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SUBJECT: Forwards proposed rev to BFN Unit 3 RPV matl surveillance program, for NRC approval.

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April 30, 1999

10 CFR 50, Appendix H

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

Gentlemen:

In the Matter of)
Tennessee Valley Authority)

Docket No. 50-296

BROWNS FERRY NUCLEAR PLANT (BFN) - UNIT 3, LICENSE NO. DPR-68
PROPOSED REVISION TO THE UNIT 3 REACTOR PRESSURE (RPV) VESSEL MATERIAL SURVEILLANCE PROGRAM

References:

1. NRC Letter to TVA dated August 3, 1989, Revision to Technical Specifications Pertaining to Surveillance Requirement 4.6.A.3 and Bases Section 3.6./4.6 - (TAC 73141, 73142, 73143) (TS 270) - Browns Ferry Nuclear Plants, Units 1, 2, and 3.

2. TVA Letter to NRC dated May 15, 1989, TVA BFN Technical Specification No. 270 - Reactor Vessel Test Specimen Withdrawal.

Pursuant to 10 CFR 50, Appendix H, Section III.B.3, TVA is submitting a proposed revision to the BFN Unit 3 RPV material surveillance program for NRC approval.

A008

INTRODUCTION

The current Unit 3 schedule for withdrawal of RPV surveillance capsules requires the first capsule to be withdrawn at 8 Effective Full Power Years (EFPY) with subsequent withdrawals at 6 EFPY intervals thereafter.

Three capsules were originally installed in the Unit 3 RPV. The first capsule was removed in accordance with the current schedule during the Unit 3, Cycle 8 refueling outage completed in the fall of 1998. Material testing has not been performed on this capsule. TVA proposes to revise the schedule for the first capsule withdrawal from 8 EFPY to 18 EFPY, and return the first capsule to the vessel during the upcoming Unit 3, Cycle 9 refueling outage. The second capsule would be withdrawn at a time to be determined later with the third capsule being designated as a spare.

The revised schedule conforms to the guidelines of American Society for Testing Materials (ASTM) Standard E 185-82, "Standard Practice for Conducting Surveillance Tests for Light-water Cooled Nuclear Reactor Vessels" and meets the requirements of 10 CFR 50, Appendix H.

BACKGROUND

Appendix H of 10 CFR 50 requires licensees to withdraw surveillance capsules from their reactor vessels periodically according to the appropriate withdrawal schedule specified in ASTM E 185. ASTM E 185 provides guidelines for designing a minimum surveillance program, selecting surveillance materials, and evaluating test results. Section III.B.3 of Appendix H allows changes to the schedule as long as the proposed schedule is submitted with technical justification and NRC approval is obtained prior to implementation.

By letter dated August 3, 1989 (Reference 1), NRC approved TVA's May 15, 1989 (Reference 2) request to update the BFN surveillance capsule withdrawal schedule from the ASTM E 185-70 guidance to ASTM E 185-82. The Reference 1 letter approved the current capsule withdrawal schedule for the three capsules originally installed in the Unit 3 RPV.

The number of surveillance capsules (three) installed in the Unit 3 RPV was determined per ASTM E 185-66. As required by the current surveillance program, the first capsule was

removed during the Unit 3, Cycle 8 refueling outage completed in the Fall of 1998. The analysis of the first capsule has not been performed pending NRC's review of this request to change the withdrawal schedule. As stated above, if this request is approved, TVA plans to reinstall this capsule in the Unit 3 RPV during the Cycle 9 refueling outage (Spring, 2000), and to resume irradiation of the specimens. This capsule will be designated as a spare.

DISCUSSION

The current Unit 3 schedule was developed in accordance with the intent of 10 CFR 50, Appendix H, and did not incorporate the specific conditions listed below:

- Good plate and weld chemistry (copper content from 0.09% - 0.24%)
- Low RPV ¼-thickness 32 EFPY beltline fluence ($<< 5 \times 10^{18}$ n/cm^2)
- Low predicted shift in the capsule material reference nil-ductility temperature (RTndt)

If the current schedule for the withdrawal of the first capsule is used, the measured data may not be useful, as the expected shift in RTndt (ΔRTndt) is small and may be indistinguishable from the data scatter that would typically be experienced from the testing of an unirradiated specimen. The most recently approved ASTM E 185 guidance (ASTM E 185-82) regarding first capsule withdrawal states: "The first capsule is scheduled for withdrawal early in the vessel life to verify the initial predictions of the surveillance material response to the actual radiation environment. It is removed when the predicted shift exceeds the expected scatter by sufficient margin to be measurable." Since expected shift of the Unit 3 vessel material is low, the first surveillance capsule material testing should be deferred to when the majority of the shift in the vessel RTndt has been achieved and is expected to be measurable. Removal and testing at the revised withdrawal schedule will permit the collection of more credible data for fracture toughness predictions.

The proposed change to the Unit 3 RPV material surveillance program described above is supported by the Enclosure 1 report, "Surveillance Specimen Program Evaluation for Tennessee Valley Authority Browns Ferry Unit 3,"

GE-NE-B1302026-00-01, April, 1999. Removal of the first capsule at 8 EFPY is not essential for continued safe operation for the following reasons:

1. The BFN Unit 3 fluence used for RTndt shift predictions in accordance with Regulatory Guide 1.99, Revision 2 is based upon a conservative calculation, and will bound the actual fluence.
2. Predicted shifts bound the measured results based on review of predicted RTndt shifts and measured RTndt shifts from other BWR surveillance capsules.
3. Based on actual ART calculations performed in accordance with Regulatory Guide 1.99, Revision 2, the shift (ΔRTndt + margin) for the Browns Ferry Unit 3 surveillance weld is calculated to be 60° F at 32 EFPY. If the first capsule is removed at 8 EFPY, the actual shift (predicted to be 13° F) may not be large enough to be differentiated from the data scatter, since the predicted fluence of the capsule at 8 EFPY (1.85×10^{17} n/cm^2) is low. In addition, the chemistry of the Unit 3 capsule weld material is good (0.11% copper). Thus, the data obtained would not be useful for predicting the material behavior, as it may be indistinguishable from the unirradiated data.
4. The BWROG Supplemental Surveillance Program (SSP) will provide early test data for a weld similar to the Unit 3 surveillance weld. The weld is the material of concern, as the vessel weld material is limiting throughout plant life. This program supplements the Unit 3 surveillance program by providing timely detection of anomalous RTndt shifts, should any occur. The fluences on the SSP capsules are comparable to the fluence for the Unit 3 vessel wall in the time frame of interest.

As demonstrated in the enclosed report, extension of the schedule is justified because 1)Evaluation of similar data from actual surveillance programs has shown that the measured fluence , shift, and chemistry are bounded by expected values, 2)The Unit 3 pressure-temperature curves are inherently conservative, and 3)The SSP data will complement the available data and will identify any anomalous information in the predicted values.

Withdrawal schedule requirements per 10 CFR 50, Appendix H and ASTM E 185-82, state that the first specimen holder be removed at 6 EFPY (or when the accumulated fluence of the capsule exceeds 5 x 10^{18} n/cm^2 or when the highest predicted ΔRTndt of the capsule materials is approximately 50° F, whichever comes first). These criteria are satisfied by the recommendation to withdraw the first capsule at 24 EFPY. Although the enclosed Unit 3 Surveillance Program Evaluation performed by General Electric Nuclear Energy recommends the first capsule be withdrawn at 24 EFPY, TVA proposes to conservatively withdraw the first capsule at 18 EFPY. This schedule is consistent with the 20 EFPY expiration of the Unit 3 pressure-temperature curves.

As demonstrated by the enclosed Surveillance Specimen Program Evaluation, it is likewise appropriate to extend the withdrawal schedule of the second capsule. Material testing results from the SSP and/or the first Unit 3 capsule will be used to develop an appropriate schedule for the second surveillance capsule.

Precedent exists for the approval of this request. Based on plant-specific circumstances, the NRC has previously approved similar surveillance program changes for other licensees including Entergy Operations' Grand Gulf Nuclear Station (August 21, 1996), Nebraska Public Power District's Cooper Nuclear Station (May 7, 1997), PECO Energy's Limerick Generating Station Unit 1 (April 15, 1998) and Unit 2 (January 12, 1999).

The current RPV material surveillance program withdrawal schedule resides in Browns Ferry Technical Instruction (TI) 0-TI-381, Reactor Vessel Test Specimens. The proposed schedule change if approved by NRC will be placed in 0-TI-381.

CONCLUSION

Based on the justifications summarized above and supported by the details contained in the enclosed report, the proposed 18 EFPY withdrawal schedule for the first surveillance capsule for Unit 3 is conservative. Furthermore, the proposed schedule meets the intent of ASTM E 185-82, since the first capsule would be removed with the capsule fluence being less than 5 x 10^{18} n/cm^3 and the value of ΔRTndt would be less than 50° F.

NRC approval of the proposed is requested by September 15, 1999. This schedule has been coordinated with the BFN Nuclear Reactor Regulation Project Manager. The commitment contained in this letter is listed in Enclosure 2. If you have any questions about this request, please telephone me at (256) 729-2636.

Sincerely,

T. E. Abney
Manager of Licensing
and Industry Affairs

Enclosures
cc: See page 7

Enclosures
cc (Enclosures):

Mr. Albert W. De Agazio, Senior Project Manager
U.S. Nuclear Regulatory Commission
One White Flint, North
11555 Rockville Pike
Rockville, Maryland 20852

Mr. Paul E. Fredrickson
U.S. Nuclear Regulatory Commission
Region II
61 Forsyth Street, S. W.
Suite 23T85
Atlanta, Georgia 30303

NRC Resident Inspector
Browns Ferry Nuclear Plant
10833 Shaw Road
Athens, Alabama 35611

ENCLOSURE 1
TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNIT 3

PROPOSED REVISION TO THE UNIT 3 REACTOR PRESSURE VESSEL MATERIAL SURVEILLANCE PROGRAM

Surveillance Specimen Program Evaluation for Tennessee Valley Authority Browns Ferry Unit 3

GE-NE-B1302026-00-01

[See the attached report]