

April 14, 1983

Docket No. 50-259

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

Dear Mr. Parris:

SUBJECT: SINGLE LOOP OPERATION

Re: Browns Ferry Nuclear Plant, Unit 1

The Commission has issued the enclosed Amendment No. 89 to Facility License No. DPR-33 for the Browns Ferry Nuclear Plant, Unit No. 1. This amendment changes the Technical Specifications in response to your request of January 25, 1983 (TVA BFNP TS 183).

Your letter requested changes to permit Browns Ferry Unit No. 1 to operate at power levels up to 50% of rated power from January 25, 1983 to January 31, 1983 with one recirculation loop out of service. Our telephoned authorization of January 25, 1983 to operate in this mode was confirmed by our letter of January 26, 1983. This amendment document supersedes the previous authorization and the new requirements added to the Technical Specification when operating with a single recirculation loop during the above period of time.

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

Sincerely,

Richard J. Clark, Project Manager
Operating Reactors Branch #2
Division of Licensing

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P PDR

- Enclosures:
1. Amendment No. 89 to DPR-33
 2. Safety Evaluation
 3. Notice

cc w/enclosures
See next page

amendment and notice only

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Mr. Hugh G. Parris

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

TENNESSEE VALLEY AUTHORITY

DOCKET NO. 50-259

BROWNS FERRY NUCLEAR PLANT, UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 89
License No. DPR-33

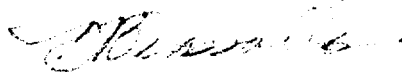
1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Tennessee Valley Authority (the licensee) dated January 25, 1983 complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules 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-33 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 89, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of January 25, 1983.

FOR THE NUCLEAR REGULATORY COMMISSION



Domenic B. Vassallo, Chief
Operating Reactors Branch #2
Division of Licensing

Attachment:
Changes to the Technical
Specifications

Date of Issuance: April 14, 1983

ATTACHMENT TO LICENSE AMENDMENT NO. 89

FACILITY OPERATING LICENSE NO. DPR-33

DOCKET NO. 50-259

Revise Appendix A as follows:

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

182

2. Marginal lines on the above page indicate revised area

3. Add the following new page:

182a

3.6.F Jet Pump Flow Mismatch

1. The reactor shall not be operated with one recirculation loop out of service for more than 24 hours. With the reactor operating, if one recirculation loop is out of service, the plant shall be placed in a hot shutdown condition within 24 hours unless the loop is sooner returned to service.
2. Following one pump operation, the discharge valve of the low speed pump may not be opened unless the speed of the faster pump is less than 50% of its rated speed.
3. Steady state operation with both recirculation pumps out of service for up to 12 hrs is permitted. During such interval restart of the recirculation pumps is permitted, provided the loop discharge temperature is within 75°F of the saturation temperature of the reactor vessel water as determined by dome pressure. The total elapsed time in natural circulation and one pump operation must be no greater than 24 hrs.

G. Structural Integrity

1. The structural integrity of the primary system shall be

*Section 3.6.F.1 is amended to permit operation with one recirculation loop out of service from January 25, 1983 to midnight (CST) January 31, 1983 in accordance with the conditions of Section 3.6.F.4

4.6.E Jet Pumps

- b. The indicated value of core flow rate varies from the value derived from loop flow measurements by more than 10%.
- c. The diffuser to lower plenum differential pressure reading on an individual jet pump varies from the mean of all jet pump differential pressures by more than 10%.

2. Whenever there is recirculation flow with the reactor in the Startup or Run Mode and one recirculation pump is operating with the equalizer valve closed, the diffuser to lower plenum differential pressure shall be checked daily and the differential pressure of an individual jet pump in a loop shall not vary from the mean of all jet pump differential pressures in that loop by more than 10%.

F. Recirculation Pump Operation

1. Recirculation pump speeds shall be checked and logged at least once per day.
2. No additional surveillance required.
3. Before starting either recirculation pump during steady state operation, check and log the loop discharge temperature and dome saturation temperature.

G. Structural Integrity

1. Table 4.6.A together with supplementary notes, specifies the

3.6.F Recirculation Pump Operation

4. With one recirculation loop out of service, the following restrictions apply:
 - a. The steady-state thermal power level shall not exceed 50% of rated.
 - b. The Minimum Critical Power Ratio (MCPR) Safety Limit will be increased by .01 to 1.08.
 - c. The MCPR Limiting Condition for Operation (LCO) values of Section 3.5.K will be increased by 0.01.
 - d. The Maximum Average Planar Linear Heat Generation Rate (MAPLEGR) limits will be reduced by multiplying 0.83, 0.82, and 0.82 for 8x8, 8x8R, P8x8R fuel respectively. (Tables 3.5.I-1 through 3.5.I-5.)
 - e. APKM Flux noise will be measured once per shift and the recirculation pump speed will be reduced if the flux noise exceeds 7-percent peak to peak.
 - f. The core plate delta P noise will be measured once per shift and the recirculation pump speed will be reduced if the noise exceeds 2 psi peak to peak.

*Section 3.6.F.4 is added to permit operation with one recirculation loop out of service from January 25, 1983 to midnight (CST) January 31, 1983.

4.6.F Jet Pumps



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 89 TO FACILITY OPERATING LICENSE NO. DPR-33

TENNESSEE VALLEY AUTHORITY

BROWNS FERRY NUCLEAR PLANT, UNIT NO. 1

DOCKET NO. 50-259

1.0 Introduction

By letter dated January 25, 1983, the Tennessee Valley Authority (the licensee or TVA) requested changes to the Technical Specifications (Appendix A) appended to Facility Operating License No. DPR-33 for the Browns Ferry Nuclear Plant, Unit 1 (BFNP-1). Unit 1 was shutdown on January 25, 1983 because the MG set fluid drive system for recirculation pump "A" was inoperable. The changes to the Technical Specifications were requested to permit Unit No. 1 to operate with one recirculation loop out of service until the MG set could be repaired (estimated to be by January 31, 1983). Unit 2 has been shutdown since July 30, 1982, for NRC required modifications; the projected startup date for Unit 2 is March 7, 1983. At the time, Unit 3 was also shutdown, having been taken off the line on January 12, 1983 for unscheduled maintenance; it was estimated that the repairs would not be completed until January 31, 1983. (Unit 3 did return to service on January 31). The requested change to the Technical Specifications to permit Unit 1 to operate with one recirculation loop out of service was authorized on January 25, 1983 and confirmed by letter to TVA on January 26, 1983. The changes authorized Unit 1 to operate in this mode until midnight, January 31, 1983. Repairs to the MG set were completed late in the evening of January 25, 1983 and the morning of January 26, 1983. Unit 1 resumed power generation with both recirculation loops in service. This safety evaluation documents the safety evaluation prepared on January 25, 1983 to support the authorization granted on that date for temporary operation at 50% power with one recirculation loop.

2.0 Background

The current BFNP-1, 2, and 3 Technical Specification do not allow plant operation beyond 24 hours if an idle recirculation loop cannot be returned to service. The ability to operate at reduced power with a single loop is highly desirable from an availability/outage planning standpoint in the event that maintenance or component unavailability renders one loop inoperable.

By letter dated March 4, 1982, TVA requested changes to the Technical Specifications for BFNP 1, 2 and 3 to permit unlimited operation of the facilities at 50% power with one recirculation loop out of service. In response to our requests for additional information, TVA supplemented their submittal by letters dated September 3, 1982 and January 6, 1983. Our evaluation of this application is essentially complete. Our evaluation of TVA's request of January 25, 1983 which was only requesting approval for single loop operation for a limited period of time (i.e., from January 25, 1983 to midnight, January 31, 1983) was largely

based on the detailed review of the March 4, 1982 submittal. In addition, our evaluation had the benefit of operating experience gained from other BWRs which have been authorized to operate for limited periods of time with one recirculation loop out of service. For example, Browns Ferry Unit 1 which is the subject of this request was authorized by Amendment No. 43 to Facility License No. DPR-33, issued September 29, 1978, to operate at power levels up to 82% for two months with one recirculation loop out of service. There was thus a significant basis to support the licensing action authorized.

3.0 Evaluation

3.1 Accidents (Other than Loss of Coolant Accident (LOCA)) and Transients Affected by One Recirculation Loop Out of Service

3.1.1 One Pump Seizure Accident

The licensee states that the one-pump seizure accident is a relatively mild event during two recirculation pump operation. Similar analyses were performed to determine the impact this accident would have on one recirculation pump operation. These analyses were performed using NRC approved models for BFNP-1. The analyses were conducted from steady-state operation at the following initial conditions, with the added condition of one inactive recirculation loop. Two sets of initial conditions were assumed:

- a. Thermal Power = 75% and core flow = 58% of rated
- b. Thermal Power = 82% and core flow = 56% of rated

These conditions were chosen because they represent reasonable upper limits of single-loop operation within existing Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) and Minimum Critical Power Ratio (MCPR) limits at the same maximum pump speed. Pump seizure was simulated by setting the single operating pump speed to zero instantaneously.

The anticipated sequence of events following a recirculation pump seizure which occurs during plant operation with the alternate recirculation loop out of service is as follows:

- a. The recirculation loop flow in the loop in which the pump seizure occurs drops instantaneously to zero.
- b. Core voids increase which results in a negative reactivity insertion and sharp decrease in neutron flux.
- c. Heat flux drops more slowly because of the fuel time constant.
- d. Neutron flux, heat flux, reactor water level, steam flow, and feedwater flow all exhibit transient behaviors. However, it is not anticipated that the increase in water level will cause a turbine trip and result in scram.

It is expected that the transient will terminate at a condition of natural circulation and reactor operation will continue. There will also be a small decrease in system pressure.

The licensee concludes that the MCPR for the pump seizure accident for BFNP-1 was determined to be greater than the fuel cladding integrity safety limit; therefore, no fuel failures were postulated to occur as a result of this analyzed event.

3.1.2 Abnormal Transients

3.1.2.1 a. Idle Loop Startup

The idle loop startup transient was analyzed in the BFNP-1, 2 & 3 FSAR, with an initial power of 68%. The licensee is to operate at no greater than 50% power with one loop out of service. Since the consequences of an idle loop startup are more severe at higher power levels and since the consequences of transients resulting from startup of an idle loop have been evaluated and found acceptable at power levels well above 50%, operation in the proposed mode is acceptable.

b. Flow Increase

For single-loop operation, the rated condition steady-state MCPR limit is increased by 0.01 to account for increased uncertainties in the core total flow and Traversing In-core Probe (TIP) readings. The MCPR will vary depending on flow conditions. This leads to the possibility of a large inadvertent flow increase which could cause the MCPR to decrease below the Safety Limit for a low initial MCPR at reduced flow conditions. Therefore, the required MCPR must be increased at reduced core flow by a flow factor K_f . The K_f factors are derived assuming both recirculation loop pumps increase speed to the maximum permitted by the scoop tube position set screws. These conditions maximize the power increase and hence maximum Δ MCPR for transients initiated from less than rated conditions. When operating on one loop the flow and power increase will be less than associated with two pumps increasing speed; therefore, the K_f factors derived from the two-pump assumption are conservative for single-loop operation.

c. Rod Withdrawal Error

The rod withdrawal error at rated power is given in the FSAR for the initial core and in cycle dependent reload supplemental submittals. These analyses are performed to demonstrate that, even if the operator ignores all instrument indications and the alarm which could occur during the course of the transients, the rod block system will stop rod withdrawal at a minimum critical power ratio which is higher than the fuel cladding integrity safety limit. Correction of the rod block equation and lower initial power for single-loop operation assures that the MCPR safety limit is not violated.

One-pump operation results in backflow through 10 of the 20 jet pumps while flow is being supplied to the lower plenum from the active jet pumps. Because of this backflow through the inactive jet pumps the present rod-block equation and APRM settings must be modified. The licensee has modified the two-pump rod block equation and APRM settings that exist in the Technical Specification for one-pump operation and the staff has found them acceptable.

The staff finds that one loop transients and accidents other than LOCA, which is discussed below, are bounded by the two loop operation analysis and are therefore acceptable.

3.2 Loss of Coolant Accident (LOCA)

The licensee has contracted General Electric Co. (GE) to perform single loop operation analysis for BFNP-1, 2 & 3 LOCA. The licensee states that evaluation of these calculations (that are performed according to the procedure outlined in NEDO-20566-2, Rev. 1) indicates that a multiplier of 0.70 (7x7 fuel), 0.83 (8x8 fuel), 0.82 (8x8R Fuel) and 0.82 (P8x8R fuel) (Ref: - NEDO 24236 May 1981) should be applied to the MAPLHGR limits for single loop operation of BFNP 1, 2 & 3. However, BFNP-1 no longer has any 7x7 fuel elements in the core, so the 0.70 multiplier is not applicable to Unit 1.

We find the use of these MAPLHGR multipliers to be acceptable.

4.0 Summary on Single Loop Operation

1. Steady State Thermal Power Level will not exceed 50%

Several BWRs have previously been authorized to operate for a short period of time with one recirculation loop. In all but one case, power level has been limited to 50 percent; the one exception was Browns Ferry Unit No. 1. On September 29, 1978, based on analyses performed for TVA by the General Electric Company (GE), we authorized TVA to operate Browns Ferry 1 for about two months at power levels up to 82 percent of full rated power.

By Amendments issued May 15, 1981 Peach Bottom Units 2 and 3 were authorized to operate at 50% power for unlimited periods of time in the single loop mode with limiting conditions of operation (LCOs) similar to those discussed above. Similarly, Dresden Units 2 and 3 and Quad Cities Units 1 and 2 were authorized to operate at power levels of 50% with one recirculation loop by Amendments issued July 9, 1981. Thus, there is considerable operating experience to support single loop operation at 50% power.

2. Minimum Critical Power Ratio (MCPR) Safety Limit will be Increased by 0.01 to 1.08

The MCPR Safety Limit will be increased by 0.01 to account for increased uncertainties in core flow and Traversing Incore Probe (TIP) readings. The licensee has reported that this increase in the MCPR Safety Limit was addressed in GE reports specifically for

BFNP-1, 2 & 3 for one loop operation. On the basis of previous staff reviews for Cooper, Duane Arnold, Dresden 2 and 3, Quad Cities 1 and 2 and Peach Bottom 2 and 3 and our review of plant comparisons we find this analysis acceptable for BFNP-1.

3. Minimum Critical Power Ratio (MCPR) Limiting Condition for Operation (LCO) will be Increased by 0.01

The staff requires that the operating limit MCPR be increased by 0.01 and multiplied by the appropriate two loop K_f factors that are in the BFNP-1, 2 & 3 T S. This will preclude an inadvertent flow increase from causing the MCPR to drop below the safety limit MCPR. This was also approved by the staff for Peach Bottom 2 and 3.

4. The Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) Limits will be Reduced by Appropriate Multipliers

The licensee proposed reducing the T S MAPLHGR by 0.83 (8x8 fuel); 0.82 (8x8R) and 0.82 (P8x8R) for single loop operation. These reductions were based on analyses by General Electric (GE) in reports NEDE 24011-P-A1 and NEDO 24236. The Peach Bottom units were allowed to operate with their MAPLHGR values reduced by factors of 0.83 and 0.83 and 0.81 for an unlimited period of time for the first two types of fuel listed above.

5. The Recirculation Control will be in Manual Control

The staff requires that the licensee operate the recirculation system in the manual mode to eliminate the need for control system analyses and to reduce the effects of potential flow instabilities. This was also required of Peach Bottom.

6. Surveillance Requirements

The staff requires that the licensee perform daily surveillance on the jet pumps to ensure that the pressure drop for one jet pump in a loop does not vary from the mean of all jet pumps in that loop by more than 7%.

In summary, the provisions to allow operation with one recirculation loop out of service are set forth below. These conditions are being incorporated in the Technical Specifications as an added Section 3.6.F.4. As proposed in TVA's letter of January 25, 1983, Section 3.6.F.1 has a footnote added to state that "Section 3.6.F.1 is amended to permit operation with one recirculation loop out of service from January 25, 1983 to midnight (CST) January 31, 1983 in accordance with the conditions of Section 3.6.F.4

1. The steady-state thermal power level will not exceed 50% of rated
2. The Minimum Critical Power Ratio (MCPR) Safety Limit will be increased by .01 to 1.08
3. The MCPR Limiting Condition for Operation (LCO) values of

Section 3.5K will be increased by 0.01.

4. The Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) limits presently in the Technical Specifications will be reduced by multiplying the values by 0.83, 0.82, and 0.82 for 8x8, 8x8R, P8x8R fuel respectively during single loop operations. (Tables 3.5.I-1 thru 3.5.I-5).

5. APRM flux noise will be measured once per shift and the recirculation pump speed will be reduced if the flux noise exceeds 7 percent peak to peak.

6. The core plate delta p noise will be measured once per shift and the recirculation pump speed will be reduced if the noise exceeds 2 psi peak to peak.

Therefore, based upon the above evaluation and a history of successful operation of other BWRs of the same type as BFNP-1, 2 & 3 we conclude that single-loop operation of BFNP-1 up to a power level of 50% and in accordance with the proposed TSs, will not exceed the accident and transient bounds previously found acceptable by the NRC staff and is therefore acceptable.

5.0 Environmental Considerations

We have determined that the 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 the 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.

6.0 Conclusion

We have concluded, based on the considerations discussed above, that: (1) because the amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated, does not create the possibility of an accident of a type different from any evaluated previously, and does not involve a significant reduction in a margin of safety, 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: January 25, 1983

Principal Contributor: G. Thomas, L. Phillips, G. Schwenk, R. Clark

UNITED STATES NUCLEAR REGULATORY COMMISSIONDOCKET NO. 50-259TENNESSEE VALLEY AUTHORITYNOTICE OF ISSUANCE OF AMENDMENT TO FACILITY
OPERATING LICENSE

The U. S. Nuclear Regulatory Commission (the Commission) has issued Amendment No. 89 to Facility Operating License No. DPR-33 issued to Tennessee Valley Authority (the licensee), which revised the Technical Specifications for operation of the Browns Ferry Nuclear Plant, Unit No. 1 (the facility) located in Limestone County, Alabama. The amendment was effective January 25, 1983.

This amendment changed the Technical Specifications to permit operation at 50% power between January 25, 1983 and January 31, 1983 with one recirculation loop out of service.


The application for this 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.

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 January 25, 1983 (2) Amendment No. 89 to License No. DPR-33, 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 Licensing.

Dated at Bethesda, Maryland, this 14th day of April 1983.

FOR THE NUCLEAR REGULATORY COMMISSION


Domenic B. Vassallo, Chief
Operating Reactors Branch #2
Division of Licensing