



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

September 11, 2020

Mr. Zackary W. Rad, Director  
Regulatory Affairs  
NuScale Power, LLC  
1100 Circle Boulevard, Suite 200  
Corvallis, OR 97330

SUBJECT: STANDARD DESIGN APPROVAL FOR THE NUSCALE POWER PLANT  
BASED ON THE NUSCALE STANDARD PLANT DESIGN CERTIFICATION  
APPLICATION

Dear Mr. Rad:

In response to the NuScale Power, LLC. (NuScale) letter to the U.S. Nuclear Regulatory Commission (NRC), "NuScale Power, LLC Request for Standard Design Approval based on the NuScale Standard Plant Design Certification Application," dated July 13, 2020 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML20195C766), this letter provides the standard design approval (SDA) for the NuScale reactor standard design. The NuScale SDA is attached and can be found in ADAMS (Accession No. ML20246G536).

The NuScale design certification application (DCA) was submitted in the NuScale letter to the NRC, "NuScale Power, LLC Submittal of the NuScale Standard Plant Design Certification Application (NRC Project No. 0769)," dated December 31, 2016 (ADAMS Accession No. ML17013A229). The final version of the NuScale Standard Plant Design Certification Application, Revision 5, dated July 29, 2020, can be found in ADAMS (Accession No. ML20225A044).

The SDA allows the NuScale design to be referenced in an application for a construction permit or operating license under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," or an application for a combined license or manufacturing license under 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants." However, this SDA does not constitute a commitment to issue a permit, design certification (DC), or license, or in any way affect the authority of the Commission, the Atomic Safety and Licensing Board, or other presiding officers in any proceeding under 10 CFR Part 2, "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders."

Issuance of the enclosed SDA signifies the completion of the NRC staff's technical review of the NuScale design. The NRC staff performed its technical review of the NuScale design control document in accordance with the standards for review of SDA applications set forth in 10 CFR 52.139, "Standards for review of applications," including the NRC staff's approved exemptions and proposed rulemaking exclusions regarding items that do not currently receive final design approval: shield wall design, containment leakage from combustible gas monitoring, and steam generator tube structural and leakage integrity. Additionally, the Advisory Committee on Reactor Safeguards (ACRS) reviewed and reported on the NRC staff's safety evaluation report (SER) with no open items for the NuScale application in its letter dated July 29, 2020 (ADAMS Accession No. ML20211M386) and concluded that: (1) there is reasonable assurance that the NuScale design can be constructed and operated without undue risk to the health and safety of the public, and (2) the NRC staff's final SER for the NuScale design should be issued. ACRS also concluded that the SDA for the NuScale design should be issued.

On the basis of its evaluation and independent analyses, as described in the NRC final safety evaluation report (ADAMS Accession No. ML20023A318), the NRC staff concludes that NuScale's application for a SDA meets the applicable portions of 10 CFR 52.137, "Contents of applications; technical information," and the review standards in 10 CFR 52.139. The duration of this SDA is 15 years in accordance with 10 CFR 52.147, "Duration of design approval." If the NuScale design is subsequently certified, then this SDA will be updated, as needed, to conform to any changes resulting from the DC certification rulemaking.

If you have questions about this approval, please contact Gregory Cranston at (301) 415-0546, or via e-mail at [Gregory.Cranston@nrc.gov](mailto:Gregory.Cranston@nrc.gov).

Sincerely,

Anna H. Bradford, Division Director  
Division of New and Renewed Licenses  
Office of New Reactor Regulation

Docket No. 52-048

Enclosure:  
As stated

SUBJECT: STANDARD DESIGN APPROVAL FOR THE NUSCALE POWER PLANT  
 BASED ON THE NUSCALE STANDARD PLANT DESIGN CERTIFICATION  
 APPLICATION DATED: SEPTEMBER 11, 2020

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**ADAMS Accession No(s): ML20247J564****\*via e-mail****NRR-106**

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DOCKET NO. 52-048

NUSCALE POWER STANDARD DESIGN

STANDARD DESIGN APPROVAL

PURSUANT TO SUBPART E OF 10 CFR PART 52

- (1) On December 31, 2016, NuScale Power, LLC (NuScale) submitted to the U.S. Nuclear Regulatory Commission (NRC), an application for certification of the NuScale power plant standard design pursuant to Subpart B of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants" (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17013A229). The NuScale nuclear power plant is a facility of the type described in 10 CFR 50.22, "Class 103 licenses; for commercial and industrial facilities."
- (2) On July 13, 2020, NuScale submitted a letter to the NRC, "NuScale Power, LLC, Request for Standard Design Approval based on the NuScale Standard Plant Design Certification Application," to request a standard design approval (SDA) for the NuScale nuclear power plant pursuant to Subpart E of 10 CFR Part 52, in addition to the request for a design certification (DC) under Subpart B of 10 CFR Part 52 (ADAMS Accession No. ML20195C766).
- (3) On July 29, 2020, NuScale submitted Revision 5 of the design control document (DCD) for the NuScale standard plant design (ADAMS Accession No. ML20225A044).
- (4) The DCD and its references contain design information that Subpart E, "Standard Design Approvals," of 10 CFR Part 52, requires for a standard plant design. The NuScale standard design is a nuclear power facility with a rated reactor core power level of 160 megawatts thermal (MWt) or 50 megawatts electrical (MWe), per module with a capability for up to 12 modules. Therefore, the overall power output for a 12-module plant is 1,920 MWt (600 MWe). Chapter 1 of the DCD describes the scope of this design.
- (5) The NRC staff reviewed the NuScale standard design and reached its finding that there is reasonable assurance that the NuScale design can be constructed and operated without undue risk to the health and safety of the public. The NRC staff's final safety evaluation report (FSER) dated August 28, 2020, presents the findings of the NRC staff's evaluation of the NuScale standard design (ADAMS Accession No. ML20023A318).
- (6) The Advisory Committee on Reactor Safeguards (ACRS) reviewed and reported on the NRC staff's safety evaluation report (SER) with no open items for the NuScale design certification application in a letter, "Report on the Safety Aspects of the NuScale Small

Modular Reactor,” dated July 29, 2020 (ML20211M386). The ACRS concluded that: (1) there is reasonable assurance that the NuScale design can be constructed and operated without undue risk to the health and safety of the public, and (2) the NRC staff’s final SER for the NuScale design should be issued.

- (7) The NRC staff identified three issues as not resolved within the scope of its 10 CFR Part 52.63(a)(5) review. Insufficient information was provided regarding: (1) the shielding wall design in certain areas of the plant; (2) the potential for containment leakage from the combustible gas monitoring system; and (3) the ability of the steam generator tubes to maintain structural and leakage integrity during density wave oscillations in the secondary fluid system, including the method of analysis to predict the thermal-hydraulic conditions of the steam generator secondary fluid system and resulting loads, stresses, and deformations from density wave oscillations from reverse flow. For all three issues listed below, the appendix to 10 CFR Part 52 that codifies the NuScale design certification will clarify that these issues are not resolved within the meaning of 10 CFR 52.63(a)(5) and will state that a future combined license (COL) or construction permit (CP) applicant is responsible for providing the additional design information needed to address these issues prior to any license being issued. Similarly, this SDA does not make a finding on these issues.
- Regarding the shielding wall design, the NRC staff identified that there were not sufficient design details available about shielding wall design with the presence of large penetrations, such as the main steam lines; main feed water lines; and power module bay heating, ventilation, and air conditioning lines in the radiation shield wall between the power module bay and the reactor building steam gallery area. Without this shielding design information, the NRC staff is unable to confirm that the radiological doses to workers will be maintained within the radiation zone limits specified in the application.
  - Regarding containment leakage from the combustible gas monitoring system, the NRC staff identified that there was not sufficient information available regarding the NuScale combustible gas monitoring system and the potential for leakage from this system outside containment. Without additional information regarding the potential for leakage from this system, the NRC staff was unable to determine whether this leakage could impact analyses performed to assess main control room dose consequences and offsite dose consequences to members of the public and whether this system can be safely re-isolated after monitoring is initiated.
  - Regarding steam generator stability during density wave oscillations and the associated method of analysis, the NRC staff identified that there was not sufficient information available to demonstrate that the flow oscillations that are predicted to occur on the secondary side of the steam generators will not cause failure of the inlet flow restrictors. Structural and leakage integrity of the inlet flow restrictors in the steam generators is necessary to avoid damage to multiple steam generator tubes, caused directly by broken parts or indirectly by unexpected density wave oscillation loads. Damage to multiple steam generator tubes could disrupt natural circulation in the reactor coolant pathway and interfere with the decay heat removal system and the emergency core cooling system, which is relied upon to cool the reactor core in a NuScale nuclear power module. This steam generator design issue is narrowly focused on the effects of

density wave oscillations in the secondary fluid system on steam generator tubes to maintain structural and leakage integrity, including the method of analysis to predict the thermal-hydraulic conditions of the steam generator secondary fluid system and resulting loads, stresses, and deformations from density wave oscillations including reverse flow.

- (8) On the basis of its review and the findings reported in the FSER, the NRC staff concludes that the information in the DCD, regarding the NuScale design, described in item (3) above, complies with the requirements in Subpart E of 10 CFR Part 52 except for the three specific items described in item (7) above.
- (9) The NRC staff finds that the NuScale standard design is acceptable for use as a reference design for a CP, operating license, manufacturing license, or COL application for a facility that is located at a site whose characteristics fall within the site parameters specified in the DCD and provided that portions of the facility that are outside the scope of the approved standard design and interface with the approved standard design conform to the interface requirements given in the DCD.
- (10) This SDA and all applications that reference it are subject to all applicable provisions of the Atomic Energy Act of 1954, as amended, and to the rules, regulations, and orders of the Commission now or hereafter in effect. In addition, an applicant who references this SDA shall incorporate into its application, the operational requirements specified in the DCD, including the technical specifications.
- (11) This SDA does not constitute a commitment to issue a permit, DC, or license or in any way affect the authority of the Commission, the Atomic Safety and Licensing Board, or other presiding officers in any proceeding under 10 CFR Part 2, "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders."
- (12) This SDA is effective on September 09, 2020, and will expire on September 09, 2035, unless the NRC staff extends the date. The expiration of the SDA shall not affect its use in applications docketed before such date.

Dated in Rockville, Maryland, this 11th day of September, 2020.

FOR THE NUCLEAR REGULATORY COMMISSION

Ho K. Nieh, Director,  
Office of Nuclear Reactor Regulation