

ASME Code, section XI, Appendix G, limits.

ASME Code Case N-641 permits the use of alternate reference fracture toughness (*i.e.*, use of " K_{IC} fracture toughness curve" instead of " K_{IA} fracture toughness curve," where K_{IC} and K_{IA} are "Reference Stress Intensity Factors," as defined in ASME Code, section XI, Appendices A and G, respectively) for reactor vessel materials in determining the P-T curves and low temperature overpressure protection system setpoints for effective temperature and allowable pressure. Since the K_{IC} fracture toughness curve shown in ASME Code, section XI, Appendix A, Figure A-2200-1 (the K_{IC} fracture toughness curve), provides greater allowable fracture toughness than the corresponding K_{IA} fracture toughness curve of ASME Code, section XI, Appendix G, Figure G-2210-1 (the K_{IA} fracture toughness curve), using ASME Code Case N-641 to establish the P-T curves and low temperature overpressure protection system setpoints would be less conservative than the methodology currently endorsed by 10 CFR part 50, Appendix G. Therefore, an exemption to apply ASME Code Case N-641 is required.

The proposed action is in accordance with the licensee's application dated December 10, 2002.

The Need for the Proposed Action

The proposed exemption is needed to allow the licensee to implement ASME Code Case N-641 in order to revise the method used to determine the P-T curves and because low temperature overpressure protection system setpoints based on the method specified by Appendix G to 10 CFR part 50, unnecessarily restrict the P-T operating window.

The underlying purpose of Appendix G, is to protect the integrity of the reactor coolant pressure boundary (RCPB) in nuclear power plants. This is accomplished through regulations that, in part, specify fracture toughness requirements for ferritic materials of the RCPB. Pursuant to 10 CFR part 50, Appendix G, it is required that P-T limits for the reactor coolant system (RCS) be at least as conservative as those obtained by applying the methodology of the ASME Code, section XI, Appendix G. Current P-T limits produce operational constraints by limiting the P-T range available to the operator to heat up or cool down the plant. The operating window through which the operator heats up and cools down the RCS, becomes more restrictive with continued reactor vessel service. Reducing this operating window could

potentially have an adverse safety impact by increasing the possibility of inadvertent low temperature overpressure protection system (OPPS) actuation due to pressure surges associated with normal plant evolutions, such as reactor coolant pump start and swapping operating charging pumps with the RCS in a water-solid condition. P-T limits for an increased service period of operation of 32 effective full-power years for D. C. Cook Unit 1, based on ASME Code, section XI, Appendix G requirements, would significantly restrict the ability to perform plant heatup and cooldown, create an unnecessary burden to plant operations, and challenge control of plant evolutions required with OPPS enabled. Continued operation of D. C. Cook Unit 1 with P-T curves developed to satisfy ASME Code, section XI, Appendix G, requirements without the relief provided by ASME Code Case N-641, would unnecessarily restrict the P-T operating window, especially at low temperature conditions. Use of the K_{IC} curve in determining the lower bound fracture toughness of RPV steels is more technically correct than use of the K_{IA} curve, since the rate of loading during a heatup or cooldown is slow and is more representative of a static condition than a dynamic condition. The K_{IC} curve appropriately implements the use of static initiation fracture toughness behavior to evaluate the controlled heatup and cooldown process of a reactor vessel. The staff has required use of the conservatism of the K_{IA} curve since 1974, when the curve was adopted by the ASME Code. This conservatism was initially necessary due to the limited knowledge of the fracture toughness of RPV materials at that time. Since 1974, additional knowledge has been gained about RPV materials, which demonstrates that the lower bound on fracture toughness provided by the K_{IA} curve greatly exceeds the margin of safety required, and that the K_{IC} curve is sufficiently conservative to protect the public health and safety from potential RPV failure. Application of ASME Code Case N-641 will provide results that are sufficiently conservative to ensure the integrity of the RCPB, while providing P-T curves and low temperature overpressure protection system setpoints that are not overly restrictive. Implementation of the proposed P-T curves and low temperature overpressure protection system setpoints, as allowed by ASME Code Case N-641, will continue to provide significant safety margin for the RCPB.

In the associated exemption, the NRC staff has determined that, pursuant to 10

CFR part 50, section 50.12(a)(2)(ii), the underlying purpose of the regulation will continue to be served by the implementation of ASME Code Case N-641.

Environmental Impacts of the Proposed Action

The NRC has completed its evaluation of the proposed action and concludes that there are no significant environmental impacts associated with the use of the alternative analysis method to support the revision of the RCS P-T limits.

The proposed action will not significantly increase the probability or consequences of accidents, no changes are being made in the types of effluents that may be released off site, and there is no significant increase in occupational or public radiation exposure. Therefore, there are no significant radiological environmental impacts associated with the proposed action.

With regard to potential nonradiological impacts, the proposed action does not have a potential to affect any historic sites. It does not affect nonradiological plant effluents and has no other environmental impact. Therefore, there are no significant nonradiological environmental impacts associated with the proposed action.

Accordingly, the NRC concludes that there are no significant environmental impacts associated with the proposed action.

Environmental Impacts of the Alternatives to the Proposed Action

As an alternative to the proposed action, the staff considered denial of the proposed action (*i.e.*, the "no-action" alternative). Denial of the application would result in no change in current environmental impacts. The environmental impacts of the proposed action and the alternative action are similar.

Alternative Use of Resources

The action does not involve the use of any different resource than those previously considered in the Final Environmental Statement for the Donald C. Nuclear Plant Units 1 and 2, dated August 1973.

Agencies and Persons Consulted

On June 6, 2003, the staff consulted with the Michigan State official, Ms. Sara De Cair of the Department of Environmental Quality, regarding the environmental impact of the proposed action. The State official had no comments.