



August 28, 2018

Docket: PROJ0769

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. 9513 (eRAI No. 9513) on the NuScale Topical Report, "Non-Loss of Coolant Accident Analysis Methodology," TR-0516-49416, Revision 1

REFERENCES: 1. U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 9513 (eRAI No. 9513)," dated May 08, 2018
2. NuScale Topical Report, "Non-Loss of Coolant Accident Analysis Methodology," TR-0516-49416, Revision 1, dated August 2017
3. NuScale Power, LLC Response to NRC "Request for Additional Information No.9513 (eRAI 9513)," dated July 9, 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. 9513:

- 15.00.02-15

A majority of the responses to RAI No. 9513, eRAI 9513, questions were previously provided in Reference 3. The response to question 15.00.02-16 will be provided by September 28, 2018.

Enclosure 1 is the proprietary version of the NuScale Response to NRC RAI No. 9513 (eRAI No. 9513). 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. 9513, proprietary

Enclosure 2: NuScale Response to NRC Request for Additional Information eRAI No. 9513, nonproprietary

Enclosure 3: Affidavit of Zackary W. Rad, AF-0818-61587



Enclosure 1:

NuScale Response to NRC Request for Additional Information eRAI No. 9513, proprietary



Enclosure 2:

NuScale Response to NRC Request for Additional Information eRAI No. 9513, nonproprietary

Response to Request for Additional Information Docket: PROJ0769

eRAI No.: 9513

Date of RAI Issue: 05/08/2018

NRC Question No.: 15.00.02-15

Title 10 of the *Code of Federal Regulations* (10 CFR) 50.43(e) states that applications that use simplified, inherent, passive, or other innovative means to accomplish their safety functions will be approved only if sufficient data exist on the safety features of the design to assess the analytical tools used for safety analyses over a sufficient range of normal operating conditions, transient conditions, and specified accident sequences. The NuScale design credits a passive decay heat removal system (DHRS) that operates on the principle of natural circulation to provide core cooling following transients and accidents. The DHRS is therefore one of the design features relied upon to meet GDC 10 and GDC 15.

TR-0516-49416-P, Section 5.3.1, describes the KAIST experiments, which formed part of the validation of the NuScale NRELAP5 DHRS model. TR-0516-49416-P concludes that the assessment shows reasonable to excellent agreement between calculated NRELAP5 and KAIST measured data. While the staff observes the agreement is generally good, the staff is of the opinion that the assessed quantities (condensed liquid flows, heat transfer coefficients, and inner wall temperatures) do not provide adequate assurance of qualification of the NRELAP5 DHRS model to predict {{ }}^{2(a),(c)}, so additional information is therefore necessary to support a finding on GDC 10 and 15. Please provide additional justification of the qualification of the NRELAP5 DHRS model for this purpose, such as a plot of measured versus calculated total heat transfer as a function of pressure {{ }}^{2(a),(c)}. Update TR-0516-49416-P as appropriate.

NuScale Response:

The NRELAP5 assessment of the KAIST (Korea Advanced Institute of Science and Technology) test data was updated to add the calculation of the measured and predicted total heat transfer rate of the test section. An error on the measured inner wall temperature uncertainty band was also corrected. The updated assessment was performed using NRELAP5 v1.4.

Measured and Predicted Total Heat Transfer Rates of the Test Section

Measured and predicted total heat transfer rates of the test section are compared in Table-1. Figure 1 shows the measured and predicted total heat transfer rates as a function of pressure. Figure 2 shows the ratio of predicted/measured total heat transfer rates as a function of pressure.

The total measured heat transfer rate of the test section was calculated based on experimental data for each of the evaluated KAIST test cases and compared with the NRELAP5 predicted total heat transfer rate.

To perform the total measured heat transfer calculation, first, the heat flux was calculated based on the bulk fluid temperature, inner wall temperature and heat transfer coefficient at various elevations where the test data were available. These three parameters were reported as part of the experimental data in Reference 1. The total heat transfer over the entire test section was then calculated using the heat flux and heat transfer area.

The total heat transfer rate predicted by NRELAP5 was calculated through the sum of the heat transfer rates through each of the test section's heat structure node in the NRELAP5 model.

{{

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

Table 1, Figure 1, and Figure 2 demonstrate that the NRELAP5 predictions on high pressure pure steam condensation are in the "Reasonable-to-Excellent Agreement" range with the KAIST measured experimental data.

Table 1. Measured and predicted total heat transfer rates of the test section

{{

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

{{

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

Figure 1. Comparison of measured and predicted total heat transfer rates vs. pressure

{{

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

Figure 2. Ratio of predicted/measured total heat transfer rates vs. pressure

Correction of the Measured Inner Wall Temperature Uncertainty Band

The inner wall measurement temperature uncertainty is {{ }}^{2(a),(c)} as determined by KAIST.
{{

}}^{2(a),(c)} Figure 5-2 of the KAIST assessment results in the non-LOCA topical report (TR-0516-49416-P) was revised to show the updated results as indicated at the end of this response.



References

1. Kim, S.J., "Turbulent film condensation of high pressure steam in a vertical tube of Passive Secondary Condensation System," PhD Thesis, Korea Advanced Institute of Science and Technology, 2000.

Impact on Topical Report:

Topical Report TR-0516-49416, Non-Loss of Coolant Accident Analysis Methodology, has been revised as described in the response above and as shown in the markup provided in this response.

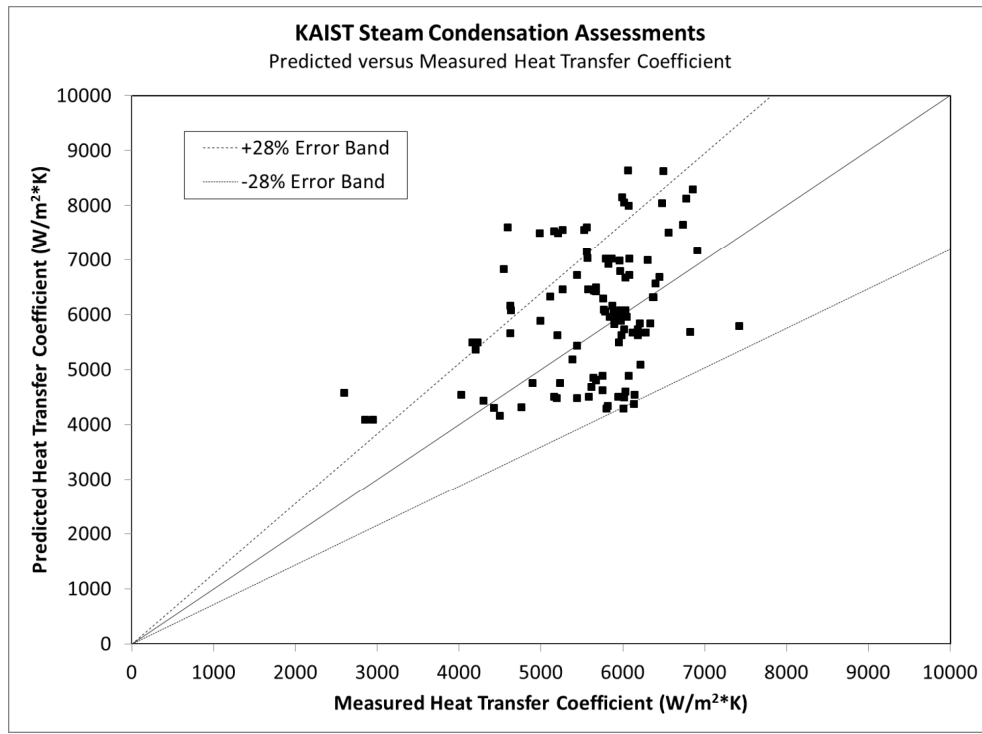


Figure 5-2 Measured vs predicted heat transfer coefficient



Enclosure 3:

Affidavit of Zackary W. Rad, AF-0818-61587

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 non-loss of coolant accident analysis methodology.

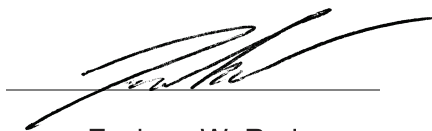
NuScale has performed significant research and evaluation to develop a basis for this method and has invested significant resources, including the expenditure of a considerable sum of money.

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. 9513, eRAI 9513. 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 28, 2018.



Zackary W. Rad