



50-220

UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

November 2, 1998

Mr. John H. Mueller  
Chief Nuclear Officer  
Niagara Mohawk Power Corporation  
Nine Mile Point Nuclear Station  
Operations Building, Second Floor  
P.O. Box 63  
Lycoming, NY 13093

SUBJECT: NRC STAFF SAFETY EVALUATION OF REQUEST TO EXTEND REINSPECTION  
INTERVAL FOR CORE SHROUD VERTICAL WELDS, NINE MILE POINT  
NUCLEAR STATION, UNIT NO. 1 (TAC NO. M99720)

Dear Mr. Mueller:

During the 1997 refueling outage at Nine Mile Point Nuclear Station, Unit 1 (NMP1), Niagara Mohawk Power Corporation (NMPC) performed core shroud inspections in accordance with the BWR Vessel and Internals Program (BWRVIP) document BWRVIP-07, "Guidelines for Reinspection of BWR Core Shrouds," dated February 1996 and found cracking in the vertical welds. NMPC also found that shroud stabilizer assemblies ("tie rod") nuts had lost some preload and that the lower wedge retainer clips on three of four stabilizer assemblies had experienced damage, including one that had actually broken off. NMPC modified the lower wedge retainer clip design to restore the stabilizer assemblies to the intended function previously approved by the NRC staff. The repair modification was considered as an alternate repair under the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Section XI definition of repair or replacement pursuant to 10 CFR 50.55a(a)(3)(i) and was approved by the NRC staff in a letter and safety evaluation (SE) dated May 8, 1997. In addition, NMPC proposed that reinspection of the shroud vertical welds be performed after 10,600 hours of hot operation. This interval, 10,600 hours of hot operation, was based upon a fracture mechanics analysis of the most limiting case of vertical weld V-9. The allowable flaw size for weld V-9 was determined by using the conservative linear elastic fracture mechanics (LEFM) analysis. The 10,600 hours of hot operation was calculated using a bounding crack growth rate of  $5 \times 10^{-5}$  inch/hour. By letter dated April 8, 1997, NMPC stated that additional analyses were planned, and would be submitted to the NRC staff, to justify extension of the reinspection interval for the shroud vertical welds.

The testing and analyses results reported in NMPC's letters dated September 30, 1997, and January 30, February 27, September 21, and October 22, 1998, show that the characteristics of the observed cracking were consistent with the features of intergranular stress corrosion cracking (IGSCC). Further, the estimated fluence at the remaining uncracked ligaments was shown to be less than  $5 \times 10^{20}$  n/cm<sup>2</sup> at the end of the current operating cycle (cycle 13) extended to 14,500 hours.

By letter dated February 27, 1998, NMPC submitted a request to extend the reinspection interval for the NMP1 core shroud vertical welds from 10,600 hours to 14,500 hours of hot operation. To support the request, the submittal included the results of the metallurgical evaluation of two boat

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samples, fluence measurements and calculations, and reassessment of the crack growth for welds V-9 and V-10 with the application of a stress intensity factor (K)-independent crack growth rate of  $2.2 \times 10^{-5}$  inch/hour.

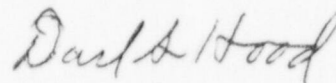
The NRC staff has completed its review of the extension request and supporting information and finds the proposed extension to be acceptable. The NRC staff's related SE is enclosed. Based upon a review of the results of the metallurgical testing of the two vertical weld boat samples, as well as the fluence measurements and neutron flux calculations, the NRC staff has determined that the use of a K-independent crack growth rate of  $2.2 \times 10^{-5}$  inch/hour given in BWRVIP-14 for the calculations of crack growth in shroud vertical welds is appropriate for application to NMP1 because all the conditions stipulated by the NRC staff regarding the use of the lower crack growth rate have been satisfied. Therefore, the NRC staff concludes that reasonable assurance exists that NMP1 can be safely operated for a period of 14,500 hours before reinspecting the core shroud vertical welds because the structural integrity of the vertical welds will be maintained with safety margin specified by the ASME Code. Therefore, the NRC staff also concludes that a mid-cycle reinspection (after 10,600 hours of hot operation) of the shroud vertical welds is not necessary since a mid-cycle reinspection would result in hardship without a compensating increase in the level of quality and safety.

This approval of NMPC's request to extend the core shroud reinspection interval at NMP1 does not affect the NRC staff's earlier letter and SE dated May 8, 1997, which approved a design modification of a 1995 shroud repair pursuant to 10 CFR 50.55a(a)(3)(i).

During its review of the extension request, the NRC staff has considered comments received from members of the public and local officials during an NRC meeting with the public in Oswego, New York, on September 24, 1998. The comments expressed a preference that the reinspection occur once the 10,600 hours of hot operation has been reached, primarily because of the higher assurance afforded by actual observation compared to reliance upon engineering calculations. As discussed in the enclosed SE, the NRC staff has concluded that reasonable assurance exists that NMP1 can be safely operated with the current operating cycle extended to 14,500 hours before reinspection of the vertical welds. Therefore, the mid-cycle reinspection at 10,600 hours is not necessary as it would result in a hardship without a compensating increase in the level of quality and safety.

This completes the NRC staff's efforts under TAC No. M99720. If you have questions, please contact me by phone on (301) 415-3049 or by electronic mail at [dsh@nrc.gov](mailto:dsh@nrc.gov).

Sincerely,



Darl S. Hood, Senior Project Manager  
Project Directorate I-1  
Division of Reactor Projects - I/II  
Office of Nuclear Reactor Regulation

Docket No. 50-220

Enclosure: Safety Evaluation

cc w/encl: See next page

samples, fluence measurements and calculations, and reassessment of the crack growth for welds V-9 and V-10 with the application of a stress intensity factor (K)-independent crack growth rate of  $2.2 \times 10^{-5}$  inch/hour.

The NRC staff has completed its review of the extension request and supporting information and finds the proposed extension to be acceptable. The NRC staff's related SE is enclosed. Based upon a review of the results of the metallurgical testing of the two vertical weld boat samples, as well as the fluence measurements and neutron flux calculations, the NRC staff has determined that the use of a K-independent crack growth rate of  $2.2 \times 10^{-5}$  inch/hour given in BWRVIP-14 for the calculations of crack growth in shroud vertical welds is appropriate for application to NMP1 because all the conditions stipulated by the NRC staff regarding the use of the lower crack growth rate have been satisfied. Therefore, the NRC staff concludes that reasonable assurance exists that NMP1 can be safely operated for a period of 14,500 hours before reinspecting the core shroud vertical welds because the structural integrity of the vertical welds will be maintained with safety margin specified by the ASME Code. Therefore, the NRC staff also concludes that a mid-cycle reinspection (after 10,600 hours of hot operation) of the shroud vertical welds is not necessary since a mid-cycle reinspection would result in hardship without a compensating increase in the level of quality and safety.

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This completes the NRC staff's efforts under TAC No. M99720. If you have questions, please contact me by phone on (301) 415-3049 or by electronic mail at dsh@nrc.gov.

Sincerely,

ORIGINAL SIGNED BY:

Darl S. Hood, Senior Project Manager  
Project Directorate I-1  
Division of Reactor Projects - I/II  
Office of Nuclear Reactor Regulation

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Enclosure: Safety Evaluation  
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