September 19, 2019

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 Submittal of Changes to Final Safety Analysis Report, Tier 1, Section 3.11, "Reactor Building" and Section 3.13, "Control Building," and Tier 2, Section 3.8.4, "Design of Category I Structure" and Section 14.3, "Certified Design Material and Inspections, Tests, Analyses, and Acceptance Criteria"

REFERENCES: Letter from NuScale Power, LLC to Nuclear Regulatory Commission, "NuScale Power, LLC Submittal of the NuScale Standard Plant Design Certification Application, Revision 3," dated September 22, 2019 (ML19241A315)

During several public teleconferences with the NRC Project manager and NRC reviewers, NuScale Power, LLC (NuScale) discussed potential updates to Final Safety Analysis Report (FSAR), Tier 1, Section 3.11, "Reactor Building" and Section 3.13, "Control Building," and Tier 2, Section 3.8.4, "Design of Category I Structure" and Section 14.3, "Certified Design Material and Inspections, Tests, Analyses, and Acceptance Criteria". As a result of this discussion, NuScale changed Tier 1, Sections 3.11 and 3.12 and Tier 2, Sections 3.8.4 and 14.3. The Enclosure to this letter provides a mark-up of the FSAR pages incorporating revisions in redline/strikeout format. NuScale will include this change as part of a future revision to the NuScale Design Certification Application.

This letter makes no regulatory commitments or revisions to any existing regulatory commitments.

If you have any questions, please feel free to contact Nadja Joergensen at 541-452-7338 or at njoergensen@nuscalepower.com.

Sincerely,

Zackary W. Rad
Director, Regulatory Affairs
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Enclosure: NuScale Power, LLC Submittal of Changes to Final Safety Analysis Report, Tier 1, Section 3.11, "Reactor Building" and Section 3.13, "Control Building," and Tier 2, Section 3.8.4, "Design of Category I Structure" and Section 14.3, "Certified Design Material and Inspections, Tests, Analyses, and Acceptance Criteria"

Enclosure:

NuScale Power, LLC Submittal of Changes to Final Safety Analysis Report, Tier 1, Section 3.11, “Reactor Building” and Section 3.13, “Control Building,” and Tier 2, Section 3.8.4, “Design of Category I Structure” and Section 14.3, “Certified Design Material and Inspections, Tests, Analyses, and Acceptance Criteria”

RAI 14.03-3, RAI 14.03.02-3, RAI 14.03.03-1, RAI 14.03-3, RAI 14.03.03-11S1

Table 3.11-2: Reactor Building Inspections, Tests, Analyses, and Acceptance Criteria

No.	Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1	Fire and smoke barriers provide confinement so that the impact from internal fires, smoke, hot gases,or fire suppressants is contained within the RXB fire area of origin.	An inspection will be performed of the RXB as-built fire and smoke barriers.	The following RXB fire and smoke barriers exist in accordance with the fire hazards analysis, and have been qualified for the fire rating specified in the fire hazards analysis: • fire-rated doors • fire-rated penetration seals • fire-rated dampers • fire-rated walls, floors, and ceilings • smoke barriers
2	Internal flooding barriers provide confinement so that the impact from internal flooding is contained within the RXB flooding area of origin.	An inspection will be performed of the RXB as-built internal flooding barriers.	The following RXB internal flooding barriers exist in accordance with the internal flooding analysis report and have been qualified as specified in the internal flooding analysis report: • flood resistant doors • curbs and sills • walls • water tight penetration seals • National Electrical Manufacturer's Association enclosures
3	The Seismic Category I RXB is protected against external flooding in order to prevent flooding of safety-related SSC within the structure.	An inspection will be performed of the RXB as-built floor elevation at ground entrances.	The RXB floor elevation at ground entrances is higher than the maximum external flood elevation.
4	The RXB includes radiation shielding barriers for normal operation and post-accident radiation shielding.	An inspection and analysis will be performed of the as-built RXB radiation shielding barriers.	A report exists and concludes the radiation attenuation capability of RXB radiation shielding barriers is greater than or equal to the required attenuation capability of the approved design.
5	The RXB includes radiation attenuating doors for normal operation and for post-accident radiation shielding. These doors have a radiation attenuation capability that meets or exceeds that of the wall within which they are installed.	An inspection will be performed of the as-built RXB radiation attenuating doors.	The RXB radiation attenuating doors are installed in their design location and have a radiation attenuation capability that meets or exceeds that of the wall within which they are installed.

Table 3.11-2: Reactor Building Inspections, Tests, Analyses, and Acceptance Criteria (Continued)

No.	Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6	The RXB is Seismic Category I and maintains its structural integrity under the design basis loads.	~~i. An inspection and analysis will be performed of the as-built RXB.~~ ~~ii. An inspection will be performed of the as-built RXB.~~A reconciliation analysis will be performed of the as-built RXB under the actual design basis loads.	~~i.~~A design summary report exists and concludes that~~ the~~ (1) the as-built RXB maintains its structural integrity in accordance with the approved design under the actual design basis loads, and (2) the in-structure responses for the as-built RXB are enveloped by those in the approved design. ~~deviations between the drawings used for construction and the as-built RXB have been reconciled, and the RXB maintains its structural integrity under the design basis loads and that all demand to capacity ratios are less than 1.0 (i.e. D/C < 1.0).~~ ~~ii.The dimensions of the RXB critical sections conform to the approved design.~~
7	Non-Seismic Category I SSC located where there is a potential for adverse interaction with the RXB or a Seismic Category I SSC in the RXB will not impair the ability of Seismic Category I SSC to perform their safety functions during or following a SSE.	An inspection and analysis will be performed of the as-built non-Seismic Category I SSC located where there is a potential for adverse interaction with the RXB or a Seismic Category I SSC in the RXB.	A report exists and concludes that the Non-Seismic Category I SSC located where there is a potential for adverse interaction with the RXB or a Seismic Category I SSC in the RXB will not impair the ability of Seismic Category I SSC to perform their safety functions during or following an SSE as demonstrated by one or more of the following criteria: • Seismic Category I SSC are isolated from non-Seismic Category I SSC, so that interaction does not occur. • Seismic Category I SSC are analyzed to confirm that the ability to perform their safety functions is not impaired as a result of impact from non-Seismic Category I SSC. • A non-Seismic Category I restraint system designed to Seismic Category I requirements is used to assure that no interaction occurs between Seismic Category I SSC and non-Seismic Category I SSC.
8	Safety-related SSC are protected against the dynamic and environmental effects associated with postulated failures in high- and moderate-energy piping systems.	An inspection and analysis will be performed of the as-built high- and moderate-energy piping systems and protective features for the safety-related SSC located in the RXB outside the Reactor Pool Bay.	Protective features are installed in accordance with the as-built Pipe Break Hazard Analysis Report and safety-related SSC are protected against or qualified to withstand the dynamic and environmental effects associated with postulated failures in high- and moderate-energy piping systems.

RAI 14.03-3, RAI 14.03.02-3

Table 3.13-1: Control Building Inspections, Tests, Analyses, and Acceptance Criteria

No.	Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1	Fire and smoke barriers provide confinement so that the impact from internal fires, smoke, hot gases, or fire suppressants is contained within the CRB fire area of origin.	An inspection will be performed of the CRB as-built fire and smoke barriers.	The following CRB fire and smoke barriers exist in accordance with the fire hazards analysis, and have been qualified for the fire rating specified in the fire hazards analysis: • fire-rated doors • fire-rated penetration seals • fire-rated dampers • fire-rated walls, floors, and ceilings • smoke barriers
2	Internal flooding barriers provide confinement so that the impact from internal flooding is contained within the CRB flooding area of origin.	An inspection will be performed of the CRB as-built internal flooding barriers.	The following CRB internal flooding barriers exist in accordance with the internal flooding analysis report and have been qualified as specified in the internal flooding analysis report: • flood resistant doors • walls • water tight penetration seals • National Electrical Manufacturer's Association (NEMA) enclosures
3	The Seismic Category I CRB is protected against external flooding in order to prevent flooding of safety-related SSC within the structure.	An inspection will be performed of the CRB as-built floor elevation at ground entrances.	The CRB floor elevation at ground entrances is higher than the maximum external flood elevation.
4	The CRB at Elevation 120'-0" and below (except for the elevator shaft, the stairwells, and the fire protection vestibule which are Seismic Category II) is Seismic Category I and maintains its structural integrity under the design basis loads.	~~i. An inspection and analysis will be performed of the as-built CRB.~~ ~~ii. An inspection will be performed of the as-built CRB at Elevation 120'-0" and below.~~A reconciliation analysis will be performed of the as-built CRB at Elevation 120'-0" and below under the actual design basis loads.	~~i.~~A design summary report exists and concludes that (1) the as-built CRB at Elevation 120'-0" and below maintains its structural integrity in accordance with the approved design under the actual design basis loads, and (2) the in-structure responses for the as-built CRB at Elevation 120'-0" and below are enveloped by those in the approved design.~~the deviations between the drawings used for construction and the as-built CRB have been reconciled, and the CRB at Elevation 120'-0" and below (except for the elevator shaft, the stairwells, and the fire protection vestibule) maintains its structural integrity under the design basis loads and that all demand to capacity ratios are less than 1.0 (i.e. D/C < 1.0).~~ ~~ii. The dimensions of the CRB critical sections conform to the approved design.~~

category I steel structures. Load combination comparisons are performed on a case by case basis between AISC N690-1994 including Supplement 2 (2004) and AISC N690-2012 for verification that AISC N690-2012 provides the governing case.

Appendix 3B, Reactor Building and Control Building Design Approach and Critical Section Details, provides results for selected sections of both the RXB and CRB.

Section 3.8.5.5 identifies acceptance criteria applicable to additional basemat load combinations.

RAI 03.08.04-1, RAI 03.08.04-1S1

The RFT stand and upper support structure are Seismic Category I (SC- I) structures, and are designed and demonstrated via analysis to meet the requirements of an SC-I structure. They are therefore designed and analyzed to meet the requirements of supporting the lower reactor pressure vessel during an SSE, and to meet the requirements of Subsection NF of ASME Boiler and Pressure Vessel Code, Section III, Division 1 (Reference 3.8.4-9) rules and criteria. The load combinations used for the design of the structural members are shown in Table 3.8.4-23.

RAI 03.08.04-1

Per Subsubparagraph NF-3256.2(a)(1) of ASME Boiler and Pressure Vessel Code, Section III, Division 1, "Rules for Construction of Nuclear Facility Components", 2013 Edition (Reference 3.8.4-9), the allowable stress limits for full penetration welds shall not exceed the allowable stress value for the base metal.

3.8.4.5.1 Design Summary Report

RAI 14.03-3

~~A design summary report is prepared for Seismic Category I structures documenting that the structures meet the acceptance criteria specified in Section 3.7 and Section 3.8.~~

RAI 14.03-3

~~Deviations from the design due to as-procured or as-built conditions are acceptable based on an evaluation consistent with the methods and procedures of Section 3.7 and Section 3.8 provided the following acceptance criteria are met:~~

RAI 14.03-3

- ~~the structural design meets the acceptance criteria specified in Section 3.8, and~~

RAI 14.03-3

- ~~the in-structure seismic response spectra meet the acceptance criteria specified in Section 3.7.~~

RAI 14.03-3

- ~~the seismic demand meet the acceptance criteria in Section 3.7.~~

RAI 14.03-3

~~Deviations from the design are tracked as required by 10 CFR Part 50, Appendix B, Criterion III, "Design Control."~~

RAI 14.03-3

~~Depending on the extent of the deviations, the evaluation may range from documentation of an engineering judgment to performance of a revised analysis and design. The results of the evaluation will be documented in an as-built summary report.~~

RAI 14.03-3

A Design Summary Report is prepared that documents the results of a reconciliation analysis of the cumulative effect of changes between the approved design and the actual design basis loads and as-built structural components to demonstrate that (1) the computed demand continues to be within the capacity of the structural component and (2) the as-built in-structure seismic response is enveloped by the in-structure seismic response in the approved design.

RAI 14.03-3

The Design Summary Report documents that the Seismic Category I structures meet the acceptance criteria specified in Section 3.7 and Section 3.8.

RAI 14.03-3

Deviations from the design are tracked as required by 10 CFR Part 50, Appendix B, and are evaluated consistent with the methods and procedures of Section 3.7 and Section 3.8. Deviations include changes outside applicable tolerances in load, dimension, and configuration between the approved design and as-built structure. Depending on the extent of the deviation, the evaluation may range from documentation of the basis of an engineering judgment to inclusion of the change in the performance of a revised analysis. The results of these evaluations will be documented in the Design Summary Report.

3.8.4.6 Materials, Quality Control and Special Construction Techniques

3.8.4.6.1 Materials

The principal construction materials for structures are concrete, reinforcing steel, structural steel, stainless steel, bolts, anchor bolts and weld electrodes.
Table 3.8.4-10 provides the specifics of the materials considered for the structural design.

3.8.4.6.1.1 Concrete

Structural concrete used in the Seismic Category I RXB and CRB conforms to ACI 349, as supplemented by RG 1.142, and ACI 301. The majority of the structural concrete has a minimum compressive strength (f'c) of 5000 psi. The exception is the external walls of the RXB which require a higher compressive strength of 7000 psi.

Specific concrete mix will be developed based upon site conditions. Concrete mixes are designed in accordance with ACI 211.1, using materials qualified and accepted for this work. The mix will be based on field testing of trial mixtures

RAI 09.01.04-1, RAI 09.05.01-6, RAI 14.03-3, RAI 14.03.02-1, RAI 14.03.02-2, RAI 14.03.03-1, RAI 14.03.03-6, RAI 14.03.03-7, RAI 14.03.03-8, RAI 14.03.07-1, RAI 14.03.08-1S1, RAI 14.03.09-1, RAI 14.03.09-2, RAI 14.03.09-3, RAI 14.03.12-2, RAI 14.03.12-3, RAI 18-46S1

Table 14.3-2: Shared/Common Structures, Systems, and Components and Non-Structures, Systems, and components Based Design Features and Inspections, Tests, Analyses, and Acceptance Criteria Cross Reference(1)

ITAAC No.	System	Discussion	DBA	Internal/External Hazard	Radiological	PRA & Severe Accident	FP
03.01.01	CRH	Testing is performed on the CRE in accordance with RG 1.197, "Demonstrating Control Room Envelope Integrity at Nuclear Power Reactors," Revision 0, to demonstrate that air exfiltration from the CRE is controlled. RG 1.197 allows two options for CRE testing; either integrated testing (tracer gas testing) or component testing. Section 6.4 Control Room Habitability, describes the testing requirements for the CRE habitability program. Section 6.4 provides the maximum air exfiltration allowed from the CRE. In accordance with Table 14.2-18, a preoperational test using the tracer gas test method demonstrates that the air exfiltration from the CRE does not exceed the assumed unfiltered leakage rate provided in Table 6.4-1: Control Room Habitability System Design Parameters for the dose analysis. Tracer gas testing in accordance with ASTM E741 will be performed to measure the unfiltered in-leakage into the CRE with the control room habitability system (CRHS) operating.			X		
03.01.02	CRH	The CRHS valves are tested by remote operation to demonstrate the capability to perform their function to transfer open and transfer closed under preoperational temperature, differential pressure, and flow conditions. In accordance with Table 14.2-18, a preoperational test demonstrates that each CRHS valve listed in Tier 1 Table 3.1-1 (Table 14.3-4a) strokes fully open and fully closed by remote operation under preoperational test conditions. Preoperational test conditions are established that approximate design-basis temperature, differential pressure, and flow conditions to the extent practicable, consistent with preoperational test limitations.			X		

Table 14.3-2: Shared/Common Structures, Systems, and Components and Non-Structures, Systems, and components Based Design Features and Inspections, Tests, Analyses, and Acceptance Criteria Cross Reference[1] (Continued)

ITAAC No.	System	Discussion	DBA	Internal/External Hazard	Radiological	PRA & Severe Accident	FP
03.11.06	RXB	Section 3.8.4.4, Design and Analysis Procedures, and Appendix 3B, NuScale Plant Critical Sections, provide descriptive information, including plans and sections of each Seismic Category I structure, to establish that there is sufficient information to define the primary structural aspects and elements relied upon for the structure to perform the intended safety functions. Critical dimensions are identified in Appendix 3B. The RXB and its design basis loads are discussed in Section 3.8.4.3, Loads and Load Combinations. Critical sections are the subcomponents of individual Seismic Category I structures (i.e., shear walls, floor slabs and roofs, structure-to-structure connections) that are analytically representative of an essentially complete design. Design basis load combinations are shown in Table 3.8.4-1 and Table 3.8.4-2. ~~Table 3.8.4-3 and Table 3.8.4-4 and may include:~~ • ~~D = Dead loads, including piping, equipment, and partitions.~~ • ~~F = Loads due to weight and pressures of fluids.~~ • ~~H = Loads due to weight and static pressure of soil, water in soil, or other materials.~~ • ~~L = Live loads due to occupancy and moveable equipment.~~ • ~~Lr = Roof live load.~~ • ~~Ro = Piping and equipment reaction loads.~~ • ~~Ra = Piping and equipment reaction loads due to a postulated accident.~~ • ~~To = Thermal loads due to normal operating temperatures.~~ • ~~Ta = Thermal loads due to accident condition temperatures.~~ • ~~R = Rain load.~~	X				

Table 14.3-2: Shared/Common Structures, Systems, and Components and Non-Structures, Systems, and components Based Design Features and Inspections, Tests, Analyses, and Acceptance Criteria Cross Reference(1) (Continued)

ITAAC No.	System	Discussion	DBA	Internal/External Hazard	Radiological	PRA & Severe Accident	FP
		• ~~S = Snow load.~~ • ~~Se = Extreme snow load.~~ • ~~W = Straight line wind load.~~ • ~~Wt = Loads due to the design basis tornado.~~ • ~~Wh = Loads due to the design basis hurricane.~~ • ~~Eo = Seismic load due to an operating basis earthquake.~~ • ~~Ess = Seismic load due to an SSE.~~ • ~~Ccr = Loads due to the RBC.~~ • ~~Pa = Pressure loads due to accident conditions.~~ • ~~Yj = Jet impingement load generated by a postulated pipe break.~~ • ~~Yr = Loads on the structure generated by the reaction of the broken pipe during a postulated break.~~ • ~~Ym = Missile impact load, or related internal moments and forces, on the structure generated by a postulated pipe break.~~ • ~~B = Loads due to buoyant force.~~ ~~Guidance for the content and structure of the design report is provided in Standard Review Plan Section 3.8.4, Appendix C as shown in Table 3.B-2.~~ ~~An ITAAC inspection and~~ A reconciliation analysis of the as-built RXB is performed to ensure ~~that deviations between the drawings used for construction and of the as-built RXB are reconciled and~~ the RXB maintains its structural integrity ~~under the design basis loads~~in accordance with the approved design under the actual design basis loads, and the in-structure responses for the RXB are enveloped by those in the approved design. The design summary report provides criteria for the reconciliation between design and as-built conditions, as described in Section 3.8.4.5.1. ~~An ITAAC inspection is performed of the as-built RXB to verify that the dimensions of the RXB critical sections listed in Appendix B, Table 3B-54, conform to the approved design.~~					

Table 14.3-2: Shared/Common Structures, Systems, and Components and Non-Structures, Systems, and components Based Design Features and Inspections, Tests, Analyses, and Acceptance Criteria Cross Reference(1) (Continued)

ITAAC No.	System	Discussion	DBA	Internal/External Hazard	Radiological	PRA & Severe Accident	FP
03.13.04	CRB	Section 3.8.4.4, Design and Analysis Procedures, and Appendix 3B, NuScale Plant Critical Sections, provide descriptive information, including plans and sections of each Seismic Category I structure, to establish that there is sufficient information to define the primary structural aspects and elements relied upon for the structure to perform the intended safety functions. Critical dimensions are identified in Appendix 3B. The CRB at Elevation 120'-0" and below and its design basis loads are discussed in Section 3.8.4.3, Loads and Load Combinations. Critical sections are the subcomponents of individual Seismic Category I structures (i.e., shear walls, floor slabs and roofs, structure-to-structure connections) that are analytically representative of an essentially complete design. Design basis loads load combinations are shown in Table 3.8.4-1 and Table 3.8.4-2~~, Table 3.8.4-3 and Table 3.8.4-4 and may include:~~	X				

Table 14.3-2: Shared/Common Structures, Systems, and Components and Non-Structures, Systems, and components Based Design Features and Inspections, Tests, Analyses, and Acceptance Criteria Cross Reference[1] (Continued)

ITAAC No.	System	Discussion	DBA	Internal/External Hazard	Radiological	PRA & Severe Accident	FP
		• ~~D = Dead loads, including piping, equipment, and partitions.~~ • ~~F = Loads due to weight and pressures of fluids.~~ • ~~H = Loads due to weight and static pressure of soil, water in soil, or other materials.~~ • ~~L = Live loads due to occupancy and moveable equipment.~~ • ~~Lr = Roof live load.~~ • ~~Ro = Piping and equipment reaction loads.~~ • ~~Ra = Piping and equipment reaction loads due to a postulated accident.~~ • ~~To = Thermal loads due to normal operating temperatures.~~ • ~~Ta = Thermal loads due to accident condition temperatures.~~ • ~~R = Rain load.~~ • ~~S = Snow load.~~ • ~~Se = Extreme snow load.~~ • ~~W = Straight line wind load.~~ • ~~Wt = Loads due to the design basis tornado.~~ • ~~Wh = Loads due to the design basis hurricane.~~ • ~~Ess = Seismic load due to an SSE.~~ • ~~Pa = Pressure loads due to accident conditions.~~					

Table 14.3-2: Shared/Common Structures, Systems, and Components and Non-Structures, Systems, and components Based Design Features and Inspections, Tests, Analyses, and Acceptance Criteria Cross Reference[1] (Continued)

ITAAC No.	System	Discussion	DBA	Internal/External Hazard	Radiological	PRA & Severe Accident	FP
		~~Guidance for the content and structure of the design report is provided in Standard Review Plan Section 3.8.4, Appendix C as shown in Table 3.B-2.~~ ~~An ITAAC inspection and~~ A reconciliation analysis of the as-built CRB at Elevation 120'-0" and below is performed to ensure the CRB maintains its structural integrity in accordance with the approved design under the actual design basis loads, and the in-structure responses for the CRB are enveloped by those in the approved design.~~is performed to ensure that deviations between the drawings used for construction and of the as-built CRB are reconciled.~~ The design summary report provides criteria for the reconciliation between design and as-built conditions, as described in Section 3.8.4.5.1. ~~An ITAAC inspection is performed of the as-built CRB at Elevation 120' 0" and below to verify that the dimensions of the CRB critical sections listed in Appendix B, Table 3B-55, conform to the approved design.~~					