July 13, 2001

Mr. J. A. Scalice
President, TVA Nuclear and
Chief Nuclear Officer
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, Tennessee 37402-2801

SUBJECT: SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2 - REQUEST FOR ADDITIONAL INFORMATION ON A PROPOSED RISK-INFORMED INSERVICE INSPECTION PROGRAM (TAC NOS. MB1566 AND MB1567)

Dear Mr. Scalice:

A request for approval of an alternate inservice inspection program, one that is risk-informed, was submitted to the U.S. Nuclear Regulatory Commission (NRC) on March 23, 2001, by the Tennessee Valley Authority (TVA). The proposed program is based upon Westinghouse Topical Report WCAP-14572 and would be applicable to the Sequoyah Nuclear Plant (SQN), Units 1 and 2. The NRC staff is in the process of reviewing the request and has a need for additional information to complete its review. The enclosed Request for Additional Information was discussed with your staff during a conference call on June 27, 2001. Following the call, Mr. Donald V. Goodin, of the SQN Licensing Staff, stated that TVA would respond to this request on or before August 31, 2001.

Please have your staff contact me at (301) 415-2010 if there are any questions regarding the enclosed request.

Sincerely,

/RA/

Ronald W. Hernan, Senior Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-327 and 50-328

Enclosure: Request for Additional Information

cc w/enclosure: See next page

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REQUEST FOR ADDITIONAL INFORMATION

RISK-INFORMED INSERVICE INSPECTION PROGRAM PLAN

SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2

DOCKET NOS. 50-327 and 50-328

1) One major step in the Westinghouse Commercial Atomic Power (WCAP) process is the identification of degradation mechanisms and the development of corresponding pipe failure frequencies. The requested Table 1 summarizes the qualitative results of this step by identifying the different degradation mechanisms, combinations of mechanisms, and the prevalence of the different mechanism. The calculated ranges in Table 1 summarize the quantitative results of the analysis. This information will illustrate how the degradation mechanism identification and failure frequency development step in the WCAP methodology was implemented, and provided an overview of the results generated. Please expand the current Table 3.4-1 to include the following information.

a) System	b) Degradation Mechanism/ Combination	c) Failure Probability Range at 40 years with no ISI		d) Number of Susceptible Segments	e) Comments
		Leak	Disabling Leak		

a) System: Each system included in the analysis.

b) Degradation Mechanism/Combination: Segment failure probabilities are characterized in the WCAP method by imposing all degradation mechanisms in a segment (even if they occur at different welds) and the worst case operating conditions at the segment on a "representative" weld, and using the resulting failure probability for the segment. Please identify the dominant degradation mechanisms and combination of degradation mechanisms selected in each system. The reported mechanisms should cover all segments in the system. The table in the current submittal is not clear about which specific degradation mechanisms or combination of mechanisms are included in the leak estimates provided.

c) Failure Probability Range at 40 years with no inservice inspection (ISI): For each dominant degradation mechanism and combination of degradation mechanisms, please provide the range of estimates developed for the leak and disabling leak sizes as applicable. The table in the current template provided the range of leak estimates only.

d) Number of Susceptible Segments: Please identify the total number of segments susceptible to each dominant degradation mechanism and combination of degradation mechanisms.

e) Comments: The contents of this column are still being developed. It should provide further explanation and clarifications on the degradation mechanism and results as appropriate. Examples of items to be included are identification of which degradation

Enclosure

mechanism are applied to socket welds and if a break calculation was needed to evaluate pipe whip constraints.

2) Another major step in the WCAP process is assignment of segments into safety significance categories based on integrated decision making process, and the selection of segments for inspection locations. The requested Table 3 summarizes the results of the safety significance categorization process as determined by the quantitative criteria, by the expert panel's deliberation on the medium safety significant segments, and by the expert panel's deliberations based on other considerations. The summarizing information requested in Table 3 will provide an overview of the distribution of the safety significance of the segments based on the quantitative results, and the final distribution based on the integrated decision making. Each segment has four risk reduction worths (RRWs) calculated, a core damage frequency with and without operator action, and a large early release frequency (LERF) with and without operator action. Please provide the following Table.

System	Number of Segments with Any RRW >1.005	Number of Segments with Any RRW Between 1.005 and 1.001	Number of Segments with Any RRW Between 1.005 and 1.001 Placed in HSS	Number of Segments with All RRW < 1.001 Selected for Inspection

3) Another major step in the WCAP process is development of the consequences of segment ruptures. The WCAP methodology requires that a summary of the consequences be developed for each system and provided to the expert panel during their deliberations. Please provide this summary for each system. The summary will illustrate that the appropriate types of consequences (i.e., initiating events, mitigating system failure, and combinations) are included in the evaluation and will provide an overview of the results of the step.

4) Please add the statement that the uncertainty analysis that is described on pages 125 and 129 (Section 3.6.1) of WCAP-14572, Rev. 1-NP-A, was performed. Also, please identify how many segments' RRW increased from below 1.001 to greater than or equal to 1.005 in the uncertainty analysis. If the uncertainty analysis was not performed as described on pages 125 and 129 of WCAP-14572, Rev. 1-NP-A, please provide a description of how the process considered uncertainties and provide the justification for the adequacy of this deviation.

5) Please state that the change in risk calculations were performed according to all the guidelines provided on page 213 (Section 4.4.2) of WCAP-14572, Rev. 1-NP-A, or provide a description and justification of any deviation.

6) The quantitative change in risk results are adequately summarized in the current template tables 3-5 and 3-10. Please state that all four criteria for accepting the final selection of inspection locations provided on pages 214 and 215 (Section 4.4.2) of WCAP-14572,

Rev. 1-NP-A were applied. If all four criteria were not used, please provide a description and justification of the deviation. If comparison with any of the criteria indicated that "reevaluation" of the selected locations was needed, please identify the criteria that required the reevaluation and summarize the results of the reevaluation. If the results of the reevaluation can be found in the footnotes of Table 5-1, please refer to the footnotes.

7) Briefly describe the qualifications, experience, and training of the users of the SRRA [structural reliability and risk assessment] code on the capabilities and limitations of the code.

8) Please provide the following information regarding the treatment of augmented programs during the risk informed (RI)-ISI program development.

   a) Treatment of augmented program inspections during categorization is described on page 80 (Section 3.5.5) of WCAP-14572, Rev. 1-NP-A. Please add the statement that the effects of ISI of existing augmented programs are included in your calculations used to categorize the segments or provide a description and justification of any deviation.

   b) When the SRRA code is used for calculating failure probabilities for flow-accelerated corrosion, please describe if calculations were coordinated with the existing plant program since the code requires input that can be obtained from the knowledge gained from ongoing monitoring and evaluations of wall thinning rates.

9) Please confirm that SRRA code was only used to calculate failure probabilities for the failure modes, materials, degradation mechanisms, input variables, and uncertainties it was programmed to consider as discussed in the WCAP Supplement 1, page 15. For example, the SRRA code should only be applied to standard piping geometry (circular piping geometry with uniform wall thickness). If the code was applied to any non-standard geometry, please describe how the SRRA inputs were developed.

10) Please describe any sensitivity studies performed to support the use of the SRRA code.

11) Table 5-1 indicates that 74 Class 1 elements were selected for the Unit 1 RI-ISI program and Table 5-2 indicates that 69 Class 1 elements were selected for the Unit 2 RI-ISI program. For each unit, what is the total number of Class 1 butt welds and what percentage of these welds were selected for volumetric inspection in the RI-ISI program? For each unit, what is the total number of Class 1 socket welds greater than 1-inch in size and what percentage of these welds were selected for inspection in the RI-ISI program?

12) Section 3.4 of the submittal states that, "The engineering team that performed this evaluation used the Westinghouse structural reliability and risk assessment (SRRA) software program . . . to aid in the process." Page 83 (Section 3.5.6) of WCAP-14572, Rev. 1-NP-A, states that for Westinghouse Owners Group (WOG) plant application "(SRRA) tools were used to estimate the failure probabilities for the piping segment." Pages 6 and 7 of the related safety evaluation (SE Section 3.2.3) also state that the failure probability estimate of the weld "is subsequently used to represent the failure probability of the segment." Please explain how the quantitative SRRA results were used and how the method comports with WCAP-14572, Rev. 1-NP-A, and the associated SE. If the quantitative results were not directly used as input into the calculations, please describe

what failure probability values were used and the basis for the selection of these values.

13) For the different reactor coolant system loss-of-coolant accident (LOCA) break sizes in the Sequoyah Revision 1 probabilistic risk assessment (PRA) model and for this risk-informed application, what conditional core damage probability (CCDP) and conditional large early release probability (CLERP) values were applied for each break size? If the CCDP and/or CLERP values are location dependent, please provide the range of estimates?

14) This submittal is based on the Sequoyah Revision 1 PRA model.

    1) A previous RI-IST submittal cited a LERF value for the Sequoyah Revision 1 model that is a factor of five greater than the value cited in this submittal. What major enhancements, changes, and assumptions were incorporated into the Sequoyah Revision 1 model that accounts for this reduction in LERF? Please describe how these changes affect this application.

    2) How does the peer-reviewed Draft-Revision 2 model differ from the Sequoyah Revision 1 model used in this application? Please describe the differences between the Revision 1 and Draft-Revision 2 model, its affect on this application, and how these differences were considered in this application. Also, please describe the WOG Probabilistic Safety Assessment Peer Review findings and observations that affect this application (e.g., LOCA, main steamline break, feedwater line break and reactor coolant pump seal LOCA analyses, success criteria, operator recovery actions, modeling, and associated system logic), what impacts these findings and observations have on this application, and if/how these impacts were considered in this application.

15) Section 3.8 indicates that there were 61 segments at Unit 1 and 54 segments at Unit 2 that were placed in Region 1 of Figure 3.7-1 of WCAP-14572, Rev. 1-NP-A. There are also 28 segments at Unit 1 and 33 segments at Unit 2 that were placed in Region 2.

    a) What is the breakdown of Class 1 and 2 piping segments in Region 1?

    b) How many elements are in Region 1a? Are there any segments in Region 1 that do not have an element in Region 1a? If so, please identify these segments and explain why these segments do not have an element in Region 1a.

    c) It is expected that there would be at least two elements selected for inspection for every segment that is in Region 1 (all Region 1a elements not in an augmented program, which should be at least one for every segment, and Region 1b elements selected for every segment using an acceptable statistical evaluation process, which should also be at least one for every segment) and one element selected for inspection for every segment that is in Region 2 (using an acceptable statistical evaluation process, which should be at least one for every segment). Based on the information provided in Section 3.8 of the submittal, the minimum number of RI-ISI elements expected is 150 [61(Region 1a)+61(Region 1b)+28(Region 2)] at Unit 1 and 141 [54(Region 1a)+54(Region 1b)+33(Region 2)] at Unit 2, however, there are only 140 and 135 respectively. Please explain the difference in the expected number of selected elements and the actual number of elements selected.

16) What specific value(s) was(were) used to differentiate between High Failure Importance and Low Failure Importance in Figure 3.7-1 of WCAP-14572, Rev. 1-NP-A? Please include the break size and frequency (or 40-year probability).

17) Section 3.8 indicates that 9 segments at Unit 1 and 7 segments at Unit 2 are ". . . outside the applicability of the model or had only one weld in the segment." How many segments were considered outside the applicability of the model (as opposed to having only one weld) and why? Please describe what failure probability values were used for these segments and provide the basis for selection of these values.