June 2, 2003

MEMORANDUM TO: File

FROM: Drew Holland, Project Manager, Section 2 **/RA/**
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION (RAI) – WCAP-15973, "LOW ALLOY STEEL ANALYSES TO SUPPORT A600/A690 NOZZLE REPAIRS" (TAC No. MB6805)

The attached draft RAI was faxed to the Westinghouse Owners Group (WOG) on May 28, 2003. The WOG will decide if a conference call is needed to better understand the request for additional information.

Project No. 694

Attachment: Draft RAI

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REQUEST FOR ADDITIONAL INFORMATION

TOPICAL REPORT WCAP-15973-P, REVISION 00, "LOW ALLOY STEEL COMPONENT CORROSION ANALYSIS SUPPORTING SMALL-DIAMETER ALLOY 600/690 NOZZLE REPAIR/REPLACEMENT PROGRAMS"

WESTINGHOUSE OWNERS GROUP

PROJECT NO. 694

1. Section 2.6 of the topical report (TR) provides previous field experience of the half-nozzle repairs, including a pressurizer vapor space instrumentation nozzle repair performed in 1990 at Arkansas Nuclear One, Unit 1 (ANO-1). The repair was ultrasonic test (UT) inspected at the 1st and 2nd refueling outages and is currently UT inspected on an every-other-cycle basis. The repair is exposed to a high temperature steam environment which contains some boron, but not the same level as a pipe nozzle. This repair was approved provided that the licensee implements a monitoring program with a nondestructive examination technique demonstrated to be effective in evaluating base metal corrosion. A UT inspection method was developed and implemented. The monitoring plan was considered to be an essential part of the repair to provide assurance of continued safe operation, since laboratory data may not necessarily duplicate field conditions. Also, since there is limited experience with the behavior of the repair and different conditions such as potential extended outages or chemistry control fluctuations, periodic UT inspections performed every other outage of the repairs will provide the necessary data to understand the behavior of the repair and its continued safe operation. Why is a monitoring program not specified to evaluate repairs in nozzles with borated water that may be susceptible to primary water stress corrosion cracking? Please provide justification for omitting a volumetric monitoring program (such as UT inspection).

2. Sections 3.1 and 3.3 of the TR specify stress intensity factor ranges of KI(?KI) and crack growth (?a). These seem to be typographical errors. Please correct these errors.

3. Section 4.0 of CN-CI-02-71 (Summary of Fatigue Crack Growth Evaluation Associated with Small Diameter Nozzles in CEOG Plants) states that the elastic-plastic fracture mechanics (EPFM) evaluation is based on the Appendix K (ASME Section XI) approach. The Appendix K methodology is for the evaluation of flaws in reactor vessels when the vessel temperature is in the upper-shelf range. Justify the use of the Appendix K methodology in the current evaluation of crack stability for flaws originated from small diameter nozzle holes in pressurizers.

4. Section 6.1 of CN-CI-02-71 states that fatigue crack growth of the flaw is calculated over the remaining plant life and the final flaw size is used to confirm flaw stability at the end of plant life. However, plant life is not defined for these calculations. Please provide the length of time these calculations address. In addition, revise Tables 2-1, 2-3, and 2-5, by including in the tables the remaining plant life for each limiting plant selected for the fatigue crack growth calculation for the three locations. Further, report the RT_{NDT} values for the materials at the three locations being evaluated.

5. Section 6.2.2 of CN-CI-02-71 states that the specified design operating transients pertinent to this evaluation is similar for all plants. Confirm that the occurrences of transients specified in this section is for 40 years and the fatigue crack growth calculation was based on the portion of the occurrences corresponding to the remaining plant life for specific limiting plants.

6. Section 6.2.2.1 of CN-CI-02-71 discusses the establishment of the pressure curve based on "P_{SAT}+ 200°F." Please clarify how you shift the saturation curve.

7. Section 6.3.1 of CN-CI-02-71 indicates that both the hand calculations and ANSYS results for stresses are presented in Appendix B, Reference 7.1.18. Provide a discussion on these two sets of results as related to the validation of your ANSYS results.

8. Section 6.3.2 of CN-CI-02-71 states that the fracture mechanics evaluation used "the guidance outlined in ASME Code Section XI Appendix A for a double-sided crack that has propagated through the J-Weld..." Provide the Figure number for the crack growth rate of Appendix A and the Edition of the ASME Code that you referenced.

9. Discuss the differences between the relative hole size and crack geometry of your issue and those of Raju-Newman's; address the need to use an additional margin to account for the concern for applying Raju-Newman's analytical results directly.

10. The last paragraph of Section 6.3.2. of CN-CI-02-71 indicates that thermal stresses are dominant in the pressurizer lower head due to its thick cladding. Was cladding with an appropriate thermal expansion coefficient modeled in your heat transfer analysis? Discuss the appropriateness of your heat transfer analysis.

11. Provide justification for using the J-Material curve of NUREG CR-5729 in your evaluation.