NuScaleDCRaisPEm Resource

From: Cranston, Gregory
Sent: Tuesday, January 15, 2019 12:29 PM
To: NuScaleDCRaisPEm Resource
Cc: Chowdhury, Prosanta; Tesfaye, Getachew
Subject: RE: Request for Additional Information No. 366 RAI No. 9292 (12.3)
Attachments: Request for Additional Information No. 366 (eRAI No. 9292).pdf

Resending with attachment.

From: Cranston, Gregory
Sent: Tuesday, January 15, 2019 12:02 PM
To: NuScaleDCRaisPEm Resource <NuScaleDCRaisPEm.Resource@nrc.gov>
Cc: Lee, Samuel <Samuel.Lee@nrc.gov>; Chowdhury, Prosanta <Prosanta.Chowdhury@nrc.gov>; Tesfaye, Getachew <Getachew.Tesfaye@nrc.gov>
Subject: Request for Additional Information No. 366 RAI No. 9292 (12.3)

From: Cranston, Gregory
Sent: Friday, February 09, 2018 10:19 AM
To: 'RAI@nuscalepower.com' <RAI@nuscalepower.com>
Cc: Lee, Samuel <Samuel.Lee@nrc.gov>; Chowdhury, Prosanta <Prosanta.Chowdhury@nrc.gov>; Dudek, Michael <Michael.Dudek@nrc.gov>; Lavera, Ronald <Ronald.LaVera@nrc.gov>; Markley, Anthony <Anthony.Markley@nrc.gov>
Subject: Request for Additional Information No. 366 RAI No. 9292 (12.3)

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.

If you have any questions, please contact me.

Thank you.

Hearing Identifier: NuScale_SMR_DC_RAI_Public
Email Number: 560

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Subject: RE: Request for Additional Information No. 366 RAI No. 9292 (12.3)
Sent Date: 1/15/2019 12:28:45 PM
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From: Cranston, Gregory

Created By: Gregory.Cranston@nrc.gov

Recipients:
"Chowdhury, Prosanta" <Prosanta.Chowdhury@nrc.gov>
Tracking Status: None
"Tesfaye, Getachew" <Getachew.Tesfaye@nrc.gov>
Tracking Status: None
"NuScaleDCRaisPEm Resource" <NuScaleDCRaisPEm.Resource@nrc.gov>
Tracking Status: None

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MESSAGE	1347	1/15/2019 12:28:50 PM
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Options
Priority: Standard
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Reply Requested: No
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Expiration Date:
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Request for Additional Information No. 366 (eRAI No. 9292)

Issue Date: 02/08/2018
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, 3.8

QUESTIONS

12.03-43

Regulatory Basis

Appendix A to 10 CFR Part 50— "General Design Criteria for Nuclear Power Plants," Criterion (GDC) 61 "Fuel Storage and Handling and Radioactivity Control," requires that new and spent fuel storage facilities include provisions for inspection and the provision for testing are important to verify that there is no corrosion of the spent fuel pool liner.

10 CFR 52.47(a)(6) requires compliance with the requirements of 10 CFR 20.1406 "Minimization of contamination," which requires a description in the DCD how facility design and procedures for operation will minimize, to the extent practicable, contamination of the facility and the environment, facilitate eventual decommissioning, and minimize, to the extent practicable, the generation of radioactive waste.

10 CFR 20.1406 requires applicants to describe in the application how facility design and procedures for operation will minimize, to the extent practicable, contamination of the facility and the environment, facilitate eventual decommissioning, and minimize, to the extent practicable, the generation of radioactive waste. The acceptance criteria of NuScale DSRS Section 12.3-12.4, "Radiation Protection Design Features," state that the applicant is to describe how facility design addresses the requirements of 10 CFR 20.1406.

10 CFR 20.1101(b) and 10 CFR 20.1003, require the use of engineering controls to maintain exposures to radiation as far below the dose limits in 10 CFR Part 20 as is practical. The guidance provided in NuScale DSRS Section 12.3-12.4 "Radiation Protection Design Features," and Standard Review Plan (SRP) Section 9.1.2 "New and Spent Fuel Storage," are consistent with and support the review of the design features provided for satisfy these regulatory requirements.

Background

Information contained in DCD Tier 2 Revision 0, and in the response to RAI 8963 Question 03.08.05 Question 23, dated October 17 2017, (RAI-8963-03.08.05-23) indicates that portions of the pool liner may not be covered by the pool leakage detection system (PLDS). Based on the information contained within the RAI response and the DCD, it is not clear to the staff how the applicant intends to meet the regulatory requirements for providing at an early stage of the design, sufficient information that demonstrates the capability of the PLDS to detect low leakage rates from structures containing pool water.

The "Liquid Radioactive Release Task Force Final Report" (ADAMS Accession No. ML062650312,) documents that radioisotopes have been released from spent fuel pools, including fission products. The report further noted that the potential exists for unplanned and unmonitored releases of radioactive liquids to migrate offsite undetected, including those portions of spent fuel pools not visible to operators. Leakage (and the resultant contamination) that enters the ground below the plant may be undetected. Radioactive contamination in groundwater onsite may migrate offsite undetected. One of the main components resulting in ground water contamination identified by the Task Force was leakage from spent fuel pools.

Key Issue 1

The NuScale response states that FSAR Tier 2, Section 9.1.3.2.5 describes the pool leakage detection system (PLDS). Per this section, the PLDS consists of floor leakage channels, perimeter leakage channels, channel drainage lines, leak collection headers, leakage rate measuring lines, and valves. The floor leakage channels are embedded in the concrete beneath the field welded seams of the pool floor liner plates in the UHS pools and the dry dock. A perimeter channel is embedded in concrete at the wall and floor liner joint area. Based on the staff interpretation of this response and information contained in the DCD, it appears that the NuScale design only monitors for leakage from welds located on the base mat and at the juncture of the walls and the base mat.

However, the guidance in SRP Section 9.1.2 does not make a distinction between those sections of the pool liner located on the wall, and those sections of the liner located on the base mat.

The acceptance criteria of DSRS Section 12.3-12.4 states that the acceptability of the design features described in the application will be based on the guidance contained in RG 4.21 and Appendix 12.3-12.4-A "Evaluation and Scoping information for Structures, Systems, and Components 10 CFR 20.1406 Design Review." Attachment A of DSRS 12.3-12.4 Appendix 12.3-12.4-A, specifically identifies structures, systems and components, such as spent fuel pools, separated from the environment by a single barrier, or with below grade concrete-to-concrete joints (such as the Ultimate Heat Sink pool in the NuScale Reactor Building). Appendix 12.3-12.4-A Attachment B "Examples of Structures, Systems, and Components for 20.1406 Review," specifically identifies the spent fuel pool as an area for the staff to review.

Question 1

a) Please discuss how the proposed NuScale design is consistent with the requirements of GDC 61 and 10 CFR 20.1406.
b) Alternatively, revise the DCD to include sufficient information to describe any features to address potential-leakage monitoring for all walls in contact with the pool water, including the Ultimate Heat Sink, the fuel storage area, the dry dock area and the refueling area.

OR

Provide the specific alternative approaches used and the associated justification.

12.03-44

The Regulatory Basis and Background are in RAI-9292 Question 31048

Key Issue 2

DCD Tier 2 Revision 0 Table 9.3.2-4: "Local Sample Points," does not list the pool leakage detection system (PLDS), as one of the process sampling points. Furthermore, the response to RAI-8963-03.08.05-23, states that channels collect leakage from the pool liner plates and direct it to a sump or to collection header piping that leads to a sump that is part of the radioactive waste drain system (RWDS). The RWDS sumps are located in the reactor building (RXB) gallery areas at top of concrete elevation 24'-0". However, neither DCD Figure 1.2-10: "Reactor Building 24'-0" Elevation," nor DCD Figure 12.3-1a: "Reactor Building Radiation Zone Map - 24' Elevation" show sumps on this elevation of the Reactor Building.

Question 2

Revise DCD Figure 1.2-10 or DCD Figure 12.3-1a to show the location of the sump(s) used as collection points for the pool liner leakage detection system.

OR

Provide the specific alternative approaches used and the associated justification.

12.03-45

The Regulatory Basis and Background are in RAI-9292 Question 31048

Key Issue 3

The "Liquid Radioactive Release Lessons Learned Task Force Final Report," dated September 1, 2006 (ADAMS Accession No. ML062650312), describes an event where the liner leakage detection system became clogged with boric acid precipitate. DCD Section 9.1.3.2.5 "Pool Leakage Detection System," and the response to RAI-8963-03.08.05-23 state that The PLDS shall be designed to support periodic testing and inspection of PLDS components to allow identification of leakage from the reactor building components pool liner (RBCM PL) welds. However, with the PLDS located in radioactive waste system sumps, it is not clear to the staff what design features are provided to facilitate the inspection and cleaning of the PLDS. For instance, are the sumps large enough to permit personnel or test equipment access? Can the sumps be accessed while one or more nuclear power modules are operating?

Question 3

Describe the design features provide to minimize radiation exposure in accordance with 10 CFR 20.1101(b) and 10 CFR 20.1701(a) during maintenance and testing activities.

OR

Provide the specific alternative approaches used and the associated justification.

12.03-46

The Regulatory Basis and Background are in RAI-9292 Question 31048

Key Issue 4

DCD section 9.1.3.2.5 “Pool Leakage Detection System,” states that the sumps in the RWDS are monitored for level and that the RWDS supports the leakage detection function of the PLDS by providing local and control room indication and associated alarms when the leakage rate from the PLDS reaches a predetermined level. However, DCD Section 9.3.3.2.3 “System Operation,” states that the pool leak detection (PLD) system works in cooperation with the RWDS equipment drain subsystem. The PLD drains are not individually monitored; however, because all other drains into the equipment drain system are manually initiated, unplanned changes in sump volume can be attributed to the PLD system. The guidance contained in RG 4.21, “Minimization of Contamination and Radioactive Waste Generation: Life-Cycle Planning,” regarding the regulatory requirements of 10 CFR 20.1406, states that structures and components, such as a spent fuel pool and associated piping, should be provided with the capability to detect and quantify small leakage rates (e.g., several gallons per week) from each zone. Based on the staff operating experience, other sources of radioactive liquid are volumetrically large enough that actuation of the radioactive sump pumps from normally expected in leakage will mask all but major liner weld failures.

Question 4

a) Consistent with DCD section 9.1.3.2.5 “Pool Leakage Detection System,” describe in the DCD how the sumps in the RWDS, associated with the PLDS, are monitored for level.
b) Consistent with DCD section 9.1.3.2.5 “Pool Leakage Detection System,” describe in the DCD, the types and functions of the alarms and indications available for detecting leakage from the PLDS.
c) Describe the leakage rate detection criteria for the PLDS (i.e.. how many gallons per minute of leakage from the PLDS will initiate an alarm) Describe how the components of the PLDS satisfy this leakage detection criteria.
d) If the leakage detection criteria is more than several gallons per week, please provide the justification for the value selected.

OR

Provide the specific alternative approaches used and the associated justification.

12.03-47

The Regulatory Basis and Background are in RAI-9292 Question 31048

Key Issue 5

The PLDS system appears to be connected to sumps in the Reactor Building that are part of the RWDS. Any ingress of water from the sump into the PLDS will contaminate the PLDS with borated water, which may dry and clog the PLDS, or be mistaken for pool leakage.

Question 5

Please describe in the DCD the design features of the PLDS and RWDS that are provided to prevent back flow from the RWDS into the PLDS.

OR

Provide the specific alternative approaches used and the associated justification.