

August 23, 2004

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- PROPOSED TECHNICAL SPECIFICATIONS (TS) CHANGE TS - 431 - REQUEST FOR LICENSE AMENDMENT - EXTENDED POWER UPRATE (EPU) OPERATION PROBABILISTIC SAFETY ASSESSMENT (PSA) UPDATE

This letter provides updated Probabilistic Safety Assessment (PSA) information to support NRC Staff review of BFN Unit 1 Proposed Technical Specification Change TS-431 transmitted to the NRC by letter dated June 28, 2004 (Reference 1). This update reflects BFN Unit 1 PSA modeling changes made since submittal of Reference 1. These changes do not alter the conclusions reached in Reference 1 that BFN Unit 1 can be safely operated at Extended Power Uprate (EPU) conditions.

Reference 1, Enclosure 4, Section 10.5, "Individual Plant Evaluation," provided the BFN Unit 1 Core Damage Frequency (CDF) and Large Early Release Frequency (LERF) results for operation at EPU conditions. Section 10.5 also reported information relating to initiating event contributions to these quantities, and relative importance of specific operator actions. As a result of the PSA model update, many of these values have changed. The changes to the CDF and LERF are as follows:

Parameter	Reference 1 Value	Revised Value
Total CDF (yr ⁻¹ , mean value)	1.66 E-6	1.86 E-6
LERF (yr ⁻¹ , mean value)	2.93 E-7	1.87 E-7

U.S. Nuclear Regulatory Commission
Page 2
August 23, 2004

Enclosure 1 to this letter identifies the impact of these changes to Reference 1, Enclosure 4 resulting from the BFN Unit 1 PSA modeling changes. These changes do not alter the conclusions reached in Reference 1 that BFN Unit 1 can safely operate at the requested license power level of 3952 MWt.

If you have any questions about this submittal, please contact me at (256) 729-2636.

Sincerely,

Original signed by

T. E. Abney
Manager of Licensing
and Industry Affairs

REFERENCE

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

U.S. Nuclear Regulatory Commission
Page 3
August 23, 2004

(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

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

U.S. Nuclear Regulatory Commission
Page 4
August 23, 2004

MJB:BAB

Enclosure

cc (w/o Enclosure):

A. S. Bhatnagar, LP 6A-C
M. J. Burzynski, BR 4X-C
J. C. Fornicola, LP 6A-C
D. F. Helms, BR 4T-C
J. E. Maddox, LP 6A-C
R. F. Marks, PAB 1C-BFN
R. G. Jones, NAB 1A-BFN
K. L. Krueger, POB 2C-BFN
J. R. Rupert, NAB 1A-BFN
K. W. Singer, LP 6A-C
M. D. Skaggs, PAB 1E-BFN
E. J. Vigluicci, ET 11A-K
NSRB Support, LP 5M-C
EDMS WT CA - K (with Enclosure)

S:\Licensing\Lic\Submit\Subs\U1 EPU PSA Update Supplement 8-23-04.doc

ENCLOSURE 1

UPDATE TO BFN UNIT 1 PROBABILISTIC SAFETY ASSESSMENT AT EXTENDED POWER UPRATE CONDITIONS

INTRODUCTION

By letter dated June 28, 2004 (Reference 1), TVA transmitted to the NRC TS-431 - Request For License Amendment - Extended Power Uprate (EPU) Operation. That amendment application requested NRC approval to increase the licensed maximum thermal power level from 3293 MWt to 3952 MWt. Enclosure 4 of that request contained NEDC-33101P, "Browns Ferry Unit 1 Safety Analysis Report for Extended Power Uprate," Revision 0 (BFN Unit 1 PUSAR). Section 10.5 of the PUSAR, "Individual Plant Evaluation," provided the results of the BFN Unit 1 specific Probabilistic Safety Assessment (PSA) performed at Extended Power Uprate (EPU) Conditions.

As a result of BFN Unit 1 PSA modeling changes made since submittal of Reference 1, the calculated values of the BFN Unit 1 Core Damage Frequency (CDF) and Large Early Release Frequency (LERF) at EPU conditions has changed. These changes result from revisions to the initiator contributions to the BFN Unit 1 CDF and LERF (reported in the BFN Unit 1 PUSAR, Table 10-4) and the "Frequency Weighted Fractional Importance to Core Damage of Operator Actions Used in Browns Ferry Unit 1 PRA" (reported in the BFN Unit 1 PUSAR, Table 10-5). These changes are detailed below.

CHANGES RESULTING FROM BFN UNIT 1 PSA MODELING IMPROVEMENTS

The specific changes to information previously reported to the NRC in Reference 1, Enclosure 4, are described below.

1. PUSAR Section 10.5, "Individual Plant Evaluation"

Paragraph 7 Text:

"An uncertainty analysis was performed to more fully describe the core damage frequency. The mean core damage frequency is 1.66E-6. The fifth percentile is 5.13E-7 while the ninety-fifth percentile is 4.65E-6. The ratio of the ninety-fifth percentile to the median for this distribution is 3.9."

Paragraph 7 Impact Based on PSA Update:

"An uncertainty analysis was performed to more fully describe the core damage frequency. The mean core damage frequency is 1.86E-6. The fifth percentile is 5.37E-7 while the

ninety-fifth percentile is 4.80E-6. The ratio of the ninety-fifth percentile to the median for this distribution is 3.6."

2. **PUSAR Table 10-3, "Browns Ferry Summary of CDF and LERF"**

The values in BFN Unit 1 PUSAR Table 10-3 have changed as follows:

Table 10-3

Browns Ferry Summary of CDF and LERF

Parameter	Value
Total CDF (yr ⁻¹ , mean value)	1.86 E-6
LERF (yr ⁻¹ , mean value)	1.87 E-7

3. **PUSAR Table 10-4, "Summary of the Initiator Contributions to CDF and LERF for Browns Ferry Unit 1"**

The update to the BFN Unit 1 PSA has resulted in the values in BFN Unit 1 PUSAR Table 10-4 changing as follows:

Table 10-4

Summary of the Initiator Contributions to CDF and LERF for Browns Ferry Unit 1

Initiator Category Contribution to CDF and LERF			
Initiator Category	Mean frequency (events per year)	CDF	LERF
Transient initiator categories			
Inadvertent Opening of One SRV	4.36E-2	1.42E-8	2.28E-11
Spurious Scram at Power	8.70E-2	2.98E-8	5.83E-11
Loss of 500kV Switchyard to Plant	9.73E-3	2.38E-8	1.70E-10

Initiator Category Contribution to CDF and LERF			
Initiator Category	Mean frequency (events per year)	CDF	LERF
Loss of 500kV Switchyard to Unit	2.30E-2	5.14E-8	4.48E-10
Loss of Instrumentation and Control Bus 1A	4.10E-3	9.73E-10	< 1E-12
Loss of Instrumentation and Control Bus 1B	4.10E-3	2.93E-8	6.79E-11
Total Loss of Condensate Flow	9.09E-3	3.76E-8	1.55E-10
Partial Loss of Condensate Flow	1.80E-2	5.55E-9	7.07E-12
MSIV Closure	5.70E-2	9.67E-8	1.21E-9
Turbine Bypass Unavailable	1.96E-3	3.10E-9	2.82E-11
Loss of Condenser Vacuum	9.72E-2	1.67E-7	2.16E-9
Total Loss of Feedwater	2.58E-2	5.59E-8	5.02E-10
Partial Loss of Feedwater	2.58E-2	7.94E-9	1.12E-11
Loss of Plant Control Air	1.20E-2	6.58E-8	2.23E-10
Loss of Offsite Power	6.43E-3	2.17E-7	9.32E-10
Loss of Raw Cooling Water	7.95E-3	1.21E-8	1.73E-10
Momentary Loss of Offsite Power	7.17E-3	1.88E-9	1.08E-12
Turbine Trip	5.09E-1	1.86E-7	4.88E-10
High Pressure Trip	4.30E-2	1.40E-8	2.25E-11
Excessive Feedwater Flow	2.60E-2	8.00E-9	1.13E-11
Other Transients	3.70E-1	1.38E-7	3.50E-10

Initiator Category Contribution to CDF and LERF			
Initiator Category	Mean frequency (events per year)	CDF	LERF
ATWS Categories			
Turbine Trip ATWS	N/A	1.54E-7	8.18E-8
LOSP ATWS	N/A	1.86E-9	9.73E-10
Loss of Condenser Heat Sink ATWS	N/A	4.77E-8	2.52E-8
Inadvertent Opening of SRV ATWS	N/A	1.21E-8	6.37E-9
Loss of Feedwater ATWS	N/A	9.87E-8	5.23E-8
LOCA initiator categories			
Breaks Outside Containment	6.67E-4	3.12E-8	2.06E-10
Excessive LOCA (reactor vessel failure)	9.39E-9	9.09E-9	4.16E-11
Interfacing Systems LOCA	3.15E-5	5.00E-8	5.20E-9
Large LOCA – Core Spray Line Break			
Loop I	1.57E-6	4.37E-9	1.44E-10
Loop II	1.57E-6	4.36E-9	1.44E-10
Large LOCA – Recirculation Discharge Line Break			
Loop A	1.10E-5	1.85E-8	1.13E-9
Loop B	1.10E-5	1.85E-8	1.13E-9
Large LOCA – Recirculation Suction Line Break			
Loop A	7.85E-7	4.72E-9	6.80E-11
Loop B	7.85E-7	4.72E-9	6.80E-11
Other Large LOCA	1.57E-6	2.45E-9	1.42E-10

Initiator Category Contribution to CDF and LERF			
Initiator Category	Mean frequency (events per year)	CDF	LERF
Medium LOCA Inside Containment	4.00E-5	2.13E-8	4.21E-9
Small LOCA Inside Containment	5.00E-4	1.34E-10	1.08E-11
Very Small LOCA Inside Containment	3.38E-3	7.71E-10	< 1E-12
EECW Flood in Reactor Building – shutdown units	1.20E-3	7.41E-11	< 1E-12
EECW Flood in Reactor Building – operating unit	1.85E-6	1.19E-9	2.10E-12
Flood from the Condensate Storage Tank	1.22E-4	1.39E-9	4.95E-12
Flood from the Torus	1.22E-4	4.01E-8	8.55E-10
Large Turbine Building Flood	3.65E-3	5.51E-8	7.41E-11
Small Turbine Building Flood	1.65E-2	1.65E-8	3.38E-11

4. **PUSAR Table 10-5, "Frequency Weighted Fractional Importance to Core Damage of Operator Actions Used in Browns Ferry Unit 1 PRA."**

PUSAR Table 10-5 identifies and ranks the operator actions with the largest contributions to core damage. As a result of the BFN Unit 1 PSA Update, the importance of some actions has increased and some decreased. Since the table lists these actions in order of importance (from largest contribution to core damage to smallest), the order of some of the operator actions has changed, some operator actions previously listed in Table 10-5 have been removed, while others not previously listed have been added. The values in BFN Unit 1 PUSAR Table 10-5 have changed as follows:

Table 10-5

**Frequency Weighted Fractional Importance to Core Damage of Operator Actions
Used in Browns Ferry Unit 1 PRA**

Database Variable	Operator Action Description	Frequency-Weighted Fractional Importance to Core Damage
HPRVD1	OPERATOR FAILS TO INITIATE DEPRESSURIZATION	2.6734E-001
HPWWV1	OPERATOR FAILS TO OPEN WETWELL VENT	2.3142E-001
HRSPC1	OPERATOR FAILS TO LOCALLY RECOVER SP COOLING FAILURE	1.3861E-001
HOU11	OPERATOR FAILS TO ALIGN THE RHR UNIT 1/UNIT 2 CROSSTIE	4.0047E-002
HPHPE1	OPERATOR FAILS TO CONTROL LEVEL WITH HPCI/RCIC (EARLY – 6 HOURS)	1.9984E-002
HPHPR1	OPERATOR FAILS TO CONTROL LEVEL WITH HPCI/RCIC FOLLOWING LEVEL 8 TRIP	1.7241E-002
HOTAF1	OPERATOR FAILS TO CONTROL LEVEL AT TAF DURING ATWS – UNISOLATED VESSEL	1.5492E-002
HPSPC1	OPERATOR FAILS TO ALIGN SUPPRESSION POOL COOLING – THIS IS A NON ATWS SCENARIO	1.0550E-002
HODWS1	OPERATOR FAILS TO ALIGN FOR DRYWELL SPRAY. THIS IS A NON ATWS SCENARIO.	6.5391E-003
HPRVD2	OPERATOR FAILS TO INITIATE DEPRESSURIZATION GIVEN FAILURE TO CONTROL HIGH PRESSURE LEVEL CONTROL	6.1699E-003
HPTAF2	OPERATOR FAILS TO CONTROL LEVEL AT TAF DURING ATWS– ISOLATED VESSEL	3.3992E-003
HREEC1	OPERATOR FAILS TO RESPOND TO INADEQUATE EECW FLOW TO DG FOLLOWING LOSP	2.8482E-003
HPSLC1	OPERATOR FAILS TO INITIATE SLC GIVEN RPV ISOLATED	1.4401E-003
HPSPC2	OPERATORS FAIL TO ALIGN SUPPRESSION POOL COOLING DURING ATWS	1.4147E-003

Database Variable	Operator Action Description	Frequency-Weighted Fractional Importance to Core Damage
HOREE2	OPERATOR FAILS TO ALIGN SWING RHRSW PUMPS FOR EECW (SCENARIO REQUIRES 1 PUMP TO BE ALIGNED)	4.3626E-004
HPHPL1	OPERATOR FAILS TO CONTROL HPCI/RCIC LONG TERM (6-24 HOURS)	3.3985E-004
HOSL2	OPERATOR FAILS TO INITIATE STANDBY LIQUID CONTROL – VESSEL IS ISOLATED FROM CONDENSER	3.1950E-004
HOX2	OPERATOR FAILS TO CROSSTIE 4 KV SHUTDOWN BOARD	3.1177E-004
HOX1	OPERATOR FAILS TO ALIGN BATTERY CHARGER 2B TO 250V DC BATTERY BOARD	2.6481E-004
HOAD1	OPERATOR FAILS TO INHIBIT ADS	2.0260E-004
HODSB1	OPERATOR FAILS TO ALIGN DIESEL BOARD FOR DIESEL C	6.4999E-005
HOR480	OPERATOR FAILS TO RECOVER 480 SHUTDOWN BOARD	3.8890E-005
HOLPC1	OPERATOR FAILS TO CONTROL LPCI/CS INJECTION	1.7068E-005
HORTB1	OPERATOR FAILS TO PROVIDE BACKUP TRIP SIGNAL	4.6205E-006

REFERENCE

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