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

January 6, 2006

TVA-BFN-TS-443

10 CFR 50.90

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

Gentlemen:

In the Matter of) Docket No. 50-259
Tennessee Valley Authority)

BROWNS FERRY NUCLEAR PLANT (BFN) UNIT 1 - TECHNICAL SPECIFICATIONS (TS) CHANGE TS-443 - OSCILLATION POWER RANGE MONITOR (OPRM)

Pursuant to 10 CFR 50.90, Tennessee Valley Authority (TVA) is submitting a request for a TS change (TS-443) to license DPR-33 for BFN Unit 1. The proposed TS change involves the activation of thermal-hydraulic stability monitoring instrumentation.

The OPRM module of the Power Range Neutron Monitoring (PRNM) System is designed to provide TVA's solution regarding reactor stability as requested by Generic Letter 94-02. TVA intends to operate the OPRM module in the "armed" mode when the unit returns to power operations.

This proposed TS must be considered and its approval coordinated with other pending Unit 1 proposed TS:

- TVA previously submitted proposed TS-430 (Reference 1), which addressed the planned replacement of the power range monitoring portion of the existing Neutron Monitoring System with a digital upgrade. The hardware upgrades and TS changes described in TS-430 are necessary for implementation of the OPRM function. This submittal and implementation of the OPRM function assumes TS-430 has been approved by NRC. NRC should coordinate their reviews and approvals such as not to invalidate this assumption.

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- TVA previously submitted proposed TS-433 (Reference 2), which addressed the transition from an 18 month fuel cycle to a 24 month fuel cycle. The new surveillance frequencies proposed by this TS-443 submittal assume the 24 month fuel cycle has been approved for Unit 1.

- TVA has also previously submitted proposed TS-431 (Reference 3), which permits Unit 1 to operate at extended power uprate (EPU) conditions. The analysis and setpoints discussed in this TS-443 submittal reflect EPU conditions.

This application is also based on:

- TVA's application and NRC's approval for implementation and operation of the same OPRM Upscale Trip function on Units 2 and 3 (References 4 through 7).

- Licensing Topical Report NEDC-32410P-A, Supplement 1, Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Plus Option III Stability Trip Function.

- Licensing Topical Report NEDO-31960-A, BWR Owners' Group Long-Term Stability Solution Licensing Methodology.

- Licensing Topical Report NEDO 32465-A, Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications.

The proposed TS changes are necessary to support the restart of Unit 1. Therefore, TVA requests the amendment be approved by December 29, 2006 and that the implementation of the revised TS be within 60 days of approval.

TVA has determined that there are no significant hazards considerations associated with the proposed amendment and that the amendment 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 letter and attachments to the Alabama State Department of Public Health.

Enclosure 1 provides TVA's evaluation of the TS change. Enclosure 2 provides mark-ups of the proposed change to the TS pages.

There are no regulatory commitments associated with this submittal. If you have any questions about this amendment, please contact me at (256) 729-2636.

I declare under penalty of perjury that the foregoing is true and correct. Executed on January 6, 2006.

Sincerely,

William D. Crouch

William D. Crouch
Manager of Licensing
and Industry Affairs

Enclosures:

1. TVA Evaluation of Proposed Change
2. Proposed Technical Specifications Changes (mark-up)

References:

1. TVA letter to NRC, dated November 10, 2003, "Browns Ferry Nuclear Plant (BFN) Unit 1 - Technical Specifications (TS) Change 430 - Power Range Neutron Monitor Upgrade With Implementation of Average Power Range Monitor and Rod Block Monitor Technical Specification Improvements and Maximum Extended Load Line Limit Analyses."

2. TVA letter to NRC, dated August 16, 2004, "Browns Ferry Nuclear Plant (BFN) Unit 1 - Technical Specification Change (TS) 433 - 24 Month Fuel Cycle."

3. TVA letter to NRC, dated June 28, 2004, "Browns Ferry Nuclear Plant (BFN) - Unit 1 - Proposed Technical Specifications (TS) Change TS-431 - Request For License Amendment - Extended Power Uprate (EPU) Operation."

4. TVA letter to NRC, dated September 8, 1998, "Browns Ferry Nuclear Plant (BFN) - Unit 2 - Technical Specification (TS) Change - 354 - Oscillation Power Range Monitor."

5. NRC letter to TVA, dated March 5, 1999, "Amendment No. 258 to Facility Operating License No. DPR-52: Oscillation Power Range Monitor Upscale Trip Function in the Average Power Range Monitor - Technical Specification Change TS-354 (TAC NO. MA3556)."

6. TVA letter to NRC, dated June 28, 1999, "Browns Ferry Nuclear Plant (BFN) - Unit 3 - Technical Specifications (TS) Change 398 - Oscillating Power Range Monitor (TAC No. MA5976)."

7. NRC letter to TVA, dated September 27, 1999, "Browns Ferry Nuclear Plant, Unit 3 - Issuance of Amendment Regarding Oscillation Power Range Monitor (TAC No MA5976)."

cc (Enclosures):
(Via NRC Electronic Distribution)
U.S. Nuclear Regulatory Commission
Region II
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW, Suite 23T85
Atlanta, Georgia 30303-3415

Mr. Stephen J. Cahill, Branch Chief
U.S. Nuclear Regulatory Commission
Region II
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW, Suite 23T85
Atlanta, Georgia 30303-8931

NRC Senior Resident Inspector
Browns Ferry Nuclear Plant
10833 Shaw Road
Athens, AL 35611-6970

Ms. Margaret Chernoff, Senior Project Manager
U.S. Nuclear Regulatory Commission
(MS 08G9)
One White Flint, North
11555 Rockville Pike
Rockville, Maryland 20852-2739

Ms. Eva A. Brown, Project Manager
U.S. Nuclear Regulatory Commission
(MS 08G9)
One White Flint, North
11555 Rockville Pike
Rockville, Maryland 20852-2739

ENCLOSURE 1

BROWNS FERRY NUCLEAR PLANT (BFN) UNIT 1

TECHNICAL SPECIFICATIONS (TS) CHANGE TS-443 - OSCILLATION POWER RANGE MONITOR (OPRM)

TVA EVALUATION OF PROPOSED CHANGE

INDEX

1.0 DESCRIPTION

This letter requests an amendment to license DPR-33 for BFN Unit 1. The proposed TS change involves the activation of thermal-hydraulic stability monitoring instrumentation as requested by Generic Letter 94-02. The proposed TS changes are necessary to support the restart of Unit 1. Therefore, TVA requests that the amendment be approved by December 29, 2006, and that the implementation of the revised TS be within 60 days of approval.

2.0 PROPOSED CHANGE

The proposed amendment will add the Oscillation Power Range Monitor (ORPM) function to the TS. The deleted text is shown with ~~strikethrough~~, and changed or added text is shown in ***bold italics***.

1. Limiting Condition for Operation (LCO) 3.3.1.1, Reactor Protection System (RPS) Instrumentation -

   The Actions table for LCO 3.3.1.1 is revised to add appropriate requirements applicable to the OPRM Upscale trip function (Function 2.f)

   - In Required Action A.2, the Note is revised to say that the Required Action is also not applicable for new Function 2.f.
   - In Condition B, the same change is being made to the note.

   The revised Note reads as follows:

   ```
   ------------NOTE------------
   Not applicable for
   Functions 2.a, 2.b, 2.c,
   or 2.d or 2.f.
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   ```

2. LCO 3.3.1.1, RPS Instrumentation -

   New Conditions I and J, together with the Required Actions and Completion Times, are added to the LCO Actions table. The new entries are as follows:

CONDITION	REQUIRED ACTION	COMPLETION TIME
I. As required by Required Action D.1 and referenced in Table 3.3.1.1-1.	*I.1 Initiate alternate method to detect and suppress thermal hydraulic instability oscillations.*	*12 hours*
J. Required Action and associated Completion Time of Condition I not met.	*J.1 Be in Mode 2.*	*4 hours*

3. Surveillance Requirements (SR) 3.3.1.1, LCO 3.3.1.1, RPS Instrumentation -

New SR 3.3.1.1.17 is being added. The new entry is as follows:

SURVEILLANCE		FREQUENCY
SR 3.3.1.1.17	*Verify OPRM is not bypassed when APRM Simulated Thermal Power is ≥ 25% and recirculation drive flow is < 60% of rated recirculation drive flow.*	*24 months*

4. Table 3.3.1.1-1, RPS Instrumentation -

The new Average Power Range Monitor (APRM) Function 2.f (the OPRM Upscale trip function), together with its Applicable Modes, Required Channels, Conditions Referenced, SRs, and Allowable Value are added to Table 3.3.1.1-1. The new entry is as follows:

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION D.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
f. OPRM Upscale	*1*	*3(b)*	*I*	*SR 3.3.1.1.1 SR 3.3.1.1.7 SR 3.3.1.1.13 SR 3.3.1.1.16 SR 3.3.1.1.17*	*NA*

5. LCO 3.4.1, Recirculation Loops Operating -

The restrictions related to operation in the thermal-hydraulic instability regions are no longer required. The revised LCO reads as follows:

LCO 3.4.1 Two recirculation loops with matched flows shall be in operation. ~~with core flow as a function of THERMAL POWER outside Regions I and II and the Operation Not Permitted Region of Figure 3.4.1-1.~~

OR

One recirculation loop may be in operation ~~with core flow as a function of THERMAL POWER outside Regions I and II and the Operation Not Permitted Region of Figure 3.4.1-1 and~~ provided the following limits are applied when the associated LCO is applicable:

a. LCO 3.2.1, "AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)," single loop operation limits specified in the COLR;

b. LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)," single loop operation limits specified in the COLR;

c. LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation," Function 2.b (Average Power Range Monitors Flow Biased Simulated Thermal Power - High), Allowable Value of Table 3.3.1.1-1 is reset for single loop operation;

~~d. LCO 3.3.2.1, "Control Rod Block Instrumentation," Function 1.a (Rod Block Monitor Upscale (Flow Biased)), Allowable Value of Table 3.3.2.1-1 is reset for single loop operation.~~

6. LCO 3.4.1, Recirculation Loops Operating -

Restrictions related to operation in the thermal-hydraulic instability regions are no longer required. Therefore, Actions A and B, together with their associated Required Actions and Completion times, are being deleted.

The deleted LCOs are shown below:

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~A. Reactor operation with core flow as a function of THERMAL POWER inside of Region I of Figure 3.4.1-1.~~	~~A.1 Place mode switch in the shutdown position.~~	~~Immediately~~
~~B. Reactor operation with core flow as a function of THERMAL POWER inside of Region II of Figure 3.4.1-1.~~	~~B.1 Place mode switch in the shutdown position.~~ ~~AND~~ ~~B.2 Exit Region II.~~	~~Immediately upon discovery of thermal hydraulic instability~~ ~~2 hours~~

7. LCO 3.4.1, Recirculation Loops Operating -

Conditions C and D are relabeled A and B, and they are edited for clarity.

The revised LCO reads as follows:

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~C~~*A*. Requirements of the LCO not met. ~~for reasons other than A or B.~~	~~C~~*A*.1 Satisfy the requirements of the LCO.	24 hours
~~D~~*B*. Required Action and associated Completion Time of Conditions A ~~B or C~~ not met. OR No recirculation loops in operation. ~~while in MODE 2.~~	~~D~~*B*.1 Be in MODE 3.	12 hours

8. LCO 3.4.1, Recirculation Loops Operating -

Action E, together with its associated Required Actions and Completion times, is also being deleted.

The deleted LCO is shown below:

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~E. No recirculation loops in operation while in MODE 1.~~	~~E.1 Place mode switch in the shutdown position.~~	~~Immediately~~

9. SR 3.4.1, Recirculation Loops Operating -

Restrictions related to operation in the thermal-hydraulic instability regions are no longer required. Therefore, SR 3.4.1.2 and its associated frequency are being deleted.

The deleted SR is shown below:

SURVEILLANCE	FREQUENCY
~~SR 3.4.1.2 Verify the reactor is outside of Region I and II of Figure 3.4.1-1.~~	~~Immediately after any increase > 5% RTP while initial core flow is < 50% of rated~~ ~~AND~~ ~~Immediately after any decrease of > 10% rated core flow while initial thermal power is > 40% of rated~~

10. SR 3.4.1, Recirculation Loops Operating -

Restrictions related to operation in the thermal-hydraulic instability regions are no longer required. Therefore, Figure 3.4.1-1, *Thermal Power Versus Core Flow Stability Regions*, is being deleted in its entirety.

The deleted figure is shown below:

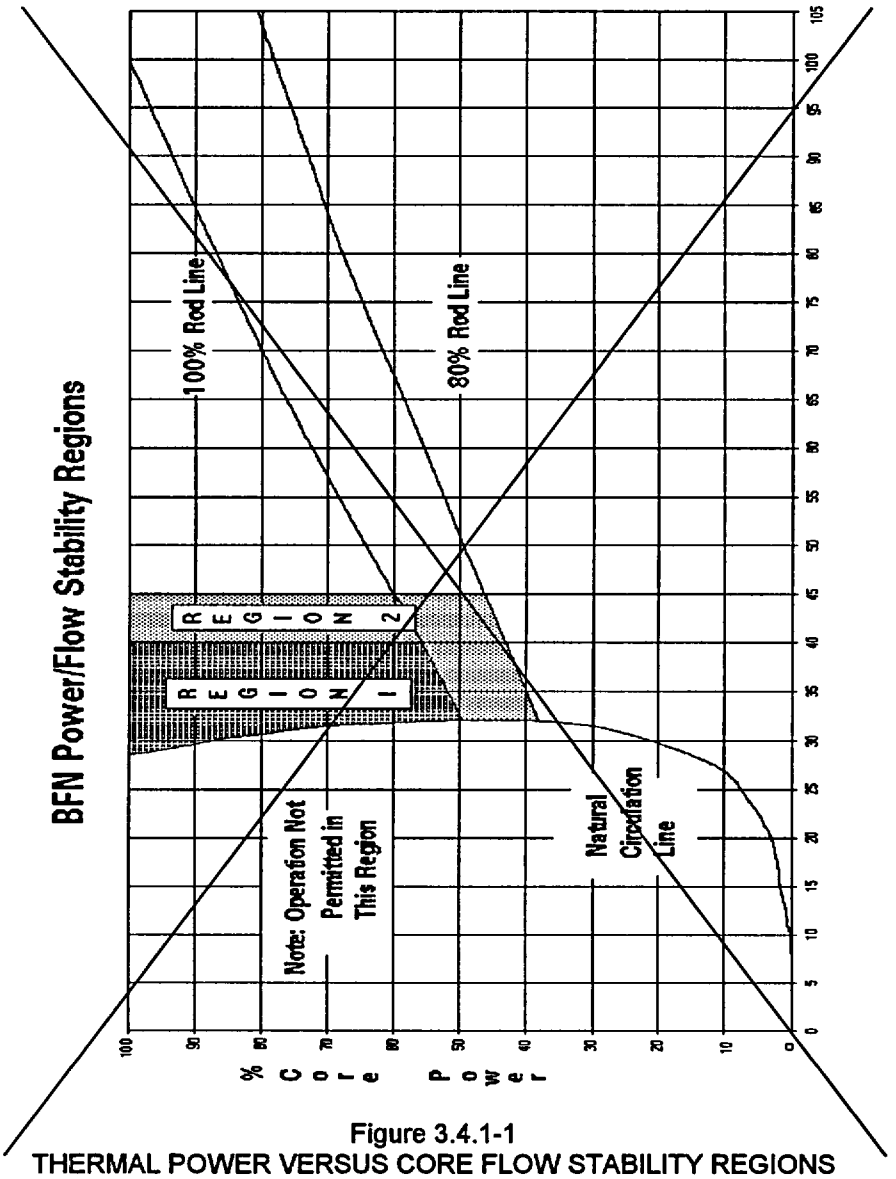

Figure 3.4.1-1
THERMAL POWER VERSUS CORE FLOW STABILITY REGIONS

Note that the proposed deletion of Figure 3.4.1-1 was previously proposed as part of TS-431, *Extended Power Uprate Operation* (Reference 1). If TS-431 is approved prior to this proposed TS change, then deletion of Figure 3.4.1-1 will no longer be necessary. If this proposed TS change is approved before TS-431, then deletion of Figure 3.4.1-1 will no longer be required as part of TS-431.

Enclosure 2 provides mark-ups of the proposed change to the TS pages.

3.0 BACKGROUND

Reason for the Proposed Change

General Design Criterion (GDC) 10 requires that the reactor core be designed with appropriate margin to assure that specified acceptable fuel design limits will not be exceeded during any condition of normal operation, including the effects of anticipated operational occurrences. GDC 12 requires assurance that power oscillations which can result in conditions exceeding specified acceptable fuel design limits are either not possible or can be reliably and readily detected and suppressed.

Under certain conditions, BWRs may be susceptible to coupled thermal-hydraulic instabilities. These instabilities are characterized by power and flow oscillations. If power and flow oscillations become large enough, the fuel cladding integrity Minimum Critical Power Ratio (MCPR) safety limit and GDC 10 and 12 requirements may be challenged. This proposed TS addresses the thermal hydraulic instability issue.

As part of Generic Letter (GL) 94-02, *Long-Term Solutions and Upgrade of Interim Operating Recommendations for Thermal-Hydraulic Instabilities in Boiling Water Reactors*, licensees of BWRs were requested to develop and submit to the NRC a plan for long-term stability corrective actions.

In response to GL 94-02 (References 2 and 3), TVA informed NRC of its plan to proceed with a long-term solution designated as Option III in NEDO-31960 and NEDO-31960, Supplement 1, "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology." TVA stated that it would implement the Option III methodology as an integrated part of an advanced digital power range neutron monitoring (PRNM) upgrade using General Electric's (GE) Nuclear Measurement, Analysis, and Control (NUMAC) equipment. The NUMAC PRNM equipment was installed on BFN Unit 2 during its Fall 1997 refueling outage and on Unit 3 during its Fall 1998 refueling outage. Approval for the installation of the NUMAC PRNM equipment on Unit 1 was proposed in TS-430 (Reference 4).

4.0 TECHNICAL ANALYSIS

4.1 Installation of the OPRM

Stability Long Term Solution Option III, which is described in Reference 5, consists of hardware and software that provides for reliable, automatic detection and suppression of stability related power oscillations. The Option III hardware automatically initiates control rod insertion (scram) to terminate the power oscillation while it is still small. The combination of hardware, software, and system setpoints were initially designed to provide protection against violation of the MCPR safety limit should oscillations occur. TVA has implemented the long-term solution on Units 2 and 3 (References 6-9). The necessary TS revisions for the replacement of the power range monitoring portion of the existing Unit 1 Neutron Monitoring System with a digital upgrade were submitted for NRC approval in TS-430.

Hardware to implement the OPRM Upscale trip, for proposed new Function 2.f, is housed in the same chassis as the APRM hardware, and the OPRM Upscale trip is considered a sub-function of the APRM System.

The APRM channels provide the primary indication of neutron flux within the core and respond almost instantaneously to neutron flux increases. The APRM channels receive input signals from local power range monitors (LPRMs) positioned within the reactor core to provide an indication of the power distribution and local power changes. The APRM channels average these LPRM signals to provide a continuous indication of average reactor power from a few percent to greater than 100 percent reactor thermal power (RTP). Each APRM also includes an OPRM Upscale Function which monitors small groups of LPRM signals to detect thermal hydraulic instabilities.

The APRM System is divided into four APRM channels and four 2-out-of-4 voter channels. Each APRM channel provides inputs to each of the four voter channels. The four voter channels are divided into two groups of two each, with each group of two providing inputs to one RPS trip system. The system is designed to allow one APRM channel, but no voter channels, to be bypassed. A trip from any one unbypassed APRM will result in a "half-trip" in all four of the voter channels, but no trip inputs to either RPS trip system. APRM trip Functions 2.a, 2.b, 2.c, and 2.d are voted independently from OPRM Upscale Function 2.f. Therefore, any Function 2.a, 2.b, 2.c or 2.d trip from any two unbypassed APRM channels will result in a full trip in each of the four voter channels, which in turn results in two trip inputs to each RPS trip system logic channel (A1, A2, B1, and B2). Similarly, a

Function 2.f trip from any two unbypassed APRM channels will result in a full trip from each of the four voter channels.

Three of the four APRM channels and all four of the voter channels are required to be operable to ensure that no single failure will preclude a scram on a valid signal. In addition, to provide adequate coverage of the entire core, consistent with the design bases for the APRM Functions 2.a, 2.b, and 2.c, at least twenty (20) LPRM inputs, with at least three (3) LPRM inputs from each of the four axial levels at which the LPRMs are located, must be operable for each APRM channel. For the OPRM Upscale Function 2.f, LPRMs are assigned to "cells" with either 3 or 4 detectors, with a total of 33 "cells" assigned to each OPRM channel. A minimum of 23 cells, each with a minimum of 2 LPRMs, must be operable for the OPRM Upscale Function 2.f to be operable.

Because of the integrated nature of the OPRM Upscale trip function within the APRM channel, the OPRM Inop function and the OPRM 2-Out-Of-4 Voter function are included with the corresponding APRM Inop and APRM 2-Out-Of-4 Voter function. The integration of the OPRM Inop with the APRM Inop reflect actual system design (i.e., conditions which cause an APRM Inop signal also cause an OPRM Inop signal and vice versa). However, unlike the APRM trips, the OPRM Upscale trip is voted separately from the Inoperable trip in the 2-Out-Of-4 Voter function. Thus, an APRM/OPRM Inoperable trip in one APRM channel and an OPRM Upscale trip in another channel will result in two half-trips in each of the 2-Out-Of-4 Voter channels, but no RPS trip. Conversely, an Inoperable trip in any two APRM/OPRM channels or an OPRM Upscale trip in any two channels will result in RPS trip outputs from all four 2-Out-Of-4 Voter channels.

For the APRM Flux trip functions, an APRM/OPRM Inop trip in one APRM channel and an APRM Upscale trip in another channel will result in RPS trip outputs from all four voters. This reflects a more conservative APRM design in response to channel failures when compared with the OPRM design. This additional conservatism is of limited value in the OPRM design. If OPRM Upscale trips were combined in logic with Inoperable trips to generate RPS trip signals, spurious and unnecessary reactor scrams might result. However, an automatic trip will occur upon an unexpected systematic failure of multiple APRM channels. This will result in an APRM/OPRM Inop trip in two or more unbypassed channels, regardless of the OPRM Upscale (or APRM Flux) trip status.

Independent of the APRM/OPRM Inoperable logic, which originates in the APRM channel, a loss of communication from an APRM channel to a voter channel will result in both the APRM and OPRM voting logic in the 2-Out-Of-4 Voter channel declaring the inputs from

that APRM channel inoperative. This condition is alarmed via the 2-Out-Of-4 Voter self-test diagnostics. A loss of communication may be the result of either a hardware failure (affects input to one or more voters) or a loss of power to the APRM channel (affects inputs to all voters). Loss of power to the 2-Out-Of-4 Voter channel will result in immediate RPS trip outputs from that voter channel. Combining the OPRM trip voting and the APRM trip voting into a single 2-Out-Of-4 Voter function simplifies overall operation and the decision-making process, because most conditions affecting operability of the voter channel will affect both the APRM trip voting and the OPRM trip voting. However, the final voting and output relays from the voter for these two functions are different. In addition, the output relays for each function are redundant (i.e., two relay outputs for the APRM trips and two additional relays for the OPRM Upscale trip). Even though there is only one voter channel for both the APRM and OPRM trips, the LCO will be entered as soon as any portion of a voter channel is determined to be inoperable.

Consistent with the APRM Neutron Flux - High Function, the OPRM Upscale function is required only when the plant is operating in Mode 1. In addition, the OPRM Upscale is bypassed automatically when thermal power is below 25% RTP (as indicated by APRM Simulated Thermal Power) or with recirculation drive flow above 60% rated. In the regions below 25% RTP and above 60% recirculation drive flow, thermal-hydraulic instabilities are not considered credible. The 25% RTP threshold is supported by NEDO-32465-A (Reference 10).

The licensing basis trip algorithm for the Option III system is the Period Based Detection Algorithm (PBDA) which includes an amplitude setpoint. This setpoint is calculated or reconfirmed for each operating cycle in accordance with the requirements of NEDO-32465-A. As described in NEDO-32465-A, one aspect of the calculation of the PBDA setpoint is the use of a relationship [known as DIVOM (Delta CPR /Initial CPR Versus Oscillation Magnitude)] that describes the Critical Power Ratio response to an oscillation.

GE previously issued a 10 CFR Part 21 notification (Reference 11), which identified that the constant DIVOM slope provided in NEDO-32465-A may not have been conservative for all operating conditions in plants that had implemented the Option III system. Closure of this issue was documented in Reference 12, which specifies that a plant-specific DIVOM calculation should be performed instead of relying upon the constant DIVOM slope. As documented in Reference 12, the NRC endorsed this method of closure which included no changes to NEDO-32465-A and no additional generic submittals. Unit 1 will utilize this plant-specific DIVOM calculation in the calculation

of setpoints for the Option III system using the same process currently used for Units 2 and 3.

Identified events (e.g., recirculation pump trips or run-backs) can change flow to less than 60% without operator action. Other events (e.g., loss of feedwater heaters) can take the plant from a power less than 25% RTP to a power greater than 25% RTP without operator action. Therefore, even though the OPRM Upscale trip is bypassed above 60% recirculation drive flow and below 25% RTP, the function must be operable so that if one of the identified events occurs, the OPRM Upscale trip capability is immediately available without operator action. Requiring OPRM operability in Mode 1 provides adequate margin to cover the operating region where oscillations may occur as well as the operating regions from which the plant might enter the potential instability region without operator action.

The outputs of the OPRM channels are shared by each RPS trip system via the independent 2-Out-Of-4 Voter channels. Any two of the four OPRM channels and one of the 2-Out-Of-4 Voter channels in each RPS trip system are required to function for the OPRM Upscale trip function to be accomplished. Therefore, a minimum of three OPRM channels assures at least two OPRM channels can provide trip inputs to the 2-Out-Of-4 Voter channels, even in the event of a single OPRM channel failure. The minimum of two 2-Out-Of-4 Voter channels per RPS trip system assures at least one voter channel will be operable per RPS trip system, even in the event of a single voter channel failure.

The 2-Out-Of-4 logic module is designed for simplicity to assure high reliability and to detect loss of input signals from the OPRM channels. This feature, combined with the highly reliable digital electronics implementing the OPRM Upscale trip function and the on-line automatic self-test functions, assures the four-channel OPRM configuration will provide reliability, relative to the safety trip functions, equal to or greater than the current APRM system. This level of reliability is adequate for the OPRM Upscale trip function.

Because the OPRM Upscale trip function is implemented in the same equipment as the APRM trip functions, equipment reliability is also the same. The OPRM Upscale SRs are similar to those for the APRM flux trip functions. The expected demand for the OPRM Upscale trip functions is equal to or less than the demand for the APRM flux trip functions. Therefore, the OPRM Upscale SRs are adequate.

Based on the above discussion, adding the OPRM Upscale Function to the TS is reasonable and consistent with instability detect and suppress objectives.

4.2 Justification for Each Specific Proposed TS Change

There are ten specific proposed TS changes delineated in Section 2 of this application. The numbering in this section is the same as the proposed TS changes described in Section 2. A justification for each of the changes is provided below:

1. The existing Note in TS 3.3.1.1 is being modified to state that Required Action A.2 and Condition B are not applicable for the new OPRM Upscale trip function (2.f). Required Action A.2, *Place associated trip system in trip*, is not applicable to the OPRM Upscale trip function since the OPRM provides signals to both RPS trip systems. Condition B is not applicable since the loss of more than one of the three required OPRM channels results in the loss of OPRM scram capability. This would require entry into Condition C.

2. New Conditions I and J are being added to TS 3.3.1.1. Condition I allows an alternate method to detect and suppress thermal-hydraulic instabilities. The contingent alternate method meets the requirements of the BWROG Interim Corrective Actions, which were outlined in the June 6, 1994 letter to NRC (Reference 13). If Condition I is not met, Condition J requires the plant to be in Mode 2 in four hours. Being in Mode 2 ensures the plant is at a power level below the regions of potential instability.

3. New Surveillance Requirement SR 3.3.1.1.17 is being added to support the new OPRM Upscale trip function. The new SR ensures that scrams initiated from the OPRM Upscale trip function are not inadvertently bypassed when APRM Simulated Thermal Power is greater than or equal to 25% and recirculation flow is less than 60% rated flow. The OPRM auto-enable region is determined by Simulated Thermal Power and recirculation drive flow setpoints in the APRM channels. Even though these setpoints are unlikely to change once set, periodic confirmation is appropriate. The frequency of 24 months is based on engineering judgment, the fact that the actual values are stored digitally with no drift therefore being possible, and the reliability of the components. Hardware failures affecting the Simulated Thermal Power and recirculation drive flow setpoints are detected by the automatic self-test functions. Other surveillances verify the relationships between reactor thermal power and APRM Simulated Thermal Power and between core flow and recirculation flow.

4. The new OPRM Upscale trip function is being implemented using the same equipment as the APRM trip functions. Except for the requirement to verify that the Intermediate Range Monitor (IRM) and APRM channels overlap and the new SR 3.3.1.1.17 discussed above, the applicable modes, required channels per trip system and surveillances are the same.

5. The restrictions related to operation in the thermal-hydraulic stability regions are no longer required. These restrictions on operation in regions of potential thermal-hydraulic instability were originally added to the TS in response to NRC Bulletin 88-07, Supplement 1, as interim corrective actions until a long-term resolution to stability concerns could be developed and implemented. With the OPRM Upscale trip function installed and enabled, these interim corrective actions are no longer required. The OPRMs will detect and automatically suppress any significant core wide or regional power oscillations over the previously defined Regions I and II of the power-to-flow map. Implementation of the PRNM Average Power Range Monitor and Rod Block Monitor Technical Specification (ARTS) improvements / Maximum Extended Load Line Limit (MELLL) function also eliminated the need for the flow biased Rod Block Monitor function.

6. As discussed in 5 above, the restrictions related to operation in the thermal-hydraulic stability region are no longer required.

7. These conditions were relabeled, edited for clarity and consistency with the Units 2 and 3 TS.

8. This action was originally incorporated into the TS because Bulletin 88-07, Supplement 1, requested licensees of BWRs to include a procedural requirement for a manual scram under all circumstances in which there are no recirculation pumps operating with the reactor in the RUN mode. This action was not applicable to plants with effective automatic scram protection against out-of-phase regional oscillations, which is being incorporated as part of this TS change. Prohibition against being in Mode 1 with no recirculation loops in operation is now addressed in revised Condition B. Therefore this action is being deleted.

9. As discussed in 5 above, restrictions related to operation in the thermal-hydraulic stability region are no longer required. Therefore, this SR is being deleted.

10. As discussed in 5 above, restrictions related to operation in the thermal-hydraulic stability region are no longer required. Therefore, this figure is being deleted.

5.0 REGULATORY SAFETY ANALYSIS

The Tennessee Valley Authority (TVA) is submitting an amendment request to license DPR-33 for the Browns Ferry Nuclear Plant (BFN) Unit 1. The proposed amendment enables the Oscillation Power Range Monitor (OPRM) Upscale trip function, which is contained in the previously requested Power Range Neutron Monitoring (PRNM) equipment. Enabling the OPRM hardware provides the long-term stability solution requested by Generic Letter 94-02. The OPRM is designed to meet all requirements of General Design Criteria (GDC) 10 and 12 by automatically detecting and suppressing design basis thermal-hydraulic power oscillations prior to challenging the fuel Minimum Critical Power Ratio (MCPR) Safety Limit. The OPRM system provides this protection during operation in the region of the power-to-flow map where instabilities can occur.

5.1 No Significant Hazards Consideration

TVA has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of Amendment", as discussed below:

1. Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No

Operating in the region of the power-to-flow map where instabilities can occur may cause a slight, but not significant, increase in the possibility that an instability will occur. This slight increase is acceptable because the OPRM Upscale trip function automatically detects and suppresses design basis thermal-hydraulic power oscillations prior to challenging the fuel MCPR Safety Limit. Thus, the proposed changes do not significantly increase the probability of an accident previously evaluated.

Since the OPRM Upscale trip function precludes challenges to the fuel MCPR Safety Limit, the proposed changes do not involve a significant increase in the consequences of an accident previously evaluated.

2. Does the proposed amendment create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No

The proposed changes do not modify the basic functional requirements of the affected equipment nor create any new system failure modes or sequence of events that could lead to an accident. The worst case failure of the affected equipment is failure to perform a mitigation action. Failure of this equipment to perform a mitigating action does not create the possibility of a new or different kind of accident.

No new external threats or release pathways are created. Therefore, the proposed changes do not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does the proposed amendment involve a significant reduction in a margin of safety?

Response: No

The proposed changes do not revise any safety margin requirements. The OPRM Upscale trip function is designed to meet all requirements of General Design Criteria (GDC) 10 and 12 by automatically detecting and suppressing design basis thermal-hydraulic power oscillations prior to challenging the fuel MCPR Safety Limit. Thus, the new equipment improves the ability of the equipment to automatically enforce compliance with margins of safety. Therefore, the proposed changes do not involve a reduction in a margin of safety.

Based on the above, TVA concludes that the proposed amendments present no 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.

5.2 Applicable Regulatory Requirements/Criteria

Enabling the OPRM Upscale trip function is designed to meet all requirements of GDC 10 and 12 by automatically detecting and

suppressing design basis thermal-hydraulic power oscillations prior to challenging the fuel MCPR Safety Limit.

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 the health and safety of the public.

6.0 ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed amendment does not involve:

(i) A significant hazards consideration,

(ii) A significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or

(iii) A significant increase in individual or cumulative occupational radiation exposure.

Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 50.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

7.0 REFERENCES

1. TVA letter to NRC, dated June 28, 2004, "Browns Ferry Nuclear Plant (BFN) - Unit 1- Proposed Technical Specifications (TS) Change TS-431 - Request For License Amendment - Extended Power Uprate (EPU) Operation."

2. TVA letter to NRC, dated September 8, 1984, "Browns Ferry Nuclear Plant (BFN) - Units 1, 2, and 3 Response to NRC Generic Letter (GL) 94-02 - Long-Term Solutions and Upgrade of Interim Operating Recommendations for Thermal-Hydraulic Instabilities in Boiling Water Reactors."

3. TVA letter to NRC, dated July 10, 1996, "Browns Ferry Nuclear Plant (BFN) - Units 1, 2, and 3 - Installation Schedule for the Long-Term Stability Solution for Generic Letter (GL) 94-02."

4. TVA letter to NRC, dated November 10, 2003, "Browns Ferry Nuclear Plant (BFN) Unit 1 - Technical Specifications (TS) Change 430 - Power Range Neutron Monitor Upgrade With Implementation of Average Power Range Monitor and Rod Block Monitor Technical Specification Improvements and Maximum Extended Load Line Limit Analyses."

5. Licensing Topical Report NEDO-31960-A, BWR Owners' Group Long-Term Stability Solution Licensing Methodology.

6. TVA letter to NRC, dated September 8, 1998, "Browns Ferry Nuclear Plant (BFN) - Unit 2 - Technical Specification (TS) Change - 354 - Oscillation Power Range Monitor."

7. NRC letter to TVA, dated March 5, 1999, "Amendment No. 258 to Facility Operating License No. DPR-52: Oscillation Power Range Monitor Upscale Trip Function in the Average Power Range Monitor - Technical Specification Change TS-354 (TAC NO. MA3556)."

8. TVA letter to NRC, dated June 28, 1999, "Browns Ferry Nuclear Plant (BFN) - Unit 3 - Technical Specifications (TS) Change 398 - Oscillating Power Range Monitor (TAC No. MA5976)."

9. NRC letter to TVA, dated September 27, 1999, "Browns Ferry Nuclear Plant, Unit 3 - Issuance of Amendment Regarding Oscillation Power Range Monitor (TAC No MA5976)."

10. Licensing Topical Report NEDO 32465-A, Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications.

11. GE letter (J. S. Post) to NRC, dated August 31, 2001, "Stability Reload Licensing Calculations Using Generic DIVOM Curve."

12. BWROG letter (K. S. Putnam) to NRC, dated September 30, 2004, "Resolution of Reportable Condition for Stability Reload Licensing Calculations Using Generic Regional Mode DIVOM Curve."

13. BWROG letter to NRC, L.A. England to M.J. Virilio, dated June 6, 1994 "BWR Owners' Group Guidelines for Stability Interim Corrective Action."

ENCLOSURE 2

BROWNS FERRY NUCLEAR PLANT (BFN) UNIT 1

TECHNICAL SPECIFICATION (TS) CHANGE TS-443 -
OSCILLATION POWER RANGE MONITOR (OPRM)

PROPOSED TECHNICAL SPECIFICATION CHANGES (MARK-UP)

3.3 INSTRUMENTATION

3.3.1.1 Reactor Protection System (RPS) Instrumentation

LCO 3.3.1.1 The RPS instrumentation for each Function in Table 3.3.1.1-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.1.1-1.

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each channel.

CONDITION		REQUIRED ACTION	COMPLETION TIME
A. One or more required channels inoperable.	A.1	Place channel in trip.	12 hours
	OR		
	A.2	----------NOTE---------- Not applicable for Functions 2.a, 2.b, 2.c, ~~or~~ 2.d, or 2.f. ---------- Place associated trip system in trip.	12 hours
B. ----------NOTE---------- Not applicable for Functions 2.a, 2.b, 2.c, ~~or~~ 2.d, or 2.f. ---------- One or more Functions with one or more required channels inoperable in both trip systems.	B.1	Place channel in one trip system in trip.	6 hours
	OR		
	B.2	Place one trip system in trip.	6 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
I. As required by Required Action D.1 and referenced in Table 3.3.1.1-1.	I.1 Initiate alternate method to detect and suppress thermal hydraulic instability oscillations.	12 hours
J. Required Action and associated Completion Time of Condition I not met.	J.1 Be in Mode 2.	4 hours

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.1.17	Verify OPRM is not bypassed when APRM Simulated Thermal Power is ≥ 25% and recirculation drive flow is < 60% of rated recirculation drive flow.	24 months

Table 3.3.1.1-1 (page 2 of 3)
Reactor Protection System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION D.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
2. Average Power Range Monitors (continued)					
d. Inop	1,2	3[(b)]	G	SR 3.3.1.1.16	NA
e. 2-Out-Of-4 Voter	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.14 SR 3.3.1.1.16	NA
f. OPRM Upscale	1	3[(b)]	I	SR 3.3.1.1.1 SR 3.3.1.1.7 SR 3.3.1.1.13 SR 3.3.1.1.16 SR 3.3.1.1.17	NA
3. Reactor Vessel Steam Dome Pressure - High	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.8 SR 3.3.1.1.10 SR 3.3.1.1.14	≤ 1055 psig
4. Reactor Vessel Water Level - Low, Level 3	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.8 SR 3.3.1.1.13 SR 3.3.1.1.14	≥ 538 inches above vessel zero
5. Main Steam Isolation Valve - Closure	1	8	F	SR 3.3.1.1.8 SR 3.3.1.1.13 SR 3.3.1.1.14	≤ 10% closed
6. Drywell Pressure - High	1,2	2	G	SR 3.3.1.1.8 SR 3.3.1.1.13 SR 3.3.1.1.14	≤ 2.5 psig

(continued)

(a) With any control rod withdrawn from a core cell containing one or more fuel assemblies.

(b) Each APRM channel provides inputs to both trip systems.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.1 Recirculation Loops Operating

LCO 3.4.1 Two recirculation loops with matched flows shall be in operation. ~~with core flow as a function of THERMAL POWER outside Regions I and II and the Operation Not Permitted Region of Figure 3.4.1-1~~.

OR

One recirculation loop may be in operation ~~with core flow as a function of THERMAL POWER outside Regions I and II and the Operation Not Permitted Region of Figure 3.4.1-1 and~~ provided the following limits are applied when the associated LCO is applicable:

a. LCO 3.2.1, "AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)," single loop operation limits specified in the COLR;

b. LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)," single loop operation limits specified in the COLR;

c. LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation," Function 2.b (Average Power Range Monitors Flow Biased Simulated Thermal Power - High), Allowable Value of Table 3.3.1.1-1 is reset for single loop operation;

~~d. LCO 3.3.2.1, "Control Rod Block Instrumentation," Function 1.a (Rod Block Monitor Upscale (Flow Biased)), Allowable Value of Table 3.3.2.1-1 is reset for single loop operation.~~

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~A. Reactor operation with core flow as a function of THERMAL POWER inside of Region I of Figure 3.4.1-1.~~	~~A.1 Place mode switch in the shutdown position.~~	~~Immediately~~
~~B. Reactor operation with core flow as a function of THERMAL POWER inside of Region II of Figure 3.4.1-1.~~	~~B.1 Place mode switch in the shutdown position.~~ ~~AND~~ ~~B.2 Exit Region II.~~	~~Immediately upon discovery of thermal hydraulic instability~~ ~~2 hours~~
~~C~~A. Requirements of the LCO not met. ~~for reasons other than A or B.~~	~~C~~A.1 Satisfy the requirements of the LCO.	24 hours
~~D~~B. Required Action and associated Completion Time of Conditions~~s~~ A ~~B or C~~ not met. OR No recirculation loops in operation. ~~while in MODE 2.~~	~~D~~B.1 Be in MODE 3.	12 hours
~~E. No recirculation loops in operation while in MODE 1.~~	~~E.1 Place mode switch in the shutdown position.~~	~~Immediately~~

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.4.1.1	----------NOTE---------- Not required to be performed until 24 hours after both recirculation loops are in operation. ---------- Verify recirculation loop jet pump flow mismatch with both recirculation loops in operation is: a. ≤ 10% of rated core flow when operating at < 70% of rated core flow; and b. ≤ 5% of rated core flow when operating at ≥ 70% of rated core flow.	24 hours
~~SR 3.4.1.2~~	~~Verify the reactor is outside of Region I and II of Figure 3.4.1-1.~~	~~Immediately after any increase > 5% RTP while initial core flow is < 50% of rated~~ ~~AND~~ ~~Immediately after any decrease of > 10% rated core flow while initial thermal power is > 40% of rated~~

DELETED AS PART OF EPU SUBMITTAL

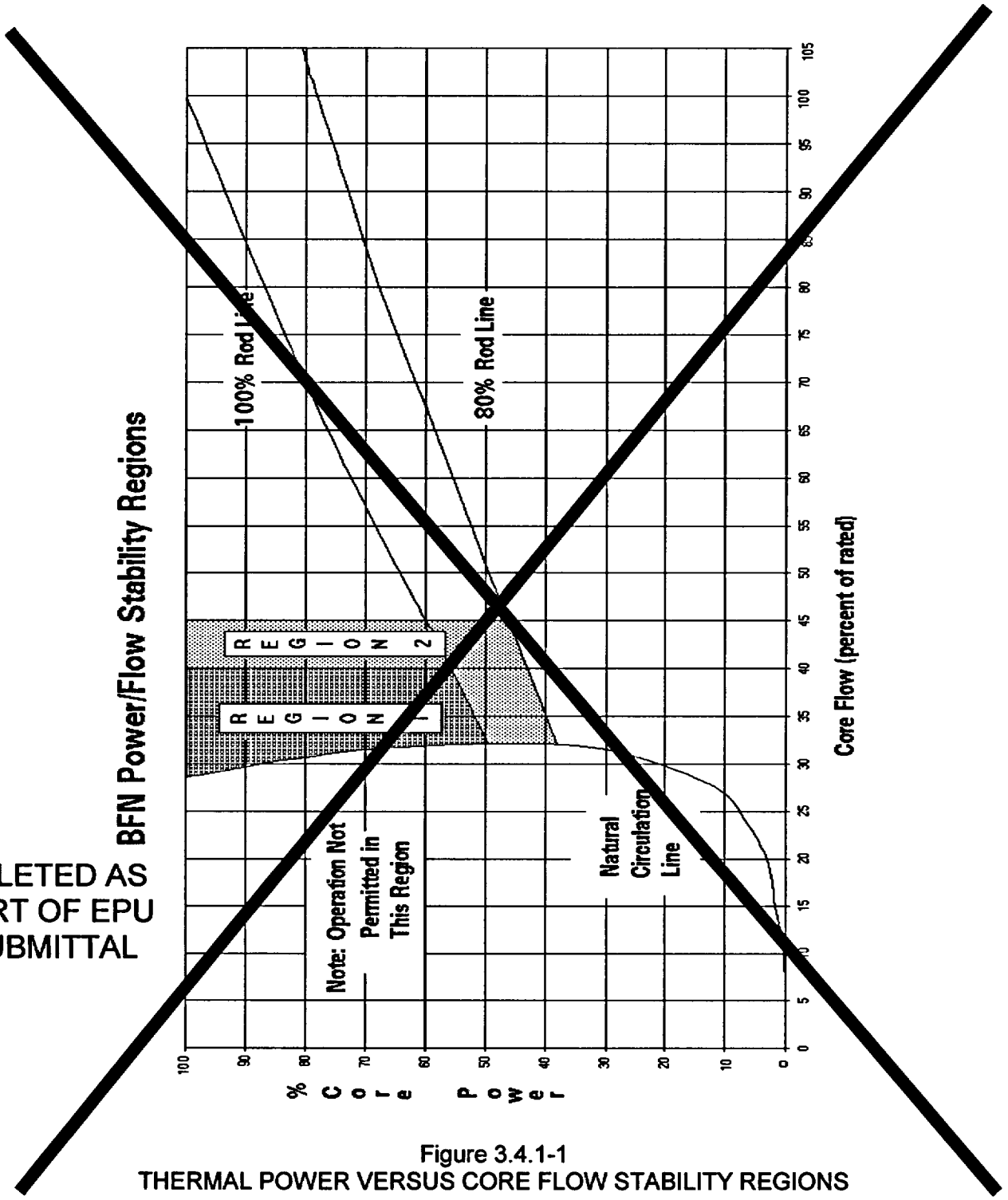

Figure 3.4.1-1
THERMAL POWER VERSUS CORE FLOW STABILITY REGIONS