



1101 Market Street, Chattanooga, Tennessee 37402

CNL-23-037

June 1, 2023

10 CFR 50.55a

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Browns Ferry Nuclear Plant, Units 1, 2, and 3
Renewed Facility Operating License Nos. DPR-33, DPR-52, and DPR-68
NRC Docket Nos. 50-259, 50-260, and 50-296

Subject: **Response to Request for Additional Information Regarding Browns Ferry Nuclear Plant, Units 1, 2, and 3 - Request to Use a Later Edition of the American Society of Mechanical Engineers Operation and Maintenance Code and Alternative Requests for the Fifth Inservice Testing Interval (EPID L-2022-LLR-0086)**

- References:
1. TVA letter to NRC, CNL-22-090, "Browns Ferry Nuclear Plant, Units 1, 2, and 3 - Request to Use a Later Edition of the American Society of Mechanical Engineers Operation and Maintenance Code and Alternative Requests for the Fifth Inservice Testing Interval," dated December 12, 2022 (ML22346A189)
 2. NRC email to TVA, "Request for Additional Information Related to Proposed Alternative Requests for the 5th 10-Year Inservice Testing Interval for Browns Ferry Nuclear Plant, Units 1, 2, and 3 (EPID L-2022-LLR-0086)," dated May 3, 2023 (ML23124A008)

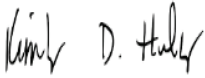
In Reference 1, Tennessee Valley Authority (TVA) submitted, for Nuclear Regulatory Commission (NRC) approval, a request to use a later edition of the American Society of Mechanical Engineers Code for Operation and Maintenance of Nuclear Power Plants for Browns Ferry Nuclear Plant (BFN), Units 1, 2, and 3 and corresponding inservice testing (IST) alternative requests in support of the upcoming BFN Units 1, 2, and 3 fifth IST interval.

In Reference 2, the NRC issued a request for additional information (RAI) and requested that TVA respond by June 2, 2023. The enclosure to this letter provides the response to the RAI.

U.S. Nuclear Regulatory Commission
CNL-23-037
Page 2
June 1, 2023

There are no new regulatory commitments associated with this submittal. Please address any questions regarding this request to Stuart L. Rymer, Senior Manager, Fleet Licensing, at slymer@tva.gov.

Respectfully,



Digitally signed by Edmondson,
Carla
Date: 2023.06.01 11:03:01 -04'00'

Kimberly D. Hulvey
Director, Nuclear Regulatory Affairs

Enclosure:

Response to NRC Request for Additional Information

cc (Enclosure):

NRC Regional Administrator - Region II
NRC Senior Resident Inspector - Browns Ferry Nuclear Plant
NRC Project Manager - Browns Ferry Nuclear Plant

Response to NRC Request for Additional Information

Nuclear Regulatory Commission Introduction

References

1. *Letter from Tennessee Valley Authority (TVA) to U.S. Nuclear Regulatory Commission (NRC), Alternative Requests BFN-IST-01 through 05 and Use of a Later Edition of the ASME OM Code for the Fifth 10-Year Interval Inservice Testing (IST) Program for the Browns Ferry Nuclear Plant (Browns Ferry) Units 1, 2, and 3, dated December 12, 2022 (ADAMS Accession No. ML22346A189).*
2. *Inservice Testing Program for the Fourth 10-Year Interval for the Browns Ferry Nuclear Plant, Units 1, 2, and 3 (ADAMS Accession No. ML13291A384).*

Regulatory Requirements

The NRC regulations in Section 55a, "Codes and standards," in Part 50, "Domestic Licensing of Production and Utilization Facilities," in Title 10, "Energy," of the Code of Federal Regulations (10 CFR) 50.55a) in paragraph (z), "Alternatives to codes and standards requirements," state the following:

Alternatives to the requirements of paragraphs (b) through (h) of this section or portions thereof may be used when authorized by the Director, Office of Nuclear Reactor Regulation. A proposed alternative must be submitted and authorized prior to implementation. The applicant or licensee must demonstrate that:

- (1) *Acceptable level of quality and safety. The proposed alternative would provide an acceptable level of quality and safety; or*
- (2) *Hardship without a compensating increase in quality and safety. Compliance with the specified requirements of this section would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.*

RAI-BFN-IST-01

1. *Alternative Request BFN-IST-01, Section V, "Proposed Alternative," second paragraph, second and third sentences, state:*

Supplemental position verification of the SDV [scram discharge volume] vent and drain valves in the closed position will be satisfied by demonstrating annunciation of the SDIV [scram discharge instrument volume] high level alarm during a scram. Failure of any individual valve to close would be detectable using remote position indication in the control room.

Explain how receipt of a high level alarm provides positive indication that all valves are closed, particularly the SDIV vent valves.

2. *The current Browns Ferry, Units 1, 2, and 3, Fourth 10-Year Interval IST Program Plan (ML13291A384) includes drain valves 1/2/3-FCV-85-37C/37E and vent valves 1/2/3-FCV-85-82A/83A and references Browns Ferry Procedures*

Enclosure

1/2/3-SR-3.3.3.2.1(85) and 1/2/3-SR-3.1.8.2 for these drain and vent valves. The Browns Ferry Technical Specification (TS) Surveillance Requirement (SR) 3.3.3.2.1 and SR 3.1.8.2 Frequencies refer to the Surveillance Frequency Control Program (SFCP). However, the request states that the proposed alternative testing will be performed at the American Society of Mechanical Engineers (ASME) Operation and Maintenance (OM Code) of Nuclear Power Plants paragraph ISTC-3700 frequency of at least once every two years.

- a. *If this alternative is authorized, confirm that TVA will perform the alternative testing at least once every two years as specified in paragraph ISTC-3700, and that the frequency will not be decreased unless authorized by the NRC in response to a 10 CFR 50.55a(z) alternative request, or by use of an applicable ASME OM Code Case endorsed in Regulatory Guide (RG) 1.192 as incorporated by reference in 10 CFR 50.55a.*
- b. *Explain how the frequency will remain consistent with the ASME OM Code requirement as incorporated by reference in 10 CFR 50.55a for the Fifth 10-Year IST interval.*

TVA Response

1. As noted in Section IV of alternative request BFN-IST-01 (Reference 1 of the NRC Introduction), due to the design of the Browns Ferry Nuclear Plant (BFN) Unit 1, 2, and 3 control rod drive (CRD) system, the SDV vent and drain valves cannot be individually operated to perform supplemental position indication verification as required by the OM Condition in 10 CFR 50.55a(b)(3)(xi). The 2-inch vent air operated valves (AOV) are designed as a series pair (one Code Class 2 equivalent and one non-Code Class equivalent). Verification of individual obturator position is impractical to perform on each valve in the scope of this alternative request due to the design of the pneumatic control system for these AOVs. Each vent and drain line have two AOVs in series, with no installed capability to verify individual valve obturator position with supplemental indications.

Verification of the SDV vent and drain valves in the closed position will be satisfied by demonstrating annunciation of the SDIV high level alarm during a scram inserted during the primary system pressure test. During this test, if series valves on either tank failed to close, reactor pressure vessel (RPV) pressure test conditions would be affected by a change in RPV volume and makeup requirements. TVA procedures ensure that the system is pressurized up to the AOVs for alternate VT-2 inspections during the Class 1 system pressure test. This verification demonstrates that both AOVs on each line indicate closed, and the lack of change in system parameters indicate that at least one AOV per line is providing required isolation. The SDIV high level alarm in conjunction with normal RPV pressure test conditions demonstrates that each SDV vent and drain line is physically isolated by at least one valve, and the position indication of all valves are closed.

2. a. TVA confirms that the alternative testing will be performed at least once every 2 years as specified in paragraph ISTC-3700, and that the frequency will not be decreased unless authorized by the NRC in response to a 10 CFR 50.55a(z) alternative request, or by use of an applicable ASME OM Code Case endorsed in RG 1.192, "Operation and Maintenance Code Case Acceptability, ASME OM Code," as incorporated by reference in 10 CFR 50.55a.

Enclosure

- b. The implementing procedures for the referenced BFN TS SRs specify the IST program required frequencies when the testing is credited for IST program compliance. The SFCP process does not allow changing the frequencies of the BFN IST program unless authorized by the NRC in response to a 10 CFR 50.55a(z) alternative request, or by use of an applicable ASME OM Code Case endorsed in RG 1.192 as incorporated by reference in 10 CFR 50.55a. TVA administrative procedures provide adequate control to prevent unauthorized changes to IST required frequencies.

RAI-BFN-IST-02

1. *The current Browns Ferry, Units 1, 2, and 3, Fourth 10-Year Interval IST Program Plan (ML13291A384) references Browns Ferry Procedures 2/3-SR-3.3.3.1.4(HCT) for valves 2/3-FCV-74-46, 2/3-SHV-74-91, and 3-SHV-74-150. The Browns Ferry, Units 2 and 3, TS SR 3.3.3.1.4 Frequency refers to the SFCP. However, the request states that the proposed alternative testing will be performed at the ASME OM Code paragraph ISTC-3700 frequency of at least once every two years.*
 - a. *If this alternative is authorized, confirm that TVA will perform the alternative testing at least once every two years as specified in paragraph ISTC-3700, and that the frequency will not be decreased unless authorized by the NRC in response to a 10 CFR 50.55a(z) alternative request, or by use of an applicable ASME OM Code Case endorsed in RG 1.192 as incorporated by reference in 10 CFR 50.55a.*
 - b. *Explain how the frequency will remain consistent with the ASME OM Code requirement as incorporated by reference in 10 CFR 50.55a for the Fifth 10-Year IST interval.*

TVA Response

See the response to Part 2 of RAI-BFN-IST-01.

RAI-BFN-IST-03

1. *The current BFN Units 1, 2, and 3 Fourth 10-Year Interval IST Program Plan (ML13291A384) references Browns Ferry Procedures 1/2/3-SR 3.3.3.1.4(A) for valves 1/2/3-FCV-1-168, -169, -170, and -171. The TS SR 3.3.3.1.4 Frequency refers to the SFCP. However, the request states that the proposed alternative testing will be performed at the OM Code paragraph ISTC-3700 frequency of at least once every two years.*
 - a. *If this alternative is authorized, confirm that TVA will perform the alternative testing at least once every two years as specified in ISTC-3700, and that the frequency will not be decreased unless authorized by the NRC in response to a 10 CFR 50.55a(z) alternative request, or by use of an applicable ASME OM Code Case endorsed in RG 1.192 as incorporated by reference in 10 CFR 50.55a.*
 - b. *Explain how the frequency will remain consistent with the ASME OM Code requirement as incorporated by reference in 10 CFR 50.55a for the Fifth 10-Year IST interval.*

TVA Response

See the response to Part 2 of RAI-BFN-IST-01.

RAI-BFN-IST-04

1. *Alternative Request BFN-IST-04, Section V, "Proposed Alternative", states:*

TVA proposes to test MSRVs [Main Steam Relief Valves] in accordance with the OM Code Mandatory Appendix I requirements for Class I Main Steam Pressure Relief Valves with Auxiliary Actuating Devices.

Section VI, "Basis for Proposed Alternative," sixth paragraph states:

Mandatory Appendix I, I-3310 provides sufficient test requirements to ensure the MSRVs are capable of remote manual operation and automatic operation at set pressure including verification of the pressure integrity and stroke capability of the air actuator and verification of operation and electrical characteristics of position indicators. TVA considers the testing required by Mandatory Appendix I to fully satisfy the intent of 10 CFR 50.55a(b)(3)(xi).

Explain how I-3310 will be used to verify the open and closed positions of these valves.

2. *For the MSRVs, the BFN Units 1, 2, and 3 Fourth 10-Year Interval IST Program Plan (ML13291A384) references BFN procedures 1/2/3 SI-3.2.9, 0-SR-3.4.3.1.a, 0-SR-3.4.3.1.b, and 1/2/3-SR-3.4.3.2. The Browns Ferry TS SR 3.4.3.2 Frequency refers to the SFCP. Mandatory Appendix I specifies the test frequencies for Class 1 pressure relief devices.*
 - a. *If this alternative is authorized, confirm that TVA will perform the alternative testing as specified in Mandatory Appendix I, and that the frequency will not be decreased unless authorized by the NRC in response to a 10 CFR 50.55a(z) alternative request, or by use of an applicable ASME OM Code Case endorsed in RG 1.192 as incorporated by reference in 10 CFR 50.55a.*
 - b. *Explain how the frequency will remain consistent with the ASME OM Code requirement as incorporated by reference in 10 CFR 50.55a for the Fifth 10-Year IST interval.*

TVA Response

1. TVA has two potential methodologies to demonstrate open and closed valve positions in accordance with OM Code paragraph I-3310. Currently, manual actuation tests prescribed in BFN TS SRs 3.4.3.2 and 3.5.1.11 provide demonstration of the mechanical operation of the safety/relief valves (S/RVs) and overlaps with other testing to demonstrate that the functions of the S/RVs can be performed. These manual actuation tests are currently performed once per operating cycle (24 months) corresponding to start-up from refueling outages. The S/RV manual actuation lift test is credited for demonstrating the mechanical functioning of the valve for the remote actuation mode and for the automatic depressurization function. These tests demonstrate that the air actuator strokes open to allow the pilot to actuate the main body, and that the air actuator closes and allows the main body to re-seat. Each MSRV tail pipe contains external systems for acoustic monitoring or temperature

Enclosure

change to monitor open and closed positions by sensing steam flow conditions and providing indications of steam flow and cutoff during MSR/V cycling.

Secondly, TVA submitted a license amendment request for NRC approval (Reference), which will allow for an alternate test methodology to be included in BFN Units 1, 2, and 3, SRs 3.4.3.2 and 3.5.1.11. As a second option to performing a manual actuation of each S/RV once per cycle, TVA proposed, in accordance with the code of record (COR), which for the fifth BFN IST interval will be the 2020 Edition of the ASME OM Code, to credit overlapping code and SR (testing) to ensure the capability of the S/RV to open. Manual actuation testing will, however, be retained as an alternative in the TS SRs, which will provide an alternative to the current requirement to demonstrate the capability of the relief valves to open when manually actuated during plant startup. This alternative provides another option to satisfy the SRs allowing a determination to be made that the valve is capable of being opened. Crediting of other testing and verification of electrical and pneumatic connections is in accordance with the COR, paragraph I-3410(d).

The combination of testing the S/RV actuator and solenoid valves and verifications of the capability of the S/RV to open provides a complete verification of the functional capability in accordance with the COR. A solenoid operated valve (SOV) functional test is performed in-situ for each S/RV solenoid valve once per operating cycle, prior to assembling the solenoid to the pilot. In the SOV functional test, a test rig with a pressure gauge is connected downstream of the SOV pneumatic manifold in place of the S/RV actuator. Each SOV is energized from the main control room, and pneumatic pressure at the downstream connection will be recorded and compared with pneumatic header pressure to verify the solenoid is operable. Once the S/RV is installed in accordance with paragraph I-3410(d), the SOV is installed on the S/RV assembly.

As noted in Section VI to alternative request BFN-IST-04 (Reference 1 of the NRC Introduction), "The position indicating lights provided in the main control room (MCR) indicate only the status of the solenoid valve (energized or de-energized) and do not indicate stem or obturator movement. Energizing the solenoid control valve admits plant air to the air operator piston chamber and strokes the air operator stem, in turn stroking the pilot disc via the pilot rod. De-energizing the solenoid vents the air operator diaphragm chamber causing the air operator stem to return to its unstroked position. The pilot stage then reseats if system pressure is at the valve design reseal pressure or below. The air operator provided is relied upon only to stroke the spring loaded pilot disc and is not relied upon to provide a required torque, thrust, stroke time, or seating force to perform a required function."

OM Code paragraph I-3310 requires, in part, that (a) visual examination, (b) seat tightness determination, if practicable, and (c) set-pressure determination be performed prior to maintenance or adjustment. Test requirements for I-3310(a), (b), and (c) do not impact remote position indication or supplemental position indication. OM Code paragraphs I-3310(d) through (i) are performed after maintenance as described below.

OM Code paragraph I-3310(d) requires determination of electrical characteristics and pressure integrity of the solenoid valve(s). This will be accomplished by either manual exercise of the MSR/V during low power operation or by ensuring each S/RV solenoid valve ports pneumatic pressure to the associated S/RV actuator when energized during in-situ testing as described above.

OM Code paragraph I-3310(e) requires determination of pressure integrity and stroke

Enclosure

capability of the air actuator. This will be accomplished by either manual exercise of the MSRV during low power operation or by ensuring each S/RV actuator stem moves when manually lift tested during vendor certification. With exception of the main and pilot stages this test demonstrates mechanical operation.

OM Code paragraph I-3310(f) requires determination of operation and electrical characteristics of position indicators. This will be accomplished by either manual exercise of the MSRV during low power operation or by verifying remote position indication accurately reflects S/RV solenoid valve position during in-situ testing of electrical characteristics and pressure integrity of the solenoid valve(s).

Each MSRV tail pipe contains external systems for acoustic monitoring or temperature change to monitor open and closed positions by sensing steam flow conditions and providing indications of steam flow and cutoff during MSRV cycling. Per ISTC-1200(c), external control and protection systems responsible for sensing plant conditions and providing signals for valve operation are excluded from the testing requirements. Acoustic monitoring and thermocouple temperature monitoring instrumentation is monitored per BFN Technical Requirements Manual, Section 3.3.5.

OM Code paragraph I-3310(g) requires determination of operation and electrical characteristics of bellows alarm switch. This subparagraph is not applicable to the Target Rock Model 7567F pilot-operated S/RV.

OM Code paragraph I-3310(h) requires determination of actuating pressure of auxiliary actuating device sensing element, where applicable, and electrical continuity. This subparagraph is not applicable to the Target Rock Model 7567F pilot-operated S/RV.

OM Code paragraph I-3310(i) requires determination of compliance with the owner's seat tightness criteria. Test requirements for I-3310(i) do not impact remote position indication or supplemental position indication.

2. a. TVA confirms that the alternative testing will be performed at least once every 2 years as specified in Mandatory Appendix I, and that the frequency will not be decreased unless authorized by the NRC in response to a 10 CFR 50.55a(z) alternative request, or by use of an applicable ASME OM Code Case endorsed in RG 1.192 as incorporated by reference in 10 CFR 50.55a.
- b. See the response to Part 2b of RAI-BFN-IST-01.

Reference

TVA letter to NRC, CNL-23-018, "Browns Ferry Nuclear Plant, Units 1, 2, and 3 – Request for Amendment Regarding Technical Specification Surveillance Requirements 3.4.3.2 and 3.5.1.11 Regarding Safety Relief Valves (BFN TS-540)," dated March 30, 2023 (ML23089A167)

RAI-BFN-IST-05

1. *TVA submitted Alternative Request BFN-IST-05 as a request under 10 CFR 50.55a(z)(1) that the alternative provides an acceptable level of quality and safety. This request appears to be more applicable to a hardship request under 10 CFR 50.55a(z)(2). Discuss any concerns related to an evaluation of this request under 10 CFR 50.55a(z)(2), and provide any additional information needed to support a (z)(2) request if TVA decides that (z)(2) is appropriate.*

2. *Alternative Request BFN-IST-05, Section III, "Applicable Code Requirements," in the last sentence states that "position verification for active MOVs [motor-operated valves] shall be tested in accordance with Division 1, Mandatory Appendix III." Paragraph (e) in Section III-3300, "Inservice Test," in Appendix III states that "Remote position indication shall be verified locally during inservice testing or maintenance activities." In that the capability of MOV diagnostics to verify valve obturator position depends on the valve type and its performance, explain how TVA plans to implement the requirements in 10 CFR 50.55a(b)(3)(xi) as part of the Appendix III program for MOVs at Browns Ferry.*
3. *The Browns Ferry, Units 1, 2, and 3, Fourth 10-Year Interval IST Program Plan (ML1329A384) describes testing details regarding valves 0-FCV-67-1, 0-FCV-67-5, 0-FCV-67-8, and 0-FCV-67-11 and references Procedures 0-SI-4.5.C.1(A3-COMP) and 0-SI-4.5.C.1(A3). Explain how the frequency of the valve position indication will remain consistent with the ASME OM Code requirement as incorporated by reference in 10 CFR 50.55a, or an authorized alternative, for the Fifth 10-Year IST interval.*

TVA Response

1. TVA concurs that the alternative request should be processed as a hardship request under 10 CFR 50.55a(z)(2). TVA does not have any concerns related to processing this alternative request under 10 CFR 50.55a(z)(2) and that the information provided in alternative request BFN-IST-05 supports the information required by 10 CFR 50.55a(z)(2).
2. The following TVA response applies only to the strainer backwash valves that are within the scope of alternative request BFN-IST-05. As noted in the alternative request, TVA cannot fully comply with the requirements of 10 CFR 50.55a(b)(3)(xi) regarding ISTC-3700. ISTC-3700 notes that position verification for active MOVs shall be tested in accordance with Mandatory Appendix III. Mandatory Appendix III-3300(e) requires that remote position indication be verified locally during IST or maintenance activities. TVA has maintenance activities to perform motor operated valve (MOV) diagnostic testing at an initial frequency of 104 weeks for the strainer backwash valves. This frequency will be adjusted as necessary in accordance with the requirements of Mandatory Appendix III-6440. The diagnostic testing activity will confirm strainer backwash valve setup meets design requirements and will also verify local valve position and light position indication. MOV diagnostics are not sufficient to verify obturator position for the installed strainer backwash valve design. Diagnostic testing will also be required as a post-maintenance test for any maintenance activity which could impact valve setup.

In order to satisfy the OM Code Subsection ISTC-3700 frequency of every 2 years, monitoring of system parameters and alarms during IST pump testing will be used to supplement remote position indication, and will be credited during performance of emergency equipment cooling water pump testing for the respective strainer backwash valve. Specifically, the absence of strainer high differential pressure alarms when the strainer is in operation for IST pump testing demonstrates the valve is in the open position. The presence of a strainer high differential pressure alarm when the respective strainer is in operation for IST pump testing is an indicator that the valve may have failed closed in the closed position.

Enclosure

3. TVA will perform the alternative testing in accordance with the requirements specified in subparagraph III-3300(e) of the ASME OM Code, unless otherwise authorized by the NRC in response to a 10 CFR 50.55a(z) alternative request, or by use of an applicable ASME OM Code Case endorsed in RG 1.192 as incorporated by reference in 10 CFR 50.55a. TVA administrative procedures provide adequate control to prevent unauthorized changes to IST required frequencies.