NuScale Power

RAIO-1017-56626

October 16, 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. 44 (eRAI No. 8755) on the NuScale Design Certification Application

REFERENCE: U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 44 (eRAI No. 8755)," dated June 02, 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. 8755:

- 11.03-2

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 Steven Mirsky at 240-833-3001 or at smirsky@nuscalepower.com.

Sincerely,

Zackary W. Rad
Director, Regulatory Affairs
NuScale Power, LLC

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Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 8755

Enclosure 1:

NuScale Response to NRC Request for Additional Information eRAI No. 8755

NuScale Power

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

eRAI No.: 8755
Date of RAI Issue: 06/02/2017

NRC Question No.: 11.03-2

Meeting the requirements of GDCs 2 and 61 provide reasonable assurance that the necessary information is available to identify the amounts of radioactive materials contained in GWMS and assess the radiological impacts during postulated accidents, as described in DSRS Section 11.3, BTP 11-5, and analysis of RG 1.143 in assigning the safety classifications to SSCs of the GWMS for design purposes.

BTP 11-5 describes acceptable methods to evaluate EAB doses associated with the postulated releases of radioactive gases and iodines resulting from the failure of a gas storage tank or charcoal decay tank or a leak from a GWMS component. The BTP presents guidance for selecting the type of failure and model assumptions that provide reasonable assurance that the radiological consequences of a single failure of an active component will not result in doses exceeding a small fraction (10 percent) of the 10 CFR Part 100 dose limits for the whole body to any offsite individuals for the postulated event of systems designed to withstand explosions and earthquakes, or 1 mSv (0.1 rem) for systems not designed to withstand explosions and earthquakes. The analysis assumes that the waste gas system fails to meet its design bases, as required by 10 CFR 50.34a and GDCs 60 and 61 of Appendix A to 10 CFR Part 50. The analysis relies on methods described in BTP 11-5 and the use of the PWR-GALE code (NUREG-0017) and RG 1.112, as modified to reflect the design features of SMRs. The applicant should document the basis of any difference, with sufficient supporting information included in the application, to allow the staff to conduct an independent evaluation of the applicant's use of alternate code parameters. The review of proposed short-term atmospheric dispersion parameters, as they relate to the calculation of doses at the EAB, is performed under SRP Section 2.3.4.

DCD Chapter 11, Section 11.3.3.1 provides COL Item 11.3-2, and describes a postulated GRWS event representing a gaseous radioactive waste system leak or failure analysis, but does not sufficiently provide the methodology and calculations using the guidance in BTP 11-5.

The applicant also refers to Table 11.3-8 for the source term used in their dose calculation; however, Table 11.3-9 includes a gaseous source term and dose consequences from the 11.3.3.1 GRWS described event. The DCD should contain source term information, in accordance with BTP 11-5, (The source term for a PWR is described in BTP 11-5 as 1 percent

of the operating fission product inventory in the core being released to the primary coolant.) or justify a replacement source term.

The applicant's Safety Analysis Report (SAR) based on the guidance of SRP Section 11.3, should provide an analysis of the radiological consequences of a single failure of an active component in the waste gas system. The analysis should provide reasonable assurance that, in the event of a postulated failure or leak of the waste gas system, the resulting total body exposure to an individual at the nearest EAB will not exceed 25 mSv (2.5 rem) for systems that are designed to withstand internal explosions and earthquakes, or 1 mSv (0.1 rem) for systems that are not designed to withstand internal explosions and earthquakes.

The DCD does not include sufficient information for the staff to confirm the postulated gaseous radioactive waste system leak or failure analysis. This information is needed to allow the staff to make its required regulatory findings.

Please address these items and provide a markup for the proposed DCD changes.

NuScale Response:

The NuScale FSAR has been revised to reflect the Branch Technical Position (BTP) 11-5 source term for the Gaseous Radioactive Waste System failure evaluation, which uses an assumption of one percent (1%) failed fuel in each of the 12 operating NuScale Power Modules.

Impact on DCA:

FSAR Section 11.3.3.1 FSAR Table 11.3-9 been revised as described in the response above and as shown in the markup provided in this response.

The maximum individual doses at the exclusion area boundary are calculated using the GASPAR II Code. The input parameters for the calculation are tabulated in Table 11.3-6. The resultant doses are tabulated in Table 11.3-8 and demonstrates compliance with the limits of 10 CFR 50 Appendix I.

COL Item 11.3-2: 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 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.

11.3.3.1 Radioactive Effluent Releases and Dose Calculation due to Gaseous Radioactive Waste System Leak or Failure

RAI 11.03-2

The GRWS is designed to minimize the potential for both air in-leakage and system process gas out-leakage. However, failure of the GRWS is postulated, which results in a release of gaseous radionuclides. The analysis of a GRWS leak or failure follows the guidance of Branch Technical Position 11-5 and demonstrates compliance with regulatory limits. The dose consequence analysis evaluates a postulated event in which the GRWS fails, and the charcoal guard bed and charcoal decay beds are bypassed for one hour. The analysis used in determining the radionuclide content of the effluents assumes that ~~the primary coolant is operating at the design basis source term concentrations (Section 11.1)~~one percent of the operating fission product inventory in the core is released to the primary coolant. This event releases the inventory of gaseous radionuclides that are transferred from 12 operating NPMs to a degasifier as a ground-level release. The release source term is found in ~~Table 11.3-8~~Table 11.3-9. The dose consequences are calculated using the Radionuclide Transport and Removal and Dose (RADTRAD) code using the two-hour exclusion area boundary atmospheric dispersion factor from Section 2.3.4. The resultant offsite doses are also presented in Table 11.3-9.

COL Item 11.3-3: A COL 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.

11.3.4 Ventilation Systems

Radioactive gases are potentially present in the RXB and RWB due to evaporation or leakages. The design of the ventilation systems for normal operation are in accordance with RG 1.140, and are described in Section 9.4.2 and Section 9.4.3. Airborne radioactivity levels are discussed in Section 12.2.2.

The RWBVS and RBVS ventilation flow provides dilution for GRWS releases in the plant exhaust stack, where the releases are monitored per GDC 64 as detailed in Section 11.5. The GRWS discharge isolation valve upstream of the discharge radiation monitor closes upon a loss of RBVS or RWBVS flow. This prevents the release of concentrated gaseous waste and the potential accumulation of hydrogen gas. Equipment cubicles are ventilated to reduce the accumulation of airborne radioactive materials transported to the atmosphere from

RAI 11.03-2

Table 11.3-9: Gaseous Effluent Dose Evaluation for Gaseous Radioactive Waste System Failure

Parameter	Value
Release Source Term:	
I-131	~~2.61E-05~~9.33E-04 Ci
I-132	~~1.04E-05~~3.71E-04 Ci
I-133	~~3.72E-05~~1.33E-03 Ci
I-134	~~5.67E-06~~2.03E-04 Ci
I-135	~~2.18E-05~~7.80E-04 Ci
Xe-133	~~7.85E-01~~2.80E+01 Ci
Xe-135	~~2.70E-02~~9.63E-01 Ci
Kr-85m	~~2.99E-03~~1.07E-01 Ci
Kr-85	~~9.30E-01~~3.32E+01 Ci
Kr-87	~~1.63E-03~~5.82E-02 Ci
Kr-88	~~4.74E-03~~1.69E-01 Ci
Dispersion factor (0-2 hour exclusion area boundary)	~~5.72~~6.22E-04 sec/m^3
Offsite dose consequence	< 10 mrem
Allowable dose limit	100 mrem