



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

December 20, 2018

MEMORANDUM TO: Samuel Lee, Chief
Licensing Branch 1
Division of Licensing, Siting, and Environmental Analysis
Office of New Reactors

FROM: Rebecca Karas, Chief **/RA/**
Reactor Systems, Nuclear Performance and
Code Review Branch
Division of Safety Systems Risk Assessment and
Advance Reactors
Office of New Reactors

SUBJECT: AUDIT PLAN FOR THE REGULATORY AUDIT OF
NUSCALE POWER, LLC DESIGN CERTIFICATION
APPLICATION, CHAPTER 15, "TRANSIENT AND
ACCIDENT ANALYSES"

By letter dated December 31, 2016, NuScale submitted to the U.S. Nuclear Regulatory Commission (NRC) a final safety analysis report for its design certification application of the NuScale design (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17013A229). Over the course of the technical review, NRC staff issued several Request for Additional Information (RAIs) that resulted in NuScale performing additional analyses. The purpose of this regulatory audit is to clarify NRC staff's understanding of the RAI responses and the associated analyses.

The objective of this audit is for the NRC staff to gain a better understanding of new or changed calculations or information that supports the design control document resulting from staff RAIs as well as the transition to NRELAP5 Version 1.4 and to confirm certain statements made in RAI responses. The staff needs to fully comprehend the new and changed calculations and information to ensure it supports the applicant's docketed conclusions.

The audit will take place via the Electronic Reading Room and/or at NuScale's offices in Rockville, Maryland. The contents of the audit plan are provided as an enclosure. Please have your staff coordinate and schedule the audit entrance meeting at a mutually acceptable time.

Docket No. 52-048

Enclosure: Audit Plan

CONTACT: Jeffrey Schmidt, NRO/DSRA
301-415-4016

SUBJECT: AUDIT PLAN FOR THE REGULATORY AUDIT OF NUSCALE POWER, LLC
DESIGN CERTIFICATION APPLICATION, CHAPTER 15, "TRANSIENT AND
ACCIDENT ANALYSES" DATED: December 20, 2018

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ADAMS Accession No: ML19004A098

NRO-002

OFFICE	NRO/DSRA	NRO/DSRA
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DATE	12/20/18	12/20/18

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**UNITED STATES NUCLEAR REGULATORY COMMISSION
AUDIT PLAN FOR THE REGULATORY AUDIT OF
OF NUSCALE POWER, LLC DESIGN CERTIFICATION APPLICATION, CHAPTER 15,
“TRANSIENT AND ACCIDENT ANALYSES”**

Docket No. 52-048

AUDIT PLAN

APPLICANT: NuScale Power, LLC (NuScale)

APPLICANT CONTACTS: Marty Bryan
Paul Infanger
Steven Mirsky

DURATION: 7.5 months

Phase 3: January 10, 2019, through February 28, 2019

Phase 4: March 1, 2019, through July 31, 2019

Note: Phase 3 and Phase 4 durations are contingent on the submittal of all responses to requests for additional information (RAIs) by December 31, 2018, and receipt of updated Final Safety Analysis Report (FSAR) Chapter 15 containing any and all revised NRELAP5 calculations by May 31, 2019. The duration(s) may be extended if RAI responses and/or receipt of updated FSAR is delayed.

LOCATION: **U.S. Nuclear Regulatory Commission (NRC) Headquarters
(via NuScale’s electronic reading room (eRR))**
Two White Flint North
11545 Rockville Pike
Rockville, Maryland 20852-2738

NuScale
11333 Woodglen Drive, Suite 205
Rockville, Maryland 20852

AUDIT TEAM: Jeff Schmidt, Office of New Reactors (NRO), Audit Team Lead
Rebecca Karas, NRO, SRSB Branch Chief
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Rani Franovich, NRO, Project Manager
Gregory Cranston, NRO, Project Manager

Enclosure

I. BACKGROUND AND OBJECTIVES

By letter dated December 31, 2016, NuScale submitted to the U.S. Nuclear Regulatory Commission (NRC) an FSAR for its Design Certification (DC) application of the NuScale design (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17013A229). Over the course of the technical review, NRC staff issued several RAIs that resulted in NuScale performing additional analyses. The purpose of this regulatory audit is to clarify NRC staff's understanding of the RAI responses and the associated analyses.

The objective of this audit is for the NRC staff to gain a better understanding of new or changed calculations or information that supports the DCD resulting from staff RAIs as well as the transition to NRELAP5 Version 1.4 and to confirm certain statements made in RAI responses. The staff needs to fully comprehend the new and changed calculations and information to ensure it supports the applicant's docketed conclusions.

To facilitate the NRC staff's understanding of the calculations and rationale underlying RAI responses and the updates to DCD Chapter 15 as a result of implementing a new version of NRELAP5, the staff is planning the following:

- An audit entrance meeting is scheduled for January 10, 2019, via conference call.
- Audit Phase 3 will focus on certain underlying calculations or information supporting RAI responses, and it ends February 28, 2019, or 60 days after the submittal of the last outstanding RAI response, whichever is later.
- Audit Phase 4 will focus on updates to DCD Chapter 15 as a result of NRELAP5 Version 1.4, and it ends July 31, 2019, or 60 days after NRC receipt of the updated DCD containing revised NRELAP5 calculations and results, whichever is later.
- The audit is expected to be performed primarily via the NuScale eRR or, if necessary, at NuScale's Rockville office.
- Should any information needs be identified during the audit in addition to those identified in this audit plan, the audit report will capture those items.

II. REGULATORY AUDIT BASIS

This regulatory audit is based on the following:

- NuScale FSAR, Tier 2, Chapter 15, "Transient and Accident Analyses"
- Information provided by NuScale identified in the table below:

FSAR Section	RAI/Question No.	ADAMS Accession No.
15.2.1-15.2.9	9407/15.02.01-9	ML18141A880
15.2.4	9407/15.02.01-11	ML18141A880
15.4.3	9512/15.04.03-2, 15.04.03-4	ML18163A421
15.4.7	9504/15.04.07-3	ML18179A522

Based on some RAI responses provided to date related to DCD Chapter 15, the staff has identified a need to audit the underlying calculations and evaluations referred to in those responses (see Section IV of this audit plan). In addition, the staff has identified a need to audit information related to the planned revision to DCD Chapter 15 to update NRELAP5 calculations and results. This will help the staff to understand and confirm new or changed information supporting the Chapter 15 conclusions.

III. REGULATORY AUDIT SCOPE

The audit team will view supporting calculations and documentation associated with the transient and accident analyses. The audit team may also request to meet with subject matter expert(s) to discuss details of the analyses presented in FSAR, Tier 2, Chapter 15, and the information provided to NRC staff in the RAI responses identified in Section II of this audit plan.

Additional audit tasks may be added, subject to the staff's review of RAI responses scheduled to be submitted in the future and the changes to the DCD. All documents audited will be added to the audit report prepared by the staff following the conclusion of the audit.

IV. INFORMATION AND OTHER MATERIAL NECESSARY FOR THE REGULATORY AUDIT

The staff requests that the latest version of the following documents (including any Engineering Change Notices), organized by review area, be made available to the audit team via the electronic reading room:

FSAR, Tier 2, Section 15.0

- EC-0000-4820, "Overcooling Return to Power Analysis"
- EC-0000-4848, "ECCS Overcooling Reactivity Coping Analysis"
- Calculation package(s) associated with reactivity coefficient determinations of EC-0000-4820 and EC-0000-4848

FSAR, Tier 2, Section 15.1

- EC-0000-2017, "Decrease in Feedwater Temperature Analysis"
- Subchannel analysis calculation note for decrease in feedwater temperature event
- EC-0000-2016, "Increase in Feedwater Flow Analysis"
- EC-0000-3077, "Subchannel Analysis of an Increase in Feedwater Flow"

FSAR, Tier 2, Section 15.2

- Calculational Package(s) (e.g., calcnotes or analysis packages, including input decks and output files) and any other documentation (specifically detailed drawings, diagrams, and P&IDs) which supports the development of the limiting events in FSAR Sections 15.2.1 to 15.2.8.
 - The staff needs to understand why the minimum critical heat flux ratio (MCHFR) trend for each 15.2 event is different between Revision 0 and Revision 1 of the FSAR.
 - The 10/30 public meeting response from NuScale on this subject did not provide a sufficient rationale for the different MCHFR trends between FSAR revisions. This request is in support of evaluating the response in RAI 9407, Question 15.02.01-9, regarding the applicant's proposal to remove the MCHFR timing from the sequence tables in FSAR Section 15.2.
 - To assist with the staff with its understanding of the MCHFR trends, and to view sensitivity calculations discussed in the response to RAI 9407, the staff requests to audit the following documents:
 - EC-0000-1997, "Loss of External Load, Turbine Trip, Loss of Condenser Vacuum"
 - Subchannel analysis calculation note for loss of external load, turbine trip, and loss of condenser vacuum events
 - EC-0000-2995, "Closure of Main Steam Isolation Valve Transient Analysis"
 - Subchannel analysis calculation note for main steam isolation valve closure event
 - EC-0000-2908, "Loss of Non-Emergency AC Power to the Station Auxiliaries Analysis"
 - Subchannel analysis calculation note for loss of non-emergency AC power to the station auxiliaries event

FSAR, Tier 2, Section 15.4

- EC-0000-2910, "Uncontrolled Control Rod Assembly Withdrawal From A Subcritical Or Low Power Startup Condition"
- EC-0000-3080, "Subchannel Analysis of an Uncontrolled Control Rod Assembly Withdrawal from a Subcritical or Low Power"
- EC-0000-1999, "Uncontrolled Control Rod Assembly Withdrawal at Power Transient Analysis"
- EC-0000-2899, "Subchannel Analysis of Uncontrolled Rod Assembly Withdrawal at Power"
- Calculational Package(s) (e.g., calcnotes or analysis packages) and any other documentation containing power-dependent moderator temperature coefficient values, as discussed in the response to RAI 9512, Question 15.04.03-4

- Calculational Package(s) (e.g., calcnotes or analysis packages) and any other documentation that supports the development of the limiting single CRA withdrawal and CRA drop events in FSAR Tier 2, Section 15.4.3, "Control Rod Misoperation (System Malfunction or Operator Error)" (e.g., EC-A021-1922, EC-A021-1977, EC-0000-2139, EC-0000-2897)
- EC-A021-2405, "Control Rod Misalignment Analysis" (supporting the response to RAI 9512, Question 15.04.03-2)
- EC-0000-4309, "Subchannel Analysis of a Control Rod Misalignment" (supporting the response to RAI 9512, Question 15.04.03-2)
- Nuclear design calculation to determine the limiting radial peaking augmentation factor for the inadvertent loading and operation of a fuel assembly in an improper position event, as discussed in the response to RAI 9504, Question 15.04.07-3
- EC-0000-2646, "Subchannel Analysis of Inadvertent Loading and Operation of a Fuel Assembly in an Improper Position"

FSAR, Tier 2, Section 15.6

- EC-0000-4684, "Spurious Opening of an RPV Valve"
- EC-0000-3221, "Identification and Classification of Deterministic Design Basis Events for the NuScale Power SMR"
- EC-0000-4888, "NuScale LOCA Evaluation Model Supporting Calculations"
- EC-A010-1782, "NuScale NRELAP Module Basemodel"

V SPECIAL REQUESTS

The NRC staff requests the applicant make the identified documents available to the NRC auditors in NuScale's eRR to the extent possible. Use of the eRR allows multiple auditors in different geographic locations to examine the same document at the same time, which improves the efficiency and reduces the cost of the audit. Additional documents may be identified as the review progresses. When the staff's review of the documents associated with a specific issue is complete, the NRC staff will notify NuScale that these documents can be removed from eRR, thereby minimizing their residence time in eRR.

In addition, the NRC staff may request in-person or telephone audit meetings with NuScale personnel to facilitate the staff's understanding of material to be audited. Such meetings will be scheduled based on mutual availability. The staff requests that document titles identified by NRC staff that are germane to an audit meeting be made available in the eRR prior to any scheduled audit meeting.

VI DELIVERABLES

The NRC audit team is expected to consist of aforementioned individuals reviewing FSAR Chapter 15. The NRC staff will conduct this audit in accordance with the guidance provided in NRO-REG-108, "Regulatory Audits" (ADAMS Accession No. ML081910260). The NRC staff acknowledges the proprietary nature of the information requested and will handle it appropriately throughout the audit. While the NRC staff will take notes, the NRC staff will not remove hard copies or electronic files from the audit site(s).

The staff will hold audit calls and/or meetings with NuScale as necessary to understand audit material.

The NRC will inform NuScale of emerging information needs as well as documents that can be removed from eRR.

An audit report will be generated at the completion of the audit. If necessary, any circumstances related to the conductance of the audit will be communicated to Gregory Cranston (NRC) at 301-415-0546 or Gregory.Cranston@nrc.gov.