

# Draft for Comment



## U.S. NUCLEAR REGULATORY COMMISSION **DESIGN-SPECIFIC REVIEW STANDARD FOR NuScale SMR DESIGN**

### **5.4.2.2 STEAM GENERATOR PROGRAM**

#### **REVIEW RESPONSIBILITIES**

**Primary -** Organization responsible for the review of component integrity issues related to steam generator tubes

**Secondary -** None

#### **I. AREAS OF REVIEW**

The NuScale integral pressurized water reactor (iPWR) designed by B&W includes a single internal steam generator.

The purpose of this review is to (1) ensure that the design of the steam generator is adequate for implementing a steam generator program and (2) verify that the steam generator program will result in maintaining tube integrity during operation and postulated accident conditions. The steam generator program is intended to ensure that the structural and leakage integrity of the tubes is maintained at a level comparable to that of the original design requirements.

The specific areas of review are as follows:

1. The design of the primary and secondary side of the steam generator is reviewed to ensure that it permits implementation of a steam generator program.
2. The steam generator program is reviewed to ensure that it provides reasonable assurance that the structural and leakage integrity of the steam generator tubes will be maintained.
3. For a combined license (COL) application, the staff reviews the operational program description and the proposed implementation milestone for the portion of the inservice inspection (ISI) operational program that addresses steam generators.
4. Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC). For design certification (DC) and COL reviews, the staff reviews the applicant's proposed ITAAC associated with the structures, systems, and components (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 design-specific review standard (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 Standard Review Plan (SRP) Section 14.3.

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.

6. Operational Program Description and Implementation. For a COL application, the staff reviews the Steam Generator Program description and the proposed implementation milestones. The staff also reviews final safety analysis report (FSAR) Table 13.x to ensure that the Steam Generator Program and associated milestones are included.

Specific to this DSRS section, the Steam Generator Program is based on the requirements of 10 CFR 50.36, 10 CFR 50, Appendix B, 10 CFR 50.55a and 10 CFR 50.65. The inservice inspection and testing of other areas of the reactor coolant pressure boundary (RCPB) (e.g., steam generator primary channel head) are reviewed under DSRS Section 5.2.4.

#### Review Interfaces

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

1. The acceptability of the classification of systems and components is reviewed under DSRS Section 3.2.2. The classification of the systems and components may affect the steam generator program requirements.
2. The inspection of bolting and threaded fasteners is reviewed under DSRS Section 3.13.
3. The acceptability of any American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (ASME Code) cases that the applicant may have invoked in connection with the steam generator program is reviewed under DSRS Section 5.2.1.2.
4. The ISI and testing of other areas of the RCPB (e.g., steam generator primary channel head) are reviewed under DSRS Section 5.2.4.
5. The acceptability of the steam generator design and materials is reviewed under DSRS Section 5.4.2.1.
6. The ISI of Class 2 and 3 components (e.g., steam generator shell) is reviewed under DSRS Section 6.6.
7. For COL reviews of operational programs, the review of the applicant's implementation plan is performed under DSRS Section 13.4, "Operational Programs."
8. Review of proposed ITAAC associated with SSCs for RCPB overpressure protection (under SRP Section 14.3).

9. The acceptability of the technical specifications is reviewed under DSRS Section 16.0 and SRP Section 16.1; however, the acceptability of the technical requirements listed in the steam generator portion of the technical specifications in the latest revision of NUREG-1430 is reviewed under this DSRS section.
10. Review of the reliability assurance program is coordinated and performed under SRP Section 17.4.
11. The acceptability of the quality assurance program is reviewed under SRP Section 17.5.
12. Review of steam generator tube component integrity operations support and maintenance is performed under SRP Section 17.6.
13. Review of probabilistic risk assessments evaluating risk significance of the mPower™ steam generator is coordinated and performed under SRP Chapter 19.

## II. ACCEPTANCE CRITERIA

### Requirements

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

1. General Design Criterion (GDC) 32 of Appendix A to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50. GDC 32 requires, in part, that the designs of all components that are part of the RCPB permit periodic inspection and testing of critical areas and features to assess their structural and leaktight integrity.
2. 10 CFR 50.55a(g) requires that ISI programs meet the applicable inspection requirements in Section XI of the ASME Code. The steam generator program is a portion of the ISI program. In addition, 10 CFR 50.55a(b)(2)(iii) specifically addresses steam generator tubes and states that if the plant technical specifications include inspection requirements that differ from those in Article IWB-2000 of Section XI of the ASME Code, the Technical Specifications govern.
3. 10 CFR 50.36 applies to the steam generator program in the technical specifications.
4. Appendix B to 10 CFR Part 50 applies to the implementation of the steam generator program. Of particular note are Criteria IX, XI, and XVI. Criterion IX requires, in part, that measures shall be established to ensure that special processes, including nondestructive testing, are controlled and accomplished by qualified personnel using qualified procedures. Criterion XI requires, in part, the establishment of a test program to ensure that all testing required to demonstrate that SSCs will perform satisfactorily in service is identified and performed in accordance with written test procedures that incorporate the requirements and acceptance limits in applicable design documents. Criterion XVI requires, in part, that measures shall be established to ensure the prompt identification and correction of conditions that are adverse to quality.
5. 10 CFR 50.65 requires that licensees monitor the performance or condition of SSCs against goals to provide reasonable assurance that such SSCs are capable of fulfilling their intended functions.

6. 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 (AEA), and the U.S. Nuclear Regulatory Commission's (NRC's) regulations;
7. 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 combined license, 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. Steam generator tubes are susceptible to degradation. This degradation can occur anywhere along the length of the tube. As a result, each tube is required to be accessible for inspection along its entire length and removable from service if unacceptable flaws are observed. The entire length of each tube must be inspectable using currently available nondestructive examination methods and techniques capable of finding the forms of degradation that may occur during the service life of the steam generators. The design of the steam generators should permit tubes with unacceptable flaws to be removed from service to ensure that tube integrity will be maintained. Tubes with unacceptable flaws should also be capable of being stabilized if it is determined that a plugged tube potentially may sever (as a result of continued degradation) and subsequently affect the integrity of an active tube.

Access to both the primary and secondary sides of the steam generator tubes is required because conditions may exist on either side of the steam generator tubes that could affect their structural and leakage integrity. This should include, for example, access to the secondary face of the tubesheet, open tube lanes, feedwater inlet area and other locations that may impair tube integrity. Degradation of secondary side internals can result in the generation of loose parts, inadequate tube support, and mechanical damage to the tubes. In addition, the introduction of foreign objects (including loose parts) into the steam generator during fabrication, maintenance, or operation of the steam generators could impact tube integrity. Sludge buildup and deposits on the tubes can increase the susceptibility of the tubing to corrosion and make it more difficult to inspect the tubing (e.g., because of noise in eddy current data or obstructions in a visual inspection).

As a result, the design of the steam generators is considered acceptable for the purposes of implementing the steam generator program if it (1) ensures that all steam generator tubes are accessible for periodic inspection, testing, and repair (including

plugging and stabilizing), (2) permits an inspection of the full length of every tube, using currently available nondestructive examination methods and techniques, (3) allows access to the tubes from the primary side, (4) permits access to the secondary side of the steam generator for assessing the condition of SSCs that may affect tube integrity and for taking appropriate corrective action if adverse/anomalous conditions are identified, (4) permits inspection for, and removal of, foreign objects (including loose parts), and (5) allows the removal of each tube from service.

2. A steam generator program is needed to ensure the effective monitoring and management of tube degradation and degradation precursors (so as to ensure steam generator tube integrity). This permits prompt preventive and corrective actions to ensure that the structural and leakage integrity of the steam generator tubes is maintained. The steam generator program should include elements such as an assessment of degradation, inspection requirements for the tubes and any repairs to the tubes (including plugging), integrity assessment procedures, tube plugging and repairs, primary-to-secondary leak monitoring, foreign material exclusion (including management of loose parts), maintenance of steam generator secondary side integrity, contractor oversight, self assessment, and reporting. For light water reactors (LWRs), Nuclear Energy Institute (NEI) 97-06 discusses many of the elements of a steam generator program. The water chemistry portion of the steam generator program is reviewed under BTP 5-3, "Monitoring of Secondary Side Water Chemistry in PWR Steam Generators."
3. The latest revision of NUREG-1430 provides for the establishment and implementation of a steam generator program to ensure that tube integrity is maintained for the operating interval between tube inspections, consistent with the requirements of GDC 32. The technical specifications provide the objectives of the steam generator program, maximum limits on the quantity of primary-to-secondary leakage permitted during operation, maximum time interval between inspections, objectives of the techniques used to inspect the tubes, tube repair criteria, and tube repair methods. "Notice of Availability of Model Application Concerning Technical Specification Improvement To Modify Requirements Regarding Steam Generator Tube Integrity Using the Consolidated Line Item Improvement Process," and "Notice of Opportunity To Comment on Model Safety Evaluation on Technical Specification Improvement To Modify Requirements Regarding the Addition of LCO 3.4.[17] on Steam Generator Tube Integrity Using the Consolidated Line Item Improvement Process" include the staff's evaluation of these Technical Specifications. The intention of implementing this program is to ensure tube integrity consistent with the original design criteria for the tubes.

Certain aspects of the steam generator portion of the Standard Technical Specifications specify a plant-specific evaluation. For example, the tube repair criteria and tube repair methods are evaluated on a plant-specific basis.

4. With respect to the steam generator tube repair criteria, Regulatory Guide (RG) 1.121 describes a methodology acceptable to the NRC staff for determining the repair criteria specified in the Technical Specifications. Specifically, RG 1.121 describes a methodology for determining the minimum acceptable steam generator tube wall thickness. This methodology accounts for flaw growth and the uncertainty in measuring the size of the flaw (i.e., nondestructive examination uncertainty). The general principles of RG 1.121 can also be used to evaluate the acceptability of alternate tube repair criteria, that is, to assess tube repair criteria based on inspection parameters (e.g., flaw length) other than the depth of the flaw (i.e., other than a minimum wall-thickness repair criterion). Tubes with flaws that exceed the repair criteria, as determined by the steam

generator program, are removed from service consistent with the objective of the steam generator program to maintain tube integrity.

5. With respect to tube repair methods, the review of these methods ensures that the repair is accessible for inspection and that techniques are available to find the forms of degradation to which the repair may be susceptible. The acceptability of any materials used in the repair is evaluated under DSRS Section 5.4.2.1. The review of the acceptability of the mechanical design of the repair is consistent with the design requirements of the ASME Code and the steam generator performance criteria in the Standard Technical Specifications. The repair criteria for the repair method are reviewed under the guidance in RG 1.121.
6. The latest revision of NUREG-1430 addresses ISI; however, preservice inspections are essential in assessing the nature and significance of indications detected during ISI. As a result, it is important to inspect all tubes before placing the steam generators in service, using techniques that should be used during subsequent inspections (i.e., ISI). Although preservice inspections should use techniques that are expected to be employed during ISI, this expectation should not be construed to inhibit the use of new technology or to imply that the techniques used during the preservice inspection will always remain acceptable (i.e., different techniques may be appropriate based on operating experience).
7. 10 CFR 50.55a(b)(2)(iii) specifically addresses the inspection of steam generator tubes and states that if the plant Technical Specifications include inspection requirements that differ from those in Article IWB-2000 of Section XI of the ASME Code, the Technical Specifications govern. This requirement is intended to resolve any conflict between the requirements in the ASME Code and the Technical Specifications. If a conflict (i.e., difference) does not exist pertaining to a specific requirement, both the requirements of the ASME Code and the Technical Specifications must be met. In general, the requirements in the ASME Code and the Technical Specifications are complementary.
8. For applicants referencing a certified design, the Standard Technical Specifications associated with the referenced design will specify the guidelines for periodic inspection and testing of the steam generator tube portion of the RCPB.
9. Operational Programs. For COL reviews, the description of the operational program and proposed implementation milestones for the Steam Generator Program are reviewed in accordance with 10 CFR.55a(g) as it relates to periodic inspection and testing of the steam generator tubes as detailed in Section XI of the ASME Code. The implementation milestone is the establishment and completion of an acceptable steam generator program per Article IWA-2430(b) of Section XI of the ASME Code before placing the plant into commercial service.

The steam generator program is acceptable if it:

- A. Complies with 10 CFR 50.55a as it relates to periodic inspection and testing of the steam generator tubes as detailed in Section XI of the ASME Code.
- B. Complies with 10 CFR 50.65 as it relates to monitoring SSCs and establishing goals to provide reasonable assurance that such SSCs are capable of fulfilling their intended functions.

## Draft for Comment

- C. Incorporates the steam generator program requirements in the latest revision of the Standard Technical Specification NUREG-1430 into the facility's technical specifications (the steam generator program in the standard technical specifications meets the requirements of 10 CFR 50.36).
  - D. Verifies that all potential conflicts between the technical specifications and the ASME Code are identified.
  - E. Verifies that the steam generator program includes the elements discussed above.
  - F. Ensures that all tubes are inspected before being placed in service, using techniques that are expected to be used during subsequent inspections.
10. 10 CFR 52.47(b)(1) specifies that the application of a design certification should contain proposed ITAAC for SSCs necessary and sufficient to assure the plant is built and will operate in accordance with the design certification. 10 CFR 52.80(a) specifies that the COL Applicant identifies the ITAAC for SSCs 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 Act, and Commission's rules and regulations. SRP 14.3 provides guidance for reviewing the ITAAC. The requirements of 10 CFR 52.47(b)(1) and 10 CFR 52.80(a) will be met, in part, by identifying inspections, tests, analyses, and acceptance criteria of the top-level design features of the steam generator program in the design certification application and the combined license, respectively.

### 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 paragraph:

The mPower™ integral once-through steam generator serves as the boundary between the primary and secondary sides of the iPWR. As a result, it serves both as the RCPB and as the containment. Primary leakage into the secondary system could lead to the direct release of radioactivity to the environment.

### 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.

- 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 reviewer verifies that the design of the steam generator meets the acceptance criteria specified in Subsection II of this DSRS.
4. Operational Programs. The reviewer verifies that the Steam Generator Program is fully described and that implementation milestones have been identified. The reviewer verifies that the program and implementation milestones are included in technical submittal Table 13.x.

Implementation of this program will be inspected in accordance with NRC Inspection Manual Chapter IMC-2504, "Construction Inspection Program - Non-ITAAC Inspections."

The staff reviews the discussion on the operational program and its implementation. The implementation description should contain one or more milestones, depending on whether the program will be implemented all at once or in a phased approach. The staff will obtain a reasonable assurance finding on each program and its proposed implementation, including the adequacy of the of the implementation milestones. The Evaluation Findings section of the staff's SER will document these findings. In addition, the staff proposes a license condition that will link program implementation milestones to the license.

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 technical submittal meets the acceptance criteria. 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 application.

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, SRP 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.

- 5.. For the review of amendments to existing operating licenses, construction permits, or COLs, the current configuration of the steam generators will be considered (e.g., presence of loose parts, as-built configuration of the steam generator). These reviews are intended to verify that any proposed modification to the steam generator or the conditions under which it operates will continue to ensure that the tubes or tube repairs remain accessible for inspection and that the steam generator program (including the Technical Specifications) remains sufficient for ensuring steam generator tube integrity (consistent with the above).

For license amendment reviews pertaining to steam generators, the NRC staff determines which if any of the above areas are impacted by the amendment and ensures that the acceptance criteria for those areas are still satisfied. For example, sleeves proposed for repairing steam generator tubes should be reviewed to verify that the sleeve design permits an inspection and that inspection techniques exist for finding the forms of degradation that could potentially affect the sleeves. In the case of power uprate amendments, the effect of changes in operating parameters (e.g., differential pressure, temperature, and flow rates) on the tube repair limits and on the ability of the

ISI to ensure tube integrity for the operating interval between inspections should be reviewed. Consideration should be given to the actual condition of the steam generator at the time that the amendment is approved (e.g., presence of loose parts, extent of degradation).

The level of detail to which the reviewer verifies the above acceptance criteria is to be determined on a case-by-case basis consistent with a risk-informed, performance-based regulatory approach. Previous operating experience should be used in determining the level of detail for the review (e.g., review of qualification data for inspection techniques to be used).

#### 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. To ensure that no deleterious defects develop during service, steam generator tubes will be inspected before plant startup and periodically throughout the life of the plant. The applicant (licensee) has stated that the steam generator program will comply (complies) with the rules published in 10 CFR 50.55a, 10 CFR 50.65, and the applicant's (licensee's) technical specifications. The applicant (licensee) has stated that the steam generator program includes the tubes, tube repairs (including plugs), and steam generator secondary side internals that can affect the integrity of the tubes. In addition, the licensee has indicated that the program addresses the inspection for, and removal of, foreign objects (loose parts) that can affect tube integrity.
2. The applicant (licensee) has stated that the entire length of each tube can be inspected with currently available methods and techniques. These methods and techniques are capable of finding the forms of degradation that could potentially occur during the service life of the steam generators. If unacceptable flaws are identified during the course of an inspection, each tube is accessible and can be removed from service and stabilized, as necessary. The design of the steam generator includes provisions for access to both the primary and secondary sides of the steam generator. Access to the secondary side includes the secondary face of the tubesheet, open tube lanes, feedwater inlet area (e.g., J-tubes or preheater inlet), and other components that could affect steam generator tube integrity.

The steam generator program is (will be) consistent with the latest revisions of the Standard Technical Specification NUREG-1430. In addition, the steam generator tube repair criteria specified in the technical specifications were (will be) determined by using the methodology specified in RG 1.121.

3. The applicant (licensee) has identified all instances in which the inspection (surveillance) requirements in the plant technical specifications differ (will differ) from those in Article IWB-2000 of Section XI of the ASME Code. In these instances, the requirements of the plant technical specifications will govern, consistent with the requirements in 10 CFR 50.55a(b)(2)(iii).
4. The applicant (licensee) has indicated that the steam generator program will be implemented in accordance with the requirements of Appendix B to 10 CFR Part 50.

5. The staff concludes that the steam generator program is acceptable and meets the requirements of GDC 32, 10 CFR 50.55a, 10 CFR 50.36, 10 CFR Part 50, Appendix B and 10 CFR 50.65. This conclusion is based on the design of the steam generator being accessible for inspection and the implementation of a steam generator program to maintain the structural and leakage integrity of the steam generator tubes.

For COL reviews, a license condition for operational programs should be added to the license with the evaluation findings including a specific conclusion regarding its implementation.

The applicant described the Steam Generator Program and its implementation in conformance with 10 CFR 50.55a. In addition, the findings will include a license condition as follows:

The licensee should implement the programs (or portions of programs) identified in Table\_\_\_\_\_on or before the associated milestone(s) in Table\_\_\_\_\_.

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 50.36, "Technical Specifications."
2. 10 CFR 50.55a, "Codes and Standards."
3. 10 CFR Part 50, Appendix A, General Design Criterion 32, "Inspection of Reactor Coolant Pressure Boundary."
4. 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants."
5. 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants."
6. RG 1.121, "Bases for Plugging Degraded PWR Steam Generator Tubes."
7. NUREG-1430, "Standard Technical Specifications for Babcock and Wilcox Pressurized Water Reactors."
8. "Notice of Availability of Model Application Concerning Technical Specification Improvement To Modify Requirements Regarding Steam Generator Tube Integrity Using the Consolidated Line Item Improvement Process," ADAMS Accession No. ML051160106, May 2, 2005.
9. "Notice of Opportunity To Comment on Model Safety Evaluation on Technical Specification Improvement To Modify Requirements Regarding the Addition of LCO 3.4.[17] on Steam Generator Tube Integrity Using the Consolidated Line Item Improvement Process," ADAMS Accession No. ML050310015, February 22, 2005.
10. SECY-05-0197, "Review of Operational Programs in a Combined License Application and Generic Emergency Planning Inspections, Tests, Analyses, and Acceptance Criteria."
11. Nuclear Energy Institute, NEI 97-06, Revision 2, "Steam Generator Program Guidelines," ADAMS Accession No. ML052710007, September 9, 2005.
12. ASME Boiler and Pressure Vessel Code, Section II, "Materials Specifications."
13. ASME Boiler and Pressure Vessel Code, Section III, "Rules for Construction of Nuclear Facility Components."

14. ASME Boiler and Pressure Vessel Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components."
15. NRC Inspection Manual Chapter IMC-2504, "Construction Inspection Program - Non-ITAAC Inspections," issued April 25, 2006.
16. Branch Technical Position 5-1, "Monitoring of Secondary Side Water Chemistry in PWR Steam Generators."