

NuScaleDCRaisPEm Resource

From: Cranston, Gregory
Sent: Saturday, August 05, 2017 11:34 AM
To: RAI@nuscalepower.com
Cc: NuScaleDCRaisPEm Resource; Lee, Samuel; Chowdhury, Prosanta; Samaddar, Sujit; Patel, Pravin; Vera Amadiz, Marieliz; Chakravorty, Manas
Subject: RE: Request for Additional Information No. 135, RAI 8928 (3.7.3)
Attachments: Request for Additional Information No. 135 (eRAI No. 8928).pdf

Attached please find NRC staff's request for additional information concerning review of the NuScale Design Certification Application.

Please submit your technically correct and complete response within 60 days of the date of this RAI to the NRC Document Control Desk. The NRC Staff recognizes that NuScale has preliminarily identified that the response to one or more questions in this RAI is likely to require greater than 60 days. NuScale is expected to provide a schedule for the RAI response by email within 20 days.

If you have any questions, please contact me.

Thank you.

Gregory Cranston, Senior Project Manager
Licensing Branch 1 (NuScale)
Division of New Reactor Licensing
Office of New Reactors
U.S. Nuclear Regulatory Commission
301-415-0546

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Request for Additional Information No. 135 (eRAI No. 8928)

Issue Date: 08/05/2017

Application Title: NuScale Standard Design Certification - 52-048

Operating Company: NuScale Power, LLC

Docket No. 52-048

Review Section: 03.07.03 - Seismic Subsystem Analysis

Application Section: 3.7.3

QUESTIONS

03.07.03-1

Title 10 of the Code of Federal Regulations, Part 50, Appendix A, Criterion 2 and Appendix S to 10 CFR Part 50, provide the requirements to be met by SSC important to safety. DSRS Section 3.7.3 provides review guidance pertaining to the design of important to safety seismic Category I substructures such as platforms; support frame structures; yard structures; buried piping; tunnels, and conduits; concrete dams; and atmospheric tanks. Consistent with DSRS Section 3.7.3, the staff reviewed the descriptive information, including plans and sections of each structure, to establish that there is sufficient information to define the structural aspects and elements relied upon for the substructure to perform the intended safety function.

Staff reviewed the FSAR sections related to the Reactor Building Crane (RBC). The Reactor Building Crane is described in FSAR Sections 3.7.2.1.2.3, "Reactor Building Crane," and 3.7.3.3.1, "Reactor Building Crane." In Section 3.7.2.1.2.3 it is stated that "for the analysis of the RXB, the RBC is unloaded (i.e., no suspended NPM) and located in the middle of the reactor pool area." In the section 3.7.3.3.1, it is stated that "The RBC is then evaluated as a decoupled model using the ISRS [in-structure response spectra] developed from the building model. If significant changes are necessary to the RBC, the beam model is updated. If the structure is re-analyzed (due to any significant change in the model), new ISRS are generated. The new ISRS are compared to the ISRS used as input for the design of the RBC. If warranted, a new analysis of the RBC is performed."

The staff requests the applicant to clarify whether or not: 1) the iterative process mentioned above has been completed and 2) the respective results are included in the DCD. Also, explain why the selected ISRS is based solely on the RBC located in the middle of the reactor pool area.

03.07.03-2

Title 10 of the Code of Federal Regulations, Part 50, Appendix A, Criterion 2 and Appendix S to 10 CFR Part 50, provide the requirements to be met by SSC important to safety. DSRS Section 3.7.3 provides review guidance pertaining to the design of important to safety seismic Category I substructures such as platforms; support frame structures; yard structures; buried piping; tunnels, and conduits; concrete dams; and atmospheric tanks. Consistent with DSRS Section 3.7.3, the staff reviewed the descriptive information, including plans and sections of each structure, to establish that there is sufficient information to define the structural aspects and elements relied upon for the substructure to perform the intended safety function.

Staff reviewed Section 3.7.3.3.2, "Bioshields," the subsection entitled, "Reinforced Concrete Properties and Slab Capacity," of the FSAR. The last paragraph on page 3.7-56 states, "The welded connections between the vertical and horizontal component of the

bioshield are designed based on the provisions of Chapter J of AISC 360.” The applicant is requested to provide a technical justification for use of the AISC 360 code for the welded connections between the vertical and horizontal component of the seismic Category II bioshield. Page 16.1-2 of the AISC 360-10 code lists the requirements for nuclear applications, including the use of AISC N690. The applicant is also requested to clarify any additional provisions from AISC N690 regarding the design and weld inspection that are applicable to the bioshield.

03.07.03-3

Title 10 of the Code of Federal Regulations, Part 50, Appendix A, Criterion 2 and Appendix S to 10 CFR Part 50, provide the requirements to be met by SSC important to safety. DSRS Section 3.7.3 provides review guidance pertaining to the design of important to safety seismic Category I substructures such as platforms; support frame structures; yard structures; buried piping; tunnels, and conduits; concrete dams; and atmospheric tanks. Consistent with DSRS Section 3.7.3, the staff reviewed the descriptive information, including plans and sections of each structure, to establish that there is sufficient information to define the structural aspects and elements relied upon for the substructure to perform the intended safety function.

Staff reviewed Section 3.7.3.3.2, “Bioshields,” the subsection entitled, “Structural Steel Properties,” of the FSAR. The paragraph on page 3.7-56 states, in part, “The operation environment underneath the bioshield is expected to be higher than the ambient building temperature. Therefore, a yield strength of 21.4 ksi, corresponding to a temperature of 200 °F, is used.” The applicant is requested to provide a technical bases for using a design temperature of 200 °F for the bioshield components. Additionally, the applicant is requested to address the following:

- a. If the bioshield vertical face is below the water surface, what would be the compartment pressure and temperature on the bioshield? This effect should be considered for the bio shield design. In this scenario, what will be the safety classification if the bio shield requires blow out?
- b. It is not clear to the staff whether or not the vertical plate is vented. Provide the detail design basis temperature, pressure, and safety classification of the bioshield. Also, provide detailed design information for the bioshield design and description for the plate/tubing configuration including welded joints.

03.07.03-4

Title 10 of the Code of Federal Regulations, Part 50, Appendix A, Criterion 2 and Appendix S to 10 CFR Part 50, provide the requirements to be met by SSC important to safety. DSRS Section 3.7.3 provides review guidance pertaining to the design of important to safety seismic Category I substructures such as platforms; support frame structures; yard structures; buried piping; tunnels, and conduits; concrete dams; and atmospheric tanks. Consistent with DSRS Section 3.7.3, the staff reviewed the descriptive information, including plans and sections of each structure, to establish that there is sufficient information to define the structural aspects and elements relied upon for the substructure to perform the intended safety function.

Staff reviewed Section 3.7.3.3.2.1, “Evaluation,” of the FSAR. The last paragraph on page 3.7-57 states, in part, “the capacity of the anchor bolt is checked. The anchor bolt material is ASTM A193 Grade B7 due to its temperature and corrosion resistance.” The

bioshield has a seismic Category II categorization. In evaluating the slab and anchor bolts for the bioshield, the staff noticed that the safety classification of the anchor bolt was not provided. The staff believes that the bolts used for anchoring the bioshield to the slab should be safety related. Therefore, the applicant is requested to provide the following:

- a. The safety classification of the bolts.
- b. The anchor bolts pattern (spacing) for the bioshield mounting as stated in the application that, "The bioshield slab is anchored to the NPM bay walls with four 1.5-in. vertical bolts on each wall and to the NPM pool wall with eight 1.5-in. bolts in the horizontal direction."
- c. A description as to how the horizontal direction bolts are installed.

03.07.03-5

Title 10 of the Code of Federal Regulations, Part 50, Appendix A, Criterion 2 and Appendix S to 10 CFR Part 50, provide the requirements to be met by SSC important to safety. DSRS Section 3.7.3 provides review guidance pertaining to the design of important to safety seismic Category I substructures such as platforms; support frame structures; yard structures; buried piping; tunnels, and conduits; concrete dams; and atmospheric tanks. Consistent with DSRS Section 3.7.3, the staff reviews the descriptive information, including plans and sections of each structure, to establish that there is sufficient information to define the structural aspects and elements relied upon for the substructure to perform the intended safety function.

The staff reviewed Section 3.7.3.3.1, "Reactor Building Crane," of the FSAR and noted that additional information is needed to complete the safety review of the RBC. Thus, the staff is requesting the applicant to augment Section 3.7.3.3.1 to include the finite element model of the crane and its characteristics, the dynamic properties, along with the seismic responses at the critical locations.