TENNESSEE VALLEY AUTHORITY

1101 Market Street, Chattanooga, Tennessee 37402

CNL-22-089

December 20, 2022

10 CFR 50.90

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: **License Amendment Request for Adoption of TSTF-478, Revision 2, "BWR Technical Specification Changes that Implement the Revised Rule for Combustible Gas Control" (BFN TS-546)**

References:

1. TSTF-478, Revision 2, “BWR Technical Specification Changes that Implement the Revised Rule for Combustible Gas Control,” dated July 10, 2007 (ML071920140)

2. Federal Register Notice 72FR65610, “Notice of Availability On Model Safety Evaluation, Model No Significant Hazards Determination, and Model Application For Licensees that Wish to Adopt TSTF-478, Revision 2, ‘BWR Technical Specification Changes that Implement the Revised Rule for Combustible Gas Control’,” dated November 21, 2007 (ML073170138)

In accordance with the provisions of Section 50.90 of Title 10 of the *Code of Federal Regulations* (10 CFR), Tennessee Valley Authority (TVA) is submitting a request for an amendment to the technical specifications (TS) for Browns Ferry Nuclear Plant (BFN), Units 1, 2, and 3.

The proposed amendments would delete TS 3.6.3.1, “Containment Atmosphere Dilution (CAD) System,” and the associated Bases, to modify containment combustible gas control requirements as permitted by 10 CFR 50.44. This change is consistent with Nuclear Regulatory Commission (NRC) approved Revision 2 to Technical Specification Task Force (TSTF) Traveler, TSTF-478-A, “BWR Technical Specification Changes that Implement the Revised Rule for Combustible Gas Control” (Reference 1). The availability of this TS improvement was announced in the Federal Register on November 21, 2007 (Reference 2), as part of the consolidated line item improvement process (CLIIP).

Enclosure 1 provides a description and assessment of the proposed change. Attachment 1 to the enclosure provides the existing TS pages marked up to show the proposed changes. Attachment 2 to the enclosure provides the proposed TS changes in final typed format. Attachment 3 to the enclosure provides the existing Bases pages marked up to show the proposed changes, for information only (only Unit 1 Bases changes are provided, as the Unit 2 and Unit 3 Bases changes are identical).

TVA requests that the amendment be reviewed under the CLIIP. Approval of the proposed amendment is requested within 6 months of completion of the NRC's acceptance review. Once approved, the amendment shall be implemented within 90 days.

TVA has determined that there are no significant hazards considerations associated with the proposed change and that the TS change qualifies for a categorical exclusion from environmental review pursuant to the provisions of 10 CFR 51.22(c)(9). In accordance with 10 CFR 50.91(b)(1), TVA is sending a copy of this letter and enclosure to the Alabama Department of Public Health.

There are no new regulatory commitments contained in this letter. If you have any questions regarding this submittal, please contact Stuart L. Rymer, Director (Acting), Nuclear Regulatory Affairs, at slrymer@tva.gov.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 20th day of December 2022.

Respectfully,

James Barstow

Digitally signed by Rearden, Pamela S
Date: 2022.12.20 12:11:18 -05'00'

James Barstow
Vice President, Nuclear Regulatory Affairs & Support Services

Enclosure:

Description and Assessment of the Proposed Change

cc (Enclosure):

NRC Regional Administrator - Region II
NRC Senior Resident Inspector - Browns Ferry Nuclear Plant
NRC Project Manager - Browns Ferry Nuclear Plant
State Health Officer, Alabama Department of Public Health

Enclosure

Description and Assessment of the Proposed Change

Subject: License Amendment Request for Adoption of TSTF-478, Revision 2, "BWR Technical Specification Changes that Implement the Revised Rule for Combustible Gas Control" (BFN TS-546)

CONTENTS

Attachments:

1. Proposed Technical Specification Changes (Markups) for BFN Units 1, 2, and 3
2. Proposed Technical Specification Pages (Final Typed) for BFN Units 1, 2, and 3
3. Proposed Technical Specification Bases Changes (Markups) for BFN Unit 1 (For Information Only)

1.0 SUMMARY DESCRIPTION

The proposed amendment would delete the Browns Ferry Nuclear Plant (BFN) Technical Specification (TS) 3.6.3.1, "Containment Atmosphere Dilution (CAD) System," and the associated Bases, that will result in modifications to containment combustible gas control TS requirements as permitted by Title 10 of the *Code of Federal Regulations* (10 CFR) 50.44. This change is consistent with Nuclear Regulatory Commission (NRC) approved Revision 2 to Technical Specification Task Force (TSTF) Traveler, TSTF-478-A, "BWR Technical Specification Changes that Implement the Revised Rule for Combustible Gas Control" (Reference 1). The availability of this TS improvement was announced in the Federal Register on November 21, 2007 (Reference 2), as part of the consolidated line item improvement process (CLIIP).

2.0 PROPOSED CHANGE

Consistent with the NRC approved Revision 2 of TSTF-478-A, the proposed TS changes delete TS 3.6.3.1, "Containment Atmosphere Dilution (CAD) System." Proposed revisions to the TS Bases are also included in this application. Adoption of the TS Bases associated with TSTF-478-A, Revision 2 is an integral part of implementing this TS amendment. The changes to the affected TS Bases pages will be incorporated in accordance with the TS Bases Control Program.

This application is being made in accordance with the CLIIP. Tennessee Valley Authority (TVA) is proposing variations or deviations from the TS changes described in TSTF-478-A, Revision 2, or the NRC staff's model safety evaluation (SE) published on November 21, 2007 (72FR65610), as part of the CLIIP Notice of Availability.

- The BFN Units 1, 2, and 3, TS for the CAD system is TS 3.6.3.1 rather than TS 3.6.3.3 as provided in the TSTF-478-A, Revision 2, markups.
- TSTF-478-A, Revision 2, also makes TS and Bases changes for the TS section on drywell cooling system fans. Because the BFN Units 1, 2, and 3, TS do not have this section, these changes are not applicable.

3.0 BACKGROUND

The background for this application is adequately addressed by the NRC Notice of Availability published on November 21, 2007 (72FR65610).

4.0 TECHNICAL ANALYSIS

TVA has reviewed the SE published on November 21, 2007 (72FR65610), as part of the CLIIP Notice of Availability. TVA has concluded that the technical justifications presented in the SE prepared by the NRC staff are applicable to BFN Units 1, 2, and 3, and therefore justify this amendment for the incorporation of the proposed changes to the BFN TS.

5.0 REGULATORY SAFETY ANALYSIS

5.1 Applicable Regulatory Requirements / Criteria

A description of the proposed TS change and its relationship to applicable regulatory requirements was provided in the NRC Notice of Availability published on November 21, 2007 (72FR65610).

5.2 Precedent

This application is being made in accordance with the CLIIP. TVA is not proposing significant variations or deviations from the TS changes described in TSTF-478-A, Revision 2 or in the content of the NRC's model SE published in the Federal Register on November 21, 2007 (72FR65610). A similar amendment request was submitted by Exelon Generation for James A. Fitzpatrick Nuclear Power Plant on June 30, 2020 (ML20182A161). The NRC approved the license amendment request for Fitzpatrick on April 28, 2021 (ML21049A355).

5.3 No Significant Hazards Determination

TVA has reviewed the no significant hazards determination published on November 21, 2007 (72FR65610), as part of the CLIIP Notice of Availability. TVA has concluded that the determination presented in the notice is applicable to BFN Units 1, 2, and 3, and the determination is hereby incorporated by reference to satisfy the requirements of 10 CFR 50.91(a).

Based on the above, TVA concludes that the proposed changes do not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and accordingly, a finding of no significant hazards consideration is justified.

5.4 Conclusion

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

6.0 ENVIRONMENTAL CONSIDERATION

TVA has reviewed the environmental evaluation included in the SE published on November 21, 2007 (72FR65610), as part of the CLIIP Notice of Availability. TVA has concluded that the NRC staff's findings presented in that evaluation are applicable to BFN Units 1, 2, and 3, and the evaluation is hereby incorporated by reference for this application.

7.0 REFERENCES

1. TSTF-478, Revision 2, “BWR Technical Specification Changes that Implement the Revised Rule for Combustible Gas Control,” dated July 10, 2007 (ML071920140)
2. Federal Register Notice 72FR65610, “Notice of Availability On Model Safety Evaluation, Model No Significant Hazards Determination, and Model Application For Licensees that Wish to Adopt TSTF-478, Revision 2, ‘BWR Technical Specification Changes that Implement the Revised Rule for Combustible Gas Control’,” dated November 21, 2007 (ML073170138)

Enclosure

Attachment 1
Proposed Technical Specification Changes (Markups) for BFN Units 1, 2, and 3
(6 pages)

3.6 CONTAINMENT SYSTEMS

3.6.3.1 Containment Atmosphere Dilution (CAD) System

(Deleted)

~~LCO 3.6.3.1 Two CAD subsystems shall be OPERABLE.~~

~~APPLICABILITY: MODES 1 and 2.~~

~~ACTIONS~~

~~CONDITION~~	~~REQUIRED ACTION~~	~~COMPLETION TIME~~
~~A. One CAD subsystem inoperable.~~	~~A.1 Restore CAD subsystem to OPERABLE status.~~	~~30 days~~
~~B. Two CAD subsystems inoperable~~	~~B.1 Verify by administrative means that the hydrogen control function is maintained.~~ ~~AND~~ ~~B.2 Restore one CAD subsystem to OPERABLE status.~~	~~1 hour~~ ~~AND~~ ~~Once per 12 hours thereafter~~ ~~7 days~~
~~C. Required Action and associated Completion Time not met.~~	~~C.1 Be in MODE 3.~~	~~12 hours~~

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.3.1.1	Verify ≥ 2615 gal of liquid nitrogen are contained in each nitrogen storage tank.	In accordance with the Surveillance Frequency Control Program
SR 3.6.3.1.2	Verify each CAD subsystem manual, power operated, and automatic valve in the flow path that is not locked, sealed, or otherwise secured in position is in the correct position or can be aligned to the correct position.	In accordance with the Surveillance Frequency Control Program

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SR 3.6.3.1.2	Verify each CAD subsystem manual, power operated, and automatic valve in the flow path that is not locked, sealed, or otherwise secured in position is in the correct position or can be aligned to the correct position.	In accordance with the Surveillance Frequency Control Program

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Enclosure

Attachment 2
Proposed Technical Specification Pages (Final Typed) for BFN Units 1, 2, and 3
(6 pages)

3.6 CONTAINMENT SYSTEMS

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Enclosure

Attachment 3
Proposed Technical Specification Bases Changes (Markups) for BFN Unit 1
(For Information Only) (8 pages)

B 3.6 CONTAINMENT SYSTEMS

B 3.6.3.1 Containment Atmosphere Dilution (CAD) System

BASES

BACKGROUND The CAD System functions to maintain combustible gas concentrations within the primary containment at or below the flammability limits following a postulated loss of coolant accident (LOCA) by diluting hydrogen and oxygen with nitrogen. To ensure that a combustible gas mixture does not occur, oxygen concentration is kept < 5.0 volume percent (v/o), or hydrogen concentration is kept < 4.0 v/o.

The CAD System is manually initiated and consists of two independent, 100% capacity subsystems, each of which is capable of supplying nitrogen through separate piping systems to the drywell and suppression chamber of each unit. Each subsystem includes a liquid nitrogen supply tank, ambient vaporizer, electric heater (unqualified), and a manifold with branches to each primary containment (for Units 1, 2, and 3). The nitrogen storage tanks each contain ≥ 2615 gal, which is adequate for 7 days of CAD subsystem operation (Ref. 4).

The CAD System operates in conjunction with emergency operating procedures that are used to reduce primary containment pressure periodically during CAD System operation. This combination results in a feed and bleed approach to maintaining hydrogen and oxygen concentrations below combustible levels.

(continued)

BASES (continued)

APPLICABLE SAFETY ANALYSES

To evaluate the potential for hydrogen and oxygen accumulation in primary containment following a LOCA, hydrogen and oxygen generation is calculated (as a function of time following the initiation of the accident). The assumptions stated in Reference 1 are used to maximize the amount of hydrogen and oxygen generated. The calculation confirms that when the mitigating systems are actuated in accordance with emergency operating instructions, the peak oxygen concentration in primary containment is < 5.0 v/o (Ref. 2).

Hydrogen and oxygen may accumulate within primary containment following a LOCA as a result of:

a. A metal water reaction between the zirconium fuel rod cladding and the reactor coolant; or

b. Radiolytic decomposition of water in the Reactor Coolant System.

The CAD System satisfies Criterion 3 of the NRC Policy Statement (Ref. 3).

LCO

Two CAD subsystems must be OPERABLE. This ensures operation of at least one CAD subsystem in the event of a worst case single active failure. Operation of at least one CAD subsystem is designed to maintain primary containment post-LOCA oxygen concentration < 5.0 v/o for 7 days.

(continued)

BASES (continued)

APPLICABILITY In MODES 1 and 2, the CAD System is required to maintain the oxygen concentration within primary containment below the flammability limit of 5.0 v/o following a LOCA. This ensures that the relative leak tightness of primary containment is adequate and prevents damage to safety related equipment and instruments located within primary containment.

In MODE 3, both the hydrogen and oxygen production rates and the total amounts produced after a LOCA would be less than those calculated for the Design Basis Accident LOCA. Thus, if the analysis were to be performed starting with a LOCA in MODE 3, the time to reach a flammable concentration would be extended beyond the time conservatively calculated for MODES 1 and 2. The extended time would allow hydrogen removal from the primary containment atmosphere by other means and also allow repair of an inoperable CAD subsystem, if CAD were not available. Therefore, the CAD System is not required to be OPERABLE in MODE 3.

In MODES 4 and 5, the probability and consequences of a LOCA are reduced due to the pressure and temperature limitations of these MODES. Therefore, the CAD System is not required to be OPERABLE in MODES 4 and 5.

(continued)

BASES (continued)

ACTIONS

A.1

If one CAD subsystem is inoperable, it must be restored to OPERABLE status within 30 days. In this Condition, the remaining OPERABLE CAD subsystem is adequate to perform the oxygen control function. However, the overall reliability is reduced because a single failure in the OPERABLE subsystem could result in reduced oxygen control capability. The 30 day Completion Time is based on the low probability of the occurrence of a LOCA that would generate hydrogen and oxygen in amounts capable of exceeding the flammability limit, the amount of time available after the event for operator action to prevent exceeding this limit, and the availability of the OPERABLE CAD subsystem and other hydrogen mitigating systems.

B.1 and B.2

With two CAD subsystems inoperable, the ability to control the hydrogen control function via alternate capabilities must be verified by administrative means within 1 hour. The alternate hydrogen control capabilities are provided by the Primary Containment Inerting System. The 1 hour Completion Time allows a reasonable period of time to verify that a loss of hydrogen control function does not exist. In addition, the alternate hydrogen control system (Primary Containment Inerting) capability must be verified once per 12 hours thereafter to ensure its continued availability. Both the initial verification and all subsequent verifications may be performed as an administrative check by examining logs or other information to determine the availability of the alternate hydrogen control system (Primary Containment Inerting). If the ability to perform the hydrogen control function is maintained via the Primary Containment Inerting System, continued operation for up to 7 days is permitted with two CAD subsystems inoperable.

(continued)

BASES

ACTIONS B.1 and B.2 (continued)

The Completion Time of 7 days is a reasonable time to allow continued reactor operation with two CAD subsystems inoperable because the hydrogen control function is maintained (via the Primary Containment Inerting System) and because of the low probability of the occurrence of a LOCA that would generate hydrogen in amounts capable of exceeding the flammability limit.

C.1

If any Required Action cannot be met within the associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours. The allowed Completion Time of 12 hours is reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS SR 3.6.3.1.1

Verifying that there is ≥ 2615 gal of liquid nitrogen supply in each nitrogen storage tank will ensure at least 7 days of post-LOCA CAD operation. This minimum volume of liquid nitrogen represents the analytical limit assumed in the analysis of the primary containment atmosphere following a postulated LOCA and does not include allowance for potential nitrogen boiloff and tank level instrumentation inaccuracies. This minimum volume of liquid nitrogen allows sufficient time after an accident to replenish the nitrogen supply for long term inerting. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.3.1.2

Verifying the correct alignment for manual, power operated, and automatic valves in each of the CAD subsystem flow paths provides assurance that the proper flow paths exist for system operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these valves were verified to be in the correct position prior to locking, sealing, or securing.

A valve is also allowed to be in the nonaccident position provided it can be aligned to the accident position within the time assumed in the accident analysis. This is acceptable because the CAD System is manually initiated. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of being mispositioned are in the correct position.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

(continued)

BASES (continued)

REFERENCES

1. AEC Safety Guide 7, Control of Combustible Gas Concentrations in Containment Following a Loss-of-Coolant Accident, March 10, 1971.

2. FSAR, Section 5.2.6.

3. NRC No. 93-102, "Final Policy Statement on Technical Specification Improvements," July 23, 1993.

4. ANP-3403P, “Fuel Uprate Safety Analysis Report for Browns Ferry Nuclear Plant Units 1, 2, and 3,” Section 2.6.4.

B 3.6 CONTAINMENT SYSTEMS

B 3.6.3.2 Primary Containment Oxygen Concentration

BASES

BACKGROUND

All nuclear reactors must be designed to withstand events that generate hydrogen either due to the zirconium metal water reaction in the core or due to radiolysis. The primary method to control hydrogen is to inert the primary containment. With the primary containment inert, that is, oxygen concentration < 4.0 volume percent (v/o), a combustible mixture cannot be present in the primary containment for any hydrogen concentration. The capability to inert the primary containment and maintain oxygen < 4.0 v/o works together with the Containment Atmosphere Dilution (CAD) System ~~(LCO 3.6.3.1)~~ to provide redundant and diverse methods to mitigate events that produce hydrogen. For example, an event that rapidly generates hydrogen from zirconium metal water reaction will result in excessive hydrogen in primary containment, but oxygen concentration will remain < 5.0 v/o and no combustion can occur. Long term generation of both hydrogen and oxygen from radiolytic decomposition of water could eventually result in a combustible mixture in primary containment, except that the CAD system ~~(LCO 3.6.3.1)~~ will limit the peak hydrogen concentration to 4.0 v/o and again no combustion can occur. This LCO ensures that oxygen concentration does not exceed 4.0 v/o during operation in the applicable conditions.

(continued)