July 20, 2007

U.S. Nuclear Regulatory Commission 10 CFR 50.73
ATTN: Document Control Desk
Mail Stop OWFN, P1-35
Washington, D. C. 20555-0001

Dear Sir:

TENNESSEE VALLEY AUTHORITY - BROWNS FERRY NUCLEAR PLANT (BFN) - UNIT 1 - DOCKET 50-259 - FACILITY OPERATING LICENSE DPR - 33 - LICENSEE EVENT REPORT (LER) 50-259/2007-001-00

The enclosed report provides details of exceeding the Technical Specification allowable outage time in Mode 2 due to inoperable Average Power Range Monitors.

As such, in accordance with 10 CFR 50.73(a)(2)(i)(B), TVA is reporting this as any operation or condition prohibited by the unit's TS. There are no commitments contained in this letter.

Sincerely,

Original signed by:

Brian O'Grady

cc: See page 2

Enclosure
cc (Enclosure):

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NRC FORM 366 (6-2004) U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2007
LICENSEE EVENT REPORT (LER) (See reverse for required number of digits/characters for each block)	Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Browns Ferry Unit 1	05000259	1 OF 5

4. TITLE
Average Power Range Monitors Inoperable in Excess of Technical Specification Allowable Outage Time in Mode 2

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									None	N/A
05	21	2007	2007	- 001 -	00	07	20	2007	None	N/A

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*			
2	☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
	☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
	☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
	☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
10. POWER LEVEL	☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
	☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
004	☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
	☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER Specify in Abstract below or in NRC Form 366A
	☐ 20.2203(a)(2)(vi)	☒ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER *(Include Area Code)*
Denzel Housley, Licensing Engineer	256-614-6398

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 15. EXPECTED SUBMISSION DATE)* ☒ NO		N/A	N/A	N/A

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

On May 27, 2007, during restart activities for Unit 1, it was identified that the Average Power Range Monitors (APRM) channels were indicating reactor power level lower than expected for the plant condition. Investigation identified that the gain factors for the individual Local Power Range Monitor (LPRM) channels that provide input signals to the APRM channels were set lower than expected. The lower gain factor settings for all of the LPRM channels reduced the signals to the APRMs to the point where the APRM gain factor adjustments could not compensate for the reduced LPRM channel signals. With the APRM channels indicating a power level lower than the actual reactor power, Technical Specification 3.3.1.1, "RPS Instrumentation," Table 3.3.1.1-1 Function 2.a (APRM Neutron Flux - High, Setdown) would not be operable as required in Mode 2. This condition existed when Mode 2 was entered initially on May 21, 2007.

The root cause of this condition was inadequate verification of post-modification testing and work order closure. The original planners for the LPRM replacement work order excluded the normal procedure steps to set the LPRM gains because they presumed later stages of testing would perform this action. The original planners associated with the LPRM replacement are no longer employed at BFN. Current Instrument & Controls planners and craftsmen have been briefed on this event.

NARRATIVE

I. PLANT CONDITION(S)

During this event, Unit 1 was in Mode 2 (Startup) and less than approximately 4 percent rated thermal power (RTP) during restart activities following the extended shutdown of Unit 1. Units 2 and 3 were unaffected by this event.

II. DESCRIPTION OF EVENT

A. Event:

On May 27, 2007, during restart activities for Unit 1, it was identified that the Average Power Range Monitor (APRM) [IG] channels were indicating reactor power level lower than expected for the plant condition. Steps were taken to adjust the individual APRM channel gain factors to increase the indicated reactor power. Prior to the adjustment, reactor power was calculated to be approximately 4 percent RTP and the APRM channels were indicating approximately 1 percent RTP. During the APRM adjustment, with the maximum gain factor adjustment, the indication could only be raised to approximately 2.5 percent RTP.

Further investigation identified that the gain factors for the individual Local Power Range Monitor (LPRM) channels that provide input signals to the APRMs were set to a value lower than expected. Prior to restart of Unit 1 following the extended outage, all the LPRM detectors had been replaced. At the time of restart, the gain factors for the individual LPRM channels were approximately 1 instead of the expected setting of 2.5. The lower gain factor settings for all of the LPRM channels reduced the signals to the APRMs to the point where the APRM gain factor adjustments could not compensate for the reduced LPRM channel signals.

Following this discovery, the LPRM gain factors were adjusted to 2.5 and the APRM channel gain factors were readjusted to conservatively indicate reactor power. These actions were completed at 1312 hours Central Daylight Time (CDT) on May 27, 2007. At this time, reactor power had decreased to approximately 2.8 percent RTP and the APRM channels conservatively indicated approximately 4 percent RTP.

Technical Specification (TS) 3.3.1.1, "RPS Instrumentation," requires that Table 3.3.1.1-1 Function 2.a (APRM Neutron Flux - High, Setdown) be operable while in Mode 2. This function provides a Reactor Protection System (RPS) trip function in Mode 2 when the APRM channels sense a reactor power exceeding an allowable value of </= 15 percent RTP. With the APRM channels indicating a power level lower than the actual reactor power, this TS requirement would not have been met and this APRM trip function would be considered inoperable. In accordance with TS 3.3.1.1 Action G, the reactor would have to be placed in Mode 3 within 12 hours.

Unit 1 commenced start-up activities in late May 2007, after an extended outage. Mode 2 was entered initially on May 21, 2007, at 323 hours CDT. Unit 1 went critical on May 22, 2007, and was manually shutdown on May 24, 2007, following a turbine electrohydraulic control (EHC) system leak. Prior to the scram, the reactor remained in Mode 2 at low power levels (< 3 percent RTP). When restart activities were resumed after the scram recovery, Unit 1 entered Mode 2 on May 26, 2007, at 1027 hours CDT. Power was increased up to approximately 4 percent RTP when the condition with the APRM indication was identified. The APRM Neutron Flux - High, Setdown function was not operable during the time the reactor was in Mode 2 until LPRM channel gain factor adjustments were made. Since this condition was not identified until May 27, 2007, the completion time for the required LCO action was not met. Therefore, in accordance with 10 CFR 50.73(a)(2)(i)(B), TVA is reporting this event as any operation or condition prohibited by the plant's Technical Specifications.

NARRATIVE

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

None.

C. **Dates and Approximate Times of Major Occurrences:**

May 21, 2007	323 hours CDT	Mode 2 entered for first time following extended outage
May 24, 2007	211 hours CDT	Unit 1 scrams and exits Mode 2
May 26, 2007	1027 hours CDT	Mode 2 entered following scram
May 27, 2007	1312 hours CDT	LPRM and APRM adjustments completed

D. **Other Systems or Secondary Functions Affected**

None.

E. **Method of Discovery**

The non-conservative APRM channel indications were identified during normal observation during the May 27, 2007, reactor startup.

F. **Operator Actions**

None.

G. **Safety System Responses**

None.

III. CAUSE OF THE EVENT

A. **Immediate Cause**

The immediate cause of this reportable condition was the failure to correctly adjust the LPRM channel gain factors following replacement during the extended outage.

B. **Root Cause**

The root cause of this condition was inadequate verification of post-modification testing and work order closure. The original planners for the LPRM replacement work order excluded the normal procedure steps to set the LPRM gains because they presumed later stages of testing would perform this action.

C. **Contributing Factors**

None.

IV. ANALYSIS OF THE EVENT

The APRM channels receive input signals from the LPRM detectors 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 RTP. In Mode 2, the Intermediate Range Monitors (IRM) and the APRM channels (allowable value of 15 percent RTP) provide separate trip signals to the RPS for reactor power transients.

LPRM detector replacement and testing is performed using a Special Instrument Instruction (SII) that includes steps to adjust the LPRM channel gains for replaced LPRMs. In this event, the LPRM detectors had been replaced during the extended Unit 1 outage well in advance of the installation of the Power Range Neutron Monitoring System (PRNMS) equipment on which the LPRM gain factors are adjusted. The work order that controlled the replacement of the Unit 1 LPRMs excluded the normal SII steps to adjust the LPRM gain factors. It was believed that later outage activities would perform this step when the associated PRNMS equipment was installed. The required testing was not confirmed to be in a later document. Replacement of LPRMs during normal refueling outages on Units 2 and 3 have resulted in correct adjustment for the replaced LPRM gain factors as specified by the SII.

During Unit 1 startup in Mode 2, the IRM and high reactor pressure trip functions were operable. Therefore, reactor power transients would have been mitigated by these functions.

V. ASSESSMENT OF SAFETY CONSEQUENCES

For operation at low power (i.e., Mode 2), the APRM Neutron Flux - High (Setdown) function is capable of generating a trip signal that prevents fuel damage resulting from abnormal operating transients in this power range. For most operation at low power levels, this APRM function provides a secondary scram function to the IRM Neutron Flux - High function. No specific safety analyses take direct credit for the APRM Neutron Flux - High (Setdown) function. However, this function indirectly ensures that before the reactor mode switch is placed in Mode 1 (Power Operation), reactor power does not exceed 25 percent RTP when operating at low reactor pressure and low core flow. Therefore, it indirectly prevents fuel damage during significant reactivity increases with thermal power less than 25 percent RTP.

During this event, the IRM Neutron Flux - High and Rector Pressure - High trip functions were operable. Since the APRM Neutron Flux - High (Setdown) function is not credited in any safety analyses, this event is not considered to be safety significant.

VI. CORRECTIVE ACTIONS

A. Immediate Corrective Actions

Upon discovery, steps were taken to appropriately adjust the LPRM and APRM gain factors to conservatively indicate reactor thermal power.

B. Corrective Actions to Prevent Recurrence[1]

The original planners associated with the LPRM replacement are no longer employed at BFN. Current Instrument & Controls planners and craftsmen have been briefed on this event.

VII. ADDITIONAL INFORMATION

A. Failed or Degraded Components

None.

[1] TVA does not consider this corrective action a regulatory commitment. The completion of this action will be tracked in TVA's Corrective Action Program.

NARRATIVE

B. Previous LERs on Similar Events

None.

C. Additional Information

Browns Ferry Corrective Action document PER 125408.

D. Safety System Functional Failure Consideration:

The APRM Neutron Flux - High (Setdown) function in Mode 2 is not credited in any safety analyses. During this event, the IRM high flux and high reactor pressure trip functions were operable and would have provided any necessary trip signals to the RPS on a reactor power transient. Therefore, this event is not considered a safety system function failure in accordance with NEI 99-02.

E. Loss of Normal Heat Removal Consideration:

The condition being reported did not involve a reactor scram.

VIII. COMMITMENTS

None.