

Distribution

Docket
 ORB #3
 NRR Reading
 Local PDR
 NRC PDR
 HDenton
 VStello
 BGrimes
 TIPPOLITO
 RClark
 SSheppard
 Atty, OELD
 OI&E (5)
 BJones (4)
 BScharf (10)
 STSG

DEisenhut
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 OPA (CMiles)
 DRoss
 TERA
 JRBuchanan
 RDiggs

MAR 14 1979

Docket No. 50-296

Mr. Hugh G. Parris
 Manager of Power
 Tennessee Valley Authority
 500 A Chestnut Street, Tower II
 Chattanooga, Tennessee 37401

Dear Mr. Parris:

On November 18, 1978, we issued Amendment No. 18 to Facility License No. DPR-68 for Browns Ferry Unit No. 3. This amendment changed the Technical Specifications to incorporate the limiting conditions for operation during the second fuel cycle for this unit. The operating limit minimum critical power ratios (OLMCPRs) incorporated by Amendment No. 18 only apply for the initial 2000 megawatt days per tonne of fuel exposure during the fuel cycle. As noted in our letter transmitting Amendment No. 18, we were continuing to evaluate appropriate critical power ratios for operation during the balance of the present fuel cycle.

The OLMCPRs proposed in your letter of January 15, 1979 provide a conservative basis for operation of Unit No. 3 for the balance of Cycle 2. Accordingly, the Commission has issued the enclosed Amendment No. 2/ to Facility License No. DPR-68 to change the Technical Specifications in response to your request of August 3, 1978, as supplemented by your letters of October 20, 1978 and January 15, 1979.

Copies of the Safety Evaluation and Notice of Issuance are also enclosed.

Sincerely,

Original Signed by
 T. A. Ippolito

*cmr
ccp*

Thomas A. Ippolito, Chief
 Operating Reactors Branch #3
 Division of Operating Reactors

7904050029

Enclosures:

1. Amendment No. 2/ to DPR-68
2. Safety Evaluation
3. Notice

*SEE PREVIOUS YELLOW FOR CONCURRENCES

OFFICE >	ORB #3	ORB #3	AD, E&P	ORB #3
BURNNAME >	*SSheppard	RClark	BGrimes	*Tippolito
DATE >	3/ /79	3/13/79	3/14/79	3/14/79

cc w/enclosures: See page 2
RSB
H. Vonderhorst
3/14/79

Docket No. 50-296

Mr. Hugh G. Parris
Manager of Power
Tennessee Valley Authority
500 A Chestnut Street, Tower II
Chattanooga, Tennessee 37401

Dear Mr. Parris:

On November 18, 1978, we issued Amendment No. 18 to Facility License No. DPR-68 for Browns Ferry Unit No. 3. This amendment changed the Technical Specifications to incorporate the limiting conditions for operation during the second fuel cycle for this unit. The operating limit minimum critical power ratios (OLMCPRs) incorporated by Amendment No. 18 only apply for the initial 2000 megawatt days per tonne of fuel exposure during the fuel cycle. As noted in our letter transmitting Amendment No. 18, we were continuing to evaluate appropriate critical power ratios for operation during the balance of the present fuel cycle.

The OLMCPRs proposed in your letter of January 15, 1979 provide a conservative basis for operation of Unit No. 3 for the balance of Cycle 2. Accordingly, the Commission has issued the enclosed Amendment No. to Facility License No. DPR-68 to change the Technical Specifications in response to your request of January 15, 1979.

Copies of the Safety Evaluation and Notice of Issuance are also enclosed.

Sincerely,

Thomas A. Ippolito, Chief
Operating Reactors Branch #3
Division of Operating Reactors

Enclosures:

1. Amendment No. to DPR-68
2. Safety Evaluation
3. Notice

*SEE PREVIOUS YELLOW FOR CONCURRENCES

Distribution

Docket	ACRS (16)
ORB #3	OPA (CMiles)
MRR Reading	DRoss
Local PDR	TERA
NRC PDR	JRBuchanan
HDenton	RDiggs
VStello	
BGrimes	
Tippolito	
RClark	
SSheppard	
ATTY, OELD	
OI&E (5)	
BJones (4)	
BScharf (10)	
STSG	
DEisenhut	

cc w/enclosures:

OFFICE	See page 2	ORB #3	ORB #3 <i>[Signature]</i>	ADE&P	OELD	ORB #3 <i>[Signature]</i>
SURNAME		SSheppard	*RClark:mjf	BGrimes		Tippolito
DATE		3/ /79	3/13/79	3/ /79	3/ /79	3/14/79



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

March 14, 1979

Docket No. 50-296

Mr. Hugh G. Parris
Manager of Power
Tennessee Valley Authority
500 A Chestnut Street, Tower II
Chattanooga, Tennessee 37401

Dear Mr. Parris:

On November 18, 1978, we issued Amendment No. 18 to Facility License No. DPR-68 for Browns Ferry Unit No. 3. This amendment changed the Technical Specifications to incorporate the limiting conditions for operation during the second fuel cycle for this unit. The operating limit minimum critical power ratios (OLMCPRs) incorporated by Amendment No. 18 only apply for the initial 2000 megawatt days per tonne of fuel exposure during the fuel cycle. As noted in our letter transmitting Amendment No. 18, we were continuing to evaluate appropriate critical power ratios for operation during the balance of the present fuel cycle.

The OLMCPRs proposed in your letter of January 15, 1979 provide a conservative basis for operation of Unit No. 3 for the balance of Cycle 2. Accordingly, the Commission has issued the enclosed Amendment No. 21 to Facility License No. DPR-68 to change the Technical Specifications in response to your request of August 3, 1978, as supplemented by your letters of October 20, 1978 and January 15, 1979.

Copies of the Safety Evaluation and Notice of Issuance are also enclosed.

Sincerely,


Thomas A. Ippolito, Chief
Operating Reactors Branch #3
Division of Operating Reactors

Enclosures:

1. Amendment No. 21 to DPR-68
2. Safety Evaluation
3. Notice

cc w/enclosures:
See page 2

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Mr. Hugh G. Parris

- 2 -

cc: H. S. Sanger, Jr., Esquire
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400 Commerce Avenue
E 11B 33C
Knoxville, Tennessee 37902

U. S. Environmental Protection
Agency
Region IV Office
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345 Courtland Street
Atlanta, Georgia 30308

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Tennessee Valley Authority
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Chattanooga, Tennessee 37401

Mr. Robert F. Sullivan
U. S. Nuclear Regulatory Commission
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Mr. Charles R. Christopher
Chairman, Limestone County Commission
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Athens, Alabama 35611

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State Health Officer
State Department of Public Health
State Office Building
Montgomery, Alabama 36104

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Knoxville, Tennessee 37902

Athens Public Library
South and Forrest
Athens, Alabama 35611

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Affairs
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Director, Technical Assessment Division
Office of Radiation Programs (AW-459)
US EPA
Crystal Mall #2
Arlington, Virginia 20460



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

TENNESSEE VALLEY AUTHORITY

DOCKET NO. 50-296

BROWNS FERRY NUCLEAR PLANT, UNIT NO. 3

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 21
License No. DPR-68

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Tennessee Valley Authority (the licensee) dated August 3, 1978, as supplemented by letters dated October 20, 1978 and January 15, 1979, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and paragraph 2.C(2) of Facility License No. DPR-68 is hereby amended to read as follows:

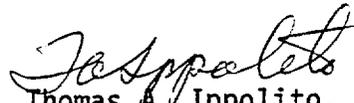
(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 21, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

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3. This license amendment is effective as of the date of its issuance.

FOR THE NUCLEAR REGULATORY COMMISSION


Thomas A. Ippolito, Chief
Operating Reactors Branch #3
Division of Operating Reactors

Attachment:
Changes to the Technical
Specifications

Date of Issuance: March 14, 1979

ATTACHMENT TO LICENSE AMENDMENT NO. 21

FACILITY OPERATING LICENSE NO. DPR-68

DOCKET NO. 50-296

Revise Appendix A as follows:

1. Remove the following page and replace with the identically numbered page:

167

2. The marginal line indicates the revised area.



3.5 CORE AND CONTAINMENT COOLING SYSTEMS

and corresponding action shall continue until reactor operation is within the prescribed limits.

K. Minimum Critical Power Ratio (MCPR)

The MCPR operating limit is 1.24 for 8x8 fuel and 1.21 for 8x8R fuel from BOC-2 to EOC-2 minus 2000 MWd/T and 1.24 for both 8x8 and 8x8R fuel from EOC-2 minus 2000 MWd/T to EOC-2. These limits apply to steady state power operation at rated power and flow. For core flows other than rated, the MCPR shall be greater than the above limits times K_f . K_f is the value shown in Figure 3.5.2. If at any time during operation it is determined by normal surveillance that the limiting value for MCPR is being exceeded, action shall be initiated within 15 minutes to restore operation to within the prescribed limits. If the steady state MCPR is not returned to within the prescribed limits within two (2) hours, the reactor shall be brought to the Cold Shutdown condition within 36 hours. Surveillance and corresponding action shall continue until reactor operation is within the prescribed limits.

L. Reporting Requirements

If any of the limiting values identified in Specification 3.5.I, J or K are exceeded and the specified remedial action is taken, the event shall be logged and reported in a 30-day written report.

4.5 CORE AND CONTAINMENT COOLING SYSTEMS

K. Minimum Critical Power Ratio (MCPR)

MCPR shall be determined daily during reactor power operation at $\geq 25\%$ rated thermal power and following any change in power level or distribution that would cause operation with a limiting control rod pattern as described in the bases for Specification 3.3.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 21 TO FACILITY OPERATING LICENSE NO. DPR-68

TENNESSEE VALLEY AUTHORITY

BROWNS FERRY NUCLEAR PLANT, UNIT NO. 3

DOCKET NO. 50-296

1.0 Introduction

By letter dated August 3, 1978, and supplemented by letter dated October 20, 1978, the Tennessee Valley Authority (the licensee or TVA) requested changes to the Technical Specifications (Appendix A) appended to Facility Operating License No. DPR-68 for the Browns Ferry Nuclear Plant, Unit No. 3. The proposed amendment and revised Technical Specifications were to incorporate the limiting conditions for operation associated with Cycle 2 operation of Unit No. 3.

On November 18, 1978, the Commission issued Amendment No. 18 to Facility License No. DPR-68 in response to the above application which permitted Unit No. 3 to operate for the initial 2000 megawatt days per tonne (MWd/T) of fuel exposure during the second fuel cycle. As discussed in Section 3.2.2 of the Safety Evaluation accompanying Amendment No. 18, operation of Unit No. 3 (BF-3) was limited to the initial 2000 MWd/T while the staff and licensee further evaluated the conservatism in the licensee's proposed operating limit minimum critical power ratios (OLMCPRs) for the end of core life conditions. Subsequent to issuance of Amendment No. 18, there were a number of discussions and meetings with the licensee relating to analyses for critical power ratios during various transients. In their initial submittal of August 3, 1978, the licensee proposed OLMCPRs of 1.24 for 8x8 fuel and 1.21 for 8x8R fuel throughout the entire fuel cycle. As a result of the discussions with the staff, the licensee by letter dated January 15, 1979, proposed OLMCPRs of 1.24 for 8x8 fuel and 1.21 for 8x8R fuel from the beginning of fuel cycle No. 2 (BOC-2) to the end of cycle 2 minus 2000 MWd/T (EOC-2 minus 2000 MWd/T) and an OLMCPR of 1.24 for both 8x8 and 8x8R fuel for the last 2000 MWd/T of fuel exposure during the cycle (EOC-2 minus 2000 MWd/T to EOC).

2.0 Discussion

The Safety Evaluation accompanying Amendment No. 18 covered all aspects of our reload analysis for operation of BF-3 in the second fuel cycle, including nuclear characteristics, fuel cladding integrity safety

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limit, operating limit minimum critical power ratios, thermal hydraulic stability, simmer margin, ECCS Appendix K analyses, control rod drop accidents, fuel loading error, overpressure analysis, ADS Out-of-Service Analysis, the end-of-cycle recirculation pump trip feature and the physics startup testing. All issues were resolved to the staff's satisfaction except for the OLMCPR for the end-of-cycle operation. Amendment No. 18 approved all operating parameters proposed by TVA in their initial submittal of August 3, 1978 except for the OLMCPRs. On the latter, we agreed with the licensee that the OLMCPRs proposed in the August 3, 1978 submittal were adequately conservative for at least the initial 2000 MWd/T of fuel exposure but that their adequacy for the end-of-core life conditions required further evaluation. Accordingly, Amendment No. 18 authorized TVA to startup and operate BF-3 for the initial 2000 MWd/T of fuel exposure. This safety evaluation is limited to the licensee's and the staff's evaluation of the OLMCPR's for the remainder of the current BF-3 second fuel cycle.

3.0

Evaluation

Various transients or perturbations to the critical power ratio (CPR) distribution could reduce the CPR below the intended operating limit MCPR during Cycle 2 operation. The most limiting of these operational transients and the fuel loading error were analyzed by the licensee to determine which event could potentially induce the largest reduction in the initial power ratio (Δ CPR).

The transients evaluated were the limiting pressure and power increase transient (either turbine trip or load rejection without bypass, depending on which values have the faster closure time), the limiting coolant temperature decrease transient (loss of feedwater heater), the feedwater controller failure transient, and the control rod withdrawal error transient. The staff's evaluation of these transient analyses was discussed in Section 3.2.2 of the Safety Evaluation accompanying Amendment No. 18 to the BF-3 License.

Transient severity is greatest at the end of a fuel cycle when the control rods are fully withdrawn and thus would take longer to insert to suppress a transient. In their submittal of August 3, 1978, TVA calculated the transients for the EOC conditions, which are the most severe conditions. Because of this phenomenon, some licensees have found that it warrants the cost to determine OLMCPRs at a number of points in the fuel cycle; these exposure dependent OLMCPRs are generally calculated in 500 MWd/T increments of burnup for the last 2000 MWd/T of the cycle.

During the last refueling outage (September 8, 1978 to November 25, 1978), TVA installed an end-of-cycle recirculation pump trip system (hereafter referred to as RPT system) in BF-3. RPT systems have also been installed in Units 1 and 2. This system provides automatic trip of both recirculation pumps after turbine trip or generator load rejection if reactor power is above approximately 30 percent of rated full load. The purpose of this trip is to reduce the peak reactor pressure and peak heat flux resulting from transients in which it is postulated that there is a coincident failure of the turbine bypass system. The recirculation pump trip signal results from either turbine control valve fast closure or turbine stop valve closure. Reactor scram is also initiated by these signals. Since the recirculation pump trip involves opening of circuit breakers between the motor-generator set and the pumps, the flow coastdown is more rapid than that resulting from loss of power to the motor-generator sets. The very rapid reduction in core flow following a recirculation pump trip early in these transients reduces the severity of the events because the immediate resultant increase in core voids provides negative reactivity which supplements the negative reactivity from control rod scram.

The Δ CPR credit for the prompt RPT was calculated with the REDY code. The REDY code employs a two node steamline thermal hydraulic model and a point kinetics neutronics model. Several pressurization experiments at Peach Bottom Unit 2 (Reference 1) were designed to check the validity of these REDY models.

The experimental results showed that the REDY steamline model did not accurately predict pressurization rate which is the mechanism reducing the CPR. Also, the REDY point kinetics model could not simulate the axial reactivity variation in the core. GE immediately provided calculational comparisons of REDY and test results, and attempted to demonstrate that although REDY did not accurately model some transient effects, it did provide a conservative basis for current licensing calculations.

We agree with GE's general conclusion that REDY provides a conservative calculation for the current licensing basis transients on operating reactors. However, we also recognized that REDY's inability to accurately predict pressurization rate and axial reactivity response limits simulation of effects of RPT. The Peach Bottom tests demonstrated the existence of a pressure wave phenomenon in the steam lines (2,3). In addition, it was noted that the power rise associated with pressurization was significantly greater in the upper portion of the core than in the lower portion.

Quantitative comparison of the tests with REDY calculations indicated that the REDY model underpredicted the pressurization rate but overpredicted the core's response to pressurization effects. Thus, there are two discrepancies between REDY simulated effects and real transient's effects. One is non-conservative and the other is conservative. It is impossible to state from these comparisons which effect would predominate for a given transient.

After the analysis of the tests, comparisons were made between REDY simulations and simulations using detailed steamline modeling and a time-varying axial power distribution (4). These comparisons, although rather limited, suggest a trend in which REDY-based calculations conservatively predicted Δ CPR for more severe transients but underpredicted Δ CPR (for a given set of input parameters) for less severe transients (4). These calculations also showed that the Δ CPR benefits for the RPT feature may be overpredicted by REDY as compared to the detailed steamline and core modeling predictions.

With the addition of the RPT feature, the limiting pressure and power increase transient analyses generally predict a Δ CPR in the range where REDY is less conservative. We find that full credit for the RPT effect cannot be justified solely on a REDY analyses for the end-of-core life conditions. The staff's evaluation of alternative courses of action is discussed in Section 3.1 of the Safety Evaluation for the recent reload for Browns Ferry Unit 1, which also includes an RPT system (Amendment No. 48 to Facility License No. DPR-33 for the Browns Ferry Nuclear Plant, Unit No. 1, issued February 8, 1979). As discussed therein, the staff and the licensee have agreed that a conservative bound to the REDY calculation with RPT would be assured with a 0.03 Δ CPR increase for rapid pressurization transients for 8x8R fuel during the last 2000 Mwd/T of fuel exposure in Cycle 2.

The operating limit MCPRs which the licensee has proposed in their letter of January 15, 1979 and which are acceptable to the staff are as follows:

Operating Limit MCPR

<u>Fuel Type</u>	<u>B.O.C. to EOC-2000Mwd/T</u>	<u>EOC-2000 Mwd/T to EOC</u>
8x8	1.24	1.24
8x8R	1.21	1.24

Thus, when the reactor is operated in accordance with the above operating limit MCPRs the 1.07 safety limit MCPR will not be violated in the event of the most severe abnormal operational transient. This is acceptable to the staff.

4.0 Environmental Considerations

We have determined that this amendment does not authorize a change in effluent types or total amounts nor an increase in power level and will not result in any significant environmental impact. Having made this determination, we have further concluded that this amendment involves an action which is insignificant from the standpoint of environmental impact and pursuant to 10 CFR 51.5(d)(4) that an environmental impact statement, or negative declaration and environmental impact appraisal need not be prepared in connection with the issuance of this amendment.

5.0 Conclusion

We have concluded: (1) because the amendment does not involve a significant increase in the probability or consequence of accidents previously considered and does not involve a significant decrease in a safety margin, the amendment does not involve a significant hazards consideration, (2) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (3) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

Dated: March 14, 1979

References

1. Carmichael, L. A., and Niemi, R. O., "Transient and Stability Tests at Peach Bottom Atomic Power Station Unit 2 at End of Cycle 2," EPRI-NP-564, June 1978.
2. Letter, R. Engel (GE) to Office of Nuclear Reactor Regulation (NRC), dated July 11, 1977.
3. Letter, E. D. Fuller (GE) to U. S. Nuclear Regulatory Commission, dated October 25, 1977.
4. "Impact of One-Dimensional Transient Model on Plant Operating Limits," enclosure of letter, E. D. Fuller (GE) to U. S. Nuclear Regulatory Commission, dated June 26, 1978.

UNITED STATES NUCLEAR REGULATORY COMMISSIONDOCKET NO. 50-296TENNESSEE VALLEY AUTHORITYNOTICE OF ISSUANCE OF AMENDMENT TO FACILITY
OPERATING LICENSE

The U. S. Nuclear Regulatory Commission (the Commission) has issued Amendment No. 21 to Facility Operating License No. DPR-68 issued to the Tennessee Valley Authority (the licensee), which revised Technical Specifications for operation of the Browns Ferry Nuclear Plant, Unit No. 3, located in Limestone County, Alabama. The amendment is effective as of the date of issuance.

On November 18, 1978, the Commission issued Amendment No. 18 to Facility License No. DPR-68, which changed the Technical Specifications to permit operation of Browns Ferry Unit No. 3 for the initial 2000 megawatt days per tonne (MWd/T) of fuel exposure during the second fuel cycle. Amendment No. 21 changes the Technical Specifications to permit operation throughout fuel cycle number 2.

The application for the amendment complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations. The Commission has made appropriate findings as required by the Act and the Commission's rules and regulations in 10 CFR Chapter I, which are set forth in the license amendment. Prior public notice of this amendment was not required since the amendment does not involve a significant hazards consideration.

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The Commission has determined that the issuance of this amendment will not result in any significant environmental impact and that pursuant to 10 CFR §51.5(d)(4) an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared in connection with issuance of this amendment.

For further details with respect to this action, see (1) the application for amendment dated August 3, 1978, as supplemented by letters dated October 20, 1978 and January 15, 1979, (2) Amendment No. 21 to License No. DPR-68, and (3) the Commission's related Safety Evaluation. All of these items are available for public inspection at the Commission's Public Document Room, 1717 H Street, N. W., Washington, D. C. and at the Athens Public Library, South and Forrest, Athens, Alabama 35611. A copy of items (2) and (3) may be obtained upon request addressed to the U. S. Nuclear Regulatory Commission, Washington, D. C. 20555, Attention: Director, Division of Operating Reactors.

Dated at Bethesda, Maryland, this 14th day of March 1979.

FOR THE NUCLEAR REGULATORY COMMISSION


Thomas A. Ippolito, Chief
Operating Reactors Branch #3
Division of Operating Reactors