NuScaleDCRaisPEm Resource

From: Chowdhury, Prosanta
Sent: Thursday, June 6, 2019 8:34 AM
To: Request for Additional Information
Cc: Lee, Samuel; Cranston, Gregory; Tesfaye, Getachew; Stutzcage, Edward; Dudek, Michael; NuScaleDCRaisPEm Resource
Subject: Request for Additional Information No. 523 eRAI No. 9682 (12.3-12.4, 9.3.2)
Attachments: Request for Additional Information 523 (eRAI No. 9682).pdf

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

Please submit your technically correct and complete response by August 5, 2019, to the RAI to the NRC Document Control Desk.

If you have any questions, please contact me (email: Prosanta.Chowdhury@nrc.gov, or Ph. 301-415-1647), or Lead Project Manager Gregory Cranston (email: Gregory.Cranston@nrc.gov, or Ph. 301-415-0546)

Thank you.

Prosanta Chowdhury
Project Manager
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Office of New reactors

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Request for Additional Information 523 (eRAI No. 9682)
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Application Title: NuScale Standard Design Certification - 52-048
Operating Company: NuScale Power, LLC
Docket No. 52-048
Review Section: 12.03-12.04 - Radiation Protection Design Features
Application Section: 12.3-12.4, 9.3.2

QUESTIONS

12.03-64

Regulatory Basis:

10 CFR 50.34(f)(2)(viii) requires that applicants provide a capability to promptly obtain and analyze samples from the reactor coolant system and containment that may contain accident source term radioactive materials without radiation exposures to any individual exceeding 5 rems to the whole body. Materials to be analyzed and quantified include certain radionuclides, hydrogen in the containment atmosphere, dissolved gases, chloride, and boron concentrations.

Background:

On January 31, 2019, NuScale submitted an exemption request from 10 CFR 50.34(f)(2)(viii). The cover letter indicates that the exemption is requesting, "that sampling contingency plans for a NuScale Power Plant need not be demonstrated in terms of the dose criteria otherwise applicable under 10 CFR 50.34(f)(2)(viii)." However, the summary of the exemption specifies that NuScale, "requests an exemption from 10 CFR 50.34(f)(2)(viii), requiring capability for post-accident sampling of the reactor coolant system and containment." This summary appears to indicate that it is a request to be exempt from 10 CFR 50.34(f)(2)(viii) in its entirety.

On March 29, 2019, NuScale provided proposed FSAR markups associated with the exemption request. These FSAR markups included an update to FSAR Table 1.9-5, "Conformance with TMI Requirements (10 CFR 50.34(f)) and Generic Issues (NUREG-0933)" which was revised to indicate that NuScale is taking a "departure" from 10 CFR 50.34(f)(2)(viii). The comment column of the table states, "Per Design Specific Review Standards (DSRS) 9.3.2, post-accident sampling is a contingency plan to be developed by a COL applicant (COL Item 9.3-2). The NuScale design supports an exemption from the portions of 10 CFR 50.34(f)(2)(viii) related to demonstrating the personnel radiation exposures." Finally, Section 12.4.1.8 of the proposed FSAR markups also indicates that the exemption is from exceeding prescribed radiation dose limits.

Issue:

The staff seeks clarification on the scope of the proposed exemption. For example, is the exemption request (1) a request for a full exemption from 10 CFR 50.34(f)(2)(viii) (i.e. a request to not be required to take post-accident samples at all); (2) a request to be exempt from the 5

rem design criteria for post-accident sampling in 10 CFR 50.34(f)(2)(viii); or (3) an exemption from 10 CFR Part 20 or other requirements.

Requests:

1. Please clearly specify the full scope of the exemption request and ensure that the enclosed details and FSAR appropriately reflect the intended scope of the exemption.

2. A technical justification is needed for why NuScale does not need to promptly obtain and analyze samples from the reactor coolant system and containment for radionuclides, hydrogen, dissolved gases, chlorides, and boron concentration. Please provide a detailed technical justification regarding why post-accident sampling is not needed for each of the sample types individually. If NuScale is requesting a full exemption from post-accident sampling, the response should consider any potential consequences of not sampling following both core damage and non-core damage accidents.

3. Section 9.3.2 of the DSRS is draft and has not been formally approved by NRC. Please correct this reference.

12.03-65

Regulatory Basis:

10 CFR 50.34(f)(2)(viii) requires that the design provides the capability to promptly obtain and analyze samples from the reactor coolant system and containment without exceeding 5 rem.

10 CFR Part 20 establishes standards for protection against ionizing radiation resulting from activities conducted under licenses issued by the Nuclear Regulatory Commission. In addition, 10 CFR Part 20, Subpart C, establishes the occupational dose limits.

Background:

On January 31, 2019, NuScale submitted an exemption request from 10 CFR 50.34(f)(2)(viii). In Section 16.2.2 of the exemption request, under "Radiological Exposure to Workers," the applicant states the following:

"As a result of this exemption, a licensee need not demonstrate sampling contingency plans in terms of the dose criteria otherwise applicable under 10 CFR 50.34(f)(2)(viii). A licensee will be required by 10 CFR 50.47(b)(11) to establish means for controlling radiological exposures to workers in an emergency, which will include exposure guidelines consistent with EPA Emergency Worker and Lifesaving Activity Protective Action Guides. Therefore, emergency workers will be protected from undue radiological exposure during emergency conditions that may necessitate obtaining post-accident samples or monitoring of containment hydrogen and oxygen."

While the requirements of 10 CFR Part 20 are not intended to limit actions that may be necessary to protect health and safety, the regulations of 10 CFR Part 20 do still apply during post-accident conditions. This is supported by the statements of consideration for 10 CFR Part

20 (FRN Vol. 56, No. 98, Tuesday, May 21, 1991), which state that, "[t]he Commission believes that the dose limits for normal operation should remain the primary guidelines in emergencies. However, the Commission also recognizes that, in an emergency, operations that do not conform to the regulations may have to be carried out to achieve the high-priority tasks of worker, public, and facility protection." It also states, "In evaluating any ensuing violations and their severity, the Commission will consider on a case-by-case basis any extenuating circumstances."

Issue:

Based on the regulations of 10 CFR Part 20 and the statements of consideration associated with 10 CFR Part 20, the regulations of 10 CFR Part 20 apply during post-accident conditions. As a result, the staff is seeking additional information on the regulatory basis for replacing 10 CFR Part 20 with the EPA Emergency Worker and Lifesaving Activity Protective Action Guides (EPA PAGs).

Requests:

1. Please clarify the scope of NuScale's exemption request intent in specifying that the exposure guidelines provided in the EPA PAGs will be used for controlling worker exposure when collecting post-accident samples.

2. If NuScale's exemption request retains the ability to perform post-accident sampling, explain how Part 20 exposure limits will be met by the proposed approach and provide appropriate revisions/markups of applicable documentation.

3. It appears that NuScale is indicating that the exposure guidelines provided in the EPA PAGs will be used for controlling worker exposure when monitoring containment hydrogen and oxygen. Please clarify if this is the intent.

12.03-66

Regulatory Basis:

10 CFR 50.44(c)(4) requires that equipment must be provided for monitoring hydrogen and oxygen in the containment. The equipment must be functional, reliable, and capable of continuously measuring the concentration of hydrogen and oxygen in the containment atmosphere following significant beyond design-basis accidents, for accident management, including emergency planning.

10 CFR 50.34(f)(2)(vii) requires that applicants perform radiation and shielding design reviews of spaces around systems that may, as a result of an accident, contain accident source term radioactive materials, and design as necessary to permit adequate access to important areas.

10 CFR Part 20 establishes standards for protection against ionizing radiation resulting from activities conducted under licenses issued by the Nuclear Regulatory Commission. In addition, 10 CFR Part 20, Subpart C, establishes the occupational dose limits.

In addition, while NUREG-0737 doesn't establish regulatory requirements for the NuScale application, NUREG-0737, Section II.B.2, provides context regarding the actions that should be considered in addressing the requirement of 10 CFR 50.34(f)(2)(vii). NUREG-0737, Section II.B.2, indicates that any area which will or may require occupancy to permit an operator to aid in the mitigation of or recovery from an accident are areas that should be reviewed to ensure that adequate access is permitted. Furthermore, Section II.B.2 provides numerous examples of areas that should be considered for this evaluation, these areas include to the hydrogen control system and containment isolation reset control area. These examples clearly specify that actions associated with hydrogen control and isolation of containment should be considered as actions necessary for consideration to meeting 10 CFR 50.34(f)(2)(vii). Furthermore, Section II.B.2 indicates that the dose criteria used for this evaluation should be 5 rem.

Background:

On January 31, 2019, NuScale submitted an exemption request from 10 CFR 50.34(f)(2)(viii). NuScale indicates in the exemption request that part of the basis for the exemption is because the NuScale design includes the capability to perform hydrogen and oxygen monitoring in accordance with 10 CFR 50.44(c)(4). NuScale describes the process for conducting hydrogen and oxygen monitoring in the FSAR and in TR-0716-50424, "Combustible Gas Control." However, while NuScale requests an exemption from 10 CFR 50.34(f)(2)(viii) based in part on the ability to perform hydrogen and oxygen monitoring, NuScale has not demonstrated an ability to perform hydrogen and oxygen monitoring within applicable Part 20 Occupational Dose Limits. Therefore, it is apparent that the applicant needs to demonstrate that the design meets the requirements of 10 CFR 50.44(c)(4) and 10 CFR 50.34(f)(2)(vii) by adequately demonstrating safe access to perform the necessary actions to conduct hydrogen and oxygen monitoring.

Issue:

In order for staff to conclude that actions associated with hydrogen and oxygen monitoring can be performed in accordance with NRC requirements, the staff needs additional information.

Requests:

1. Provide information demonstrating the ability of operators to perform post-accident hydrogen and oxygen monitoring following a significant beyond design-basis accident. The response should discuss all necessary manual actions, the locations and expected durations of these actions, including any actions necessary to prevent an uncontrolled release of radioactive material. The source term assumed for this analysis must be based on a significant beyond design-basis accident. The response should consider all significant sources of radiation exposure (including airborne radioactive material) and access and egress to areas. The evaluation should provide assurance that manual actions can be conducted without exceeding the 5 rem occupational dose limits in Part 20.

2. Provide, drawings which demonstrate the flow path, including equipment, which would establish the continuous monitoring of hydrogen and oxygen in containment following a beyond design basis accident.

12.03-67

Regulatory Basis:

10 CFR 50.34(f)(2)(vii) requires that applicants perform radiation and shielding design reviews of spaces around systems that may, as a result of an accident, contain accident source term radioactive materials, and design as necessary to permit adequate access to important areas.

10 CFR Part 20 establishes standards for protection against ionizing radiation resulting from activities conducted under licenses issued by the Nuclear Regulatory Commission. In addition, 10 CFR Part 20, Subpart C, establishes the occupational dose limits.

In addition, while NUREG-0737 doesn't establish regulatory requirements for the NuScale application, NUREG-0737, Section II.B.2, provides context regarding the actions that should be considered in addressing the requirement of 10 CFR 50.34(f)(2)(vii). NUREG-0737, Section II.B.2, indicates that any area which will or may require occupancy to permit an operator to aid in the mitigation of or recovery from an accident are areas that should be reviewed to ensure that adequate access is permitted. Furthermore, Section II.B.2 provides numerous examples of areas that should be considered for this evaluation, these areas include to the hydrogen control system and containment isolation reset control area. These examples clearly specify that actions associated with hydrogen control and isolation of containment should be considered as actions necessary for consideration to meeting 10 CFR 50.34(f)(2)(vii). Furthermore, Section II.B.2 indicates that the dose criteria used for this evaluation should be 5 rem.

Background:

On January 31, 2019, NuScale submitted an exemption request from 10 CFR 50.34(f)(2)(viii). NuScale indicates in the exemption request that part of the basis for the exemption is because the NuScale design includes the capability to perform hydrogen and oxygen monitoring in accordance with 10 CFR 50.44(c)(4). NuScale describes the process for conducting hydrogen and oxygen monitoring in the FSAR and in TR-0716-50424, "Combustible Gas Control," which requires un-isolating containment. While NuScale has indicated that they do not believe they have any required actions within the scope of 10 CFR 50.34(f)(2)(vii), NuScale is required to perform hydrogen and oxygen monitoring under 10 CFR 50.44(c)(4) and NuScale has not provided justification regarding if there is a need to re-isolate containment. In addition, staff requests additional information related to the exemption request.

Issue:

NuScale has not provided information regarding if manual actions associated with re-isolating containment are necessary. In addition, the staff requests additional information regarding information related to the exemption request.

Requests:

1. After opening containment to perform hydrogen and oxygen monitoring, discuss if there is a need to re-isolate containment. If manual actions may be necessary to re-isolate containment, please describe these manual actions. If re-isolation of containment is unnecessary, please explain why.

2. If manual actions are necessary to re-isolate containment, please demonstrate adequate safe access to perform the necessary actions to isolate containment (similar to the radiological review performed to ensure the capability to perform hydrogen and oxygen monitoring actions) to demonstrate compliance with 10 CFR 50.34(f)(2)(vii) or justify why the access requirements of 10 CFR 50.34(f)(2)(vii) would not apply to manual actions to re-isolate containment.

3. On March 29, 2019, NuScale provided proposed FSAR markups associated with the exemption request from 10 CFR 50.34(f)(2)(viii). In the proposed FSAR changes associated with the exemption request, the applicant proposed to remove the post-accident radiation zone maps provided in FSAR Figures 12.3-4a through 12.3-4d but did not provide any information or justification explaining why they are being removed. The post-accident radiation zone figures provide information relevant to ensuring post-accident doses to operators are appropriate. Please also provide all post-accident radiation zone information necessary to provide information demonstrating that post-accident actions can be performed within the dose limits in the NuScale FSAR.

4. The staff determined that FSAR Figures 9.3.6-1, "Containment Evacuation System Diagram" and 9.3.6-2, "Containment Flooding and Drain System Diagram," contain inconsistencies and lack sufficient detail to evaluate necessary actions in post-accident conditions. Please ensure that the FSAR Figures 9.3.6-1 and 9.3.6-2 provide consistent, accurate, and up to date information and the appropriate level of detail for the staff to make a finding relative to the acceptability of these systems for performing required functions.

5. The staff cannot locate a diagram depicting the configuration of the sampling system in the FSAR. However, during public meetings, the applicant indicated that this system contained the pump used for pumping post-accident fluid, along with valves and piping not shown on the connected systems. Please update the FSAR to provide a figure showing the configuration of the sampling system with the appropriate level of detail for the staff to make a finding relative to the acceptability of these systems for performing required functions. As an alternative, ensure that the FSAR provides an adequate description of the configuration of the system or justify why it is not necessary.