U.S. NUCLEAR REGULATORY COMMISSION

DESIGN-SPECIFIC REVIEW STANDARD FOR NuScale SMR DESIGN

14.3.6 ELECTRICAL SYSTEMS - INSPECTIONS, TESTS, ANALYSES, AND ACCEPTANCE CRITERIA

REVIEW RESPONSIBILITIES

Primary - The organization responsible for electrical engineering review

Secondary - None

I. AREAS OF REVIEW

This Design Specific Review Standard (DSRS) section addresses inspections, tests, analyses, and acceptance criteria (ITAAC) related to the station electrical systems. ITAAC are based on information contained in the final safety analysis report (FSAR) of a combined license (COL) application and are provided in a separate part of the COL application. In addition, ITAAC are included in the Tier 1 portion of the design control document (DCD) of a design certification (DC) application. This DSRS section primarily involves the station electrical system, including Class 1E portions of the system, equipment qualification (EQ), major portions of the non-Class 1E system, and portions of the plant lightning protection, grounding, and lighting systems. The development of ITAAC for evolutionary plants typically involve a significant amount of reliance on alternating current (AC) electrical systems for accomplishing safety functions, but it may be much different for passive plant designs that involve much less reliance on AC electrical systems for accomplishing safety functions.

The specific areas of review are as follows:

1. The organization responsible for electrical engineering reviews the Tier 1 portion of the DCD submitted by the applicant. The organization responsible for electrical engineering has primary review responsibility for the station electrical systems in Tier 1. Review guidance for developing ITAAC is provided in Appendix A,"Information on Prior Design Certification Reviews," to Standard Review Plan (SRP) Section 14.3. The scope of the electrical review includes the entire Class 1E portion of the electrical system, equipment qualification (EQ), as well as a major portion of the non-Class 1E electrical system. It also includes portions of the plant lightning protection, grounding, and lighting systems.

   The onsite power supply system for "passive plant" designs and other advanced reactor designs, including small modular reactor plants, are mostly non-safety-related with some portions classified as risk-significant. Thus, they are classified as "non-safety-related risk-significant." For these passive plant designs, the onsite power supply may be subject to special regulatory treatment of non-safety-related systems (RTNSS) considerations. The criteria for classifying non-safety-related systems that perform risk-significant or important functions (defense-in-depth) as RTNSS are provided by Standard Review Plan SRP Section 19.3, "Regulatory Treatment of Non-Safety Systems (Passive Advanced Light Water Reactors)," as well as the general regulatory

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requirements for RTNSS SSCs. The current passive plant designs (e.g., AP1000, ESBWR, and mPower™) include the following onsite AC power supplies:

A. Ancillary Diesel Generators (ADGs) – typically classified as RTNSS Criterion B and designed for seismic events and other natural phenomena. ADGs may not be included in the NuScale design.

B. Standby Diesel Generators (SDGs) – typically classified as RTNSS Criterion C. SDGs may not be included in the NuScale design.

2. The organization responsible for electrical engineering has the lead responsibility for the review of Tier 1 information regarding qualification of equipment to withstand harsh environments.

3. The organization responsible for electrical engineering has responsibility for the review of selected Tier 1 definitions, ITAAC, and interface requirements included in a DC application for the standard design that pertain to electrical systems and equipment. This organization is also responsible for the review of site-specific portions of the design included in a COL application that pertain to electrical equipment.

4. The organization responsible for electrical engineering performs related reviews and coordination activities, as requested by other organizations, for Tier 1 systems using Class 1E power.

5. For a DC application:

A. The staff reviews the proposed ITAAC that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a plant that incorporates the design certification has been constructed and will be operated in accordance with the design certification, the Atomic Energy Act, and the NRC's regulations.

B. The staff reviews Tier 1 interface requirements and the applicant's justification that compliance with the interface requirements is verifiable through inspections, tests, or analysis. The interface requirements define the significant attributes and performance characteristics that the portion of the facility that is outside the scope of the design certification must have in order to support the in-scope portion of the design. The method to be used for verification of interface requirements must be included as part of the design certification ITAAC.

6. For a COL application:

A. The staff reviews the proposed ITAAC to ensure that they are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, the facility has been constructed and will operate in conformity with the combined license, the Atomic Energy Act, and the NRC's regulations.

B. If the application references an early site permit with ITAAC, the early site permit ITAAC must apply to those aspects of the combined license which are approved in the early site permit, and the staff shall verify they have been properly incorporated into the COL.

C. If the application references a standard design certification, the ITAAC contained in the certified design must apply to those portions of the facility design which are approved in the design certification, and the staff shall verify they have been properly incorporated into the COL.

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).

   For a COL application referencing a DC, a COL applicant must address COL action items (referred to as COL information items in certain DCs) included in the referenced DC. Additionally, a COL applicant must address requirements and restrictions (e.g., interface and site-specific requirements) included in the referenced DC.

Review Interfaces

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

1. SRP Section 14.3 provides general guidance on ITAAC information and review interfaces.

2. Acceptability of ITAAC information regarding qualification of equipment for seismic environments is reviewed under DSRS Section 14.3.2.

3. Review of ITAAC information regarding EQ of electrical and mechanical equipment is reviewed under DSRS Section 3.11. The specific acceptance criteria and review procedures are contained in the referenced DSRS sections.

II. ACCEPTANCE CRITERIA

Requirements

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

1. 10 CFR 52.47(b)(1), which requires that a DC application contain the proposed ITAAC that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a facility that incorporates the design certification has been constructed and will be operated in conformity with the design certification, the provisions of the Atomic Energy Act, and the NRC's regulations;

2. 10 CFR 52.80(a), which requires that a COL application contain the proposed inspections, tests, and analyses, including those applicable to emergency planning , that the licensee shall perform, and the acceptance criteria that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, the facility has been constructed and will be operated in conformity with the combined license, the provisions of the Atomic Energy Act, and the NRC's regulations.

3. 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 17, Electric power systems.

4. 10 CFR 50.49 as it relates to EQ of electrical equipment important to safety for nuclear power plants. Applicants must ensure that (1) safety-related electric equipment, (2) non-safety-related electric equipment whose failure under postulated environmental conditions could prevent the safety-related equipment from accomplishing their safety functions specified in 10 CFR 50.49(b)(1)(i)(A) through (C), and (3) certain post-accident monitoring equipment can perform their intended functions in various anticipated environmental conditions.
5. 10 CFR Part 50, Appendix A, GDC 5, Sharing of structures, systems, and components.

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.

Class 1E electrical systems provided for standard passive plant designs may include: (1) a Class 1E electrical power distribution system, (2) a Class 1E direct current (dc) power supply, and (3) Class 1E vital AC and Class 1E instrument and control power supplies. Using the above regulations, IEEE standards, operating and licensing experience, and probabilistic risk assessment (PRA) as its bases, the applicant should establish top-level design commitments for Class 1E electrical systems of the standard passive plant design to be included in the design descriptions and verified by ITAAC. The top-level design commitments for Class 1E electrical systems include design aspects related to:

1. Equipment qualification for seismic and harsh environment

   To ensure that the seismic design requirements of GDC 2 and the EQ requirements of 10 CFR 50.49 have been adequately addressed, specific ITAAC may be established for applicable systems to verify these design aspects of electrical equipment important to safety.

   The Design Description should identify that Class 1E equipment that is seismic Category 1 and located in a harsh environment needs to be qualified. Specific ITAAC addressing the seismic qualification of Class 1E equipment may be used to verify these design requirements.

EQ of safe-shutdown equipment may be verified by specific ITAAC that address the equipment qualification requirement for safety-related systems. EQ treatment in the ITAAC would then be discussed in the General Provisions section of Tier 1 (see SRP Section 14.3 Appendix A). Verification may include type tests or a combination of type tests and analyses of Class IE electrical equipment identified in the Design Description or accompanying figures to show that the equipment can withstand the conditions associated with a design basis event (DBE) without loss of safety function for the time that the function is needed.

Qualification of systems and components for seismic and harsh environments should be verified by ITAAC. State-of-the-art digital instrumentation and control (I&C) equipment and digital control and protection systems located in an "other than harsh" environment should also be subject to ITAAC. Operational experience has shown these state-of-the-art equipment and systems to be sensitive to temperature. ITAAC should also be included to verify the qualification of equipment whose performance may be impacted by sensitivity to particular environmental conditions, such as electromagnetic or radio-frequency interferences and power surges, not considered by regulations to be harsh.

2. Redundancy and independence

To ensure that Class 1E electric systems meet the single failure requirements of GDC 17 (and GDC 5 with respect to shared systems), ITAAC may be established to verify the redundancy and independence of a Class 1E electrical design. For the electrical systems ITAAC, Class 1E divisional assignments and independence of electric power should be verified by both inspections and tests. Independence is established by both electrical isolation and physical separation. Identification of Class 1E divisional equipment should be included to aid in demonstrating the separation. (The detailed requirements are specified in Tier 2. For example, separation distances and identification are outlined in Tier 2). These attributes should be verified all the way to the electrically powered loads by a combination of the electrical system ITAAC and the ITAAC of the individual fluid, I&C, and heating, ventilation and air conditioning (HVAC) systems which also cover the electrical independence and divisional power supply requirements.

ITAAC should be included to verify adequate separation, required inter-ties (if any), proper routing/termination (i.e., location), and separation of non-Class 1E loads from Class 1E buses. Post-fire safe shutdown separation of electrical circuits should be addressed in the fire protection system ITAAC.

3. Capacity and Capability

To ensure that the electrical systems have adequate capacity and capability to supply the safety-related electrical loads for design basis events, ITAAC should be established to verify the adequate sizing of the electrical system equipment and its ability to respond automatically and in the times needed to support the accident analyses. This includes the Class 1E portion and the non-Class 1E portion to the extent that it is involved in supporting any Class 1E system functions.

ITAAC should be included to analyze the as-built electrical system and installed equipment (transformers, switchgear, batteries, etc.) to verify its ability to power the loads. In addition, the ITAAC should also include tests to demonstrate the operation of

the equipment. In some cases regulatory guidance specifies the need for margin in capacity to allow for future load growth.

ITAAC should be developed to verify the initiation of any Class 1E equipment necessary to mitigate postulated events for which the equipment is credited (e.g., loss of coolant accident (LOCA) or loss of offsite power (LOOP)).

ITAAC should be included to analyze the as-built electrical power system for its response to a LOCA, LOOP, combinations of LOCA and LOOP, degraded voltage, and the loss of one or two of the three phases of the offsite power circuit (Reference 13) including tests to demonstrate the actuation of the electrical equipment in response to postulated events.

Analyses to demonstrate the acceptability of expected voltage drop should be included in ITAAC to verify that the accomplishment of a direct safety function can still be achieved assuming the expected voltage drop. The ITAAC should also include verification that the measured voltage drop meets the acceptance criteria as established by the calculated voltage drop in accordance with DSRS BTP 8-6.

4. Electrical protection features

To ensure that the electrical power system is protected against potential electrical faults, ITAAC should be established to verify the adequacy of the electrical circuit protection included in the design. Operating experience and NRC Electrical Distribution System Functional Inspections (EDSFIs) have indicated some problems with the short circuit rating of some electrical equipment and breaker and protective device coordination. Inclusion in ITAAC should be based on the potential for preventing safety functions and the operating experience.

ITAAC should be included to analyze the as-built electrical system equipment for its ability to withstand and clear electrical faults. ITAAC should also be included to analyze the protection feature coordination to verify its ability to limit the loss of equipment due to postulated faults. Equipment short circuit capability and breaker coordination should be verified by specifying ITAAC for analyses. The description of the analyses should be included in the applicable section of the application.

5. Displays/controls/alarms

To help ensure that the electrical power system is available when required, ITAAC should be included to verify the existence of monitoring and controls for the electrical equipment. The minimum set of displays, alarms, and controls is based on the emergency procedure guidelines. In some cases, additional displays, alarms, and controls may be specified based on special considerations in the design and/or operating experience.

ITAAC should be included to inspect for the ability to retrieve the information (displays and alarms), and to control the electrical power system in the main control room and/or at locations provided for remote shutdown.

Other Electrical Equipment Important to Safety

In addition to the Class 1E systems addressed above, other aspects of the electrical design that are deemed to be important to safety and the top-level design commitments are included in Tier 1.

1. Interface (Offsite Power)

   To ensure that the requirements of GDC 17 for the adequacy and independence of the preferred offsite power sources within the standard design scope were met, ITAAC should verify the capacity and capability of the offsite sources to feed any Class 1E divisions, and the independence of those sources.

   ITAAC should be included to inspect the direct connection of the offsite sources to any Class 1E divisions and to inspect for the independence/separation of the offsite sources.

   In addition, ITAAC should be included to analyze and inspect the main generator rated power factor that permits plant output to the transmission system via the main step-up transformer, and to provide power to station auxiliary loads via the unit auxiliary transformer (UAT) and switchyard. ITAAC should also be included to verify that the main generator circuit breaker is designed to supply power to the plant loads if the unit trips; however, this feature may not be included in the NuScale design.

2. Containment Electrical Penetrations

   To ensure that the containment electrical penetrations (both those containing any Class 1E circuits and those containing Non Class 1E circuits) do not fail due to electrical faults and potentially breach the containment, ITAAC should verify that all electrical containment penetrations are protected against postulated currents greater than their continuous current rating.

3. Site-specific information

   The DC application should include appropriate site interface requirements to ensure that the design functions specified in the DC as requiring support from site-specific design features are identified and that those necessary supporting functions are provided by the COL applicant. In addition, the reviewer should ensure that the NuScale DC application includes appropriate ITAAC to verify the functions needed to support those design functions specified in the interface requirements of the NuScale DCD.

4. Lighting, Grounding, and Lightning Protection

ITAAC should be included to verify the continuity of power sources for plant lighting, systems to ensure that portions of the plant lighting remain available during accident scenarios, and power failures. The basis for inclusion may be more related to defense-in-depth, support function, licensing and operating experience, or PRA rather than "accomplishing a direct safety function."

ITAAC should be developed to inspect for appropriate grounding and lightning protection features.

5. Electrical Power for Non-Safety Plant Systems

To ensure that electrical power is provided to support the non-safety plant systems, Design Descriptions cover portions of the non-Class 1E electrical systems. ITAAC should be included to verify the functional arrangement of electrical power systems provided to support non-safety plant systems to the extent that those systems perform a significant safety function.

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 17, in part, requires that an onsite and offsite electric power system be provided to permit functioning of structures, systems and components important to safety. It further requires that the onsite electric power system have independence and redundancy and that the electric power supplied by the offsite system be supplied by two physically independent circuits. This provides a reasonable assurance that the facility will function reliably in the event of a fault in an area of the electrical design.

2. Compliance with 10 CFR 50.49 requires that certain electrical equipment important to safety located in harsh environments be qualified for DBE. This provides a reasonable assurance that the equipment will perform its intended function.

III. REVIEW PROCEDURES

The reviewer will select material from the procedures described below, as may be appropriate for a particular case.

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.

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: Integral Pressurized Water 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 SMR framework.

Using the graded approach described in NUREG-0800 Intro Part 2, the NRC staff may determine that, for certain structures, systems, and components (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 completion of the applicable ITAAC. The use of the selected programs to augment or replace traditional review procedures is described in Figure 1 of NUREG-0800, Introduction - Part 2. Examples of such programs that may be relevant to the graded approach for these SSCs include:

- 10 CFR Part 50, Appendix A, General Design Criteria (GDC), Overall Requirements, Criteria 1 through 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 Non-Safety 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 design certification or combined license applications submitted under 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 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. In establishing the top level requirements for the electrical design, the reviewer should use the Code of Federal Regulations (CFR) including the GDC in 10 CFR Part 50, Appendix A and 10 CFR 50.49. In addition, the Institute of Electrical and Electronics Engineers (IEEE) nuclear standards should be used, as appropriate, to further establish top level requirements. The reviewer should use the electrical review checklists provided in Appendix C, "Detailed Review Guidance," to SRP Section 14.3 as an aid for establishing consistency and comprehensiveness in the review of the systems. Also, the

reviewer should consider significant lessons learned from operating and licensing experience problems and insights gained from the PRA for the design.

4. Follow the general procedures for review of Tier 1 contained in the Review Procedures section of SRP Section 14.3. Ensure that the DCD is consistent with Appendix A to SRP Section 14.3.

5. Ensure that all Tier 1 information is consistent with Tier 2 information. Figures and diagrams should be reviewed to ensure that they accurately depict the functional arrangement and requirements of the systems. Reviewers should use the electrical systems review checklist shown in Appendix C to SRP Section 14.3 as an aid in establishing consistent and comprehensive treatment of issues.

6. Ensure that the electrical systems are clearly described in Tier 1, including the key performance characteristics and safety functions of SSCs based on their safety significance.

7. The reviewer should ensure that appropriate guidance is provided to other technical branches such that electrical issues in Tier 1 are treated in a consistent manner.

8. Ensure ITAAC entries for EQ related to electrical systems are included for the appropriate systems of the design. In particular, the reviewer should review the specific ITAAC proposed for verification of EQ for acceptability. For ITAAC proposed to verify seismic qualification, the reviewer should coordinate with the organization responsible for the SRP Section 3.2.1 review of seismic qualification of electrical components. The reviewer should ensure consistent application and treatment of ITAAC entries for divisional power supply, physical separation, and independence for electrical and I&C systems in Tier 1.

9. Ensure that design features for the resolution of selected technical and policy issues are adequately addressed in Tier 1, based on safety significance. Ensure that the appropriate Commission guidance, requirements, bases and resolutions for these items are documented clearly in the SER.

10. Ensure that definitions, legends, and interface requirements that pertain to electrical issues are treated consistently and appropriately in Tier 1 of the DC application. Ensure that ITAAC proposed by a COL applicant referencing the NuScale DC are consistent with the Tier 1 information.

11. 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), set forth in the FSAR meets the acceptance criteria. DCs have referred to the FSAR as the 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.

    In general, 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 (ESP) or other NRC approvals (e.g., site suitability report or topical report). For a COL application referencing a DC, the COL application addresses COL action items and site-specific information.

IV. EVALUATION FINDINGS

The reviewer verifies that the applicant has provided sufficient information and that the review and calculations (if applicable) support conclusions of the following type to be included in the staff's safety evaluation report. The reviewer also states the bases for those conclusions.

1. The reviewer verifies that sufficient information has been provided to satisfy SRP Section 14.3 and this DSRS section and concludes that the ITAAC is acceptable. A finding similar to that in the Evaluation Findings section of SRP Section 14.3 should be provided in a separate section of the SER.

2. For DC and COL reviews, the findings will also summarize the staff's evaluation regarding DC requirements and restrictions (e.g., interface requirements) and site-specific information 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 Standard Review Plan (SRP) revision in effect six 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 small modular reactor (SMR) designs, however, differ significantly from large light-water nuclear reactor 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 SRM- COMGBJ-10-0004/COMGEA-10-0001, "Use of Risk Insights to Enhance the Safety Focus of Small Modular Reactor Reviews," dated August 31, 2010 (ML102510405) (SRM). 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 pre-application activities. Accordingly, the staff has developed the content of the DSRS as an alternative method for the evaluation of 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 in order to address new design or siting assumptions.

VI. REFERENCES

1. 10 CFR Part 20, "Standards for Protection Against Radiation."

2. 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities."

3. 10 CFR Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants."

4. GDC 61, "Fuel Storage and Handling and Radioactivity Control."

5. GDC 19, "Control Room."

6. GDC 4, "Environmental and Dynamic Effects Design Bases."

7. RG 1.7, "Control of Combustible Gas Concentrations in Containment Following a Loss-of-Coolant Accident."

8. RG 1.112, "Calculations of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Light-Water-Cooled Power Reactors."

9. RG 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors."

10. ANSI/ANS Standard 18.1-1999, "Source Term Specification," American National Standards Institute/American Nuclear Society."

11. NUREG-0737, "Clarification of TMI Action Plan Requirements."

12. 40 CFR Part 190, "Environmental Radiation Protection Standards For Nuclear Power Operations."

13. RG 1.89, "Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants."

14. RG 1.143, "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants."

15. RG 1.26, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants."

16. RG 1.29, "Seismic Design Classification."

17. RG 1.117, “Tornado Design Classification.”

18. RG 1.206, “Combined License Applications for Nuclear Power Plants (LWR Edition).”

19. EPRI, “Pressurized Water Reactor Primary Water Chemistry Guidelines.”

20. EPRI, “Pressurized Water Reactor Primary Water Zinc Application Guidelines.”

21. EPRI, “Advanced Light Water Reactor Utility Requirements Document, Volume III, ALWR Passive Plant.”

22. NUREG-1242, “NRC Review of Electric Power Research Institute's Advanced Light Water Reactor Utility Requirements Document, Passive Plant Designs” Volume 3, Part 1 and Volume 3, Part 2 (ADAMS Accession Nos. ML070600372 and ML070600373).

23. EPRI, “Cobalt Reduction Guidelines.”

24. RG 8.8, “Information Relevant to Assuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be as Low as is Reasonably Achievable.”