

TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401

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DEC 09 1988

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, D.C. 20555

Gentlemen:

In the Matter of	)	Docket Nos. 50-259
Tennessee Valley Authority	)	50-260
	)	50-296
	)	50-327
	)	50-328
	)	50-390
	)	50-391

BROWNS FERRY NUCLEAR PLANT (BFN), SEQUOYAH NUCLEAR PLANT (SQN), AND WATTS BAR NUCLEAR PLANT (WBN) - RESPONSE TO GENERIC LETTER 88-11 - NRC POSITION ON RADIATION EMBRITTLEMENT OF REACTOR VESSEL MATERIALS AND ITS IMPACT ON PLANT OPERATIONS

This letter supersedes our letter to you dated November 30, 1988 on the subject generic letter, and was discussed December 6, 1988, with Steven Richardson. In our letter dated November 30, 1988, following enclosure 2, some preliminary information relating to WBN was enclosed by mistake and was not intended to be a part of that specific submittal.

Therefore, this letter provides our response to the subject generic letter. This generic letter requested licensees to: (1) use the methodology described in revision 2 to Regulatory Guide (RG) 1.99, "Radiation Embrittlement of Reactor Vessel Materials," to predict the effect of neutron radiation on reactor vessel material as required by 10 CFR 50, Appendix G; (2) determine the impact of this RG on plant operations; and (3) determine what measures will be taken to alleviate operational difficulty because of implementation of the RG.

We have performed the necessary technical analysis and have compared the new curves with the current pressure-temperature (P-T) limit curves in each plant's technical specification. The comparison indicates that RG 1.99, revision 2, methodology has no immediate impact on plant operations and that the P-T curves for each plant are valid through the next two fuel cycles with the exception of BFN unit 1. BFN unit 1 is defueled with a startup date to be determined. The details of this evaluation for each plant are provided in enclosure 1.

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Enclosure 2 provides a list of commitments made by us in this response. If you have any questions, please telephone D. L. Williams at (615) 632-7170.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

  
R. Grigley, Manager  
Nuclear Licensing and  
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Enclosures

cc (Enclosures):

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Watts Bar Nuclear Plant  
P.O. Box 700  
Spring City, Tennessee 37381


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R. Gridley, Manager  
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## ENCLOSURE 1

### RESPONSE TO GENERIC LETTER 88-11 CONCERNING RADIATION EMBRITTLEMENT OF REACTOR VESSEL MATERIAL

TVA has performed the necessary technical analysis using the methodology provided in Regulatory Guide (RG) 1.99, revision 2, and provides the following responses for Browns Ferry Nuclear Plant (BFN), Sequoyah Nuclear Plant (SQN), and Watts Bar Nuclear Plant (WBN).

#### BFN

The pressure-temperature (P-T) limits for BFN are included in figure 3.6-1 of units 1, 2, and 3 technical specifications (TS). These limit curves were incorporated by BFN TS 191, supplement 1, submitted to the NRC on March 20, 1985, and approved by safety evaluation dated September 16, 1985. The curves are based on RG 1.99, revision 1, and the American Society of Mechanical Engineers (ASME), Section III, Appendix G, methodology and are valid through 12 effective full-power years (EFPY). Currently, unit 1 is at 6.14 EFPY of operation; unit 2 is at 5.54 EFPY; and unit 3 is at 4.68 EFPY.

The current curves for the three units are identical and based on the most limiting weld among the three units. The limiting weld is circumferential weld WF154 located in unit 1 and was assumed in the March 20, 1985 submittal, to be located approximately 28 inches below the core midplane. However, our review in response to this generic letter determined that the weld is actually 37 inches below the midplane. Thus, the assumption in the previous TS submittal resulted in extra conservatism in the P-T curves.

Using the RG 1.99, revision 2, methodology, P-T limits were determined for the limiting weld on each unit at the hydrostatic testing pressure of 1100 pounds per square inch (lb/in<sup>2</sup>). A comparison was then made to the same limit derived from the TS curves. The evaluation shows that the TSs are currently bounding for units 2 and 3 at 1100 lb/in<sup>2</sup>. Unit 1 is not bounded with present neutron exposure using revision 2 methodology because it exceeds the present curve by approximately 5 degrees Fahrenheit. Units 2 and 3 will be bounded by the present TS until approximately 10 EFPY, which is expected to carry the units through two operating cycles. Units 2 and 3 have more operating margin than unit 1 because the most limiting weld in those reactor vessels has less copper and nickel content and a lower initial nil-ductility transition temperature.

It is also projected that a minimum hydrostatic testing temperature of 200 degrees Fahrenheit will be reached on unit 1 at the end of cycle 12 and on units 2 and 3 at the end of cycle 18. It is recognized that testing at the minimum temperature of 200 degrees Fahrenheit may have an impact on plant operations. However, it is anticipated that industry experience and recommendations should be available by that time, to minimize this potential problem.

The three BFN units are currently shut down. Unit 2 is expected to restart in 1989. Units 1 and 3 are on administrative hold with projected restart dates to be determined. TVA does not expect the revision 2 methodology to have a significant impact before March 1, 1991; therefore, TVA will submit TS revisions before March 1, 1991, to comply with RG 1.99, revision 2. Unit 1 TS revisions will be submitted for approval before fuel load if the fuel load date occurs before March 1, 1991.

### SQL

The present P-T limits for SQL are included in TS figures 3.4-2 and 3.4-3 of the respective unit. These curves are based upon the methodology described in Westinghouse WCAP-7024-A, "Basis for Heatup and Cooldown Limit Curves," and ASME Section III, Appendix G, and were computed so that the curves are valid through 9.2 EFPY for SQL unit 1 and 16 EFPY for SQL unit 2. These curves were approved by the NRC in safety evaluation, supplement 1, dated February 1980. The current EFPY of operation for each reactor vessel is approximately 2.9 for both SQL units 1 and 2.

Using the RG 1.99, revision 2, methodology and ASME, Section III, Appendix G, P-T limits were determined for the limiting material for each unit (the lower forging for SQL unit 1 and the intermediate forging for SQL unit 2). A comparison was then made to the existing TS curves. The present P-T curves are bounding for approximately 5 EFPY for both units. It is not anticipated that the low temperature overpressurization setpoints or the enable temperatures will result in an operational problem for the current licenses period of the units.

It is unlikely that RG 1.99, revision 2, will have a significant impact before March 1, 1991, or before the end of the current operating license period of the units. TVA will submit TS revisions for SQL units 1 and 2 by March 1, 1991, to comply with RG 1.99, revision 2.

### WBN

The P-T limit curves to predict the effect of neutron radiation on reactor vessel material for WBN will be located in the respective unit's TS, figures 3.4-2 and 3.4-3. Preliminary calculations were performed using the RG 1.99, revision 2, methodology. It is not anticipated that the RG 1.99, revision 2, methodology will have an impact on plant operations for the operating license period. To comply with RG 1.99, revision 2, this revised methodology will be used to develop the initial P-T curves for the WBN TS that will be submitted to the NRC for approval before fuel load of unit 1.

ENCLOSURE 2

GENERIC LETTER 88-11  
RESPONSE FOR BFN, SQN, AND WBN  
LIST OF COMMITMENTS

1. TVA will submit BFN units 1, 2, and 3 Technical Specification (TS) revisions by March 1, 1991, to comply with Regulatory Guide (RG) 1.99, revision 2.
2. BFN unit 1 TS revisions will be submitted for approval before fuel load if the fuel load date occurs before March 1, 1991.
3. TVA will submit TS revisions for SQN units 1 and 2 by March 1, 1991, to comply with RG 1.99, revision 2.
4. To comply with RG 1.99, revision 2, this methodology will be used to develop the initial P-T curves for the WBN TS that will be submitted to the NRC for approval before fuel load of unit 1.