



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

May 31, 2019

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

FROM: Getachew Tesfaye, Senior Project Manager */RA/*  
Licensing Branch 1  
Division of Licensing, Siting,  
and Environmental Analysis  
Office of New Reactors

SUBJECT: AUDIT PLAN FOR THE PHASE IV REGULATORY AUDIT OF  
THE IODINE SPIKE DESIGN BASIS SOURCE TERM AND  
SAMPLING AND MONITORING INFORMATION

By letter dated December 31, 2016, NuScale Power, LLC., (NuScale) submitted to the U.S. Nuclear Regulatory Commission (NRC) a Design Control Document for its Design Certification Application (DCA) (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17013A229). The NRC staff started its detailed technical review of NuScale's DCA on March 27, 2017.

The purpose of this audit plan for this focused NRC Phase IV Regulatory Audit is for the NRC staff to (1) obtain information related to the new iodine spike design basis accident source term (AST) and (2) ensure that the new AST appropriately represents the most severe design basis accident for equipment inside containment, and (3) that the new AST is appropriately accounted for as it impacts radiological conditions of the facility and the environmental qualification of equipment, consistent with the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) 50.49(e)(4). In addition, the purpose of the audit is to obtain additional information related to the proposed equipment survivability changes to Chapter 19 of the Final Safety Analysis Report.

Separate from the iodine spike design basis AST portion of the audit, this audit also proposes to allow staff to review available information related to the post-accident sampling exemption request and post-accident hydrogen and oxygen monitoring, including information related to the dose to workers performing actions associated with performing post-accident sampling and post-accident hydrogen and oxygen monitoring, as necessary.

CONTACT: Getachew Tesfaye, NRO/DLSE  
(301) 415-8013

S. Lee

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This audit will take place at NuScale's offices, in Rockville, Maryland, and/or via the NRC staff's review of electronic information to which NuScale will grant electronic access via the electronic reading room (eRR). The audit is currently scheduled to start on June 3, 2019, with an entrance meeting, and end on July 26, 2019 with an exit meeting on August 08, 2019. The audit plan is provided as an enclosure.

Docket No. 52-048

Enclosure:

As stated

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

SUBJECT: AUDIT PLAN FOR THE PHASE IV REGULATORY AUDIT OF THE IODINE SPIKE  
 DESIGN BASIS SOURCE TERM AND SAMPLING AND MONITORING  
 INFORMATION DATED: May 31, 2019.

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NRO-002

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DATE	05/28/19	5/30/19	5/31/2019

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**U.S. NUCLEAR REGULATORY COMMISSION**

AUDIT PLAN FOR THE PHASE IV REGULATORY AUDIT OF THE IODINE SPIKE DESIGN  
BASIS SOURCE TERM AND SAMPLING AND MONITORING INFORMATION

**DOCKET NO. 52-048**

**AUDIT PLAN**

**APPLICANT:** NuScale Power, LLC (NuScale)

**APPLICANT CONTACTS:** Carrie Fosaaen (NuScale)

**DURATION:** June 3, 2019 through July 26, 2019

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

**AUDIT TEAM:** Michelle Hart (NRO, Technical Reviewer)  
Ronald LaVera (NRO, Technical Reviewer)  
Edward Stutzcage (NRO, Technical Reviewer)  
Zachary Gran (NRO, Technical Reviewer)  
Anne-Marie Grady (NRO, Technical Reviewer)  
Michael Dudek (NRO/RGRB Branch Chief)  
Getachew Tesfaye (NRO, Senior Project Manager)  
Supporting NRC Staff (as needed)

**I. BACKGROUND**

By letter dated December 31, 2016, NuScale Power, LLC (NuScale), submitted a Design Certification Application (DCA) 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 January 31, 2019, NuScale submitted WP-0318-58980, Revision 1, "Accident Source Terms Regulatory Framework White Paper" (ADAMS Accession No. ML19032A146, in which the applicant provided information regarding plans to revise the accident source term methodology for the NuScale design. The applicant indicated that they intended to revise TR-0915-17565, "Accident Source Term Methodology," and related information in the DCA Final Safety Analysis Report (FSAR) to reclassify core melt events as beyond design basis events with respect to the evaluation of radiological consequences and to add a new iodine spike design basis source term. On April 21, 2019, the applicant provided Revision 3 to the accident source term topical report (ADAMS Accession No. ML19112A173). Associated FSAR markups (ADAMS Accession No. ML19112A220) were submitted on April 19, 2019. Finally, on May 22, 2019 NuScale submitted proposed changes to Chapter 19 of the FSAR associated with the AST submittal (ADAMS Accession No. ML19142A397).

The staff has reviewed the topical report and associated information. The applicant indicated in the topical report that while spiking effects may occur for radionuclides besides iodine, any potential spiking of radionuclides besides iodine is accounted for by conservative treatments of the iodine spike source term. The staff did determine that additional justification is needed to make their finding for this statement in the submittal. In addition, through independent calculation analysis the staff was unable to verify the iodine spike design basis source term. For example, the staff calculated different spike values for iodine nuclides than the iodine spike values provided in FSAR Revision 2, Table 12.2-34, "Maximum Post-Accident Radionuclide Concentrations." Using the applicant's source term, the staff also estimated significantly different gamma dose rates for areas in and around containment than provided by the applicant in FSAR Table 3C-8, "Limiting Design Basis Accident EQ Radiation Dose."

As a result, the NRC staff will review calculations and other information related to the iodine spike design basis source term and associated dose rates. This includes identifying the types of radionuclides present, the quantities of radionuclides present, and the energies of the resulting radiation as they are used to determine the total dose rates and the bases for the iodine spike design basis source term and values of all radionuclides provided in FSAR Revision 2, Table 12.2-34. It also includes any available information associated with developing the source term, including information demonstrating that spiking of other radionuclides in the source term is unnecessary because of other conservatisms. Finally, it includes dose rate calculations associated with the iodine spike source term and the limiting design basis accident Environmental Qualification (EQ) radiation doses provided in FSAR Table 3C-8.

The staff will also use the audit to review calculations and other information related to the equipment survivability changes provided in Chapter 19 of the FSAR.

The NRC staff identified some of the Requests Additional Information (RAIs) currently under review that have a nexus to the change in the iodine spike design basis source term:

- RAI 8837
- RAI 9261
- RAI 9268

In addition, separate from the AST information, on January 31, 2019, NuScale submitted a proposed exemption request from the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) 50.34(f)(2)(viii) (ADAMS Accession No. ML19031C975). On March 29, 2019, the applicant submitted proposed FSAR changes associated with the exemption request. The staff continues to evaluate the exemption request and the ability to perform necessary actions associated with performing post-accident hydrogen and oxygen monitoring. As part of this audit, the staff also proposes to discuss aspects related to the post-accident sampling exemption request and post-accident hydrogen and oxygen monitoring with NuScale, including information related to the source terms and dose to workers performing actions associated with performing post-accident sampling and post-accident hydrogen and oxygen monitoring, as appropriate. The staff plans to discuss aspects of these topics during the audit and may request information related to these topics, as part of the audit.

The NRC staff identified some of the RAIs currently under review that have a nexus to the Post Accident Sampling System (PASS) exemption request:

- RAI 9044
- RAI 9278

To facilitate the NRC staff's evaluation of information related to characterizing the radiation fields present, the NRC staff proposes this audit plan to include:

- A regulatory audit that will commence on June 3, 2019, end on July 26, 2019 and exit on August 8, 2019. The audit will take place at NuScale's offices in Rockville, Maryland, and/or via the NRC staff's review of electronic information to which NuScale grants access. During this audit the NRC staff will examine information requested and any NuScale documentation that will facilitate an understanding of the basis for the iodine spike design basis source term including the methodology and FSAR changes associated with the source term and the implementation of the source term for equipment qualification. In addition, the staff will review information and documentation associated with the PASS exemption request and manual actions associated with hydrogen and oxygen monitoring, as appropriate.

## **II. PURPOSE AND REGULATORY BASIS**

The purpose of the focused NRC Phase IV Regulatory Audit of the Nuclear Power Module radiation environment is to:

- Allow the NRC staff to conclude that the new iodine spike design basis source term appropriately represents the most severe design basis accident for equipment inside containment and appropriately accounted for as it impacts radiological conditions of the facility and the EQ of equipment, consistent with the requirements of 10 CFR 50.49(e)(4).
- Allow the NRC staff to evaluate information related to the exemption from 10 CFR 50.34(f)(2)(viii) in order to ensure that the appropriate information is provided and that the exemption request from 10 CFR 50.34(f)(2)(viii) is justified.
- Allow the NRC staff to conclude that the actions associated with performing post-accident hydrogen and oxygen monitoring can be performed within the dose limits of 10 CFR Part 20. This is necessary to allow staff to conclude that the design includes the capability to perform hydrogen and oxygen monitoring, in accordance with the requirements of 10 CFR 50.44(c)(4).

The NRC staff determined efficiency gains would be realized by auditing the information supporting the DCA, as well as in the responses to RAIs, and would help determine if further specific information is needed to support its regulatory findings. During the audit and interactions with the applicant additional detailed NRC requests for information may be developed, which could be part of a future formal correspondence.

The NRC staff's acceptance criteria described in the Design Specific Review Standard (DSRS) Section 12.2, "Radiation Sources" (ADAMS Accession No. ML15350A320); DSRS Section 3.11,

“Environmental Qualification of Mechanical and Electrical Equipment” (ADAMS Accession No. ML15355A455), and DSRS Section 15.0.3, “Design Basis Accident Radiological Consequence Analyses for Advanced Light Water Reactors” (ADAMS Accession No. ML15355A341), are based on meeting the relevant requirements of the following NRC regulations:

- 10 CFR 50.34(f)(2)(vii)
- 10 CFR 50.34(f)(2)(viii)
- 10 CFR 50.44(c)(4)
- 10 CFR 50.49
- 10 CFR Part 50, Appendix A General Design Criteria 4
- 10 CFR Part 50, Appendix A General Design Criteria 19
- 10 CFR 52.47(a)(2)(iv)
- 10 CFR 50.47(a)(5)

The DSRS and NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition” (SRP), are not a substitute for NRC regulations and compliance with them is not required. As an alternative, an applicant may identify the differences between a DSRS section and the design features, analytical techniques, and procedural measures proposed in an application and discuss how the proposed alternative provides an acceptable method of complying with NRC regulations that underlie the DSRS acceptance criteria. Where the DCA contents differed from the guidance contained in the DSRS, the NRC staff reviewed the associated analytical techniques, data, and conclusions associated with the proposed alternative.

The NRC staff must have sufficient information to ensure that the applicant’s analytical approach has adequately addressed the regulatory requirements used as the basis for the NuScale DSRS and other relevant guidance.

### **III. REGULATORY AUDIT SCOPE**

The staff plans to discuss aspects of the AST (including core-damage source term and aerosol modeling) and PASS topics (including actions associated with hydrogen and oxygen monitoring) during the audit and may request additional information related to these topics, as part of the audit. The NRC staff will schedule time with NuScale staff to review specific documents at the NuScale Rockville, Maryland office, as needed.

The NRC staff requests the current calculation packages related to the above information be provided on the applicant’s electronic reading room (eRR) to the extent possible. The NRC staff also requests the associated revised Excel® Workbooks and other supporting information, in native format, be provided to support the review. As necessary, the NRC staff will schedule time with NuScale staff to review specific features of the information provided by NuScale.

Additionally, because of the complexity of the issue and the different aspects of the review that may be impacted by the accident source terms, the NRC staff may also ask additional questions during the course of the audit that are not currently summarized above. The agenda for the audit is presented in Attachment A of this audit plan. If necessary, any circumstances related to the conduct of the audit will be communicated to the NRC project manager, Getachew Tesfaye, at (301) 415-8013 or [Getachew.Tesfaye@nrc.gov](mailto:Getachew.Tesfaye@nrc.gov).

#### **IV. AUDIT TEAM**

The following are the NRC audit team members:

- Michelle Hart (NRO, Technical Reviewer)
- Ronald LaVera (NRO, Technical Reviewer)
- Edward Stutzcage (NRO, Technical Reviewer)
- Zachary Gran (NRO, Technical Reviewer)
- Anne-Marie Grady (NRO, Technical Reviewer)
- Michael Dudek (NRO/RGRB Branch Chief)
- Getachew Tesfaye (NRO, Senior Project Manager)
- Jason Schaperow (NRO, Technical Reviewer)
- Shawn Campbell (RES, Technical Reviewer)
- Hossein Esmaille (RES, Technical Reviewer)
- Michelle Hayes (NRO, Branch Chief)
- Supporting NRC Staff (as needed)

The following is the applicant contact:

- Carrie Fosaaen (NuScale)

#### **V. LOGISTICS**

The NRC staff will address in the audit report the technical areas identified in the Regulatory Audit Scope of this audit plan along with presenting the audit outcomes.

Depending on the availability of the applicant's documentation and supporting NRC staff, the audit is planned to start on June 3, 2019, with an entrance meeting, and end on July 26, 2019 with an exit meeting on August 8, 2019. The audit is intended to be conducted from the NRC Headquarters via the applicant's eRR or a local office of the applicant.

A non-public entrance meeting will be conducted the first day of the audit, and a non-public exit meeting will be held at the conclusion of the audit.

The NRC staff acknowledges the proprietary nature of the information requested. It will be handled appropriately throughout the audit. While performing the audit, the NRC staff will take notes that will be marked as proprietary and will not remove hard copies or copy electronic files from the audit site(s).



## **VI. SPECIAL REQUESTS**

To facilitate the preparation of the audit report, the NRC staff request that the documents reviewed during the course of the audit remain available for reference in the eRR and the NuScale office, as appropriate, until 45 days after the audit exit. The staff also request two copies of files provided in native format in order to facilitate a timely review.

If necessary, any circumstances related to the performance of the audit will be communicated to Getachew Tesfaye, NRO/DLSE 301-415-8013 or [Getachew.Tesfaye@nrc.gov](mailto:Getachew.Tesfaye@nrc.gov).

## **VII. DELIVERABLES**

The NRC staff will issue an audit report within 90 days after completion of the audit. The audit outcome may be used to identify any additional information to be submitted for making regulatory decisions, and will assist the NRC staff in the issuance of RAIs (if necessary) in completing its review. With the anticipated exit on August 8, 2019, the audit report is expected to be completed by November 8, 2019, and made publicly available in ADAMS.

**ATTACHMENT A**

**U.S. NUCLEAR REGULATORY COMMISSION**

AUDIT PLAN FOR THE PHASE IV REGULATORY AUDIT OF THE IODINE SPIKE DESIGN  
BASIS SOURCE TERM AND SAMPLING AND MONITORING INFORMATION  
FOR NUSCALE POWER, LLC DESIGN CERTIFICATION APPLICATION

DOCKET NO. 52-048

AUDIT PLAN AGENDA\*

June 3, 2019	Entrance Meeting and Start of Audit
July 26, 2019	End of Audit
August 8, 2019	Exit Meeting to Discuss Audit Observations

\* The audit may also include additional planned meetings, as necessary.