RAIO-0817-55643

August 24, 2017

Docket No. 52-048

U.S. Nuclear Regulatory Commission
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**SUBJECT:** NuScale Power, LLC Response to NRC Request for Additional Information No. 72 (eRAI No. 8750) on the NuScale Design Certification Application

**REFERENCE:** U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 72 (eRAI No. 8750)," dated June 27, 2017

The purpose of this letter is to provide the NuScale Power, LLC (NuScale) response to the referenced NRC Request for Additional Information (RAI).

The Enclosure to this letter contains NuScale's response to the following RAI Question from NRC eRAI No. 8750:

- 02.04.13-1

This letter and the enclosed response make no new regulatory commitments and no revisions to any existing regulatory commitments.

If you have any questions on this response, please contact Marty Bryan at 541-452-7172 or at mbryan@nuscalepower.com.

Sincerely,

Zackary W. Rad
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Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 8750

**Enclosure 1:**

NuScale Response to NRC Request for Additional Information eRAI No. 8750

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# Response to Request for Additional Information
# Docket No. 52-048

**eRAI No.:** 8750
**Date of RAI Issue:** 06/27/2017

**NRC Question No.:** 02.04.13-1

Meeting the requirements of regulations Appendix A to 10 CFR Part 50, GDC 61, is related to the ability of the LWMS design to ensure adequate safety under normal and postulated accident conditions, as described in SRP Section 2.4.13, DSRS Section 11.2, Branch Technical Position (BTP) 11-6 and analysis of RG 1.143 in assigning the safety classifications to LWMS SSCs for design purposes. The review of the impacts of an accidental release of radioactive liquids in ground or surface water and effects on existing users or likely future users of ground or surface water resources is performed under SRP Section 2.4.13 and information and guidance from DSRS Section 11.2 and SRP Branch Technical Position (BTP) 11-6.

The DCD, Section 11.2.3.2 should contain information, in accordance with BTP 11-6, to describe all outdoor tanks that are likely to contain radioactive liquids, and the radionuclide inventories and volumes for each liquid tank, and identify the limiting source term liquid tank. The DCD should describe the postulated liquid tank failure analysis including the approach, methodology and assumptions, and the design features applied in mitigating the effects of its failure.

DCD Chapter 11, Section 11.2.2.2.1 states there are no outdoor Liquid Radioactive Waste Storage (LRWS) system tanks. However, all outdoor tanks that potentially contain liquid radioactivity should be considered in the postulated liquid tank failure analysis using the guidance in BTP 11-6. Section 9.1.3.2.4 Pool Surge Control System (PSCS) describes a complete system that maintains and cleans any radioactive material in the main pool of water surrounding the reactor vessels and the fuel storage and handling activities. The tank associated with the PSCS is located outside of the reactor building in the plant yard and may potentially contain radionuclides. The vent line on the outside PSCS Tank has a continuous air monitor with radioactive grab sample capabilities to monitor effluent releases. The 1.1 million gallon outdoor PSCS Tank with the outdoor PSCS Storage Tank Catch Basin of unknown volume could potentially release radioactive liquids to the environment, and therefore, should be sufficiently described in the DCD using the guidance in BTP 11-6 (identify/describe limiting tank, tank specifications, radionuclide concentrations and distribution, mitigative design features, failure analysis, dose acceptance criteria, calculation methodology, etc.).

The DCD provides COL Items 2.4-1 and 11.2-3, however Chapter 2 or Chapter 11 of the DCD

does not provide an analysis of an accidental release of radioactive liquid effluents in groundwater and surface water using the methodology and guidance in BTP 11-6.

The DCD does not include sufficient information for the staff to confirm the postulated liquid tank failure analysis and the additional information described above is needed to support the staff's regulatory findings.

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**NuScale Response:**

The only outdoor tank expected to contain radioactive liquids is the PSCS storage tank, which is described in FSAR Section 9.1.3.2.4. The PSCS storage tank catch basin has sufficient volume to store the contents of the PSCS storage tank plus the contents of related piping. The radionuclide inventory of the PSCS storage tank is provided in FSAR Table 12.2-10. The volume of the PSCS storage tank is provided in FSAR Table 9.1.3-1d. The PSCS storage tank is the limiting source term liquid tank for use in a postulated liquid tank failure analysis.

An analysis of an accidental release of radioactive liquid effluents in groundwater and surface water is not provided in the FSAR because it is site-specific and is addressed by COL Item 2.4-1 and COL Item 11.2-3.

FSAR Sections 1.8, 2.4, and 11.2 have been revised as shown in the attached markups to clarify that a COL applicant will use the PSCS storage tank as the limiting source term liquid tank.

**Impact on DCA:**

FSAR Sections 1.8, 2.4, and 11.2 have been revised as described in the response above and as shown in the markup provided in this response.

**Table 1.8-2: Combined License Information Items (Continued)**

| Item No. | Description of COL Information Item | Section |
|---|---|---|
| COL Item 10.4-2: | A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will describe the site-specific auxiliary boiler system, the chemistry requirements, chemistry maintenance program, and how the system meets the design requirements. | 10.4 |
| COL Item 10.4-3: | A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will provide a secondary water chemistry analysis. This analysis will show that the size, materials, and capacity of the feedwater treatment system equipment and components satisfies the water quality requirements of the secondary water chemistry program described in Section 10.3.5, and that it is compatible with the chemicals used. | 10.4 |
| COL Item 11.2-1: | A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will ensure mobile equipment used and connected to plant systems is in accordance with ANSI/ ANS-40.37, Regulatory Guide (RG) 1.143, 10 CFR 20.1406, NRC IE Bulletin 80-10 and 10 CFR 50.34a. | 11.2 |
| COL Item 11.2-2: | A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will calculate doses to members of the public using the site-specific parameters, compare those liquid effluent doses to the numerical design objectives of 10 CFR 50, Appendix I, and comply with the requirements of 10 CFR 20.1302 and 40 CFR 190. | 11.2 |
| COL Item 11.2-3: | A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will perform a site-specific evaluation of the consequences of an accidental release of radioactive liquid from the PSCS storage tank in accordance with NRC Branch Technical Position 11-6. | 11.2 |
| COL Item 11.2-4: | A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will perform a site-specific evaluation using the site-specific dilution flow. | 11.2 |
| COL Item 11.2-5: | A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will perform a cost-benefit analysis as required by 10 CFR 50.34a and 10 CFR 50, Appendix I, to demonstrate conformance with regulatory requirements. This cost-benefit analysis is to be performed using the guidance of Regulatory Guide 1.110. | 11.2 |
| COL Item 11.3-1: | A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will perform a site-specific cost-benefit analysis. | 11.3 |
| COL Item 11.3-2: | A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will calculate doses to members of the public using the site-specific parameters, compare those gaseous effluent doses to the numerical design objectives of 10 CFR 50, Appendix I, and comply with the requirements of 10 CFR 20.1302 and 40 CFR 190. | 11.3 |
| COL Item 11.3-3: | A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will perform an analysis in accordance with Branch Technical Position 11-5 using the site-specific parameters. | 11.3 |
| COL Item 11.4-1: | A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will describe any mobile equipment used and connected to plant systems in accordance with ANSI/ ANS 40.37, Regulatory Guide 1.143, 10 CFR 20.1406, IE Bulletin 80-10, and 10 CFR 50.34a. | 11.4 |
| COL Item 11.4-2: | A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will develop a site-specific Process Control Program following the guidance of Nuclear Energy Institute (NEI) 07-10A (Reference 11.4-3). | 11.4 |
| COL Item 11.5-1: | A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will describe site-specific process and effluent monitoring and sampling system components and address the guidance provided in ANSI N13.1-2011, ANSI N42.18-2004 and RGs 1.21, 1.33 and 4.15. | 11.5 |
| COL Item 11.5-2: | A COL ~~Applicant~~applicant that references the NuScale Power design certification will develop an offsite dose calculation manual (ODCM) that contains a description of the methodology and parameters used for calculation of offsite doses for gaseous and liquid effluents, using the guidance of Nuclear Energy Institute (NEI) 07-09A (Reference 11.5-8). | 11.5 |
| COL Item 11.5-3: | A COL ~~Applicant~~applicant that references the NuScale Power design certification will develop a radiological environmental monitoring program (REMP), consistent with the guidance in NUREG-1301 and NUREG-0133, that considers local land use census data for the identification of potential radiation pathways radioactive materials present in liquid and gaseous effluents, and direct external radiation from systems, structures, and components. | 11.5 |

### 2.4.7 Ice Effects

The design does not rely upon a safety-related intake structure as a makeup source for the reactor pool, which acts as the ultimate heat sink. Therefore, ice effects do not affect safety related cooling.

### 2.4.8 Cooling Water Canals and Reservoirs

The design does not rely upon safety-related cooling water canals or reservoirs as a makeup source for the reactor pool, which acts as the ultimate heat sink.

### 2.4.9 Channel Diversions

The design does not rely upon a safety-related makeup water source. Therefore, upstream channel diversions would not adversely affect safety-related cooling.

### 2.4.10 Flood Protection Requirements

The design assumes that the baseline plant elevation is one foot above the maximum flood level. Therefore there are no flood protection requirements.

### 2.4.11 Low Water Considerations

The design does not rely upon a safety-related source of makeup water. Low flow from surges, seiches, tsunamis, downstream dam failures, future water controls, ice effects, upstream channel diversions, or other sources of low water would not adversely affect safety-related cooling.

The potential effects of low water levels on nonsafety-related water supplies is site-specific and is addressed by the COL applicant as part of the response to COL Item 2.4-1.

### 2.4.12 Groundwater

The design does not employ a permanent dewatering system. Groundwater is assumed to be a minimum of two feet below site grade. High groundwater has an adverse effect on stability. This is a key design parameter.

Groundwater is site-specific and is addressed by the COL applicant as part of the response to COL Item 2.4-1.

### 2.4.13 Accidental Releases of Radioactive Liquid Effluents in Groundwater and Surface Waters

RAI 02.04.13-1

Dilution factors, dispersion coefficients, flow velocities, travel times, adsorption, and pathways of liquid contaminants for radioactive liquid effluents from accidental releases into groundwater or surface water is site-specific and is addressed by the COL applicant as part of the response to COL Item 2.4-1. The source term provided in Table 12.2-10 associated with the pool surge control system storage tank is used in the site-specific

analysis to evaluate the effects of an accidental release of radioactive liquid as part of the response to COL Item 2.4-1 demonstrating the adequacy of the site's hydrogeologic properties.

### 2.4.14 Technical Specifications and Emergency Operation Requirements

The design does not require emergency protective measures to minimize the impact of adverse hydrology-related events on safety-related facilities.

Site-specific emergency protective measures are addressed by the COL applicant as part of the response to COL Item 2.4-1.

The degasifier is sized for maximum letdown from a reactor heatup and the simultaneous deboration letdown from three other reactors. Each of the two degasifiers has a liquid ring vacuum pump and a vent condenser. Each degasifier also has a liquid transfer pump with full recovery of sealed liquid.

Floor and Equipment Drains

As described in Section 9.3.3, building floor drains, equipment drains, and pool leakage are collected by the RWDS and routed to the LRWS if determined to be radioactive.

Containment Evacuation System

Containment evacuation liquid waste includes liquid leakage from the reactor coolant system, the RCCWS, the main steam system, the feedwater system, the CVCS, and potentially the reactor pool and any in-leakage to the containment evacuation system itself.

RCCW Drain Tank

The reactor component cooling water drain tank collects water drained from various RCCWS components prior to maintenance. The RCCWS is normally non-radioactive and is normally returned to the RCCWS as makeup water.

Solid Radioactive Waste System Dewatering Skid

Contaminated water from the dewatering process in the SRWS is directed to the LRWS for processing.

Clean-in-Place Flushing Water

The LRWS includes a CIP system that provides clean demineralized water for flushing CVCS and LRWS resin sluice lines to the spent resin storage tank or pool cleanup system (PCUS) resin sluice lines to the phase separator tank. Use of clean water keeps the spent resin pipe line as clean as possible for ALARA purposes. Connections are provided to allow use of the CIP system prior to maintenance (e.g. flushing tanks and transfer lines).

Boric Addition System

As a contingency, in the case of a chemically contaminated batch of boric acid, the boron addition system can send the contaminated batch to the LRWS.

RAI 02.04.13-1

Pool Surge Control System Storage Tank ~~Dike~~Catch Basin

~~Dike water~~Water from the pool surge control system (PSCS) storage tank is collected in the drain sump of the PSCS storage tank catch basin and sent to the LRWS for processing, if radioactive.

provided in Table 11.2-4. The total resultant liquid release concentrations are provided in Table 11.2-8, and demonstrate compliance with 10 CFR 20 Appendix B, Table 2.

The maximum individual doses are calculated using the LADTAP II Code, using the input parameters listed in Table 11.2-6. The resultant doses are presented in Table 11.2-7 and demonstrate compliance with the limits of 10 CFR 50 Appendix I.

COL Item 11.2-2: A COL applicant that references the NuScale Power Plant design certification will calculate doses to members of the public using the site-specific parameters, compare those liquid effluent doses to the numerical design objectives of 10 CFR 50, Appendix I, and comply with the requirements of 10 CFR 20.1302 and 40 CFR 190.

### 11.2.3.2 Compliance with Branch Technical Position 11-6

RAI 02.04.13-1

The only outdoor tank expected to contain radioactive liquids is the PSCS storage tank, described in FSAR Section 9.1.3.2.4. The PSCS storage tank catch basin has sufficient volume to store the contents of the PSCS storage tank plus the contents of related piping. The radionuclide inventory of the PSCS storage tank is provided in Table 12.2-10. The PSCS storage tank is the limiting source term liquid tank for use in a postulated radioactive liquid-containing tank failure analysis.

RAI 02.04.13-1

An analysis of an accidental release of radioactive liquid effluents in groundwater and surface water is site-specific and addressed by COL Item 2.4-1 and COL Item 11.2-3.

RAI 02.04.13-1

COL Item 11.2-3: A COL applicant that references the NuScale Power Plant design certification will perform a site-specific evaluation of the consequences of an accidental release of radioactive liquid from the PSCS storage tank in accordance with NRC Branch Technical Position 11-6.

### 11.2.3.3 Dilution Factors

The liquid effluent from LRWS is discharged through the discharge header and ties into the UWS as shown in Figure 11.2-1g. The UWS receives discharge water from multiple sources that provides dilution for the LRWS discharge in the discharge basin (Section 9.2.9). The UWS also provides a signal to LRWS in the event that dilution flow reduces to an unacceptable level to automatically close the LRWS discharge header isolation valves (Section 11.5.2.1).

A dilution factor of 5.56 cfs of the LRWS discharge is assumed in the calculation of the site boundary concentrations, as shown in Table 11.2-4. This ensures that the discharge site boundary concentrations are within 10 CFR 20 Appendix B, Table 2, limits. The offsite doses are calculated using an additional dilution factor of 740 cfs, which results in the offsite doses being within 10 CFR 50, Appendix I, limits.