NuScaleDCRaisPEm Resource

From: Cranston, Gregory
Sent: Friday, December 15, 2017 9:20 AM
To: RAI@nuscalepower.com
Cc: NuScaleDCRaisPEm Resource; Lee, Samuel; Chowdhury, Prosanta; Mitchell, Matthew; Yeshnik, Andrew; Murray, Demetrius
Subject: RE: Request for Additional Information No. 299 RAI No. 9247 (9.1.3)
Attachments: Request for Additional Information No. 299 (eRAI No. 9247).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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Division of New Reactor Licensing
Office of New Reactors
U.S. Nuclear Regulatory Commission
301-415-0546

Hearing Identifier: NuScale_SMR_DC_RAI_Public
Email Number: 326

Mail Envelope Properties (MWHPR09MB1200C5FB053490A6F56AE680900B0)

Subject: RE: Request for Additional Information No. 299 RAI No. 9247 (9.1.3)
Sent Date: 12/15/2017 9:20:18 AM
Received Date: 12/15/2017 9:20:23 AM
From: Cranston, Gregory

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Post Office: MWHPR09MB1200.namprd09.prod.outlook.com

Files	**Size**	**Date & Time**
MESSAGE	713	12/15/2017 9:20:23 AM
Request for Additional Information No. 299 (eRAI No. 9247).pdf	96524	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

Request for Additional Information No. 299 (eRAI No. 9247)

Issue Date: 12/15/2017
Application Title: NuScale Standard Design Certification - 52-048
Operating Company: NuScale Power, LLC
Docket No. 52-048
Review Section: 09.01.03 - Spent Fuel Pool Cooling and Cleanup System
Application Section: 9.1.3

QUESTIONS

09.01.03-3

Regulatory basis: Title 10 of the Code of Federal Regulations (CFR) Part 50, Appendix A, General Design Criterion (GDC) 4 requires structures, systems, and components (SSCs) to be designed and fabricated to accommodate the effects of environmental conditions during normal, off normal, and accident conditions. In the NuScale Design Control Document (DCD) the spent fuel assemblies, spent fuel racks, and the NuScale containment modules sit within the Ultimate Heat Sink (UHS). These important to safety and safety-related components are designed for the normal, off normal, and accident environments by: (1) selecting materials that are resistant to degradation as practicable and (2) maintaining water chemistry. The staff seeks further information on the water chemistry controls to ensure that important to safety and safety-related components will perform their safety functions.

In DCD Tier 2, Final Safety Analysis Report (FSAR) Table 9.1.3-1c, "Equipment Parameters for the Pool Cleanup System," the applicant described the capacity of the Pool Cleanup System (PCUS).

Table 9.1.3-1c describes parallel trains of the PCUS and a flow capacity values for components in the system. For instance, "PCUS Resin Traps A, B, and C" have a flow capacity of 1450 gpm. In DCD Tier 2, FSAR Section 9.1.3.2.3, "Pool Cleanup System," the applicant states that normal operation of the PCUS utilizes one train of the demineralizer and resin trap. The staff is unclear if the 1450 gpm flow capacity applies to one train of the PCUS or is the entire capacity of the PCUS. Provide the staff with information on the capacity of a single train of the PCUS.

09.01.03-4

Regulatory basis: 10 CFR Part 50, Appendix A, GDC 4 requires SSCs to be designed and fabricated to accommodate the effects of environmental conditions during normal, off normal, and accident conditions. As stated in the NuScale DCD, the spent fuel assemblies, spent fuel racks, and the NuScale containment modules sit within the UHS. The staff seeks further information on the water chemistry controls to ensure that important to safety and safety-related components within the UHS will perform their safety functions.

In DCD Tier 2, FSAR Table 9.1.3-1c, "Equipment Parameters for the Pool Cleanup System," the applicant described the capacity of the PCUS.

Table 9.1.3-1c describes parallel trains of the PCUS and a flow capacity values for components in the system. In DCD Tier 2, FSAR Section 9.1.3.2.3, "Pool Cleanup System," the applicant states that normal operation of the PCUS is "capable of cleanup of the combined volume of the UHS every two months."

The staff seeks additional information on the cleanup of the UHS.

1) The applicant states that the PCUS is "capable of cleanup of the combined volume of the UHS every two months." Provide the staff with the meaning of the phrase "capable of cleanup." In the context of what the phase is intended to mean, please explain:

    a. The number of PCUS trains in operation necessary to achieve UHS cleanup in two months.
    b. The assumed cleaning efficiency of a single train of the PCUS.
    c. The effective flow capacity of cleaned water into the UHS used to calculate the two month cleanup time.
    d. An estimate of the number of gallons of water filtered during the two month cleanup.

    Update the DCD Tier 2 information as necessary to describe the PCUS cleanup capability for normal operations.

2) The PCUS should be designed to maintain the UHS water chemistry in accordance with the water chemistry parameters described in DCD Tier 2 FSAR Table 9.1.3-2, “Water Chemistry Parameters Monitored for Ultimate Heat Sink Pools.” The DCD Tier 2 FSAR does not describe how the design of the PCUS is sufficient to maintain water chemistry.

   Provide the staff with additional information on the PCUS. This should include:

   a. A technical basis that describes how normal operation of the PCUS over a two month period maintains water chemistry considering (i) constant introduction of contaminates into the UHS from the reactor building (dust, etc.) and (ii) sudden introduction of contaminates into the UHS.
   b. A discussion how sampling the UHS from a single location upstream of the demineralizer is an accurate representation of the bulk water chemistry of the UHS. The applicant should describe any additional UHS water chemistry samples taken from the bulk pool.
   c. A discussion of local water chemistry uncertainty considering that the water chemistry parameters apply to bulk water chemistry. The discussion should include mixing of the UHS will be achieved by procedures or natural flow and estimated stagnant water areas in the UHS.

   Update the DCD Tier 2 information as necessary to describe the PCUS cleanup capability for normal operations.

3) For a NuScale plant with twelve power modules the applicant states that refueling outages will be staged such that a refueling outage will occur every two months. Considering that the PCUS is “capable of cleanup of the combined volume of the UHS every two months” the staff is concerned that the UHS water chemistry may not be sufficiently clean due to an introduction of contamination into the UHS prior to a scheduled refueling outage.

   If contaminates were introduced into the UHS how would plant personnel determine if refueling operations should begin or if refueling should be halted? Does the PCUS have the ability to rapidly clean the UHS if necessary or would a licensee need to use the NuScale reactor module’s Chemical and Volume Control Systems to treat the UHS water?

   Provide the staff with a discussion on how normal operation of the PCUS provides sufficient cleaning of the UHS to enable a two month refueling interval. Update the DCD Tier 2 information as necessary to describe the PCUS cleanup capability for normal operations.

09.01.03-5

Regulatory basis: 10 CFR Part 50, Appendix A, GDC 4 requires SSCs to be designed and fabricated to accommodate the effects of environmental conditions during normal, off normal, and accident conditions. As stated in the NuScale DCD, the spent fuel assemblies, spent fuel racks, and the NuScale containment modules sit within the UHS. The staff seeks further information on the water chemistry controls to ensure that important to safety and safety-related components within the UHS will perform their safety functions.

In DCD Tier 2 FSAR Table 9.1.3-2, “Water Chemistry Parameters Monitored for Ultimate Heat Sink Pools,” the applicant described the water chemistry parameters for the UHS.

In Table 9.1.3.2 the “expected value” parameters for Conductivity and pH are “trend for unexpected changes.” This acceptance criteria insufficient – the only means to violate this criteria is to fail to maintain a monitoring program which is not the intent of water chemistry control parameters.

Update FSAR Table 9.1.3-2 to specify Conductivity and pH acceptance criteria values.

09.01.03-6

Regulatory basis: 10 CFR Part 50, Appendix A, GDC 4 requires SSCs to be designed and fabricated to accommodate the effects of environmental conditions during normal, off normal, and accident conditions. As stated in the NuScale DCD, the spent fuel assemblies, spent fuel racks, and the NuScale containment modules sit within the UHS. The staff seeks further information on the water chemistry controls to ensure that important to safety and safety-related components within the UHS will perform their safety functions.

In DCD Tier 2 FSAR Table 9.1.3-2, “Water Chemistry Parameters Monitored for Ultimate Heat Sink Pools,” the applicant described the water chemistry parameters for the UHS.

The water chemistry parameters mirror the guidance in the EPRI Primary Water Chemistry Guidelines, Appendix B.7, “Spent Fuel Pool Cooling and Cleanup System.” However FSAR Table 9.1.3-2 does not include sampling frequency.

Update the DCD Tier 2, FSAR the UHS water chemistry control sampling frequency.