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January 21, 2003

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

10 CFR 50.73

Dear Sir:

TENNESSEE VALLEY AUTHORITY - BROWNS FERRY NUCLEAR PLANT (BFN) - UNITS 2 and 3 - DOCKETS 50-260 AND -296 - FACILITY OPERATING LICENSES DPR - 52 AND DPR - 68 - LICENSEE EVENT REPORT (LER) 50-260/2002-003-00

The enclosed report provides details concerning a failure to meet the Technical Specifications. This report is submitted in accordance with 10CFR 50.73 (a)(2)(i)(B) as any operation or condition which was prohibited by the plant's Technical Specifications. There are no commitments contained in this letter.

Sincerely,

original signed by R. G. Jones, for

Ashok S. Bhatnagar

cc: See page 2

Enclosure
cc (Enclosure):
(Via NRC Electronic Distribution)

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s:lic/submit/lers/260-2002-03

NRC FORM 366 (7-2001)	U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB NO. 3150-0104	EXPIRES 7-31-2004

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Browns Ferry Nuclear Plant Unit 2	05000260	1 OF 6

4. TITLE

Non-Conservative Oscillation Power Range Monitoring T_{min} Specification For Unit 2 and Unit 3

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									Brown Ferry Unit 3	05000296
11	22	2002	2002	- 003 -	00	01	21	2003	FACILITY NAME None	DOCKET NUMBER N/A

9. OPERATING MODE	1
10. POWER LEVEL	100

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)

	20.2201(b)		20.2203(a)(3)(ii)		50.73(a)(2)(ii)(B)		50.73(a)(2)(ix)(A)
	20.2201(d)		20.2203(a)(4)		50.73(a)(2)(iii)		50.73(a)(2)(x)
	20.2203(a)(1)		50.36(c)(1)(i)(A)		50.73(a)(2)(iv)(A)		73.71(a)(4)
	20.2203(a)(2)(i)		50.36(c)(1)(ii)(A)		50.73(a)(2)(v)(A)		73.71(a)(5)
	20.2203(a)(2)(ii)		50.36(c)(2)		50.73(a)(2)(v)(B)		OTHER
	20.2203(a)(2)(iii)		50.46(a)(3)(ii)		50.73(a)(2)(v)(C)		specify in Abstract below or in
	20.2203(a)(2)(iv)		50.73(a)(2)(i)(A)		50.73(a)(2)(v)(D)		NRC Form 366A
	20.2203(a)(2)(v)	X	50.73(a)(2)(i)(B)		50.73(a)(2)(vii)		
	20.2203(a)(2)(vi)		50.73(a)(2)(i)(C)		50.73(a)(2)(viii)(A)		
	20.2203(a)(3)(i)		50.73(a)(2)(ii)(A)		50.73(a)(2)(viii)(B)		

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
Paul S. Heck, Nuclear Engineer, Licensing and Industry Affairs	256-729-3624

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX		CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

14. SUPPLEMENTAL REPORT EXPECTED			15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
	YES (if yes, complete EXPECTED SUBMISSION DATE)	X NO				

16. ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On November 22, 2002, General Electric (GE) notified TVA of a 10 CFR Part 21 condition potentially affecting Browns Ferry (BFN) related to the use of a non-conservative T_{min} value in the Oscillation Power Range Monitor (OPRM) system algorithm. TVA confirmed that the condition was applicable to BFN. At 1630 hours Central Standard Time on November 22, the OPRM upscale trip function was declared inoperable on Unit 2 and Unit 3. Technical Specifications Limiting Condition for Operation 3.3.1.1 Condition I was entered, and Required Action I.1 was taken to initiate within 12 hours an alternate method to detect and suppress thermal-hydraulic instability oscillations.

The root cause of this event was a flawed original GE design of the OPRM system algorithm. Interim corrective actions have been implemented to establish manual methods for detection and suppression of instability. BFN will monitor the actions of GE and the Boiling Water Reactor Owners' Group (BWROG) Detect and Suppress Committee Option III design reviews and recommendations to determine what corrective actions are required to resolve the OPRM problems identified in the November 22, 2002 10 CFR 21 notification.

NARRATIVE *(If more space is required, use additional copies of NRC Form 366A) (17)*

I. PLANT CONDITION(S)

At the time of discovery of this condition, Unit 2 and Unit 3 were at 100 percent power. Unit 1 was shutdown and defueled.

II. DESCRIPTION OF EVENT

A. Event:

On November 22, 2002, General Electric (GE) notified TVA of a 10 CFR Part 21 condition potentially affecting Browns Ferry (BFN) related to the use of a non-conservative T_{min} value in the Oscillation Power Range Monitor (OPRM) [IG] system algorithm. TVA confirmed that the condition was applicable to BFN. At 1630 hours Central Standard Time (CST) on November 22, the OPRM upscale trip function was declared inoperable on Unit 2 and Unit 3. Technical Specifications (TS) Limiting Condition for Operation (LCO) 3.3.1.1 Condition I was entered, and Required Action I.1 was taken to initiate within 12 hours an alternate method to detect and suppress thermal-hydraulic instability oscillations.

At approximately 1730 hours CST the plant operators commenced testing to demonstrate that reactor thermal power and core flow were within appropriate parameter limits to prevent uncontrolled power oscillations. This testing was commenced on Unit 2 at 1730 hours via the performance of procedure 2-SR-3.3.1.1.I, Core Thermal Hydraulic Stability. The test was satisfactorily completed at 1736 hours. On Unit 3, using procedure 3-SR-3.3.1.1.I, plant operators commenced testing at 1755 hours and the testing was satisfactorily completed at 1910 hours.

The OPRM module of the GE Power Range Neutron Monitoring System (PRNMS) [IG] was installed to satisfy TVA's long-term solution regarding reactor core stability. Browns Ferry has implemented the long-term stability solution designated as Option III in NEDO-31960, Supplement 1, "BWR Owners' Group Long-Term Stability Solution Licensing Methodology." This is accomplished by the PRNMS OPRM upscale trip function. This trip function was enabled in May 1999 on Unit 2 and in May 2000 on Unit 3. The OPRM upscale trip function provides protection against exceeding the fuel minimum critical power ratio (MCPR) Safety Limit should thermal-hydraulic power oscillations occur.

Because this condition has existed on Unit 2 since May 1999 and on Unit 3 since May 2000, TVA is reporting this event, pursuant to 10 CFR 50.73(a)(2)(i)(B), as any operation or condition which was prohibited by the plant's Technical Specifications.

B. Inoperable Structures, Components, or Systems that Contributed to the Event:

None

C. Dates and Approximate Times of Major Occurrences:

May 1999		OPRM upscale trip function enabled on Unit 2
May 2000		OPRM upscale trip function enabled on Unit 3
November 22, 2002		GE notified TVA of a 10 CFR 21 condition potentially affecting BFN related to the use of non-conservative setpoints within the OPRM system algorithm.
November 22, 2002	1630 hours CST	After evaluating the information, TVA concluded that the 10 CFR 21 condition was applicable to BFN and entered the required TS Actions on Unit 2 and Unit 3.
November 22, 2002	1736 hours CST	Required TS actions completed on Unit 2
November 22, 2002	1910 hours CST	Required TS actions completed on Unit 3

D. Other Systems or Secondary Functions Affected

None

E. Method of Discovery

GE notified TVA via a 10 CFR 21 report of the use of a setpoint value for the OPRM T_{min} parameter that resulted in potentially non-conservative system operation.

F. Operator Actions

Following the conclusion that the OPRM function was no longer operable because of the T_{min} value used, the OPRM channels were formally declared inoperable. The necessary TS actions were taken within the appropriate time frame.

G. Safety System Responses

None required

NARRATIVE *(If more space is required, use additional copies of NRC Form 366A) (17)*

III. CAUSE OF THE EVENT

A. Immediate Cause

The immediate cause of exceeding the TS LCO times for reactor operation with an inoperable OPRM function was the specification of a non-conservative value for the T_{min} parameter in the OPRM system algorithm. Because of the T_{min} value in use, computations performed by the OPRM channels could not be shown as conservative for all reactor operational conditions.

B. Root Cause

The root cause of this event was a flawed original GE design of the OPRM system algorithm. As described in the 10 CFR 21 report, the system algorithm has been determined to be inadequate if a T_{min} value greater than 1.2 seconds is used. The OPRM system design procured from GE and installed by BFN on Unit 2 and Unit 3 used T_{min} values of 1.4 seconds.

C. Contributing Factors

None

IV. ANALYSIS OF THE EVENT

Browns Ferry has implemented the long-term stability solution designated as Option III in NEDO-31960, Supplement 1, "BWR Owners' Group Long-Term Stability Solution Licensing Methodology." This is accomplished via the PRNMS OPRM trip function. The trip function was enabled in May 1999 on Unit 2 and May 2000 on Unit 3. The OPRM trip function provides protection from exceeding the fuel MCPR Safety Limit should thermal-hydraulic power oscillations occur.

The OPRM is designed to detect reactor core thermal-hydraulic instability and provide readout, alarms, and trips associated with an instability event. The OPRM receives data from the PRNMS. A reactor scram is initiated if oscillatory changes in the neutron flux are detected.

The OPRM trip function is required to be operable when the plant is in a region of power-flow operation where actual thermal-hydraulic oscillations might occur. When the reactor is operating in regions of the power/flow map where it has been determined that unstable power oscillations cannot occur, OPRM trips are automatically bypassed. Each OPRM channel provides an oscillation trip enable input to an alarm that indicates when the reactor has entered the operating region where instability can occur and the trip is no longer bypassed.

If the OPRM trip function should become inoperable, as in the case described by this event report, the implementation of alternate methods to detect and suppress oscillations allow continued reactor operation. The TS allow reactor operation for an unlimited period of time while such alternate methods are being utilized. Procedures require the use of control room instrumentation and process computer [ID] outputs to determine the operating conditions to be plotted on the power flow map. By plotting the reactor power versus core flow, the operating staff can demonstrate the reactor is not operating under conditions where thermal-hydraulic instability might occur.

NARRATIVE *(If more space is required, use additional copies of NRC Form 366A) (17)*

According to the 10 CFR 21 report by GE, at core flow rates between approximately 60% and 63% of rated core flow, an oscillation period of less than 1.4 seconds is possible. Therefore, as currently configured, it cannot be assured that the BFN OPRM function on Unit 2 and Unit 3 would provide an automatic trip for all analytically possible thermal-hydraulic situations, and the function cannot be considered operable in accordance with the TS. Since both Unit 2 and Unit 3 at BFN have been operating for a period of years with an OPRM function that was inoperable, a TS non-compliance event resulted.

An earlier 10 CFR 21 issue affecting the BFN OPRM function was reported to the NRC by BFN in LER 260/2001-02, " Non-Conservative Analysis for Oscillation Power Range Monitoring Scram Setpoint for Unit 2 and Unit 3." Design reviews undertaken via the BWROG as a result of this previous event led to the discovery of the current T_{min} issue.

V. ASSESSMENT OF SAFETY CONSEQUENCES

An inherent characteristic of a boiling water reactor is that, at relatively high core powers in conjunction with relatively low core flows and certain other core characteristics, it becomes possible for thermal-hydraulic oscillations to occur. Such oscillations have occurred in the past at both domestic and foreign commercial BWRs. However, the probability of such events is low for three primary reasons:

- operating procedures direct the avoidance of the susceptible region (high power/low flow) of the power flow map during routine power operation
- transients which result in unintentional operation in this region do not occur frequently
- core designs take the possibility of thermal-hydraulic instability into account such that even when high power/low flow core conditions occur, instability situations do not invariably ensue

BFN has never experienced a thermal-hydraulic instability event. BFN operating procedures do not allow routine operation of BFN in high power/low flow regions of the power flow map where thermal-hydraulic instability becomes a possibility. An abnormal operating event, such as a dual reactor recirculation pump [AD] runback or pump trip, would have to occur to enter the region. Operating procedures dictate the actions necessary to exit the region should it be entered, and procedures also direct the control room crew in how to monitor for any evidence of instability while the reactor is operating in the region. The operating crews are trained on how to respond to such transients.

Additionally, during the time interval on Unit 2 and Unit 3 when the OPRM was not operable in accordance with the TS, the system would still have functioned in a majority of hypothetical instability scenarios, where the oscillation period was greater than 1.4 seconds. Also, as stated by GE in the 10 CFR 21 report, should an actual failure of the OPRM automatic detection function under these conditions have occurred, no fuel failures would have been expected.

Given that the probability of an instability event is low, the operating staff is well trained and is equipped with good procedural guidance for such eventualities, and no fuel failure would have been expected, the TS inoperability of the automatic OPRM trip function is not significant. It is concluded that there is no adverse impact on safety as a result of this event.

NARRATIVE *(If more space is required, use additional copies of NRC Form 366A) (17)*

VI. CORRECTIVE ACTIONS

A. Immediate Corrective Actions

TVA declared the OPRM function for Unit 2 and Unit 3 inoperable, and the TS required actions were implemented to initiate an alternate method of detecting and suppressing thermal-hydraulic oscillations.

B. Corrective Actions to Prevent Recurrence[(1)]

The BFN Reactor Engineering section shall review the GE/BWR Owners' Group (BWROG) Detect and Suppress Committee Option III design reviews and recommendations to determine what corrective actions are required to resolve the OPRM problems identified in the November 22, 2002 10 CFR 21 notification.

VII. ADDITIONAL INFORMATION

A. Failed Components

None

B. Previous LERs on Similar Events

LER 260/2001-02 - Non-Conservative Analysis for Oscillation Power Range Monitoring Scram Setpoint for Unit 2 and Unit 3

C. Additional Information

None

D. Safety System Functional Failure Consideration:

This event did not result in a safety system functional failure.

E. Loss of Normal Heat Removal Consideration:

N/A This event did not involve a reactor scram.

VIII. COMMITMENTS

None

(1) TVA does not consider these corrective actions as regulatory commitments. The completion of these actions will be tracked in TVA's Corrective Action Program.