

July 27, 2001

MEMORANDUM TO: File

FROM: Jack N. Donohew, Senior Project Manager Section 2
Project Directorate IV /RA/
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

SUBJECT: QUESTIONS ON THE LICENSE AMENDMENT REQUEST
REGARDING REACTOR PRESSURE VESSEL HEAD CLOSURE
BOLTS FOR WOLF CREEK GENERATING STATION (TAC NO.
MA9990)

In the application of September 15, 2000 (WO 00-0036), the Wolf Creek Nuclear Operating Corporation (the licensee) requested an amendment to the technical specifications (TSs) for Wolf Creek Generating Station (WCGS). The amendment would reduce by one the number of reactor pressure vessel (RPV) head closure bolts required to be fully tensioned in Mode 4 (hot shutdown) and Mode 5 (cold shutdown) in footnote (b) of Table 1.1, "Modes," of the TSs. Footnote (c) of the table would also be changed so that the refueling mode would require more than one closure bolt to not be fully tensioned. The amendment would allow the plant to operate at full power with one closure bolt less than fully tensioned.

The supplemental information (ADAMS Accession No. ML003760844) provided clarifying information about the application and did not expand the scope of the application as published in the *Federal Register* on October 4, 2000 (65 FR 59227).

The attached request for additional information (RAI) was developed from questions submitted to the WCGS Project Manager from several technical branches. The attached RAI was provided to the licensee by e-mail on June 8, 2001, to expedite the staff's review of the licensee's application so that the review would be completed no later than September 30, 2001, to be consistent with the NRR goal of completing reviews within one year of the application. This RAI will allow (1) the licensee to review the questions and seek any clarifications with the staff so the licensee clearly understands what is being requested, and (2) the staff to discuss with the licensee when the responses could be submitted. Because of the complexity of the review, it was intended to have a meeting between the licensee and the staff in late July or early August to discuss the responses to the attached RAI before the licensee would submit its responses on the docket. The expectation was that it would be likely that the meeting would result in additional or expanded information that would be requested through the meeting. The questions would have been docketed in the meeting summary issued by the staff and in the licensee's response submittal.

In the last week, for various reasons, it has become evident that a meeting cannot be set up in late July or in August that would allow all the required participants to be at the meeting. Therefore, it has been decided to have the licensee request any conferences by phone to clarify

the questions and to submit its responses to the RAI as soon as it can. The licensee has stated by phone that it believes that it can submit its responses no later than August 10, 2001. The licensee requested that there be a meeting in September if the staff does not accept the application and the RAI responses as justifying the licensee's request. There will be phone conferences between the staff and licensee so that the staff understands the licensee's responses.

Docket No. 50-482

Attachment: Request for Additional Information

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REQUEST FOR ADDITIONAL INFORMATION

The following are questions on the licensee's application dated September 15, 2000, for changes to Tables 1.1-1, "Modes," of the Technical Specifications (TSs), to allow operation of the Wolf Creek plant with one reactor pressure vessel (RPV) head closure bolt not fully tensioned. The requirements on the bolts being fully tensioned are in footnotes (b) and (c) of the table. The proposed amendment to TS Table 1.1-1 are to these footnotes. A closure bolt is composed of a stud, nut, and washer. There are 54 bolts in the RPV head. With one bolt not fully tensioned, there would be 53 bolts fully tensioned.

1. Discuss bolt degradation mechanisms. For instance, are any of the bolts overly hard (yield strength over 150 ksi, hardness higher than Rockwell C32) and, therefore, subject to hydrogen embrittlement from moisture in the air?
2. Could any degradation mechanism fail a stud next to or near the untensioned stud and lead to multiple failures of the studs? Discuss how many studs will have to fail before a leakage occurs and how many studs will have to fail to result in a off-design condition that would not meet ASME Code allowable stress criteria?
3. Discuss degradation mechanisms that could lead to plant operation with a bolt not fully tensioned. Because it is stated in the application that operation with one bolt not fully tensioned is "not standard operating practice" and because such operation would be in a degraded condition (i.e., the plant be in an off-design condition), discuss what efforts would be done to prevent operation with one bolt not fully tensioned.
4. Describe the inspections, and their frequency, of the bolts and which are required by regulations. Discuss what would be the maximum non-detectable flaw for the bolts for these inspections?
5. If one stud is stuck in the vessel flange and can not be fully tensioned, how will that affect the torquing sequence of the remaining bolts? How will you ensure that the torquing sequence will not increase the probability of developing leakage? Discuss the effect this leakage would have on plant operation.
6. Discuss any evidence of cracking of any of the studs at Wolf Creek. Discuss the industry experience for such cracking and how it relates to Wolf Creek plant-specific operating history?
7. The finite element analyses performed by the Dominion Engineering Inc. assumed the remaining 53 studs are in sound condition with no degradation. Analyses performed for similar conditions typically assume that studs are degraded to the minimum detectable non-destructive examination (NDE) limit which is the minimum detectable flaw using ultrasonic techniques (UT). Experience has shown that a minimum detectable flaw is about 0.1 inches. Assuming an 0.1 inch crack extending 360 degree around the remaining 53 studs, how will that affect the finite element analyses results? Specifically, discuss if the results would still meet the ASME Code allowable stress criteria?

8. Discuss the minimum number of failed bolts, and in what pattern, that could cause the RPV head to fail, and the uncertainty in the number. Discuss the expected frequency of that number of bolt failures, and the basis for the estimate. What is the effect of the proposed amendment on this number of failed bolts and the frequency of that number failing.
9. In considering the risk of operating indefinitely with one bolt not fully tensioned, as proposed in your application, discuss how you meet the guidance in Regulatory Guide 1.174 including the following: (a) compare the changes in core damage frequency and LERF (including the impact on ATWS sequences) to the Regulatory Guide 1.174 guidance, and (b) discuss your proposed monitoring program. Also discuss why the reliability, redundancy, diversity, and defense-in-depth of the RPV head leak detection system is adequate.
10. Discuss the effect of a failure of a bolt during power operation. How could this be detected? What is the history of such failures? Address defense-in-depth and changes to safety margins in the proposed operation of the plant with a failed bolt.
11. Discuss the alternative approach to the proposed changes to TS Table 1.1-1 of having a program on the bolts in Section 5.5 of the Administrative Controls. The program would provide the controls to allow power operation of the plant with one bolt not fully tensioned, including the following: stating whether plant operation would be limited to only one operating cycle without NRC staff approval, listing the inspections and frequency of the bolts, discussing criteria by which a failed bolt would not be repaired during a current/upcoming refueling outage and plant operation would be started/continued with one bolt not fully tensioned, listing the analyses upon which the plant operation would be based, and listing the commitments provided in the application.