

May 30, 2017

MEMORANDUM TO: Samuel Lee, Chief
Licensing Branch 1
Division of New Reactor Licensing
Office of New Reactors

FROM: Rani Franovich, Senior Project Manager **/RA/**
Licensing Branch 1
Division of New Reactor Licensing
Office of New Reactors

SUBJECT: SUPPLEMENT 1 TO AUDIT OF PROBABILISTIC RISK ASSESSMENT,
SEVERE ACCIDENT EVALUATION, AND RELIABILITY ASSURANCE
PROGRAM AS PART OF THE NUSCALE POWER, LLC DESIGN
CONTROL DOCUMENT DESIGN CERTIFICATION

On January 6, 2017, NuScale Power, LLC (NuScale), submitted a Design Control Document (DCD) for its Design Certification Application (DCA) of the NuScale design to the U. S. Nuclear Regulatory Commission (NRC) for review (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17013A229). On March 15, 2017, the NRC staff accepted the DCA for docketing and initiated its technical review. On March 31, 2017, the NRC issued an initial plan (ADAMS Accession No. ML17087A109) for an audit of non-docketed information to facilitate the NRC staff's evaluation of probabilistic risk assessment (PRA), severe accident evaluation (SA), reliability assurance program (RAP) information and to complete its safety review of NuScale's DCA Chapters 19, "PRA and Severe Accidents," and 17.4, "Reliability Assurance Program."

The purpose of the NRC's regulatory audit of NuScale's subject line chapters is to: (1) gain a better understanding of NuScale's PRA, SA and RAP development; (2) verify information; (3) evaluate the quality and programmatic control process/procedures; and, (4) identify any information needed on the docket to support the basis of a reasonable assurance finding. The audit will take place at NuScale's offices in Rockville, Maryland and online via NuScale's electronic reading room. The audit entrance was held on April 3, 2017. This supplement highlights the extension of the audit until July 18, 2017. The contents of the supplemented audit plan is provided as an enclosure.

Docket No. 52-048

Enclosure:
Audit Plan

cc w/encl.: DC NuScale Power, LLC Listserv

CONTACT: Rani Franovich, NRO/DNRL
301-415-7334

SUBJECT: SUPPLEMENT 1 TO AUDIT OF PROBABILISTIC RISK ASSESSMENT, SEVERE ACCIDENT EVALUATION, AND RELIABILITY ASSURANCE PROGRAM AS PART OF THE NUSCALE POWER, LLC DESIGN CONTROL DOCUMENT DESIGN CERTIFICATION

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ADAMS Accession No: ML17143A139***via email****NRO-002**

OFFICE	NRO/DNRL/LB1: PM	NRO/DNRL/LB1: LA	NRO/DNRL/LB1
NAME	RFranovich (BBavol for)	MBrown*	BBavol (signed)
DATE	5/30/2017	5/25/17	5/30/2017

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SUPPLEMENT 1
U.S. NUCLEAR REGULATORY COMMISSION REGULATORY
AUDIT OF PROBABILISTIC RISK ASSESSMENT, SEVERE ACCIDENT EVALUATION, AND
RELIABILITY ASSURANCE PROGRAM AS PART OF THE NUSCALE POWER, LLC DESIGN
CONTROL DOCUMENT DESIGN CERTIFICATION

DOCKET NO. 52-048

AUDIT PLAN

APPLICANT: NuScale Power LLC (NuScale)

APPLICANT CONTACTS: Steven Mirsky (NuScale)
Steven Pope (NuScale)
Darrell Gardner (NuScale)

DURATION: The audit duration is from April 3, 2017 until July 18, 2017. During this time the U.S. Nuclear Regulatory Commission (NRC) staff will examine probabilistic risk assessment (PRA), severe accident (SA) evaluation, and reliability assurance program (RAP) documents.

LOCATION: NuScale Rockville Office
11333 Woodglen Drive, Suite 205
Rockville, MD 20852

AUDIT TEAM: Mark Caruso (NRO, Audit Lead)
Michelle Hayes (NRO/Acting Branch Chief)
Jason Schaperow (NRO)
Marie Pohida (NRO)
Tony Nakanishi (NRO)
Supporting staff (As needed)
Rani Franovich (NRO, Project Manager)

I. BACKGROUND

On January 6, 2017, NuScale, submitted a Design Control Document (DCD) for its Design Certification Application (DCA) of the NuScale design to the U. S. Nuclear Regulatory Commission (NRC) for review (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17013A229). On March 15, 2017, the NRC staff accepted the DCA for docketing and initiated its technical review. On March 31, 2017, the NRC issued an initial plan (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17087A109) for an audit of non-docketed information to facilitate the NRC staff's evaluation of PRA, SA, and RAP information and to complete its safety review of NuScale DCA Chapters 19, "PRA and Severe Accidents," and 17.4, "Reliability Assurance Program." The NRC staff has revised the plan for the audit from what is described in the original audit plan. The revision reflects and extension to the audit period in order for auditors to complete their review of the large number of documents being made available for audit. The NRC staff will conduct an audit commencing on April 3, 2017 and terminating on July 18, 2017. The audit will be conducted via the NuScale electronic reading room (eRR), in NuScale's Rockville office, as necessary, and through weekly scheduled telephone conversations between appropriate NRC and NuScale staff. An exit

meeting will be conducted at the end of the audit to report the overall results of the audit. During this audit the NRC staff will examine the at-power and low-power and shutdown PRA (including Level 1 and Level 2 internal events, internal floods, and internal fires), external events, PRA-based seismic margin assessment (SMA), PRA-related information (i.e., RAP list), and SA evaluation.

II. PURPOSE AND REGULATORY BASIS

The purpose of this audit is for the staff to examine and evaluate non-docketed information to:

1. Gain a better understanding of NuScale PRA, SA and RAP development,
2. Verify information in the DCA and evaluate its conformance with the SRP or technical guidance,
3. evaluate the quality and programmatic control process/procedures used by NuScale for PRA and RAP, and
4. Identify any information needed on the docket to support the basis of a reasonable assurance finding.

Title 10 of the *Code of Federal Regulation* (CFR), Section 52.47(a)(27) states that a DC application must contain a final safety analysis report (FSAR) that includes a description of the design-specific PRA and its results. 10 CFR 52.47(a)(23) states that a DC application must contain a final safety analysis report (FSAR) that includes, for light-water reactor designs, a description and analysis of design features for the prevention and mitigation of SAs (e.g., challenges to containment integrity caused by core-concrete interaction, steam explosion, high-pressure core melt ejection, hydrogen combustion, and containment bypass).

The NRC staff must have sufficient information to ensure that the applicant has adequately considered SAs and the use of PRA in the design and operation of facilities under review as outlined in Regulatory Guide 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)," Section C.I.19.2.

III. REGULATORY AUDIT SCOPE

The specific scope of this audit will include reviewing the following topics:

- Level 1 and Level 2 internal events At-Power PRA (including internal fires and floods and high winds)
- Level 1 and Level 2 low-power and shutdown PRA (including internal fires and floods and high winds)
- PRA-based SMA
- External events risk evaluation
- Regulatory Treatment of Non-Safety Systems

- RAP list and process
- Security target set
- SA evaluations
- Risk insights

IV. DOCUMENTS/INFORMATION NECESSARY FOR THE AUDIT

NuScale should make available documents pertaining to topic areas listed in Attachment A. The audit team expects to look at portions of many of these documents.

V. SPECIAL REQUESTS

The NRC staff requests the documents associated with topic areas listed in Attachment A be available to NRC auditors in the eRR to the extent possible. Use of the eRR allows multiple auditors to examine the same document at the same time, which improves the efficiency of the audit.

VI. AUDIT ACTIVITIES AND DELIVERABLES

The NRC audit team is expected to consist of four to five individuals covering the technical areas identified in the PRA, SA, and RAP. The task assignments are shown in Table 1, "Reviewer Assignments." Depending upon how much effort is needed in a given area, NRC team members may be reassigned to ensure adequate coverage of important technical elements.

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 copy or electronic files from the audit site(s).

A non-public entrance meeting will be conducted the first day of the audit, and a non-public exit meeting will be held after the audit is completed to present audit results to NuScale representatives (See Agenda in Appendix B). During the audit, NRC staff will communicate with NuScale staff each week via teleconference. These communications will consist of requests for additional materials to be placed in the eRR, if needed, discussions for the purpose of clarifying information the staff has audited and any other issues related to the implementation or progress of the audit. The staff will provide its questions to NuScale staff in writing via e-mail prior to teleconferences to allow NuScale staff to prepare for the discussion. Teleconferences will be held Tuesday and/or Thursday of each week as needed during the course of the audit. A minimum of one teleconference will be held each week to ensure regular communication and that issues are identified in a timely manner. An audit report will be prepared to document the results of the audit. This report will be made publicly available in ADAMS.

The audit will assist the NRC staff in determining if RAIs will be necessary to complete the licensing review of NuScale's FSAR Chapters 19 and 17.4 and other PRA-related information reviewed to prepare the NRC staff's SER.

The agenda for the audit is presented in Attachment B of this audit plan. If necessary, any circumstances related to the conductance of the audit will be communicated to the NRC project

manager, Rani Franovich, at 301-415-7334 or r1f2@nrc.gov.

Table 1 – Reviewer Assignments

No.	Assignment	Technical Elements			
		Mark Caruso	Marie Pohida	Tony Nakanishi	Jason Schaperow
1.	PRA Quality and Maintenance		X	X	
2.	Use of PRA (ITAAC, security target set, human factor, Technical specifications, etc.)	X			
3.	Level 1 - Internal Events Initiating Events Accident Sequence Success Criteria			X	
4.	Level 1 - Internal Events Systems Analysis Human Reliability Data Analysis Quantification			X	
5.	Level 2 - Internal Events		X		
6.	Level 1 - Internal Floods			X	
7.	Level 2 - Internal Floods		X		
8.	Level 1 - Internal Fires			X	
9.	Level 2 - Internal Fires		X		
10.	PRA-based SMA	X			
12.	Other External Events	X			
13.	Level 1 - Low-Power and Shutdown PRA Internal Events External Events			X	
14.	Level 1 – Low-Power and Shutdown PRA Internal Floods Internal Fires			X	
15.	Level 2 –Low-Power and Shutdown PRA		X		
16.	Severe Accident Evaluations				X
17.	Containment Performance				X
18.	Reliability Assurance Program	X			
19.	Risk Insights	X	X	X	X

ATTACHMENT A

Documents Supporting Probabilistic Risk Assessment, Severe Accident Evaluation, and Reliability Assurance Program:

- Supporting the assessment of severe accident mitigation design alternatives and Category 1 thru 7 releases
- External Events to include analyses, evaluations and external hazard notebooks
- Low Power/Shutdown assessments and notebooks
- Thermal-hydraulic studies, calculations, models and modeling methodologies
- Multi-module PRA and notebook
- Final Report of the NuScale PRA Expert Panel Probabilistic Risk Assessment Group Functions and Quality Controls
- Probabilistic Assessment of Re-criticality Scenarios
- External Review of the NuScale PRA Self-Assessment
- NuScale PRA Narrative
- Comparative Reliability of the Highly-Reliable DC Power System
- Probabilistic Risk Assessment Main Report
- Probabilistic Risk Assessment Quantification Notebook
- Probabilistic Risk Assessment Core Damage Frequency Definition
- Probabilistic Risk Assessment Large Release Frequency Definition
- Release Fraction Determination for PRA Large Release
- NuScale SAPHIRE Probabilistic Risk Assessment Base Model
- Probabilistic Risk Assessment Update (memo)
- Risk Significance Determination
- Level 1 PRA studies, evaluations, notebooks and analyses to include system notebooks and internal hazard notebooks
- Level 2 PRA analyses, assessments, success criteria and the Level 2 PRA Notebook

- Level 3 PRA documents that support the Environmental Report Severe Accident Mitigation Design Alternatives

ATTACHMENT B

U.S. NUCLEAR REGULATORY COMMISSION REGULATORY AUDIT OF PROBABILISTIC RISK ASSESSMENT, SEVERE ACCIDENT EVALUATION, AND RELIABILITY ASSURANCE PROGRAM AS PART OF THE NUSCALE POWER, LLC DESIGN CONTROL DOCUMENT DESIGN CERTIFICATION

SUPPLEMENT 1

AUDIT AGENDA

April 3, 2017

1:00 p.m. – 1:15 p.m.	Entrance Meeting	(NRC/NuScale)
1:15 p.m. – 5:00 p.m.	NRC Review of Documents in eRR	(NRC/NuScale)

April 4 - July 17, 2017¹

8:00 a.m. – 4:00 p.m.	NRC Review of Documents in eRR	(NRC/NuScale)
9:00 a.m. – 10:00 a.m.	NRC Staff Caucus (as needed)	(NRC)
2:00 p.m. – 3:00pm ²	Progress report and Discussion of audited material	(NRC/NuScale)

July 18, 2017

8:00 a.m. – 2:00 p.m.	NRC Review of Documents in eRR	(NRC/NuScale)
2:00 p.m. – 3:00 p.m.	NRC Staff Caucus (as needed)	(NRC)
3:00 p.m. – 4:30 p.m.	Exit Meeting to Present Audit Results	(NRC/NuScale)

¹ Staff caucus occurs only on Tuesdays and Thursdays if needed

² Discussions of audited material occur on Tuesdays or Thursdays as needed; report of audit progress occurs at least once per week on either Tuesday or Thursday