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SUBJECT: Responds to NRC 980330 RAI re license amend request to allow operation at uprated power level of 3458 MWt.

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April 28, 1998

U.S. Nuclear Regulatory Commission
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Washington, D.C. 20555

Gentlemen:

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

BROWNS FERRY NUCLEAR PLANT (BFN) - RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI) REGARDING UNITS 2 and 3 TECHNICAL SPECIFICATION (TS) CHANGE TS - 384, - RESPONSE TO THE REQUEST FOR ADDITIONAL INFORMATION RELATING TO LICENSE AMENDMENT FOR POWER UPRATE OPERATION, (TAC NOS. M99711, M99712)

This letter provides additional information requested by NRC in support of TS-384. On October 1, 1997, TVA provided TS-384, an amendment to Operating Licenses DPR-52 and DPR-68 that will allow Units 2 and 3 to operate at an uprated power level of 3458 MWt. On March 30, 1998, NRC requested that TVA provide additional information to complete the review of the amendment request.

Enclosure 1 provides the requested information.

A030

The commitments made in this letter are contained in Enclosure 2. If you have any questions, please telephone me at (256) 729-2636.

Sincerely,

T. E. Abney
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and Industry Affairs

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ENCLOSURE 1
TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT
UNITS 2 AND 3

BROWNS FERRY NUCLEAR PLANT (BFN) - RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI) REGARDING UNITS 2 and 3 TECHNICAL SPECIFICATION (TS) CHANGE TS - 384, - RESPONSE TO THE REQUEST FOR ADDITIONAL INFORMATION RELATING TO LICENSE AMENDMENT FOR POWER UPRATE OPERATION, (TAC NOS. M99711, M99712)

This enclosure provides TVA's response to the March 30, 1998, NRC RAI. Any commitments made in this response to NRC's requests are identified in Enclosure 2.

NRC Request 1

Discuss whether the power uprate will change the type and scope of plant emergency and abnormal operating procedures. Will the power uprate change the type, scope, and nature of operator actions needed for accident mitigation and will new operator actions be required?

TVA Reply

For BFN, Emergency Operating Procedures and Abnormal Operating Procedures are designated as Emergency Operating Instructions (EOIs) and Abnormal Operating Instructions (AOIs). The EOIs for Browns Ferry are symptom based. Changes in the EOIs and the AOIs required for power uprate implementation consist of revisions to previously defined numerical values (e.g., reactor pressure vessel (RPV) high pressure scram setpoint value). The definition of these parameters has not been altered, only the numerical value of the parameter has changed. Therefore, the type, scope, and nature of the operator actions required for accident mitigation are unchanged. Consequently, no new operator actions are necessary for power uprate.

NRC Request 2

Provide examples of operator actions that are particularly sensitive to the proposed increase in power level and discuss how the power uprate will effect operator reliability or performance. Identify all operator actions that will have their response times changed because of the power uprate. Specify the expected response times before the power uprate and the new (reduced/increased) response times. Discuss why any reduced operator response times are needed. Discuss whether any reduction in time available for operator actions, due to the

power uprate, will significantly affect the operator's ability to complete the required manual actions in the times allowed. Discuss results of simulator observations regarding operator response times for operator actions that are potentially sensitive to power uprate.

TVA Reply

Examples of operator actions particularly sensitive to power uprate are: initiation of emergency RPV depressurization in response to a loss of high pressure injection systems and initiation of the Standby Liquid Control system (SLC) following a high-powered Anticipated Transient Without Scram (ATWS).

As discussed in the response to NRC Request 1, the plant conditions delineated in the EOIs key the plant operator to take appropriate actions to mitigate transients or accidents. The EOIs are symptom based and do not contain specific times for the operator actions.

Power uprate implementation will modify some of the EOI figures (e.g., the heat capacity temperature limit (HCTL) and the boron injection initiation temperature (BIIT)) which are used by the operator in making decisions during a postulated emergency. An example of this is an ATWS with MSIV closure. Failure of all control rods to insert at 105% of pre-uprate power results in additional steam admitted to the suppression pool attributing in a slightly quicker increase in suppression pool temperature. Just as prior to power uprate, the operator will continue to follow the EOI steps to initiate SLC before the BIIT is exceeded. Since the operator will continue to follow the symptom based EOIs, the effect of power uprate on operator reliability or performance is considered insignificant.

While no operator response times are specified in either the EOIs or AOIs, the evaluations contained in the Browns Ferry Probabilistic Safety Assessment (PSA) determined required operator response time for input to determine the core damage frequency. The operator response times identified in GE topical report NEDC-31984P, Supplement 2, were reviewed with respect to the Browns Ferry PSA model. The GE report evaluated the impact of power uprate on a generic basis. The report indicates that some operator response times would be reduced after power uprate implementation; however, the effects on operator reliability and performance due to response time changes were determined to be insignificant. The review of all Browns Ferry operator response times used in the Browns Ferry PSA confirmed that the impact on operator response times are consistent with the generic findings in the topical report.

The following table indicates all operator actions contained in the Browns Ferry PSA which require operator responses in a time frame which could be affected by power uprate. The table also indicates the expected reduction in operator response time for each action.

Operator Response Time

Operator Action	Pre-uprate assumed operator response time in PSA	Uprate assumed reduction in operator response time
Manual depressurization of RPV using MSRVs upon loss of high pressure injection systems	30 minutes to recognize need to depressurize	2 minute reduction in operator response time
	3-5 minutes to reach -190 inch vessel level once -162 inch vessel level reached	6 second reduction in operator response time
Initiate SLC, given ATWS with vessel isolated	2 minutes to reach BIIT	6 second reduction in operator response time
Inhibit ADS during ATWS	3.5 minutes	6 second reduction in operator response time

Power uprate will reduce the assumed operator response times in an amount essentially proportional to the increase in reactor power (i.e., 5 percent). The reduction in operator time indicated in the PSA is because the operator actions included in the above table are triggered by either suppression pool temperature as a function of reactor power/pressure or by the reduction in vessel inventory. Power uprate conditions which will affect this timing are potentially higher main steam relief valve flow, higher initial power level, and higher decay heat after a scram. Since the operator actions are controlled by EOI variables, which are revised for power uprate parameters, the slight reduction in times shown in the table will not significantly affect the operator's ability to safely complete the required actions.

The only plant procedures that specify times for operator response to an emergency event are Appendix R Safe Shutdown Instructions (SSIs). It has been determined that one manual operator action required by the SSIs has a reduction in response time. This is the manual termination of the High Pressure Coolant Injection (HPCI) system injection following spurious

initiation during a postulated Appendix R fire event. The pre-uprate analysis, performed using the GE SAFE model, predicts a required operator action time to shutdown HPCI, in order to prevent flooding of the main steam lines, of ten(10) minutes. The power uprate analysis, performed using the SAFER model, predicts a required operator action time of seven(7) minutes. This reduction in available response time is not driven by power uprate conditions, but by the use of a different model (SAFER) for the power uprate analysis.

TVA has found that this action, shutdown HPCI, is required in nine(9) Unit 2 SSIs and seven(7) of the Unit 3 SSIs. Of these SSIs, only one instruction for each unit, requires HPCI shutdown from outside the main control room. TVA has previously demonstrated that this action, close one valve from the 250V DC reactor motor operated valve board, located on the same elevation just outside the main control room, can be performed within the shorter time predicted by the SAFER model. Therefore, this reduction in time will not significantly affect the operator's ability to safely complete the required action.

NRC Request 3

Discuss all changes the power uprate will have on control room alarms, controls, and displays. For example, will zone markings on meters change (e.g. normal range, marginal range, and out-or-tolerance range)? If changes will occur, discuss how they will be addressed.

TVA Response

As a result of power uprate two changes in control room indication are planned. Three(3) control room indicators, (wide range reactor pressure) will require modification for power uprate. These require modification to revise the low limit of the scale "red-zone" marking due to the power uprate increase in the reactor pressure scram setpoint. Also, one change in indication to accommodate forebay temperature indication. The indication span will be modified to accommodate a lower forebay high temperature setpoint.

There are various instructional aids in the main control room that will also be revised due to power uprate. These instructional aids are labels, sketches, or markings, which are posted and used as memory or instructional guidance. These include, the power/flow map, and reactor water level compensation curves at reduced pressure conditions, and Main Steam Relief Valve Setpoints/Locations.

The changes in instrumentation and instructional aids in the main

control room will be prepared in accordance with the plant modification process, which incorporates detailed review of the proposed control room design change package. All required changes will be implemented prior to operation at uprated conditions.

NRC Request 4

Discuss all changes the power uprate will have on the Safety Parameter Display System and how they will be addressed.

TVA Response

The changes to the Safety Parameter Display System (SPDS) include recalibration of Input/Output points, changes to constants which input to the displayed points (e.g., rated core thermal power), changes to MSRV lift setpoints, and changes to the EOI Limit graphs. The design and intent of the SPDS remain unchanged. The information presented on the SPDS display (top level display) and the method of presentation remain the same as before power uprate. These changes will be transparent to the operator in that EOI execution will not be affected.

NRC Request 5

Describe all changes the power uprate will have on the operator training program and the plant simulator. Provide a copy of the post-modification test report (or test abstracts) to document and support the effectiveness of simulator changes as required by ANSI/ANS 3.5-1985, Section 5.4.1.

Specifically, please propose a license condition and/or commitment that stipulates the following:

(a) Provide classroom and simulator training on all changes that effect operator performance caused by the power uprate modification. All training and the plant simulator will be modified, as necessary, to incorporate changes identified during the startup testing program.

(b) Complete simulator changes that are consistent with ANSI/ANS 3.5-1985. Simulator fidelity will be re-validated in accordance with ANSI/ANS 3.5-1985, Section 5.4.1, "Simulator Performance Testing." Simulator revalidation will include comparison of individual simulated systems and components and simulated integrated plant steady state and transient performance with reference plant responses using similar startup test procedures.

(c) Complete all control room and plant process computer system changes as a result of the power uprate.

(d) Modify operator training and the plant simulator, as required, to address all related issues and discrepancies that are identified during the startup testing program.

TVA Response

TVA's response to the RAI questions are provided below. TVA proposes the commitments (in lieu of license conditions) listed in Enclosure 2 as requested by the staff.

(a) Operator training content will be revised to include the power uprate. Classroom and simulator training will be conducted prior to restart of Unit 3 at uprated conditions. Additional training will be conducted as needed, using data obtained during the Power Uprate Refueling Test Program.

The classroom training will address changes made to Unit 3 and will include the power uprate, as well as other modifications, in sufficient detail to ensure operator understanding and proficiency. The classroom training will involve an overview of various aspects of the power uprate (i.e., operating parameter value changes, setpoints and scaling changes, procedure changes, system changes, startup test plan, etc.) The classroom training will be followed by or in conjunction with simulator training.

The operators will be required to respond using plant procedures. Additional transients may be added for procedure response after the power uprate modifications are installed on the simulator and an evaluation of the transients are made.

Other transients included in training discussions will compare non-uprate to uprate plant responses using trend data; these include:

- Increase in reactor pressurization transients.
- Stuck open MSRV.
- Reactivity and power distribution transients.
- The simulator training will include as a minimum, a demonstration of transients that show the greatest change in plant response at uprated power compared to the non-uprated power including changes in time

to achieve critical points for operator actions. Decrease in reactor coolant inventory.

- High power ATWS with MSIV closure (include changes in time to achieve conditions requiring Boron). This will include initiating SLC and inhibiting ADS.

- Loss of High Pressure makeup (include changes in time to achieve conditions requiring emergency depressurization at top of active fuel; non-ATWS).

- Appendix R Safe Shutdown Instructions involving the high pressure coolant injection system.

(b) The BFN Simulator will be upgraded for power uprate and ready for training in support of power uprate implementation. The power uprate modifications will be implemented on the simulator prior to installation in the plant. The changes will include hardware changes (meter scales, labels/mimic changes, instrument recalibrations) and software changes (major items are EHC and turbine modifications, setpoint changes, and re-tuning of core physics model for Unit 3 Cycle 9 specific data). Two simulator software loads will be maintained, one for changes noted above and the second for Unit 2 configuration and non-power uprate conditions. Some differences may temporarily exist until power uprate is implemented on both Units 2 and 3 (i.e., hardware changes to meter scales, ICS, and digital feedwater control). The differences will be recorded on the Simulator/Unit 2/Unit 3 Differences listing which will be covered in Training.

An acceptance test will be run to benchmark simulator performance based on design and engineering analysis data. The primary focus will be matching the heat balance data for the 105% power steady-state test as required in ANSI/ANS 3.5-1985 Appendix B1.1.

Once the plant modifications are completed on Unit 3, data will be collected, including the post power uprate refueling test report, and compared to simulator data as required by ANSI/ANS 3.5-1985, Section 5.4.1. TVA intends to complete this revalidation as part of BFN's required simulator certification program.

(c) TVA will complete control room and plant process computer system changes as a result of the power uprate. The control room changes will be completed as part of the Unit 3 Cycle 8 outage. The reference plant simulator control room and plant simulator process computer changes will be completed as required to support the training program.

(d) Operator training will be modified, as necessary, based on observations of plant and operator performance during the Power Uprate Refueling Test Program.

ENCLOSURE 2
TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT
UNITS 2 AND 3

BROWNS FERRY NUCLEAR PLANT (BFN) - RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI) REGARDING UNITS 2 and 3 TECHNICAL SPECIFICATION (TS) CHANGE TS - 384, - RESPONSE TO THE REQUEST FOR ADDITIONAL INFORMATION RELATING TO LICENSE AMENDMENT FOR POWER UPRATE OPERATION, (TAC NOS. M99711, M99712)

1. Operator training content will be revised to include power uprate. Classroom and simulator training will be conducted prior to restart of Unit 3 at uprated conditions.

2. The plant simulator control room and plant simulator process computer changes will be completed as required to support the training program. TVA expects to complete this action prior to simulator training for power uprate.

3. An acceptance test will be run to benchmark simulator performance based on design and engineering analysis data. The primary focus will be matching the heat balance data for the 105% power steady-state test as required in ANSI/ANS 3.5-1985 Appendix B1.1. TVA expects to complete this action prior to simulator training for power uprate.

4. Once the power uprate modifications are completed on Unit 3, data will be collected, including the post power uprate refueling test report, and compared to simulator data as required by ANSI/ANS 3.5-1985, Section 5.4.1. TVA expects to complete this as part of BFN's required simulator certification program. TVA expects to submit this report within 60 days following completion of certification.

5. Operator training will be modified, as necessary, based on observations of plant and operator performance during the Power Uprate Refueling Testing Program.

6. TVA will complete control room and plant process computer system changes as a result of the power uprate. The control room changes will be completed as part of the Unit 3 Cycle 8 refueling outage.