REQUEST FOR ADDITIONAL INFORMATION

BY THE OFFICE OF NUCLEAR REACTOR REGULATION

EPRI REPORT TR-1013401, DECEMBER 2007, "BWR VESSEL AND INTERNALS PROJECT, TOP GUIDE GRID BEAM INSPECTION AND FLAW EVALUATION GUIDELINES (BWRVIP-183)" (TAC NO. ME2178)

PROJECT 704

By letter dated January 15, 2008, the BWR Vessel and Internals Project (BWRVIP) submitted the Electric Power Research Institute (EPRI) Proprietary Report TR-1013401, December 2007, "BWR Vessel and Internals Project, Top Guide Grid Beam Inspection and Flaw Evaluation Guidelines (BWRVIP-183)," for NRC staff review and approval. Upon review of the information provided, the NRC staff has determined that additional information is needed to continue its review and identified the following areas for which additional information is needed to complete the review.

1. Section 2.2.1, "Environment," states that the top guide projected neutron fluence at the end of 32 EFPY can reach a value of approximately [[ ]]. In Section 4.2.2, "Fluence Dependent Fracture Toughness," the BWRVIP recommends using a fracture toughness value of [[ ]] for the flaw evaluation methodology for top guide components that are exposed to a neutron fluence value greater than [[ ]]. It is likely that the projected neutron fluence value at the end of 54 EFPY will be greater than the neutron fluence value at the end of 32 EFPY. Section 2.3.3 of the BWRVIP-100-A, "BWRVIP Vessel and Internals Project: Updated Assessment of the Fracture Toughness of Irradiated Stainless Steel for BWR Core Shrouds," report indicates that the fracture toughness values may drop below [[ ]] at neutron fluence levels above [[ ]]. Provide and justify the use of a fracture toughness value which would be consistent with the bounding neutron fluence levels expected for the top guide components through 54 EFPY.

2. Section 4.2.3, "Fluence Dependent Crack Growth Rate," states that, "A detailed evaluation of the Nine Mile Point, Unit 1 [NMP-1] top guide grid beam flaws is presented in Appendix A, as an example analysis." Section 5.2, "Seismic Analysis," states that, "[a] finite element analysis [FEA] was performed on the Oyster Creek top guide." Evidently, the results and conclusions of the BWRVIP-183 report are based on two different FEA models. Please address the variability of the top guide structures in terms of their geometry, materials, and loading among all Boiling Water Reactor (BWR)/2-5 plants to demonstrate that the NMP-1 and Oyster Creek results contain sufficient margin to account for this variability, so that the results and conclusions of the BWRVIP-183 report can be applied to any BWR/2-5 plant.

3. Section 5.3, "Results and Conclusion," states that, "Figure 5-1 shows a maximum deflection [[ ]] at indication 5 of the Oyster Creek top guide." Confirm that the deflection is in the X-Z plane (i.e., the plane of the paper) with respect to the bottom support of the lower shroud cylinder. Provide the relative deflection between the two severed points at indication 5. If the maximum deflection of [[ ]]

mentioned in the previous question is an absolute deflection, then it is inadequate to assume "arbitrary axial lengths of [[ ]] for the upper and lower shroud cylinders" as described in Section A.2.3, "Shroud," because a lower shroud cylinder with an axial length much greater than [[ ]] will provide a significantly larger deflection at indication 5. Provide the revised maximum deflection considering a realistic flexibility of the lower shroud cylinder and address the control rod blade insertion issue.

4. Section A.4, "Load Combination Stress Analyses," states that, "Appropriate scale factors are applied to these load cases to reflect the actual loads on the NMP-1 top guide." Discuss how much the actual loads for other plants could vary from the loads associated with the NMP-1 top guide, especially for those plants located at the active seismic region.

The following RAIs are related to the fidelity of finite element modeling.

5. Appendix A.2.2, "Grid Beam Intersections," states that, "while the ends of the beams are directly attached to the top guide rim." Figure A-3 indicates that the bottom of the beam end plate elements contact the flat ring connecting the upper and lower shroud cylinders. Please confirm that the beam end plate elements are not attached to the flat ring in your FEA model per the original design.

6. Appendix A.2.2 further states that, "[t]he top and bottom of each interlocking notch are coupled to the perpendicular beam's matching node (along the axial direction of the notched beam). This produces a three-node couple in the axial direction of the beam." For each pair of interlocking notches, there is only one contact point (i.e., the notch end of the lower beam contacts the matching notch end of the upper beam). At the contact point, these two notch ends have the same axial displacement, but are free in the remaining two translational and two rotational degrees of freedom. With this understanding, what does the "three-node couple" mean? Separately, confirm whether the upper beams are firmly locked to the lower beams through interference fit along the entire length of the notches. How does the FEA model reflect this?

7. Section A.2.3 states that, "the mid-radius for the upper shroud cylinder is [[ ]] for the lower shroud cylinder. This results in a [[ ]] gap between the top guide rim and the lower shroud cylinder." This statement is misleading. It should be revised to, "the mid-radius for the top guide rim is [[ ]] for the lower shroud cylinder. This results in a [[ ]] gap between the top guide rim and the lower shroud cylinder." After the revision, another Section A.2.3 statement, "the mid-radius for the lower shroud cylinder is modeled the same as that for the top guide rim, [[ ]]," becomes clear to indicate that the [[ ]] gap is not modeled in the FEM model.

8. Section A.2.3 states that, "the top guide rim is seated on the lower shroud cylinder." However, Section A.2.4 states that, "the vertical separating between the top guide rim and the shroud is taken as [[ ]], instead of [[ ]]." Which one is true? If the latter one is, then do the spar elements provide the axial connection between the top guide rim and the lower shroud cylinder?

9. Sections A.3.2 to A.3.5 discuss seismic excitations in different directions. A typical statement in these sections describing the locations where pressure applies is, "a pressure of [[ ]] is applied in the positive [or negative] X [or Z]

direction, simulating a seismic motion in the negative [or positive] X [or Z] direction, to all cells having 4 fuel assemblies." Please use load case A.3.2 as an example to identify the surface(s) of a typical 4-fuel-assembly cell where the pressure is applied in the FEA model.