



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

June 12, 2019

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

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

SUBJECT: AUDIT PLAN FOR THE AUDIT OF NUSCALE POWER, LLC,
HELICAL STEAM GENERATOR TUBE MODAL TESTING

On January 6, 2017, NuScale Power, LLC (NuScale), submitted a design certification (DC) application for a small modular reactor to the U.S. Nuclear Regulatory Commission (NRC) (Agencywide Documents Access and Management System Accession No. ML17013A229). The NRC staff started its detailed technical review of NuScale's DC application on March 15, 2017.

The purpose of the subject audit is to examine NuScale's helical steam generator tube modal testing related to the reactor internals comprehensive vibration assessment review. The onsite audit will take place at General Vessels in Cremosano and SIET S.p.A in Piacenza, Italy, from June 24 - 25, 2019. The audit is currently scheduled from June 24, 2019 to August 30, 2019, including potential post-onsite audit activities such as reviewing preliminary modal testing results in the electronic reading room. The audit plan is enclosed.

Docket No. 52-048

Enclosure:
Audit Plan

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

CONTACT: Marieliz Vera, NRO/DLSE
301-415-5861

SUBJECT: AUDIT PLAN FOR THE AUDIT OF NUSCALE POWER, LLC. HELICAL STEAM
GENERATOR TUBE MODAL TESTING
DATED: June 12, 2019

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U.S. NUCLEAR REGULATORY COMMISSION

AUDIT OF NUSCALE POWER, LLC, HELICAL STEAM GENERATOR TUBE MODAL TESTING

DOCKET NO. 52-048

AUDIT PLAN

APPLICANT: NuScale Power, LLC (NuScale)

APPLICANT CONTACT: Richard Danforth

DURATION: June 24, 2019 to August 30, 2019

LOCATION: General Vessels
Via Delle Lame 1
26010 Cremosano, Italy

SIET S.p.A.
Via Nino Bixio, 27/c
29121 Piacenza, Italy

AUDIT TEAM: Yuken Wong (NRO, Audit Lead)
Stephen Hambric (NRC Consultant)
Marieliz Vera (NRO, Project Manager)

I. BACKGROUND

On March 15, 2017, the U.S. Nuclear Regulatory Commission (NRC) accepted and docketed (Reference 1) a standard design certification application (DCA) (Reference 2) submitted by NuScale Power, LLC (NuScale), to certify its small module reactor design.

Between September 5, 2018, and October 4, 2018, the NRC staff completed Phase 2 of the NuScale reactor internals comprehensive vibration assessment program (CVAP) audit that included review and examination of NuScale's design documents, drawings, test plans, and test reports. The NRC staff's Phase 2 audit summary report is available in Agencywide Documents Access and Management System (ADAMS) under Accession No. ML18333A221 (Reference 3). This summary outlined the main criteria the NRC staff will consider when determining the need for steam generator tube TF-3 testing in support of the design certification review. These considerations included updating the steam generator design calculations for fluid-elastic instability (FEI) and vortex shedding (VS) to include steam generator (SG) tube boundary conditions validated using the ongoing TF-3 single tube modal testing.

This audit plan describes the NRC staff's plans for conducting the audit of NuScale's helical steam generator tube modal testing (TF-3).

II. PURPOSE

The purpose of the audit is to examine the NuScale helical steam generator tube modal testing (TF-3) to verify that the tube and support configuration is prototypical to the design and boundary conditions that will exist during operation. The results of this audit will inform the NRC staff's decision if NuScale helical steam generator tube flow testing data is needed to support the design certification and the subsequent safety finding of the adequacy of the steam generator tube design against flow-induced vibration.

III. REGULATORY AUDIT BASIS

Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, "Domestic Licensing of Production and Utilization Facilities," Appendix A, "General Design Criteria for Nuclear Power Plants," General Design Criterion 4, "Environmental and dynamic effects design bases," states the following:

Structures, systems, and components important to safety shall be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents. These structures, systems, and components shall be appropriately protected against dynamic effects, including the effects of missiles, pipe whipping, and discharging fluids, that may result from equipment failures and from events and conditions outside the nuclear power unit.

The NRC staff will conduct this audit in accordance with the guidance provided in the Office of New Reactors (NRO)-REG-108, "Regulatory Audits" (Reference 4).

IV. REGULATORY AUDIT SCOPE

The scope of the NRC staff's audit will include the examination of the helical steam generator tube modal testing (TF-3) in General Vessels (Cremona, Italy) to verify that the tube and support configuration are prototypical of the design and boundary conditions during operation. The modal testing will verify the vibration analysis input assumptions such as frequency, damping values, and thermal expansion. The audit will also include the examination of the helical steam generator tube specimen used for the TF-1 and TF-2 testing in SIET (Cremona, Italy). In the Phase 2 CVAP audit report (ADAMS Accession No. ML18333A221), the NRC staff outlined the approach to make a reasonable assurance finding and a decision if the helical steam generator tube TF-3 testing data is needed for design certification. This audit at General Vessels and SIET is one part of this approach to being able to make the finding.

V. DOCUMENTS/INFORMATION NECESSARY FOR THE AUDIT

The NRC staff requests NuScale to make documents available to the NRC staff related to the helical steam generator tube thermal expansion calculation and TF-3 test plan and procedure. A NuScale engineer and/or SIET engineer familiar with the test and documents should be available during the audit.

Appropriate handling and protection of proprietary/export-controlled information shall be acknowledged and observed throughout the audit.

VI. SPECIAL REQUESTS

The NRC staff requests that NuScale provide at the test facility hardcopies of the documents stated in Section V or on a computer with electronic files of these documents. The NRC staff also requests that NuScale provide these documents in the electronic reading room (eRR) prior to the start of the audit (if available) and for the duration of the audit. The NRC staff may request preliminary modal testing results be provided in the eRR.

VII. AUDIT ACTIVITIES AND DELIVERABLES

The NRC audit team will review the technical areas identified in Section IV of this audit plan. Depending upon the effort needed in a given area, NRC team members may be reassigned to ensure adequate coverage of important technical elements.

The regulatory audit is currently scheduled between June 24, 2019 to August 30, 2019. Within 90 days from the conclusion of the audit, the audit team will issue a publicly available audit summary report to the applicant.

The NRC project manager will coordinate with NuScale in advance of audit activities to verify specific documents and identify any changes to the audit schedule and requested documents. The audit entrance/exit meetings are to be scheduled as follows:

- Entrance Meeting: June 24, 2019.
- Exit Meeting: August 30, 2019.

Periodic audit meetings may be requested by the NRC staff after the onsite audit at General Vessels in Cremosano and SIET S.p.A in Piacenza, Italy, is completed to address questions or issues that may arise. These meetings will be schedule through the project manager, on an as-needed basis.

The NRC staff acknowledges the proprietary nature of the information requested. It will be handled 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.

The audit outcome may be used to identify any additional information to be submitted for making regulatory decisions, and it will assist the NRC staff in the issuance of RAIs (if necessary) for the licensing review of NuScale Final Safety Analysis Report, Chapter 3, and any related information provided in other chapters, in preparation of the NRC's Safety Evaluation Report.

If necessary, any circumstances related to the conductance of the audit will be communicated to Marieliz Vera (NRC) at 301-415-5861, or email: Marieliz.Vera@nrc.gov.

VIII. REFERENCES

1. NRC Letter, "NuScale Power, LLC, – Acceptance of an Application for Standard Design Certification of a Small Modular Reactor," ML17074A087, issued March 23, 2017.
2. NuScale Standard Plant DCA, Revision 0, issued December 2016.

3. Audit Summary Report of Phase 2 NuScale Reactor Internals Comprehensive Vibration Assessment Program, ML18333A221, issued December 13, 2018.
4. NRO-REG-108, "Regulatory Audits," ML081910260, issued April 2, 2009.