

#### UNITED STATES NUCLEAR REGULATORY COMMISSION WASHINGTON, D.C. 20555-0001

March 16, 2022

Mr. James Barstow Vice President, Nuclear Regulatory Affairs and Support Services Tennessee Valley Authority 1101 Market Street, LP 4A-C Chattanooga, TN 37402-2801

SUBJECT: BROWNS FERRY NUCLEAR PLANT, UNITS 1, 2, AND 3 - ISSUANCE OF AMENDMENT NOS. 320, 343, AND 303 REGARDING THE ADOPTION OF APPROVED TECHNICAL SPECIFICATION TASK FORCE TRAVELER TSTF-568, REVISION 2 (EPID L-2021-LLA-0212)

Dear Mr. Barstow:

The U.S. Nuclear Regulatory Commission (the Commission) has issued the enclosed Amendment Nos. 320, 343, and 303 to Renewed Facility Operating License Nos. DPR-33, DPR-52, and DPR-68 for the Browns Ferry Nuclear Plant (Browns Ferry), Units 1, 2, and 3, respectively. These amendments are in response to your application dated November 19, 2021.

The amendments revise Technical Specification (TS) 3.6.2.6, "Drywell-to-Suppression Chamber Differential Pressure," and TS 3.6.3.2, "Primary Containment Oxygen Concentration," based on approved Technical Specification Task Force (TSTF) Traveler TSTF-568, Revision 2, "Revise Applicability of BWR/4 TS 3.6.2.5 and TS 3.6.3.2."

A copy of our related Safety Evaluation is also enclosed. Notice of issuance will be included in the Commission's monthly *Federal Register* notice.

If you have any questions regarding this matter, please contact me at (301) 415-0272 or by e-mail at <u>Lucas.Haeg@nrc.gov</u>.

Sincerely,

# /RA/

Luke Haeg, Project Manager Plant Licensing Branch II-2 Division of Operating Reactor Licensing Office of Nuclear Reactor Regulation

Docket Nos. 50-259; 50-260; and 50-296

Enclosures:

- 1. Amendment No. 320 to DPR-33
- 2. Amendment No. 343 to DPR-52
- 3. Amendment No. 303 to DPR-68
- 4. Safety Evaluation

cc: Listserv



#### UNITED STATES NUCLEAR REGULATORY COMMISSION WASHINGTON, D.C. 20555-0001

## TENNESSEE VALLEY AUTHORITY

## DOCKET NO. 50-259

#### BROWNS FERRY NUCLEAR PLANT, UNIT 1

#### AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 320 Renewed License No. DPR-33

- 1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment by the Tennessee Valley Authority (the licensee) dated November 19, 2021, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in Title 10 of the *Code of Federal Regulations* (10 CFR) Chapter I;
  - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
  - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
  - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
  - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

- 2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and paragraph 2.C.(2) of Facility Operating License No. DPR-33 is hereby amended to read as follows:
  - (2) <u>Technical Specifications</u>

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 320, are hereby incorporated in the renewed operating license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 30 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

David J. Wrona, Chief Plant Licensing Branch II-2 Division of Operating Reactor Licensing Office of Nuclear Reactor Regulation

Attachment: Changes to the Renewed Facility Operating License and Technical Specifications

Date of Issuance: March 16, 2022

#### ATTACHMENT TO AMENDMENT NO. 320

#### BROWNS FERRY NUCLEAR PLANT, UNIT 1

#### RENEWED FACILITY OPERATING LICENSE NO. DPR-33

#### DOCKET NO. 50-259

Replace page 3 of Renewed Facility Operating License No. DPR-33 with the attached revised page 3. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

| Remove Page | Insert Page |
|-------------|-------------|
| 3.6-38      | 3.6-38      |
| 3.6-42      | 3.6-42      |

- (3) Pursuant to the Act and 10 CFR Parts 30, 40, and 70, to receive, possess, and use at any time any byproduct, source, and special nuclear material as sealed neutron sources for reactor startup, sealed sources for reactor instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required;
- (4) Pursuant to the Act and 10 CFR Parts 30, 40, and 70, to receive, possess, and use in amounts as required any byproduct, source, or special nuclear material without restriction to chemical or physical form for sample analysis or equipment and instrument calibration or associated with radioactive apparatus or components;
- (5) Pursuant to the Act and 10 CFR Parts 30 and 70, to possess but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.
- C. This renewed operating license shall be deemed to contain and is subject to the conditions specified in the following Commission regulations in 10 CFR Chapter I: Part 20, Section 30.34 of Part 30, Section 40.41 of Part 40, Sections 50.54 and 50.59 of Part 50, and Section 70.32 of Part 70; is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:
  - (1) <u>Maximum Power Level</u>

The licensee is authorized to operate the facility at steady state reactor core power levels not in excess of 3952 megawatts thermal.

(2) <u>Technical Specifications</u>

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 320, are hereby incorporated in the renewed operating license. The licensee shall operate the facility in accordance with the Technical Specifications.

For Surveillance Requirements (SRs) that are new in Amendment 234 to Facility Operating License DPR-33, the first performance is due at the end of the first surveillance interval that begins at implementation of the Amendment 234. For SRs that existed prior to Amendment 234, including SRs with modified acceptance criteria and SRs whose frequency of performance is being extended, the first performance is due at the end of the first surveillance interval that begins on the date the surveillance was last performed prior to implementation of Amendment 234.

# 3.6 CONTAINMENT SYSTEMS

3.6.2.6 Drywell-to-Suppression Chamber Differential Pressure

LCO 3.6.2.6 The drywell pressure shall be maintained  $\ge$  1.1 psid above the pressure of the suppression chamber.

This differential may be decreased to < 1.1 psid for a maximum of 4 hours during required operability testing of the HPCI system, the RCIC system or the suppression chamber-to-drywell vacuum breakers.

# APPLICABILITY: MODE 1 with THERMAL POWER > 15% RTP.

## ACTIONS

|    | CONDITION  |     | REQUIRED ACTION                                | COMPLETION<br>TIME |
|----|--|-----|--|--------------------|
| Α. | Drywell-to-suppression<br>chamber differential<br>pressure not within limit. |     | 3.0.4.c is applicable.                         |                    |
|    |  | A.1 | Restore differential pressure to within limit. | 72 hours           |
| В. | Required Action and associated Completion Time not met.                      | B.1 | Reduce THERMAL<br>POWER to ≤ 15% RTP.          | 12 hours           |

# 3.6 CONTAINMENT SYSTEMS

- 3.6.3.2 Primary Containment Oxygen Concentration
- LCO 3.6.3.2 The primary containment oxygen concentration shall be < 4.0 volume percent.

APPLICABILITY: MODES 1 and 2.

# ACTIONS

| _  | CONDITION  | REQUIRED ACTION |   | COMPLETION<br>TIME |
|----|--|-----------------|---|--------------------|
| A. | Primary containment<br>oxygen concentration not<br>within limit. |                 | NOTE<br>3.0.4.c is applicable.                      |                    |
|    |  | A.1             | Restore oxygen<br>concentration to within<br>limit. | 72 hours           |
| B. | Required Action and associated Completion Time not met.          | B.1             | Be in MODE 3.                                       | 12 hours           |



#### UNITED STATES NUCLEAR REGULATORY COMMISSION WASHINGTON, D.C. 20555-0001

## TENNESSEE VALLEY AUTHORITY

## DOCKET NO. 50-260

#### BROWNS FERRY NUCLEAR PLANT, UNIT 2

#### AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 343 License No. DPR-52

- 1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment by Tennessee Valley Authority (the licensee) dated November 19, 2021, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
  - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
  - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
  - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
  - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

- 2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and paragraph 2.C.(2) of Renewed Facility Operating License No. DPR-52 is hereby amended to read as follows:
  - (2) <u>Technical Specifications</u>

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 343, are hereby incorporated in the renewed operating license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 30 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

David J. Wrona, Chief Plant Licensing Branch II-2 Division of Operating Reactor Licensing Office of Nuclear Reactor Regulation

Attachment: Changes to the Renewed Facility Operating License and Technical Specifications

Date of Issuance: March 16, 2022

# ATTACHMENT TO AMENDMENT NO. 343

#### BROWNS FERRY NUCLEAR PLANT, UNIT 2

### FACILITY OPERATING LICENSE NO. DPR-52

### DOCKET NO. 50-260

Replace page 3 of Renewed Facility Operating License No. DPR-52 with the attached revised page 3. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

| Remove Page | Insert Page |
|-------------|-------------|
| 3.6-38      | 3.6-38      |
| 3.6-42      | 3.6-42      |

sealed neutron sources for reactor startup, sealed sources for reactor instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required;

- (4) Pursuant to the Act and 10 CFR Parts 30, 40, and 70, to receive, possess, and use in amounts as required any byproduct, source, or special nuclear material without restriction to chemical or physical form for sample analysis or equipment and instrument calibration or associated with radioactive apparatus or components;
- (5) Pursuant to the Act and 10 CFR Parts 30 and 70, to possess but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.
- C. This renewed operating license shall be deemed to contain and is subject to the conditions specified in the following Commission regulations in 10 CFR Chapter I: Part 20, Section 30.34 of Part 30, Section 40.41 of Part 40, Sections 50.54 and 50.59 of Part 50, and Section 70.32 of Part 70; is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:
  - (1) <u>Maximum Power Level</u>

The licensee is authorized to operate the facility at steady state reactor core power levels not in excess of 3952 megawatts thermal.

(2) <u>Technical Specifications</u>

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 343, are hereby incorporated in the renewed operating license. The licensee shall operate the facility in accordance with the Technical Specifications.

For Surveillance Requirements (SRs) that are new in Amendment 253 to Facility Operating License DPR-52, the first performance is due at the end of the first surveillance interval that begins at implementation of the Amendment 253. For SRs that existed prior to Amendment 253, including SRs with modified acceptance criteria and SRs whose frequency of performance is being extended, the first performance is due at the end of the first surveillance interval that begins on the date the surveillance was last performed prior to implementation of Amendment 253.

3) The licensee is authorized to relocate certain requirements included in Appendix A and the former Appendix B to licensee-controlled documents. Implementation of this amendment shall include the relocation of these requirements to the appropriate documents, as described in the licensee's

# 3.6 CONTAINMENT SYSTEMS

3.6.2.6 Drywell-to-Suppression Chamber Differential Pressure

LCO 3.6.2.6 The drywell pressure shall be maintained  $\ge$  1.1 psid above the pressure of the suppression chamber.

This differential may be decreased to < 1.1 psid for a maximum of 4 hours during required operability testing of the HPCI system, the RCIC system or the suppression chamber-to-drywell vacuum breakers.

APPLICABILITY: MODE 1 with THERMAL POWER > 15% RTP.

# ACTIONS

| CONDITION   | REQUIRED ACTION                                    | COMPLETION<br>TIME |
|---|--|--------------------|
| A. Drywell-to-suppression<br>chamber differential<br>pressure not within limit. | NOTENOTE-LCO 3.0.4.c is applicable.                |                    |
|   | A.1 Restore differential pressure to within limit. | 72 hours           |
| B. Required Action and<br>associated Completion<br>Time not met.                | B.1 Reduce THERMAL<br>POWER to ≤ 15% RTP.          | 12 hours           |

# 3.6 CONTAINMENT SYSTEMS

- 3.6.3.2 Primary Containment Oxygen Concentration
- LCO 3.6.3.2 The primary containment oxygen concentration shall be < 4.0 volume percent.

APPLICABILITY: MODES 1 and 2.

# ACTIONS

| CONDITION   | REQUIRED ACTION   | COMPLETION<br>TIME |
|---|---|--------------------|
| A. Primary containment<br>oxygen concentration not<br>within limit. | NOTENOTE  |                    |
|   | A.1 Restore oxygen<br>concentration to within<br>limit. | 72 hours           |
| B. Required Action and<br>associated Completion<br>Time not met.    | B.1 Be in MODE 3.                                       | 12 hours           |



#### UNITED STATES NUCLEAR REGULATORY COMMISSION WASHINGTON, D.C. 20555-0001

## TENNESSEE VALLEY AUTHORITY

## DOCKET NO. 50-296

#### BROWNS FERRY NUCLEAR PLANT, UNIT 3

#### AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 303 License No. DPR-68

- 1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment by Tennessee Valley Authority (the licensee) dated November 19, 2021, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
  - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
  - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
  - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
  - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

- 2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and paragraph 2.C.(2) of Renewed Facility Operating License No. DPR-68 is hereby amended to read as follows:
  - (2) <u>Technical Specifications</u>

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 303, are hereby incorporated in the renewed operating license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 30 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

David J. Wrona, Chief Plant Licensing Branch II-2 Division of Operating Reactor Licensing Office of Nuclear Reactor Regulation

Attachment: Changes to the Renewed Facility Operating License and Technical Specifications

Date of Issuance: March 16, 2022

### ATTACHMENT TO AMENDMENT NO. 303

#### BROWNS FERRY NUCLEAR PLANT, UNIT 3

#### FACILITY OPERATING LICENSE NO. DPR-68

#### DOCKET NO. 50-296

Replace page 3 of Renewed Facility Operating License No. DPR-68 with the attached revised page 3. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

| Remove Page | Insert Page |
|-------------|-------------|
| 3.6-38      | 3.6-38      |
| 3.6-42      | 3.6-42      |

- (3) Pursuant to the Act and 10 CFR Parts 30, 40, and 70, to receive, possess, and use at any time any byproduct, source, and special nuclear material as sealed neutron sources for reactor startup, sealed sources for reactor instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required;
- (4) Pursuant to the Act and 10 CFR Parts 30, 40, and 70, to receive, possess, and use in amounts as required any byproduct, source, or special nuclear material without restriction to chemical or physical form for sample analysis or equipment and instrument calibration or associated with radioactive apparatus or components;
- (5) Pursuant to the Act and 10 CFR Parts 30 and 70, to possess but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.
- C. This renewed operating license shall be deemed to contain and is subject to the conditions specified in the following Commission regulations in 10 CFR Chapter I: Part 20, Section 30.34 of Part 30, Section 40.41 of Part 40, Sections 50.54 and 50.59 of Part 50, and Section 70.32 of Part 70; is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:
  - (1) <u>Maximum Power Level</u>

The licensee is authorized to operate the facility at steady state reactor core power levels not in excess of 3952 megawatts thermal.

(2) <u>Technical Specifications</u>

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 303, are hereby incorporated in the renewed operating license. The licensee shall operate the facility in accordance with the Technical Specifications.

For Surveillance Requirements (SRs) that are new in Amendment 212 to Facility Operating License DPR-68, the first performance is due at the end of the first surveillance interval that begins at implementation of the Amendment 212. For SRs that existed prior to Amendment 212, including SRs with modified acceptance criteria and SRs whose frequency of performance is being extended, the first performance is due at the end of the first surveillance interval that begins on the date the surveillance was last performed prior to implementation of Amendment 212.

# 3.6 CONTAINMENT SYSTEMS

3.6.2.6 Drywell-to-Suppression Chamber Differential Pressure

LCO 3.6.2.6 The drywell pressure shall be maintained  $\ge$  1.1 psid above the pressure of the suppression chamber.

This differential may be decreased to < 1.1 psid for a maximum of 4 hours during required operability testing of the HPCI system, the RCIC system or the suppression chamber-to-drywell vacuum breakers.

APPLICABILITY: MODE 1 with THERMAL POWER > 15% RTP.

# ACTIONS

|    | CONDITION  |     | REQUIRED ACTION                                | COMPLETION<br>TIME |
|----|--|-----|--|--------------------|
| A. | Drywell-to-suppression<br>chamber differential<br>pressure not within limit. |     | NOTE<br>3.0.4.c is applicable.                 |                    |
| _  |  | A.1 | Restore differential pressure to within limit. | 72 hours           |
| В. | Required Action and associated Completion Time not met.                      | B.1 | Reduce THERMAL<br>POWER to ≤ 15% RTP.          | 12 hours           |

# 3.6 CONTAINMENT SYSTEMS

- 3.6.3.2 Primary Containment Oxygen Concentration
- LCO 3.6.3.2 The primary containment oxygen concentration shall be < 4.0 volume percent.

APPLICABILITY: MODES 1 and 2.

#### ACTIONS

|    | CONDITION  |     | REQUIRED ACTION                                     | COMPLETION<br>TIME |
|----|--|-----|---|--------------------|
| Α. | Primary containment<br>oxygen concentration not<br>within limit. |     | 3.0.4.c is applicable.                              |                    |
|    |  | A.1 | Restore oxygen<br>concentration to within<br>limit. | 72 hours           |
| В. | Required Action and associated Completion Time not met.          | B.1 | Be in MODE 3.                                       | 12 hours           |



#### UNITED STATES NUCLEAR REGULATORY COMMISSION WASHINGTON, D.C. 20555-0001

## SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

#### RELATED TO AMENDMENT NOS. 320, 343, AND 303

#### TO RENEWED FACILITY OPERATING LICENSE NOS. DPR-33, DPR-52, AND DPR-68

#### TENNESSEE VALLEY AUTHORITY

#### BROWNS FERRY NUCLEAR PLANT, UNITS 1, 2, AND 3

#### DOCKET NOS. 50-259, 50-260, AND 50-296

#### 1.0 INTRODUCTION

By application dated November 19, 2021 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML21323A125), the Tennessee Valley Authority (TVA, the licensee) submitted a license amendment request (LAR) for Browns Ferry Nuclear Plant, Units 1, 2, and 3 (Browns Ferry).

The proposed changes would revise Technical Specification (TS) 3.6.2.6, "Drywell-to-Suppression Chamber Differential Pressure," and TS 3.6.3.2, "Primary Containment Oxygen Concentration." The proposed changes simplify and clarify the applicability statements, which if misapplied, could conflict with the corresponding required actions. The proposed changes also remove the undefined term "scheduled plant shutdown" and provide adequate terminal actions.

The proposed amendment is based on approved Technical Specifications Task Force (TSTF) Traveler TSTF-568, Revision 2, "Revise Applicability of BWR/4 TS 3.6.2.5 and TS 3.6.3.2" (ADAMS Accession No. ML19141A122). The U.S. Nuclear Regulatory Commission (NRC or the Commission) approved TSTF-568, Revision 2, by letter dated December 17, 2019 (ADAMS Package Accession No. ML19325C444). The NRC staff's safety evaluation (SE) of the traveler was enclosed with the NRC staff's approval letter.

The licensee is not proposing any variations from the TS changes described in TSTF-568, Revision 2, or the applicable parts of the NRC staff's SE of TSTF-568, Revision 2. The Browns Ferry TS 3.6.2.6 correlates to the Standard Technical Specification (STS) 3.6.2.5 described in Traveler TSTF-568, Revision 2.

Throughout the LAR, the licensee referred to TSTF-568-A as a basis for the requested amendment. The NRC staff notes that the "-A" designation added to TSTF-568 is an industry convention used to indicate that the traveler has been approved by the NRC. TSTF-568 and TSTF-568-A are the same document; however, since TSTF-568-A is not an NRC designation, this SE refers to the TSTF Traveler as TSTF-568.

## 2.0 REGULATORY EVALUATION

#### 2.1 <u>Description of Structures, Systems, Components, and TS Sections</u>

#### 2.1.1 Current Drywell-to-Suppression Chamber Differential Pressure Control

The drywell-to-suppression chamber differential pressure control is a safety-related operational feature of Mark I containment designs. The TS 3.6.2.6 requires a minimum differential pressure of 1.1 pounds per square inch differential (psid) to reduce the loss-of-coolant accident (LOCA) hydrodynamic loads during the Mark I containment load definition short- and long-term programs.<sup>1</sup> The LOCA pool swell loads are significantly reduced because the differential pressure control reduces the length of water leg in the downcomer. The LOCA vent clearing and pool swell due to bubble formation would occur earlier (i.e., at a lower drywell pressure resulting in lesser forces on the suppression chamber thereby increasing the safety margin for containment integrity, containment internal structures, and pressure boundary). Decreasing the allowable suppression chamber water level has a similar effect.

It is difficult to control the differential pressure during startup and shutdown transients. This is because of the variation of the drywell heat loads from the primary and auxiliary systems and because the inerting (during startup) or the de-inerting (during shutdown) of containment. Inerting the containment during startup involves the addition of large volumes of nitrogen. De-inerting containment during shutdown involves the addition of large volumes of air. In order to allow operation during the time differential pressure control is difficult, the current TS 3.6.2.6 is applicable from 24 hours following startup after the thermal power exceeds 15 percent rated thermal power (RTP) to 24 hours prior to reducing thermal power less than 15 percent RTP prior to the next scheduled reactor shutdown.

#### 2.1.2 Current Containment Oxygen Concentration Requirement

The regulation at Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.44, "Combustible gas control for nuclear power reactors," states that for a plant with an inerted containment atmosphere, the oxygen concentration in the primary containment is required to be maintained below 4.0 percent by volume during normal plant operation. This requirement ensures that an accident that produces hydrogen does not result in a combustible mixture inside the primary containment. The current TS 3.6.3.2 requires primary containment oxygen concentration to be less than 4.0 percent by volume when in Mode 1 during the period from 24 hours after thermal power exceeds 15 percent RTP following startup to 24 hours prior to reducing thermal power to less than 15 percent RTP prior to the next scheduled reactor shutdown. TSTF-568, Revision 2, stated that the 24 hour allowance above 15 percent RTP is provided in the primary containment oxygen concentration specification to delay inerting the primary containment in a plant startup and to accelerate de-inerting for a plant shutdown. This allowance is provided so that plant personnel can safely enter the primary containment without breathing apparatus to perform needed inspections and maintenance adjustments.

The containment consists of a drywell (in the shape of an inverted light bulb), a suppression chamber (in the shape of a toroid), and a network of vents which extend radially outward and downward from the drywell to the suppression chamber. The containment atmosphere is

<sup>&</sup>lt;sup>1</sup> U.S. Nuclear Regulatory Commission, NUREG-0661, "Safety Evaluation Report Mark I Containment Long-term Program Resolution of Generic Technical Activity A-7," July 1980 (ADAMS Accession No. ML072710452).

inerted with nitrogen gas during normal operation to prevent a combustible mixture of hydrogen and oxygen from forming during accident conditions. Long-term control of post-LOCA hydrogen gas concentration is accomplished by adding additional nitrogen gas and then venting the primary containment through the standby gas treatment system.

## 2.1.3 Pressure Suppression Following a LOCA

The drywell is immediately pressurized when a postulated line break occurs within the primary containment. As drywell pressure increases, drywell atmosphere (primarily nitrogen gas) and steam are blown down through the vents into the suppression pool via the downcomers. The steam condenses in the suppression pool which suppresses the peak pressure in the drywell. Non-condensable gases discharged into the suppression pool collect in the free air volume of the suppression chamber, increasing the suppression chamber pressure. As steam is condensed in the suppression pool and on the structures in the drywell, the pressure decreases until the suppression chamber pressure exceeds the drywell pressure and the suppression chamber-drywell vacuum breakers open and vent non-condensable gases back into the drywell.

## 2.1.4 TS 3.6.2.6, "Drywell-to-Suppression Chamber Differential Pressure"

A drywell-to-suppression chamber differential pressure limit is required to ensure the containment conditions assumed in the safety analyses are met. Failure to maintain the required differential pressure could result in excessive forces on the suppression chamber due to higher water clearing loads from downcomer vents and higher-pressure buildup in the drywell during a LOCA. Drywell-to-suppression chamber differential pressure must be controlled when the primary containment is inert. The TS requires that the drywell pressure be maintained  $\geq$  1.1 psid above the pressure of the suppression chamber.

#### 2.1.5 TS 3.6.3.2, "Primary Containment Oxygen Concentration"

The primary containment oxygen concentration is maintained to ensure that a LOCA, a postulated event that produces hydrogen, does not result in a combustible mixture inside primary containment. The TS requires that the primary containment oxygen concentration be maintained below 4.0 volume percent. Below this concentration, the primary containment is inerted and no combustion can occur.

#### 2.2 <u>Description of Proposed Technical Specification Changes</u>

2.2.1 Proposed Changes to TS 3.6.2.6, "Drywell-to-Suppression Chamber Differential Pressure"

The Applicability of TS 3.6.2.6, "Drywell-to-Suppression Chamber Differential Pressure," is revised as shown below.

| Current TS Applicability   | Proposed TS Applicability               |
|--|---|
| MODE 1 during the time period:<br>a. From 24 hours after THERMAL POWER<br>is > 15% RTP following startup, to                           | MODE 1 with THERMAL POWER > 15%<br>RTP. |
| <ul> <li>b. 24 hours prior to reducing THERMAL</li> <li>POWER to &lt; 15% RTP prior to the next scheduled reactor shutdown.</li> </ul> |   |

Required Action A.1 and the completion time (CT) are revised as shown below.

#### ACTIONS

| CONDITION   | REQUIRED ACTION |  | COMPLETION TIME       |
|---|-----------------|--|-----------------------|
| A. Drywell-to-suppression<br>chamber differential | A.1             | NOTE<br>LCO 3.0.4.c is applicable.             | 72 <del>8</del> hours |
| pressure not within himit.                        |                 | Restore differential pressure to within limit. |                       |

The NRC staff understands the overall purpose of the proposed changes is to simplify the applicability statement by adding a new note and revising the CT. This change provides similar operational flexibility but more closely follows established TS conventions.

2.2.2 Proposed Changes to TS 3.6.3.2, "Primary Containment Oxygen Concentration"

The Applicability of TS 3.6.3.2, "Primary Containment Oxygen Concentration," would be revised as shown below.

| Current TS Applicability  | Proposed TS Applicability |
|---|---------------------------|
| <ul> <li>MODE 1 during the time period:</li> <li>c. From 24 hours after THERMAL POWER<br/>is &gt; 15% RTP following startup, to</li> <li>d. 24 hours prior to reducing THERMAL<br/>POWER to &lt; 15% RTP prior to the next<br/>scheduled reactor shutdown.</li> </ul> | MODES 1 and 2.            |

Required Actions A.1 and B.1 and their associated CTs are revised as shown below.

#### ACTIONS

|   | CONDITION  |     | REQUIRED ACTION   | COMPLETION TIME         |
|---|--|-----|---|-------------------------|
| A. Pr   | Primary containment<br>oxygen concentration<br>not within limit. | A.1 | NOTE<br>LCO 3.0.4.c is applicable.  | 72 <del>24 h</del> ours |
| The second se |  |     | Restore oxygen concentration to within limit.   |                         |
| B. Ro<br>as<br>Ti   | equired Action and<br>ssociated Completion<br>ime not met.       | B.1 | Be in MODE 3 <del>Reduce</del><br><del>THERMAL POWER to</del><br><del>≤ [15]% RTP</del> . | 128 hours               |

The NRC staff understands the overall purpose of the proposed changes is to simplify the applicability statement by adding a new note and revising the CT. This change provides operational flexibility but more closely follows established TS conventions and requires that the plant be in Mode 3 if oxygen concentration cannot be restored to within limits.

#### 2.3 Applicable Regulatory Requirements and Guidance

Section 50.90 of 10 CFR, "Application for amendment of license, construction permit, or early site permit," requires that whenever a licensee desires to amend the license, application for an amendment must be filed with the Commission fully describing the changes desired, and following as far as applicable, the form prescribed for original applications.

Under 10 CFR 50.92(a), determinations on whether to grant an applied-for license amendment are to be guided by the considerations that govern the issuance of initial licenses or construction permits to the extent applicable and appropriate. Both the common standards for licenses and construction permits in 10 CFR 50.40(a), and those specifically for issuance of operating licenses in 10 CFR 50.57(a)(3), provide that there must be "reasonable assurance" that the activities at issue will not endanger the health and safety of the public.

The regulation, 10 CFR 50.36, "Technical specifications," establishes the regulatory requirements related to the content of TSs. Section 50.36(a)(1) requires an application for an operating license to include proposed TSs. A summary statement of the bases or reasons for such specifications, other than those covering administrative controls, must also be included in the application, but shall not become part of the TSs.

The regulation, 10 CFR 50.36(b), requires:

Each license authorizing operation of a ...utilization facility ...will include technical specifications. The technical specifications will be derived from the analyses and evaluation included in the safety analysis report, and amendments thereto, submitted pursuant to [10 CFR] 50.34 ["Contents of applications;

technical information"]. The Commission may include such additional technical specifications as the Commission finds appropriate.

The categories of items required to be in the TS are listed in 10 CFR 50.36(c).

In accordance with 10 CFR 50.36(c)(2), limiting conditions for operation (LCOs) are the lowest functional capability or performance levels of equipment required for safe operation of the facility. When LCOs are not met, the licensee must shut down the reactor or follow any remedial action permitted by the TSs until the condition can be met. In addition, 10 CFR 50.36(c)(2)(ii)(B) requires a TS LCO of a nuclear reactor must be established for a process variable, design feature, or operating restriction that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

The regulation, 10 CFR 50.44(b)(2)(i), states that "All boiling water reactors with Mark I or Mark II type containments must have an inerted atmosphere." Section 50.44(a)(1) defines "[i]nerted atmosphere" as a containment atmosphere with less than 4 percent of oxygen by volume.

Chapter 6.2.1.1.C, Revision 7, "Pressure-Suppression Type BWR Containments" of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR [Light-Water Reactor] Edition" (SRP), dated March 2007 (ADAMS Accession No. ML063600403) states: "The acceptability of LOCA pool dynamic loads for plants with Mark I containments is based on conformance with NRC acceptance criteria found in NUREG-0661."

The NRC staff's guidance for the review of TSs is in Chapter 16.0, Revision 3, "Technical Specifications," of the SRP, March 2010 (ADAMS Accession No. ML100351425). As described therein, as part of the regulatory standardization effort, the NRC staff has prepared STS for each of the LWR nuclear designs. Accordingly, the NRC staff's review includes consideration of whether the proposed changes are consistent with the applicable reference STS (i.e., the current STS), as modified by NRC-approved travelers. The STS applicable to Browns Ferry is Revision 5.0 to NUREG-1433.<sup>2</sup>

# 3.0 TECHNICAL EVALUATION

The proposed amendments are based on the NRC-approved TSTF-568, Revision 2. The NRC staff also considered the regulations and guidance discussed in Section 2.3 of this SE in its review.

# 3.1 PROPOSED CHANGES TO TS 3.6.2.6

#### 3.1.1 Proposed Changes in the Applicability

The licensee proposed to delete the time periods, dependent on startup and shutdown times, from the applicability section and to replace them with a thermal power value. These time periods are "a. From 24 hours after THERMAL POWER is > 15 percent RTP following startup,"

<sup>&</sup>lt;sup>2</sup> U.S. Nuclear Regulatory Commission, "Standard Technical Specifications, General Electric BWR/4 Plants," NUREG-1433, Volume 1, "Specifications," and Volume 2, "Bases," Revision 5.0, September 2021 (ADAMS Accession Nos. ML21272A357 and ML21272A358, respectively).

to b. "24 hours prior to reducing THERMAL POWER to < 15 percent RTP prior to the next scheduled reactor shutdown." These time periods would be replaced by flexibilities and requirements in the revised completion times and the inserted note referencing LCO 3.0.4.c. This would result in requiring the drywell pressure during Mode 1 to be maintained above the specified limit whenever the thermal power is above 15 percent. The current limitations of applicability, dependent on startup and shutdown, were established to allow licensees operational flexibilities, such as containment entry to perform maintenance and surveillances while at power.

In TSTF-568, Revision 2, Attachment, General Electric (GE) Safety Communication (SC) 02-10, page 4, under the heading "Corrective/Preventive Actions," item 2, it is recommended that Mark I plants that use TS 3.6.2.5 should "confirm that their containment is structurally designed for pool swell loads with a zero drywell-to-suppression chamber differential pressure." For these plants, the Mark I containment load definition program has defined the pool swell loads associated with zero drywell-to-suppression chamber differential pressure. NUREG-0661, Appendix A, Section 2.3, states that each plant with a differential pressure control (i.e., TS 3.6.2.5) perform a structural assessment to demonstrate that the containment can maintain its functional capability when the differential pressure control is out-of-service (i.e., the differential pressure is zero).

Browns Ferry, Units 1, 2, and 3 are applying the drywell-to-suppression chamber differential pressure control TS 3.6.2.6. The licensee's plant-specific analysis report called PUAR [Plant Unique Analysis Report] was approved by the NRC.<sup>3</sup> As stated in SC 02-10, page 3, structural assessment based on zero drywell-to-suppression chamber differential pressure pool swell load definition was used to confirm the functional capability of the suppression chamber against the Service Level D limit. The SC 02-10 also identifies the following two major conservatisms in the pool swell load definitions based on the Mark I Quarter Scale tests:

(a) The drywell pressurization test transient was based on the predicted drywell pressure from the NRC-approved conservative GE code M3CPT. This code predicts about 50 percent higher drywell pressurization than a realistic analysis using the GE-Hitachi code TRACG.

(b) The break was simulated by air to pressurize the drywell, which produces a more severe pool swell response than a realistic nitrogen/steam mixture and enhances the bubble growth.

The NRC approval confirmed that the licensee met the acceptance criteria specified in NUREG-0661, Appendix A, and reviewed and approved any exceptions the licensee took from the acceptance criteria. Therefore, the NRC staff approval of the PUAR confirmed that with the drywell-to-suppression chamber differential pressure out-of-service, the containment is structurally designed for the pool swell loads during a large-break LOCA.

Based on the PUAR, the NRC staff finds it acceptable for the reactor to not be depressurized when the differential pressure is out-of-service at  $\leq$  15 percent RTP. Further NUREG-0661, Section 3.12.7, concluded that if the differential pressure is out-of-service, the probability of occurrence of a large-break LOCA, is less than 10E-7 per reactor-year, which is sufficiently small. This minimal probability of occurrence paired with the short period during which plants are in the transition state of less than 15 percent RTP, support the adequacy of this change

<sup>&</sup>lt;sup>3</sup> Vassallo, Domenic B., U.S. Nuclear Regulatory Commission, letter to Hugh G. Parris, Tennessee Valley Authority, "Mark I Containment Long-Term Program, Re: Browns Ferry Nuclear Plant, Units 1, 2, and 3," dated May 6, 1985 (ADAMS Package Accession No. ML18029A537).

because the LOCA dynamic loads are not adversely affected. The NRC staff determined the proposed deletion of the time periods is acceptable because they are now included in the note insertion (discussed in Section 3.1.2 of this SE) and change in the CT (discussed in Section 3.1.3 of this SE). In addition, the proposed change is acceptable since it simplifies and clarifies the applicability statement and continues to provide the lowest functional capability of equipment required for safe operation of the facility as required by 10 CFR 50.36(c)(2) by protecting containment integrity.

3.1.2 Proposed Changes in Required Action A.1

In accordance with approved Traveler TSTF-568, Revision 2, the licensee proposed to add the following note to Required Action A.1: "LCO 3.0.4.c is applicable." LCO 3.0.4 states:

When an LCO is not met, entry into a MODE or other specified condition in the Applicability shall only be made:

- a. When the associated ACTIONS to be entered permit continued operation in the MODE or other specified condition in the Applicability for an unlimited period of time;
- b. After performance of a risk assessment addressing inoperable systems and components, consideration of the results, determination of the acceptability of entering the MODE or other specified condition in the Applicability, and establishment of risk management actions, if appropriate; exceptions to this Specification are stated in the individual Specifications, or
- c. When an allowance is stated in the individual value, parameter, or other Specification.

This Specification shall not prevent changes in MODES or other specified conditions in the Applicability that are required to comply with ACTIONS or that are part of a shutdown of the unit.

The criteria applicable to TS LCO 3.6.2.6 is LCO 3.0.4.c since this LCO establishes an individual value or parameter (i.e., drywell pressure maintained above a certain value). The new note will allow entry into the mode of applicability of TS LCO 3.6.2.6 with the drywell pressure outside of the required limit. This note allows the licensee operational flexibility as it permits entry into Mode 1 at greater than 15 percent RTP when drywell pressure is outside of the required limit during startup configurations. The NRC staff concludes that the addition of the note is acceptable because it clarifies and simplifies the intent of the current TS LCO 3.6.2.6 applicability statement "a." of allowing startup operation with the LCO not met.

#### 3.1.3 Proposed Changes in the CT of Condition A

In accordance with approved Traveler TSTF-568, Revision 2, the licensee proposed to change the CT for Required Action A.1 from 8 hours to 72 hours. TSTF-568, Revision 2, stated the proposed change will permit safe entry of personnel into the containment in Modes 1 and 2. The 72 hours provides: 24 hours to de-inert the containment to permit safe personnel access, 24 hours to perform the required work, and 24 hours to re-inert containment. The NRC staff finds that the extended CT incorporates the time currently allowed through the applicability

statement in Section 3.1.1 of this SE. The NRC staff finds that 72 hours is reasonable to conduct these activities based on operating experience and the requested completion time does not present a significant change in risk given the low probability that a large line break would occur during this period. Therefore, NRC staff finds this change acceptable.

## 3.1.4 Conclusion for Proposed Changes to TS 3.6.2.6

The NRC staff finds the changes proposed in TS 3.6.2.6 acceptable and continue to meet 10 CFR 50.36(c)(2) since the revised LCO provides the lowest functional capability of equipment required for safe operation of the facility by protecting containment integrity.

## 3.2 PROPOSED CHANGES TO TS 3.6.3.2

3.2.1 Proposed Changes in the Applicability

In accordance with approved Traveler TSTF-568, Revision 2, the licensee proposed to expand the applicability of this LCO to Modes 1 and 2 without exception. The NRC staff finds the proposed change acceptable because it is more restrictive since an unlikely LOCA event leading to a degraded core that could produce hydrogen has the highest probability of occurrence during Modes 1 and 2 conditions.

## 3.2.2 Proposed Changes in Required Action A.1

In accordance with approved Traveler TSTF-568, Revision 2, the licensee proposed to add the following note to Required Action A.1: "LCO 3.0.4.c is applicable." As stated in Section 3.1.2 of this SE, TS LCO 3.0.4.c allows entering the mode of applicability of TS LCO 3.6.3.2 with the LCO not met. Therefore, the proposed change would permit entry into Modes 1 and 2 with primary containment oxygen concentration higher than the required limit. The NRC staff concludes the addition of the note is acceptable because it clarifies and simplifies the intent of the current TS LCO 3.6.3.2 applicability statement "a." of allowing startup operation with the LCO not met.

#### 3.2.3 Proposed Changes in the CT of Condition A

In accordance with approved Traveler TSTF-568, Revision 2, the licensee proposed changing the CT from 24 hours to 72 hours based on the following sequence of operations: allow 24 hours to de-inert the containment to permit safe personnel access, allow 24 hours to perform the required maintenance or repair work, and allow 24 hours to inert the containment. The NRC staff determined that the presence of a higher oxygen concentration for the 72-hour CT is appropriate considering the low safety significance of the change for potential accidents and the additional restrictions and conservatisms in the revised applicability.

#### 3.2.4 Proposed Changes in Required Action B.1

In accordance with approved Traveler TSTF-568, Revision 2, the licensee proposed to change the applicability statement of TS LCO 3.6.3.2 to Modes 1 and 2. If the oxygen concentration cannot be restored within the required limit and CT of Required Action A.1, the reactor should

be brought to Mode 3. In this mode, the reactor would be in a hot shutdown condition (control rods fully inserted) with all reactor vessel head bolts fully tensioned.

The NRC staff recognizes that on entering Mode 3, the decay heat is rapidly decreasing. Steam is initially available for operating the reactor core isolation cooling/high pressure coolant injection steam turbine-driven pumps until the reactor pressure and thus water temperature is substantially reduced. As the decay heat continues to decrease, operators have increased time and options for achieving adequate water injection using the low-pressure emergency core cooling system to avoid core damage and associated generation of combustible gas. Therefore, the occurrence of a LOCA leading to degraded core is highly unlikely in Mode 3.

The NRC staff finds the proposed change in Required Action B.1 acceptable because it provides a more appropriate terminal action since it requires the plant to be placed in a mode in which the LCO does not apply and the oxygen concentration limit is no longer required. The previous terminal action allowed an indefinite period of operation at  $\leq$  15 percent RTP.

Due to the low potential for hydrogen generation when the reactor is in Mode 3, inerting of containment in Mode 3 is not needed. Therefore, the NRC staff concluded the proposed change is acceptable because it continues to protect containment integrity and meets 10 CFR 50.36(c)(2) by providing the lowest functional capability of equipment required for safe operation of the plant.

## 3.2.5 Proposed Changes in the CT of Condition B

In accordance with approved Traveler TSTF-568, Revision 2, the licensee proposed to change the Condition B CT from 8 hours to 12 hours, stating that 12 hours is a reasonable time to reduce reactor power from full power conditions to Mode 3 in an orderly manner and without challenging plant systems. The proposed change from 8 hours to 12 hours for bringing the reactor to a hot shutdown condition from full power is acceptable to NRC staff because it is not a significant change and is based on industry operating experience.

#### 3.2.6 Conclusion for Proposed Changes to TS 3.6.3.2

The NRC staff concludes the proposed changes in the applicability statement for TS 3.6.3.2 are acceptable since they are more restrictive as the applicability now extends to Modes 1 and 2 without exception. In addition, the occurrence of a LOCA that could lead to degraded core conditions with containment de-inerted, while in Mode 3, is unlikely. Therefore, the changes proposed in TS 3.6.3.2 are acceptable and continue to meet 10 CFR 50.36(c)(2).

# 4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Alabama State official was notified of the proposed issuance of the amendment on January 12, 2022. The State official had no comments.

# 5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes requirements with respect to the installation or use of facility components located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no

significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, which was published in the *Federal Register* on December 28, 2021 (86 FR 73815), and there has been no public comment on such finding. Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

# 6.0 <u>CONCLUSION</u>

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) there is reasonable assurance that 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.

Principal Contributors: L. Haeg, NRR/DORL/LPL2-2 C. Ashley, NRR/DSS/STSB

Date: March 16, 2022

#### J. Barstow

SUBJECT: BROWNS FERRY NUCLEAR PLANT, UNITS 1, 2, AND 3 - ISSUANCE OF AMENDMENT NOS. 320, 343, AND 303 REGARDING THE ADOPTION OF APPROVED TECHNICAL SPECIFICATION TASK FORCE TRAVELER TSTF-568, REVISION 2 (EPID L-2021-LLA-0212) DATED MARCH 16, 2022

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