U.S. NUCLEAR REGULATORY COMMISSION

DESIGN-SPECIFIC REVIEW STANDARD FOR NuScale SMR DESIGN

9.2.6 CONDENSATE STORAGE FACILITIES

REVIEW RESPONSIBILITIES

Primary - Organization responsible for the review of cooling water systems

Secondary - None

I. AREAS OF REVIEW

The condensate storage facility (CSF) provides make-up water to the main condenser and the condensate and feedwater system. It also supplies water to, and receives return water from various plant auxiliary systems.

The CSF may be designed either as a safety-related or as a nonsafety-related structure, system, or component (SSC), depending on the plant. The safety-related function performed by the CSF is to ensure an adequate supply of water if that is required for the safe shutdown of the reactor. Normal plant system functions performed by the CSF, such as supplying makeup water to the condenser hotwells and other auxiliary systems of the plant, are reviewed to verify that any failure will not adversely affect the safety-related or risk-significant functions of SSCs in other systems. The CSF system design is also reviewed to assure that it incorporates provisions to monitor radioactive effluents within in the CSF system, and to control of the release of radioactive effluents to the environment.

The review performed by the responsible organization includes the CSF from the condensate storage tank up to the connections or interfaces with other systems to ensure conformance with the requirements of 10 CFR Part 50, Appendix A, General Design Criteria (GDC) 2, 4, 5, 60, and 64, and with 10 CFR 20.1406 and 10 CFR 50.63.

The specific areas of review are as follows:

1. The CSF system function relative to other safety-related systems to determine whether portions of the system are safety-related or risk-significant

2. The capability of the CSF to supply water to various auxiliary systems and to receive return water from other systems.

3. The CSF is evaluated to verify the following:

   A. Failures of CSF components do not adversely affect safety-related or risk-significant SCCs either directly as a result of system connections, or indirectly as a result of structural failure or flooding resulting from structural or system failure.

   B. System components meet design code requirements consistent with the component quality group and seismic design classifications.

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C. Provisions for mitigating the environmental effects of system leakage or storage tank failure are addressed.

D. Provisions for the safe handling of storage tank overflow, the associated instrumentation necessary to detect high or low water levels, and a means of isolation are supplied.

E The CSF system is designed with adequate design features and provisions that, when supplemented by adequate operating procedures it provides reasonable assurance that the potential for release of radioactive material to the facility, site and environment will be minimized.

F Provisions to control and monitor releases of radioactivity from the CFS to he environment must conform to the requirements of General Design Criteria 60 and 64.

4. Inspections, Tests, Analyses, and Acceptance Criteria (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 design specific review standard (DSRS) section in accordance with Standard Review Plan (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 and DSRS Section 14.3.7.

5. 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.

Review Interfaces

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

1. Review of flood protection under DSRS Section 3.4.1

2. Review of the protection against internally generated missiles under DSRS Section 3.5.1.1

3. Review of the SSCs to be protected against externally generated missiles under DSRS Section 3.5.2

4. Review of high- and moderate-energy pipe breaks under SRP Section 3.6.1

5. Evaluation of the radioactivity concentrations in the CSF as part of its primary review responsibility under DSRS Section 11.1

6. Review of the assured supply of water to the spent fuel pool cooling and cleanup system under DSRS Section 9.1.3

7. Review of fire protection under SRP Section 9.5.1.1

8. Review of the condensate and feedwater system under DSRS Section 10.4.7.

9. Review of initial tests, and system inspection, test, analyses and acceptance criteria under DSRS Section 14.2 and SRP Section 14.3.

10. Review of risk significance of CSF SSCs required availabilities and failure modes and effects under SRP Chapter 19.0.

In addition, the lead organization will coordinate other organization evaluations that interface with the overall review of the system as follows:

1. As part of its review responsibility under SRP Sections 3.9.1, 3.9.2, and 3.9.3, the organization responsible for mechanical engineering will determine that components, piping, and structures are designed in accordance with applicable codes and standards. As part of its primary review responsibility under SRP Sections 3.2.1 and 3.2.2, this organization will also determine the acceptability of the seismic and quality group classifications for system components. The review will address the adequacy of the inservice testing program for pumps and valves under SRP Section 3.9.6.

2. As part of the reviews performed under DSRS Sections 3.3.1, 3.3.2, 3.5.3, 3.7.1, 3.7.2, 3.7.3,3.8.4, and 3.8.5 and SRP Sections 3.7.4, , the organizations responsible for structural engineering and/or geosciences will determine the acceptability of the design analyses, procedures, and criteria used to establish the ability of seismic Category I structures housing the system and supporting systems to withstand the effects of natural phenomena such as the safe-shutdown earthquake, probable maximum flood, and tornado-generated missiles. As part of its review responsibility under DSRS Section 6.6, this organization will also verify that the inservice inspection requirements are met for system components.

3. As part of its primary review responsibility under DSRS Section 6.1.1, the organization responsible for materials and chemical engineering will verify the compatibility of the materials of construction with the service conditions.

4. As part of its review responsibilities under DSRS Chapter 7, the organization responsible for instrumentation and controls will verify the adequacy of the design, installation, inspection, and testing of all instrumentation and control systems (sensing, control, and power) required for proper operation.

5. As part of its primary review responsibility under SRP Section 12.1, the organization responsible for radiation protection will review the facility design to ensure that radiation exposure for personnel will be maintained as low as is reasonably achievable.

6. As part of its review responsibility under SRP Chapter 17, the organization responsible for quality assurance will perform the review for quality assurance.

7. As part of its review responsibility under SRP Chapter 19, the organization responsible for probabilistic risk assessment will perform the review to identify any risk significant aspects of the CSF SSCs affecting the frequency or consequence of accidents that result in core damage.

II. ACCEPTANCE CRITERIA

Requirements

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

1. General Design Criterion (GDC 2) *Design Bases for Protection Against Natural Phenomena*.

2. GDC 4 Environmental and Dynamic Effects Design Bases.

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

4. GDC 60 Control of Releases of Radioactive Materials to the Environment.

5. GDC 64 Monitoring Radioactivity Releases.

6. 10 CFR 20.1406, as it relates to facility design and procedures for operation that will minimize, to the extent practicable, contamination of the facility and the environment; facilitate eventual decommissioning; and minimize, to the extent practicable, the generation of radioactive waste.

7. 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 DC has been constructed and will operate in conformity with the DC, the provisions of the Atomic Energy Act (AEA), and the NRC's regulations.

8. 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 operate in conformity with the COL, the provisions of the AEA, and the NRC's regulations.

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. Protection Against Natural Phenomena. Acceptance for meeting the relevant aspects of GDC 2 is based in part on meeting the of Regulatory Guide (RG) 1.29, Position C1 for safety-related portions and Position C.2 for nonsafety-related portions. Also, acceptance is based in part on (1) meeting the guidance of RG 1.117 with respect to identifying portions of the system that should be protected from tornadoes and (2) meeting the guidance of RG 1.102 with respect to identifying portions of the system that should be protected from flooding.

2. Environmental and Dynamic Effects Design Basis. Information that addresses the requirements of GDC 4 regarding consideration of environmental and dynamic effects will be considered acceptable if the acceptance criteria in the following DSRS Sections, as they apply to the CSF, are met: DSRS Sections 3.5.1.1, 3.5.1.4, 3.5.2, and 3.6.1.

3. Sharing of Structures, Systems, and Components. Information that addresses the requirements of GDC 5 regarding the capability of safety-related or risk-significant shared systems and components important to safety to perform required safety functions will be considered acceptable if the use of the CSF in multiple-unit plants during an accident in one unit does not significantly affect the capability to conduct a safe and orderly shutdown and cool-down in the unaffected unit(s).

4. Control of Radioactive Releases to the Environment. Acceptance for meeting the relevant aspects of GDCs 60 and 64 is based on meeting the guidance of RG 1.143.

5. The requirements of 10 CFR 20.1406 are met when the design and procedures identify provisions to detect contamination that may enter as in-leakage from other systems, identify potential collection points such as water treatment systems or system low points, and address the long term control of radioactive material in the system. DC/COL-ISG-06 and RG 4.21 relate to acceptable levels of detail and content required to demonstrate compliance with 10 CFR 20.1406.

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. GDC 2 requires that SSCs important to safety be designed to withstand the effects of seismic events and other natural phenomena without losing the capability to perform their safety functions. The subject SSCs are those necessary to ensure (1) the integrity of the reactor coolant pressure boundary, (2) the capability to shut down the reactor and maintain it in a safe-shutdown condition, or (3) the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to the guideline exposures of 10 CFR Part 100 Subpart B. When the plant design includes

the CSF as an essential source of cooling water to prevent or mitigate the consequences of accidents or to shut down the reactor and maintain it in a safe-shutdown condition., those portions of the CSF that perform this essential function must be capable of withstanding the effects of an earthquake. Meeting the requirements of GDC 2 provides assurance that adequate reactor cooling will be available in the event of an earthquake, thus preventing offsite exposures that exceed the guidelines in 10 CFR Part 100, Subpart B, Section 100.21.

GDC 2 requires that SSCs important to safety shall be designed to withstand the effects of tornadoes. Regulatory Guides 1.76 and 1.117 identify the characteristics of a design-basis tornado (DBT), and the SSCs that should be designed to withstand the effects of such a tornado and still remain functional. The CSF provides makeup water to systems that remove heat from the reactor if normal heat removal methods fail or are unavailable. In the event of a DBT, severe damage may occur to those systems that are not designed to withstand these effects. Compliance with GDC 2 provides assurance that the CSF will perform its safety function in the event of a DBT.

GDC 2 also requires that SSCs important to safety shall be designed to withstand the effects of floods. Regulatory Guides 1.59 and 1.102 identify the characteristics of a design-basis flood (DBF) and the SSCs that should be designed to withstand the effects of such an event and still remain functional. The CSF provides makeup water to systems that remove heat from the reactor if normal heat removal systems fail or are unavailable. In the event of a DBF, severe damage may occur to those systems that are not designed to withstand these effects. Compliance with GDC 2 provides assurance that the CSF will perform its safety function in the event of a DBF.

2. GDC 4 requires that SSCs important to safety be designed to accommodate the effects of, and to be compatible with, environmental conditions of normal operations, maintenance, testing, and postulated accidents, including LOCAs and dynamic effects of pipe whip, missiles, and discharging fluids. The CSF, or portions of the CFS, may be non-safety-related,and/or non-seismic, in which case failure of CFS components and piping may result in the discharge of fluids that could potentially impact other SSCs. GDC 4 applies to any portion of CSF which may fail and result in fluid discharge.

3. GDC 5 prohibits the sharing of SSCs among nuclear power plant units unless it can be shown that such sharing will not significantly impair their ability to perform their safety-related or risk-significant functions, including, in the event of an accident in one unit, an orderly shutdown and cooldown of the remaining units. The CSF may provide a source of water for decay heat removal from the reactor core and makeup to the spent fuel pool cooling and cleanup system in those plants for which the design includes this system to support the plant in its response to an accident. Meeting the requirements of GDC 5 provides assurance that the unacceptable effects of equipment failures or other events occurring in one unit of a multiunit site will not propagate to the unaffected units.

4. GDC 60 requires that nuclear power unit designs include a means to control the release of radioactive materials in gaseous and liquid effluents produced during normal reactor operation, including anticipated operational occurrences. The criteria in GDC 60 apply to all tanks that are located outside the reactor containment and include radioactive materials in liquids. These tanks have the potential for uncontrolled releases of radioactive materials attributable to spillage. Through its connections with the reactor

coolant system (in boiling-water reactors) or secondary coolant system (in pressurized-water reactors), the CSF potentially contains radioactive material. Meeting the requirements of GDC 60 helps to ensure that radiation exposures for operating personnel and the general public are as low as is reasonably achievable. RG 1.143 provides specific guidance for implementing GDC 60. Compliance with this RG provides assurance that the design of the CSF will include features to prevent uncontrolled releases of radioactive material.

5. GDC 64 requires that means be available for monitoring from effluent discharge paths, and the plant environs for radioactivity that may be released during normal operations, anticipated operational occurrences, and postulated accidents. GDC 64 applies to the CFS because of the possibility of radioactive effluents being introduced into the system inadvertently or through equipment failure (i.e. steam generator tube rupture). The reviewer verifies that monitoring of effluent discharges from the CFS occurs in accordance with GDC 64.

6 10 CFR 20.1406 requires the design of a nuclear power unit to address minimization of contamination of the facility and the environment, and ease of eventual decommissioning. 10 CFR 20.1406 applies to this DSRS section because the condensate storage facility could connect with contaminated systems. Final Interim Staff Guidance DC/COL-ISG-06 and RG 4.21 provide guidance to meet 10 CFR 20.1406. Specific guidance to meet 10 CFR 20.1406 is identified in RG 4.21 Positions C.1 through C.4.

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. The application is reviewed to confirm that the facility and the piping and instrumentation diagrams (P&IDs) delineate the CSF equipment that is used for normal operation, abnormal operation, and accident conditions as follows:

   A. The facility functional requirements and the minimum flow requirements for supplying water auxiliary systems, such as the ultimate heat sink tanks, spent fuel pool cooling and cleanup system, feedwater system, or other safety-related or risk-significant systems are described.

   B. Allowable operational degradation of components (e.g., pump leakage) and the procedures that will be followed to detect and correct degraded conditions when they become excessive are described. Using failure modes and effects analyses or independent calculations, the reviewer confirms that the facility is capable of

losing any active component and still meeting minimum flow requirements to the safety-related or risk-significant systems.

C. The use of tank coatings, floating covers, and other passive components to protect the purity and cleanliness of the condensate is described. These components are evaluated to provide assurance that the methods used to prevent degradation and the procedures to detect such degradation would be effective in protecting the safety-related or risk-significant water supply from adverse effects.

4. The system description and schematics/drawings are reviewed to confirm the following:

A. Safety-related or risk-significant portions of the CSF are correctly identified and are isolable from other portions of the system. The design is reviewed to verify that it clearly indicates the physical division between each portion. The design is also reviewed to verify that it shows the means for accomplishing isolation, and the facility description is reviewed to identify minimum performance requirements for the isolation valves.

B. Safety-related or risk-significant portions of the CSF, including the isolation valves separating seismic Category I portions from the nonseismic portions, are classified as Quality Group C and seismic Category I.

C. Design provisions have been incorporated that permit appropriate inservice inspection and functional testing of safety-related or risk-significant system components. It will be acceptable if the application delineates a testing and inspection program and if the system design shows the necessary test recirculation loops around pumps or isolation valves that this program would require.

5. The CSF is reviewed to ensure that it meets the requirements of 10 CFR 20.1406 for which guidance is provided in DC/COL-ISG-06, “Final Interim Staff Guidance Evaluation and Acceptance Criteria for 10 CFR 20.1406 to Support Design Certification and Combined License Applications”, (ADAMS Accession No. ML092470100) and RG 4.21.

6. The reviewer verifies that the system has been designed so that facility integrity functions are maintained as required in the event of adverse natural phenomena such as tornadoes, hurricanes, and floods, and/or a loss of offsite power or an SBO.
The reviewer evaluates the facility using engineering judgment and the results of failure modes and effects analyses to determine the following:

A. The failure of portions of the facility or of other systems not designed to seismic Category I standards and located close to safety-related or risk-significant portions of the facility or nonseismic Category I structures that house, support, or are close to safety-related portions of the CSF does not preclude safety-related or risk-significant functions. References will be necessary to Chapter 2, of the applicant’s technical submittal, which describes site features and the general arrangement and layout drawings, and to the applicant’s tabulation of seismic design classifications for structures and facilities.

B. The safety-related portions of the CSF for which failures that could adversely impact safety-related or risk-significant SSCs in other systems are protected from the effects of floods, cold weather conditions, hurricanes, tornadoes, and internally or externally generated missiles. The DSRS sections for Chapter 3 of the applicant's submittal discuss and evaluate in detail the flood protection and missile protection criteria. The location and design of the facility and structures are reviewed to confirm that the degree of protection provided is adequate. A statement is acceptable if it indicates (1) that the facility is located in a seismic Category I structure that is protected from tornadoes, missiles, and floods or (2) that components of the facility will be located in individual structures that will withstand the effects of freezing, flooding, and missiles.

C. The condensate storage tank overflow piping is connected to the radioactive waste system. The outdoor storage tank is designed in compliance with GDC 60 and the guidance of RG 1.143 and has a dike or retention basin capable of preventing runoff if a tank overflows or fails. For a nonsafety-related storage facility, the need for a seismic Category I dike or retention basin is reviewed. In accordance with RG 1.143, high liquid level conditions actuate alarms both locally and in the control room.

F. The portions of the CSF for which failures could adversely impact safety-related or risk-significant SSCs in other systems are protected from the effects of high- and moderate-energy line breaks or cracks. The design is reviewed to ensure that no high- or moderate-energy piping systems are close to safety-related or risk-significant portions of the CSF or, if necessary, protection from the effects of failure will be provided. Section 3.6 of the applicant's Safety Analysis Report (SAR) will describe the means of providing such protection, and corresponding DSRS sections note the procedures for reviewing this information.

7. The descriptive information, P&IDs, system drawings, and failure modes and effects analyses in the SAR are reviewed to ensure that safety-related portions of the CSF will function as needed following design-basis accidents, assuming a concurrent single active or passive component failure. The reviewer evaluates the information in the SAR to determine the ability of required components to function, traces the availability of these components on system drawings, and checks that the SAR contains verification that system flow requirements are met for each accident situation for the required time spans. For each case, the design will be acceptable if minimum system flow requirements are met.

   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 DCD.

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., manufacturing license, site suitability report or topical report).

For review of both DC and COL applications, DSRS Section 14.3 should be followed for the review of ITAAC. The review of ITAAC cannot be completed until after the completion of this section.

IV. EVALUATION FINDINGS

The reviewer verifies that the applicant has provided sufficient information and that the staff's technical review and analysis 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.

The CSF includes all components and piping associated with the facility to the points of connection or interfaces with other systems. The review confirms the adequacy of the applicant's proposed design criteria and bases for the CSF and the requirements for sufficient water supply to safety-related or risk-significant systems during normal, abnormal, and accident conditions. Portions of the CSF that are necessary to perform a safe shutdown or to mitigate the consequences of an accident are classified as seismic Category I and Quality Group C.

If applicable, the staff will conclude that the design of the CSF is acceptable and meets the requirements of 10 CFR 20.1406, and GDC 2,4, 5, 60 and 64 based on the following:

1. The applicant has met the requirements of GDC 2 with respect to the ability of the safety-related or risk-significant portions of the system to withstand the effects of earthquakes. Acceptance is based on meeting the guidance of Position C.1 of RG 1.29 if any portion is deemed safety related or risk significant and of Position C.2 for nonsafety-related portions. A portion of the system is deemed safety related or risk significant if a failure or malfunction could adversely affect safety-related or risk-significant systems or components (i.e., those necessary for safe shutdown, accident prevention, or accident mitigation).

2. The applicant has met the requirements of GDC 2 with respect to safety-related or risk-significant portions of the system being designed to withstand the effects of tornadoes. Acceptance is based on meeting the guidance of RGs 1.76 and 1.117.

3. The applicant has met the requirements of GDC 2 with respect to safety-related or risk-significant portions of the system being designed to withstand the effects of floods if a failure or malfunction could adversely affect safety-related or risk-significant systems or components (i.e., those necessary for safe shutdown, accident prevention, or accident mitigation). Acceptance is based on meeting the guidance of RGs 1.59 and 1.102.

4. The applicant has met the requirements of GDC 4 with respect to SSCs important to safety being designed to accommodate the effects of, and to be compatible with, environmental conditions of normal operations, maintenance, testing, and postulated accidents, including LOCAs and dynamic effects of pipe whip, missiles, and discharging fluids. Acceptance is based on applicant's demonstrating that provisions for mitigating the environmental effects of system leakage or storage tank failure are addressed.

5. The applicant has met the requirements of GDC 5 with respect to sharing SSCs by demonstrating that such sharing does not affect the safe shutdown of either unit in the event of an active or passive failure.

6. The applicant has met the requirements of GDC 60 with respect to tanks located outside the reactor containment that include radioactive materials in liquids. Acceptance is based on meeting the guidance of Position C.1.2 of RG 1.143.

7. The applicant has met the requirements of GDC 64 with respect to having design features in place to control and monitor releases of radioactive materials to the environment. Acceptance is based on providing provisions for monitoring releases to the environment.

8 The applicant has met the requirements of 10 CFR 20.1406 consistent with the guidance in DC/COL-ISG-06 and RG 4.21 and is therefore acceptable.

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.

In addition, to the extent that the review is not discussed in other SER sections, the findings will summarize the staff's evaluation of the ITAAC, including design acceptance criteria, as applicable.

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 20.1406, “Minimization of Contamination.”

2. 10 CFR Part 50, Appendix A, GDC 2, Design Bases for Protection Against Natural Phenomena.

3. 10 CFR Part 50, Appendix A, GDC 5, Sharing of Structures, Systems, and Components.

4. 10 CFR Part 50, Appendix A, GDC 60, Control of Releases of Radioactive Materials to the Environment.

5. 10 CFR Part 50, Appendix A, GDC 64, Monitoring Radioactivity Releases Control of Releases of Radioactive Materials to the Environment.

6. DC/COL-ISG-06, “Final Interim Staff Guidance Evaluation and Acceptance Criteria for 10 CFR 20.1406 to Support Design Certification and Combined License Applications”, Oct 2, 2009, (ADAMS Accession No. ML092470100).

7. Regulatory Guide 1.29, Seismic Design Classification.

8. Regulatory Guide 1.68, Initial Test Programs for Water-Cooled Nuclear Power Plants.

9. Regulatory Guide 4.21, Minimization of Contamination and Radioactive Waste Generation: Life-Cycle Planning.

10. Regulatory Guide 1.143, Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants.

11. Regulatory Guide 1.160, “Monitoring the Effectiveness of Maintenance at Nuclear Power Plants.”

12. 10 CFR Part 52.47(b)(1), “Contents of Applications, Technical Information, Inspections, Tests, Analyses, and Acceptance Criteria.”

13. 10 CFR Part 52.80(a), "Contents of Applications, Technical Information, Inspections, Tests, Analyses, and Acceptance Criteria."