

DOCKET NUMBER
PETITION RULE PRM 50-69
(65 FR 6044)

DOCKETED
US [7590-01-P]

'00 FEB -2 AM 1:39

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket No. PRM-50-69]

Westinghouse Electric Company LLC ;
Receipt of Petition for Rulemaking

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; Notice of receipt.

SUMMARY: The Nuclear Regulatory Commission (NRC) has received and requests public comment on a petition for rulemaking filed by Westinghouse Electric Company LLC (petitioner). The petition has been docketed by the Commission and has been assigned Docket No. PRM-50-69. The petitioner is requesting that the NRC regulations governing pressure and temperature limits for the reactor pressure vessel be amended to eliminate requirements for the metal temperature of the closure head flange and vessel flange regions. The petitioner believes the elimination of the flange requirement has no impact on Boiling Water Reactors (BWRs) and could improve plant safety in Pressurized Water Reactors (PWRs).

April 24, 2000

DATE: Submit comments by (~~75~~ days following publication in the Federal Register).

Comments received after this date will be considered if it is practical to do so, but assurance of consideration cannot be given except as to comments received on or before this date.

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Pub. on 2/8/00

ADDRESSES: Submit comments to: Secretary, U.S. Nuclear Regulatory Commission, Washington, DC 20555. Attention: Rulemakings and Adjudications staff.

Deliver comments to 11555 Rockville Pike, Rockville, Maryland, between 7:30 am and 4:15 pm on Federal workdays.

For a copy of the petition, write: David L. Meyer, Chief, Rules and Directives Branch; Division of Administrative Services, Office of Administration, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Documents related to this action are available for public inspection at the NRC Public Document Room (PDR) located at the Gelman Building, 2120 L Street, NW, Washington, DC 20555. Documents created or received at the NRC after November 1, 1999 are also available electronically at the NRC's Public Electronic Reading Room on the Internet at <http://www.nrc.gov/NRC/ADAMS/index.html>. From this site, the public can gain entry into the NRC's Agencywide Document Access and Management System (ADAMS), which provides text and image files of NRC's public documents. For more information, contact the NRC Public Document Room (PDR) reference staff at 1-800-397-4209, 202-634-3273, or by email to pdr@nrc.gov.

You may also provide comments via the NRC's interactive rulemaking website through the NRC home page (<http://ruleforum.llnl.gov>). This site provides the availability to view and upload comments as files (any format), if your web browser supports that function. For information about the interactive rulemaking website, contact Ms. Carol Gallagher, 301-415-5905 (e-mail: CAG@nrc.gov).

FOR FURTHER INFORMATION CONTACT: David L. Meyer, Office of Administration, U.S. Nuclear Regulatory Commission, Washington, DC 20555. Telephone: 301-415-7162 or Toll Free: 1-800-368-5642 or E-mail: DLM1@NRC.GOV.

SUPPLEMENTARY INFORMATION:**Background**

The Nuclear Regulatory Commission received a petition for rulemaking dated November 4, 1999, submitted by Westinghouse Electric Company LLC (petitioner). The petitioner is requesting that Table 1 in 10 CFR Part 50, Appendix G, be amended by removing requirements related to the metal temperature of the closure head flange and vessel flange regions. Specifically, the petitioner is requesting that footnotes 2 and 6 be removed from Table 1. The removal of these footnotes would eliminate requirements that restrict heat-up and cool-down pressure temperature curves.

In support of its petition, the petitioner has attached a Westinghouse document, WCAP-15315, "Reactor Vessel Closure Head/Vessel Flange Requirements Evaluation for Operating PWR and BWR Plants" (October 1999). The petitioner believes that this document sets forth the technical basis for the proposed modification, the grounds for and interest in the requested action, and the specific issues and facts that support the petition.

On the basis of the information in WCAP-15315, the petitioner has concluded that the requirements pertaining to the reactor vessel closure head flange in 10 CFR Part 50, Appendix G, Table 1, are not necessary and believes that removal of these requirements will have no impact on BWRs and could improve plant safety in PWRs. The petitioner requests that the regulations in 10 CFR Part 50 be amended by removing footnotes 2 and 6 in Table 1 of Appendix G that pertain to the reactor vessel closure head flange.

The NRC has determined that the petition meets the threshold sufficiency requirements for a petition for rulemaking under 10 CFR 2.802. The petition has been docketed as PRM-50-69. The NRC is soliciting public comment on the petition for rulemaking.

Discussion of the Petition

The petitioner notes that requirements pertaining to the reactor vessel closure head flange are contained in 10 CFR Part 50, Appendix G, Table 1 entitled, "Pressure and Temperature Requirements for the Reactor Pressure Vessel." These requirements appear in footnotes 2 and 6 of Table 1. These footnotes require that the metal temperature of the closure flange regions must exceed the material unirradiated RT_{NOT} by at least 120° F for normal operation when the pressure exceeds 20 percent of the pre-service hydrostatic test pressure (621 psig for a typical PWR and 300 psig for a typical BWR). The petitioner believes that these requirements are unnecessary and requests that these footnotes be eliminated.

In support of its petition, the petitioner has attached a Westinghouse document, WCAP-15315, "Reactor Vessel Closure Head/Vessel Flange Requirements Evaluation for Operating PWR and BWR Plants" (October 1999) that it believes sets forth the technical basis for the proposed modification, the grounds for and interest in the requested action, and the specific issues and facts that support the petition. The Westinghouse document indicates that the method used to develop pressure-temperature limits on the reactor vessel closure head flange in NRC requirements is based on fracture toughness data from the mid 1970s. Specifically, the margin of 120° F and the pressure limitation of 20 percent of hydrotest pressure were developed using the K_{IA} fracture toughness curve provided in Appendix G to Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code. The petitioner does not specify the editions of the ASME B&PV Code that contain the K_{IA} or the K_{IC} fracture toughness curves. The petitioner believes that improved knowledge of fracture toughness and other factors affecting the integrity of the reactor vessel have led to the recent change to permit the use of the K_{IC} fracture toughness curve, provided in Appendix A to Section XI of the ASME B&PV Code, in the development of pressure-temperature curves as

specified in ASME Code Case N640, "Alternative Reference Fracture Toughness for Development of P-T Limit Curves for Section XI, Division 1."

The petitioner also believes the Westinghouse report demonstrates that a typical heat-up curve for both PWRs and BWRs using the K_{Ic} curve provides for a much higher allowable pressure through the entire range of temperatures. The petitioner concludes that the higher specified limits for a typical PWR are negated by the current NRC closure flange requirement. The petitioner contends that the Westinghouse report shows that the use of the K_{Ic} curve recently adopted by the ASME for flange considerations will lead to the conclusion that the current flange requirement can be eliminated.

The petitioner contends that the Westinghouse report demonstrates that irradiation effects studies lead to the conclusion that the location of the closure flange region is in an area of the reactor where irradiation levels are very low, meaning that the fracture toughness of the closure head flange is not measurably affected. The Westinghouse report indicates that steady state operation stresses in several PWR designs are not very high, but in other designs the stresses are much higher. Loadings are primarily membrane stress with somewhat lower bending stresses for two PWR designs. In other PWR designs, the bending stresses are approximately twice (or more) the membrane stresses. In BWRs, the membrane stress is very similar to that in PWRs, but the bending stresses are higher in BWR designs, due to the larger diameter and smaller thickness.

The report indicates that the relative impact of these stresses is best addressed through a fracture mechanics evaluation that postulates a semi-elliptic surface flaw at the outer surface of the closure head flange. The petitioner believes the report demonstrates that in both BWRs and PWRs, the stress intensity factors and fracture toughness variables at boltup provide a significant margin of safety and concludes that the integrity of the closure head/flange region is not a concern for any operating plant using the K_{Ic} fracture toughness curve. The petitioner

also believes the report concludes that there are no known mechanisms of degradation in this region other than fatigue and that the calculated design fatigue usage level is so low that flaws are unlikely to initiate in the closure head/flange region.

The Westinghouse document indicates that for PWRs the boltup temperature ranges from 10° F to 51° F, with a nominal boltup temperature of 60° F. For BWRs the boltup temperature using the K_{Ic} fracture toughness curve ranges from 10° F to 66° F, with a nominal boltup temperature of 80° F. The petitioner believes that these comparisons make it clear that no additional boltup requirements are necessary and concludes that the requirements in footnotes 2 and 6 of Table 1 in 10 CFR Part 50, Appendix G can be eliminated.

The Westinghouse report states that an important safety concern is the narrow operating window at low temperatures forced by the closure flange requirement. Because the flange requirement sets a pressure limit of 621 psi for a PWR (20 percent of hydrotest pressure), the pressure-temperature (P-T) limit curve may be superceded by the flange requirement for temperatures below $RT_{NDT} + 120^{\circ} F$. The report also states that although this requirement was originally imposed to ensure the integrity of the flange region during boltup, it is no longer a concern as specified in the "Flange Integrity" analysis section of the report.

The report indicates that the flange requirement can cause severe operational limitations when instrument uncertainties are added to the lower limit (621 psi) for the Low Temperature Overpressure Protection (LTOP) system of PWRs. Because the minimum pressure required to cool the seals of the main coolant pumps is 325 psi, the operating window between minimum system pressure necessary for seal cooling and maximum system pressure to comply with PT limits on the flange sometimes becomes very small. The report states that if the operator allows the pressure to drop below the pump seal limit, the seals could fail and cause the equivalent of a small break loss of cooling accident (LOCA), a significant safety problem. The petitioner believes that elimination of the flange requirement will significantly

widen the operating window for most PWRs as stated in the report, reducing the likelihood of such an occurrence.

The Westinghouse report cites the Byron Unit 1 facility as an example of a PWR that the petitioner believes illustrates how elimination of the flange requirement could improve plant safety. According to the report, Byron has LTOP setpoints significantly below the flange requirement of 621 psi, because of a relatively large instrument uncertainty. The setpoints of the two power-operated relief valves (PORVs) are staggered by about 16 psi to prevent a simultaneous activation. Because the two PORVs have different instrument uncertainties, the higher uncertainty is used for conservatism. The report states that:

“Elimination of the flange requirement for Byron Unit 1 would mean that the PORV curve could become level at 604/587 psig, which are the leading/trailing setpoints to protect the PORV downstream piping, through the temperature of the 350° F down to boltup at 60° F. The operating window between the leading PORV and the pump seal limit rises from 121 psig (446-325) to 262 psig (587-325). This change will make a significant improvement in plant safety by reducing the probability of a small LOCA, and easing the burden on operators.”

The report acknowledges that the Byron situation is only one example of the flange requirement's impact. The report also states that although each operating PWR facility will have different parameters, the operational safety will generally be improved by elimination of the flange requirement.

The Westinghouse report further states that elimination of the flange temperature requirement would have no impact on BWRs:

“The saturation temperature corresponding to the 300 psig operating pressure (20% of the pre-service hydrostatic test pressure) is 420° F. This is well in excess of the $RT_{NDT} + 120^{\circ}$ F requirement. Therefore the flange temperature

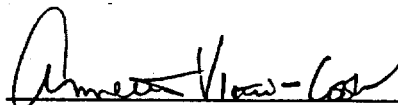
requirements are satisfied regardless of whether they exist or not. Therefore, elimination of the flange temperature requirement has no impact on BWR flange integrity.”

The Petitioner's Conclusions

The petitioner has concluded that the NRC requirements governing pressure and temperature limits for the reactor pressure vessel should be amended to eliminate reactor vessel closure head flange requirements. The petitioner has also concluded that the elimination of the flange requirement has no impact on BWRs and could improve plant safety in PWRs. The petitioner requests that the reactor vessel closure head flange requirement be eliminated from the regulations at 10 CFR Part 50, Appendix G, Table 1 as presented in its petition for rulemaking.

Dated at Rockville, Maryland, this 1st day of February, 2000.

For the Nuclear Regulatory Commission.



Annette Vietti-Cook,
Secretary of the Commission.