June 29, 2017

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

FROM: Marieliz A. Vera, Project Manager **/RA/**
Licensing Branch 1
Division of New Reactor Licensing
Office of New Reactors

SUBJECT: AUDIT PLAN FOR THE REGULATORY AUDIT OF NUSCALE POWER, LLC DESIGN CERTIFICATION APPLICATION, DESIGN CONTROL DOCUMENT, TIER 2, CHAPTER 3, SECTION 3.13, "THREADED FASTENERS (AMERICAN SOCIETY OF MECHANICAL ENGINEERS CODE CLASS 1, 2, AND 3)"

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 NRC staff has identified a need to conduct a regulatory audit on the topic of threaded fasteners in Tier 2, Section 3.13 of the NuScale design control document. The purpose of the audit is to: (1) gain a better understanding of information in the area of threaded fasteners and the use of threaded inserts; and (2) identify information that will require docketing to support the basis of the licensing or regulatory decision.

The audit will take place at NuScale's offices in Rockville, Maryland, and online via NuScale's electronic reading room. The audit entrance meeting will be held July 5, 2017. The content of the audit plan is provided as an enclosure.

Docket No.: 52-048

Enclosure:
Audit Plan

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

CONTACT: Marieliz A. Vera, NRO/DNRL
301-415-5861

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DATED: June 29, 2017

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REGULATORY AUDIT OF SECTION 3.13, "THREADED FASTENERS (AMERICAN SOCIETY OF MECHANICAL ENGINEERS CODE CLASS 1, 2, AND 3)" OF THE NUSCALE POWER, LLC STANDARD PLANT

DESIGN CERTIFICATION AUDIT PLAN

DOCKET NO. 52-048

APPLICANT:	NuScale Power, LLC
APPLICANT CONTACTS:	Marty Bryan Jennie Wike
DURATION:	40 days July 5, 2017 through August 15, 2017
LOCATIONS:	NuScale Power, LLC (Rockville Office) 11333 Woodglen Drive, Suite 205 Rockville, Maryland 20852 Electronic Reading Room
AUDIT TEAM:	Nicholas McMurray (NRO/MCB Materials Engineer, Audit Lead) Jason Huang (NRO/MEB Mechanical Engineer) Matthew Mitchell (NRO/MCB Branch Chief) Marieliz Vera Amadiz (NRO, Project Manager) Supporting staff (as needed)

BACKGROUND AND OBJECTIVES

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 (ADAMS) Accession No. ML17013A229). The NRC staff started its detailed technical review of NuScale's DC application on March 15, 2017.

The design and inspection of the threaded fasteners for the NuScale design are described mainly in Design Control Document (DCD) Tier 2, Chapter 3.13, "Threaded Fasteners (ASME Code Class 1, 2, and 3)." Threaded fasteners are used throughout the design to maintain the pressure boundary of the reactor pressure vessel (RPV) and containment vessel (CNV).

Enclosure

The staff reviewed the final safety analysis report (FSAR) and located several safety significant locations where threaded inserts are used:

- CNV bolting including the upper shell assembly and inspection port and manway covers (Section 6.1.1.1 and Table 6.1-1)

- RPV flange studs (Table 6.2-4)

The threaded inserts are manufactured out of SA-479, Type 304/304L stainless steel.

The threaded inserts provide a barrier between the borated water and the low alloy steel. Therefore, in order to maintain the structural integrity of the low alloy steel, the threaded insert and attachment weld needs to maintain their integrity and remain leaktight.

Furthermore, the threaded fasteners for the inspection ports, manway covers, and flanges are part of the RPV and CNV pressure boundaries. Therefore, the threaded inserts have a structural function to maintain the pressure boundaries.

Currently, the FSAR does not contain information related to the design of the threaded inserts, and does not fully describe the scope of which threaded fasteners will use a threaded insert.

The NRC staff determined it would be advantageous to audit information supporting the use of threaded inserts. Specifically, the staff intends to audit information related to how the threaded inserts are designed and the controls that are in place to ensure their integrity during normal, testing, refueling, and accident conditions. The staff will conduct this audit in accordance with the guidance in NRO-REG-108, “Regulatory Audits.”

The audit will begin with an entrance meeting on July 5, 2017, via conference call. The audit may be performed via the NuScale Electronic Reading Room (eRR) or at NuScale’s Rockville office. During this audit, the NRC staff will examine the referenced documents and analyses listed in this audit plan. These documents and analyses are not incorporated by reference into the design but support information in the DCD.

The objectives of this audit are to enable the NRC staff to:

- Gain a better understanding of information underlying the application in the area of threaded inserts

- Identify information that will require docketing to support the basis of the licensing or regulatory decision.

REGULATORY AUDIT BASIS

Title 10 of the *Code of Federal Regulations* (CFR), Section 52.47(a)(3)(i) states:

> *A DC application must contain a final safety analysis report (FSAR) that includes a description of principle design criteria for the facility.*

An audit is required to examine detailed information related to the applicant’s principle design criteria, and reach a safety conclusion on the NuScale application sections in the scope of this

audit plan. The NRC staff must have sufficient information to ensure that acceptable risk and reasonable assurance of safety can be documented in the NRC staff's safety evaluation.

This regulatory audit is based on the following regulations:

- 10 CFR 52.47, "Contents of applications; technical information in final safety analysis report."

- General Design Criteria (GDC) 1 of Appendix A to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," requires that structures, systems, and components (SSCs) important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. These threaded inserts are part of the RPV and CNV pressure boundaries. Therefore, they need to be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety function.

- GDC 4 requires that SSCs 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 threaded inserts are within the borated water of the ultimate heat sink. Additionally, these threaded inserts (and their attachment welds) need to maintain their integrity during refueling operation.

REGULATORY AUDIT SCOPE

The specific scope of this audit is information related to the threaded fasteners and threaded inserts. This information supports mainly the following DCD Sections:

- Tier 2, Section 3.13, "Threaded Fasteners (ASME Code Class 1, 2, and 3)"

The documents supporting the technical areas listed above are to be made available to the NRC staff in the NuScale eRR or at the NuScale office in Rockville, Maryland. The documents already identified by the staff are listed below. Additional documents will be requested by the staff as needed (when referenced by a document being audited by the staff, for instance), and these documents will be added to the audit report prepared by the staff following the conclusion of the audit.

Documents Requested

1. The design drawings of the threaded inserts that will be used in the NuScale design.

2. Information related to the installation of the threaded inserts. This includes any information related to the preservice examinations that will be performed on the attachment welds.

3. Information that demonstrates how NuScale will ensure that the threaded inserts and/or clad are not damaged during installation, service, and refueling. This includes any information related to the inservice examinations that will be performed on the attachment welds.

SPECIAL REQUESTS

The NRC staff asks that the requested documents be available to the NRC auditors in NuScale's eRR. 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 staff will notify either Division of New Reactor Licensing or NuScale that these documents can be removed from eRR. The staff also requests that NuScale personnel knowledgeable in the audit topics be available to the NRC staff (with reasonable notification). Finally, the staff requests that a conference room with a speaker phone be available when auditing at the NuScale office.

AUDIT ACTIVITIES AND DELIVERABLES

The NRC staff acknowledges that if the information requested is proprietary then it will be handled appropriately throughout the audit. While the NRC staff will take notes, they will not remove hard copy or electronic files from the audit site(s). Any NRC contractors participating in the audit will be evaluated and approved through standard NRC processes for handling sensitive material.

Near the midpoint of the audit, or as mutually agreed to, the NRC will hold a status call and/or meeting with NuScale to identify issues that have been closed or will be resolved by another mechanism, such as requests for additional information (RAIs) or public meetings. In the status meeting NRC will also identify any emerging information needs as well as documents that can be removed from eRR. The NRC will hold a conference call or meeting to exit the audit.

At the completion of the audit, the audit team will issue an audit summary within 90 days that will be declared and entered as an official agency record in the NRC's ADAMS records management system, in accordance with NRO-REG-108. The audit outcome may be used to assist the NRC staff in the issuance of RAIs (if necessary) for the licensing review of the NuScale DCD and to identify any additional information to be submitted on the docket in support of the NRC staff's preparation of their safety evaluation report.

If necessary, any circumstances related to the conduct of the audit will be communicated to the NRC project manager, Marieliz Vera Amadiz at 301-415-5861 or Marieliz.VeraAmadiz@nrc.gov.