U.S. NUCLEAR REGULATORY COMMISSION

DESIGN-SPECIFIC REVIEW STANDARD FOR mPOWER™ iPWR DESIGN

3.9.6 FUNCTIONAL DESIGN, QUALIFICATION, AND INSERVICE TESTING PROGRAMS FOR PUMPS, VALVES, AND DYNAMIC RESTRAINTS

REVIEW RESPONSIBILITIES

Primary - Organization responsible for the review of component performance and testing

Secondary - None

I. AREAS OF REVIEW

This design specific review standard (DSRS) section addresses the areas of the final safety analysis report (FSAR) or the design control document (DCD) of design certification and combined license (COL) applicants under 10 CFR Part 52, as applicable, that describe the functional design and qualification provisions and inservice testing (IST) programs for certain safety-related pumps, valves, and dynamic restraints (snubbers) designated as Class 1, 2, or 3 under Section III of the American Society of Mechanical Engineers (ASME) *Boiler & Pressure Vessel Code* (B&PV Code). The review should include any other pumps, valves, and dynamic restraints not categorized as ASME Code Class 1, 2, or 3 that are safety related. Conformance with the specific guidance in Subsection II of this DSRS section will provide reasonable assurance that the functional design and qualification of pumps, valves, and dynamic restraints within the scope of this DSRS section and their associated IST programs satisfy the applicable regulatory requirements in Section 55a, "Codes and Standards," of Part 50, "Domestic Licensing of Production and Utilization Facilities," in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50 that incorporates by reference the IST program requirements of the ASME *Code for Operation and Maintenance of Nuclear Power Plants* (OM Code);Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50; Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50; and 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants."

The U.S. Nuclear Regulatory Commission (NRC) regulations in Appendix A to 10 CFR Part 50 specify general design criteria (GDC) that require that structures, systems, and components (SSCs) important to safety be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. Appendix A to 10 CFR Part 50 states that 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 a quality product in keeping with the required safety function. Appendix A to 10 CFR Part 50 also requires that a quality assurance (QA) program be established and implemented in order to provide adequate assurance that these SSCs will satisfactorily perform their safety functions. Appendix B to 10 CFR Part 50 specifies criteria for the QA program to provide adequate confidence that SSCs will perform their safety-related functions satisfactorily in service.

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In 10 CFR 50.55a, the NRC regulations incorporate by reference the ASME OM Code provisions for an IST program for pumps, valves, and dynamic restraints used in nuclear power plants. The ASME OM Code (1995 Edition through 2006 Addenda) specifies the performance of stroke-time testing of power-operated valves (POVs) on a quarterly frequency as part of the IST program. Based on valve operating experience and research results, the NRC determined that the ASME OM provision for quarterly stroke-time testing was inadequate to provide reasonable assurance in the operational readiness of motor-operated valves (MOVs) to perform their safety functions. Therefore, the NRC regulations in 10 CFR 50.55a(b)(3)(ii) supplement the testing requirements for MOVs in the ASME OM Code by requiring that licensees implementing the ASME OM Code as part of the IST program at their nuclear power plants shall also establish a program to ensure that MOVs continue to be capable of performing their design-basis safety functions.

In SECY-02-0067, "Inspections, Tests, Analyses, and Acceptance Criteria for Operational Programs (Programmatic ITAAC)," the NRC staff recommended that COL applications for nuclear power plants submitted in accordance with the requirements of 10 CFR Part 52 contain ITAAC for operational programs required by regulations to the extent that such ITAAC are necessary and sufficient to support the finding that the facility has been constructed and will be operated in conformity with the license, the provisions of the Atomic Energy Act, and the Commission's rules and regulations. In a Staff Requirements Memorandum (SRM) dated September 11, 2002, the Commission determined that a COL applicant is not required to have ITAAC for operational programs for a nuclear power plant licensed under 10 CFR Part 52 (with the exception of emergency planning). The Commission stated that ITAAC for operational programs should not be necessary if the programs and their implementation are fully described in a COL application and found to be acceptable by the NRC staff at the COL stage. The Commission noted that the burden was on the applicant to provide the necessary and sufficient programmatic information for approval of the COL without ITAAC.

In SECY-04-0032, "Programmatic Information Needed for Approval of a Combined License Without Inspections, Tests, Analyses, and Acceptance Criteria," the NRC staff provided recommendations to the Commission regarding the level of programmatic information needed for approval of a COL without ITAAC for operational programs. In an SRM dated May 14, 2004, the Commission stated that "fully described" for an operational program should be understood to mean that the program is clearly and sufficiently described in terms for scope and level of detail to allow a reasonable assurance finding of acceptability. The Commission noted that required operational programs should always be described at a functional level and an increasing level of detail where implementation choices could materially and negatively affect the program effectiveness and acceptability. The Commission also stated that the staff should continue the practice of inspecting relevant licensee procedures and programs in a similar manner as was done in the past and consistent with applicable inspection programs. The staff should also continue to ensure, consistent with the inspection and enforcement processes, that licensees address pertinent issues prior to fuel loading.

The NRC staff discussed the Commission's position on operational programs for COL applications in SECY-05-0197, "Review of Operational Programs in a Combined License Application and General Emergency Planning Inspections, Tests, Analyses, and Acceptance Criteria [ITAAC]." In SECY-05-0197, the NRC staff defines operational programs for new nuclear power plants as programs that are required by regulation, are reviewed by NRC staff for acceptability with the results documented in the safety evaluation report, and will be verified for implementation by NRC inspectors. For example, SECY-05-0197 includes the preservice testing (PST) and IST programs, and MOV Testing program, as operational programs. The

description of the programs would contain the information necessary for the staff to make a reasonable assurance finding on the acceptability of the operational program in the review of a COL application. The staff proposed license conditions to provide certainty as to when the operational programs are scheduled to be implemented.

In their FSARs, COL applicants have incorporated by reference the descriptions of the functional design, qualification, and IST programs provided in the DCD or FSAR submitted by the design certification applicant with supplemental information or departures. The NRC reviews the program descriptions provided in the design certification DCD/FSAR for acceptability for reference by COL applicants in preparing the safety evaluation report (SER) on the design certification application. The NRC reviews the program descriptions provided in the COL FSAR in preparing its SER on the COL application for reasonable assurance that pumps, valves, and dynamic restraints are capable of performing their safety functions. Therefore, the full descriptions of the functional design, qualification, and IST programs are provided by the combination of the design certification DCD/FSAR and the COL FSAR, together with the NRC SERs on the design certification application and the COL application.

In evaluating a COL application, the NRC staff will review the description of the IST program based on the edition and addenda to the ASME OM Code as incorporated by reference in 10 CFR 50.55a as specified in the application. The NRC regulations in 10 CFR 50.55a(f)(4)(i) and (g)(4)(i) require that the IST program for pumps, valves, and dynamic restraints for the initial 10-year IST program interval for a nuclear power plant licensed under 10 CFR Part 52 comply with the ASME Code edition and addenda incorporated by reference in the NRC regulations 12 months before fuel load. Therefore, the COL applicant will need to consider lessons learned from current operating experience and research programs when describing the IST program for pumps, valves, and dynamic restraints to provide reasonable assurance that the IST program will satisfy the testing requirements in Appendices A and B to 10 CFR Part 50 and to anticipate improvements that will be incorporated into the ASME OM Code prior to construction of the nuclear power plant.

Regulatory Guide (RG) 1.206, “Combined License Applications for Nuclear Power Plants (LWR Edition),” provides guidance for the content of COL applications for a description of the Inservice Inspection (ISI) and IST programs to meet 10 CFR 50.55a.

The specific areas of review are as follows:

1. <u>Functional Design and Qualification of Pumps, Valves, and Dynamic Restraints</u>

   A. The staff reviews system and component designs and equipment qualification provisions to ensure that pumps, valves, and dynamic restraints (snubbers) are designed, manufactured, tested, and installed to perform their applicable safety functions and to accommodate anticipated inservice examination or inspection and testing.

   B. This DSRS section provides guidance for the assessment of the functional design and qualification of pumps and valves. Standard Review Plan (SRP) Section 3.10 provides guidance for the assessment of the seismic and dynamic qualification of pumps and valves.

   C. SRP Section 3.9.3 provides guidance for the assessment of the design and installation of safety and relief valves.

D. Dynamic restraints (snubbers) for plant piping and components do not provide a load path or force transmission during normal plant operations, but function as rigid supports when subjected to dynamic transient loads. SRP Section 3.9.3 provides guidance for staff assessment of the design and qualification of snubbers.

E. The staff will conduct an audit of the procurement specifications as discussed in the introduction of 10 CFR 52.47 for the functional design and qualification of pumps, valves, and dynamic restraints. This audit could be conducted as part of the review of the applicable COL application.

2. Inservice Testing Program Scope and Description

A. The staff will review the scope of the IST program specified in the description provided by the design certification or COL applicant.

B. The staff will review the description of the IST program provided by the applicant for compliance with the ASME OM Code as incorporated by reference in 10 CFR 50.55a.

C. The staff will review the consideration of lessons learned from operating experience and research programs in developing the description of the IST program to provide reasonable assurance that the testing requirements of Appendices A and B to 10 CFR Part 50 are satisfied.

D. The staff will verify that the DCD or FSAR specify that the plant will be designed to provide accessibility to perform IST activities.

E. The staff will review justifications for the schedules of cold shutdown and refueling outage tests.

F. The staff will conduct an audit of the implementation of the IST program implementation for compliance with 10 CFR 52.79(a)(11).

3. Inservice Testing Program for Pumps

A. The staff will review the scope of the pump IST program as described in the DCD or FSAR, including those ASME Code Class 1, 2, and 3 system pumps whose function is required for safety, as well as pumps not categorized as ASME Code Class 1, 2, or 3 but which the staff considers to be safety related.

B. The staff will review the pump IST program description for compliance with the requirements in the ASME OM Code as incorporated by reference in 10 CFR 50.55a, and consideration of lessons learned from operating experience and research programs to provide reasonable assurance that pump testing requirements in Appendices A and B to 10 CFR Part 50 are satisfied.

4. Inservice Testing Program for Valves

A. The staff will review the scope of the valve IST program, including those ASME Code Class 1, 2 and 3 valves whose function is required for safety, as well as valves not categorized as ASME Code Class 1, 2, or 3 but which are safety related.

B. The staff will review the description of the IST methods for valves provided in the FSAR or DCD for compliance with the requirements in the ASME OM Code as incorporated by reference in 10 CFR 50.55a, and consideration of lessons learned from operating experience and research programs to provide reasonable assurance that valve testing requirements in Appendices A and B to 10 CFR Part 50 are satisfied.

5. Inservice Testing Program for Dynamic Restraints

A. The staff will review the scope of the dynamic restraint IST program (including inservice testing and inspection), including those ASME Code Class 1, 2, and 3 system dynamic restraints whose function is required for safety, as well as dynamic restraints not categorized as ASME Code Class 1, 2, and 3 but which are safety related.

B. The staff will review the program description for IST activities related to dynamic restraints for compliance with the ASME OM Code as incorporated by reference in 10 CFR 50.55a, and consideration of lessons learned from operating experience and research programs to provide reasonable assurance that snubber examination and inspection requirements in Appendices A and B to 10 CFR Part 50 are satisfied.

C. SRP Section 3.9.3 provides additional guidance for the design and testing of dynamic restraints.

6. Relief Requests and Alternative Authorizations to ASME OM Code

A. Pursuant to 10 CFR 50.55a(a)(3), the Commission may authorize alternatives to OM Code requirements if the alternatives will provide an acceptable level of quality and safety, or compliance will result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The OM Code also provides for alternatives for the code user initiating a request to use a code case. Code cases clarify the intent of existing requirements or provide alternative requirements. Acceptable code cases addressed by the staff are listed in RG 1.192. Plant-specific requests for the application of alternatives are primarily suitable to unique non-recurring applications where a code case is not considered to be appropriate.

B. Pursuant to 10 CFR 50.55a(f)(6)(i) for pumps and valves, and 10 CFR 50.55a(g)(6)(i) for dynamic restraints, the Commission may grant relief from the OM Code requirements if conformance would be impractical for the facility and may impose such alterative requirements as it determines is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest, giving due consideration to

the burden upon the license that could result from imposing the requirements. The staff will review any requests for relief to determine if the proposed exceptions to the OM Code will degrade overall plant safety. The staff will give due consideration to the burden upon the applicant that could result if it imposed the IST requirements of the OM Code on the facility. Commission policy is that new reactors should be designed to avoid the need for relief from ASME OM Code requirements.

C. Pursuant to 10 CFR 50.55a(f)(6)(ii) for pumps and valves, and 10 CFR 50.55a(g)(6)(ii) for dynamic restraints, the Commission may require the licensee or applicant to follow an augmented IST program for pumps, valves, and dynamic restraints for which the Commission deems that added assurance of operational readiness is necessary.

D. Under 10 CFR 50.55a(f)(4) and 10 CFR 50.55a(g)(4), a nuclear power facility must periodically update its IST program to meet the requirements of future revisions of the OM Code, as specified in 10 CFR 50.55a at the time the IST program is revised. However, if it proves impractical to implement these requirements, the applicant is allowed to submit requests for relief from the OM Code requirements on a case-by-case basis. Accordingly, the staff will review any requests for relief to determine if the proposed exceptions to the OM Code will degrade overall plant safety. The staff will give due consideration to the burden upon the applicant that could result if the staff imposed the updated IST criteria of the OM Code on the facility.

7. Inspection, Test, Analysis, and Acceptance Criteria (ITAAC). For design certification (DC) and COL reviews, the applicant's proposed information on the ITAAC associated with SSCs related to this DSRS section is reviewed in accordance with SRP Section 14.3, "Inspections, Tests, Analyses, and Acceptance Criteria - Design Certification." The staff recognizes that the review of ITAAC is performed after review of the application against acceptance criteria contained in this DSRS section. Further, the ITAAC are reviewed to assure that all SSCs in this area of review are identified and addressed as appropriate in accordance with SRP Section 14.3. The DCD Tier 1 needs to include ITAAC to verify the functional design and qualification for all safety-related pumps and valves to be capable of performing their intended function for the full range of operating conditions up to design-basis conditions. For such ITAAC, the Design Commitment column should specify that pumps and valves identified in the applicable Tier 1 table will be functionally designed and qualified such that each pump and valve is capable of performing its intended function for a full range of system differential pressure and flow, ambient temperatures, and available voltage (as applicable) under conditions ranging from normal operating to design-basis accident conditions. The Inspections, Tests, and Analyses column should specify that tests or type tests of the pumps and valves listed in the applicable Tier 1 table will be conducted to demonstrate that the pumps and valves function under conditions ranging from normal operating conditions to design-basis accident conditions. The Acceptance Criteria column should specify that a test report exists and concludes that the pumps and valves listed in the applicable Tier 1 table function under conditions ranging from normal operating conditions to design-basis accident conditions. All of the applicable sections of the DCD Tier 1 should specify ITAAC to verify the functional design and qualification of all safety-related pumps and valves to perform their intended function for a full range of operating conditions up to design-basis conditions.

8. COL Action Items and Certification Requirements and Restrictions. For a DC application, the review will 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.

9. Operational Program Description and Implementation. For a COL application, the staff reviews the PST program, IST program, ISI program and the MOV testing program descriptions and the proposed implementation milestones. The staff also reviews FSAR Table 13.x to ensure that the PST program, IST program, ISI program, MOV test program and associated milestones are included.

10. Application of Risk Insights. The NRC regulations in 10 CFR 52.47(a)(27) and 52.79(a)(46) require DC and COL applicants, respectively, to submit a description of the plant-specific probabilistic risk assessment (PRA) and its results in their applications. As discussed in Part 2, "iPWR Design Pre-Application Activities and Application Reviews," of the Introduction to NUREG-0800, "Standard Review Plan," the NRC staff may incorporate risk insights into the review of DC and COL applications as described in this and other SRP and DSRS sections. When applying risk insights in its application review, the applicable NRC Office of New Reactors (NRO) technical branch will focus its review on components important to safety categorized as having high risk significance. For components categorized as having low risk significance, the staff may rely on the applicant's certification of component qualification and programmatic requirements to provide reasonable confidence that the components satisfy their functional design and qualification requirements, with confirmation of compliance with those regulatory requirements through ITAAC verification and inspection activities. In addition, the staff will evaluate the quality standards specified by the applicant for the design, fabrication, erection, inspection, and testing of components outside the scope of the codes and standards incorporated by reference in 10 CFR 50.55a, but determined to have high risk significance, commensurate with the importance of the safety function to be performed.

Review Interfaces

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

1. DSRS Section 3.2.2 addresses the classification system and quality group for pumps and valves.

2. SRP Section 3.10 addresses the seismic and dynamic qualification of safety-related pumps and valves.

3. SRP Section 3.9.2 addresses dynamic testing and analysis of safety-related pumps, valves, and dynamic restraints.

4. SRP Section 3.9.3 addresses the structural design of safety-related pumps, valves, and dynamic restraints.

5. DSRS Section 3.11 addresses the environmental qualification of safety-related pumps and valves.

6. DSRS Section 9.2.2 addresses Reactor Auxiliary Cooling Water Systems.

7. DSRS Sections 6.2.4 and 6.2.6 address the containment isolation system and the overall containment leakage testing program, respectively.

8. DSRS Section 3.12 addresses the design and leak testing provisions of pressure-retaining systems and components that interface with the reactor coolant system as part of the primary review responsibility for intersystem loss-of-coolant accidents.

9. DSRS Section 10.3 addresses the number and size of valves specified for the steam and feedwater systems.

10. DSRS Section 5.2.2 addresses the number and size of valves specified for the reactor coolant pressure boundary (RCPB).

11. SRP Section 5.2.4 addresses RCPB Inservice Inspection and Testing.

12. DSRS Sections 5.4.7 and 6.3 address residual heat remove and emergency core cooling systems piping, respectively that is connected to the reactor coolant system and is subject to thermally stratified flow, thermal striping, and/or thermal cyclic effects.

13. DSRS Section 6.2.1.2 addresses the applicant's analyses of subcompartment differential pressures resulting from postulated pipe breaks.

14. DSRS Section 6.6 addresses Inservice Inspection and Testing of Class 2 and 3 Components.

15. DSRS Section 3.13 addresses programs for ensuring bolting and threaded fastener adequacy and integrity.

16. SRP Section 17.4 addresses Reliability Assurance Program (RAP).

17. SRP Section 17.6 addresses Maintenance Rule.

18. For COL reviews of operational programs, the review of the applicant's implementation plan is performed under SRP Section 13.4, "Operational Programs."

19. Review of the Probabilistic Risk Assessment is performed under SRP Section 19.

20. SRP Section 14.3 provides guidance for reviewing ITAAC.

II. ACCEPTANCE CRITERIA

Requirements

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

1. 10 CFR 50.55a and 10 CFR Part 50, Appendix A, GDC 1 as they relate to pumps, valves, and dynamic restraints important to safety being designed, fabricated, tested, and inspected to quality standards commensurate with the importance of the safety functions to be performed.

2. GDC 2, as it relates to pumps, valves, and dynamic restraints important to safety to withstand the effects of natural phenomena combined with the effects of normal and accident conditions.

3. GDC 4, as it relates to designing pumps, valves, and dynamic restraints important to safety to accommodate the effects of and to be compatible with the environment conditions associated with normal operation, maintenance, testing, and postulated accidents.

4. GDC 14, as it relates to designing pumps, valves, and dynamic restraints that form the reactor coolant boundary so as to have an extremely low probability of abnormal leakage, rapidly propagating failure, and gross rupture.

5. GDC 15, as it relates to pumps, valves, and dynamic restraints that form the reactor coolant system being designed with sufficient margin to ensure that the design conditions are not exceeded.

6. GDC 37, as it relates to designing the emergency core cooling to permit periodic functional testing to ensure the leak tight integrity and performance of its active components.

7. GDC 40, as it relates to designing periodic functional testing of the containment heat removal system to ensure the leak tight integrity and performance of its active components.

8. GDC 43, as it relates to designing the containment atmospheric cleanup systems to permit periodic functional testing to ensure the leak tight integrity and the performance of the active components.

9. GDC 46, as it relates to designing the cooling water system to permit periodic functional testing to ensure the leak tight integrity and performance of the active components.

10. GDC 54, as it relates to designing piping systems penetrating containment with the capability to test periodically the operability of the isolation valves and determine valve leakage acceptability.

11. Appendix B to 10 CFR Part 50, as it relates to quality assurance in the design, fabrication, construction, and testing safety-related pumps, valves, and dynamic restraints.

12. 10 CFR 50.55a(c)-(e), which incorporates the ASME Code, Section III, as it relates to qualification of mechanical equipment and supports.

13. 10 CFR 50.55a(f) for pumps and valves, and 10 CFR 50.55a(g) for dynamic restraints, whose function is required for safety in the IST program, as it relates to assessing operational readiness.

14. 10 CFR 50.55a(b)(3)(ii), as it relates to requirements for an MOV testing program.

15. 10 CFR 50.65 as it relates to requirements of the maintenance rule.

16. 10 CFR 52.47, which states that the Commission will require, before design certification, that information normally contained in certain procurement specifications and construction and installation specifications be completed and available for audit if the information is necessary for the Commission to make its safety determination.

17. 10 CFR 52.47(b)(1), which requires that a DC application contain the proposed ITAAC that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a facility that incorporates the design certification has been constructed and will be operated in conformity with the design certification, the provisions of the Atomic Energy Act, and the NRC's regulations.

18. 10 CFR 52.79(a)(11), which requires a COL applicant to provide, in its safety analysis report, a description of the programs and their implementation necessary to ensure that the systems and components meet the requirements of the ASME B&PV Code and ASME OM Code in accordance with 10 CFR 50.55a at a level sufficient to enable the NRC to reach a final conclusion on all safety matters that must be resolved before COL issuance.

19. 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 or applicant 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.

20. 10 CFR 52.97(b), which requires that the COL identify the ITAAC necessary and sufficient to assure that the facility has been constructed and will be operated in conformity with the license.

<u>DSRS Acceptance Criteria</u>

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. 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." The same approach may be used to meet the requirements of 10 CFR 52.79(a)(41) for COL applications.

1. 10 CFR Part 50, Appendix A, GDC 1 requires that SSCs be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety function to be performed. For those SSCs defined as safety-related, the NRC regulations specify special treatment requirements to provide reasonable assurance of

the capability of those SSCs to perform their safety-related functions. One special treatment requirement is that applicable components meet the requirements in the ASME B&PV Code and ASME OM Code as incorporated by reference in 10 CFR 50.55a. In addition to its application for safety-related components, the staff will apply this position in its review of nonsafety-related components that are categorized as having high risk significance, where risk insights are applied in the integral pressurized water reactor (iPWR) application review.

2. The NRC staff considers ASME Code Cases to satisfy the requirements in 10 CFR Part 50, Appendix A, GDC 1 to design, fabricate, erect, and test components to quality standards commensurate with the importance of the safety function to be performed, where those Code Cases have been accepted by the NRC staff. The NRC regulations in 10 CFR 50.55a incorporate by reference specific revisions of NRC regulatory guides (RGs) for the acceptability of ASME Code Cases. For example, RG 1.192, "Operation and Maintenance Code Case Acceptability, ASME OM Code," lists ASME OM Code Cases oriented to operation and maintenance for nuclear power plant components that are acceptable to the staff for implementation in the licensing of nuclear power plants. For Code Cases not covered in applicable RGs, the iPWR applicant may submit a request for NRC authorization to use an alternative to the ASME Code requirements in accordance with 10 CFR 50.55a. The NRC staff will review the proposed alternative for authorization based on the following considerations as indicated in 10 CFR 50.55a:

   A. If the proposed Code Cases provide an acceptable level of quality and safety; or

   B. If compliance with the specified requirements of 10 CFR 50.55a would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Additional guidance regarding the historical and current perspectives on the regulatory requirements for IST programs is available in NUREG-1482, , which includes information on the suggested format and content for IST programs and relief requests, examples of relief requests, clarification of issues described in NRC communications on IST, and information regarding current staff positions on IST.

As an alternative to deterministic IST programs, a risk-based approach may be used to prioritize valve test activities, such as the frequency of individual valve tests and selection of valves to be tested. The valve test program should ensure that safety-related valves will remain capable of performing their safety functions until the next scheduled test. The importance of the valve should be considered in determining an appropriate mix of exercising and diagnostic testing. An applicant may use NRC-approved risk-informed ASME Code cases referenced in RG 1.192 to construct a risk-based approach for IST programs.

Acceptance criteria in specific review areas are as follows:

1. <u>Functional Design and Qualification of Pumps, Valves, and Dynamic Restraints</u>

   A. For new plant applications, safety-related pump, valve, and piping designs should include provisions to allow testing of pumps and valves at the maximum flow specified in the plant accident analyses.

B. Functional design and qualification of each safety-related pump and valve should be accomplished such that each pump and valve is capable of performing its intended function for a full range of system differential pressure and flow, ambient temperatures, and available voltage (as applicable) under all conditions ranging from normal operating to design-basis accident conditions.

C. Acceptance criteria for the design of dynamic restraints (snubbers) are provided in SRP Section 3.9.3.

D. Acceptance criteria for the design and installation of safety and relief valves are provided in SRP Section 3.9.3.

E. Acceptance criteria for the seismic and dynamic qualification of mechanical and electrical equipment are provided in SRP Section 3.10.

F. As required by GDC 14, safety-related valves that are part of the RCPB should be designed and tested such that these valves will not experience any abnormal leakage, or increase in leakage, from their loading, as addressed in SRP Section 3.10.

G. For new plant applications, pumps, valves, and dynamic restraints in safety-related systems must include provisions to allow access for IST program activities.

H. DCD Tier 2, Chapter 3 should have specific provisions for methods used by the COL applicant or licensee for the design, qualification, and testing of pumps and valves to demonstrate their design-basis capability. For example, ASME Standard QME-1-2007, "Qualification of Active Mechanical Equipment Used in Nuclear Power Plants," incorporates lessons learned from operating experience and research programs to provide assurance that pumps, valves, and dynamic restraints are functionally designed and qualified to perform their safety functions. The NRC staff accepted the use of ASME QME-1-2007 in Revision 3 to RG 1.100, "Seismic Qualification of Electrical and Active Mechanical Equipment and Functional Qualification of Active Mechanical Equipment for Nuclear Power Plants," with specific conditions. This material should be considered for designation as Tier 2* information. In addition, POVs should be identified as Tier 2* components in the design certification appendix in 10 CFR Part 52. Tier 2* information is addressed further in SRP Section 14.3, Appendix A.

I. During an audit, the applicant should make available procurement specifications as discussed in the introduction of 10 CFR 52.47 to support a demonstration of compliance with 10 CFR 52.79(a)(11) for a description of the programs and their implementation necessary to ensure that components meet the requirements of the ASME B&PV Code and ASME OM Code.

2. Inservice Testing Program Scope and Description

A. The scope of the IST program is acceptable if it includes all of the ASME Code Class 1, 2, and 3 pumps, valves and dynamic restraints described in 10 CFR 50.55a and Subsection ISTA-1100 of the OM Code. In addition, the IST program should include pumps, valves, and dynamic restraints not categorized as ASME Code Class 1, 2, or 3 but which the staff considers to be safety-related.

B. The Commission specified that the applicant must fully describe the IST program in terms for scope and level of detail to allow a reasonable assurance finding of acceptability. The applicant will need to describe the IST program at a functional level and an increasing level of detail where implementation choices could materially and negatively affect the program effectiveness and acceptability.

C. The applicant must consider lessons learned from operating experience and research programs in developing the description of the IST program because the NRC regulations in Appendices A and B to 10 CFR Part 50 require testing activities to provide reasonable assurance that pumps, valves, and dynamic restraints are capable of performing their safety functions. In addition, the NRC regulations require the COL licensee to implement the initial IST program interval in compliance with the most recent ASME OM Code incorporated by reference in 10 CFR 50.55a 12 months before fuel loading.

D. The ASME OM Code contains requirements for the verification of valve position indication. Beginning in 1985, the NRC staff in NUREG-1482 alerted applicants and licensees to ambiguous Code provisions regarding valve position indication. Appendix A to 10 CFR Part 50 states that 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 a quality product in keeping with the required safety function. The reviewer should evaluate the description of the IST program in the COL application for conducting adequate testing to provide reasonable assurance that valve position is accurately indicated such that valves are capable of performing their safety functions in accordance with the NRC regulations. Additional guidance on valve position indication verification is provided in NUREG-1482.

E. During an audit, the applicant should make available documentation to support a demonstration of compliance with 10 CFR 52.79(a)(11) for a description of the programs and their implementation necessary to provide reasonable assurance that pumps, valves, and dynamic restraints will be capable of performing their safety functions.

3. Inservice Testing Program for Pumps

A. The scope of the applicant's test program is acceptable for design certification and COL applications if it includes all of the ASME Code Class 1, 2, and 3 pumps described in 10 CFR 50.55a(f) and Subsection ISTA-1100 of the OM Code and, in addition, includes pumps not categorized as ASME Code Class 1, 2, or 3, but which the staff considers to be safety-related. The DCD or FSAR pump list should identify the specific pumps in the IST program with their identification

number, description, pump type, ASME Code Class, ASME OM Code Group, and IST parameters and frequency.

B. The description of the pump IST program is acceptable for the COL application if it meets the requirements specified Subsection ISTB of the ASME OM Code as incorporated by reference in 10 CFR 50.55a, and incorporates lessons learned from operating experience and research programs to provide reasonable assurance that pumps are capable of performing their safety functions in accordance with Appendices A and B to 10 CFR Part 50.

4. Inservice Testing Program for Valves

A. To be acceptable for design certification or COL applications, the FSAR or DCD valve test list must contain all safety-related ASME Code Class 1, 2, and 3 valves required by 10 CFR 50.55a(f) and the OM Code, except those nonsafety-related valves excepted by Subsection ISTC-1200 of the OM Code. It should also include valves not categorized as ASME Code Class 1, 2, or 3 but which are safety related. The FSAR or DCD valve list must include a valve categorization that complies with the provisions of Subsection ISTC-1300 of the OM Code. The FSAR or DCD should list each specific valve to be tested under the rules of Subsection ISTA-1100 of the OM Code by valve identification number, description and function, valve and actuator type, ASME Code Class, ASME OM Code Category, active or passive function, safety position, and IST parameters and frequency.

B. The description of the valve IST program is acceptable for the COL application if it meets the provisions of Subsection ISTC of the OM Code as incorporated by reference in 10 CFR 50.55a, and incorporates lessons learned from operating experience and research programs to provide reasonable assurance that valves are capable of performing their safety functions in accordance with Appendices A and B to 10 CFR Part 50.

C. The following provides additional acceptance criteria for specific valve or actuator types, and leak testing:

i. Inservice Testing Program for Motor-Operated Valves

(1) In addition to the IST program requirements in the ASME OM Code incorporated by reference in 10 CFR 50.55a(f), 10 CFR 50.55(b)(3)(ii) requires establishment of a program to ensure that the safety-related MOVs continue to be capable of performing their design-basis safety functions. GL 96-05 provides additional guidance for the periodic verification of MOV design-basis capability. Further, ASME Code Cases OMN-1 and OMN-11, as accepted by the NRC staff with conditions in RG 1.192, provide an alternative method to MOV stroke-time testing that also satisfies the requirement in 10 CFR 50.55a to supplement the OM Code IST provisions with a program to ensure that safety-related MOVs continue to be capable of performing their safety functions.

(2) Beginning with the 2009 Edition, the ASME OM Code replaced the quarterly MOV stroke-time testing requirements with a performance-based diagnostic testing program described in Appendix III, “Preservice and Inservice Testing of Active Electric Motor Operated Valve Assemblies in Light-Water Reactor Power Plants,” to periodically verify that MOVs are capable of performing their design-basis safety functions. The NRC staff is preparing rulemaking to incorporate by reference the updated version of the ASME OM Code. Through the specific MOV requirements in 10 CFR 50.55a or the updated ASME OM Code when incorporated by reference in the regulations, COL applicants under 10 CFR Part 52 are required to provide a description of a program that will maintain the capability of their MOVs to perform the applicable design-basis safety functions.

(3) Periodic testing should be conducted that objectively demonstrates continuing MOV capability to perform its safety functions to open and close, as applicable, under design-basis conditions. Where testing is not conducted under design-basis conditions (e.g., under environmental conditions), an analysis combined with test results should demonstrate the continued design-basis capability of the MOV.

(4) The interval between testing demonstrating continued design-basis capability should not exceed 5 years or three refueling outages, whichever is longer, unless a longer interval can be justified. Longer design-basis verification intervals may be justified through implementation of ASME Code Case OMN-1, as accepted in RG 1.192.

(5) Acceptance criteria for successful completion of the preservice and inservice testing of MOVs should include the following:

(a) Consistent with the safety function, the valve should fully open and/or the valve fully close or both. Diagnostic equipment should indicate hard seat contact.

(b) The testing should demonstrate adequate margin with respect to the design basis, including consideration of diagnostic equipment inaccuracies, degraded voltage, control switch repeatability, load sensitive MOV behavior, and margin for degradation.

(c) The maximum torque and/or thrust (as applicable) achieved by the MOV, allowing sufficient margin for diagnostic equipment inaccuracies and control switch repeatability, should not exceed the allowable structural and undervoltage motor capability limits for the individual parts of the MOV.

ii. Inservice Testing Program for Power-Operated Valves Other Than Motor-Operated Valves

(1) As required by 10 CFR Part 50 Appendices A and B, safety-related POVs must be capable of performing their design-basis functions.

(2) NRC Regulatory Issue Summary (RIS) 2000-03 provides guidance for the development of programs for POVs that incorporate the lessons learned from MOV analysis and tests in response to GL 89-10.

The COL FSAR together with the design certification DCD/FSAR should specify that the IST program will incorporate the attributes for a successful long-term POV periodic verification program as described in RIS 2000-03 by applying lessons learned from previous nuclear power plant operations and research programs as they relate to the periodic testing of Air Operated Valves (AOVs) and other POVs included in the IST program. For example, the COL FSAR should specify that the AOV program will include the following elements:

Setpoints for AOVs will be defined based on current vendor information or valve qualification diagnostic testing, such that the valve is capable of performing its design-basis functions.

Periodic static testing will be performed to identify potential degradation, unless those valves are periodically cycled during normal plant operation under conditions that meet or exceed the worst case operating conditions within the licensing basis of the plant for the valve, which would provide adequate periodic demonstration of AOV capability. If necessary based on valve qualification or operating experience, periodic dynamic testing will be performed to re-verify the capability of the valve to perform its safety functions.

Sufficient diagnostics will be used to collect relevant data (e.g., valve stem thrust and torque, fluid pressure and temperature, stroke time, operating and/or control air pressure, etc.) to verify the valve meets the functional requirements of the qualification specification.

Test frequency will be specified and evaluated each refueling outage based on data trends as a result of testing. Frequency for periodic testing will be in accordance with the Joint Owners Group (JOG) AOV Program and the NRC staff comments on that program, with a minimum of 5 years (or 3 refueling cycles) of data collected and evaluated before extending test intervals.

Post-maintenance procedures include appropriate instructions and criteria to ensure baseline testing is re-performed as necessary

when valve maintenance, repair or replacement has the potential to affect valve functional performance.

Guidance is included to address lessons learned from other valve programs in procedures and training specific to the AOV program.

Documentation from AOV testing, including maintenance records and records from the corrective action program are retained and periodically evaluated as part of the AOV program.

The attributes of the AOV testing program to the extent that they apply to and can be implemented on other safety-related power-operated valves are applied to those valves.

(3) Class 1E SOVs are to be verified to function as designed. Each SOV should be verified, to the extent practical, to be capable of performing its safety functions for the electrical power supply amperage and voltage at design basis extremes.

iii. Inservice Testing Program for Check Valves

(1) Preservice tests should be conducted on each check valve. Each check valve should be tested in the open and closed direction, consistent with the safety function and under normal operating system conditions. Piping system design features should be able to accommodate all applicable check valve testing equipment and procedures.

(a) Diagnostic equipment or nonintrusive techniques that monitor internal component conditions or measure such parameters as fluid flow, disk position, disk movement, disk impact forces, leak tightness, leak rates, degradation, and disk stability should be used, if practical, for preoperational testing and later during IST. The equipment and its operating principles should be described and the techniques justified. The operation and accuracy of the diagnostic equipment and techniques should be verified during preoperational testing.

(b) To the extent practical, testing should be performed under temperature and flow conditions that would exist during normal operation as well as cold shutdown. Testing at temperature and flow conditions that may exist in other modes should also be conducted if such conditions are significant.

(c) Test results should identify the minimum flow that will open the valve to the full-open position.

(d) Testing should include the effects of rapid pump starts and stops, as expected for system operating conditions. The testing should include any other reverse flow conditions that may occur during expected system operating conditions.

(2) Nonintrusive (diagnostic) techniques should be used to periodically assess degradation and the performance characteristics of check valves.

(3) Acceptance criteria for the successful completion of the preservice and inservice testing of check valves should include the following:

(a) During all test modes that simulate expected system operating conditions, the valve disk should fully open or fully close as expected based on the direction of the differential pressure across the valve.

(b) Valve disk positions should be determinable without disassembly.

(c) Testing should verify that there is free disk movement to and from the seat.

(d) The valve disk should be stable in the open position under normal and other minimum system operating fluid flow conditions.

(e) For passive plant designs, testing should verify that the valve disk moves freely off the seat under normal and other minimum expected differential pressure conditions.

(4) In 10 CFR 50.55a(b)(3)(iv), the regulations specify conditions for the application of Appendix II to the OM Code. Those requirements must be satisfied when applying Appendix II to the OM Code.

(5) Nozzle check valves represent a new check valve design with different features and performance characteristics than swing check valves. The reviewer should verify that the applicant addresses PST/IST testing and surveillance consistent with the vendor recommendations. Where the ASME OM Code provisions are not sufficient for nozzle check valves, the applicant must establish PST/IST activities that provide reasonable assurance of the operational readiness of nozzle check valves to perform their safety functions. The reviewer should evaluate the planned PST/IST activities for nozzle check valves that are intended to provide reasonable assurance of the operational readiness of those valves.

iv. Pressure Isolation Valve Leak Testing

(1) Pressure isolation valves (PIVs) are the two normally closed valves, in series, within the RCPB, as defined in 10 CFR Part 50, that isolate the reactor coolant system from an attached low-pressure system. PIVs are classified as A or AC in accordance with the provisions of Subsection ISTC-1300 of the OM Code.

(2) PIV seat leakage rate tests should be conducted on each individual PIV in accordance with Subsection ISTC-3630 of the OM Code. The plant technical specifications or FSAR or DCD should specify the allowable leak rates and test intervals for each PIV. The maximum allowable leak rate for each PIV at full reactor pressure should be less than 1.9 liters per minute (L/m) (0.5 gallons per minute (gpm)) per nominal inch of valve size, and not to exceed 19 L/m (5 gpm). The test interval should be 18 months or every refueling outage, whichever is longer.

(3) The applicant's FSAR or DCD should provide a list of PIVs that includes the allowable leak rate for each valve.

v. Containment Isolation Valve Leak Testing

(1) Containment isolation valves (CIVs) should be leak tested in accordance with Appendix J to 10 CFR Part 50.

(2) The plant FSAR or DCD should provide a list of CIVs that includes the allowable leak rate for each valve or valve combination.

vi. Inservice Testing Program for Safety and Relief Valves

(1) Safety and relief valves, including thermal relief valves and vacuum relief valves, are pressure relief devices that protect systems (or portion of systems) that perform a function in shutting down the reactor to the safe-shutdown condition, maintaining the safe-shutdown condition, or mitigating the consequences of an accident.

(2) Safety and relief valve tests should be conducted in accordance with Appendix I to the OM Code.

(3) Stroke tests should be performed for dual-function safety and relief valves (e.g., boiling-water reactor main steam automatic depressurization system safety/relief valves).

(4) Power-operated relief valves should be tested in accordance with Subsection ISTC-5100 for Category B valves and Subsection ISTC-5240 for Category C valves.

(5) The test equipment, including gages, transducers, load cells, and calibration standards, used to determine valve set-pressure is

acceptable if the overall combined accuracy does not exceed ±1 percent of the indicated (measured) set pressure.

(6) The plant FSAR or DCD should provide a list of safety and relief valves that includes the set pressure and allowable tolerances for each valve.

vii. Inservice Testing Program for Manually Operated Valves

(1) The plant FSAR or DCD should provide a list of manually operated valves, including their safety-related function.

(2) In 10 CFR 50.55a(b)(3)(vi), the regulations take exception to the 5-year exercise interval for manually operated valves allowed in older editions and addenda to the OM Code. In accordance with the regulations, manual valves must be exercised on at least a 2-year interval. In the 2006 addenda and later editions and addenda, the OM Code specifies that manual valves shall be full-stroke exercised at least once every 2 years, except where adverse conditions may require the valve to be tested more frequently to ensure operational readiness.

(3) The valve should exhibit the full range of obturator position set forth in the design bases.

viii. Inservice Testing Program for Explosively Actuated Valves

(1) The ASME OM Code includes IST provisions for small and simple explosively actuated valves used in current nuclear power plants. For example, these provisions specify that at least 20 percent of the charges in explosively actuated valves should be fired and replaced at least every 2 years. If a charge fails to fire, all charges with the same batch number should be removed and replaced with charges from a different batch.

(2) In light of the complexity and safety significance of certain squib valves in new reactors, ASME has prepared updated PST and IST testing and surveillance requirements for squib valves to be used in nuclear power plants licensed after January 1, 2000. These new requirements are planned to be published in the 2012 Edition of the ASME OM Code. Therefore, nuclear power plants licensed under 10 CFR Part 52 will need to evaluate the applicability of the new squib valve surveillance requirements when implementing the ASME OM Code incorporated by reference in 10 CFR 50.55a 12 months before fuel loading.

(3) Licensees of nuclear power plants licensed under 10 CFR Part 52 that use squib valves in safety applications include provisions for developing IST programs for squib valves in their COL FSAR. The COL FSARs typically specify that industry and regulatory guidance will be considered in the development of the IST

program for squib valves. The FSARs also state that the IST program for squib valves will incorporate lessons learned from the design and qualification process for these valves such that surveillance activities provide reasonable assurance of the operational readiness of squib valves to perform their safety functions.

(4) To supplement ASME OM Code provisions for squib valves prior to the 2012 Edition, the NRC specified license conditions for PST and IST surveillance of squib valves when issuing the COLs for Vogtle Units 3 and 4 and V.C. Summer Units 2 and 3 nuclear power plants that use large and complex squib valves in safety applications. The license condition included the following requirements:

Before initial fuel load, the licensee shall implement a surveillance program for specific explosively actuated valves (squib valves) that includes the following provisions in addition to the requirements specified in the ASME OM Code as incorporated by reference in 10 CFR 50.55a.

(a) Preservice Testing

All explosively actuated valves shall be preservice tested by verifying the operational readiness of the actuation logic and associated electrical circuits for each explosively actuated valve with its pyrotechnic charge removed from the valve. This must include confirmation that sufficient electrical parameters (voltage, current, resistance) are available at the explosively actuated valve from each circuit that is relied upon to actuate the valve. In addition, a sample of at least 20 percent of the pyrotechnic charges in all explosively actuated valves shall be tested in the valve or a qualified test fixture to confirm the capability of each sampled pyrotechnic charge to provide the necessary motive force to operate the valve to perform its intended function without damage to the valve body or connected piping. The sampling must select at least one explosively actuated valve from each redundant safety train. Corrective action shall be taken to resolve any deficiencies identified in the operational readiness of the actuation logic or associated electrical circuits, or the capability of a pyrotechnic charge. If a charge fails to fire or its capability is not confirmed, all charges with the same batch number shall be removed, discarded, and replaced with charges from a different batch number that has demonstrated successful 20 percent sampling of the charges.

(b) Operational Surveillance

Explosively actuated valves shall be subject to the

following surveillance activities after commencing plant operation:

(i) At least once every 2 years, each explosively actuated valve shall undergo visual external examination and remote internal examination (including evaluation and removal of fluids or contaminants that may interfere with operation of the valve) to verify the operational readiness of the valve and its actuator. This examination shall also verify the appropriate position of the internal actuating mechanism and proper operation of remote position indicators. Corrective action shall be taken to resolve any deficiencies identified during the examination with post-maintenance testing conducted that satisfies the PST requirements.

(ii) At least once every 10 years, each explosively actuated valve shall be disassembled for internal examination of the valve and actuator to verify the operational readiness of the valve assembly and the integrity of individual components and to remove any foreign material, fluid, or corrosion. The examination schedule shall provide for each valve design used for explosively actuated valves at the facility to be included among the explosively actuated valves to be disassembled and examined every 2 years. Corrective action shall be taken to resolve any deficiencies identified during the examination with post-maintenance testing conducted that satisfies the PST requirements.

(iii) For explosively actuated valves selected for test sampling every 2 years in accordance with the ASME OM Code, the operational readiness of the actuation logic and associated electrical circuits shall be verified for each sampled explosively actuated valve following removal of its charge. This must include confirmation that sufficient electrical parameters (voltage, current, resistance) are available for each valve actuation circuit. Corrective action shall be taken to resolve any deficiencies identified in the actuation logic or associated electrical circuits.

(iv) For explosively actuated valves selected for test sampling every 2 years in accordance with the ASME OM Code, the sampling must select at least one explosively actuated valve from each redundant safety train. Each sampled pyrotechnic

charge shall be tested in the valve or a qualified test fixture to confirm the capability of the charge to provide the necessary motive force to operate the valve to perform its intended function without damage to the valve body or connected piping. Corrective action shall be taken to resolve any deficiencies identified in the capability of a pyrotechnic charge in accordance with the PST requirements.

This license condition shall expire upon (1) incorporation of the above surveillance provisions for explosively actuated valves into the facility's inservice testing program, or (2) incorporation of inservice testing requirements for explosively actuated valves in new reactors (i.e., plants receiving a construction permit, or combined license for construction and operation, after January 1, 2000) to be specified in a future edition of the ASME OM Code as incorporated by reference in 10 CFR 50.55a, including any conditions imposed by the NRC, into the facility's inservice testing program.

This license condition supplements the current requirements in the ASME OM Code for explosively actuated valves, and sets forth requirements for both pre-service testing and operational surveillance, as well as any necessary corrective action. The license condition will expire when either (1) the license condition is incorporated into the plant-specific IST program; or (2) the updated ASME OM Code requirements for squib valves in new reactors, as accepted by the NRC in 10 CFR 50.55a, are incorporated into the plant-specific IST program. For the purpose of satisfying the license condition, the licensee retains the option of including in its IST program either the requirements stated in this condition, or including updated ASME Code requirements.

(5) The reviewer should evaluate the design certification DCD/FSAR, COL FSAR, COL license conditions, and applicable ASME OM Code for the PST and IST surveillance requirements for squib valves consistent with the Commission position on squib valves for new reactors.

5. <u>Inservice Testing Program for Dynamic Restraints</u>

A. The description of the IST program for dynamic restraints is acceptable for design certification and COL applications if it complies with the requirements of

the ASME OM Code as incorporated by reference in 10 CFR 50.55a. Visual examination is required by the OM Code to check for degradation, missing parts, and leakage, and functional testing is necessary to assure operational readiness.

B. The FSAR should identify and tabulate all safety-related components that use snubbers in their support systems. The tabulation should include the following information:

i. Identification of the systems and components in those systems that use snubbers.

ii. The number of snubbers used in each system and on components in that system.

iii. The type(s) of snubber (hydraulic or mechanical) and the corresponding supplier.

iv. Specification whether the snubber was constructed in accordance with the ASME Code, Section III, Subsection NF.

v. Statement whether the snubber is used as a shock, vibration, or dual purpose snubber.

vi. For snubbers identified as either dual purpose or vibration arrestor type, an indication of whether both snubber and component were evaluated for fatigue strength, the evaluation is performed under SRP Section 3.9.3.

C. The applicant should provide assurance that all snubbers are properly installed before preoperational piping vibration and plant startup tests. The applicant may use visual observation of piping systems and measurement of thermal movements during plant startup tests to verify that snubbers are operable (not locked up). The piping preoperational vibration and plant startup test programs should discuss the provisions for such examinations and measurements as described in SRP Section 3.9.2.

D. The applicant should discuss accessibility provisions for maintenance, inservice inspection and testing, and possible repair or replacement of snubbers consistent with the provisions of the applicable NRC standard technical specifications.

6. <u>Relief Requests and Proposed Alternatives</u>

A. As discussed above, new reactors should be designed to avoid the need for relief from the ASME OM Code requirements. However, in those instances where relief is necessary, the applicant should identify the component identified for which it requests relief:

i. Name and number as given in FSAR

ii. Component functions

iii. ASME Code, Section III, Code Class

iv. Valve category as defined in Subsection ISTC-1300 of the OM Code

v. Pump group as defined in Subsection ISTB-2000 of the OM Code

B. The applicant should identify the ASME OM Code requirement from which it is requesting relief.

C. The applicant should specify the basis under which it is requesting relief and then explain why complying with the OM Code is impractical.

D. For alternatives to the OM Code requirements, the applicant should provide sufficient details to demonstrate that (1) the proposed alternative will provide an acceptable level of quality and safety, or (2) compliance with the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

E. The applicant should specify a schedule for the implementation of the relief request or alternative.

F. The approval of relief requests or alternatives involves the following:

i. Approval of relief for impractical code requirements

Pursuant to 10 CFR 50.55a(f)(6)(i) for pumps and valves, and 10 CFR 50.55a(g)(6)(i) for dynamic restraints, the Commission may grant relief from impractical code requirements because of design limitations upon application by the applicant. The NRC will consider the burden on the applicant as a factor in its review and evaluation.

ii. Approval of alternatives to the OM Code requirements

Pursuant to 10 CFR 50.55a(a)(3), the staff may authorize alternatives to IST program requirements of the OM Code if the applicant has adequately demonstrated either of the following:

(1) Proposed alternatives to the Code requirements or portions thereof will provide an acceptable level of quality and safety.

(2) Compliance with the Code requirements would result in hardships or unusual difficulties without a compensating increase in the level of quality and safety.

7. Operational Programs. For COL reviews, the description of the operational program and proposed implementation milestones for the PST program, IST program, ISI program, and MOV testing program are reviewed in accordance with 10 CFR 50.55a(f), 10 CFR 50.55a(g) and 10 CFR 50.55a(b)(3)(ii). The implementation milestones for the specific programs are specified below and included as license conditions for PST and MOV testing programs:

A. Preservice testing program

Per ASME OM Code, Subsection ISTA-2000, defines the preservice test period as the period of time following the completion of construction activities related to the component and before first electrical generation by nuclear heat.

B. IST program

Per ASME OM Code, Subsection ISTA-2000, prior to first electrical generation by nuclear heat. The table in the DCD or FSAR should also indicate that appropriate portions of the IST program will be implemented as necessary to support the system operability requirements of the technical specifications.

C. Inservice inspection program related to dynamic restraints

Per ASME Code, Section XI, IWA-2430(b), before placement of the plant into commercial service

D. MOV program

Per ASME OM, Subsection ISTA-2000, prior to first electrical generation by nuclear heat

Technical Rationale

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

1. GDC 1 in Appendix A to 10 CFR Part 50 requires, in part, that SSCs which include pumps, valves, and dynamic restraints important to safety be designed, fabricated, erected, constructed and inspected to quality standards commensurate with the importance of the safety functions to be performed. The provisions for functional design and IST programs for pumps, valves, and dynamic restraints in this DSRS section are based on sound engineering principles as well as operating experience at nuclear power plants. Meeting the requirements of GDC 1 provides assurance that pumps, valves, and dynamic restraints important to safety are capable of performing their intended safety functions.

2. GDC 2 requires, in part, that components important to safety be designed to withstand the effects of severe natural phenomena, combined with appropriate effects of normal and accident conditions, without a loss of capability to perform their safety functions. Meeting the requirements of GDC 2 provides assurance that pumps, valves, and dynamic restraints important to safety are capable of withstanding the effects of severe natural phenomena while performing their safety functions during and after the occurrence of those phenomena, as applicable.

3. GDC 4 requires, in part, that components important to safety be designed to accommodate the effects of, and be compatible with, the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents. Meeting the requirements of GDC 4 provides assurance that the components are capable of withstanding those effects and continuing to perform their intended safety functions.

4. GDC 14 requires that the RCPB be designed to have an extremely low probability of abnormal leakage, rapidly propagating failure, and gross rupture. Meeting the requirements of GDC 14 provides assurance that RCPB components will have an extremely low probability of leakage or failure.

5. GDC 15 requires that the reactor coolant system be designed with sufficient margin to ensure that the design conditions of the RCPB are not exceeded during any condition of normal operation, including anticipated operational occurrences.

6. GDC 37 requires that the emergency core cooling system be designed to permit appropriate periodic pressure and functional testing to ensure the structural and leak tight integrity of its components as well as the operability and performance of the active components of the system. The acceptance criteria in DSRS Section 3.9.6 cite ISTs required by the OM Code as well as other preservice and inservice tests for pumps and valves to ensure their leak tight integrity and their operability and performance. This testing specifically applies to safety-related pumps and valves in the emergency core cooling system and is intended to meet the requirements of GDC 37. Meeting the requirements of GDC 37 provides assurance that Emergency Core Cooling System pumps and valves important to safety are capable of performing their intended safety function.

7. GDC 40 requires that the containment heat removal system be designed to permit appropriate periodic pressure and functional testing to ensure the structural and leak tight integrity of its components as well as the operability and performance of the active components of the system. The acceptance criteria in DSRS Section 3.9.6 cite ISTs required by the OM Code as well as other preservice and inservice tests for pumps and valves to ensure their leak tight integrity and their operability and performance. This testing specifically applies to safety-related pumps and valves in the containment heat removal system and is intended to meet the requirements of GDC 40. Meeting the requirements of GDC 40 provides assurance that containment heat removal system pumps and valves important to safety are capable of performing their intended safety function.

8. GDC 43 requires that the containment atmospheric cleanup system be designed to permit appropriate periodic pressure and functional testing to ensure the structural and leak tight integrity of its components and the operability and performance of the active components of the system, including pumps and valves. The acceptance criteria in DSRS Section 3.9.6 cite ISTs required by the OM Code as well as other preservice and inservice tests for pumps and valves to ensure their leak tight integrity and their operability and performance. This testing specifically applies to safety-related pumps and valves in the containment atmospheric cleanup system and is intended to meet the requirements of GDC 43. Meeting the requirements of GDC 43 provides assurance that containment atmospheric cleanup system pumps and valves important to safety will perform their safety intended function.

9. GDC 46 requires that the cooling water system be designed to permit appropriate periodic pressure and functional testing to ensure the structural and leak tight integrity of its components and the operability and performance of the active components of the system. The acceptance criteria in DSRS Section 3.9.6 cite ISTs required by the OM Code as well as other preservice and inservice tests for pumps and valves to ensure their leak tight integrity and their operability and performance. This testing specifically applies to safety-related pumps and valves in the cooling water system and is intended to meet the requirements of GDC 46. Meeting the requirements of GDC 46 provides assurance that cooling water system pumps and valves important to safety are capable of performing their intended safety function.

10. GDC 54 requires that piping systems penetrating the primary reactor containment be provided with leak detection and isolation capabilities. Such piping systems should be designed with a capability to test the operability of the isolation valves periodically to determine if valve leakage is within acceptable limits. The acceptance criteria in DSRS Section 3.9.6 cite ISTs required by the OM Code as well as other preservice and inservice tests for valves to ensure their leak tight integrity and their operability and performance. This testing specifically applies to safety-related valves in systems that penetrate the primary containment and is intended to meet the requirements of GDC 54. Meeting the requirements of GDC 54 provides assurance that valves in such systems are capable of performing their intended safety function.

11. Appendix B to 10 CFR Part 50 requires that applicants establish and execute an acceptable quality assurance program, including design, testing, and records control. Meeting the requirements of Appendix B to 10 CFR Part 50 provides assurance that designs, tests, IST programs and documentation for pumps, valves, and dynamic restraints will comply with established standards and criteria, thereby ensuring that such equipment will be capable of performing its intended safety functions.

12. 10 CFR 50.55a(f) for pumps and valves, and 10 CFR 50.55a(g) for dynamic restraints, requires that such pumps, valves, and dynamic restraints whose function is required for safety (i.e, in code classes 1, 2, and 3) be assessed for their operational readiness in accordance with the applicable revision of the OM Code, as described therein. In 10 CFR 50.55a(b)(3), the regulations take exception to, or supplement, the OM Code provisions for these components. Meeting the requirements of 10 CFR 50.55a(f) and (g) and 10 CFR 50.55a(b)(3) provides assurance that such pumps, valves, and dynamic restraints are capable of performing their intended safety function. The following provides the applicable OM Codes for IST programs:

    A. Pumps and valves in facilities whose construction permit is issued on or after November 22, 1999 must be designed and provided with access to enable the performance of IST of the pumps and valves for assessing operational readiness as set forth in the editions and addenda of the OM Code incorporated by reference in 10 CFR 50.55a at the time the construction permit is issued.

    B. IST programs implemented during the initial 120-month interval must comply with the requirements in the latest edition and addenda of the OM Code incorporated by reference in 10 CFR 50.55a on the date 12 months before the date of issuance of the operating license under 10 CFR Part 50, or 12 months before the date of the Commission finding that the acceptance criteria have been met pursuant to 10 CFR Part 52 for a COL.

C. IST programs implemented during the successive 120-month intervals must comply with the requirements of the latest edition and addenda of the OM Code incorporated by reference in 10 CFR 50.55a 12 months before the start of the 120-month interval.

10 CFR 50.55a requires that components within the scope of the ASME B&PV Code and the ASME OM Code are subject to ISI and IST in accordance with Section XI of the ASME B&PV Code and the OM Code, respectively, as incorporated by reference in the rule. Where risk insights are applied in the iPWR application review, the applicable NRO technical staff will establish acceptance criteria to provide reasonable confidence that components outside the scope of ASME B&PV Code and OM Code, but categorized as having high risk significance, will perform their intended functions consistent the requirement in 10 CFR 50.55a that components be designed, fabricated, erected, constructed, tested, and inspected to quality standards commensurate with the importance of the safety functions to be performed.

13. 10 CFR 52.47 states that the Commission will require, before design certification, that information normally contained in certain procurement specifications and construction and installation specifications be completed and available for audit if the information is necessary for the Commission to make its safety determination.

14. 10 CFR 52.47(a)(21) requires that applications for DCs contain proposed technical resolutions of the unresolved safety issues and medium- and high-priority generic safety issues identified in the version of NUREG-0933 current on the date 6 months before application identifies as technically relevant to the design.

15. 10 CFR 52.47(b)(1) and 10 CFR 52.80(a) requires that an applicant for a DC and COL, respectively, identify the inspections, tests, and analyses that the licensee or applicant shall perform under 10 CFR Part 52, and the acceptance criteria that, if met, are necessary and sufficient to provide reasonable assurance that the facility has been constructed and will be operated in conformity with the license, the provisions of the Atomic Energy Act, and the Commission's rules and regulations.

16. 10 CFR 52.79(a)(11) requires a COL applicant to provide, in its safety analysis report, a description of the programs and their implementation necessary to ensure that the systems and components meet the requirements of the ASME B&PV Code and ASME OM Code in accordance with 10 CFR 50.55a at a level sufficient to enable the NRC to reach a final conclusion on all safety matters that must be resolved before COL issuance.

17. In SECY-05-0197, the Commission approved the use of a license condition for operational program implementation milestones that are fully described or referenced in the final safety analysis report. A license condition for operational program implementation milestones that the FSAR fully describes or references will ensure that such programs, or portions thereof, are implemented before they are needed.

III. REVIEW PROCEDURES

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

The NRC provides additional guidance regarding the review procedures for IST programs for pumps and valves in NUREG-1482. The NRC staff is preparing an updated revision to NUREG-1482. As of July 2012, 10 CFR 50.55a(b)(3) incorporates by reference the 1995 Edition through the 2006 Addenda of OM Code. The 2004 Edition through the 2006 Addenda of the OM Code is currently appropriate for the review of design certification and COL applications for new plants covered by the DSRS. Design certification and COL applicants for new plants covered by the DSRS should determine the most recent applicable ASME OM Code edition to be the Code of record for the application. As discussed, the NRC regulations require the COL licensee to implement the latest ASME OM Code edition incorporated by reference in 10 CFR 50.55a 12 months prior to fuel loading.

1. Programmatic Requirements - In accordance with the guidance in NUREG-0800 "Introduction," Part 2 as applied to this DSRS Section, the staff will review the programs proposed by the applicant to satisfy the following programmatic requirements. If any of the proposed programs satisfies the acceptance criteria described in Subsection II, it can be used to augment or replace some of the review procedures. It should be noted that the wording of "to augment or replace" applies to nonsafety-related risk-significant SSCs, but "to replace" applies to nonsafety-related nonrisk-significant SSCs according to the "graded approach" discussion in NUREG-0800 "Introduction," Part 2. Commission regulations and policy mandate programs applicable to SSCs that include:

    A. Maintenance Rule SRP Section 17.6 (SRP Section 13.4, Table 13.4, Item 17, Regulatory Guides (RG) 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." and RG 1.182; "Assessing and Managing Risk Before Maintenance Activities at Nuclear Power Plants".

    B. Quality Assurance Program SRP Sections 17.3 and 17.5 (SRP Section 13.4, Table 13.4, Item 16).

    C. Technical Specifications (DSRS Section 16.0 and SRP Section 16.1) – including brackets value for DC and COL. Brackets are used to identify information or characteristics that are plant specific or are based on preliminary design information.

    D. Reliability Assurance Program (SRP Section 17.4).

    E. Initial Plant Test Program (RG 1.68, "Initial Test Programs for Water-Cooled Nuclear Power Plants," DSRS Section 14.2, and SRP Section 13.4, Table 13.4, Item 19).

    F. ITAAC (DSRS Chapter 14).

2. In accordance with 10 CFR 52.47(a)(8),(21), and (22), for new reactor license applications submitted under Part 52, the applicant is required to (1) address the proposed technical resolution of unresolved safety issues (USIs) and medium- and high-priority generic safety issues (GSIs) that are identified in the version of NUREG-0933 current on the date 6 months before application and that 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 SER section.

3. Functional Design and Qualification of Pumps, Valves, and Dynamic Restraints

A. The staff will review the functional design of pumps, valves, and dynamic restraints as described in Subsection II.1.

B. ASME Standard QME-1-2007, "Qualification of Active Mechanical Equipment Used in Nuclear Power Plants," includes provisions for the functional design and qualification of active mechanical equipment in nuclear power plants. In this standard, ASME incorporated lessons learned from operating experience and research programs for the design and qualification of components. The NRC staff has accepted the use of ASME QME-1-2007 in Revision 3 to RG 1.100, "Seismic Qualification of Electrical and Active Mechanical Equipment and Functional Qualification of Active Mechanical Equipment for Nuclear Power Plants," with specific conditions. The reviewer should verify that the applicant for a nuclear power plant being licensed under 10 CFR Part 52 specifies the implementation of ASME QME-1-2007 as accepted in Revision 3 to RG 1.100 in its licensing documentation.

C. As part of the COL review, the NRC staff will conduct an audit of the functional design and qualification process. The staff will evaluate the applicant's procurement specifications for the functional design and qualification of pumps, valves, and dynamic restraints for consistency with the provisions in ASME QME-1-2007 as accepted in Revision 3 to RG 1.100, or other specified standards.

D. The reviewer should pay particular attention to new designs of components (such as squib valves, nozzle check valves, and gas-hydraulic actuated valves).

E. As part of DSRS Section 3.11, the reviews of COL applications should include audits of the Equipment Qualification file. The staff should review the results of tests and analyses to accomplish the following:

i. Ensure that the criteria in the certified design were properly implemented.

ii. Ensure that adequate design was demonstrated for pumps, valves, and dynamic restraints important to safety.

iii. Verify that the testing and analyses that were performed properly defined and accounted for all applicable loads.

F. SRP Section 3.9.3 provides additional review guidance for safety and relief valves and dynamic restraints.

G. The reviewer should give particular attention to flow-induced loading in functional design and qualification to account for degraded flow conditions such as those that might be encountered because of the presence of debris, impurities, and contaminants in the fluid system (e.g., containment sump pump recirculating water with debris).

4. Inservice Testing Program Scope and Description

A. The staff will review the scope of the IST program for conformance with the criteria stated in Subsection II.2.

B. The staff will review the description of the IST program for conformance with the criteria stated in Subsection II.2.

C. The staff will review the consideration on lessons learned from operating experience and research programs in developing the description of the IST program for conformance with the criteria stated in Subsection II.2.

D. The staff will review the IST program provisions for valve position indication for conformance with the criteria in Subsection II.2.

E. The staff will conduct an audit of the implementation of the IST program requirements in accordance with 10 CFR 52.79(a)(11).

5. Inservice Testing Program for Pumps

A. The staff will review the scope of the applicant's program for conformance to the criteria stated in Subsection II.3.

B. The description of the pump IST program should be in conformance with the criteria in Subsection II.3.

6. Inservice Testing Program for Valves

A. The staff will review the FSAR or DCD valve test list and categorization for conformance to the criteria stated in Subsection II.4.

B. The staff will review the valve test program description for preservice and periodic IST for conformance to the criteria stated in Subsection II.4

C. The staff will review the program description for preservice tests, ISTs, and acceptance criteria for MOVs, as described in Subsection II.4.C.i.

D. The staff will review the program description for preservice tests, ISTs, and acceptance criteria for POVs, as described in Subsection II.4.C.ii.

E. The staff will review the program description for preservice tests, ISTs, and acceptance criteria for check valves, as described in Subsection II.4.C.iii.

F. The staff will review the applicant's list of PIVs to ensure that it is complete and that the allowable leak rates for each PIV are in accordance with the guidance provided in Subsection II.4.iv.

G. The staff will review the applicant's list of CIVs to ensure that it is complete and that the allowable leak rates for each CIV are in accordance with the guidance provided in Subsection II.4.v.

H. The staff will review the safety/relief valve test program description for conformance to the criteria stated in Subsection II.4.vi.

I. The staff will review the testing requirements of manually operated valves for conformance to the criteria stated in Subsection II.4.vii.

J. The staff will review the PST and IST provisions for explosively actuated valves for conformance to the criteria stated in Subsection II.4.viii.

7. Inservice Testing Program for Dynamic Restraints

A. The staff will review the IST program for dynamic restraints for conformance with the criteria stated in Subsection II.5.

B. The staff should review and evaluate the applicant's commitments to develop and use a snubber operability assurance program containing the elements specified above.

C. A commitment to provide the snubber classification and identification is sufficient for the construction permit review stage or DC application.

D. During the operating license or COL review, the staff should ensure that the FSAR contain summaries in sufficient detail to confirm commitments.

8. Relief Requests and Proposed Alternatives

The staff will review requests for relief from and alternatives to the requirements of the ASME OM Code to determine whether the applicant has provided sufficient information and that the acceptance criteria of Subsection II.6 have been met.

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

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.

10. Operational Programs. The reviewer verifies that the PST program, IST program, ISI program, and the MOV testing program are fully described and that implementation milestones have been identified. The reviewer verifies that the program and implementation milestones are included in FSAR Table 13.x and included as license conditions for PST and MOV testing programs.

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

The staff will review the discussion on the specific 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 implementation milestones. The evaluation findings section of the staff’s SER will document these findings. In addition, the staff will identify this program and its implementation milestones within the license condition on operational programs and implementation described in SRP Section 13.4.

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 SER. The reviewer also states the bases for those conclusions.

The staff concludes that the descriptions of the applicant’s program for functional design and qualification, and IST programs for pumps, valves, and dynamic restraints are acceptable and meet the requirements of 10 CFR 50.55a; GDC 1, 2, 4, 14, 15, 37, 40, 43, 46, and 54 of Appendix A to 10 CFR Part 50; Appendix B to 10 CFR Part 50; and 10 CFR 52.47, 79 and 80, as applicable. This conclusion is based on the applicant having provided descriptions of the functional design, qualification, and IST programs to provide reasonable assurance that safety-related pumps, valves, and dynamic restraints will be maintained in a state of operational readiness to perform necessary safety functions throughout the life of the plant. This program includes functional design and qualification testing and analysis, baseline preservice or inservice testing, and periodic inservice testing. The program provides for functional testing of the components in the operating state. The applicant has also established the scope of the IST program to include all safety-related ASME Code Class 1, 2, and 3 pumps, valves, and dynamic restraints, as well as those pumps, valves, and dynamic restraints that are not ASME Code Class 1, 2, and 3 but that are safety related.

For COL reviews, the applicant described the PST program, IST program, ISI program, MOV testing program and their implementation in conformance with 10 CFR 50.55a(f), 10 CFR 50.55a(g), and 10 CFR 50.55a(b)(ii) as applicable.

The programs and their implementation milestones are included within the license condition for PST and MOV testing programs.

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 FSAR 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. ASME Boiler & Pressure Vessel Code, American Society of Mechanical Engineers, 2007 Edition through 2008 Addenda.

2. ASME Code for Operation and Maintenance of Nuclear Power Plants, American Society of Mechanical Engineers, 2004 Edition through 2006 Addenda, and OM Code cases.

3. 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities."

4. 10 CFR Part 52, "Early Site Permits; Standard Design Certification; And Combined Licenses for Nuclear Power Plants."

5. NUREG-1482, Revision 1, "Guidelines for Inservice Testing at Nuclear Power Plants," January 2005.

6. RG 1.68, "Initial Test Programs for Water-Cooled Nuclear Power Plants," March 2007.

7. RG 1.100 (Revision 3), "Seismic Qualification of Electrical and Active Mechanical Equipment and Functional Qualification of Active Mechanical Equipment for Nuclear Power Plants."

8. RG 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," March 1997.

9. RG 1.182, “Assessing and Managing Risk Before Maintenance Activities at Nuclear Power Plants,” May 2000.

10. RG 1.192, Operation and Maintenance Code Case Acceptability, ASME OM Code.”

11. RG 1.174, Revision 1, “An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis,” November 2002.

12. RG 1.175, “An Approach for Decisions on Plant-Specific Risk-Informed Decisionmaking: Inservice Testing,” August 1998.

13. RG 1.206, “Combined License Applications for Nuclear Power Plants (LWR Edition),” June 2007.

14. RG 1.215, “Guidance for ITAAC Closure Under 10 CFR Part 52,” October 2009.

15. Generic Letter (GL) 90-09, “Alternative Requirements for Snubbers Visual Inspection Intervals and Corrective Actions,” December 11, 1990.

16. GL 96-05, “Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves,” September 18, 1996.

17. MPR-2524, Revision 0, “Joint Owners’ Group (JOG) Motor Operated Valve Periodic Verification Program Summary,” February 2004, and JOG responses to NRC staff requests for additional information.

18. NRC Regulatory Issue Summary 2000-03, “Resolution of Generic Safety Issue 158: Performance of Safety-Related Power-Operated Valves Under Design Basis Conditions.”

19. GL 89-10, “Safety-Related Motor-Operated Valve Testing and Surveillance,” June 1989.

20. RG 1.148, “Functional Specification for Active Valve Assemblies in Systems Important to Safety in Nuclear Power Plants.”

21. ANSI/ASME N278.1-1975 (R-1992), “Self-Operated and Power-Operated Safety-Related Valves Functional Specification Standard,” American National Standards Institute/American Society of Mechanical Engineers.

22. ANSI/ASME N551.1, “Standard for Qualification of ASME Code Class 2 & 3 Pump Assemblies for Safety Systems Service, General Requirements,” American National Standards Institute/American Society of Mechanical Engineers.

23. ANSI B16.41, “Functional Qualification Requirements for Power Operated Active Valve Assemblies for Nuclear Power Plants,” American National Standards Institute.

24. ANSI N41.6, “Functional Qualification Requirements for Actuators for Power Operated Valve Assemblies for Nuclear Power Plants,” American National Standards Institute.

25. ANSI/ASME N551.2, “Standard for Qualification of ASME Code Class 2 & 3 Pumps for Safety Systems Service,” American National Standards Institute/American Society of Mechanical Engineers.

26. ANSI N45 N551.4, “Functional Qualification of Motor Drives for Safety Related Code Class 2 and 3 Pumps for Nuclear Power Plants,” American National Standards Institute.

27. NRC Inspection Manual Chapter IMC-2504, “Construction Inspection Program - Non-ITAAC Inspections,” issued April 25, 2006.

28. SECY-05-0197, “Review of Operational Programs in a Combined License Application and Generic Emergency Planning Inspections, Tests, Analyses, and Acceptance Criteria.”

29. ASME OM Code Case OMN-1, “Alternative Rules for Preservice and Inservice Testing of Active Electric Motor-Operated Valve Assemblies in Light-Water Reactor Power Plants.”

30. ASME OM Code Case OMN-11, “Risk-Informed Testing for Motor-Operated Valves.”