RAIO-0718-61202

August 06, 2018

Docket No. 52-048

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

SUBJECT: NuScale Power, LLC Response to NRC Request for Additional Information No. 470 (eRAI No. 9471) on the NuScale Design Certification Application

REFERENCE: U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 470 (eRAI No. 9471)," dated May 10, 2018

The purpose of this letter is to provide the NuScale Power, LLC (NuScale) response to the referenced NRC Request for Additional Information (RAI).

The Enclosures to this letter contain NuScale's response to the following RAI Question from NRC eRAI No. 9471:

- 15.06.05-9

Enclosure 1 is the proprietary version of the NuScale Response to NRC RAI No. 470 (eRAI No. 9471). NuScale requests that the proprietary version be withheld from public disclosure in accordance with the requirements of 10 CFR § 2.390. The enclosed affidavit (Enclosure 3) supports this request. Enclosure 2 is the nonproprietary version of the NuScale response.

This letter and the enclosed responses make no new regulatory commitments and no revisions to any existing regulatory commitments.

If you have any questions on this response, please contact Paul Infanger at 541-452-7351 or at pinfanger@nuscalepower.com.

Sincerely,

Zackary W. Rad
Director, Regulatory Affairs
NuScale Power, LLC

Distribution: Gregory Cranston, NRC, OWFN-8G9A
Samuel Lee, NRC, OWFN-8G9A
Rani Franovich, NRC, OWFN-8G9A

Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 9471, proprietary

Enclosure 2: NuScale Response to NRC Request for Additional Information eRAI No. 9471, nonproprietary

Enclosure 3: Affidavit of Zackary W. Rad, AF-0818-61203

NuScale Power, LLC
1100 NE Circle Blvd., Suite 200 Corvalis, Oregon 97330, Office: 541.360.0500, Fax: 541.207.3928
www.nuscalepower.com

Enclosure 1:

NuScale Response to NRC Request for Additional Information eRAI No. 9471, proprietary

NuScale Power, LLC
1100 NE Circle Blvd., Suite 200 Corvalis, Oregon 97330, Office: 541.360.0500, Fax: 541.207.3928
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Enclosure 2:

NuScale Response to NRC Request for Additional Information eRAI No. 9471, nonproprietary

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Response to Request for Additional Information
Docket No. 52-048

eRAI No.: 9471
Date of RAI Issue: 05/10/2018

NRC Question No.: 15.06.05-9

Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Appendix A, General Design Criterion (GDC) 35, "Emergency Core Cooling," requires that a system to provide abundant emergency core cooling shall be provided. The system safety function shall be to transfer heat from the reactor core following any loss of reactor coolant at a rate such that (1) fuel and clad damage that could interfere with continued effective core cooling is prevented and (2) clad metal-water reaction is limited to negligible amounts. DSRS Section 15.6.5 provides guidance for complying with GDC 35. It requires that evaluation models meet the requirements of 10 CFR 50.46, which states that the evaluation model must include sufficient supporting justification to show that the analytical technique realistically describes the behavior of the reactor system during a loss-of-coolant accident.

Section 3.3 of the Long-Term Cooling Methodology technical report, TR-0916-51299-P, Rev. 0, **a technical report supporting the DCD Chapter 15 analyses**, indicates that the {{ }}$^{2(a),(c)}$ for the LTC calculations. The most restrictive for ECCS flow assumption may not be the conservative direction for maximum cooldown cases since increased heat transfer, due to increased ECCS flow, would result in more limiting cooldown conditions.

Please confirm that this assumption is applicable for input and produce minimum RCS temperatures and inventory and minimum collapsed liquid level above the active fuel for the LTC maximum cooldown event, and provide a summary of the results along with draft markups for any changes needed to the technical report.

NuScale Response:

The NuScale Power Module (NPM) design is equipped with Emergency Core Cooling System valves consisting of two Reactor Recirculation Valves (RRVs) and three Reactor Vent Valves (RVVs). The function of these valves has two-fold:

- Achieve pressure equalization between Reactor Pressure Vessel (RPV) and Containment Vessel (CNV) through rapid depressurization/pressurization upon the actuation (Phase 1b of the LOCA progression)
- Establish flow paths in steam and liquid spaces between RPV and CNV and maintain stable recirculation between two pressure vessels (Phase 2 of the LOCA progression and long term core cooling)

The continuous ECCS operation, while maintaining necessary liquid inventory above the top of the active core, {{ }}$^{2(a)(c)}$ above RRVs inside the CNV. The detailed discussion on how the {{ }}$^{2(a)(c)}$ was presented in response to eRAI 8990, Letter RAIO-1117-57291, dated November 20, 2017. As it is explained in the response, {{

}}$^{2(a)(c)}$

Upon the pressure equalization between the pressure vessels, the flow through the ECCS valves is {{

}}$^{2(a)(c)}$ where ρ_f, ρ_g, g are the liquid and vapor densities, and acceleration due to gravity, respectively. The total flow rate of vapor through the RVVs is given by $\acute{m}_{RVV}$; the total flow rate of liquid through the RRVs is given by $\acute{m}_{RRV}$. The pressure loss coefficient given by K/A^2 is inversely proportional to the capacity of the valves. Therefore, the level depression causing minimum level above top of the core is {{

}}$^{2(a)(c)}$

{{

}}2(a)(c)

This response demonstrates that the cooldown of the RPV is primarily due to the {{

}}2(a)(c) RRV flow rate is limiting for predicting minimum collapsed liquid level in the RPV.

Impact on DCA:

There are no impacts to the DCA as a result of this response.

Enclosure 3:

Affidavit of Zackary W. Rad, AF-0818-61203

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NuScale Power, LLC

AFFIDAVIT of Zackary W. Rad

I, Zackary W. Rad, state as follows:

1. I am the Director, Regulatory Affairs of NuScale Power, LLC (NuScale), and as such, I have been specifically delegated the function of reviewing the information described in this Affidavit that NuScale seeks to have withheld from public disclosure, and am authorized to apply for its withholding on behalf of NuScale.
2. I am knowledgeable of the criteria and procedures used by NuScale in designating information as a trade secret, privileged, or as confidential commercial or financial information. This request to withhold information from public disclosure is driven by one or more of the following:
    a. The information requested to be withheld reveals distinguishing aspects of a process (or component, structure, tool, method, etc.) whose use by NuScale competitors, without a license from NuScale, would constitute a competitive economic disadvantage to NuScale.
    b. The information requested to be withheld consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), and the application of the data secures a competitive economic advantage, as described more fully in paragraph 3 of this Affidavit.
    c. Use by a competitor of the information requested to be withheld would reduce the competitor's expenditure of resources, or improve its competitive position, in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product.
    d. The information requested to be withheld reveals cost or price information, production capabilities, budget levels, or commercial strategies of NuScale.
    e. The information requested to be withheld consists of patentable ideas.
3. Public disclosure of the information sought to be withheld is likely to cause substantial harm to NuScale's competitive position and foreclose or reduce the availability of profit-making opportunities. The accompanying Request for Additional Information response reveals distinguishing aspects about the method by which NuScale develops its long term cooling analysis.

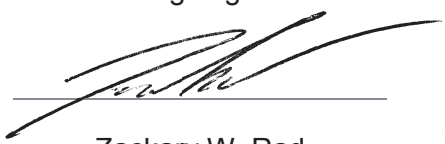
    NuScale has performed significant research and evaluation to develop a basis for this method and has invested significant resources, including the expenditure of a considerable sum of money.

    The precise financial value of the information is difficult to quantify, but it is a key element of the design basis for a NuScale plant and, therefore, has substantial value to NuScale.

    If the information were disclosed to the public, NuScale's competitors would have access to the information without purchasing the right to use it or having been required to undertake a similar expenditure of resources. Such disclosure would constitute a misappropriation of NuScale's intellectual property, and would deprive NuScale of the opportunity to exercise its competitive advantage to seek an adequate return on its investment.

4. The information sought to be withheld is in the enclosed response to NRC Request for Additional Information No. 470, eRAI 9471. The enclosure contains the designation "Proprietary" at the top of each page containing proprietary information. The information considered by NuScale to be proprietary is identified within double braces, "{{ }}" in the document.
5. The basis for proposing that the information be withheld is that NuScale treats the information as a trade secret, privileged, or as confidential commercial or financial information. NuScale relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC § 552(b)(4), as well as exemptions applicable to the NRC under 10 CFR §§ 2.390(a)(4) and 9.17(a)(4).
6. Pursuant to the provisions set forth in 10 CFR § 2.390(b)(4), the following is provided for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld:
    a. The information sought to be withheld is owned and has been held in confidence by NuScale.
    b. The information is of a sort customarily held in confidence by NuScale and, to the best of my knowledge and belief, consistently has been held in confidence by NuScale. The procedure for approval of external release of such information typically requires review by the staff manager, project manager, chief technology officer or other equivalent authority, or the manager of the cognizant marketing function (or his delegate), for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside NuScale are limited to regulatory bodies, customers and potential customers and their agents, suppliers, licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or contractual agreements to maintain confidentiality.
    c. The information is being transmitted to and received by the NRC in confidence.
    d. No public disclosure of the information has been made, and it is not available in public sources. All disclosures to third parties, including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or contractual agreements that provide for maintenance of the information in confidence.
    e. Public disclosure of the information is likely to cause substantial harm to the competitive position of NuScale, taking into account the value of the information to NuScale, the amount of effort and money expended by NuScale in developing the information, and the difficulty others would have in acquiring or duplicating the information. The information sought to be withheld is part of NuScale's technology that provides NuScale with a competitive advantage over other firms in the industry. NuScale has invested significant human and financial capital in developing this technology and NuScale believes it would be difficult for others to duplicate the technology without access to the information sought to be withheld.

I declare under penalty of perjury that the foregoing is true and correct. Executed on August 6, 2018.



Zackary W. Rad