

## NuScaleDCRaisPEm Resource

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**Sent:** Thursday, September 14, 2017 10:20 AM  
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**Subject:** Request for Additional Information No. 225, RAI 9058 (10.2.3)  
**Attachments:** Request for Additional Information No. 225 (eRAI No. 9058).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.

If you have any questions, please contact me.

Thank you.

Gregory Cranston, Senior Project Manager  
Licensing Branch 1 (NuScale)  
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:** 248

**Mail Envelope Properties** (72ce17d2fb1d40a28b0ca58f0545fea2)

**Subject:** Request for Additional Information No. 225, RAI 9058 (10.2.3)  
**Sent Date:** 9/14/2017 10:19:38 AM  
**Received Date:** 9/14/2017 10:19:40 AM  
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**Post Office:** HQPWMSMRS07.nrc.gov

Files	Size	Date & Time
MESSAGE	556	9/14/2017 10:19:40 AM
Request for Additional Information No. 225 (eRAI. No. 9058).pdf		108313

**Options**

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

## **Request for Additional Information No. 225 (eRAI. No. 9058)**

Issue Date: 09/14/2017

Application Title: NuScale Standard Design Certification - 52-048

Operating Company: NuScale Power, LLC

Docket No. 52-048

Review Section: 10.02.03 - Turbine Rotor Integrity

Application Section: 10.2.3

### **QUESTIONS**

#### **10.02.03-1**

Title 10 of the Code of Federal Regulations (10 CFR) Part 50, Appendix A, General Design Criterion (GDC) 4, "Environmental and dynamic effects design bases," states in part that structures, systems, and components important to safety shall be protected against environmental and dynamic effects, including the effects of missiles, that may result from equipment failure. Because turbine rotors rotate at relatively high speeds during normal reactor operation, failure of a rotor may result in the generation of high-energy missiles. To satisfy GDC 4, turbine rotor integrity must be maintained to minimize the probability of turbine rotor failure. Turbine rotor integrity is provided by the integrated combination of material selection, rotor design, fracture toughness requirements, tests, and inspections. This combination results in a low probability of rotor failure and generation of a turbine missile.

In order for the staff to determine whether the NuScale design meets these criteria with regard to effects of turbine missiles on components important to safety, the staff is requesting the following information.

NuScale FSAR, Tier 2, Section 10.2.4 states that "ITAAC are addressed in Section 14.3." However there are no Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) related to turbine rotor integrity/turbine missiles in Section 14.3 of the NuScale FSAR. The ITAAC are necessary since Nuscale FSAR Section 3.5.2 states the "RXB and CRB [Control Room Building] have not been credited to withstand turbine missiles." The staff requests the NuScale FSAR, Tier 1 be revised to include ITAAC related to turbine rotor integrity/turbine missiles, consistent with other design certification such as in Appendix E to 10 CFR Part 52, as it relates to:

- Turbine rotor inspection program and turbine valve in-service inspection program which includes the scope, frequency, methods, acceptance and technical basis for inspection frequency.
- Turbine missile probability analysis meeting the applicable acceptance criteria
- As-built turbine material properties, turbine rotor and blade designs, preservice inspection and testing results and in-service testing and in-service inspection requirements meeting the turbine missile probability analysis.

Or, provide adequate justification for why this information is not being provided in compliance with NRC regulations.

#### **10.02.03-2**

NuScale FSAR, Tier 2, Section 10.2.3.5 states "The inservice inspection and maintenance program for the turbine assembly complies with the manufacturer's recommendations." In addition, NuScale FSAR, Tier 2, Section 3.5.1.3 states "The turbine rotor inspection program along with the low probability of turbine missile generation provides assurance that safety related and risk significant SCCs are protected from the adverse effects of turbine missiles, consistent with GDC 4." The turbine inspection and testing program is based on the turbine missile probability analysis that will be provided by a COL applicant. Therefore, to ensure that the turbine inspection and valve testing program meets the criteria of the turbine missile probability analysis, the staff requests that a COL Item regarding the turbine inspection and testing program for this specific turbine design be included in the NuScale FSAR that addresses:

- the submittal of a description of the turbine rotor inspection program and turbine valve testing program for the plant specific turbine that meets the criteria of the turbine missile probability analysis.

It is noted that the turbine inspection and testing program is an operational program, and is subjected to reporting and implementation requirements, and therefore is usually not addressed in a bounding turbine missile probability analysis. The current COL Item 10.2-3 provides all the necessary information to be addressed in the analysis, taking into consideration assumption of the inspection and testing program. A separate COL Item should be included that addresses the operational program, which is the turbine maintenance inspection and testing program. An example of a COL Item for an operational program, used in other applications could look like the following:

Turbine Maintenance Inspection and Testing Program. The COL applicant shall provide the site-specific turbine rotor inservice inspection program, including the inspection interval, and the turbine valve test and inspection program, including the test and inspection frequency consistent with the manufacturer's turbine missile probability analysis.