



May 30, 2018

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. 423 (eRAI No. 9252) on the NuScale Design Certification Application

**REFERENCE:** U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 423 (eRAI No. 9252)," dated April 13, 2018

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. 9252:

- 11.05-3

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](mailto:smirsky@nuscalepower.com).

Sincerely,

A handwritten signature in black ink that reads "Jennie Wike".

Jennie Wike  
Manager, Licensing  
NuScale Power, LLC

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Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 9252



**Enclosure 1:**

NuScale Response to NRC Request for Additional Information eRAI No. 9252

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

**eRAI No.:** 9252

**Date of RAI Issue:** 04/12/2018

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**NRC Question No.:** 11.05-3

(Tier 1 RAI - on the CES Radmonitor) Regulatory Basis:

10 CFR 50, Appendix A, GDC 30, as it relates to requiring an applicant the provide capability for detecting leaks before break (LBB). SRP section 5.2.5 details the staff's guidance as it relates to verifying that the monitors used for LBB leakage detection are capable of detecting leakage at the value specified by the applicant. RG 1.45 describes the acceptable methods for leakage detection, as committed by the applicant. RG 1.45 specifies that an analysis of a leakage monitoring systems that measures radioactivity should use a realistic primary coolant leakage concentration.

10 CFR 50.36(2)(ii)(A), indicates the criteria for establishing Technical Specification with criterion 1 stating: "Installed instrumentation that is used to detect, and indicate in the control room, a significant abnormal degradation of the reactor coolant pressure boundary."

10 CFR 52.47(b)(1) states: "The proposed inspections, tests, analyses, and acceptance criteria that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a facility that incorporates the design certification has been constructed and will be operated in conformity with the design certification, the provisions of the Act, and the Commission's rules and regulations."

10 CFR 52.47(a)(22) as it relates to how a design will incorporate operating experience as it relates to IN-1994-046, "NONCONSERVATIVE REACTOR COOLANT SYSTEM LEAKAGE CALCULATION," and RIS-2009-02, "USE OF CONTAINMENT ATMOSPHERE GASEOUS RADIOACTIVITY MONITORS AS REACTOR COOLANT SYSTEM LEAKAGE DETECTION EQUIPMENT AT NUCLEAR POWER REACTORS," on the use of radiation monitoring for detecting leaks.

Key Issue:

The application does not provide an ITAAC to test or analyze the ability of the containment evacuation system (CES) radiation monitor's to detect unidentified RCS leakage rate of one gpm within one hour to support the LBB consistent with GDC 30, and operating experience.

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This ITAAC was identified in the letter sent to NuScale on April 8, 2017 (ML16097A121), as ITAAC M24 which tests RCS Pressure Boundary Leakage Detection Radiation Monitors. However, in review of DCD Tier 1, Section 2.3, "Containment Evacuation System," the staff determined there is no ITAAC to support testing or analysis demonstrating the radiation monitor's ability to detect one gpm of leakage in one hour. The staff determined there should be an ITAAC to test or confirm the ability to detect RCS leakage to support TS 3.4.7. The radiation monitor is the only credited RCS LBB Leakage detection instrument that does not have an ITAAC. Operating experience with the current operating fleet not properly establishing the detection capability of some LBB leakage detection instruments used in TS, is contained in IN-1994-046 and RIS-2009-02.

NuScale's generic technical specifications (TS), TS 3.4.7, for RCS Leakage Detection instrumentation, describes two condensate level channels, two containment evacuation system (CES) pressure channels and one CES gaseous radioactivity monitor. TS LCO 3.4.7 states that two of the listed RCS leakage detection instrumentation methods shall be operable. The use of the term operable denotes that the radiation monitor has the ability to detect a 1 gpm leak within one hour.

DCD Tier 1, Section 2.3, describes the CES tests performed to determine a one gpm leakage rate within one hour for the condensate level instrumentation and the CES pressure instrumentation, however, unlike the other two methods listed in TS 3.4.7, there is no corresponding ITAAC to verify this capability for the radiation monitor.

In review of both sections of the design the staff requests additional information to understand NuScale's rationale for not including an ITAAC for a test or analysis demonstrating that the CES radioactivity monitoring is capable of detecting one gpm of leakage within one hour during steady state conditions to support the leak before break analysis and operating experience.

In further review of Tier 1 Section 2.7 the staff noted the discussion of the CES radiation monitor to mitigate releases, but no test to verify the ability of the CES radiation monitor to detect RCS leakage of one gpm within one hour. Containment leakage ranges were discussed during the audit, but the Tier 1 ITAAC was not discussed during the audit.

Question:

The staff requests the applicant to update DCD Tier 1, Section 2.3 to include an ITAAC that states an analysis for the CES radiation monitor to detect leakage of one gpm within one hour will be performed.

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**NuScale Response:**

As described in FSAR Section 9.3.6.2.1, the containment evacuation system (CES) supports three separate methods that can detect leakage into the containment vessel, including leakage



from the reactor coolant pressure boundary (RCPB). Two of the methods of leak detection, containment pressure and CES sample tank level instrumentation, can quantify the leakage.

As described in FSAR Section 9.3.6.3, Regulatory Positions C.2.1, C.2.2, and C.2.3 in RG 1.45 are satisfied by the containment pressure and CES sample tank level instrumentation in that:

- leakage to the primary reactor containment from unidentified sources can be detected, monitored, and quantified for flow rates greater than or equal to 0.05 gpm using containment pressure or CES sample tank level timing.
- leakage detection response time (not including transport delay time) is less than one hour for a leakage rate greater than 1 gpm using CNV pressure or CES sample tank level timing.

The third method is CES radiation monitoring. As described in FSAR Section 11.5.2.2.7, the CES uses radiation monitoring instrumentation to detect a high radiation condition, which initiates an alarm in the main control room. The alarm prompts the operators to investigate and quantify the leakage using the other two methods of CES leakage detection.

Reactor coolant system leakage detection instrumentation is described in the Bases for Technical Specification 3.4.7. The three types of leakage detection instrumentation provided by the CES, and the specific capabilities of each type of instrumentation, are described in detail in the Background section. The CES sample vessel and its instrumentation are "...used to collect and quantify water vapor that is from the containment that may be indicative of RCS LEAKAGE."

CES inlet pressure instrumentation monitors containment pressure and provides indication in the main control room. The minimum pressure accuracy of the containment pressure monitoring instrumentation can detect a pressure change corresponding to a leak rate of < 1 gpm in 1 hour and a minimum detectable leak rate of < 0.05 gpm.

Radiation monitoring instrumentation in the CES gas discharge line is used to detect radioactivity released by reactor coolant, which is an indication of RCPB leakage.

The ability of the CES radiation monitoring instrumentation to quantify leakage within a given time frame is neither specified nor implied in the above descriptions. However, the ability to quantify leakage is specified for the CES level and pressure instrumentation, thus ITAAC for those detection methods (02.03.01 and 02.03.02, respectively) are provided.

#### **Impact on DCA:**

There are no impacts to the DCA as a result of this response.