

# Proposed - For Interim Use and Comment



## U.S. NUCLEAR REGULATORY COMMISSION DESIGN-SPECIFIC REVIEW STANDARD FOR mPOWER™ iPWR DESIGN

### 6.6 INSERVICE INSPECTION AND TESTING OF CLASS 2 AND 3 COMPONENTS

#### REVIEW RESPONSIBILITIES

**Primary -** Organization responsible for the review of the inspection, testing, evaluation, and repair of mechanical equipment and components

**Secondary -** None

#### I. AREAS OF REVIEW

Inservice inspection (ISI) and inservice testing (IST) programs are based on the requirements of 10 CFR 50.55a, which requires that Code Class components meet the applicable inspection requirements set forth in Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (hereinafter "the ASME Code"). ISI includes preservice examinations prior to initial plant startup as required by Articles IWC-2200, IWD-2200, IWE/IWL-2200, and IWF-2200 of Section XI of the ASME Code. Certain inservice testing requirements are set forth in Section XI of the ASME Code. Pressure, hydrostatic and leak tests for Code Class 2 and 3 components are addressed in Articles IWC-5000 and IWD-5000 in Section XI, and acceptance test alternatives to examinations for supports (other than dynamic restraints) for Code Class 2 and 3 components are addressed in Article IWF-1200 in Section XI. However, inspection and testing requirements for Code Class 2 and 3 components such as pumps, valves and dynamic restraints are set forth in the ASME Code for Operation and Maintenance of Nuclear Power Plants (hereinafter "the ASME OM Code") and are addressed in the review performed under DSRS Section 3.9.6, "Functional Design, Qualification, and Inservice Testing Programs for Pumps, Valves, and Dynamic Restraints."

This DSRS does not address those unique aspects of the mPower design that may limit the effective use of ASME B&PV Code, Section XI, to ensure the safe operation of the plant. Those technical issues, which include, but are not limited to, the inspection requirements for safety related piping less than 4" in diameter, the accessibility of components for inspection, and the use of a four-year refueling outage interval, will be addressed by the applicant and reviewed by the staff on a case-by-case basis.

The specific areas of review are as follows:

1. Components Subject to Examination. The descriptive information in the applicant's technical submittal is reviewed to establish that all ASME Code Class 2 and Class 3 components, as defined in Article NCA-2000, "Classification of Components," of Section III of the ASME Code, subject to examination are included in the ISI Program. Such components include safety-related components and nonsafety-related, risk significant components that are subject to Regulatory Treatment of Nonsafety Systems (RTNSS) based on the selection criteria in Section C.IV.9.3 of Regulatory Guide 1.206.

2. Accessibility. The descriptive information, including drawings, is reviewed to establish that the Section XI, Article IWA-1500, "Accessibility," provisions for system accessibility are included in the applicant's layout and design of these systems.
3. Examination Categories and Methods. The required examination categories and methods included in Articles IWA-2000, IWC-2000, IWD-2000, and IWF-2000, "Examination and Inspection," of Section XI are reviewed.
4. Inspection and Testing Intervals. The required examinations, inspections and tests listed in the applicant's technical submittal and/or plant Technical Specifications or short-term availability controls are reviewed and compared to the requirements in Articles IWA-2000, IWC-2000, IWD-2000, and IWF-2000 of Section XI to verify that they will be performed within the designated inspection interval.
5. Evaluation of Examination Results. The information concerning repair procedures is reviewed for compliance with Article IWA-4000, "Repair/Replacement Activities," of Section XI. The information concerning evaluation of examination results is reviewed for compliance with Articles IWC-3000 and IWD-3000, "Acceptance Standards," and IWF-3000, "Standards for Examination Evaluations," of Section XI. If the applicable ASME Code edition states that these requirements are in the course of preparation, the review should address suitable alternative provisions, such as those provided in Article IWB-3000 or those in later approved editions of the Code, as proposed by the applicant.
6. System Pressure Tests. The pressure test program is reviewed for compliance with Articles IWC-5000 and IWD-5000, "System Pressure Tests," of Section XI to establish that leakage and signs of structural distress are inspected as required by the ASME Code.
7. Structural Supports: The ISI program for examinations or alternative tests for fixed structural supports is reviewed for compliance with Article IWF-1200, "Component Supports subject to Examination and Test," of Section XI to establish that signs of structural distress are inspected as required by the ASME Code.
8. Code Exemptions from Examination. The ASME Code exemptions, as permitted by ASME Section XI, Articles IWC-1220 and IWD-1220, "Components Exempt from Examination," and IWF-1230, "Supports Exempt from Examination," are reviewed.
9. Relief Requests. Relief requests intended to be used are reviewed
10. Code Cases. The acceptability of any ASME Code or ASME OM Code Cases that the applicant may have invoked in connection with the ISI programs will be verified.
11. 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 DSRS section in accordance with NUREG-0800, 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.

12. 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.

13. Operational Program Description and Implementation. For a COL application, the staff reviews the Preservice Inspection and Inservice Inspection and Testing program description and the proposed implementation milestones. The staff also reviews the applicant's technical submittal Table 13.4-x to ensure that the Inservice Inspection and Testing of Class 2 and 3 Components Program and associated milestones are included.
14. For a COL application, the staff reviews the Containment Inspection Program submitted under Design-Specific Review Standard (DSRS) Section 3.8 or 6.6 to assure the program meets the requirements of IWE/IWL-2200.

### Review Interfaces

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

1. The review of the adequacy of programs for assuring the integrity of bolting and threaded fasteners is performed under DSRS Section 3.13, "Threaded Fasteners."
2. The review to ensure that systems and components are appropriately classified in accordance with regulatory requirements and NRC quality group classification guidance, including verification that quality group B and C components meet the requirements for Code Class 2 and 3 components, respectively, is performed under DSRS Section 3.2.2, "System Quality Group Classification," and DSRS Section 5.2.1.1, "Compliance with the Codes and Standards Rule, 10 CFR 50.55a."
3. The review of the design and ITAAC for ASME Code Class 1, 2, and 3 supports is performed under SRP Section 3.9.3, "ASME Code Class 1, 2, and 3 Components, and Component Supports, and Core Support Structures."
4. The review of the inservice testing programs for pumps, valves and dynamic restraints that are designated as ASME Class 1, 2, or 3 or are otherwise designated as safety-related is performed under DSRS Section 3.9.6, "Functional Design, Qualification, and Inservice Testing Programs for Pumps, Valves, and Dynamic Restraints."
5. The review of risk-informed inservice inspection and testing programs is performed in a coordinated manner jointly under DSRS Sections 3.9.7, "Risk-Informed Inservice Testing," 3.9.8, "Risk-Informed Inservice Inspection of Piping," and 19.1, "Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities." In addition, a RI-ISI program submittal may be reviewed as an ASME Code Case approved under Regulatory Guide (RG) 1.147 under this Section.

6. The review of preservice inspection and inservice inspection requirements for ASME Code Class 1 components of the reactor coolant pressure boundary is performed under SRP Section 5.2.4, "Reactor Coolant Pressure Boundary Inservice Inspection and Testing."
7. The review of the inservice inspection requirements for steam generator tubes is performed under DSRS Section 5.4.2.2, "Steam Generator Tube Inservice Inspection."
8. The review of plant programs for surveillance, testing, inspection, and maintenance of safety-related and/or risk significant cooling water systems is performed under DSRS Sections 5.4.7, "Residual Heart Removal (RHR) System," 6.2.2, "Containment Heat Removal Systems," 6.3, "Emergency Core Cooling System," 9.2.5, "Ultimate Heat Sink Tank" and its associated refill system, 9.3.4, "Reactor Coolant Inventory and Purification System, and 9.2.2, "Chilled Water System." These programs are coordinated with the ISI programs reviewed under this DSRS section, SRP section 3.9.3, DSRS Section 3.9.6, and with the risk informed assessment under the DSRS sections identified in the interface number 4 above.
9. The reviews of required quality assurance controls for inspection and testing activities and of the associated procedural controls for monitoring equipment performance and conditions are performed under SRP Sections 17.2 and 17.5.
10. The augmented ISI program, as specified in DSRS Section 3.6.2, that provides assurance against postulated piping failures of high-energy fluid systems between containment isolation valves is reviewed.
11. For COL reviews of operational programs, the review of the applicant's implementation plan is performed under DSRS Section 13.4, "Operational Programs."
12. For COL reviews of technical specifications and short-term availability controls, the review of the applicant's implementation of ISI in surveillance requirements and administrative controls such as procedures, programs and manuals for ISI programs is performed under DSRS Sections 16.0, "Technical Specifications."
13. The review of the risk significance of SSCs is performed under SRP Section 19.0.

## II. ACCEPTANCE CRITERIA

### Requirements

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

1. 10 CFR 50.36 as it pertains to surveillance requirements and administrative controls using procedures and record keeping for periodic inspections and testing implementing the ASME Code for Class 2 and 3 systems and components. The inservice testing program for Class 2 and 3 components is found in Specification 5.5.8 of the Standard Technical Specifications administrative controls and is invoked in various surveillance requirements in the Standard Technical Specifications.

2. 10 CFR 50.65 as it pertains to monitoring the performance or condition of SSCs against licensee-established goals in a manner sufficient to provide reasonable assurance that the safety-related and/or risk significant SSCs are capable of fulfilling their intended functions where licensee-established goals shall be commensurate with safety and, where practical, take into account industrywide operating experience reflected in codes and standards.
3. 10 CFR 50.55a as it pertains to specification of the preservice and periodic inspection and testing requirements of the ASME Code and the ASME OM Code for Class 2 and 3 systems and components. 10 CFR 50.55a(f) stipulates inservice testing requirements; 10 CFR 50.55a(g) stipulates inservice inspection requirements.
4. General Design Criterion (GDC) 1 found in Appendix A to 10 CFR Part 50, as it pertains to structures, systems, and components important to safety that shall be inspected and tested to quality standards commensurate with the importance of the safety functions to be performed and, where generally recognized codes and standards are used, they shall be identified and evaluated to determine their applicability, adequacy, and sufficiency and shall be supplemented or modified as necessary to assure quality in keeping with the required safety function.
5. GDC 36 found in Appendix A to 10 CFR Part 50, as it pertains to designing the emergency core cooling system (ECCS) to permit appropriate periodic inspection of important safety components.
5. GDC 37 found in Appendix A to 10 CFR Part 50, as it pertains to designing the ECCS to permit appropriate testing to assure structural integrity, leak tightness, and the operability of the system.
6. GDC 39 found in Appendix A to 10 CFR Part 50, as it pertains to designing the containment heat removal system, which for mPower™ is integral with the ECCS, to permit inspection of important components, such as the ECCS piping to the Ultimate Heat Sink (UHS) tank and the containment interfacing structure with the UHS tank, to assure the integrity and capability of the system.
7. GDC 40 found in Appendix A to 10 CFR Part 50, as it pertains to designing the containment heat removal system to permit appropriate pressure and functional testing. For mPower™ wherein the passive containment heat removal system is integrated with the ECCS and UHS tank, the requirements of GDC 37 apply to the Class 2 or 3 ECCS piping to/from the UHS tank, and GDC 40 applies to the UHS tank and containment interface along the containment dome.
8. GDC 42 found in Appendix A to 10 CFR Part 50, as it pertains to designing the containment atmosphere cleanup systems to permit appropriate inspection of components such as the hydrogen recombiners and the containment atmosphere sampling lines and isolation valves.
9. GDC 43 found in Appendix A to 10 CFR Part 50, as it pertains to designing the containment atmosphere cleanup systems to permit appropriate periodic functional testing to assure structural integrity of components and the operability and performance of components of the system.

10. GDC 45 found in Appendix A to 10 CFR Part 50, as it pertains to designing the cooling water systems to permit appropriate periodic inspection and testing of important components, such as pumps, valves, piping and heat exchangers as appropriate under this DSRS section or under DSRS section 3.9.6.
11. GDC 46 found in Appendix A to 10 CFR Part 50, as it pertains to designing the cooling water systems to permit appropriate pressure and functional testing to assure structural and leaktight integrity of its components and operability of active components such as pumps and valves (see DSRS Section 3.9.6).
12. 10 CFR Part 50 Appendix B, as it pertains to inspections, tests, and associated procedural controls and documentation of results to assure the quality of the ISI programs implementation.
13. 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.
14. 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 Atomic Energy Act, and the NRC's regulations.
15. 10 CFR 50.55a(g)(3), which requires that a Class 1, 2, and 3 components (including supports) be designed and provided with access to enable the performance of inservice examinations of these components and must meet the preservice examination requirements set forth in the additions and addenda of Section XI of the ASME Boiler and Pressure Vessel Code incorporated by reference in paragraph (b) of 10CFR 50.55a or the optional ASME Code cases listed in NRC RG 1.147.

#### DSRS Acceptance Criteria

Specific DSRS acceptance criteria acceptable to meet the relevant requirements of the NRC's regulations identified above are as follows for review described in this DSRS section. The DSRS is not a substitute for the NRC's regulations, and compliance with it is not required. Identifying the differences between this DSRS section and the design features, analytical techniques, and procedural measures proposed for the facility, and discussing how the proposed alternative provides an acceptable method of complying with the regulations that underlie the DSRS acceptance criteria, is sufficient to meet the intent of 10 CFR 52.47(a)(9), "Contents of applications; technical information."

1. Components Subject to Inspection. The applicant's definition of ASME Code Class 2 and 3 components and systems subject to an ISI program is acceptable if it is in agreement with the NRC quality group classification system or the definitions in Article NCA-2000 of Section III of the ASME Code. The classification of components by the applicant is subject to review under DSRS Section 3.2.2 for compliance with safety criteria pertaining to component classification. Where a specific item will be subject to inspection requirements different in any way from the ASME Code Section XI requirements corresponding to the item's Code Class, the exceptions for the item, including the inservice inspection requirements to be applied, should be clearly identified and described. Exceptions involving less stringent inspection requirements for Code Class 2 or 3 items other than those required by Section XI must be adequately justified. (Refer to DSRS Section 3.2.2 or Article NCA-2000 of Section III of the ASME Code.)
2. Accessibility. The design and arrangement of Class 2 and 3 systems must include allowances for adequate clearances to conduct the examinations specified in ASME Code Articles IWC-2000, IWD-2000, and IWF2000 at the frequency specified. The design and arrangement of system components are acceptable if adequate clearance is provided in accordance with ASME Code Article IWA-1500 and 10 CFR 50.55a(g)(3). Special design considerations are given to those systems that are intended to be examined during normal reactor operation
3. Examination Categories and Methods. The examination categories and requirements specified in the applicant's technical submittal are acceptable if they are in agreement with the rules of ASME Code Articles IWA-2000, IWC-2000, IWD-2000, IWE/IWL-200, and IWF-2000. Every area subject to examination should fall within one or more of the examination categories and must be examined at least to the extent specified.

The applicant's examination techniques and procedures used for preservice inspection and inservice inspection are acceptable if they are in agreement with the following criteria:

- A. The methods, techniques, and procedures for visual, surface, or volumetric examination are in accordance with Article IWA-2000.
- B. Alternative examination methods, combination of methods, or newly developed techniques to those given in A. above are acceptable provided that the results are equivalent or superior. The acceptance standards for these alternate methods are given in Articles IWC-3000, IWD-3000, and IWF-3000.
- C. The methods, procedures, and requirements regarding qualification of personnel performing ultrasonic examination reflect the guidance provided in Appendix VII, "Qualification of Nondestructive Examination Personnel for Ultrasonic Examination," to Division 1 of Section XI of the ASME Code.
- D. Performance demonstration for ultrasonic examination procedures, equipment, and personnel used to detect and size flaws are in accordance with the requirements of Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems," to Division 1 of Section XI of the ASME Code.

4. Inspection Intervals. The ISI program schedule provided in the applicant's technical submittal is acceptable if the required examinations and pressure tests are specified for completion during each interval, hereinafter designated as the "inspection interval," and as required by ASME Code Section XI, Articles IWA-2000, IWC-2000, IWD-2000, and IWF-2000.
5. Evaluation of Examination Results. The methods for evaluation of examination results are reviewed for compliance with Articles IWC-3000, IWD-3000, and IWF-3000 in the Code. If the applicable edition of the Code states that these articles are in the course of preparation, the rules of Article IWB-3000 shall apply. The repair procedures are acceptable if they are in compliance with ASME Code Section XI, Article IWA-4000.
6. System Pressure Tests. The program provided in the applicant's technical submittal for Class 2 and 3 system pressure testing is acceptable if it meets the criteria of ASME Code Section XI, Articles IWC-5000 and IWD-5000.
7. Structural Supports: The program provided in the applicant's technical submittal for examinations or alternative tests for fixed structural supports of Class 2 and 3 SSCs is acceptable if it meets the criteria of ASME Code Section XI, Article IWF-1200.
8. Augmented ISI to Protect Against Postulated Piping Failures. The augmented ISI program for high-energy fluid system piping between containment isolation valves is acceptable if it specifies the following requirements:
  - A. Protective measures, structures, and guard pipes should not prevent the access required to conduct the inservice examinations specified in the Division 1 of Section XI of the ASME Code.
  - B. For those portions of high energy fluid system piping between containment isolation valves, the extent of inservice examination completed during each inspection interval should provide 100% volumetric examination of circumferential and longitudinal pipe welds within the boundary of these portions of piping.
  - C. For those portions of high-energy fluid system piping enclosed in guard pipes, inspection ports should be provided in the guard pipes to permit the required examination of circumferential pipe welds. Inspection ports should not be located in that portion of the guard pipe passing through the annulus of dual barrier containment structures.
  - D. The areas subject to examination should be defined in accordance with Article IWC-2000, Examination Category C-F for Class 2 piping welds.
9. Code Exemptions. The exemptions from Code examination requirements identified by the applicant are acceptable if they have been permitted by Articles IWC-1220 or IWD-1220 or IWF-1230 of Section XI of the ASME Code.
10. Relief Requests. There should be no requests for relief from the ASME Code Section XI examination requirements that are found to be impractical due to the limitations of design, geometry, or materials of construction of components that are evaluated in accordance with 10 CFR 50.55a.



11. Code Cases. The exemptions from Code examination requirements identified by the applicant or licensee are acceptable if they have been permitted by appropriate ASME code cases. If a Risk Informed ISI program is to be used at a later date, the appropriate Code Case should be specified.
12. Operational Programs. For COL reviews, the description of the operational program and proposed implementation milestones for the Preservice Inspection and Inservice Inspection and testing programs for Class 2 and 3 components are reviewed in accordance with the requirements of 10 CFR 50.55a, "Codes and Standards." The implementation milestone for the inservice inspection program is when the plant enters into commercial operation.

### 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. Consistent with the provisions of 10 CFR 50.65(a), GDC 1 and 10 CFR Part 50, Appendix B, as related to performance and condition monitoring requirements and quality assurance controls for inspections and testing, 10 CFR 50.55a, "Codes and Standards," requires, in paragraph (a)(1), that structures, systems, and components (SSCs) be designed, fabricated, erected, constructed, tested, inspected, and maintained to quality standards commensurate with the importance of the safety function to be performed. Throughout the service life of a pressurized water cooled nuclear power reactor, its Code Class 2 and Class 3 systems and components must meet the requirements of Section XI of the ASME Code and of the ASME OM Code. 10 CFR 50.55a(g) addresses inservice inspection requirements, and 10 CFR 50.55a(f) addresses inservice testing requirements. Section XI of the ASME Code defines, for each Code Class, the time interval for ISI, the scope of the inspection activity, the inspection sample, sample selection methodology, the method of inspection, the acceptance criteria for various types and sizes of material flaws identified during the inspection, and various other related technical details required for properly performing the required inservice inspection activity. Compliance with the requirements of 10 CFR 50.55a ensures that periodic inspections will be performed on all Class 2 and Class 3 components for the purpose of detecting incipient degradations, leakage, indications of mechanical or structural distress caused by aging, fatigue, and/or corrosion, prior to jeopardizing the ability of the affected systems or components to perform their intended safety functions. Periodic inservice testing (such as pressure, hydrostatic and leak tests) are addressed in the ASME Code requirements for Class 2 and 3 components at Articles IWC-5000 and IWD-5000 of Section XI; testing is also an alternative acceptance option for Code Class supports (excluding dynamic restraints) under Article IWF-1200 of Section XI. Inservice testing of Class 2 and 3 pumps, valves and dynamic restraints are addressed in the ASME OM Code and are reviewed under DSRS Section 3.9.6.
2. General Design Criteria 36, 37, 39, 40, 42, 43, 45, and 46 require that the respective safety-related or risk significant systems addressed by these criteria be designed such that they permit periodic inspection, pressure testing, and functional testing of system components and piping. Specific functional classes of components for each of the safety systems addressed are identified in the GDC. The ISI programs for Class 2 and

Class 3 components rely upon these design provisions to allow performance of ISI and, where required, inservice testing. Compliance with these General Design Criteria ensures that the design of the safety systems will allow accessibility of important components so that periodic inspections can be performed that detect degradation, leakage, signs of mechanical or structural distress caused by aging, and fatigue or corrosion, prior to jeopardizing the ability of the systems to perform their intended safety-related or risk significant functions.

### 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. In accordance with 10 CFR 52.47(a)(8),(21), and (22), and 10 CFR 52.79(a)(17) and (20), for new reactor 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). 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.
2. Components Subject to Inspection. The applicant's component and system classifications, the corresponding proposed inspection or test requirements for each classification, and the proposed exceptions are reviewed for agreement with the acceptance criteria of Subsection II.1 of the DSRS Acceptance Criteria in this DSRS section as the basis for determining the acceptability of component inclusion in the ISI programs.
3. Accessibility. The design and arrangement of Class 2 and 3 systems are reviewed in terms of accessibility for ISI to establish that the design is in conformance with the acceptance criteria of Subsection II.2 of the DSRS Acceptance Criteria in this DSRS section. No remote inspection program is required for Code Class 2 or 3 components. Limitations due design, materials of construction and geometry are to be eliminated to enable the performance of inservice examinations.
4. Examination Categories and Methods. The reviewer verifies that the examination categories and methods as described by the applicant's technical submittal are in conformance with the acceptance criteria in Subsection II.3 of the DSRS Acceptance Criteria in this DSRS section.

The reviewer verifies that the training and requalification requirements of the applicant's ISI programs are in conformance with applicable portions of Section XI of the ASME Code and/or the ASME OM Code, where the latter is applicable to the plant's Expert

Panel for inservice testing. Qualification of personnel performing ultrasonic examinations should contain the elements of Appendix VII to Section XI.

The reviewer verifies that the ultrasonic examination systems required by the applicant's ISI program meet the requirements of Appendix VIII to Section XI, Division 1 of the ASME Code in accordance with the implementation requirements of 10 CFR 50.55a.

The reviewer also verifies that an appropriate long-term monitoring program for potential wall-thinning of high-energy piping by erosion/corrosion, pursuant to Generic Letter 89-08 and NUREG-1344 has been incorporated into the ISI program.

5. Inspection Intervals. The ISI program for Class 2 and 3 components in the inservice testing program in the administrative controls of the plant technical specifications is reviewed to establish that each area and component in the program is inspected on a schedule in conformance with the acceptance criteria in Subsection II.4 of the DSRS Acceptance Criteria in this DSRS section.
6. Evaluation of Examination Results. The reviewer verifies that the applicant's technical submittal describes methods for evaluation of examination results in accordance with the acceptance criteria in Subsection II.5 of the DSRS Acceptance Criteria in this DSRS section.
7. System Pressure Test. The reviewer verifies that the applicant's technical submittal describes the system pressure test program in accordance with the acceptance criteria in Subsection II.6 of the DSRS Acceptance Criteria in this DSRS section.
8. Structural Supports: The reviewer verifies that the applicant's technical submittal describes the examinations or alternative tests for fixed structural supports of Class 2 and 3 SSCs in accordance with the acceptance criteria in Subsection II.7 of the DSRS Acceptance Criteria in this DSRS section. Dynamic restraints are reviewed under DSRS Section 3.9.6.
9. Augmented ISI to Protect Against Postulated Piping Failures. The reviewer verifies that the applicant's technical submittal describes an augmented ISI program that meets the acceptance criteria identified in Subsection II.8 of the DSRS Acceptance Criteria in this DSRS section.
10. Code Exemptions. The reviewer verifies that the exemptions from Code examinations identified by the applicant or licensee are in accordance with the acceptance criteria identified in Subsection II.9 of the DSRS Acceptance Criteria in this DSRS section.
11. Relief Requests. The reviewer determines if the applicant or licensee has demonstrated that a code requirement is impractical due to the limitations of design, geometry, or materials of construction of components.
12. Operational Programs. The reviewer verifies that the Preservice Inspection and Inservice Inspection and testing programs are fully described and that implementation milestones have been identified. The reviewer verifies that the programs and implementation milestones are included in applicant's technical submittal Table 13.4-x.

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

13. The reviewer verifies 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. 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 design control document (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 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.

14. The reviewer assures that inspection of the containment in accordance with IWE/IWL is part of the operational program and is discussed either in this section or Section 3.8.

#### IV. EVALUATION FINDINGS

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

1. To ensure that no deleterious defects develop during service in ASME Code Class 2 and 3 system components, the reactor containment, selected welds and weld heat-affected zones are inspected prior to reactor startup and periodically throughout the life of the plant. In addition, Code Class 2 and 3 systems receive visual inspections while the systems are pressurized in order to detect leakage, signs of mechanical or structural distress, and corrosion.

The applicant (licensee) has stated that the inservice inspection and test (ISI) program will comply (complies) with the rules published in 10 CFR 50.55a, and Section XI of the ASME Code, ( ) Edition, including addenda through the ( ) Addenda. The ISI program will consist of a preservice inspection and test plan and an inservice inspection and test plan.

The staff concludes that the inservice inspection and test program is acceptable and meets the inspection and pressure/leak testing requirements of GDC 36, 37, 39, 40, 42, 43, 45, and 46 and 10 CFR 50.55a. This conclusion is based on the applicant's or licensee's meeting the requirements of the ASME Boiler and Pressure Vessel Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," as reviewed, by the staff and determined to be appropriate for this application.

The applicant described the Preservice Inspection and Inservice Inspection and testing programs for class 2 and 3 components and containment and implementation

milestones in the applicant's technical submittal Table 13.4-x are in conformance with 10 CFR 50.55a, "Codes and Standards."

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 staff will use this DSRS section in performing safety evaluations of mPower™-specific DC, or COL, applications submitted by applicants pursuant to 10 CFR Part 52. The staff will use the method described herein to evaluate conformance with Commission regulations.

Because of the numerous design differences between the mPower™ and large light-water nuclear reactor power plants, and in accordance with the direction given by the Commission in 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), to develop risk-informed licensing review plans for each of the small modular reactor reviews including the associated pre-application activities, the staff has developed the content of this DSRS section as an alternative method for mPower™ -specific DC, or COL submitted pursuant to 10 CFR Part 52 to comply with 10 CFR 52.47(a)(9), "Contents of applications; technical information."

This regulation states, in part, that the application must contain "an evaluation of the standard plant design against the SRP revision in effect 6 months before the docket date of the application." The content of this DSRS section has been accepted as an alternative method for complying with 10 CFR 52.47(a)(9) as long as the mPower™ DCD final safety analysis report does not deviate significantly from the design assumptions made by the NRC staff while preparing this DSRS section. The application must identify and describe all differences between the standard plant design and this DSRS section, and discuss how the proposed alternative provides an acceptable method of complying with the regulations that underlie the DSRS acceptance criteria. If the design assumptions in the DC application deviate significantly from the DSRS, the staff will use the SRP as specified in 10 CFR 52.47(a)(9). Alternatively, the staff may supplement the DSRS section by adding appropriate criteria in order to address new design assumptions. The same approach may be used to meet the requirements of 10 CFR 52.79(a)(41) for COL applications.

## VI. REFERENCES

1. 10 CFR 50.36, "Technical Specifications."
2. 10 CFR 50.55a, "Codes and Standards."
3. 10 CFR 50.65. " Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants. "
4. 10 CFR Part 50, Appendix A, GDC 1, "Quality Standards and Records."

5. 10 CFR Part 50, Appendix A, GDC 36, "Inspection of Emergency Core Cooling System"
6. 10 CFR Part 50, Appendix A, GDC 37, "Testing of Emergency Core Cooling System."
7. 10 CFR Part 50, Appendix A, GDC 39, "Inspection of Containment Heat Removal System."
8. 10 CFR Part 50, Appendix A, GDC 40, "Testing of Containment Heat Removal System."
9. 10 CFR Part 50, Appendix A, GDC 42, "Inspection of Containment Atmosphere Cleanup Systems."
10. 10 CFR Part 50, Appendix A, GDC 43, "Testing of Containment Atmosphere Cleanup Systems."
11. 10 CFR Part 50, Appendix A, GDC 45, "Inspection of Cooling Water Systems."
12. 10 CFR Part 50, Appendix A, GDC 46, "Testing of Cooling Water System."
13. 10 CFR Part 50, Appendix B, ".Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants."
14. 10 CFR 52.47, " Contents of applications; technical information."
15. 10 CFR 52.80, " Contents of applications; additional technical information."
16. RG 1.68, "Initial Test Programs for Water-Cooled Nuclear Power Plants."
17. RG 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants."
18. RG 1.182, "Assessing and Managing Risk Before Maintenance Activities at Nuclear Power Plants."
19. RG 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)."
20. RG 1.215, "Guidance for ITAAC Closure under 10 CFR Part 52."
21. NUREG-1344, "Erosion/Corrosion Induced Pipe Wall Thinning in U.S. Nuclear Power Plants."
22. NUREG-1430, Volume 1, "Standard Technical Specifications--Babcock and Wilcox Plants."
23. NRC Letter to All Holders of Operating Licenses or Construction Permits for Nuclear Power Plants, "Erosion/Corrosion-Induced Pipe Wall Thinning" (Generic Letter No. 89-08).
24. ASME Boiler and Pressure Vessel Code, Section III, "Rules for Construction of Nuclear Facility Components," Article NCA-2000, "Classification of Components," American Society of Mechanical Engineers.

- 25 ASME Boiler and Pressure Vessel Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," Division 1, "Rules for Inspection and Testing of Components of Light-Water Cooled Plants," American Society of Mechanical Engineers.
26. ASME Code for Operation and Maintenance of Nuclear Power Plants, Division 1, "Section IST: Rules for Inservice Testing of Light-Water Reactor Power Plants," American Society of Mechanical Engineers.
27. NRC Inspection Manual Chapter IMC-2504, "Construction Inspection Program - Inspection of Construction and Operational Programs," issued October 15, 2009.