

July 11, 2017

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

FROM: Bruce M. Bovol, 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 5,
SECTION 5.2.3

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

The NRC staff has identified a need to conduct a regulatory audit on the topic of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section III and Section XI compliance and appropriate use of supplemental requirements in order to meet Title 10 of the *Code of Federal Regulations* Part 50, "Domestic Licensing of Production and Utilization Facilities," Appendix A, "General Design Criteria for Nuclear Power Plants," General Design Criteria 1, "Quality Standards and Records." The purpose of the audit is to: (1) gain a better understanding of information underlying the application in the area of ASME Boiler and Pressure Vessel Code compliance, (2) identify information that will require docketing to support the basis of the licensing or regulatory decision; and (3) develop an understanding of the topics to support issuing clear requests for additional information.

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 12, 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

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SUBJECT: AUDIT PLAN FOR THE REGULATORY AUDIT OF NUSCALE POWER, LLC
DESIGN CERTIFICATION APPLICATION, DESIGN CONTROL DOCUMENT, TIER
2, CHAPTER 5, SECTION 5.2.3 DATED July XX, 2017

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***via email**

NRO-002

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DATE	7/11/2017	7/06/2017	7/11/2017

OFFICIAL RECORD COPY

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(Revised 02/07/2017)

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AUDIT PLAN FOR THE REGULATORY AUDIT
OF NUSCALE POWER, LLC DESIGN CERTIFICATION APPLICATION,
DESIGN CONTROL DOCUMENT, TIER 2, CHAPTER 5, SECTION 5.2.3
DOCKET NO. 52-048

APPLICANT:

NuScale Power, LLC (NuScale)

APPLICANT CONTACTS:

Marty Bryan
Darrell Gardner
Steven Mirsky
Jennie Wike

DURATION:

33 Days
July 12, 2017 through August 14, 2017

LOCATIONS:

NuScale (Rockville Office)
11333 Woodglen Drive, Suite 205
Rockville, Maryland 20852

Electronic Reading Room

AUDIT TEAM:

Andrew G. Yeshnik (NRO, Audit Lead)
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Nicholas R. McMurray (NRO, Technical Reviewer)
Daniel S. Widrevitz (NRO, Technical Reviewer)
Nicholas J. Hansing (NRO, Technical Reviewer)
Alexander Tsirigotis (NRO, Technical Reviewer)
Steven E. Cumblidge (NRR, Technical Reviewer)
Timothy R. Lupold (NRO/MEB Branch Chief)
Matthew A. Mitchell (NRO/MCB Branch Chief)
Bruce M. Bavol (NRO, Project Manager)
Supporting staff (as needed)

Enclosure

BACKGROUND AND OBJECTIVES

NuScale submitted by a letter dated December 31, 2016, to the U.S. Nuclear Regulatory Commission (NRC) a Design Control Document (DCD) for its Design Certification (DC) application of the NuScale reactor design (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17013A229). The NRC staff initiated this DC review on March 27, 2017.

The design and inspection of the reactor coolant system and engineered safety systems for the NuScale design is described mainly in DCD Tier 2, Chapter 5, "Reactor Coolant System and Connecting Systems"; and Tier 2, Chapter 6, "Engineered Safety Features." In the DCD Tier 2 Final Safety Analysis Report (FSAR), NuScale states that the reactor coolant pressure boundary (RCPB) and applicable portions of the engineered safety feature system will be designed, constructed, inspected, and tested in accordance with the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (henceforth referred to as the ASME Code). The use of the ASME Code is consistent with staff guidance described in Regulatory Guide 1.26, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants."

The design of the NuScale power module and the connected systems is significantly different than that of operating large light-water reactors and certified designs of large light-water reactors described in the appendices of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, "Domestic Licensing of Production and Utilization Facilities." The use of safety significant small diameter piping in the NuScale design is an example of one notable difference. An underlying assumption of the ASME Code is that small diameter piping is not safety significant. The ASME Code exempts small diameter piping from some quality assurance, inspection, and other requirements which may be inappropriate considering the safety significance of such piping in the NuScale design.

The NRC staff held a public meeting on May 15, 2017, to discuss the topic of ASME Code and the NuScale design (ADAMS Accession No. [ML17115A032](#)). During the call the NRC staff presented the staff position that verbatim compliance ASME Code does not meet the entirety of 10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants," General Design Criteria (GDC) 1 (ADAMS Accession No. [ML17115A065](#)). During the public meeting the NuScale staff stated that information on ASME Code compliance is further described in ASME Code Design Specifications which NuScale will provide for an audit.

The audit will begin with an entrance meeting on July 12, 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 ASME Code compliance
- Identify information that will require docketing to support the basis of the licensing or regulatory decision; and

- Develop an understanding of the topics to support issuing clear requests for additional information (RAI).

REGULATORY AUDIT BASIS

10 CFR Section 52.47(a)(3)(i) states:

A DC application must contain a 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."
- GDC 1, "Quality Standards and Records," of Appendix A to 10 CFR Part 50, requires that structures, systems, and components (SSC) important to safety be designed, fabricated, erected, and tested to quality standards commensurate with the important of safety functions to be performed. GDC 1 also requires that applicant or licensee will determine the applicability, adequacy and sufficiency of general recognized codes and standards, if they are utilized, and requires an applicant or licensee to supplement or modify the codes and standards as appropriate to assure a quality product in keeping with the required safety function.
- GDC 2, "Design Bases for Protection Against Natural Phenomena 2 Fire Protection," requires that SSC important to safety to be designed to withstand the effects of natural phenomena.
- GDC 4, "Environmental and Dynamic Effects Design Bases," requires that SSC important to safety be designed to accommodate the effects of and to be compatible with the environmental conditions during normal plant operation as well as during postulated accidents.
- GDC 14, "Reactor Coolant Pressure Boundary," requires that the RCPB be designed, fabricated, erected, and tested as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture.
- GDC 15, "Reactor Coolant System Design," requires that the RCPB be designed with sufficient margin to assure that the design conditions are not exceeded during normal operation, including anticipated operational occurrences.

- GDC 30, "Quality of Reactor Coolant Pressure Boundary," requires that the RCPB shall be designed, fabricated, erected, and tested to the highest quality standards practical and that means shall be provided for detecting and identifying the source of reactor coolant leakage.
- GDC 31, "Fracture Prevention of Reactor Coolant Pressure Boundary," requires that the RCPB shall be designed to prevent brittle failure and to minimize the potential for rapidly propagating fracture.
- GDC 32, "Inspection of Reactor Coolant Pressure Boundary," requires that the RCPB be designed to permit periodic inspection and testing to assess structural and leakage integrity.
- GDC 36, "Inspection of Emergency Core Cooling System," requires that the emergency core cooling system (ECCS) be designed to permit periodic inspection to assess leakage integrity and operability of the system.
- GDC 37, "Testing of Emergency Core Cooling System," requires that the ECCS be designed to permit and testing to assess structural and leakage integrity and operability of the system.
- GDC 50, "Containment Design Basis," requires that the containment structure be designed to accommodate the pressure and temperature conditions resulting for any loss-of-coolant accident.
- GDC 51, "Fracture Prevention of Containment Pressure Boundary," requires that the containment structure be designed to prevent brittle failure and to minimize the potential for rapidly propagating fracture.
- GDC 52, "Capability for Containment Leakage Rate Testing," requires that the containment structure be designed to permit periodic inspection and testing to assess leakage.
- 10 CFR 50.55a, "Codes and standards," requires that inservice inspection programs meet the applicable inspection requirements in Section XI of the ASME Boiler and Pressure Vessel Code.
- 10 CFR 50.65, "Conversion of construction permit to license; or amendment of license," requires that licensees be able to monitor the condition of the safety related components to provide reasonable assurance that the components are capable of fulfilling their intended functions.
- Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50 applies to NuScale. Criterion III "Design Control" requires that information in the licensing application is correctly reflected in specifications, drawings, procedures, and instructions.

REGULATORY AUDIT SCOPE

The scope of this audit is information related to ASME Code Section III Class 1, 2, and 3 systems and the corresponding inspection requirements of Class 1, 2, and 3 system found in ASME Code Section XI. ASME Code compliance supports safety findings in the following DCD Sections:

- Tier 2, Section 3.6.3, "Leak-Before-Break Evaluation Procedures"
- Tier 2, Section 4.5.1, "Control Rod Drive Structural Materials"
- Tier 2, Section 5.2.1.1, "Compliance with the Codes and Standards Rule, 10 CFR 50.55a"
- Tier 2, Section 5.2.1.2, "Applicable Code Cases"
- Tier 2, Section 5.2.3, "Reactor Coolant Pressure Boundary Materials"
- Tier 2, Section 5.2.4, "Reactor Coolant Pressure Boundary Inservice Inspection and Testing"
- Tier 2, Section 5.3.1, "Reactor Vessel Materials"
- Tier 2, Section 5.3.3, "Reactor Vessel Integrity"
- Tier 2, Section 5.4.2.1, "Steam Generator Materials"
- Tier 2, Section 5.4.2.2, "Steam Generator Program"
- Tier 2, Section 6.1.1, "Engineered Safety Materials"
- Tier 2, Section 6.6, "Inservice Inspection of Class 2 and 3 Components "

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

Document	Title
EQ-A010-3642	RXM Class 1, 2, and 3 Piping Design Specification
EQ-A010-2235	ASME Design Specification for Primary Systems Containment Isolation Valves
EQ-A011-1775	ASME Design Specification for Reactor Pressure Vessel
EQ-B030-3055	ASME Design Specification for DHRS Condenser
EQ-A023-1943	ASME Design Specification for Reactor Vessel Internals
EQ-A013-1826	ASME Design Specification for Containment Vessel
EQ-B020-2140	ASME Design Specification for Emergency Core Cooling Valves

SPECIAL REQUESTS

The NRC staff requests 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 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 the proprietary nature of the information requested. 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 proprietary material.

The audit will initiate on July 12, 2017. Audit reports will be generated upon completion of each phase and will be published in the NRC's ADAMS. The NRC will hold a call or meeting to close the audit.

The audit will assist the NRC staff in the issuance of RAI (if necessary) for the licensing review of the NuScale DCD Sections identified in the "REGULATORY AUDIT SCOPE" section in preparation of the NRC staff's SE.

If necessary, any circumstances related to the conduct of the audit will be communicated to the NRC project manager, Bruce Baval at 301-415-6715 or bruce.baval@nrc.gov.