

REGULATORY ANALYSIS

DRAFT REGULATORY GUIDE DG-1380 ACCEPTABILITY OF ASME CODE SECTION III, DIVISION 5, “HIGH TEMPERATURE REACTORS”

(Proposed Revision 2 of Regulatory Guide 1.87)

1. Statement of the Problem

The U.S. Nuclear Regulatory Commission (NRC) is considering revising Regulatory Guide (RG) 1.87 to endorse, with conditions, the 2017 Edition of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code ASME Code, Section III, Division 5, as a method acceptable to the staff for the mechanical/structural design, construction, testing, and quality assurance of mechanical systems and components and their supports of high-temperature reactors. This revision of the guide also addresses the acceptability of certain Code Cases related to Division 5 of the ASME Code, Section III. Additionally, this revision provides guidance for the quality group classification of components in non-light water reactor designs.

The NRC published Revision 1 of RG 1.87, “Guidance for Construction of Class 1 Components in Elevated-Temperature Reactors,” in June 1975 to provide licensees and applicants with agency-approved guidance for complying with the Title 10, of the Code of Federal Regulations (10 CFR), Part 50, “Domestic licensing of production and utilization facilities,” specifically General Design Criterion (GDC) 1, “Quality Standards and Records,” of Appendix A, “General Design Criteria for Nuclear Power Plants,” to 10 CFR Part 50 and other GDC that require mechanical/structural integrity of mechanical systems and components and their supports. The guide described interim licensing guidelines to aid applicants in implementing these requirements with respect to ASME Class 1 components operating at elevated temperatures. Specifically, the guide approved, with conditions, the initial versions of five Code Cases namely, Code Cases 1592-0, 1593-0, 1594-0, 1595-0, and 1596-0. These five Code Cases are the precursors to the other iterations of ASME’s high-temperature construction rules – Code Cases N-47 through N-51; ASME Code, Section III, Subsection NH; and currently ASME Code, Section III, Division 5. The current version of RG 1.87 (Revision 1) does not reflect the changes and updates with respect to modern design, fabrication, inspection, testing, and overpressure provisions (among others) addressed by the aforementioned Code iterations, research, and operating experience.

2. Objective

The objective of this regulatory action is to assess the need to update NRC guidance and provide applicants with a method for the mechanical/structural design, construction, testing, and quality assurance of systems and components and their supports of high-temperature reactors. Specifically, the guide would endorse, with exclusions and limitations, the 2017 Edition of ASME Code Section III, Division 5, a small portion of the 2019 Edition, and address the acceptability of two related Code Cases.

3. Alternative Approaches

The NRC staff considered the following alternative approaches:

1. Do not revise Regulatory Guide 1.87
2. Withdraw Regulatory Guide 1.87
3. Revise Regulatory Guide 1.87 to address the current methods and procedures.

Alternative 1: Do Not Revise Regulatory Guide 1.87

Under this alternative, the NRC would not revise guidance, and the current guidance would be retained. This alternative is considered the “no-action” alternative and provides a baseline condition from which any other alternatives will be assessed. However, the “no-action” alternative would not address identified concerns with the current versions of the Code Cases and the RG. It is unlikely applicants would use the old cases endorsed in this RG, so they would be burdened with developing their own approaches. This alternative would also not provide the NRC’s assessment of latest information, supporting guidance, and review practices that could benefit both applicants and the NRC. The NRC would review each application on a case-by-case basis.

Alternative 2: Withdraw Regulatory Guide 1.87

Under this alternative the NRC would withdraw this RG. This would eliminate the problems identified above regarding the Code Cases and RG. However, it would also eliminate the only readily available description of the methods endorsed by the NRC for mechanical/structural design and construction of systems and components and their supports for high-temperature reactors. Therefore, it would remove any of the benefits to the public, licensees, or the NRC from having the existing guidance. This alternative would also not provide the NRC’s assessment of latest information, supporting guidance, and review practices that could benefit both applicants and the NRC. In the absence of formal guidance, applicants would be burdened with developing their own approaches and the NRC would need to review each application on a case-by-case basis.

Alternative 3: Revise Regulatory Guide 1.87

Under this alternative, the NRC would revise RG 1.87. This revision would incorporate the latest information, supporting guidance, and review practices for the mechanical/structural design, construction, testing, and quality assurance of systems and components and their supports of high-temperature reactors. 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 updated regulatory guidance would enhance applicants’ and licensees’ ability to provide the appropriate level of detail in regard to component structural integrity to support the NRC staff’s safety finding on that topic in the context of a licensing action. Revising this RG to endorse the 2017 Edition of ASME Code Section III, Division 5 and related Code Cases 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 (ADAMS Accession No. ML18073A164). This is in accordance with the National Technology Transfer and Advancement Act of 1995 (Public Law 104-113). Moreover, revising 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 to the NRC would be the costs associated with preparing and issuing the RG revision. The impact to the public would be the voluntary costs associated with reviewing and providing comments to NRC during the public comment period. The value to NRC staff and its applicants and licensees would be the benefits associated with enhanced efficiency and effectiveness in using a common guidance document on component structural integrity as the technical basis for license applications and other interactions between the NRC and its regulated entities on that topic. The costs to applicants and licensees of implementing the revised 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 revised guidance would streamline the staff's review of component structural integrity topics in an application (i.e., relative to a case-by-case basis review due to no guidance or outdated guidance) and therefore result in the least-cost alternative for reviewing those topics.

Conclusion

Based on this regulatory analysis, the NRC staff concludes that revision of RG 1.87 is warranted. The action will enhance assurance of reactor safety by ensuring that appropriate guidance on the structural integrity of components used in high-temperature environments 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, revising this RG to endorse the 2017 Edition of ASME Code Section III, Division 5 and related Code Cases is consistent with the National Technology Transfer and Advancement Act of 1995 (Public Law 104-113), Nuclear Energy Innovation and Modernization Act (Public Law 115-439), and NRC's Management Directive 6.5.