

## **Regulatory Guide Periodic Review**

Office: RES/DE/CIB

Regulatory Guide Number: 1.161

Title: Evaluation of Reactor Pressure Vessels with Charpy Upper-Shelf Energy Less than 50 Ft-Lb

Recommended Staff Action: RG 1.161 is acceptable for continued use

**(1) What are the known technical or regulatory issues with the current version of the RG?**

Regulatory Guide 1.161, "Evaluation of Reactor Pressure Vessels with Charpy Upper-Shelf Energy Less than 50 ft-lb," established a method acceptable to the staff to calculate alternative Charpy upper-shelf energy requirements. It applies elastic-plastic fracture mechanics, which is appropriate for reactor operation at upper-shelf temperatures. Since the regulatory guide's development, potential technical issues have arisen with the determination of crack driving force and toughness. The staff is currently assessing the impacts of the plastic contributions to the crack driving force, and improving the Charpy- $J_R$  correlations. While the staff has identified potential technical issues with RG 1.161 procedures as a part of their continued research efforts, those technical issues have not indicated any safety concerns or a need to revise the RG at this time.

**(2) What is the impact on internal and external stakeholders of not updating the RG for the known issues, in terms of numbers of future licensing and inspection activities?**

Although one submittal under RG 1.161 is currently under review, many licensees evaluate low upper-shelf energy through staff-approved equivalent margins analyses rather than RG 1.161. Up to 60 years of operation, RG 1.161 analyses may not be of major importance for existing reactors. Low upper-shelf energy may not be a regulatory concern for new reactors through 60 years of operation, given that new reactors are constructed with radiation-resistant materials. There will be no impact on future analyses of this type as a result of not updating the RG.

**(3) What is an estimate of the level of effort needed to address identified issues in terms of FTE and contract dollars?**

The technical tasks required to improve RG 1.161 are listed below.

- Comparing the RG 1.161  $J$  estimation with finite element and other  $J$  estimation schemes
- Collecting and compiling a new database for updating the  $J$ -Charpy energy correlations

- Developing a new  $J$ -Charpy energy correlation

Staff efforts will occur within the context of the ASME Code organization. Approximately 0.1 FTE is required to complete this work.

- (4) Based on the answers to the questions above, what is the recommended staff action for this guide (Reviewed, Acceptable as-is (with known issues), Revise, or Withdraw)?**

Despite the technical issues presented in the response to Question (1), an analysis performed in accordance with RG 1.161 contains built-in conservatisms that compensate for the identified simplifications. Therefore, RG 1.161 is deemed to be acceptable for continued use.

- (5) If a RG should be revised, provide a conceptual plan and timeframe to accomplish this.**

Since the RG is deemed acceptable for continued use, there is no conceptual plan or timeframe for accomplishing the RG update. As results from ongoing research activities become available, the staff will re-evaluate the need and timeframe for updating RG 1.161.