November 15, 2017

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. 232 (eRAI No. 9113) on the NuScale Design Certification Application

REFERENCE: U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 232 (eRAI No. 9113)," dated September 21, 2017

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 Questions from NRC eRAI No. 9113:

- 03.06.03-1
- 03.06.03-4
- 03.06.03-5
- 03.06.03-6
- 03.06.03-7
- 03.06.03-8
- 03.06.03-10

Enclosure 1 is the proprietary version of the NuScale Response to NRC RAI No. 232 (eRAI No. 9113). 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 Marty Bryan at 541-452-7172 or at mbryan@nuscalepower.com.

Sincerely,

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

Distribution: Gregory Cranston, NRC, OWFN-8G9A
Samuel Lee, NRC, OWFN-8G9A
Marieliz Vera, NRC, OWFN-8G9A

Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 9113, proprietary

Enclosure 2: NuScale Response to NRC Request for Additional Information eRAI No. 9113, nonproprietary

Enclosure 3: Affidavit of Zackary W. Rad, AF-1117-57191

Enclosure 1:

NuScale Response to NRC Request for Additional Information eRAI No. 9113, proprietary

Enclosure 2:

NuScale Response to NRC Request for Additional Information eRAI No. 9113, nonproprietary

NuScale Power

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

eRAI No.: 9113
Date of RAI Issue: 09/21/2017

NRC Question No.: 03.06.03-1

Final Safety Analysis Report (FSAR) Section 3.6.2.1.2 mentions the use of Alloy 690 base material but there is no mention of Alloy 690 or Alloy 52/152 welds in FSAR Section 3.6.3.2.3 or conducting leak-before-break (LBB) evaluations at those locations. Some Alloy 52/152 welds can have lower toughness than stainless steel, so please identify where Alloy 690 base material and Alloy 52/152 weld material is used in the piping systems (including nozzles) which NuScale proposes to qualify for LBB.

Revise the FSAR to include information, if applicable, identifying where Alloy 690/152/52 is used in the NuScale piping systems and the LBB analysis for those locations.

NuScale Response:

The Feedwater and Main Steam piping is austenitic stainless steel, welded to Alloy 690 base metal safe ends using a stainless steel GTAW / TIG weld. The safe end is welded to an SA-508 Grade 3 Class 2 RPV nozzle using Alloy 52 / 152 weld material. The piping system includes the piping and the piping to safe end weld, but not the safe end to nozzle weld.

The thickness, cross sectional area, and the section modulus of the nozzle, safe end, and the safe end to nozzle weld, are greater than those of the piping and the piping to safe end weld. Accordingly, the stresses at the nozzle, the safe end, and the safe end to nozzle weld due to the tensile force or bending moments are lower than those at the piping or piping to safe end weld. Because of these lower stresses, the nozzle, safe end, and the safe end to the nozzle weld are less likely to initiate a circumferential crack than the piping and the piping to the safe end weld. As a result, the nozzle, the safe end, and the safe end to the nozzle weld are not included in the LBB analysis.

The location selection for the LBB analysis is consistent with the location selection for LBB bounding curve development in the AP1000 DCD Rev 19, Chapter 3, Appendix 3B “Leak-before-break Evaluation of the AP1000 Piping” (Reference 1). As listed in Table 3B-1 of the AP1000 DCD, the LBB bounding curve development does not include any safe ends, nozzles,

or safe end to nozzle welds. Only piping base metal materials are considered in the AP1000 LBB analysis, even though the material used for buttering the nozzles at the stainless-to-carbon steel safe end is high nickel alloy (Section 3B.2.2 of Reference 1).

References:

1. AP1000 Design Control Document Tier 2, Revision 19, Chapter 3, Appendix 3B, Leak-before-break Evaluation of the AP1000 Piping (ADAMS Accession ML11171A435).

Impact on DCA:

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

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eRAI No.: 9113
Date of RAI Issue: 09/21/2017

NRC Question No.: 03.06.03-4

FSAR Section 3.6.3.1.6 addresses thermal aging of SS materials used in piping systems NuScale proposes to qualify for LBB. Contrary to the statement in FSAR Section 3.6.3.1.6 the fabrication of stainless steel welds in accordance with ASME Code Section III and NRC Regulatory Guide 1.31,"Control of Ferrite Content in Stainless Steel Weld Metal", this will not prevent the potential for material property degradation due to thermal aging in SS welds.

Provide additional justification regarding why material property degradation due to thermal aging in stainless steel welds does not need to be addressed in NuScale piping to be qualified for LBB, or modify the LBB analyses of such stainless steel weld locations to account for the material property degradation due to thermal aging over the design life.

NuScale Response:

NRC Regulatory Guide 1.31 Rev 4, Page 2, "Background" states the following:

> "*The staff concludes that ferrite content in the weld metal, as depicted by a ferrite number, should be between 5 and 20. This lower limit provides sufficient ferrite to avoid microfissuring in welds, whereas the upper limit provides a ferrite content adequate to offset dilution and reduce thermal aging effects."*

In addition, austenitic stainless steels welds have been extensively used in the primary coolant loop (RPVs, internals, pressurizers, SGs, and piping, and etc.) of the current US fleet of PWRs and BWRs. Thermal aging embrittlement has not been identified as an aging degradation mechanism for these welds by NUREG-1801 Rev 2 for any license renewal period.

Piping for which NuScale applies LBB is SA-312 TP304/304L. Welding process and weld filler metals for this piping are limited to the following. For clarification this statement has been added to FSAR Section 3.6.3.2.3:

Only gas tungsten arc welding (GTAW) is used for main steam and feedwater piping subject to

LBB qualification and the weld filler metals are limited to the following:

- *SFA-5.9: ER308, ER308L, ER316, ER316L*
- *SFA-5.30: IN308, IN308L, IN316, IN316L*

The maximum carbon content of the LBB piping and weld filler metals is limited to 0.03%. Both the piping and weld filler metals are bounded by BWR and PWR operating experience.

Because Type 316/316L contains about 2% to 3% molybdenum, which increases thermal embrittlement tendency of austenitic stainless steel welds, NuScale has supplemented the FSAR Section 3.6.3.1.6 with following:

> "*Delta ferrite for austenitic stainless steel weld filler metals with low molybdenum content such as Type 308/308L is limited to 5FN to 20FN. Delta ferrite for austenitic stainless weld filler metals with higher molybdenum content such as Type 316/316L is limited to 5FN to 16FN.*"

The above delta ferrite control for LBB piping is consistent with delta ferrite control in AP1000 DCD Rev 19, Section 5.2.3.4.6, which covers the AP1000 reactor coolant piping welds.

Impact on DCA:

FSAR Tier 2 Section 3.6.3.1.6 and Section 3.6.3.2.3 have been revised as described in the response above and as shown in the markup provided with this response.

High-cycle Fatigue

Main steam and feedwater piping design requirements also ensure the piping is not susceptible to high-cycle fatigue due to vibration. The main steam and feedwater lines are part of the reactor module and are included within the scope of the NuScale CVAP, see Section 3.9.2. Piping systems that meet the screening criteria for applicable flow induced vibration mechanisms are evaluated in the analysis program. If a large margin of safety is not demonstrated, prototype testing is performed in accordance with the CVAP measurement program.

3.6.3.1.6 Thermal Aging Embrittlement

RAI 03.06.03-4

No cast steel is used for the main steam and feedwater piping. Wrought austenitic stainless steel is used. This product form is not susceptible to thermal aging embrittlement at the maximum design temperature of the piping. ~~The stainless steel welds are also not susceptible to thermal aging embrittlement because they are fabricated in accordance with Section III of the ASME B&PV Code and U.S. NRC Regulatory Guide 1.31.~~ To minimize thermal aging embrittlement in austenitic stainless steel welds, delta ferrite content is controlled using the methods in RG 1.31. Delta ferrite for austenitic stainless steel weld filler metals with low molybdenum content such as Type 308/308L is limited to 5FN to 20FN. Delta ferrite for austenitic stainless weld filler metals with higher molybdenum content such as Type 316/316L is limited to 5FN to 16FN.

3.6.3.1.7 Thermal Stratification

Thermal stratification in piping occurs when fluid at a significantly different temperature is introduced into a long horizontal run of piping. The main steam and feedwater lines inside the CNV do not have long horizontal runs and are therefore not susceptible to thermal stratification. (See Figure 3.6-2, Figure 3.6-3, Figure 3.6-4 and Figure 3.6-5)

3.6.3.1.8 Irradiation Effects

The main steam and feedwater piping materials, including austenitic stainless steels and compatible stainless steel welds, are not susceptible to irradiation embrittlement at the radiation levels outside the reactor vessel.

The main steam and feedwater piping is not susceptible to Irradiation Assisted Stress Corrosion Cracking (IASCC) due to its low fluence. IASCC typically affects components such as core support structures in regions with high fluence, near the core and inside the reactor vessel. Because the main steam and feedwater piping is outside of the reactor vessel and above the core, the fluence is insufficient to be an IASCC concern.

The feedwater piping is evaluated in four segments:

Section Geometry	Nominal Inside Diameter (in.)	Nominal Thickness t, (in.)
NPS 5, SCH 120 straight and curved pipe base metal	4.563	0.500
NPS 5, SCH 120 pipe-to-pipe, pipe-to-tee, pipe-to-safe-end, tee-to-tee welds	4.563	0.500
NPS 4, SCH 120 straight and curved pipe base metal	3.624	0.438
NPS 4, SCH 120 pipe-to-tee pipe-to-safe-end welds	3.624	0.438

3.6.3.2.2 Operating Conditions and Load

The operating pressure and temperature for the MSS piping are 500 psia and 585 degrees F, respectively.

The operating pressure and temperature for the FWS piping are ~~550~~525 psia and 300 degrees F, respectively.

3.6.3.2.3 Materials

RAI 03.06.03-4

The MSS piping base metal is made of SA-312 and SA-182 Grade TP304/TP304L (dual certified). The pipe-to-pipe weld and pipe-to-safe-end weld are both made with austenitic stainless steel weld filler material ~~that is compatible with the base metals as specified by the design specification~~. The tensile material properties used in the analysis of MSS materials are either at 550 degrees F or 585 degrees F. It is acceptable to use material properties at 550 degrees F to approximate the material properties at the actual operating temperature (585 degrees F) because the variations in the material properties between these temperatures are insignificant.

RAI 03.06.03-4

The FWS piping base metal is made of SA-312 Grade TP304/TP304L. The pipe-to-pipe, pipe-to-safe-end, pipe-to-tee, tee-to-tee welds are made with austenitic stainless steel weld filler material ~~that is compatible with the base metals as specified by the design specification~~. The tensile material properties used in the analysis of FWS materials are at 300 degrees F.

RAI 03.06.03-4

Only gas tungsten arc welding (GTAW) is used for main steam and feedwater piping subject to LBB qualification and the weld filler metals are limited to the following:

- SFA-5.9: ER308, ER308L, ER316, ER316L
- SFA-5.30: IN308, IN308L, IN316, IN316L

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NRC Question No.: 03.06.03-5

FSAR Section 3.6.3.2.1 states that six segments are analyzed for the MS system. These segments include:

- NPS 8" piping connecting perpendicularly to NPS 12" piping and
- A transition where NPS 12" piping reduces to be welded to a NPS 8" elbow

Provide information if the LBB analyses were conducted with postulated crack locations at the following locations, (i) the perpendicular connection between NPS 8" and NPS 12" pipes (Refer to Figures 3.6.2 and 3.6.3 pipe segments 'a' and 'd' respectively shown below) and (ii) the girth welds of the reducer from NPS 12" to NPS 8" elbow shown below (Refer to Figures 3.6.2/3.6.3 segment 'd' and elbow 'f' respectively)

NuScale Response:

At the perpendicular connection between NPS 8 and NPS 12 pipes, cracks were postulated at locations B1, B2, and B3 as shown in Figure 1 below. At the weld between the reducer and elbow, a crack was postulated at location W1. Cracks at B1 and B2 were included in FSAR Section 3.6.3.2.1 "NPS 12, SCH 120 straight and curved pipe base metal." The crack at B3 was included in "NPS 8, SCH 120 straight and curved pipe base metal." The crack at W1 was included in "NPS 8, SCH 120 pipe-to-pipe weld." Figure 2 through Figure 4 show the resultant Smooth Bounding Analysis Curves (SBAC) and calculated normal and maximum stresses at these locations. Because the stress points are below the SBAC, these locations meet the LBB criteria.

Note that these stress points are illustrated in the SBAC figures as submitted in the FSAR, Figure 3.6-26, Figure 3.6-23, and Figure 3.6-24.

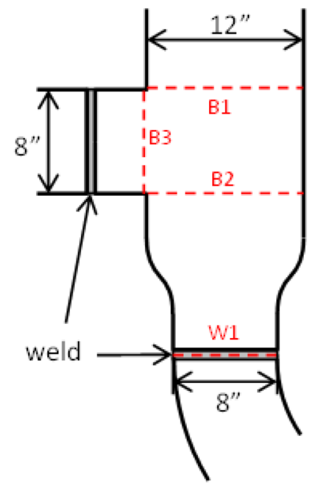

Figure 1: Reducer Tee and postulated cracks

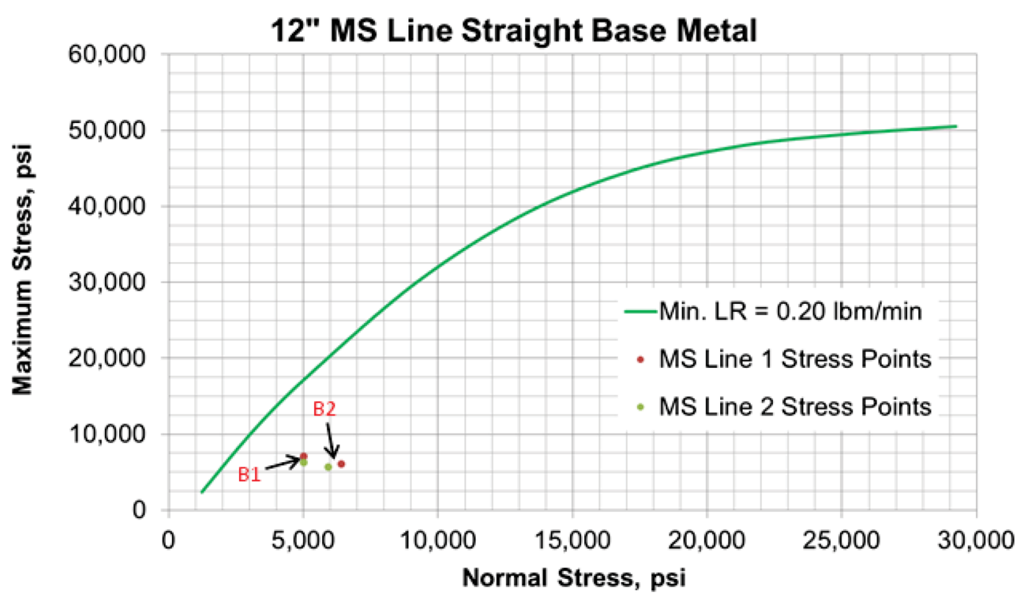

Figure 2: SBAC and stress points at locations B1 and B2

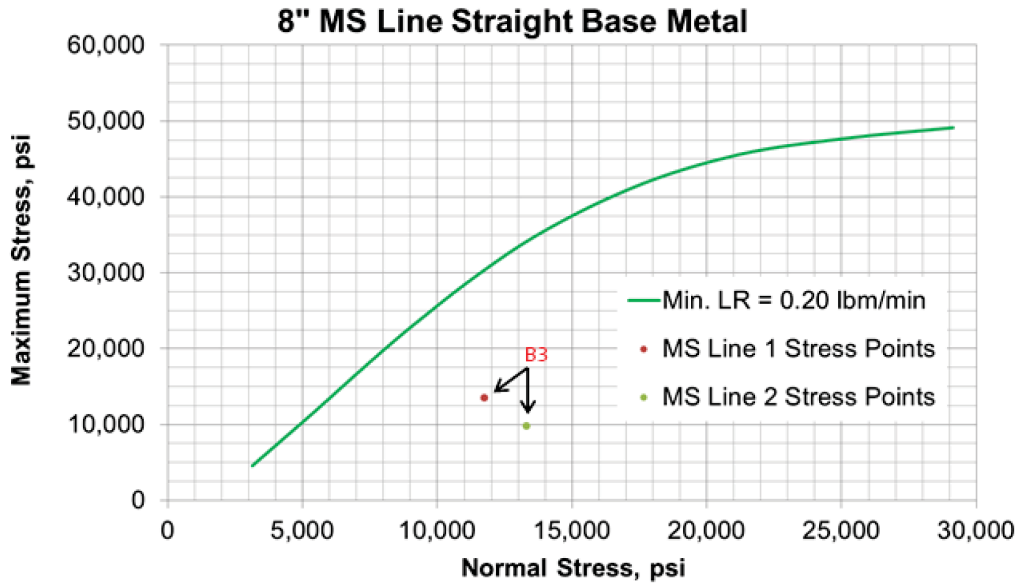

Figure 3: SBAC and stress point at location B3

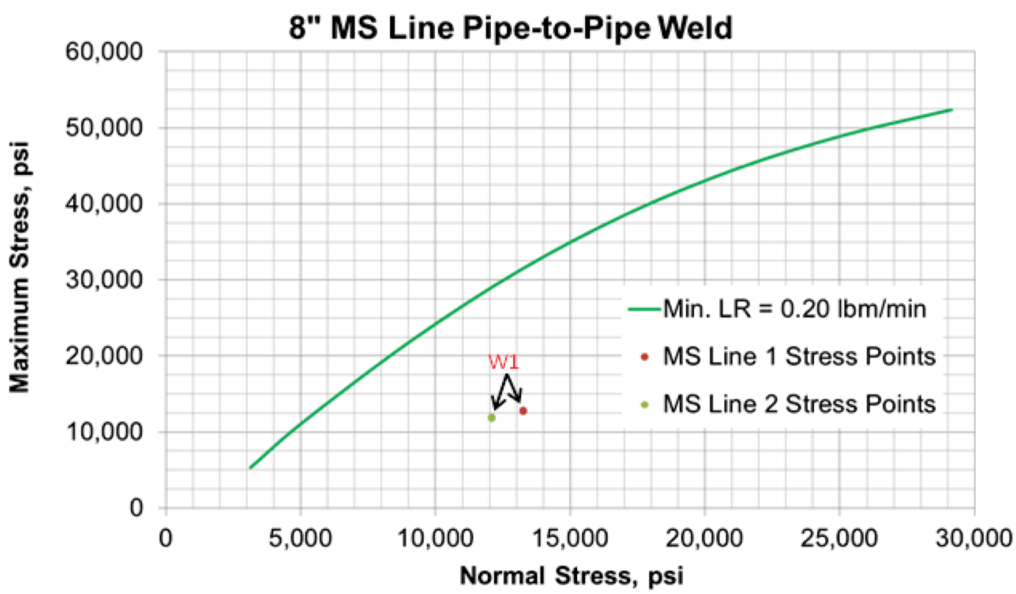

Figure 4: SBAC and stress point at location W1

Impact on DCA:

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

NuScale Power

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eRAI No.: 9113
Date of RAI Issue: 09/21/2017

NRC Question No.: 03.06.03-6

FSAR Section 3.6.3.2.4 describes the procedure used to estimate the weld metal minimum yield strength which is needed for conducting the limit-load analysis described in FSAR Section 3.6.3.3.2. The use of weld metal strength in LBB fracture analysis is typically not done since it can be non-conservative. There are several questions relative to this item;

1. Please explain if the weld metal strength was used in the analyses and if so, why?
2. Also, the LBB fracture analysis depends on the type of weld process used, i.e., SAW, SMAW, etc. Please specify what welding process will be used.
3. If the welds are SAW or SMAW weld processes, then these locations should be analyzed using elastic plastic fracture mechanics (EPFM) analysis rather than limit-load analysis.
4. Revise the LBB analysis if necessary, based on the responses to (1) through (3).

NuScale Response:

1. In the feedwater and main steam piping LBB analysis, the piping base metal and the piping to the safe end weld are considered. The weld metal minimum yield strength and minimum ultimate strength are provided in FSAR Section 3.6.3.2.4. Weld metal strength was used in LBB analysis because it was unknown if the SBAC for the weld would be bounded by that of the base metal. The results shown in the FSAR Figure 3.6-23 through 3.6-27 and FSAR Figure 3.6-29 through Figure 3.6-32 verified that the bounding analysis curves for the weld are overall higher than the bounding analysis curves for the base metal.
2. Gas tungsten arc welding (GTAW) is used for main steam and feedwater piping subject to LBB qualification.
3. The welds are neither SAW nor SMAW. Therefore, it is appropriate to use limit-load analysis.
4. Welding process and weld filler metals for the LBB piping have been added to FSAR Section 3.6.3.2.3 as shown below (see markup in response to RAI 9113 Question 03.06.03-4):

Only gas tungsten arc welding (GTAW) is used for main steam and feedwater piping subject to LBB qualification and the weld filler metals are limited to the following:

- *SFA-5.9: ER308, ER308L, ER316, ER316L*
- *SFA-5.30: IN308, IN308L, IN316, IN316L*

Impact on DCA:

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

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eRAI No.: 9113
Date of RAI Issue: 09/21/2017

NRC Question No.: 03.06.03-7

In FSAR Section 3.6.3.2.5, values for some of the listed crack morphology parameters (i.e., roughness, number of turns, flow path/thickness ratio) are for air fatigue cracks and others are for Intergranular Stress Corrosion Cracking (IGSCC) flaws. However, NUREG/CR-6004 also identifies other degradation mechanisms (e.g., corrosion or thermal fatigue) that could result in different crack morphology parameters.

Provide a description and justification for the crack morphology used.

NuScale Response:

The table in FSAR Section 3.6.3.2.5 is expanded in Table 1 below to indicate the source information.

Because the base metal and weld are austenitic stainless steel in the main steam and feedwater piping (see FSAR Section 3.6.3.2.3), only stainless steel parameters are used in the LBB analysis. Per NUREG/CR-6004 Sections 3.2.1 through 3.2.4, the cracking mechanisms applicable to stainless steel are IGSCC and fatigue in air. Other cracking mechanisms like corrosion fatigue and thermal fatigue are only applicable to carbon steel. NUREG/CR-6004 Section 3.2.4 mentions an evaluation of a thermal fatigue crack in cast stainless steel. However, this cracking mechanism is not applicable to NuScale's main steam and feedwater piping because no cast stainless steel is used for this piping (see FSAR Section 3.6.3.1.6).

Table 1: Crack morphology parameters

Parameter (Units)	Value	Source (NUREG/CR-6004)	
		Table number	Mechanism
Global roughness (μinch)	1325	Table 3.3 [part (b)]	fatigue in air
Local roughness (μinch)	317	Table 3.3 [part (b)]	fatigue in air
Number of 90-degree turns (inch^{-1})	64	Table 3.5 [part (b)]	fatigue in air
Global path deviation: K_G	1.07	Table 3.7	IGSCC (average)
Global and local path deviation: K_{G+L}	1.33	Table 3.7	IGSCC (average)

For the parameters K_G and K_{G+L} in Table 1, although the main steam and feedwater piping is not susceptible to SCC (see FSAR Section 3.6.3.1.2), the values used are from stainless steel in IGSCC crack mechanism, because there is no path deviation data for the mechanism of fatigue in air. Using the values from the IGSCC condition is more conservative than using the values from fatigue in air.

As confirmation, a test LBB analysis was performed using the values from NUREG/CR-6004 Table 3.8, for corrosion fatigue in carbon steel. The results were compared in Figure 1, which shows that the SBAC is not sensitive to the path deviation parameter. Using these values from IGSCC in stainless steel gives a more conservative SBAC than using the values from corrosion fatigue in carbon steel. Therefore, it is conservative to use the values in FSAR Section 3.6.3.2.5 in NuScale's LBB analysis.

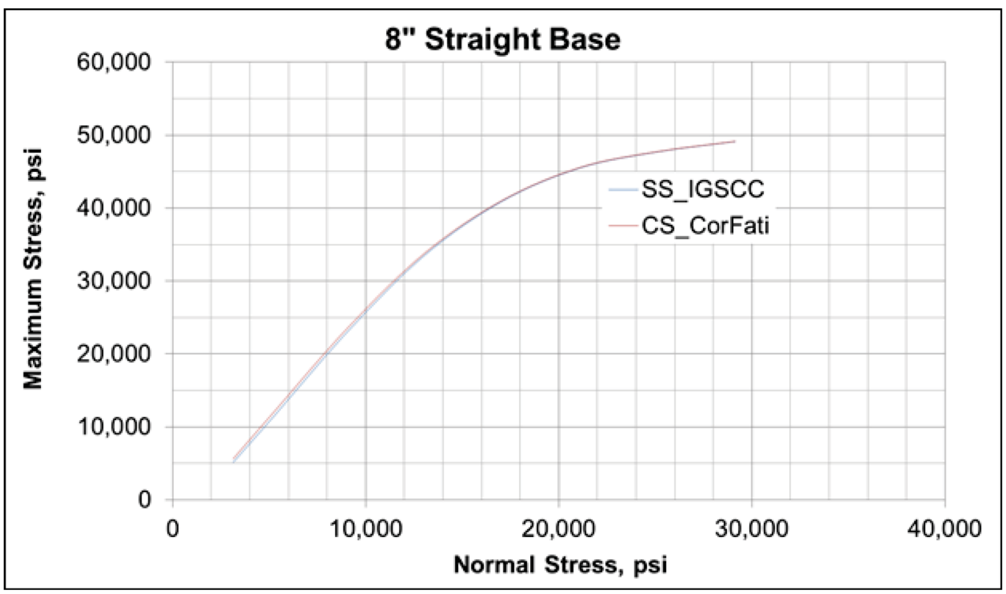

Figure 1: SBACs comparison using various path deviation parameters

Impact on DCA:

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

NuScale Power

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Date of RAI Issue: 09/21/2017

NRC Question No.: 03.06.03-8

The leak-rate methodology is described in FSAR Section 3.6.3.3.3. No moment versus leak-rate curves are provided in any of the LBB analysis cases. These curves are an intermediate step in the LBB analyses procedure and are needed to verify the margin of safety associated with the Smooth Bounding Analysis Curve (SBAC) approach described in FSAR Section 3.6.3.3.5. Provide the moment versus leak-rate curves for the LBB cases.

NuScale Response:

FSAR Table 3.6-3a lists the main steam piping stress points calculated using the approaches described in FSAR Section 3.6.3.3.5. This table was established by fixing leak rate at 0.2 lbm/min (or 2.0 lbm/min after the margin of 10 is applied) in the third step of Section 3.6.3.3.5.

To show the moment versus leak-rate curve, the fourth stress point from the column "NPS 8 base metal" (normal stress: 13,136 psi; maximum stress: 33,733 psi) is taken as an example in the following analysis. At this stress point, the calculated crack length is {{ }}[2(a),(c)].

A fracture mechanics and leak rate analysis was performed for a crack length of {{ }}[2(a),(c)]. By assigning various normal stresses, the corresponding bending moments (described in FSAR Section 3.6.3.3.5 Step 6) and leak rates are calculated as listed in Table 1 below. The resultant bending moments versus leak rates are illustrated in Figure 1. In these data points, the calculated leak rates increase with the assigned normal stresses. At data point P5, the calculated leak rate reaches 2.0 lbm/min, corresponding to the safety margin of 10 for the 0.2 lbm/min leak detection capability. Therefore, the normal stress from point P5 (13,136 psi) is determined as the normal stress being used in the fourth stress point mentioned in the paragraph above.

Table 1: Leak rate analysis data

{{

}}2(a),(c)

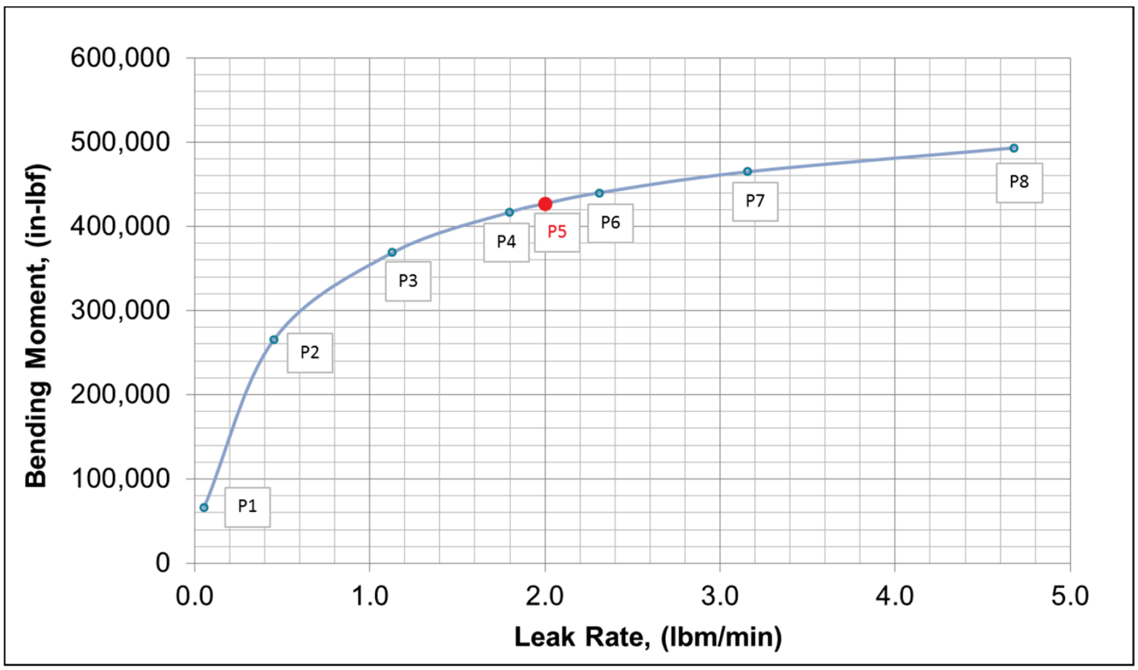

Figure 1: Bending moment versus leak rate

Impact on DCA:

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

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Date of RAI Issue: 09/21/2017

NRC Question No.: 03.06.03-10

FSAR Section 3.6.3.4.1.6 discusses the load limit analysis for the NPS 8 elbow base metal, however, it does not specify the type and location of crack being analyzed which is critical for an elbow as opposed to a straight pipe. Please clarify if this is a circumferential crack by the girth weld of the elbow, or centered on the extrados, or is it an axial crack on the flank of the elbow.

NuScale Response:

The crack analyzed for the NPS 8 elbow is the through-wall circumferential crack at extrados, as shown in Figure 1 below.

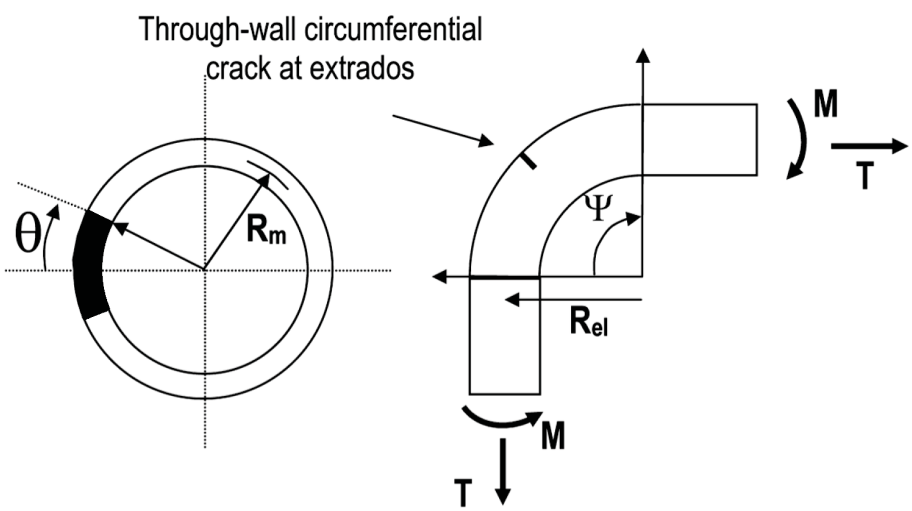

Figure 1: Crack geometry considered for elbows

Impact on DCA:

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

Enclosure 3:

Affidavit of Zackary W. Rad, AF-1117-57191

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 and analyses by which NuScale evaluates its power module systems.

    NuScale has performed significant research and evaluation to develop a basis for this method and analyses 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. 232, eRAI No. 9113. 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 11/15/2017.

Zackary W. Rad