ratios

Justify the use of EOL/beginning-of-life grid strength and stiffness ratios to predict EOL strength and stiffness of similar grids. Establish and justify a range of applicability for the relationship.

RAI 6. Flowing Water Damping Testing of CE 16x16 NGF

Explain the differences, if any, in procedure, analysis, range of testing, or number of tests that exist between the flowing water tests to be performed on the CE 16x16 NGF design and those presented in Reference 6 of WCAP-16500-P-A, Supplement 2.

RAI 7. Maximum Credible Grid Deformation

Explain how maximum predicted loads are obtained and how the bounding load used to test for the maximum credible grid deformation is determined.

RAI 8. Modified Outer Strap Details

It has been stated in Section 2 of TR WCAP-16500-P-A, Supplement 2, that there are small changes in grid loss coefficients, grid/fuel assembly pressure drop, and flow distribution. Please respond to the following requests:

- a. Provide a quantification summary of the changes in grid loss coefficients, pressure drop, and flow distribution.
- b. Provide the results of the thermal-hydraulic evaluation performed with the modified CE 16x16 fuel design that led to the conclusion that the thermal hydraulic effects, as listed in Section 2.1.3 of WCAP-16500-P-A, Supplement 2, do not require changes in methodology, but do impact some of the design bases discussed in the TR.
- c. It is stated in Section 2.1.3 of WCAP-16500-P-A, Supplement 2, that "the effects are explicitly accounted for in the standard analyses." List these "standard analyses."

RAI 9. Clarification of Changes to CENPD-178-P

Section 3.2 of TR WCAP-16500-P-A, Supplement 2, introduces several modifications to CENPD-178-P seismic/loss-of-coolant-accident methodologies. Describe these modifications in more detail and specify the resulting changes to CENPD-178-P.

REFERENCES

1. Letter from J. A. Gresham (Westinghouse) to U.S. Nuclear Regulatory Commission, "Submittal of WCAP-16500-P, Supplement 2, and WCAP-16500-NP, Supplement 2, "Evolutionary Design Changes to CE 16x16 Next Generation Fuel and Method for Addressing the Effects of End-of-Life Properties on Seismic and Loss of Coolant Accident Analyses," LTR-NRC-14-73, November 12, 2014 (Agencywide Documents Access and Management System Accession No. ML14324A015).
2. NRC Information Notice 2012-09, "Irradiation Effects on Fuel Assembly Spacer Grid Crush Strength," June 28, 2012.