NMC
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Palisades Nuclear Plant
Operated by Nuclear Management Company, LLC

July 31, 2001

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-001

DOCKET 50-255 - LICENSE DPR-20 - PALISADES PLANT
PAGE CORRECTION FOR REQUEST FOR APPROVAL TO USE ASME CODE CASE N-504-1 FOR REPAIR OF CONTROL ROD DRIVE MECHANISM UPPER HOUSING ASSEMBLIES

On July 30, 2001, Nuclear Management Company, LLC, submitted a letter "Request for Approval to Use ASME Code Case N-504-1 for Repair of Control Rod Drive Mechanism Upper Housing Assemblies." A review of Enclosure 2, Attachment 2 of that letter has identified a typographical error on page 3. In the sixth line of the paragraph on Crack Growth Rates, the reference to Reference 4 should instead be to Reference 2. There is no Reference 4. A corrected page for Enclosure 2, Attachment 2 of the subject letter is attached.

SUMMARY OF COMMITMENTS

This letter contains no new commitments and no revisions to existing commitments.

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CC Administrator, Region III, USNRC
Project Manager, NRR, USNRC
NRC Resident Inspector – Palisades

Enclosure

A047

ENCLOSURE

NUCLEAR MANAGEMENT COMPANY, LLC
PALISADES PLANT
DOCKET 50-255

JULY 31, 2001

PAGE CORRECTION FOR ENCLOSURE 2, ATTACHMENT 2
OF NMC LETTER DATED JULY 30, 2001:
"REQUEST FOR APPROVAL TO USE ASME CODE CASE N-504-1 FOR REPAIR OF CONTROL ROD DRIVE MECHANISM UPPER HOUSING ASSEMBLIES"

2 Pages

identifying the last dozen operational cycles, it was possible to estimate a growth rate for the TGSCC. Only three visible growth rings were identified on the large circumferential crack surface and these also were measured and related to the last three operational cycles. Results were averaged for each crack face separately and compared. These results indicated a consistent crack growth rate for both cracks. Measurements and computations are shown in Attachment 1.

Another feature observed was the geometry of the crack front. The small circumferential defects were located in or at the weld root. The crack front was irregular. It is suggested that this is a result of a crack front driven primarily by weld residual stresses, and had not grown sufficiently deep for the driving force to be dominated by pressure stresses. The two deeper cracks were very consistent and uniform suggesting that the driving force is dominated by pressure stresses. The driving force is an important consideration in terms of being uniform through-wall so that the crack would penetrate the wall and leak while retaining a consistent aspect ratio. This seems to be the case for the two deep cracks.

Finally, the crack aspect ratios were measured for the two deep cracks (one leaking axial crack and one part-through circumferential). Both cracks measured a 4 to 1 aspect ratio, and were quite consistent. It was noted that the growth of the axial crack appeared to be somewhat restricted on the lower side due to a rapid increase in wall thickness at the reducer. This may have minimized the growth of the crack on the reducer side and restricted the measured aspect ratio. However, a careful examination of the growth rings indicated that this effect was only operative in the later stages of crack growth and would have had minimal effect on aspect ratio.

Crack Growth Rates

The housing material at Palisades is stabilized Type 347 stainless steel. The alloy contains columbium that ties up the carbon available to precipitate carbides in grain boundaries and thus minimizes sensitization of weld heat affected zones (HAZ). IGSCC is not likely to be the stress corrosion mechanism because the grain boundaries will not be depleted in chromium. Instead, the cracking mechanism will be TGSCC and will not be restricted to heat affected volumes adjacent to welds. TGSCC will have a slower crack growth rate (References 1 and 2) than IGSCC. Crack growth ring measurements for both the deep axial and the deep circumferential defects indicate an average growth rate of 8.8×10^{-6} in/hr and 9.6×10^{-6} in/hr, respectively. This is more than 5 times lower than the overall bounding value approved for IGSCC (Reference 3). The good chemistry value for TGSCC is suggested at 2.2×10^{-5} in/hr (Reference 2). This value is more than twice the growth rate measured for the TGSCC at Palisades. The lower rate also is consistent with the growth rate estimated for the cracked CRDM housing at Ft. Calhoun (Reference 2). It should be noted that the cracking observed at Fort Calhoun was verified by metallography as TGSCC due to chlorides. The growth rings observed at the CRD-21 housing are consistent with those observed at Fort Calhoun. It is believed that the cracking at Palisades and at Fort Calhoun are due to the same mechanism operating in a similar environment.