REGULATORY ANALYSIS

DRAFT REGULATORY GUIDE DG-1383
ACCEPTABILITY OF ASME CODE, SECTION XI, DIVISION 2, "REQUIREMENTS FOR RELIABILITY AND INTEGRITY MANAGEMENT (RIM) PROGRAMS FOR NUCLEAR POWER PLANTS," FOR NON-LIGHT WATER REACTORS

1. Statement of the Problem

The U.S. Nuclear Regulatory Commission (NRC) is considering issuing a draft regulatory guide (RG), DG-1383, to describe an approach that is acceptable to the NRC staff for the development and implementation of a preservice inspection and inservice inspection program for non-light water reactors (non-LWRs). DG-1383 endorses, with conditions, the 2019 Edition of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (ASME Code), Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," Division 2, "Requirements for Reliability and Integrity Management (RIM) Programs for Nuclear Power Plants."

NRC regulations in 10 CFR 50.34(b)(6)(iv) and 52.79(a)(29)(i) require all applicants for operating and combined licenses to include plans for conducting normal operations, including maintenance, surveillance, and periodic testing of SSCs. However, the regulations prescribe specific preservice and inservice inspection program requirements only for boiling and pressurized water-cooled nuclear power reactors.[1] Nevertheless, as described below, the general design criteria in 10 CFR Part 50, Appendix A, as applicable to non-LWR designs, indicate the importance of an adequate preservice and inservice inspection program.

RG 1.232 provides guidance on how the general design criteria in 10 CFR Part 50, Appendix A may be adapted for non-LWR designs.[2] Appendix A to RG 1.232 contains the advanced reactor design criteria (ARDC). These criteria are generally applicable to six different types of non-LWR technologies (i.e., sodium-cooled fast reactors, lead-cooled fast reactors, gas-cooled fast reactors, modular high-temperature gas-cooled reactors, fluoride high-temperature reactors, and molten salt reactors).

Within Appendix A to RG 1.232 are several ARDC that relate to SSC testing:

- ARDC-1 states that SSCs important to safety are to be tested to quality standards commensurate with the importance of the safety functions to be performed.
- ARDC-14 states that the reactor coolant boundary shall be tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture.

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[1] The regulations in 10 CFR 50.55a require that systems and components of boiling- and pressurized-water-cooled nuclear power reactors meet the requirements for preservice and inservice in ASME Code, Section XI, Division 1, "Rules for Inspection and Testing of Components of Light-Water-Cooled Plants."

[2] While the general design criteria establish minimum requirements for the principal design criteria for water-cooled nuclear power plants similar in design and location to plants for which construction permits have been issued by the Commission, the general design criteria are also considered to be generally applicable to other types of nuclear power units and are intended to provide guidance in establishing the principal design criteria for such other units.

- ARDC-30 indicates that the components that are part of the reactor coolant boundary shall be tested to the highest quality standards practical.
- ARDC-32 provides that the components that are part of the reactor coolant boundary shall be designed to permit periodic inspection and functional testing of important areas and features to assess their structural and leaktight integrity.
- ARDC-36 indicates that a system that provides emergency core cooling shall be designed to permit appropriate periodic inspection of important components to ensure the integrity and capability of the system.
- ARDC-39 states that the containment heat removal system shall be designed to permit appropriate periodic inspection of important components to ensure the integrity and capability of the system.
- ARDC-42 provides that the containment atmosphere cleanup systems shall be designed to permit appropriate periodic inspection of important components, such as filter frames, ducts, and piping, to assure the integrity and capability of the systems.
- ARDC-45 indicates that the structural and equipment cooling systems shall be designed to permit appropriate periodic inspection of important components, such as heat exchangers and piping, to ensure the integrity and capability of the systems.
- ARDC-53 states that the containment structure shall be designed to permit appropriate periodic inspection of all important areas, such as penetrations.

The above ARDC indicate the need for inspection activities, and as mentioned above, the NRC requires applicants for operating and combined licenses to include plans for maintenance, surveillance, and periodic testing of SSCs, which boiling and pressurized water-cooled nuclear power reactors satisfy by implementing ASME Code, Section XI, Division 1 as incorporated in 10 CFR 50.55a. However, neither the ARDC nor the regulations of 10 CFR Part 50 or 52 indicate the appropriate standards to which a preservice/inservice program is to be developed and implemented for non-LWRs.

2. Objective

The objective of this regulatory action is to provide applicants with an acceptable means to develop and implement a preservice and inservice inspection program for non-LWRs. Specifically, this guide would endorse with conditions the programmatic requirements established in the 2019 Edition of ASME Code, Section XI, Division 2, for the development of such a program. Additionally, the guide would describe a method that applicants can use to incorporate preservice inspection and inservice inspection programs into a licensing basis.

3. Alternative Approaches

The NRC staff considered the following alternative approaches:

1. Do not develop new regulatory guidance—no action.
2. Develop new regulatory guidance.

<u>Alternative 1: Do Not Develop New Regulatory Guidance</u>

Under this alternative, the NRC would not develop guidance. This alternative is considered the “no-action” alternative and provides a baseline condition from which any other alternatives will be assessed. The “no-action” alternative would not address the lack of NRC regulatory guidance on the development of a preservice and inservice inspection program for non-LWRs. The NRC staff would be required to review each non-LWR application on a

case-by-case basis, which would increase the time and cost required to review an application and potentially result in excessive delays in licensing non-LWR designs.

Alternative 2: Develop New Regulatory Guidance

Under this alternative, the NRC would issue a new RG to endorse the use of ASME Code, Section XI, Division 2, with any appropriate conditions. This would provide applicants and licensees with a standard that the NRC finds acceptable for use in the development of a preservice and inservice inspection program but does not limit applicants and licensees to only use this specific standard. Applicants and licensees would have the option to develop a preservice and inservice inspection program using alternate criteria that can be described in the final safety analysis report. This RG would incorporate the latest information, supporting guidance, and review practices for the preservice and inservice inspection requirements for non-LWRs. By doing so, the NRC would ensure that the RG guidance available in this area is current and accurately reflects the staff's position. The RG would enhance applicants' and licensees' ability to provide the appropriate level of detail to support the NRC staff's safety finding on a licensing action. Developing an RG to endorse the 2019 Edition of ASME Code, Section XI, Division 2, is consistent with the NRC policy of evaluating the latest versions of national consensus standards to determine their suitability for endorsement by RGs. This approach also will comply with the NRC's Management Directive 6.5, "NRC Participation in the Development and Use of Consensus Standards," dated October 28, 2016 (Agencywide Documents Access and Management System Accession No. ML18073A164). This is in accordance with the National Technology Transfer and Advancement Act of 1995 (Public Law 104-113). Moreover, developing this RG as stated above is consistent with the Nuclear Energy Innovation and Modernization Act (Public Law 115-439), which directs the agency to collaborate with standards-setting organizations to identify specific technical areas for which new or updated standards are needed to support the commercial advanced nuclear reactor licensing process and incorporate the respective consensus-based codes and standards into the regulatory framework.

The impact on the NRC would be the costs associated with preparing and issuing the RG. The impact on the public would be the voluntary costs associated with reviewing and providing comments to the NRC during the public comment period. The value to the NRC staff and its applicants would be the benefits associated with enhanced efficiency and effectiveness in using a common guidance document as the technical basis for license applications and other interactions between the NRC and its regulated entities. The costs to applicants and licensees of implementing the new guidance are justified by the benefits accrued with the endorsement of consensus standards that enhance safety and provide for increased standardization and regulatory certainty. Further the staff anticipates that the new guidance would streamline the staff's review of an application (i.e., relative to a case-by-case basis review due to no guidance) and therefore result in the least cost alternative to applicants and licensees.

Conclusion

Based on this regulatory analysis, the NRC staff concludes that developing an RG is warranted. The action will provide assurance of reactor safety by ensuring that appropriate guidance is available for applicants and licensees. It could also lead to cost savings for the industry, especially with regard to support for new, near-term reactor licensing activities. As stated above, developing this RG to endorse the 2019 Edition of ASME Code, Section XI, Division 2, is consistent with the National Technology Transfer and Advancement Act of 1995 (Public Law 104-113), the Nuclear Energy Innovation and Modernization Act (Public Law 115-439), and the NRC's Management Directive 6.5.