U.S. NUCLEAR REGULATORY COMMISSION

DESIGN-SPECIFIC REVIEW STANDARD for NuScale SMR DESIGN

6.2.2 CONTAINMENT HEAT REMOVAL SYSTEMS

REVIEW RESPONSIBILITIES

Primary - Organization responsible for the review of containment integrity

Secondary - Organization responsible for the review of component performance and testing and organizations responsible for the review of other systems and technical areas related to the containment heat removal system

I. AREAS OF REVIEW

NuScale is an integral, pressurized-water, small modular reactor (SMR) with the reactor, steam generator, pressurizer, and control rod drives all located in a single pressure vessel. The NuScale reactor containment is a steel structure that is located below grade level. The nuclear steam supply system (NSSS) is enclosed in a cylindrical containment. The cylindrical steel containment is partially submerged in a common reactor building pool. The common reactor building pool is designed to support 12 units where each NSSS module is located in its own bay. The containment vessel pressure is maintained at a deep vacuum under normal operating conditions.

The review includes the information in the application concerning containment heat removal under postaccident conditions to ensure conformance with the requirements of General Design Criteria (GDC) 5, 38, 39, and 40 of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50 and 10 CFR 50.46(b)(5). The ultimate heat sink (UHS) for the NuScale design includes the reactor building pool and the reactor building air space, including heat sinks in the reactor building, to the extent the pool, air space, or another heat sink in the reactor building is credited in the safety analysis to remove heat from the containment atmosphere. The UHS is further described in Standard Review Plan (SRP) Sections 9.2.5 (Ultimate Heat Sink) and 9.4.3 (Reactor Building HVAC). This Design Specific Review Standard (DSRS) section will collectively refer to the portion of the UHS credited for containment cooling (i.e., the reactor building pool, the reactor building air space, other heat sinks in the reactor building, or some combination of them) as "the UHS."

The NuScale application will provide the classification of structures, systems, and components (SSCs), including safety-related SSCs, risk-significant nonsafety-related SSCs within the scope of the Regulatory Treatment of Nonsafety Systems (RTNSS) program, and any other risk-significant nonsafety-related SSCs. Based on this information, the staff will review the design according to SRP Sections 3.2.1, 3.2.2, 17.4, and 19.3 to confirm the acceptable determination of SSC classifications.

ADAMS Accession No. ML15356A267

The specific areas of review are as follows:

1. Analyses of the consequences of single-component malfunctions.

2. The potential for surface fouling of the inner and outer walls of the containment vessel and the effect on passive containment heat removal performance.

3. The design provisions and proposed program for periodic inservice inspection (ISI) and inservice testing (IST) of each system or component.

4. The design of the UHS for containment heat removal.

5. The evaluation and effects of accident-generated debris, including an assessment for potential loss of long-term cooling capability resulting from LOCA-generated debris, latent debris, and chemical reaction products. Potential effects include (1) blockage of system flowpaths at narrow flow passages (e.g., tight clearance valves and filters), (2) wear and abrasion of components and piping, and (3) blockage of flowpaths through fuel assemblies.

6. ITAAC. For design certification (DC) and combined license (COL) reviews, the staff reviews the applicant's proposed ITAAC associated with the SSCs related to this DSRS section in accordance with SRP Section 14.3, "Inspections, Tests, Analyses, and Acceptance Criteria." The staff recognizes that the review of ITAAC cannot be completed until after the rest of this portion of the application has been reviewed against acceptance criteria contained in this DSRS section. Furthermore, the staff reviews the ITAAC to ensure that all SSCs in this area of review are identified and addressed as appropriate in accordance with SRP Section 14.3.

7. COL Action Items and Certification Requirements and Restrictions. For a DC application, the review will also address COL action items and requirements and restrictions (e.g., interface requirements and site parameters). For a COL application referencing a DC, a COL applicant must address COL action items (referred to as COL license information in certain DCs) included in the referenced DC. Additionally, a COL applicant must address requirements and restrictions (e.g., interface requirements and site parameters) included in the referenced DC.

<u>Review Interfaces</u>

Other SRP and DSRS sections interface with this section as follows:

1. Review of the sensing instrumentation provided for the containment heat removal systems is performed under Chapter 7 DSRS sections.

2. Review of the seismic qualification test program for the containment heat removal system, such as the UHS structures, liner, welds, restraints, pool syphon breakers, and anchorages, is performed under DSRS Section 3.7.2.

3. Review of fission product control features is performed under SRP Section 6.5.3.

4. Review of the seismic and quality group classification of the containment heat removal systems is performed under SRP Sections 3.2.1 and 3.2.2, respectively.

5. Review of equipment capabilities to withstand the dynamic effects associated with external missiles and internally generated missiles, pipe whip, and jet impingement forces is performed under SRP Section 3.10.

6. Review of equipment to ensure it is environmentally designed and qualified, and will be able to accommodate the effects of, and be compatible with, the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including LOCAs, is performed under DSRS Section 3.11.

7. Review of the capability of the active, nonsafety-related cooling system that transfers heat (delivered to the reactor pool from the containment system) to the heat sink (e.g., cooling tower) is performed under DSRS Section 9.1.3.

8. Review of the UHS-reactor building pool functional requirements (e.g., pool volume, level, temperature, filling options, and leakage specifications) is performed under SRP Section 9.2.5. Review of the UHS-reactor building air space functional requirements (e.g. air space volume, temperature, and capability to passively transfer heat from containment and reactor building pool to the environment) is performed under SRP Section 9.4.3.

9. Review of the containment vessel evacuation system is performed under DSRS Section 9.3.6.

10. Review of the emergency core cooling system (ECCS) with the utilization of the reactor vent valves (RVVs) and reactor recirculation valves (RRVs) to allow recirculation from the containment sump is performed under DSRS Section 6.3.

11. Review of active mechanical components in the long-term cooling path (e.g., RVVs and RRVs) for design, manufacture, qualification, installation, testing, and maintenance to perform their intended safety functions and to accommodate anticipated inservice examination or inspection and testing is performed under SRP Section 3.9.6.

12. Review of the proposed technical specifications for each system at the operating license stage of review is performed under DSRS Section 16.0.

13. Determination of SSCs risk significance is performed under SRP Section 19.3.

14. Review of containment performance is performed for design-basis accidents (DBAs), including both LOCAs and main steamline break (MSLB) accidents, in DSRS Section 6.2.1.1.A.

15. Review of postulated pipe break sizes and locations within the reactor coolant pressure boundary is performed under DSRS Section 15.6.5.

II. ACCEPTANCE CRITERIA

Requirements

Acceptance criteria are based on meeting the relevant requirements of the following Commission regulations:

1. GDC 5, Sharing of Structures, Systems, and Components

2. GDC 38, Containment Heat Removal

3. GDC 39, Inspection of Containment Heat Removal System

4. GDC 40, Testing of Containment Heat Removal System

5. 10 CFR 50.46(b)(5), as it relates to requirements for long-term cooling, including adequate water level (head) margin above the RRVs, in the presence of LOCA-generated and latent debris

DSRS Acceptance Criteria

Specific DSRS acceptance criteria acceptable to meet the relevant requirements of the NRC's regulations identified above are set forth below. The DSRS is not a substitute for the NRC's regulations, and compliance with it is not required. As an alternative, and as described in more detail below, an applicant may identify the differences between a DSRS section and the design features (DC and COL applications only), analytical techniques, and procedural measures proposed in an application and discuss how the proposed alternative provides an acceptable method of complying with the NRC regulations that underlie the DSRS acceptance criteria.

1. In meeting the requirements of GDC 5, the analyses for containment heat removal should account for the sharing of SSCs important to safety, such as the UHS among nuclear power units, and should demonstrate that such sharing will not significantly impair the ability of each unit to perform its containment heat removal safety functions, including, in the event of an accident in one unit, an orderly shutdown and cooldown of the other units.

2. The containment heat removal systems should meet the redundancy and power source requirements for an engineered safety feature (i.e., the results of failure modes and effects analyses of each system should ensure that the system is capable of withstanding a single failure without loss of function). This conforms to the requirements of GDC 38.

3. In evaluating the heat removal capability of the containment heat removal system to satisfy GDC 38 and 10 CFR 50.46(b)(5), the analyses of its heat removal capability should account for the potential for surface fouling of the containment vessel's exterior by the reactor building pool water over the life of the plant, and containment vessel's interior by periodic exposure to reactor building pool water during maintenance activities (e.g., refueling). The effect of surface fouling on the heat removal capacity of the

containment vessel should be evaluated. The application should discuss the results of the analysis. The results will be acceptable if they demonstrate that provisions are provided to prevent surface fouling or that surface fouling has been taken into account in the establishment of the heat removal capability of the containment vessel. In addition, the evaluation of the containment heat removal system should include analyses of the capability of the UHS to transfer heat passively from the containment vessel to the outside environment.

NuScale plans to remove the core decay heat via natural circulation inside the containment and the UHS such that no residual heat removal heat exchanger and fan coolers are used. The analysis should involve natural-circulation-based decay heat removal. This would potentially need a test program and simulation models to demonstrate the performance capabilities and transient response of the containment and the UHS under natural circulation conditions. NuScale design-specific single-phase and two-phase heat transfer correlations may be needed to analyze natural circulation conditions within the containment and the UHS. Condensation calculations should also account for the effect of noncondensable gases. The impact of any surface coatings or fouling has to be assessed on boiling/condensation heat transfer from the surface.

When tests are being performed on subscale mockups to develop the computer code model, a scaling analysis should identify important nondimensional parameters related to geometry and key phenomena. Scaling distortions and their impact on the computer code model should be identified and evaluated in determining the effect of scale on the overall uncertainty of the computer code model.

4. In meeting the requirements of GDCs 39 and 40 regarding inspection and testing, the design of the containment heat removal systems should provide for periodic inspection and IST of the systems and system components.
5. To satisfy the requirements of GDC 38, and 10 CFR 50.46(b)(5) regarding long-term cooling, the containment emergency sump(s) should be designed to provide a reliable, long-term water source for ECCS. The containment and reactor vessel design should allow for the drainage of condensed water to the containment emergency sump and for recirculation of this water through the ECCS RRVs. The design of the containment emergency sump is a critical element in ensuring ECCS long-term recirculation cooling capability. Therefore, the design should reflect (1) adequate consideration of containment emergency sump pool hydraulic performance (such as water level (head) above RRV inlet), (2) evaluation of LOCA-generated debris, latent debris, chemical products, and associated effects on system and component performance (e.g., RRV blockage), and (3) impacts of debris on long-term coolability of the core (e.g., fuel blockage). Regulatory Guide 1.82, Revision 4, "Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant Accident," (Ref. 2) as modified and supplemented for pressurized-water reactors (PWRs) by the Nuclear Energy Institute (NEI) Guidance Report (GR) (Ref. 6) and the associated NRC safety evaluation (SE) on the GR (Ref. 7), provide guidance for PWR debris evaluations.

6. To satisfy the system design requirements of GDC 38, instrumentation should be provided to monitor the performance of the containment heat removal system and its components under normal and accident conditions. The instrumentation should

determine whether a system is performing its intended function or whether a system train or component is malfunctioning. The containment heat removal system for normal operation is the nonsafety-related containment evacuation system, the reactor building pool, the nonsafety-related reactor building pool cooling system, and the nonsafety-related reactor building heating, ventilation, and air conditioning (HVAC); and the systems for accident conditions are the UHS (i.e., the reactor building pool, the reactor building air space, other heat sinks in the reactor building, or some combination of them).

Technical Rationale

The technical rationale for application of these acceptance criteria to the areas of review addressed by this DSRS section is discussed in the following paragraphs:

1. Compliance with GDC 5 prohibits the sharing of SSCs important to safety among nuclear power units unless it can be shown that such sharing will not significantly impair the ability of the SSCs to perform their safety functions, including, in the event of an accident in one unit, an orderly shutdown and cooldown of the remaining units.

   GDC 5 is applicable to this DSRS section because multiple reactors share SSCs important to safety. For example, the UHS, which is shared by all reactor modules, must have sufficient inventory and heat sink capacity and capability to serve as the UHS (and spent fuel pool cooling) for all reactor modules during commonly affecting events.

   Meeting the requirements of GDC 5 provides assurance that sharing of SSCs important to safety among NuScale reactor modules will not significantly impair their ability to perform their safety functions.

2. Compliance with GDC 38 requires that systems be provided to remove heat from the reactor containment. The system safety function is to rapidly reduce containment pressure and temperature after any DBA and to maintain these indicators at acceptably low levels.

   This DSRS section describes staff positions related to safety function of the containment heat removal systems, indicating that provisions should be made to rapidly reduce the containment pressure and temperature after any DBA.

   Meeting the requirements of GDC 38 regarding the characteristics and designs of containment heat removal systems provides assurance that containment pressure and temperature will be reduced to and maintained at acceptably low levels after any DBA, thereby protecting the safety function of the containment as an engineered safety feature.

3. Compliance with GDC 39 requires that the design of containment heat removal systems allow for appropriate periodic inspection of important components, such as the UHS, and that the design account for fouling of containment surfaces to ensure the integrity and capability of this system.

This DSRS section describes staff positions related to the inspection of containment heat removal systems, indicating that provisions should be made for periodic inspection of system components.

Meeting the requirements of GDC 39 with regard to periodic inspection of containment heat removal systems provides assurance that containment pressure and temperature will be reduced to and maintained at acceptably low levels after any DBA, thereby protecting the safety function of the containment as an engineered safety feature.

4. Compliance with GDC 40 requires that the design of containment heat removal systems permit periodic pressure and functional testing to ensure leaktight integrity of components, such as the UHS (e.g., reactor building pool), as well as overall system operability for passive performance of safety-related functions.

   This DSRS section describes staff positions related to the testing of containment heat removal systems. Provisions should be made for startup and periodic IST of these systems and their components, such as testing to confirm that the containment vessel's heat transfer performance is consistent with the safety analysis.

   Meeting the requirements of GDC 40 with regard to testing of containment heat removal systems provides assurance that containment pressure and temperature are reduced to and maintained at acceptably low levels after any DBA, thereby protecting the safety function of the containment as an engineered safety feature.

5. 10 CFR 50.46(b)(5) requires that systems be provided to ensure long-term cooling after any initial operation of the ECCS. The containment heat removal system safety function in support of long-term cooling, in addition to heat removal, is to maintain adequate water level margin above the RRVs to support the ECCS function to maintain the core temperature at acceptably low levels after any LOCA.

   This DSRS section describes staff positions and is intended to ensure that systems are provided to maintain adequate core cooling.

   Meeting the requirements of 10 CFR 50.46(b)(5) with regard to long-term cooling provides assurance that core temperature will be maintained at acceptably low levels after any LOCA.

III. REVIEW PROCEDURES

These review procedures are based on the identified DSRS acceptance criteria. For deviations from these acceptance criteria, the staff should review the applicant's evaluation of how the proposed alternatives provide an acceptable method of complying with the relevant NRC requirements identified in Subsection II.

The procedures described below provide guidance for the review of containment heat removal systems. The reviewer selects and emphasizes material from the review procedures as may be appropriate for a particular case.

1. Selected Programs and Guidance—In accordance with the guidance in NUREG–0800, "Introduction – Part 2: Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: Light-Water Small Modular Reactor Edition" (NUREG-0800, Intro Part 2), as applied to this DSRS Section, the staff will review the information proposed by the applicant to evaluate whether it meets the acceptance criteria described in Subsection II of this DSRS. As noted in NUREG-0800, Intro Part 2, the NRC requirements that must be met by an SSC do not change under the small modular reactor (SMR) framework. Using the graded approach described in NUREG-0800, Intro Part 2, the NRC staff may determine that, for certain SSCs, the applicant's basis for compliance with other selected NRC requirements may help demonstrate satisfaction of the applicable acceptance criteria for that SSC in lieu of detailed independent analyses. The design-basis capabilities of specific SSCs would be verified, where applicable, as part of completing the applicable ITAAC. The use of the selected programs to augment or replace traditional review procedures is shown in Figure 1 of NUREG-0800, Intro Part 2. Examples of such programs that may be relevant to the graded approach for these SSCs include:

   - 10 CFR Part 50, Appendix A, GDC, Overall Requirements, Criteria 1–5
   - 10 CFR Part 50, Appendix B, Quality Assurance (QA) Program
   - 10 CFR 50.49, Environmental Qualification of Electrical Equipment (EQ) Program
   - 10 CFR 50.55a, Code Design, Inservice Inspection, and Inservice Testing (ISI/IST) Programs
   - 10 CFR 50.65, Maintenance Rule requirements
   - Reliability Assurance Program (RAP)
   - 10 CFR 50.36, "Technical Specifications"
   - Availability Controls for SSCs Subject to Regulatory Treatment of Nonsafety Systems (RTNSS)
   - Initial Test Program (ITP)
   - Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC)

   This list of examples is not intended to be all inclusive. It is the responsibility of the technical reviewers to determine whether the information in the application, including the degree to which the applicant seeks to rely on such selected programs and guidance, demonstrates that all acceptance criteria have been met to support the safety finding for a particular SSC.

2. In accordance with 10 CFR 52.47(a)(8), (21), and (22), and 10 CFR 52.79(a)(17), (20), and (37), for DC or COL applications submitted under 10 CFR Part 52, the applicant is

required to (1) address the proposed technical resolution of unresolved safety issues and medium- and high-priority generic safety issues which are identified in the version of NUREG-0933, “Resolution of Generic Safety Issues,” current on the date up to 6 months before the docket date of the application and which are technically relevant to the design, (2) demonstrate how the operating experience insights have been incorporated into the plant design, and (3) provide information necessary to demonstrate compliance with any technically relevant portions of the Three Mile Island requirements set forth in 10 CFR 50.34(f), except paragraphs (f)(1)(xii), (f)(2)(ix), and (f)(3)(v), for a DC application, and except paragraphs (f)(1)(xii), (f)(2)(ix), (f)(2)(xxv), and (f)(3)(v),for a COL application. These cross-cutting review areas should be addressed by the reviewer for each technical subsection and relevant conclusions documented in the corresponding safety evaluation report (SER) section.

3. Upon request from the primary review organization, the review organizations with review interface responsibilities, as noted in Subsection I, will provide input for the areas of review, as stated in Subsection I of this DSRS section. The input obtained will ensure that the review is complete. The primary review organization ensures that the design and functional capability of the containment heat removal system conforms to the requirements of 10 CFR 50.46(b)(5) and GDC 5, 38, 39, and 40.

4. The acceptability of the containment heat removal system design is determined by reviewing the system to ensure the following:

   A. All potential single failures have been identified in accordance with GDC 38, and no single failure could incapacitate the entire system.

   B. Engineered safety feature design standards have been applied.

   C. The system design provisions for periodic ISI and IST ensure that the system and components are accessible for inspection and all active components can be tested.

   D. The capability exists to monitor system performance from the control room.

5. The primary review organization evaluates the containment water height in relation to the RRVs and ensures that the applicant’s analyses for the containment recirculation phase are performed in accordance with the guidelines of Regulatory Guide 1.82, Revision 4, to include whether the containment interior allows drainage of condensate to the sump.

6. The primary review organization evaluates the post-LOCA time-dependent containment temperature and pressures analysis to ensure it accounts for: (a) in-containment recirculation from the containment sump through the RRVs into the reactor vessel, (b) the condensation of reactor coolant released through the RVVs onto the containment vessel walls, and (c) the heat transfer through the containment vessel walls into the UHS.

7. The primary review organization reviews the applicant's evaluation of LOCA-generated debris, latent debris, chemical products, and associated effects on system and component performance, including the potential for debris formation in the containment vessel during a LOCA and the potential for valve blockage. Regulatory Guide 1.82, Revision 4, provides guidelines for the acceptability of the design of debris screens, if they are necessary. The applicant's analyses of core cooling in the presence of predicted debris loading are also reviewed.

8. The secondary review organization responsible for component performance and testing will review the applicant's provisions for the design, manufacture, qualification, installation, testing, and maintenance of active mechanical components located in the long-term cooling path.

9. For review of a DC application, the reviewer should follow the above procedures to verify that the design, including requirements and restrictions (e.g., interface requirements and site parameters), set forth in the final safety analysis report (FSAR) meets the acceptance criteria. DCs have referred to the FSAR as the design control document (DCD). The reviewer should also consider the appropriateness of identified COL action items. The reviewer may identify additional COL action items; however, to ensure these COL action items are addressed during a COL application, they should be added to the DC FSAR.

   For review of a COL application, the scope of the review is dependent on whether the COL applicant references a DC, an early site permit, or other NRC approvals (e.g., manufacturing license, site suitability report, or topical report).

IV. EVALUATION FINDINGS

The reviewer verifies that the applicant has provided sufficient information and that the review and calculations (if applicable), as augmented by the application of programmatic requirements in accordance with the staff's technical review approach in the DSRS Introduction, support conclusions of the following type to be included in the staff's SER. The reviewer also states the bases for those conclusions.

Containment Heat Removal Systems

The scope of review of the containment heat removal systems for the NuScale design included system drawings and descriptive information. The review included the applicant's proposed design bases for the containment heat removal systems and analyses of the functional capability of the systems. The review included the design of the UHS for containment heat removal.

The staff concludes that the design of the containment heat removal system is acceptable and meets the requirements of 10 CFR 50.46(b)(5) and GDC 5, 38, 39, and 40.

The conclusion is based on the following:

1. The staff review documented above indicates that the applicant complied with GDC 5 by demonstrating that the shared UHS will not significantly impair the containment heat removal safety function, including, in the event of an accident in one unit, an orderly shutdown and cooldown of the remaining units.

2. The staff review documented above indicates that the applicant complied with GDC 38 by providing containment heat removal systems consisting of (list systems). The applicant designed the containment heat removal systems according to the guidance provided in Regulatory Guide 1.82, Revision 4, as well as the additional guidance in (list appropriate). The staff review indicates that the systems will be capable of performing their intended safety function, which is to rapidly reduce containment pressure and temperature and to maintain these indicators at acceptably low levels after any DBA. Suitable redundancy in components and features and suitable interconnections, leak detection, isolation, and containment capabilities shall be provided to ensure that, for onsite electric power system operation (assuming offsite power is not available) and for offsite electric power system operation (assuming onsite power is not available), the system safety function can be accomplished in the event of a single failure. The staff review indicates an acceptable evaluation by the applicant of LOCA-generated debris, latent debris, chemical products, and associated effects on system and component performance, including the potential for debris formation in the containment vessel during a LOCA and the potential for valve blockage.

3. The staff's review indicates that the applicant complied with GDC 39 by designing the containment heat removal systems to permit appropriate periodic inspection of risk-significant components of the system, such as the containment sump and the UHS.

4. The staff's review indicates that the applicant complied with GDC 40 by designing the containment heat removal system to permit appropriate periodic pressure and functional testing to ensure the structural and leaktight integrity of their components, the operability and performance of the active components of the systems, and the operability of the system as a whole. Testing will be conducted to ensure the performance of the full operational sequence that brings the systems into operation under conditions as close to design as practical, including operation of applicable portions of the protection system, the transfer between normal and emergency power sources, and the operation of associated systems.

5. The staff's review indicates that the applicant has demonstrated adequate long-term core cooling in accordance with 10 CFR 50.46(b)(5) in the presence of post-LOCA debris, as appropriate.

For DC and COL reviews, the findings will also summarize the staff's evaluation of requirements and restrictions (e.g., interface requirements and site parameters) and COL action items relevant to this DSRS section.

V. IMPLEMENTATION

The regulations in 10 CFR 52.17(a)(1)(xii), 10 CFR 52.47(a)(9), and 10 CFR 52.79(a)(41) establish requirements for applications for ESPs, DCs, and COLs, respectively. These regulations require the application to include an evaluation of the site (ESP), standard plant design (DC), or facility (COL) against the SRP revision in effect 6 months before the docket date of the application. While the SRP provides generic guidance, the staff developed the SRP guidance based on the staff's experience in reviewing applications for construction permits and operating licenses for large light-water nuclear power reactors. The proposed SMR designs, however, differ significantly from large light-water nuclear power plant designs.

In view of the differences between the designs of SMRs and the designs of large light-water power reactors, the Commission issued Staff Requirements Memorandum (SRM)-COMGBJ-10-0004/COMGEA-10-0001, "Use of Risk Insights To Enhance Safety Focus of Small Modular Reactor Reviews," dated August 31, 2010. In the SRM, the Commission directed the staff to develop risk-informed licensing review plans for each of the SMR design reviews, including plans for the associated preapplication activities. Accordingly, the staff has developed the content of the DSRS as an alternative method for evaluating a NuScale-specific application submitted pursuant to 10 CFR Part 52, and the staff has determined that each application may address the DSRS in lieu of addressing the SRP, with specified exceptions. These exceptions include particular review areas in which the DSRS directs reviewers to consult the SRP and others in which the SRP is used for the review. If an applicant chooses to address the DSRS, the application should identify and describe all differences between the design features (DC and COL applications only), analytical techniques, and procedural measures proposed in an application and the guidance of the applicable DSRS section (or SRP section, as specified in the DSRS), and discuss how the proposed alternative provides an acceptable method of complying with the regulations that underlie the DSRS acceptance criteria.

The staff has accepted the content of the DSRS as an alternative method for evaluating whether an application complies with NRC regulations for NuScale SMR applications, provided that the application does not deviate significantly from the design and siting assumptions made by the NRC staff while preparing the DSRS. If the design or siting assumptions in a NuScale application deviate significantly from the design and siting assumptions the staff used in preparing the DSRS, the staff will use the more general guidance in the SRP, as specified in 10 CFR 52.17(a)(1)(xii), 10 CFR 52.47(a)(9), or 10 CFR 52.79(a)(41), depending on the type of application. Alternatively, the staff may supplement the DSRS section by adding appropriate criteria to address new design or siting assumptions.

VI. REFERENCES

1. U.S. Nuclear Regulatory Commission, "Initial Test Programs for Water-Cooled Nuclear Power Plants," Regulatory Guide 1.68 (ADAMS Accession No. ML13051A027).

2. U.S. Nuclear Regulatory Commission, "Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant Accident," Regulatory Guide 1.82, Rev. 4, March 2012 (ADAMS Accession No. ML111330278).

3. U.S. Nuclear Regulatory Commission, “Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,” Regulatory Guide 1.160 (ADAMS Accession No. ML113610098).

4. U.S. Nuclear Regulatory Commission, “Combined License Applications for Nuclear Power Plants (LWR Edition),” Regulatory Guide 1.206.

5. U.S. Nuclear Regulatory Commission, “Guidance for ITAAC Closure Under 10 CFR Part 52,” Regulatory Guide 1.215 (ADAMS Accession No. ML112580018).

6. Nuclear Energy Institute guidance report, “Pressurized Water Reactor Sump Performance Evaluation Methodology,” including Appendices A and B, NEI 04-07, May 28, 2004.

7. U.S. Nuclear Regulatory Commission, safety evaluation of NEI GR, “Pressurized Water Reactor Containment Sump Evaluation Methodology,” December 6, 2004 (ADAMS Accession No. ML043280007).

8. U.S. Nuclear Regulatory Commission, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” Regulatory Guide 1.26 (ADAMS Accession No. ML070290283).

9. U.S. Nuclear Regulatory Commission, “Seismic Design Classification,” Regulatory Guide 1.29 (ADAMS Accession No. ML003739983).

10. SRM-COMGBJ-10-0004/COMGEA-10-0001, “Use of Risk Insights to Enhance Safety Focus of Small Modular Reactor Reviews,” dated August 31, 2010 (ADAMS Accession No. ML102510405).