NuScaleDCRaisPEm Resource

From: Cranston, Gregory
Sent: Wednesday, November 29, 2017 3:49 PM
To: RAI@nuscalepower.com
Cc: NuScaleDCRaisPEm Resource; Lee, Samuel; Chowdhury, Prosanta; Jackson, Diane; Grady, Anne-Marie; Tabatabai, Omid
Subject: RE: Request for Additional Information No. 289 RAI No. 9215 (6.2.5)
Attachments: Request for Additional Information No. 289 (eRAI No. 9215).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 this question in this RAI is likely to require greater than 60 days.

If you have any questions, please contact me.

Thank you.

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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. 289 (eRAI No. 9215)

Issue Date: 11/29/2017
Application Title: NuScale Standard Design Certification - 52-048
Operating Company: NuScale Power, LLC
Docket No. 52-048
Review Section: 06.02.05 - Combustible Gas Control in Containment
Application Section: 6.2.5

QUESTIONS

06.02.05-10

NuScale has requested an exemption from the combustible gas control requirements of 10 CFR 50.44(c)(2), which states that:

> *All containments must have an inerted atmosphere, or must limit hydrogen concentrations in containment during and following an accident that releases an equivalent amount of hydrogen as would be generated from a 100 percent fuel clad-coolant reaction, uniformly distributed, to less than 10 percent (by volume) and maintain containment structural integrity and appropriate accident mitigating features.*

10 CFR 52.47(a)(12) requires a design certification applicant to include an analysis and description of the equipment and systems for combustible gas control as required by 10 CFR 50.44.

10 CFR 50.12(a)(1) states that, *in part,* the Commission may grant exemptions from the requirements of the regulations od 10 Part 50, which are "Authorized by law, will not present an undue risk to the public health and safety."

NUREG-0800, Section 19.0, Design-Specific PRA (Procedures Specific to Integral Pressurized Water Reactors) states the following:

> *For small, modular integral pressurized water reactor designs, the staff reviews the results and description of the applicant's risk assessment for a single reactor module; and, if the applicant is seeking approval of an application for a plant containing multiple modules, the staff reviews the applicant's assessment of risk from accidents that could affect multiple modules to ensure appropriate treatment of important insights related to multi-module design and operation.*

The staff will verify that the applicant has:

i. Used a systematic process to identify accident sequences, including significant human errors that lead to multiple module core damages or large releases and described them in the application

ii. Selected alternative features, operational strategies, and design options to prevent these sequences from occurring and demonstrated that these accident sequences are not significant contributors to risk. These operational strategies should also provide reasonable assurance that there is sufficient ability to mitigate multiple core damages accidents.

Questions

The NuScale biological shield (i.e., bioshield) is a first of a kind structure / component. Current understanding of the bioshield is that for each nuclear power module (NPM), a bioshield is located above the reactor module and extends down on the pool side. The bioshield, in part, creates a compartment above the module. The compartment is created around each NPM by two side walls which are (often) shared with the next module, the reactor building pool wall, the bioshield above and on one side (as a wall in/above the reactor pool), and the water surface and exposed portion of the containment dome. The bioshield is removed while a NPM is being detached and refueled. During that time, the removed bioshield is placed on top of another NPM's in-place bioshield. The size of the compartment and the means of air/gas exchange with the reactor building is unclear from the documentation.

To assess the potential for hydrogen combustion and any safety impacts, more detailed geometric information is required of the bioshield. In the responses to questions 1-4 below, address both the typical configuration of the operating NPM under a single bioshield, and the configuration of the operating NPM under the stacked bioshield configuration.

1) Describe the region / compartment above the containment vessel and below the bioshield, including clarifying the above statements. Provide the volumes, elevations, and shapes of each compartment. Provide dimensions and compositions of the solid structures (walls, etc.) that bound or define the compartment. Additionally and/or alternatively, provide drawings of or describe the gas-occupied compartment immediate above the reactor bay pool.

2) Describe the areas/ openings in the compartment that would inter-connect the compartment with the larger space of the reactor building that could allow gas flow (e.g., number of the doors or openings and dimensions of each for the connecting compartments).

3) From supporting NuScale documents it appears that the biological shield is a type of reinforced block/plug located above the containment vessel of each plant modules; describe the functions of the bioshield. Information about the biological shield has been requested separately. For the purpose of a combustion analysis, the bioshield will be a barrier and a heat sink. Provide the thickness, composition, mass, and elevation information for the bioshield, the reactor. Also, provide the dimensions and compositions of the solid structures (walls, etc.) that bound or define the compartments.

4) To better understand the relationship of each compartment and the adjacent environment, provide volume, elevation, and compartments in the gas space within the reactor building.