Tennessee Valley Authority, Post Office Box 2000, Decatur, Alabama 35609-2000

April 24, 2009

TVA-BFN-TS-464

10 CFR 50.90

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Stop: OWFN P1-35
Washington, D.C. 20555-0001

In the Matter of	)	Docket Nos. 50-259
Tennessee Valley Authority	)	50-260
		50-296

BROWNS FERRY NUCLEAR PLANT (BFN) - UNITS 1, 2, AND 3 - TECHNICAL SPECIFICATIONS (TS) CHANGE 464 - APPLICATION FOR TECHNICAL SPECIFICATION IMPROVEMENT TO ADOPT TECHNICAL SPECIFICATION TASK FORCE (TSTF) TSTF-476, REVISION 1, "IMPROVED BPWS CONTROL ROD INSERTION PROCESS (NEDO-33091)"

Pursuant to 10 CFR 50.90, TVA is submitting a request for a TS change (TS-464) to licenses DPR-33, DPR-52, and DPR-68 for BFN Units 1, 2, and 3, respectively.

The proposed changes would revise TS Bases sections 3.1.6, "Rod Pattern Control," and 3.3.2.1, "Control Rod Block Instrumentation," to allow BFN to reference a new Banked Position Withdrawal Sequence (BPWS) shutdown sequence in the TS Bases. In addition, a footnote is added to TS Table 3.3.2.1-1, "Control Rod Block Instrumentation."

The changes are consistent with NRC approved Industry TSTF Standard Technical Specification Change Traveler, TSTF-476, Revision 1, "Improved BPWS Control Rod Insertion Process (NEDO-33091)." The availability of this TS improvement was announced in the Federal Register on May 23, 2007 (72 FR 29004) as part of the consolidated line item improvement process (CLIIP).

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Enclosure 1 provides a description and assessment of the proposed changes as well as confirmation of applicability. Enclosure 2 provides the existing TS pages marked-up to show the proposed changes. Enclosure 3 provides the existing TS Bases pages marked-up to show the proposed changes. Enclosure 4 provides a summary of the regulatory commitments made in this submittal.

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). Additionally, in accordance with 10 CFR 50.91(b)(1), TVA is sending a copy of this application and enclosures to the Alabama State Department of Public Health.

TVA requests approval of the proposed license amendment by October 1, 2009, with the amendment being implemented within 60 days of NRC approval.

If you have any questions about this TS change, please contact Russ Godwin at (256)729-2636.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 24th day, April 2009.

Sincerely,

R. G. West
Site Vice President

Enclosures:
1. Description and Assessment
2. Proposed TS Changes (mark-ups)
3. Proposed Changes to TS Bases Pages (mark-ups)
4. Regulatory Commitments

Enclosures
cc (Enclosures):

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ENCLOSURE 1

Browns Ferry Nuclear Plant
Units 1, 2, and 3

Technical Specifications Change 464

Application for Technical Specification Improvement to Adopt TSTF-476, Revision 1, "Improved BPWS Control Rod Insertion Process (NEDO-33091)"

Description and Assessment

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1. DESCRIPTION

This letter is a request to amend Operating Licenses DPR-33, DPR-52, and DPR-68 for BFN Units 1, 2, and 3, respectively.

The proposed changes would revise the Bases sections of TS 3.1.6, "Rod Pattern Control," and 3.3.2.1, "Control Rod Block Instrumentation," along with TS Table 3.3.2.1-1, "Control Rod Block Instrumentation," to allow reference to an improved, optional BPWS for use during reactor shutdown.

The new BPWS is described in Topical Report NEDO-33091-A, Revision 2, "Improved BPWS Control Rod Insertion Process," dated July 2004, and approved by the NRC by Safety Evaluation (SE) dated June 16, 2004 (ADAMS ML041700479). Technical Specification Task Force (TSTF) change traveler TSTF-476, Revision 1, "Improved BPWS Control Rod Insertion Process (NEDO-33091)" was announced for availability in the Federal Register on May 23, 2007 as part of the consolidated line item improvement process (CLIIP).

2. PROPOSED CHANGES

Consistent with NRC-approved TSTF-476, Revision 1, the proposed TS and Bases changes include:

- Revised TS Section 3.1.6 Bases to allow use of an optional BPWS during plant shutdown
- Revised TS Section 3.3.2.1 Bases to allow reprogramming of the rod worth minimizer during the optional BPWS shutdown sequence
- Revised TS Table 3.3.2.1-1, "Control Rod Block Instrumentation," which adds a footnote that allows operators to bypass the rod worth minimizer if conditions for the optional BPWS shutdown process are satisfied

3. BACKGROUND

The background for this application is as stated in the model SE in NRC's Notice of Availability published on May 23, 2007 (72 FR 29004), the NRC Notice for Comment published on May 3, 2006 (71 FR 26118), and TSTF-476, Revision 1.

4. TECHNICAL ANALYSIS

TVA has reviewed NEDO-33091-A, Revision 2, and the staff's SE dated June 16, 2004 (ML041700470), as well as TSTF-476, Revision 1, and the model SE published on May 23, 2007 (72 FR 29004) as part of the CLIIP Notice for Comment. TVA has applied the methodology in NEDO-33091-A, Revision 2 to develop the proposed TS changes. TVA has also concluded that the justifications presented in TSTF-476, Revision 1 and the model SE prepared by the NRC staff are applicable to BFN Units 1, 2, and 3, and justify this amendment for the incorporation of the changes to the BFN TS.

5. REGULATORY ANALYSIS

A description of this proposed change and its relationship to applicable regulatory requirements and guidance was provided in the NRC Notice of Availability published on May 23, 2007 (72 FR 29004), the NRC Notice for Comment published on May 3, 2006 (71 FR 26118), and TSTF-476, Revision 1.

5.1. Regulatory Commitments

As discussed in the model SE published in the Federal Register on May 23, 2007 for this TS improvement, the following plant-specific verification/commitments were performed. The SE for NEDO-33091-A explained that the potential for a control rod drop accident (CRDA) will be eliminated by the following changes to the operational procedures, which BFN has committed to make prior to implementation:

1. Before reducing power to the low power setpoint (LPSP), operators shall confirm control rod coupling integrity for all rods that are fully withdrawn. Control rods that have not been confirmed coupled and which are in intermediate positions must be fully inserted prior to power reduction to the LPSP. No action is required for fully-inserted control rods.

If a shutdown is required and all rods, which are not confirmed coupled, cannot be fully inserted prior to the power dropping below the LPSP, then the original/standard BPWS must be adhered to. The original/standard BPWS can be found in Licensing Topical Report (LTR) NEDO-21231, "Banked Position Withdrawal Sequence," January 1977, and is referred to in NUREG-1433 and NUREG-1434.

2. After reactor power drops below the LPSP, rods may be inserted from notch position 48 to notch position 00 without stopping at intermediate positions. However, GE Nuclear Energy recommends that operators insert rods in the same order as specified for the original/standard BPWS as much as is reasonably possible. If a plant is in the process of shutting down following improved BPWS with the power below the LPSP, no control rod shall be withdrawn unless the control rod pattern is in compliance with standard BPWS requirements.

In addition to the procedure changes specified above, the staff previously concluded, based on its review of NEDO-33091-A, that no single failure of the boiling water reactor control rod drive (CRD) mechanical or hydraulic system can cause a control rod to drop completely out of the reactor core during the shutdown process. Therefore, the proper use of the improved BPWS will prevent a CRDA from occurring while power is below the LPSP. TVA has verified, in accordance with NEDO-33091-A, Revision 2, that no single

failure of the boiling water reactor CRD mechanical or hydraulic system can cause a control rod drop completely out of the reactor core during the shutdown process.

6. NO SIGNIFICANT HAZARDS CONSIDERATION

TVA has reviewed the proposed no significant hazards consideration determination published on May 23, 2007 (72 FR 29004) as part of the CLIIP. TVA has concluded that the proposed 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).

7. ENVIRONMENTAL EVALUATION

TVA has reviewed the environmental consideration included in the model SE published on May 23, 2007 (72 FR 29004) as part of the CLIIP. TVA has concluded that the staff's findings presented therein are applicable to BFN Units 1, 2, and 3 and the determination is hereby incorporated by reference for this application.

8. REFERENCES

8.1. Federal Register Notices:

8.1.1. Notice for Comment published on May 3, 2006 (71 FR 26118)

8.1.2. Notice of Availability published on May 23, 2007 (72 FR 29004) and a correction to it published on May 30, 2007 (72 FR 30043)

ENCLOSURE 2

Browns Ferry Nuclear Plant
Units 1, 2, and 3

Technical Specifications Change 464

Application for Technical Specification Improvement to Adopt TSTF-476, Revision 1, "Improved BPWS Control Rod Insertion Process (NEDO-33091)"

Proposed TS Changes (mark-ups)

Table 3.3.2.1-1 (page 1 of 1)
Control Rod Block Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Rod Block Monitor				
a. Low Power Range - Upscale	(a)	2	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.8	(e)
b. Intermediate Power Range - Upscale	(b)	2	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.8	(e)
c. High Power Range - Upscale	(f),(g)	2	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.8	(e)
d. Inop	(g),(h)	2	SR 3.3.2.1.1	NA
e. Downscale	(g),(h)	2	SR 3.3.2.1.1 SR 3.3.2.1.4	(i)
2. Rod Worth Minimizer	1(c), 2(c)	1	SR 3.3.2.1.2 SR 3.3.2.1.3 SR 3.3.2.1.5 SR 3.3.2.1.7	NA
3. Reactor Mode Switch — Shutdown Position	(d)	2	SR 3.3.2.1.6	NA

(a) THERMAL POWER ≥ 27% and ≤ 62% RTP and MCPR less than the value specified in the COLR.

(b) THERMAL POWER > 62% and ≤ 82% RTP and MCPR less than the value specified in the COLR.

(c) With THERMAL POWER ≤ 10% RTP.

INSERT
, except during the reactor shutdown process if the coupling of each withdrawn control rod has been confirmed

(d) Reactor mode switch in the shutdown position.

(e) Less than or equal to the Allowable Value specified in the COLR.

(f) THERMAL POWER > 82% and < 90% RTP and MCPR less than the value specified in the COLR.

(g) THERMAL POWER ≥ 90% RTP and MCPR less than the value specified in the COLR.

(h) THERMAL POWER ≥ 27% and < 90% RTP and MCPR less than the value specified in the COLR.

(i) Greater than or equal to the Allowable Value specified in the COLR.

Table 3.3.2.1-1 (page 1 of 1)

Control Rod Block Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Rod Block Monitor				
a. Low Power Range - Upscale	(a)	2	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.8	(e)
b. Intermediate Power Range - Upscale	(b)	2	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.8	(e)
c. High Power Range - Upscale	(f), (g)	2	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.8	(e)
d. Inop	(g),(h)	2	SR 3.3.2.1.1	NA
e. Downscale	(g),(h)	2	SR 3.3.2.1.1 SR 3.3.2.1.4	(i)
2. Rod Worth Minimizer	1(c), 2(c)	1	SR 3.3.2.1.2 SR 3.3.2.1.3 SR 3.3.2.1.5 SR 3.3.2.1.7	NA
3. Reactor Mode Switch - Shutdown Position	(d)	2	SR 3.3.2.1.6	NA

(a) THERMAL POWER ≥ 27% and ≤ 62% RTP and MCPR less than the value specified in the COLR .

(b) THERMAL POWER > 62% and ≤ 82% RTP and MCPR less than the value specified in the COLR .

(c) With THERMAL POWER ≤ 10% RTP, INSERT , except during the reactor shutdown process if the coupling of each withdrawn control rod has been confirmed

(d) Reactor mode switch in the shutdown position.

(e) Less than or equal to the Allowable Value specified in the COLR.

(f) THERMAL POWER > 82% and < 90% RTP and MCPR less than the value specified in the COLR.

(g) THERMAL POWER ≥ 90% RTP and MCPR less than the value specified in the COLR.

(h) THERMAL POWER ≥ 27% and < 90% RTP and MCPR less than the value specified in the COLR.

(i) Greater than or equal to the Allowable Value specified in the COLR.

Table 3.3.2.1-1 (page 1 of 1)
Control Rod Block Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Rod Block Monitor				
a. Low Power Range - Upscale	(a)	2	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.8	(e)
b. Intermediate Power Range - Upscale	(b)	2	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.8	(e)
c. High Power Range - Upscale	(f), (g)	2	SR 3.3.2.1.1 SR 3.3.2.1.4 SR 3.3.2.1.8	(e)
d. Inop	(g),(h)	2	SR 3.3.2.1.1	NA
e. Downscale	(g),(h)	2	SR 3.3.2.1.1 SR 3.3.2.1.4	(i)
2. Rod Worth Minimizer	$_1$(c), $_2$(c)	1	SR 3.3.2.1.2 SR 3.3.2.1.3 SR 3.3.2.1.5 SR 3.3.2.1.7	NA
3. Reactor Mode Switch - Shutdown Position	(d)	2	SR 3.3.2.1.6	NA

(a) THERMAL POWER ≥ 27% and ≤ 62% RTP and MCPR less than the value specified in the COLR.

(b) THERMAL POWER > 62% and ≤ 82% RTP and MCPR less than the value specified in the COLR.

(c) With THERMAL POWER ≤ 10% RTP, except during the reactor shutdown process if the coupling of each withdrawn control rod has been confirmed

INSERT

(d) Reactor mode switch in the shutdown position.

(e) Less than or equal to the Allowable Value specified in the COLR.

(f) THERMAL POWER > 82% and < 90% RTP and MCPR less than the value specified in the COLR.

(g) THERMAL POWER ≥ 90% RTP and MCPR less than the value specified in the COLR.

(h) THERMAL POWER ≥ 27% and < 90% RTP and MCPR less than the value specified in the COLR.

(i) Greater than or equal to the Allowable Value specified in the COLR.

ENCLOSURE 3

Browns Ferry Nuclear Plant
Units 1, 2, and 3

Technical Specifications Change 464

Application for Technical Specification Improvement to Adopt TSTF-476, Revision 1, "Improved BPWS Control Rod Insertion Process (NEDO-33091)"

Proposed TS Bases Changes (mark-ups)

BASES

APPLICABLE SAFETY ANALYSES (continued)

depositions of 300 cal/gm (Ref. 3), the fuel damage limit of 280 cal/gm provides a margin of safety from significant core damage which would result in release of radioactivity (Refs. 4 and 5). Generic evaluations (Refs. 1 and 6) of a design basis CRDA (i.e., a CRDA resulting in a peak fuel energy deposition of 280 cal/gm) have shown that if the peak fuel enthalpy remains below 280 cal/gm, then the maximum reactor pressure will be less than the required ASME Code limits (Ref. 7) and the calculated offsite doses will be well within the required limits (Ref. 5).

Control rod patterns analyzed in Reference 1 follow the banked position withdrawal sequence (BPWS). The BPWS is applicable from the condition of all control rods fully inserted to 10% RTP (Ref. 2). For the BPWS, the control rods are required to be moved in groups, with all control rods assigned to a specific group required to be within specified banked positions (e.g., between notches 08 and 12). The banked positions are established to minimize the maximum incremental control rod worth without being overly restrictive during normal plant operation. Generic analysis of the BPWS (Ref. 8) has demonstrated that the 280 cal/gm fuel damage limit will not be violated during a CRDA while following the BPWS mode of operation. The evaluation provided by the generic BPWS analysis (Ref. 8) allows a limited number (i.e., eight) and corresponding distribution of fully inserted, inoperable control rods, that are not in compliance with the sequence.

INSERT "1"

Rod pattern control satisfies Criterion 3 of the NRC Policy Statement (Ref. 9).

(continued)

Insert 1

When performing a shutdown of the plant, an optional BPWS control rod sequence (Ref. 10) may be used provided that all withdrawn control rods have been confirmed to be coupled. The rods may be inserted without the need to stop at intermediate positions since the possibility of a CRDA is eliminated by the confirmation that withdrawn control rods are coupled. When using the Reference 10 control rod sequence for shutdown, the Rod Worth Minimizer may be reprogrammed to enforce the requirements of the improved BPWS control rod insertion process or bypassed in accordance with the allowance provided in the Applicability Note for the Rod Worth Minimizer in Table 3.3.2-1.

In order to use the Reference 10 BPWS shutdown process, an extra check is required in order to consider a control rod to be "confirmed" to be coupled. This extra check ensures that no Single Operator Error can result in an incorrect coupling check. For purposes of this shutdown process, the method for confirming that control rods are coupled varies depending on the position of the control rod in the core. Details on this coupling confirmation requirement are provided in Reference 10. If the requirements for use of the BPWS control rod insertion process contained in Reference 10 are followed, the plant is considered to be in compliance with BPWS requirements, as required by LCO 3.1.6.

BASES (continued)

REFERENCES

1. NEDE-24011-P-A-13, "General Electric Standard Application for Reactor Fuel," Section 2.2.3.1, August 1996.

2. Letter from T. Pickens (BWROG) to G. C. Lainas (NRC), Amendment 17 to General Electric Licensing Topical Report, NEDE-24011-P-A, August 15, 1986.

3. NUREG-0979, Section 4.2.1.3.2, April 1983.

4. NUREG-0800, Section 15.0.1.

5. 10 CFR 50.67.

6. NEDO-21778-A, "Transient Pressure Rises Affected Fracture Toughness Requirements for Boiling Water Reactors," December 1978.

7. ASME, Boiler and Pressure Vessel Code.

8. NEDO-21231, "Banked Position Withdrawal Sequence," January 1977.

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

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10. NEDO 33091-A, Revision 2, "Improved BPWS Control Rod Insertion Process," July 2004.

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BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

2. Rod Worth Minimizer

The RWM enforces the banked position withdrawal sequence (BPWS) to ensure that the initial conditions of the CRDA analysis are not violated. The analytical methods and assumptions used in evaluating the CRDA are summarized in References 4, 5, 6, ~~and~~ 7. The BPWS requires that control rods be moved in groups, with all control rods assigned to a specific group required to be within specified banked positions. Requirements that the control rod sequence is in compliance with the BPWS are specified in LCO 3.1.6, "Rod Pattern Control."

INSERT "2"

The RWM Function satisfies Criterion 3 of the NRC Policy Statement (Ref. 10).

Since the RWM is designed to act as a backup to operator control of the rod sequences, only one channel of the RWM is available and required to be OPERABLE (Ref. 7). Special circumstances provided for in the Required Action of LCO 3.1.3, "Control Rod OPERABILITY," and LCO 3.1.6 may necessitate bypassing the RWM to allow continued operation with inoperable control rods, or to allow correction of a control rod pattern not in compliance with the BPWS. The RWM may be bypassed as required by these conditions, but then it must be considered inoperable and the Required Actions of this LCO followed.

Compliance with the BPWS, and therefore OPERABILITY of the RWM, is required in MODES 1 and 2 when THERMAL POWER is ≤ 10% RTP. When THERMAL POWER is > 10% RTP, there is no possible control rod configuration that results in a control

(continued)

A

Insert 2

When performing a shutdown of the plant, an optional BPWS control rod sequence (Ref. 12) may be used if the coupling of each withdrawn control rod has been confirmed. The rods may be inserted without the need to stop at intermediate positions. When using the Reference 12 control rod insertion sequence for shutdown, the Rod Worth Minimizer may be reprogrammed to enforce the requirements of the improved BPWS control rod insertion process or bypassed if it is not programmed to reflect the optional BPWS shutdown sequence, as permitted by the Applicability Note for the Rod Worth Minimizer in Table 3.3.2-1.

BASES (continued)

REFERENCES

1. FSAR, Section 7.5.8.2.3.

2. FSAR, Section 7.16.5.3.1.k.

3. NEDC-32433P, "Maximum Extended Load Line Limit and ARTS Improvement Program Analyses for Browns Ferry Nuclear Plant Unit 1, 2 and 3," April 1995.

4. NEDE-24011-P-A-US, "General Electrical Standard Application for Reload Fuel," Supplement for United States, (revision specified in the COLR).

5. "Modifications to the Requirements for Control Rod Drop Accident Mitigating Systems," BWR Owners' Group, July 1986.

6. NEDO-21231, "Banked Position Withdrawal Sequence," January 1977.

7. NRC SER, "Acceptance of Referencing of Licensing Topical Report NEDE-24011-P-A," "General Electric Standard Application for Reactor Fuel, Revision 8, Amendment 17," December 27, 1987.

8. NEDC-30851-P-A, Supplement 1, "Technical Specification Improvement Analysis for BWR Control Rod Block Instrumentation," October 1988.

9. GENE-770-06-1, "Addendum to Bases for Changes to Surveillance Test Intervals and Allowed Out-of-Service Times for Selected Instrumentation Technical Specifications," February 1991.

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

11. NEDC-32410P-A, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function," October 1995.

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12. NEDO 33091-A, Revision 2, "Improved BPWS Control Rod Insertion Process," July 2004.

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BASES

APPLICABLE SAFETY ANALYSES (continued)

depositions of 300 cal/gm (Ref. 3), the fuel damage limit of 280 cal/gm provides a margin of safety from significant core damage which would result in release of radioactivity (Refs. 4 and 5). Generic evaluations (Refs. 1, 6, and 10) of a design basis CRDA (i.e., a CRDA resulting in a peak fuel energy deposition of 280 cal/gm) have shown that if the peak fuel enthalpy remains below 280 cal/gm, then the maximum reactor pressure will be less than the required ASME Code limits (Ref. 7) and the calculated offsite doses will be well within the required limits (Ref. 5).

Control rod patterns analyzed in References 1, 10, and 11 follow the banked position withdrawal sequence (BPWS). The BPWS is applicable from the condition of all control rods fully inserted to 10% RTP (Ref. 2). For the BPWS, the control rods are required to be moved in groups, with all control rods assigned to a specific group required to be within specified banked positions (e.g., between notches 08 and 12). The banked positions are established to minimize the maximum incremental control rod worth without being overly restrictive during normal plant operation. Analyses are performed using the Reference 10 methodology to demonstrate that the 280 cal/gm fuel damage limit will not be violated during a CRDA while following the BPWS mode of operation. The evaluation provided by the generic BPWS analysis (Ref. 8) allows a limited number (i.e., eight) and corresponding distribution of fully inserted, inoperable control rods, that are not in compliance with the sequence.

INSERT "1"

Rod pattern control satisfies Criterion 3 of the NRC Policy Statement (Ref. 9).

(continued)

Insert 1

When performing a shutdown of the plant, an optional BPWS control rod sequence (Ref. 12) may be used provided that all withdrawn control rods have been confirmed to be coupled. The rods may be inserted without the need to stop at intermediate positions since the possibility of a CRDA is eliminated by the confirmation that withdrawn control rods are coupled. When using the Reference 12 control rod sequence for shutdown, the Rod Worth Minimizer may be reprogrammed to enforce the requirements of the improved BPWS control rod insertion process or bypassed in accordance with the allowance provided in the Applicability Note for the Rod Worth Minimizer in Table 3.3.2-1.

In order to use the Reference 12 BPWS shutdown process, an extra check is required in order to consider a control rod to be "confirmed" to be coupled. This extra check ensures that no Single Operator Error can result in an incorrect coupling check. For purposes of this shutdown process, the method for confirming that control rods are coupled varies depending on the position of the control rod in the core. Details on this coupling confirmation requirement are provided in Reference 12. If the requirements for use of the BPWS control rod insertion process contained in Reference 12 are followed, the plant is considered to be in compliance with BPWS requirements, as required by LCO 3.1.6.

BASES (continued)

REFERENCES

1. NEDE-24011-P-A-13, "General Electric Standard Application for Reactor Fuel," Section 2.2.3.1, August 1996.

2. Letter from T. Pickens (BWROG) to G. C. Lainas (NRC), Amendment 17 to General Electric Licensing Topical Report, NEDE-24011-P-A, August 15, 1986.

3. NUREG-0979, Section 4.2.1.3.2, April 1983.

4. NUREG-0800, Section 15.0.1.

5. CFR 50.67.

6. NEDO-21778-A, "Transient Pressure Rises Affected Fracture Toughness Requirements for Boiling Water Reactors," December 1978.

7. ASME, Boiler and Pressure Vessel Code.

8. NEDO-21231, "Banked Position Withdrawal Sequence," January 1977.

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

10. XN-NF-80-19(P)(A) Volume 1 and Supplements 1 and 2, "Exxon Nuclear Methodology for Boiling Water Reactors - Neutronic Methods for Design and Analysis," Exxon Nuclear Company, March 1983.

11. EMF-2158(P)(A) Revision 0, "Siemens Power Corporation Methodology for Boiling Water Reactors: Evaluation and Validation of CASMO-4/MICROBURN-B2," Siemens Power Corporation, October 1999.

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12. NEDO 33091-A, Revision 2, "Improved BPWS Control Rod Insertion Process," July 2004.

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BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

2. Rod Worth Minimizer

The RWM enforces the banked position withdrawal sequence (BPWS) to ensure that the initial conditions of the CRDA analysis are not violated. The analytical methods and assumptions used in evaluating the CRDA are summarized in References 4, 5, 6, 7, 12, and 13. The BPWS requires that control rods be moved in groups, with all control rods assigned to a specific group required to be within specified banked positions. Requirements that the control rod sequence is in compliance with the BPWS are specified in LCO 3.1.6, "Rod Pattern Control."

and 14

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Standard INSERT

INSERT "2"

The RWM Function satisfies Criterion 3 of the NRC Policy Statement (Ref. 10).

Since the RWM is designed to act as a backup to operator control of the rod sequences, only one channel of the RWM is available and required to be OPERABLE (Ref. 7). Special circumstances provided for in the Required Action of LCO 3.1.3, "Control Rod OPERABILITY," and LCO 3.1.6 may necessitate bypassing the RWM to allow continued operation with inoperable control rods, or to allow correction of a control rod pattern not in compliance with the BPWS. The RWM may be bypassed as required by these conditions, but then it must be considered inoperable and the Required Actions of this LCO followed.

Compliance with the BPWS, and therefore OPERABILITY of the RWM, is required in MODES 1 and 2 when THERMAL POWER is ≤ 10% RTP. When THERMAL POWER is > 10% RTP, there is no possible control rod configuration that results in a control

(continued)

Insert 2

When performing a shutdown of the plant, an optional BPWS control rod sequence (Ref. 14) may be used if the coupling of each withdrawn control rod has been confirmed. The rods may be inserted without the need to stop at intermediate positions. When using the Reference 14 control rod insertion sequence for shutdown, the Rod Worth Minimizer may be reprogrammed to enforce the requirements of the improved BPWS control rod insertion process or bypassed if it is not programmed to reflect the optional BPWS shutdown sequence, as permitted by the Applicability Note for the Rod Worth Minimizer in Table 3.3.2-1.

BASES

REFERENCES (continued)

11. NEDC-32410P-A, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function," October 1995.

12. XN-NF-80-19(P)(A) Volume 1 and Supplements 1 and 2, "Exxon Nuclear Methodology for Boiling Water Reactors - Neutronic Methods for Design and Analysis," Exxon Nuclear Company, March 1983.

13. EMF-2158(P)(A) Revision 0, "Siemens Power Corporation Methodology for Boiling Water Reactors: Evaluation and Validation of CASMO-4/MICROBURN-B2," Siemens Power Corporation, October 1999.

INSERT

14. NEDO 33091-A, Revision 2, "Improved BPWS Control Rod Insertion Process," July 2004.

12

BASES

APPLICABLE SAFETY ANALYSES (continued)

depositions of 300 cal/gm (Ref. 3), the fuel damage limit of 280 cal/gm provides a margin of safety from significant core damage which would result in release of radioactivity (Refs. 4 and 5). Generic evaluations (Refs. 1, 6, and 10) of a design basis CRDA (i.e., a CRDA resulting in a peak fuel energy deposition of 280 cal/gm) have shown that if the peak fuel enthalpy remains below 280 cal/gm, then the maximum reactor pressure will be less than the required ASME Code limits (Ref. 7) and the calculated offsite doses will be well within the required limits (Ref. 5).

Control rod patterns analyzed in References 1, 10, and 11 follow the banked position withdrawal sequence (BPWS). The BPWS is applicable from the condition of all control rods fully inserted to 10% RTP (Ref. 2). For the BPWS, the control rods are required to be moved in groups, with all control rods assigned to a specific group required to be within specified banked positions (e.g., between notches 08 and 12). The banked positions are established to minimize the maximum incremental control rod worth without being overly restrictive during normal plant operation. Analyses are performed using the Reference 10 methodology to demonstrate that the 280 cal/gm fuel damage limit will not be violated during a CRDA while following the BPWS mode of operation. The evaluation provided by the generic BPWS analysis (Ref. 8) allows a limited number (i.e., eight) and corresponding distribution of fully inserted, inoperable control rods, that are not in compliance with the sequence.

INSERT "1"

Rod pattern control satisfies Criterion 3 of the NRC Policy Statement (Ref. 9).

(continued)

13

Insert 1

When performing a shutdown of the plant, an optional BPWS control rod sequence (Ref. 12) may be used provided that all withdrawn control rods have been confirmed to be coupled. The rods may be inserted without the need to stop at intermediate positions since the possibility of a CRDA is eliminated by the confirmation that withdrawn control rods are coupled. When using the Reference 12 control rod sequence for shutdown, the Rod Worth Minimizer may be reprogrammed to enforce the requirements of the improved BPWS control rod insertion process or bypassed in accordance with the allowance provided in the Applicability Note for the Rod Worth Minimizer in Table 3.3.2-1.

In order to use the Reference 12 BPWS shutdown process, an extra check is required in order to consider a control rod to be "confirmed" to be coupled. This extra check ensures that no Single Operator Error can result in an incorrect coupling check. For purposes of this shutdown process, the method for confirming that control rods are coupled varies depending on the position of the control rod in the core. Details on this coupling confirmation requirement are provided in Reference 12. If the requirements for use of the BPWS control rod insertion process contained in Reference 12 are followed, the plant is considered to be in compliance with BPWS requirements, as required by LCO 3.1.6.

BASES (continued)

REFERENCES

1. NEDE-24011-P-A-13, "General Electric Standard Application for Reactor Fuel," Section 2.2.3.1, August 1996.

2. Letter from T. Pickens (BWROG) to G. C. Lainas (NRC), Amendment 17 to General Electric Licensing Topical Report, NEDE-24011-P-A, August 15, 1986.

3. NUREG-0979, Section 4.2.1.3.2, April 1983.

4. NUREG-0800, Section 15.0.1.

5. 10 CFR 50.67.

6. NEDO-21778-A, "Transient Pressure Rises Affected Fracture Toughness Requirements for Boiling Water Reactors," December 1978.

7. ASME, Boiler and Pressure Vessel Code.

8. NEDO-21231, "Banked Position Withdrawal Sequence," January 1977.

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

10. XN-NF-80-19(P)(A) Volume 1 and Supplements 1 and 2, "Exxon Nuclear Methodology for Boiling Water Reactors - Neutronic Methods for Design and Analysis," Exxon Nuclear Company, March 1983.

11. EMF-2158(P)(A) Revision 0, "Siemens Power Corporation Methodology for Boiling Water Reactors: Evaluation and Validation of CASMO-4/MICROBURN-B2," Siemens Power Corporation, October 1999.

INSERT

12. NEDO 33091-A, Revision 2, "Improved BPWS Control Rod Insertion Process," July 2004.

15

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

2. Rod Worth Minimizer

The RWM enforces the banked position withdrawal sequence (BPWS) to ensure that the initial conditions of the CRDA analysis are not violated. The analytical methods and assumptions used in evaluating the CRDA are summarized in References 4, 5, 6, 7, 12, ~~and~~ 13, and 14. The BPWS requires that control rods be moved in groups, with all control rods assigned to a specific group required to be within specified banked positions. Requirements that the control rod sequence is in compliance with the BPWS are specified in LCO 3.1.6, "Rod Pattern Control."

INSERT "2"

The RWM Function satisfies Criterion 3 of the NRC Policy Statement (Ref. 10).

Since the RWM is designed to act as a backup to operator control of the rod sequences, only one channel of the RWM is available and required to be OPERABLE (Ref. 7). Special circumstances provided for in the Required Action of LCO 3.1.3, "Control Rod OPERABILITY," and LCO 3.1.6 may necessitate bypassing the RWM to allow continued operation with inoperable control rods, or to allow correction of a control rod pattern not in compliance with the BPWS. The RWM may be bypassed as required by these conditions, but then it must be considered inoperable and the Required Actions of this LCO followed.

Compliance with the BPWS, and therefore OPERABILITY of the RWM, is required in MODES 1 and 2 when THERMAL POWER is ≤ 10% RTP. When THERMAL POWER is > 10% RTP, there is no possible control rod configuration that results in a control

Standard INSERT

(continued)

16

Insert 2

When performing a shutdown of the plant, an optional BPWS control rod sequence (Ref. 14) may be used if the coupling of each withdrawn control rod has been confirmed. The rods may be inserted without the need to stop at intermediate positions. When using the Reference 14 control rod insertion sequence for shutdown, the Rod Worth Minimizer may be reprogrammed to enforce the requirements of the improved BPWS control rod insertion process or bypassed if it is not programmed to reflect the optional BPWS shutdown sequence, as permitted by the Applicability Note for the Rod Worth Minimizer in Table 3.3.2-1.

BASES

REFERENCES (continued)

11. NEDC-32410P-A, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function," October 1995.

12. XN-NF-80-19(P)(A) Volume 1 and Supplements 1 and 2, "Exxon Nuclear Methodology for Boiling Water Reactors - Neutronic Methods for Design and Analysis," Exxon Nuclear Company, March 1983.

13. EMF-2158(P)(A) Revision 0, "Siemens Power Corporation Methodology for Boiling Water Reactors: Evaluation and Validation of CASMO-4/MICROBURN-B2," Siemens Power Corporation, October 1999.

INSERT

14. NEDO 33091-A, Revision 2, "Improved BPWS Control Rod Insertion Process," July 2004.

ENCLOSURE 4

Browns Ferry Nuclear Plant
Units 1, 2, and 3

Technical Specifications Change 464

Application for Technical Specification Improvement to Adopt TSTF-476, Revision 1, "Improved BPWS Control Rod Insertion Process (NEDO-33091)"

Regulatory Commitments

The following changes will be made prior to implementation.

1. Changes will be made to operational procedures to ensure that before reducing power to the low power setpoint (LPSP), operators shall confirm control rod coupling integrity for all rods that are fully withdrawn. Control rods that have not been confirmed coupled and are in intermediate positions must be fully inserted prior to power reduction to the LPSP. If shutdown is required and all rods which are not confirmed coupled cannot be fully inserted prior to the power dropping below the LPSP, then the original standard BPWS must be adhered to.
2. Changes will be made to operational procedures to ensure that when in the process of shutting down following improved BPWS with the power below the LPSP, no control rod shall be withdrawn unless the control rod pattern is in compliance with standard BPWS requirements.