



UNITED STATES
NUCLEAR REGULATORY COMMISSION
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May 8, 2018

MEMORANDUM TO: Jennivine Rankin, Acting Chief
Licensing Branch 3
Division of Licensing, Siting, and Environmental Assessment
Office of New Reactors

FROM: Mallecia A. Sutton, Project Manager **/RA/**
Licensing Branch 3
Division of Licensing, Siting, and Environmental Assessment
Office of New Reactors

SUBJECT: SUMMARY REPORT FOR THE ENVIRONMENTAL AUDIT OF
PART 3 OF THE NUSCALE DESIGN CERTIFICATION
APPLICATION

By letter dated December 31, 2016, NuScale Power, LLC (NuScale) submitted its Design Certification Application (DCA) to the U. S. Nuclear Regulatory Commission (NRC) for review (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17013A229). On March 15, 2017, the NRC staff accepted the DCA for docketing and initiated its technical review.

As part of the NRC review, the staff conducted an audit of the documentation supporting DCA Part 3, containing "Applicant's Environmental Report – Standard Design Certification," herein denoted as the Environmental Report (ER). The staff also audited the methodology, models, assumptions, and calculation packages in support of the ER. An audit plan was used to support these interactions which is located in NRC's ADAMS under Accession No. ML17179A287.

The audit began August 14, 2017, and ended on February 28, 2018. The audit summary report is enclosed.

Docket No.: 52-048

Enclosures:
As stated

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SUBJECT: SUMMARY REPORT FOR THE ENVIRONMENTAL AUDIT OF PART 3 OF THE NUSCALE DESIGN CERTIFICATION APPLICATION DATED MAY 8, 2018

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NRO-002

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DATE	06/13/2018	05/29/2018	06/08/2018	5/21/2018

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SUMMARY NUSCALE ENVIRONMENTAL AUDIT REPORT

AUGUST 14, 2017 TO FEBRUARY 28, 2018

1.0 BACKGROUND AND PURPOSE

By letter dated December 31, 2016, NuScale Power, LLC (NuScale) submitted its Design Certification Application (DCA) to the U. S. Nuclear Regulatory Commission (NRC) for review (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17013A229). On March 15, 2017, the staff accepted the DCA for docketing and initiated its technical review.

The staff identified a need for an environmental audit of NuScale's design and severe accident mitigation design alternatives (SAMDA). In doing so, the NRC staff audited the supporting information presented in the environmental report (ER), including non-docketed supporting documents. The NRC staff also determined an audit would be needed in identifying and resolving specific information needs to support the staff's independent evaluation and confirmatory analysis for the regulatory findings required under Title 10 of the *Code of Federal Regulations* (10 CFR), Part 51 (see Appendix B for the list of information needs).

This environmental audit was coordinated with the Design Control Document (DCD) Chapter 19, "Probabilistic Risk Assessment," safety review. As such, some of the documents that were reviewed as part of this audit was reviewed as part of the DCD Tier 2 Chapter 19 safety audit. This was beneficial because these shared documents contain information from the Level 1 and Level 2 Probabilistic Risk Assessment (PRA) being applied as part of the environmental analysis used to support the SAMDA determination.

2.0 AUDIT REGULATORY BASES

A regulatory audit is a planned, license or regulation-related activity, that includes the examination and evaluation of primarily non-docketed information. A regulatory audit is conducted with the intent to gain an understanding, verify information, and/or identify information that will require docketing to support the basis of the licensing or regulatory decision. The NRC staff conducted an environmental audit of the non-docketed and proprietary offsite consequence analyses, SAMDA evaluation, and supporting information to assist in the review of the environmental impacts related to the NuScale DCA to support the staff's obligations under the National Environmental Policy Act of 1969 (NEPA), as amended.

Specifically, this regulatory audit is based on the following:

- NUREG 1555, "Environmental Standard Review Plan," Section 7.2, "Severe Accidents," and Section 7.3, "Severe Accident Mitigation Alternatives"
- Title 10 of the *Code of Federal Regulations* (10 CFR) 51.55, "Environmental report—standard design certification"
- 10 CFR 52.47, "Contents of Applications; Technical Information," subpart (b)(2)

3.0 AUDIT OBJECTIVES

The NRC staff's objective in conducting this environmental audit was to gather information on the applicant's bases for the SAMDA evaluation, including the methodology and analyses based on publicly available information and supporting non-docketed offsite consequences calculations, computer code input/output files, and related analyses that support the information contained in the ER, with the following goals:

- Obtain sufficient information with appropriate documentation from the applicant to support the staff's environmental review.
- Examine and evaluate non-docketed information such as sources of information, methodology, assumptions, calculations, analysis worksheets, and computer code input/output files.
- Gain a clear understanding of NuScale's cost-benefit analysis of SAMDAs contained in Part 3 of the application in the document entitled "Applicant's Environmental Report – Standard Design Certification," namely the NuScale ER (ADAMS Accession No. ML17013A296).

4.0 SCOPE OF THE AUDIT AND AUDIT ACTIVITIES

The audit was conducted August 14, 2017, through March 1, 2018, by reviewing appropriate documents available in NuScale's electronic reading room (eRR). In addition, the staff met with NuScale staff during a two day meeting beginning on August 28, 2018, to gain an overview of the audited information, and for further clarification on the information presented in the ER via information needs. The NRC staff conducted the audit in accordance with the Office of New Reactors (NRO) Office Instruction NRO-REG-108, "Regulatory Audits" (Reference 1).

Members of the audit team, listed below, were selected based on their detailed knowledge of radiological consequence assessment, PRAs and severe accident consequence assessment; their experience supporting previous design certification reviews; their knowledge of the regulatory framework regarding design certification; and their knowledge regarding implementation of the review framework for small modular reactors. Audit team members included:

- Donald Palmrose, Sr. Reactor Engineer (NRO/DSEA/RPAC)
- Mallecia Sutton, Project Manager (NRO/DNRL/LB3)
- Shawn Campbell, Reactor Systems Engineer (RES/DSA/FSCB)
- Hossein Esmaili, Sr. Reactor Systems Engineer (RES/DSA/FSCB)
- Michelle Hart, Sr. Reactor Engineer (NRO/DSEA/RPAC)
- Tony Nakanishi, Reliability and Risk Analyst (NRO/DSRA/SPRA)
- Marie Pohida, Sr. Reliability and Risk Analyst (NRO/DSRA/SPRA)
- Jason Schaperow, Sr. Reliability and Risk Analyst (NRO/DSRA/SPRA)

The documents reviewed by the staff either via an eRR or at NuScale's Rockville office during the audit are listed below:

1. ER-P010-3782_R0_Steam_Generator_Tube_Failure PRA
2. ER-P012-7022_R0_Internal Fires Notebook
3. ER-P020-3536_R0_Analysis_In-Vessel_Retention_Reactor_Pressure_Vessel
4. ER-P030-3751_R1_SAMDA Value Max Risk Calc
5. ER-P050-3815_R1_PRA for Reactor Building Crane
6. ER-P050-7030_R1_Low_Power_Shutdown_PRA
7. ER-P060-7085_R1_Dropped Module Conseq_Analysis
8. ER_P000-7200_R0_NuScale SAPHIRE Probabilistic Risk Assessment Base Model
9. ER_P02_3779_R1_Probabilistic_Analysis_of_Emergency_Core_Cooling_Valve_Reliability
10. ER_P013_7020_R0_Reactor_Coolant_System_PRA_Notebook
11. ER_P013_7023_R0_Internal Floods Notebook
12. ER_P020_7024_R0_Level_2_Probabilistic_Risk_Assessment_Notebook
13. ER_P030_3753_01_SAMDA_Identification_and Screening
14. ER_P030_4113_R0_MELCOR_Accident_Consequence_Code_System_MACCS_Base_Model
15. ER_P030_4524_R0_SAMDA_Release_Cat_2_Isolated_CVCS_LOCA_Outside_Contain_Offsite_Consq
16. ER_P030_4525_R0_SAMDA_Release_Cat_1_CVCS_LOCA_Inside_Contain_Offsite_Consq
17. ER_P030_4526_R0_SAMDA_Release_Cat_3_Unisolated_CVCS_LOCA_Outside_Contain_Offsite_Consq

18. ER_P030_4527_R0_SAMDA_Release_Cat_4_ECCS_Spurious_Actuation_Offsite_Conseq
19. ER_P030_4528_R1_SAMDA_Release_Cat_5_Unisolated_Steam_Generator_Tube_Failure_Offsite_Conseq
20. ER_P030_4529_R0_SAMDA_Release_Cat_6_General_Transient_with_RSV_Stuck_Open_Offsite_Conseq
21. ER_P030_4530_R0_SAMDA_Release_Cat_7_General_Transient_with_No_RSVs_Offsite_Conseq
22. ER_P040_4281_R0_Seismic_Core_Damage_Freq_Eval_for_Peach_Bottom_Surry_Sites
23. ER_P040_7026_R0_Seismic_Margin_Assessment_Notebook
24. ER_P040_7027_R0_Other_External_Events_Notebook
25. ER_P040_7028_R0_High_Winds_Notebook
26. ER_P040_7029_R0_External_Floods_Notebook
27. TR-0515-13952-NP-A Risk Significant Determination Approved Version
28. ECN-P050-4846, "Probabilistic Risk Assessment for Reactor Building Crane"
29. NuScale WinMACCS Input and Output files for each release category with baseline case and sensitivity runs provided at the NuScale Rockville Office
30. NuScale's Maximum Benefit Calculation Excel spreadsheets provided at the NuScale Rockville Office

During the audit, the staff went to NuScale's Rockville office to review non-docketed documents, such as MELCOR Accident Consequence Code System (MACCS) project folders, MACCS input files, related MACCS output files and maximum benefit calculation Excel spreadsheets.

An audit exit meeting was held February 28, 2018, by telephone to discuss feedback from the audit and to outline the staff's next review steps. The staff's summary of observations given below is based on the notes taken by the NRC staff during the audit. The NRC staff did not acquire any documents during the audit.

5.0 SUMMARY OF OBSERVATIONS

Based on the NRC staff's environmental audit of the applicant's documentation, the staff observed the following:

1. Through review of the proprietary NuScale calculation packages in the eRR, the staff was able to understand more fully the inputs, assumptions and methodology used in for the assessment of severe accidents for the NuScale design via Level 1 PRA, Level 2 PRA, and offsite consequences (i.e., a Level 3 PRA) for the various hazard and accident release categories. This is important since the number and type of release categories is different between the PRA presented in DCD Chapter 19 and the PRA information applied in the ER.
2. There were 26 information needs presented and discussed during the audit meeting (see Appendix B). Three of these items were addressed and resolved as a result of audit discussions. Three information needs will need to be resolved in a subsequent audit. For the remaining 20 items, NuScale understood the information needs and will work with the staff for revising the ER with necessary text and references. The staff will review the revised ER to determine if these information needs can be closed.
3. The staff reviewed the MACCS computer code package analysis and associated Excel spreadsheets. The staff observed that NuScale obtained the majority of the MACCS site input parameter values and modeling guidance from NRC's State-of-the-Art Reactor Consequence Analyses study.

Due to other critical, high priority work, the staff was not able to complete the audit. Thus, the decision was made to close this phase of the audit and to establish a subsequent audit when the staff's workload could support the completion of the environmental audit. Additionally, with a revised NuScale ER, the staff will incorporate questions and information needs based on the new information provided by the applicant to potentially close out the open information needs from this audit.

6.0 REFERENCES

1. NRO Office Instruction, NRO-REG-108, "Regulatory Audits," Revision 0, April 2009.
NuScale Power LLC, "Applicant's Environmental Report – Standard Design Certification," Revision 0, December 2016, ADAMS Accession No. ML17013A296.

APPENDIX A: ENVIRONMENTAL AUDIT AGENDA
AUGUST 14, 2017 TO FEBRUARY 28, 2018

DISCUSSION OF STAFF'S INFORMATION NEEDS

Location: NuScale Power, LLC
Rockville Office
11333 Woodglen Ave., Suite 205
Rockville, Maryland 20852

Date: Monday, August 28, 2017

8:30 a.m. Audit Meeting Opens
8:45 a.m. Introductions and Safety Briefing
9:00 a.m. Audit Meeting Begins
12:00 p.m. Lunch
1:00 p.m. Team Continues Audit
4:30 p.m. Team Debrief
5:00 p.m. Audit Meeting Adjourns for the Day

Date: Tuesday, August 29, 2017

8:30 a.m. Audit Meeting Resumes
12:00 p.m. Lunch
1:00 p.m. Team Continues Audit
4:30 p.m. Team Debrief
5:00 p.m. Audit Meeting Adjourns for the Day

REVIEW OF ELECTRONIC READING ROOM FILES AND MACCS INPUT & OUTPUT FILES

Dates: August 14, 2017 to December 29, 2017

- Audit of calculation files provided via the NuScale electronic reading room
- Review of MACCS input and output material at the NuScale's Rockville Office

Appendix B: NuScale Environmental Information Needs and Status

Serial No.	ER Section	Page No.	Information Need	Status
ER-01	---	---	<p>Provide access to NRC staff on the NuScale electronic reading room (eRR) for the NuScale documents as they relate to off-site consequence and risk including the following topic areas:</p> <ul style="list-style-type: none"> • Low power shutdown analyses • Dropped module consequence analyses • All transients resulting in offsite consequences • SAMDA maximum risk • SAMDA identification and screening process • Base case and sensitivity calculations using WinMACCS • The seismic evaluations for the Surry and Peach Bottom sites • PRA and analysis documentation for Reactor Building Crane failures • Unisolated accident analyses • Other PRA documents which support the analysis in the ER. <p>This information is needed since there is no specific listing or referencing in the ER of technical reports or other documents developed by NuScale regarding the technical information applied in support of the ER.</p>	<p>NuScale provided the various files (about 27 electronic files) via their eRR for the NRC staff to audit.</p> <p>ACTION: Staff will review Revision 1 of ER.</p> <p>OPEN</p>

Serial No.	ER Section	Page No.	Information Need	Status
ER-02	---	---	<p>Provide a Digital Versatile Disc (DVD) which contains WinMACCS input and output files in native format which were applied for the base case at the Surry site and the sensitivity case at the Peach Bottom site.</p> <p>This proprietary DVD will be used by the staff during the on-site portions of the audit.</p> <p>This information is needed per 10 CFR 51.41 and 10 CFR 51.45(c).</p>	<p>NuScale provided access at the NuScale Rockville Maryland office to the NRC staff to the DVD with their WinMACCS and related calculation files.</p> <p>ACTION: NRC staff will need access to relevant files once audit is reopened.</p> <p>OPEN</p>
ER-03	---	---	<p>Provide knowledgeable experts to discuss the systems, structures, and components (SSCs) of the NuScale design to discuss the potential applications of SSCs classified non-safety systems for possible consideration as severe accident mitigation design alternatives. For example:</p> <ul style="list-style-type: none"> • Non-safety systems which can inject additional water into the containment or reactor vessel module • Non-safety monitoring systems which could assist in assessing accident progression • Non-safety systems which could assist the mitigation of a release <p>This information was not provided in the ER and is needed to support the staff's regulatory environmental finding per 10 CFR 51.55(a) with respect to the bases for not incorporating severe accident mitigation design alternatives in the design to be certified.</p>	<p>The NRC and NuScale staff discussed whether such non-safety SSCs were able to have a risk significant impact.</p> <p>ACTION: NuScale would consider adding text to reference information found in DCA Final Safety Analysis Report (FSAR) Section 19.2.6, "Consideration of Potential Design Improvements Under 10 CFR 50.34(f)."</p> <p>ACTION: Staff will review Revision 1 of ER.</p> <p>OPEN</p>

Serial No.	ER Section	Page No.	Information Need	Status
ER-04	---	---	<p>Provide knowledgeable experts to discuss the technical information from the NuScale Level 1 and Level 2 PRA applied in the analysis of off-site consequences, including:</p> <ul style="list-style-type: none"> • Development of hazard groups • Determination of PRA scenarios leading to a radiological offsite release (i.e., release categories) • Determination of release source terms and plume-related information for each release category (e.g., release fractions for each chemical group, number of plume segments, durations) • Determination of event timing, for example: the declaration of a general emergency and the start of the initial release <p>Specific information in regards to the above was not provided in the ER. Environmental Standard Review Plan, NUREG-1555, Section 7.2 under "Review Interfaces" states the reviewer of severe accidents should coordinate with the DCD Tier 2, Chapter 19 reviewer to ensure consistency with the severe-accident analyses given by the applicant in the ER. See NUREG-1555, Section 7.2, Subsection III, "Review Procedures," under item (2) for additional guidance if the application references a design undergoing certification.</p>	<p>NuScale's 8 release categories based more on common initiators or equipment failures under 6 risk significant events (or hazard groups). These hazard groups are: internal events, internal fires, internal flooding, low power and shutdown, external flooding, and high winds.</p> <p>There was discussion between NRC and NuScale staff as to the level of detail needs to be in the ER for this information versus what is resolved and documented via an audit process.</p> <p>ACTION: Staff will review Revision 1 of ER.</p> <p>OPEN</p>

Serial No.	ER Section	Page No.	Information Need	Status
ER-05	---	---	Provide knowledge experts to discuss the updated Table B-18 submitted to the NRC in NuScale transmittal dated July 7, 2017 (ADAMS Accession No. ML17188A452). Specifically, to discuss with the staff the effect on the analysis and on other tables in the ER where the values were derived from the information presented in Table B-18.	NuScale discussed the updating of Table B-18. This table was more for information and the updated version did not affect the information provided in Table B-19. ACTION: CLOSED
ER-06	---	---	Provide knowledgeable experts to discuss results from the DCD Chapter 19 PRA safety audit which carry over into the analysis that supports the ER. Environmental Standard Review Plan, NUREG-1555, Section 7.2 under "Review Interfaces" states the reviewer of severe accidents should coordinate with the safety reviewer for DCD Tier 2, Chapter 19 to ensure consistency with the severe-accident analyses given by the applicant in the ER. Also see NUREG-1555, Section 7.2, Subsection III, "Review Procedures," under item (2) for additional guidance if the application references a design undergoing certification.	The NRC and NuScale staff discussed the need for when PRA information relied upon in the ER is changed, revised, or updated that the ER be appropriately updated also. ACTION: Staff will review Revision 1 of ER. CLOSED FOR AUDIT.

Serial No.	ER Section	Page No.	Information Need	Status
ER-07	---	---	<p>Provide knowledgeable experts to discuss the use of references throughout the ER and in particularly for:</p> <ul style="list-style-type: none"> • Tables in the ER, in particular for tables presenting information from other parts of the application (e.g., from Chapter 19 of Part 2 of the DCA) • PRA-related information, for example the low power and shutdown PRA analysis • MACCS calculations and results including cases applied in the sensitivity study • The seismic CDFs for the Surry and Peach Bottom sites • Appendix B <p>The degree of detail provided by the applicant in their Environmental Report should satisfy Regulatory Guide (RG) 4.2, Revision 2, "Preparation of Environmental Reports for Nuclear Power Stations," Section A.7.c, "Presentation of Information," (see RG 4.2, Revision 2, page x under ADAMS Accession No. ML003739519).</p>	<p>NRC and NuScale staff discuss the issue in that NuScale presents information or provides technical statements that cannot be verified because the source is not referenced. The NRC staff provided numerous examples.</p> <p>ACTION: Staff will review Revision 1 of ER.</p> <p>OPEN</p>

Serial No.	ER Section	Page No.	Information Need	Status
ER-08	4.0	4-13	<p>Provide knowledgeable experts to discuss the relationships the SAMDA analysis and DCD Chapter 19 may have with respect to DCD Chapter 20, Mitigation of Beyond-Design-Basis Events and in particular as related to the screening of potential SAMDA candidates.</p> <p>Environmental Standard Review Plan, NUREG-1555, Section 7.3 under "Data and Information Needs," presents the type of data and information needed from the applicant will be affected by various factors including a description and list of any alternatives that have been or will be implemented to prevent or mitigate severe accidents or reduce the risk of a severe accident. DCD Chapter 20 discusses mitigating strategies that address an extended loss of alternating current power and loss of normal access to the ultimate heat sink resulting from severe accidents (i.e., beyond design basis external events). Therefore, efforts by NuScale to mitigate severe accidents as discussed in DCD Chapter 20 could have an impact as to the SAMDAs considered in the ER.</p>	<p>NRC and NuScale staff discussed the issue. DCA FSAR Chapter 20 did not influence the SAMDAs in the ER to improve severe accident response beyond 72 hours. Essentially, the required actions for MBDBEE results in them not becoming a consideration under SAMDAs.</p> <p>ACTION: CLOSED FOR AUDIT</p>

Serial No.	ER Section	Page No.	Information Need	Status
ER-09	4.0	14-23	<p>Provide knowledgeable experts to discuss the process for creating NuScale specific SAMDAs as described in Section 4.1.1 through Section 4.1.13. One specific item for discussion is the reactor building crane failure being the significant risk scenario and the consideration of SAMDAs to address this risk.</p> <p>Environmental Standard Review Plan, NUREG-1555, Section 7.3 under Subsection II, "Acceptance Criteria," presents the following acceptance criteria is used: Completeness and reasonableness, also with respect to the following: (1) the identification of SAMAs applicable to the plant or design under consideration. Therefore the staff must understand the process NuScale followed in identifying specific SAMDAs for consideration.</p>	<p>The NRC and NuScale staff discussed the need for completeness in the ER for describing the process for developing SAMDAs. NuScale understands the need for cross-referencing back to other parts of the DCD for system descriptions and where the basic events applied for SAMDAs were derived from.</p> <p>ACTION: NuScale will revise the ER to include this information. Staff will review Revision 1 of ER.</p> <p>OPEN</p>
ER-10	4.0	4-13	<p>Provide knowledgeable experts to discuss the PRA insights from DCD Chapter 19 (see the text on pages 4 and 5 of the ER) that were applied in Section 4.</p> <p>Specific PRA insight information from DCD Chapter 19 was not provided in the ER. Environmental Standard Review Plan, NUREG-1555, Section 7.2 under "Review Interfaces," states the reviewer of severe accidents should coordinate with the safety reviewer of DCD Tier 2, Chapter 19 to ensure consistency with the severe-accident analyses given by the applicant in the ER. This is also stated in the corresponding Section 7.3 under "Review Interfaces."</p>	<p>NRC and NuScale staff discussed the need to provide in the ER more information about what was passed or relied upon from DCA FSAR Chapter 19 and how this was applied in the various sections of the ER.</p> <p>ACTION: NuScale will revise the ER to include this information. Staff will review Revision 1 of ER.</p> <p>OPEN</p>

Serial No.	ER Section	Page No.	Information Need	Status
ER-11	4.1	14-23	<p>Provide knowledgeable experts to discuss the source of information from Part 2 DCA sections for the various NuScale SSCs that are described in Section 4.1 of the ER.</p> <p>This information was not provided in the ER. Environmental Standard Review Plan, NUREG-1555, Section 7.3 under "Data and Information Needs" states the following information should be obtained from the ER: The methodology, process, and rationale used by the applicant to identify, screen, and select design alternatives and procedural modifications.</p>	<p>NRC and NuScale staff discussed the topic and NuScale understands the issue.</p> <p>ACTION: NuScale will revise the ER to reference the appropriate sections of the FSAR for the information provided in ER Section 4.1. Staff will review Revision 1 of ER.</p> <p>OPEN</p>

Serial No.	ER Section	Page No.	Information Need	Status
ER-12	4.0, 6.1.5, A	6-13; 38 to 39; A-21 to A-27	<p>Provide knowledgeable experts to discuss in detail the development and screening of NuScale design-specific SAMDAs from the discussion provided in Section 4 and Table 4-2, to the discussion in Section 6.1.5 and Tables 6-1 and 6-2 and to the final disposition of each NuScale design-specific SAMDA (Table A-1).</p> <p>Environmental Standard Review Plan, NUREG-1555, Section 7.3 under Subsection III, "Review Procedures," item (2) states for the staff to evaluate the applicant's methods for identifying the potential mitigation alternatives such that:</p> <ul style="list-style-type: none"> (a) Determine if this set of potential design alternatives and procedural modifications represents a reasonable range of preventive and mitigative alternatives. (b) Verify that the applicant's list of potential SAMAs includes a reasonable range of applicable SAMAs derived from consideration of previous analyses and based on insights from the Level 1 and Level 2 portions of the applicant's PRA or IPE/IPEEE. 	<p>NRC and NuScale staff discussed the topic and NuScale understands the issue. Not all SAMDAs provided in Table 4-2 are listed under the respective system in Section 4.1 which is then passed to Section 6 and to Appendix A.</p> <p>ACTION: NuScale to revise the ER to ensure all basic events are tied to Section 4.1, Section 6 and Appendix A. Staff will review Revision 1 of ER.</p> <p>OPEN</p>

Serial No.	ER Section	Page No.	Information Need	Status
ER-13	5.2, 5.3	25-27	<p>Provide knowledgeable experts to discuss the MACCS calculations supporting the offsite consequences for population dose and economic costs.</p> <p>The information provided on these pages of the ER does not provide a source for the development of the offsite impacts (e.g., Appendix B). Environmental Standard Review Plan, NUREG-1555, Section 7.2 under Subsection III, "Review Procedures," states "[t]he environmental consequences of severe accidents are estimated using acceptable methodology (such as the MACCS2 code package..." and the staff should "...determine if the method (computer code) used to evaluate the environmental consequences is appropriate and that it evaluates the consequences to a distance of 80 km (50 mi)." Therefore, the staff needs to understand whether the application of the MACCS code package with related inputs, outputs, and results for the various analyses conducted under Part 3 of the DCA are appropriate and reasonable.</p>	<p>NRC and NuScale staff discussed the issue. For example:</p> <ul style="list-style-type: none"> • Site data (meteorology, population distribution, economic information, etc.) came from the NRC's SOARCA study for the Surry and Peach Bottom sites. • Population data was not based on SECPOP-calculations. • Adjusted ER Table B-2 for inflation (CPI ratio). • Emergency cohorts were not based on a 10-mi inhalation EPZ per current regulations <p>ACTION: Staff will review Revision 1 of ER.</p> <p>OPEN</p>

Serial No.	ER Section	Page No.	Information Need	Status
ER-14	5.2, 5.3, B	24 to 27, B-34 and B-35	<p>Provide knowledgeable experts to discuss the absolute results for the offsite risks with the WinMACC code package. Make available to the NRC staff the internal calculation files and technical support documentation for these results and the conversion to risk values presented in ER Tables 5-1, 5-2, and B-19.</p> <p>Specific information was not provided in the ER. Environmental Standard Review Plan, NUREG-1555, Section 7.2 under Subsection III, "Review Procedures," states in item (3) "...determine if the method (computer code) used to evaluate the environmental consequences is appropriate and that it evaluates consequences to a distance of 80 km (50 mi)." Therefore, the staff needs to understand if results for the various analyses conducted under Part 3 of the DCA are appropriate and reasonable.</p>	<p>NRC and NuScale staff discussed the issue and further actions for this Information Needs are also covered under Information Needs ER-01 and ER-02.</p> <p>ACTION: Staff will review Revision 1 of ER.</p> <p>OPEN</p>

Serial No.	ER Section	Page No.	Information Need	Status
ER-15	5.2, 5.8, B.1.6	25, 35 to 37, B-5	<p>Provide knowledgeable experts to discuss in detail the SOARCA site data for Surry and Peach Bottom applied for the analysis presented in the ER. This would include discussing sources of the information with subsequent use as a reference in the ER, the rationale for selecting the respective SOARCA site data given that the SOARCA study was not intended to evaluate economic impacts (see page C-14 of NUREG-1935, Volume 2, ADAMS Accession No. ML12332A058), specific changes or modifications made to this site data for factors such as current year or other adjustments (see page 63 of NUREG-1935, Volume 1, ADAMS Accession No. ML12332A057).</p> <p>This information was not provided in the ER. Environmental Standard Review Plan, NUREG-1555, Section 7.2 under Subsection III, "Review Procedures," in items (4) through (10) provides staff guidance for determining if the various data inputs to the consequence assessment methodology used to support the ER severe accident analysis is appropriate. Therefore, the staff needs to understand in detail the SOARCA site data for Surry and Peach Bottom being applied for the analysis</p>	<p>NRC and NuScale discussed the issue. See Environmental Information Needs ER-01 and ER-02 for actions that would affect resolution of this issue. NuScale request further clarification from the NRC staff via the request for addition information (RAI) process.</p> <p>ACTION: Per NuScale e-mail request dated February 12, 2018, none of the ER audit issues should become RAIs. Staff will review Revision 1 of ER.</p> <p>OPEN</p>

Serial No.	ER Section	Page No.	Information Need	Status
ER-16	5.4, 5.5, 5.6	27-33	<p>Provide knowledgeable experts to discuss the analytical process for determining the various averted cost components.</p> <p>Environmental Standard Review Plan, NUREG-1555, Section 7.3 under Subsection III, "Review Procedures," in items (4) and (5) has the staff assessing whether the applicant's cost estimates for the SAMDAs and the benefit-cost comparison are reasonable.</p>	<p>NRC and NuScale discussed the issue. NuScale request further clarification from the NRC staff via the RAI process.</p> <p>ACTION: Per NuScale email request dated February 12, 2018, none of the ER audit issues should become RAIs. Staff will review Revision 1 of ER.</p> <p>OPEN</p>
ER-17	5.7, 5.8	33-37	<p>Provide knowledgeable experts to discuss the maximum benefit and the maximum benefit sensitivity results.</p> <p>Environmental Standard Review Plan, NUREG-1555, Section 7.3 under Subsection III, "Review Procedures," in items (4) and (5) has the staff assessing whether the applicant's cost estimates for the SAMDAs and the benefit-cost comparison are reasonable. Additional guidance is provided in NEI 05-01A, Section 8 for sensitivity analysis (see NuScale reference 8.1-1).</p>	<p>NRC and NuScale staff discuss the issue. See Environmental Information Needs ER-01 and ER-02 for actions that would affect resolution of this issue.</p> <p>ACTION: When audit is re-opened staff will continue its review.</p> <p>OPEN</p>

Serial No.	ER Section	Page No.	Information Need	Status
ER-18	5.8	35-37	<p>Provide knowledgeable experts to discuss the WinMACCS calculations for the sensitivity cases discussed in ER Section 5.8, Maximum Benefit Sensitivity Study. Provide for NRC staff review the internal calculation files and technical support documentation for the cases applied in the sensitivity study.</p> <p>Environmental Standard Review Plan, NUREG-1555, Section 7.3 under Subsection III, "Review Procedures," in items (4) and (5) has the staff assessing whether the applicant's cost estimates for the SAMDAs and the benefit-cost comparison are reasonable. Additional guidance is provided in NEI 05-01A, Section 8 for sensitivity analysis (see NuScale reference 8.1-1).</p>	<p>NRC and NuScale discussed the issue. NuScale request further clarification from the NRC staff via the RAI process.</p> <p>ACTION: Per NuScale email request dated February 12, 2018, none of the ER audit issues should become RAIs. Staff will review Revision 1 of ER.</p> <p>OPEN</p>

Serial No.	ER Section	Page No.	Information Need	Status
ER-19	5.8, 6.3, Table A-1	35 to 37, 40, A-1 - A-27	<p>Provide knowledgeable experts to discuss the assessment of potentially cost beneficial SAMDAs as presented in ER Section 6.3 based on the maximum benefit sensitivity cases for the Peach Bottom site (Case 6) and the real discount rate of three percent (Case 9) versus the SAMDAs in Table A-1 with cost of implementation less than the maximum benefit of Cases 6 and 9.</p> <p>Severe Accident Mitigation Alternatives (SAMA) Analysis, NEI 05-01A, which is based on Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission, NUREG/BR-0058, and Regulatory Analysis Technical Evaluation Handbook, NUREG/BR-0184, and is applied in the ER by NuScale, states in several parts of Section 8, Sensitivity Analysis, to “[p]rovide pertinent results and discuss how they affect the conclusions of the SAMA analysis. If SAMAs appear cost-beneficial in the sensitivity results, discussion of conservatisms in the analysis, (e.g., conservatisms in cost estimates discussed in Section 7.2), and their impact on the results may be appropriate.”</p>	<p>NRC and NuScale discussed the issue. The NRC staff is looking for a complete discussion of the determination of applying the 3 percent discount rate in the ER. NuScale requests further clarification from the NRC staff via the RAI process.</p> <p>ACTION: Per NuScale e-mail request dated February 12, 2018, none of the ER audit issues should become RAIs. Staff will review Revision 1 of ER.</p> <p>OPEN</p>

Serial No.	ER Section	Page No.	Information Need	Status
ER-20	6.2 and 6.3	53-54	<p>Provide knowledgeable experts to discuss the evaluation of potentially cost-beneficial SAMDAs based on a comparison to the Maximum Benefit sensitivity calculations.</p> <p>Several of the SAMDAs screened out by NuScale are potentially cost-beneficial based on several of the sensitivity calculations but further analysis as to why these could be screened out is not discussed. As noted in ER-19, NEI 05-01A states that “[i]f SAMAs appear cost-beneficial in the sensitivity results, discussion of conservatisms in the analysis, (e.g., conservatisms in cost estimates discussed in Section 7.2), and their impact on the results may be appropriate.”</p>	<p>NRC and NuScale discussed the issue. NuScale request further clarification from the NRC staff via the RAI process. The NRC staff will also review files in the eRR for their relevance to this issue.</p> <p>ACTION: Per NuScale e-mail request dated February 12, 2018, none of the ER audit issues should become RAIs. Staff will review Revision 1 of ER.</p> <p>OPEN</p>
ER-21	Table A-1	A-1 - A-27	<p>Provide knowledgeable experts to discuss the assessment of the SAMDAs in Table A-1 for each of the Phase I screening categories with specific emphasis for “excessive implementation cost” and “very low benefit” screening categories.</p> <p>Per 10 CFR 51.41, the staff must be responsible for the reliability of any information which it uses. Therefore, the staff needs to understand how NuScale determined it was appropriate to bin individual SAMDAs into these categories.</p>	<p>NRC and NuScale discussed the issue. For example:</p> <ul style="list-style-type: none"> • “excessive costs” tied to above \$100K • “very low benefit” could be linked to PRA information (basic events or cutsets?). <p>ACTION: Staff will review Revision 1 of ER.</p> <p>OPEN</p>

Serial No.	ER Section	Page No.	Information Need	Status
ER-22	B	---	<p>Provide knowledgeable experts to discuss the assumptions and sources of information for the setting of WinMACCS input parameter values including the relevant technical documents where the values were ascertained for the Surry and Peach Bottom sites. Provide to the NRC staff at the start of the audit a list of the associated publicly available and non-publicly available documents.</p> <p>This information was not provided in the ER. Per 10 CFR 51.41, the staff must be responsible for the reliability of any information which it uses. Therefore, the staff needs to understand how NuScale determined it was appropriate to apply the selected WinMACCS input parameter values for the analyses presented in the ER. For example, NUREG/BR-0184 in Section B.4.2, "MACCS Input Parameter Assumptions," cites to NUREG/CR-4551, Volume 2, Revision 1, Part 7 (Sprung et al., 1990) as a source for MACCS input parameter values. While the Peach Bottom and Surry SOARCA integrated analysis documents (NUREG/CR-7110, Volume 1 and 2, respectively) in Appendix C provide the input parameters applied in SOARCA, the ER does not provide an explanation as to the basis for these values as well as the input parameters being appropriate for NuScale's analyses. Please review the Commission's order CLI-16-07 (ADAMS Accession No. ML16125A150) and the note on page 47 the Commission's statement regarding "...being able to explain and make available underlying assumptions in our environmental analyses."</p>	<p>NRC and NuScale discussed the issue. NuScale has placed into the eRR for NRC staff review what they consider to be the relevant documents. Additionally, NuScale staff will review the Commission's order CLI-16-017 and consider adding a sensitivity analysis. NuScale request further clarification from the NRC staff via the RAI process.</p> <p>ACTION: Per NuScale e-mail request dated February 12, 2018, none of the ER audit issues should become RAIs. Staff will review Revision 1 of ER.</p> <p>OPEN</p>

Serial No.	ER Section	Page No.	Information Need	Status
ER-23	B	B-34	<p>Provide knowledgeable experts to discuss the rationale and methodology for establishing the arrangement of the various hazard groups (i.e., internal events, internal fires, internal flooding, low power and shutdown, external flooding, high winds, crane failure) to release Categories 1 through 8 as shown in Table B-17 of the ER.</p> <p>This information was not provided in the ER. Environmental Standard Review Plan, NUREG-1555, Section 7.3 under "Data and Information Needs," states the following data or information should be obtained:</p> <ul style="list-style-type: none"> • A list of release sequences (accident classes) for severe accidents with their associated core damage frequencies and source terms (from the ER and the design certification probable risk assessment submittal). <p>Additionally, under Subsection III, "Review Procedures," item (2)(a)) states for the staff to "...determine if the information given in the ER on which the applicant's analysis is based is appropriate (release sequences, core damage frequencies, and source terms)."</p>	<p>NRC and NuScale staff discussed the need for the information in Table B-17 to be referenced to a source document or further discussed in the ER since this information is not discussed in DCA FSAR Chapter 19.</p> <p>ACTION: Staff will review Revision 1 of ER.</p> <p>OPEN</p>

Serial No.	ER Section	Page No.	Information Need	Status
ER-24	B	B-11 - B-34	<p>Provide knowledgeable experts to discuss the rationale and/or calculations that justify no plume heat content (i.e., 0.0 watts) for 6 out of 8 release categories. See ER Tables B-6, B-7, B-9, B-10, B-12, B-13, B-14, and B-16.</p> <p>This information was not provided in the ER. Per 10 CFR 51.41, the staff must be responsible for the reliability of any information which it uses. From the review of the ER, NuScale does not provide a discussion for the how and why the plume heat content was set to the values provided in the cited Appendix B tables. Therefore, the staff needs to understand how NuScale determined it was appropriate to apply the selected values.</p>	<p>NRC and NuScale discussed NuScale's rationale for not having to include the plume heat content for the various release categories. NuScale understand the issue and will consider how to address this information needs in the ER.</p> <p>ACTION: Staff will review Revision 1 of ER.</p> <p>OPEN</p>
ER-25	B	B-18, B-19, B-23 - B-25	<p>Provide knowledgeable experts to discuss for Release Categories 3 and 5 concerning the release mechanisms and the lack of plume heat content in regards to information in ER Tables B-9 and B-12 (e.g., flow rate and gas density).</p> <p>This information was not provided in the ER. Environmental Standard Review Plan, NUREG-1555, Section 7.3 under Subsection III, "Review Procedures," item (2)(a) states "...determine if the information given in the ER on which the applicant's analysis is based is appropriate (release sequences, core damage frequencies, and source terms)."</p>	<p>Based on NRC and NuScale staff discussion, NuScale understands the information needs. NuScale will add a summary for the two release categories for the rationale for what is presented in the ER.</p> <p>ACTION: Staff will review Revision 1 of ER.</p> <p>OPEN</p>

Serial No.	ER Section	Page No.	Information Need	Status
ER-26	B.2.9	B-34	<p>Provide knowledgeable experts to discuss the rationale for the two release categories identified in the Level 2 PRA that were further refined into eight release categories to more realistically estimate the offsite risks of severe accidents (see page 25 of the ER and Table B-17).</p> <p>This information was not provided in the ER. Environmental Standard Review Plan, NUREG-1555, Section 7.2 under Subsection I in "Review Interfaces," states the reviewer of severe accidents should coordinate with the safety reviewer of DCD Tier 2, Chapter 19 to ensure consistency with the severe-accident analyses given by the applicant in the ER.</p>	<p>NuScale explained for the ER they re-classified the release information from their Level 2 PRA into 8 release categories for the severe accident analysis. This was supposed to allow a better fit for addressing SAMDAs (i.e., connecting release categories to the affected SSCs and then to a related SAMDA).</p> <p>ACTION: NuScale will consider how to address the information need. ACTION: Staff will review Revision 1 of ER.</p> <p>OPEN</p>