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TECHNICAL REPORT

TECHNICAL EVALUATION REPORT ON THE SECOND 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM PLAN: TENNESSEE VALLEY AUTHORITY, BROWNS FERRY NUCLEAR PLANT, UNIT 2, DOCKET NUMBER 50-260

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Prepared for the
U.S. NUCLEAR REGULATORY COMMISSION

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ABSTRACT

This report presents the results of the evaluation of the *Browns Ferry Nuclear Plant, Unit 2, Second 10-Year Interval Inservice Inspection (ISI) Program Plan*, through Revision 1, submitted February 16, 1993, including the requests for relief from the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code Section XI requirements that the Licensee has determined to be impractical. The *Browns Ferry Nuclear Plant, Unit 2, Second 10-Year Interval Inservice Inspection Program Plan* is evaluated in Section 2 of this report. The ISI Program Plan is evaluated for (a) compliance with the appropriate edition/addenda of Section XI, (b) acceptability of examination sample, (c) correctness of the application of system or component examination exclusion criteria, and (d) compliance with ISI-related commitments identified during previous Nuclear Regulatory Commission (NRC) reviews. The requests for relief are evaluated in Section 3 of this report.

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NRC Inservice Inspection Program

SUMMARY

The Licensee, Tennessee Valley Authority (TVA), has prepared the *Browns Ferry Nuclear Plant, Unit 2, Second 10-Year Interval Inservice Inspection (ISI) Program Plan*, through Revision 1, to meet the requirements of the 1986 Edition of the ASME Code Section XI, except that the extent of examination for Examination Category B-J welds is determined by the requirements of the 1974 Edition through Summer 1975 Addenda (74S75) as allowed by 10 CFR 50.55a(b)(2)(ii).

The second 10-year interval began May 24, 1992 and ends May 24, 2001; this inspection interval is nine years since the first interval was extended by one year as permitted by IWA-2430(d).

The information in the *Browns Ferry Nuclear Plant, Unit 2, Second 10-Year Interval Inservice Inspection Program Plan*, Revision 0, submitted May 22, 1992, was reviewed. Included in the review were the requests for relief from the ASME Code Section XI requirements that the Licensee has determined to be impractical. As a result of this review, a request for additional information (RAI) was prepared describing the information and/or clarification required from the Licensee in order to complete the review of the ISI plan. The Licensee provided the requested information February 10, 1993. In a submittal dated February 16, 1993, the Licensee provided Revision 1 to the *Browns Ferry Nuclear Plant, Unit 2, Second 10-Year Interval Inservice Inspection Program Plan*.

Based on the review of the *Browns Ferry Nuclear Plant, Unit 2, Second 10-Year Interval Inservice Inspection Program Plan*, through Revision 1, the Licensee's response to the Nuclear Regulatory Commission's RAI, and the recommendations for granting relief from the ISI examinations that cannot be performed to the extent required by Section XI of the ASME Code, it is concluded that the *Browns Ferry Nuclear Plant, Unit 2, Second 10-Year Interval Inservice Inspection Program Plan*, through Revision 1, is acceptable and in compliance with 10 CFR 50.55a(g)(4).

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1. INTRODUCTION

Throughout the service life of a water-cooled nuclear power facility, 10 CFR 50.55a(g)(4) (Reference 1) requires that components (including supports) that are classified as American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code Class 1, Class 2, and Class 3 meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code Section XI, *Rules for Inservice Inspection of Nuclear Power Plant Components* (Reference 2), to the extent practical within the limitations of design, geometry, and materials of construction of the components. This section of the regulations also requires that inservice examinations of components and system pressure tests conducted during successive 120-month inspection intervals shall comply with the requirements in the latest edition and addenda of the Code incorporated by reference in 10 CFR 50.55a(b) on the date 12 months prior to the start of the 120-month inspection interval, subject to the limitations and modifications listed therein. The components (including supports) may meet requirements set forth in subsequent editions and addenda of this Code that are incorporated by reference in 10 CFR 50.55a(b) subject to the limitations and modifications listed therein. The Licensee, Tennessee Valley Authority, has prepared the *Browns Ferry Nuclear Plant, Unit 2, Second 10-Year Interval Inservice Inspection (ISI) Program Plan*, through Revision 1, to meet the requirements of the 1986 Edition of the ASME Code Section XI, except that the extent of examination for Examination Category B-J welds is determined by the requirements of the 1974 Edition through Summer 1975 Addenda as allowed by 10 CFR 50.55a(b)(2)(ii).

The second 10-year interval began May 24, 1992 and ends May 24, 2001; this inspection interval is nine years since the first interval was extended by one year as permitted by IWA-2430(d).

As required by 10 CFR 50.55a(g)(5), if the licensee determines that certain Code examination requirements are impractical and requests relief from them, the licensee shall submit information and justification to the Nuclear Regulatory Commission (NRC) to support that determination.

Pursuant to 10 CFR 50.55a(g)(6), the NRC will evaluate the licensee's determination that Code requirements are impractical to implement. The NRC may grant relief and may impose alternative requirements that are determined to be authorized by law, will not endanger life, property, or the common defense and security, and are otherwise in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

Alternatively, pursuant to 10 CFR 50.55a(a)(3), the NRC will evaluate the licensee's determination that either (i) the proposed alternatives provide an acceptable level of quality and safety, or (ii) Code compliance would result in hardship or unusual difficulty without a compensating increase in safety. Proposed alternatives may be used when authorized by the NRC.

The information in the *Browns Ferry Nuclear Plant, Unit 2, Second 10-Year Interval ISI Program Plan*, Revision 0 (Reference 3), submitted May 22, 1992, was reviewed, including the requests for relief from the ASME Code Section XI requirements that the Licensee has determined to be impractical. The review of the ISI Program Plan was performed using the Standard Review Plans of NUREG-0800 (Reference 4), Section 5.2.4, "Reactor Coolant Boundary Inservice Inspections and Testing," and Section 6.6, "Inservice Inspection of Class 2 and 3 Components."

As a result of the above review, a request for additional information was prepared describing the information and/or clarification required from the Licensee to complete the review. In the response to the request for additional information, the Licensee, Tennessee Valley Authority, provided: a) boundary diagrams that define the ASME Code Class 1 and Class 2 boundaries for the systems in the *Browns Ferry Nuclear Plant, Unit 2, Second 10-Year Interval ISI Program Plan*; b) isometric drawings showing the Class 1 and Class 2 piping welds, components, and supports that Section XI of the ASME Code requires to be examined during the second 10-year inspection interval;

c) an itemized listing of the components subject to examination during the second 10-year interval; d) copies of Site Standard Practices SSP-6.9, *ASME Section XI Repairs and Replacements*, and SSP-6.10, *ASME Section XI Inservice Inspection*; and e) clarifications regarding the ASME Code Section XI Code Cases and requests for relief required at Browns Ferry, Unit 2, during the second 10-year inspection interval.

In a submittal dated February 16, 1993, the Licensee provided Revision 1 to the *Browns Ferry Nuclear Plant, Unit 2, Second 10-Year Interval ISI Program Plan* (Reference 5)..

The Licensee, in a submittal dated May 12, 1993 (Reference 6), provided clarification of Request for Relief SPT-5 and withdrew Requests for Relief SPT-1, SPT-2, and SPT-3. Request for Relief SPT-5 was evaluated in a Safety Evaluation Report dated May 21, 1993.

The *Browns Ferry Nuclear Plant, Unit 2, Second 10-Year Interval ISI Program Plan* through Revision 1 is evaluated in Section 2 of this report. The ISI Program Plan is evaluated for (a) compliance with the appropriate edition/addenda of Section XI, (b) acceptability of examination sample, (c) correctness of the application of system or component examination exclusion criteria, and (d) compliance with ISI-related commitments identified during the NRC's previous reviews.

The requests for relief are evaluated in Section 3 of this report. Unless otherwise stated, references to the Code refer to the ASME Code, Section XI, 1986 Edition. Specific inservice test (IST) programs for pumps and valves are being evaluated in other reports.

2. EVALUATION OF INSERVICE INSPECTION PROGRAM PLAN

This evaluation consists of a review of the applicable program documents to determine whether or not they are in compliance with the Code requirements and any previous license conditions pertinent to ISI activities. This section describes the submittals reviewed and the results of the review.

2.1 Documents Evaluated

Review has been completed on the following information from the Licensee:

(a) *Browns Ferry Nuclear Plant, Unit 2, Second 10-Year Interval ISI Program Plan*, Revision 0, submitted May 22, 1992 (Reference 3);

(b) Informal submittal from the Licensee to the NRC Project Manager dated February 10, 1993, containing boundary diagrams, isometric drawings, and an itemized listing of the components subject to ISI examination during the second 10-year ISI interval;

(c) Browns Ferry Nuclear Plant, Site Standard Practice SSP-6.9, *ASME Section XI Repairs and Replacements*, Revision 2, dated January 26, 1993 (Reference 7);

(d) Browns Ferry Nuclear Plant, Site Standard Practice SSP-6.10, *ASME Section XI Inservice Inspection Program*, Revision 2, dated May 11, 1992 (Reference 8);

(e) *Browns Ferry Nuclear Plant, Unit 2, Second 10-Year Interval ISI Program Plan*, Revision 1, submitted February 16, 1993 (Reference 5); and

(f) Letter, dated May 12, 1993, withdrawing Requests for Relief SPT-1, SPT-2, and SPT-3 (Reference 6).

2.2 Compliance with Code Requirements

2.2.1 Compliance with Applicable Code Editions

The Inservice Inspection Program Plan shall be based on the Code editions defined in 10 CFR 50.55a(g)(4) and 10 CFR 50.55a(b). Based on the starting date of May 24, 1992, the Code applicable to the second interval ISI program is the 1986 Edition. As stated in Section 1 of this report, the Licensee has prepared the *Browns Ferry Nuclear Plant, Unit 2, Second 10-Year ISI Program Plan* to meet the requirements of 1986 Edition, except

that the extent of examination for Examination Category B-J welds is determined by the requirements of the 1974 Edition through Summer 1975 Addenda (74S75) as allowed by 10 CFR 50.55a(b)(2)(ii).

2.2.2 Acceptability of the Examination Sample

Inservice volumetric, surface, and visual examinations shall be performed on ASME Code Class 1, 2, and 3 components and their supports using sampling schedules described in Section XI of the ASME Code and 10 CFR 50.55a(b). Sample size and weld selection have been implemented in accordance with the Code and 10 CFR 50.55a(b) and appear to be correct.

2.2.3 Exemption Criteria

The criteria used to exempt components from examination shall be consistent with Paragraphs IWB-1220, IWC-1220, IWC-1230, IWD-1220, and 10 CFR 50.55a(b). The exemption criteria have been applied by the Licensee in accordance with the Code, as discussed in the ISI Program Plan, and appear to be correct.

2.2.4 Augmented Examination Commitments

In addition to the requirements specified in Section XI of the ASME Code, the Licensee has committed to perform the following augmented examinations (Reference 5, Section 7.12):

(a) Weld DSRHR-2-05A: Because of an indication that was determined to be lack of fusion between layers of welding, this weld is scheduled to receive augmented radiographic (RT) and ultrasonic (UT) examinations each inspection period to monitor the size of the indication (ref. NRC Inspection Report 86-03).

(b) RPV Cladding Indication: A previously identified reactor pressure vessel (RPV) cladding indication is scheduled to receive VT-1 visual examination in refueling cycles 6, 7, and 8 to determine if there is any degradation.

(c) Welds KR-2-14, KR-2-36, KR-2-37, and KR-2-41: These welds, which had IGSCC indications that were evaluated to be acceptable for continued operation, shall be reexamined (UT) in the cycle 6 refueling outage (NRC commitment NCO 850264005).

(d) HPCI Pump Discharge Support Inspection Following Injection: An augmented VT-3 visual examination will be performed on the supports on the High Pressure Coolant Injection (HPCI) pump discharge line within three days following each HPCI injection. This augmented examination is self imposed by the Licensee (NRC commitment number NCO 850144002).

(e) Weld GR-2-15(OL): This structurally over-layed weld shall be one of the IGSCC Examination Category E welds examined during the cycle 6 refueling outage. This is a commitment by the Licensee based on the design of the overlay configuration.

(f) CRD Return Line Reroute: The augmented examination requirements of the control rod drive (CRD) return line reroute are reported to meet the requirements contained in NUREG-0619 (Reference 9).

(g) Feedwater Nozzles: The augmented examination for the feedwater nozzles shall be performed per the requirements contained in NUREG-0619. An ultrasonic examination of all the feedwater nozzle safe ends, bores, and inside blend radii is required every second refueling outage. The feedwater spargers shall be visually examined every fourth refueling outage. A liquid penetrant examination of the nozzle bore and inner radius is required every nine refueling cycles or within 135 startup/shutdown cycles based on the replacement date.

(h) Augmented Examination of Austenitic Stainless Steel and Dissimilar Metal Welds Susceptible to IGSCC: Austenitic stainless steel and dissimilar metal circumferential welds in piping four inches or larger NPS that contain reactor coolant at temperatures above 200°F during power operation shall be examined in accordance with the requirements of Generic Letter 88-01 (Reference 10) and NUREG-0313, Rev. 2 (Reference 11).

(i) Core Spray Spargers: The augmented examination requirements of the core spray spargers is included in MMI-182, which implements IE Bulletin 80-13 (Reference 12). The spargers shall be visually examined each refueling outage. Volumetric techniques may be used to evaluate any indications.

(j) Technical Specification Surveillance Requirement 4.6.G.2: The Licensee has selected 31 additional welds for augmented volumetric (UT) examination each inspection interval to provide additional protection against pipe whip.

(k) RPV Shell Weld Examinations: The RPV shell welds, Examination Category B-A, Item Numbers B1.11 and B1.12 shall be examined in refueling outage cycle 7 in accordance with the guidance of 10 CFR 50.55a(g)(6)(ii)(A) per TVA's commitment to the NRC dated September 27, 1991 (Reference 13).

2.3 Conclusions

Based on the review of the documents listed above, it is concluded that the *Browns Ferry Nuclear Plant, Unit 2, Second 10-Year Interval ISI Program Plan*, through Revision 1, is acceptable and in compliance with 10 CFR 50.55a(g)(4).

3. EVALUATION OF RELIEF REQUESTS

The requests for relief from the ASME Code requirements that the Licensee has determined to be impractical for the second 10-year inspection interval are evaluated in the following sections.

3.1 Class 1 Components

3.1.1 Reactor Pressure Vessel

3.1.1.1 Request for Relief No. ISI-2-1, Examination Category B-H, Item B8.10, Reactor Pressure Vessel (RPV) Support Skirt Integral Attachment

Code Requirement: Section XI, Table IWB-2500-1, Examination Category B-H, Item B8.10 requires a 100% surface examination of the RPV support skirt integral attachment weld as defined by Figure IWB-2500-13.

Licensee's Code Relief Request: Relief is requested from performing 100% of the Code-required surface examination of the RPV support skirt attachment weld.

Licensee's Basis for Requesting Relief: The Licensee states that nonremovable insulation limits access to the integral attachment weld of the support skirt to the RPV. Only two access ports, approximately 180 degrees apart, provide access to the outside for surface examination and the inside is totally inaccessible.

Licensee's Proposed Alternative Examination: None. The Code-required surface examination will be performed to the maximum extent practical.

Evaluation: As the Licensee has stated, the Code-required surface examination of the support skirt weld is impractical to perform because of limited access through the two access ports and the permanently installed insulation. Surface examination,

to the extent required by the Code, would necessitate redesign of the support skirt and removal and replacement of the permanent insulation. Removal of the permanent insulation for the sole purpose of performing the Code-required surface examination of the support skirt is a major effort and could result in personnel receiving excessive radiation exposure.

The Licensee reports that surface examinations can and will be performed on approximately 24 inches of the weld surface through each of the access ports. Examination of one 24 inch section will be scheduled in the second period and the other 24 inch section will be scheduled in the third period. The surface examination of approximately 48 inches of the support skirt weld will provide reasonable assurance of the continued inservice structural integrity.

Conclusions: Based on the above, it is concluded that the surface examination, to the extent required by the Code, is impractical to perform at Browns Ferry, Unit 2. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), it is recommended that relief be granted.

3.1.2 Pressurizer (Does not apply to BWRs)

3.1.3 Heat Exchangers and Steam Generators (No relief requests)

3.1.4 Piping Pressure Boundary (No relief requests)

3.1.5 Pump Pressure Boundary (No relief requests)

3.1.6 Valve Pressure Boundary (No relief requests)

3.1.7 General (No relief requests)

3.2 Class 2 Components (No relief requests)

3.3 Class 3 Components (No relief requests)

3.4 Pressure Tests

3.4.1 Class 1 System Pressure Tests

3.4.1.1 Request for Relief No. SPT-3, Code Case N-498, System Pressure Test of the Standby Liquid Control (SLC) System

In a letter dated May 12, 1993 (Reference 6), the Licensee withdrew Request for Relief No. SPT-3. The Licensee states that, after further review of the pressure test requirements, TVA determined that Request for Relief No. SPT-3 is not required and that compliance with the applicable Code requirements can be achieved.

3.4.2 Class 2 System Pressure Tests

3.4.2.1 Request for Relief No. SPT-1, Code Case N-498, System Pressure Test of the High Pressure Coolant Injection (HPCI) System

In a letter dated May 12, 1993 (Reference 6), the Licensee withdrew Request for Relief No. SPT-1. The Licensee states that, after further review of the pressure test requirements, TVA determined that Request for Relief No. SPT-1 is not required and that compliance with the applicable Code requirements can be achieved.

3.4.2.2 Request for Relief No. SPT-2, Code Case N-498, System Pressure Test of the Reactor Core Isolation Cooling (RCIC) System

In a letter dated May 12, 1993 (Reference 6), the Licensee withdrew Request for Relief No. SPT-2. The Licensee states that, after further review of the pressure test requirements, TVA determined that Request for Relief No. SPT-2 is not required and

that compliance with the applicable Code requirements can be achieved.

3.4.3 Class 3 System Pressure Tests (No relief requests)

3.4.4 General (No relief requests)

3.5 General (No relief requests)

4. CONCLUSION

Pursuant to 10 CFR 50.55a(g)(6)(i), it has been determined that certain inservice examinations cannot be performed to the extent required by Section XI of the ASME Code. In those cases where the Licensee has demonstrated that specific Section XI requirements are impractical, it is recommended that relief be granted. The granting of relief will not endanger life, property, or the common defense and security and is otherwise in the public interest, giving due consideration to the burden upon the Licensee that could result if the requirements were imposed on the facility. Request for Relief Nos. SPT-1, SPT-2, and SPT-3 were withdrawn by the Licensee in the letter dated May 12, 1993.

This technical evaluation has not identified any practical method by which the Licensee can meet all the specific inservice inspection requirements of Section XI of the ASME Code for the existing Browns Ferry Nuclear Plant, Unit 2, facility. Compliance with all the exact Section XI required inspections would necessitate redesign of a significant number of plant systems, procurement of replacement components, installation of the new components, and performance of baseline examination for these components. Even after the redesign efforts, complete compliance with the Section XI examination requirements probably could not be achieved. Therefore, it is concluded that the public interest is not served by imposing certain provisions of Section XI of the ASME Code that have been determined to be impractical.

The Licensee should continue to monitor the development of new or improved examination techniques. As improvements in these areas are achieved, the Licensee should incorporate these techniques in the ISI program plan examination requirements.

Based on the review of the *Browns Ferry Nuclear Plant, Unit 2, Second 10-Year Interval Inservice Inspection Program Plan*, through Revision 1, the Licensee's response to the NRC's request for additional information, and the recommendations for granting relief from the ISI examination requirements that have been determined to be impractical, it is concluded that the *Browns Ferry*

Nuclear Plant, Unit 2, Second 10-Year Interval Inservice Inspection Program Plan, through Revision 1, is acceptable and in compliance with 10 CFR 50.55a(g)(4).

5. REFERENCES

1. Code of Federal Regulations, Title 10, Part 50.

2. American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section XI, Division 1:

   1986 Edition
   1974 Edition through Summer 1975 Addenda

3. *Browns Ferry Nuclear Plant, Unit 2, Second 10-Year Interval Inservice Inspection Program Plan*, Revision 0, submitted May 22, 1992.

4. NUREG-0800, *Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants*, Section 5.2.4, "Reactor Coolant Boundary Inservice Inspection and Testing," and Section 6.6, "Inservice Inspection of Class 2 and 3 Components," July 1981.

5. *Browns Ferry Nuclear Plant, Unit 2, Second 10-Year Interval Inservice Inspection Program Plan*, Revision 1, submitted February 16, 1993.

6. Letter, dated May 12, 1993, O. J. Zeringue [Tennessee Valley Authority (TVA)] to Document Control Desk (NRC), Clarification of Request for Relief SPT-5 and withdrawal of Request for Relief Nos. SPT-1, SPT-2, and SPT-3.

7. Browns Ferry Nuclear Plant, Site Standard Practice SSP-6.9, *ASME Section XI Repairs and Replacements*, Revision 2, dated January 26, 1993.

8. Browns Ferry Nuclear Plant, Site Standard Practice SSP-6.10, *ASME Section XI Inservice Inspection Program*, Revision 2, dated May 11, 1992.

9. NUREG-0619, *BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking*, November 1980.

10. NRC Generic Letter 88-01, Supplement 1, *NRC Position on Intergranular Stress Corrosion Cracking (IGSCC) in BWR Austenitic Stainless Steel Piping*, February 4, 1992.

11. NUREG-0313, *Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping*, Revision 2, January 1988.

12. NRC IEB 80-13, *Cracking in Core Spray Spargers*, April 4, 1980.

13. Letter, dated September 27, 1991, O. J. Zeringue (TVA) to Document Control Desk (NRC), containing TVA's commitment regarding Browns Ferry Nuclear Plant - 10 CFR 50.55 proposed rules for Units 1, 2, and 3 reactor pressure vessel examinations.

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10. SUPPLEMENTARY NOTES

11. ABSTRACT *(200 words or less)*

This report presents the results of the evaluation of the *Browns Ferry Nuclear Plant, Unit 2, Second 10-Year Interval Inservice Inspection (ISI) Program Plan*, through Revision 1, submitted February 16, 1993, including the requests for relief from the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code Section XI requirements that the Licensee has determined to be impractical. The *Browns Ferry Nuclear Plant, Unit 2, Second 10-Year Interval Inservice Inspection Program Plan* is evaluated in Section 2 of this report. The ISI Program Plan is evaluated for (a) compliance with the appropriate edition/addenda of Section XI, (b) acceptability of examination sample, (c) correctness of the application of system or component examination exclusion criteria, and (d) compliance with ISI-related commitments identified during previous Nuclear Regulatory Commission (NRC) reviews. The requests for relief are evaluated in Section 3 of this report.

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