

May 23, 2002

Mr. Mark Warner
Site Vice President
Kewaunee and Point Beach Nuclear Power Plants
Nuclear Management Company, LLC
6610 Nuclear Road
Two Rivers, WI 54241

SUBJECT: KEWAUNEE NUCLEAR POWER PLANT - REQUEST FOR ADDITIONAL
INFORMATION RELATED TO REQUEST TO EXCLUDE DYNAMIC EFFECTS
ASSOCIATED WITH POSTULATED PIPE RUPTURES FROM LICENSING BASIS
FOR RESIDUAL HEAT REMOVAL, ACCUMULATOR INJECTION, AND SAFETY
INJECTION SYSTEM PIPING BASED UPON LEAK BEFORE BREAK ANALYSIS
(TAC NO. MB1301)

Dear Mr. Warner :

By letter dated February 23, 2001, Nuclear Management Company, LLC (NMC or the licensee) submitted a request to exclude dynamic effects associated with postulated pipe ruptures from licensing basis for residual heat removal, accumulator injection, and safety injection system piping based upon leak before break analysis at the Kewaunee Nuclear Power Plant.

The Nuclear Regulatory Commission (NRC) staff finds that the additional information identified in the enclosure is needed.

A draft of the request for additional information was e-mailed to Mr. G. Riste (NMC) on April 12, 2002.

A phone call was held between G. Riste (NMC), C. Tomes (NMC), C. Erneste (NMC), T. Maloney (NMC), T. Downing (NMC), A. Dierdoff (Structural Integrity), N. Cofie (Structural Integrity), M. Mitchell (NRC), and myself on May 10, 2002, to discuss the questions to ensure that there was no misunderstanding. Also, the phone call established a mutually agreeable response date of 30 days from the date of this letter.

Please contact me at (301) 415-1446 if future circumstances should require a change in this response date.

Sincerely,
/RA/

John G. Lamb, Project Manager, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-305
Enclosure: Request for Additional Information

cc w/encl: See next page

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Site Vice President
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SUBJECT: KEWAUNEE NUCLEAR POWER PLANT - REQUEST FOR ADDITIONAL INFORMATION RELATED TO REQUEST TO EXCLUDE DYNAMIC EFFECTS ASSOCIATED WITH POSTULATED PIPE RUPTURES FROM LICENSING BASIS FOR RESIDUAL HEAT REMOVAL, ACCUMULATOR INJECTION, AND SAFETY INJECTION SYSTEM PIPING BASED UPON LEAK BEFORE BREAK ANALYSIS (TAC NO. MB1301)

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REQUEST FOR ADDITIONAL INFORMATION REGARDING
REQUEST TO EXCLUDE DYNAMIC EFFECTS ASSOCIATED WITH POSTULATED PIPE
RUPTURES FROM LICENSING BASIS FOR RESIDUAL HEAT REMOVAL, ACCUMULATOR
INJECTION, AND SAFETY INJECTION SYSTEM PIPING BASED UPON LEAK BEFORE
BREAK ANALYSIS (TAC NO. MB1301)

1. The cover letter to NMC's February 23, 2001, submittal states that NMC is requesting Leak-Before-Break approval for the following piping at the Kewaunee Nuclear Power Plant (KNPP), along with some description of each item:

- (1) 12-inch diameter safety injection system piping;
- (2) 8-inch diameter residual heat removal system piping;
- (3) 6-inch diameter cold leg safety injection system piping;
- (4) 6-inch diameter reactor vessel safety injection system piping.

Confirm whether or not item (4) is actually included in the KNPP submittal inasmuch as no specific tabular information in the report was identified as applying to the 6-inch diameter reactor vessel safety injection system piping. If any other lines are being sought for LBB approval and are not identified above, please identify them as well in your response. Provide piping diagrams (similar to those shown in Figures 5-7, 5-8, and 5-9 of report SIR-00-045, Rev. 0) which show the specific portions of the KNPP piping systems for which LBB approval being sought.

Confirm that the information in Tables 4-3, 4-4, and 4-5 represent nodal moments specific to the KNPP systems in question.

2. Based on the description provided in Section 4.2, "Material Properties," of report SIR-00-045, Rev. 0, it appears that no cast austenitic stainless steel piping sections, elbows, safe ends, etc., are present in any of analyzed portions of piping for which NMC is seeking LBB approval for Kewaunee. Confirm that this observation is correct.
3. Based on the description provided in Section 4.2, "Material Properties," of report SIR-00-045, Rev. 0, it appears that no Inconel 600 safe ends or welds manufactured in whole or in part (i.e., buttered with) Inconel 82/182 are present in any of analyzed portions of piping for which NMC is seeking LBB approval for Kewaunee. Confirm that this observation is correct.

4. Generic material property values (tensile and fracture toughness) for austenitic stainless steel shielded metal arc welds are provided in Table 4-2 of report SIR-00-045, Rev. 0. Section 4.2, "Material Properties," of the report suggests that these welds are likely to be the most limiting locations with respect to the LBB analyses. However, for some evaluational methods, the tensile material properties of the piping which adjoins the welds is also required.

Explain whether any specific tensile material properties for the piping which adjoins the welds in the subject piping was assumed in the analyses and, if so, provide those values.

5. Section 4.3, "Piping Moments and Stresses," notes, "[a]xial loads due to dead weight, thermal expansion, and seismic were not available from the piping stress analysis and therefore were not considered in the evaluation. The stresses due to axial loads are not significant compared to those from pressure loads, so their exclusion does not significantly affect the results of the evaluation."

Explain your basis for this conclusion. Cite any available information which provides insight into the relative magnitudes of the axial loads due to the contributing factors noted above for the subject piping versus the axial load due to internal pressure. This information may not be KNPP specific, but should reflect observations/analyses of piping of similar size, geometrical configuration, operational environment, etc.

6. In Section 5.2, "Leak Rate Determination," assumptions are made regarding the crack morphology assumed for the leakage flow analysis. Specifically, a crack roughness of 0.000197 inches and no turning losses were assumed since the crack was assumed to be initiated by some other mechanism other than intergranular stress corrosion cracking (IGSCC). The staff would note that one fundamental criteria for LBB approval is that no active degradation mechanism be present in the subject line. Hence, the exclusion of crack morphologies related to SCC mechanisms could also be used to exclude morphology parameters associated with thermal fatigue, vibrational fatigue, etc.

Although the staff concurs that, to date, IGSCC of stainless steel piping in PWR environments has not been observed, SCC has been demonstrated by recent events (e.g., of an Inconel 82/182 weld at V.C. Summer) to be a credible cracking mechanism. Therefore, the staff requests that you evaluate the sensitivity of your leakage rate determination to the specific crack morphology parameters selected. The staff requests that parameters (surface roughness and number of turns) characteristic of transgranular stress corrosion cracking (TGSCC) be used, although the staff acknowledges that, to date, TGSCC has not been observed in PWR stainless steel piping (TGSCC has, however, been observed to occur in other stainless steels components in PWR primary system pressure boundary applications). Information contained in NRC NUREG/CR-6443, "Deterministic and Probabilistic Evaluations for Uncertainty in Pipe Fracture Parameters in Leak-Before-Break and In-Service Flaw Evaluations," may be useful. Evaluate what effect these modified leakage rate calculations may have on your conclusion that the subject lines are qualified for LBB approval.

7. It is stated on page 5-10 of SIR-00-045, Rev. 0 that, "[t]he evaluation consists of first modeling the piping lines and then applying a kink angle at all weld locations from the

LBB analysis. The process resulted in applied moments at each weld location that could be used in assessing leakage rate reduction. The three selected piping lines were modeled as PIPE16 elements using the ANSYS computer code [22]. All three models were bounded by two anchors, one of them being the connection to the RCS system. The other was placed at a significant distance away from the welds of interest.”

Explain what is meant by the last sentence of this passage. The sentence seems to imply that an arbitrary choice for the location of a second anchor was used. The staff would assume that the piping systems were modeled in the as-built configuration and the location of any anchors would be known. The proximity of any anchor to a weld of interest would, therefore, be known.

8. With regard to the issue of addressing restraint of pressure induced bending, confirm that the moments provided in Tables 5-13 through 5-15 represent “bounding” restraint or closure moments (moments which would conservatively act to close the leakage flaw and reduce the calculated leakage per unit crack length) which were calculated based on your analysis of the least compliant representative system from any of the three units (KNPP, Prairie Island 1 and 2) which provided information for report SIR-00-045, Rev. 0. It is the staff’s understanding that in your analysis the greatest restraint moments were calculated and used to reduce the KNPP plant-specific moments from the piping analysis in order to account for their effect on the leakage flaw size determination (as reflected in the information in Tables 5-16, 5-17, and 5-18), but were not used to modify your analysis of the critical flaw size.