Attachment 4
DLOP 228, Rev. 1 1B

For Docket only

INITIAL

NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

AND NOTICING ACTION

Docket No. 50-259/260/296 Facility: Browns Ferry Units 1, 2 and 3

Licensee: Tennessee Valley Authority Date of application: March 4, 1982 as modified September 3, 1982 and January 6, 1983

Request for:

(See attached)

Initial Determination:

( ) Proposed determination - amendment request involves no significant hazards considerations (NSHC).

(XX) Final determination - amendment request involves significant hazards considerations (SHC).

Basis for Determination

( ) Licensee's NSHC discussion has been reviewed and is accepted. See attached amendment request.

(XX) Basis for this determination is presented in the attached notice.

( ) Other (state):

(Attach additional sheets as needed.)

Initial Noticing Action: (Attach appropriate notice or input for monthly FRN)

1. ( ) Monthly FRN. Notice of opportunity for hearing (30 days) and request for comments on proposed NSHC determination - monthly FRN input is attached (Attachment 8).

2. ( ) Individual FRN (30 days). Same notice matter as above. Time does not allow waiting for next monthly FRN (Attachments 9a and 9b).

(THIS FORM SHOULD BE TYPED EXCEPT FOR UNUSUAL, URGENT CIRCUMSTANCES.)

encl 1

Request for:

Technical Specification changes and a license change to permit reactor operation at power levels of 50% of rated power with one recirculation loop out of service. Presently, the Browns Ferry Units 1, 2 and 3 operating licenses require plant shutdown if an idle recirculation loop cannot be returned to service within 24 hours. The change proposed by the licensee would delete this license condition and modify the Technical Specifications (TSs) to provide for: appropriate Average Power Range Monitor (APRM) flux scram trip and rod block settings; an increase in the safety limit Minimum Critical Power Ratio (MCPR) value; revisions to the allowable Average Planar Linear Heat Generation Rate (APLHGR) values suitable for use with an idle recirculation loop; and the inclusion of APRM flux and core plate pressure drop limits during single loop operation.

Basis:

In accordance with the Commissions regulations in 10 CFR 50.92, the staff has evaluated whether operation of the facilities in accordance with the proposed amendments is likely to involve a significant hazards consideration, using the three standards in 50.92.

1. Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

   When the Browns Ferry facilities were licensed, the Commission evaluated the consequences of a pump seizure accident - i.e., sudden stoppage of flow in one of the two recirculation loops while the unit was operating at full power. The consequences of this accident were within the design capability of the facility. The licensee has proposed to limit operation of a facility to 50% of the rated power if operation with only one recirculation loop in service, which is in the range where the core can adequately be cooled by natural circulation. Therefore, the proposed amendment is not likely to involve a significant increase in the probability or consequences of this type of accident. In postulating the consequences of a design-basis loss-of-coolant accident, the staff has previously evaluated the results if this were to incur in an active vs. inactive loop; having the break occur in an inactive loop is not likely to significantly affect the ability of the emergency core cooling systems to keep the core covered. The proposed amendments are thus not likely to involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed amendment create the probability of a new or different kind of accident from any accident previously evaluated?

   Operation with a single loop reduces the amount of coolant forced through the core and thus reduces the amount of power that can be obtained. However, it does not change other aspects of plant operation and thus does not create the probability of a new or different kind of accident from any of the accidents which have previously been evaluated for these facilities.

3. Does the proposed amendment involve a significant reduction in the margin of safety?

   In the absence of compensatory measures or limits, the reduced core flow resulting from single loop operation would reduce safety margins. One of the compensatory actions proposed by the licensee is is to reduce

maximum power level to 50%. The licensee has also proposed to increase the safety limit minimum critical power ratio (MCPR) from 1.07 to 1.08 to provide more margin in a transient to preclude entering a bulk-boiling regime (i.e., less than 0.99). The licensee has also proposed reduced maximum average power linear heat generation (MAPLHGR) limits to provide more margin on this thermal-hydraulic parameter.

During the past five years, single loop operation has been authorized for a Brown Ferry unit for a limited period of time. The most recent was Amendment No. 89 to the Browns Ferry Unit 1 license issued April 14, 1983. This amendment authorized single loop operation for a six day period while an MG set was being repaired. Until more operating data was available, for these limited periods of operation the staff proposed increased surveillance of the jet pumps, the APRM flux noise and the core plate differential pressure. The licensee accepted the staff's additional proposed requirements. These additional requirements were not included in the licensee's application of March 4, 1982. In the absence of these more conservative compensatory measures, the staff at this time - cannot conclude that single loop operation would not result in a reduction in a margin of safety.

For the above reasons, the staff has made a determination that the application for amendments to permit extended operation with a single recirculation loop may involve a significant hazards consideration.

3. ( ) Local media notice. Valid exigent circumstances exist (evaluated below). Local media notice requesting public comments on proposed NSHC determination is attached (Attachment 10).

4. ( ) No notice. A valid emergency situation exists (evaluated below) and there is no time for public notice on proposed NSHC determination. (No attachment.)

5. ( ) Individual FRN (30-days). Licensee's claim of exigent or emergency circumstances is invalid (evaluated below). Notice of opportunity for hearing (30 days) and request for comments on proposed NSHC determination is attached (Attachments 9a and 9b). Letter of explanation to licensee is also attached.

6. ( ) Individual FRN (30-days). The amendment request involves SHC. Notice of opportunity for prior hearing is attached (Attachment 5). Letter to licensee also attached.

7. ( ) Individual Short FRN. Valid emergency circumstances exist (evaluated below). There is no time for the usual 30-day FRN. (Attachment 16).

Evaluation of exigent or emergency circumstances (if applicable):

(attach additional sheets as needed)

Approvals:

		Date
1.	Richard J Clark (Project Manager)	December 27, 1983
2.	Robert A Clark (for D Ziemann) (Branch Chief)	December 27, 1983
3.	Richard J Kenyon (OELD)	1/10/84

Additional approval (for noticing actions types 3, 4, 5, 6 and 7):

4.	J C. Lai (Assistant Director)	1-19-83

Additional approval (for noticing action types 4 and 5):

5.	(Director, Division of Licensing)	

Attachment: as indicated

cc: Original - Docket File (with note "Docket File only")
Project Manager
Licensing Assistant
Branch Files

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

JUL 15 1983

2-J

MEMORANDUM FOR: Lester Rubenstein, Assistant Director
for Core and Plant Systems,
Division of Systems Integration

Robert W. Houston, Assistant Director
for Reactor Safety
Division of Systems Integration

FROM: Gus C. Lainas, Assistant Director
for Operating Reactors
Division of Licensing

SUBJECT: SINGLE LOOP OPERATION FOR BWRs

We currently have 10 pending applications from the licensees of BWR facilities requesting approval to operate with a single recirculation loop at reduced power in the event one of the recirculation pumps is inoperable. Some of these applications were submitted over two years ago. The purpose of this memorandum is to propose an approach whereby we can close out the 10 pending licensing actions this fiscal year.

SERs dating back to November 19, 1981 have been received from the Reactor Systems Branch and Core Performance Branch for all plants except Browns Ferry Units 1, 2 and 3. (For the latter, we received an SER dated August 16, 1982 from RSB which did not include the CPB input on thermal hydraulics and stability analysis.) The SERs contained a number of conditions, including one which made the SER unacceptable to DL - namely that approval was only authorized for the specific fuel cycle reviewed at the time.

After several discussions with RSB and CPB, we received a memo dated May 24, 1983 from CPB stating that single loop operation could be approved for all plants except Browns Ferry 1, 2 and 3 on a permanent basis, provided that the decay ratios calculated for subsequent cycles did not exceed the current cycle decay ratio by more than 5% and did not exceed 0.85. This would permit approval of single loop operation for six of the 10 plants. However, for Cooper the decay ratio for the upcoming cycle is 0.88 according to the supplemental reload analysis performed by GE and thus falls slightly short of the acceptable ratio.

In a memo of June 3, 1983, RSB agreed with CPB that single loop operation can be approved on a permanent basis with the limits proposed by CPB on decay ratio; the memo also stated that "we see no reason to exclude Browns Ferry from this generic approval." This memo was responded to by CPB's memo of June 13, 1983 providing the reasons why single loop operation cannot be approved for Browns Ferry until ORNL (CPB's contractor) and TVA complete a planned test at Browns Ferry (which TVA recently agreed to) and ORNL has reviewed the data and found the thermal-hydraulic stability acceptable. The test program and evaluation of the data is not likely to be completed in time to issue amendments this fiscal year for Browns Ferry in a normal manner.

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To resolve the above problems, we request that:

1. DSI review the proposed 0.85 limit on decay ratio for Cooper to determine if the condition analyzed by GE in the reload submittal would be acceptable for permanent single loop operation for this one BWR with a decay ratio of 0.88.

2. Normally, amendments are effective upon issuance or within a set period of time (e.g., 30 days, upon startup, etc.) We propose to issue the single loop amendments for Browns Ferry 1, 2 and 3 with the proviso that they would not be effective until the test is completed, and the results judged acceptable by CPB. What would be necessary is to develop- with your assistance- the necessary acceptable criteria for the test results; the amendments would be effective upon meeting these criteria. This would provide impetus to TVA to complete the tests. If you concur with this approach, please provide a draft of the test acceptance criteria so we we can pursue resolution with TVA.

Gus C. Lainas, Assistant Director
for Operating Reactors
Division of Licensing

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

2-k

JUL 27 1983

MEMORANDUM FOR: G. C. Lainas, Assistant Director
for Operating Reactors, DL

FROM: L. S. Rubenstein, Assistant Director
for Core and Plant Systems, DSI

SUBJECT: SINGLE LOOP OPERATION FOR BWRs

Reference: Memorandum from G. Lainas to L Rubenstein, "Single Loop Operation for BWRs," July 15, 1983.

In response to the request in your memorandum of July 15, 1983, CPB has reviewed the Cooper submittal for single loop operation and has found it acceptable. This acceptance is based on the following:

1. The licensee stated that oscillatory problems have not been experienced at the Cooper Station during single loop operation.

2. The licensee has proposed that they will monitor APRM flux noise and core plate delta P noise at about 40 percent of power for a period of 1/2 hour to 1 hour to establish a baseline noise level. This baseline noise level (peak to peak oscillation) will be increased by 50 percent to establish a maximum allowable level. The noises will be measured once per shift and the recirculation pump speed will be reduced if the flux noise exceeds the maximum allowable level. The maximum allowable power level during SLO will be 50 percent.

Assuming the plant is operating in a normal condition when the baseline noise level is established, CPB feels the Cooper proposal is a good one which should be included in the Technical Specifications for all of the plants granted single loop approval.

CPB has also reviewed your proposal to issue single loop amendments for Browns Ferry Units 1, 2, and 3 with the proviso that they complete a successful single loop test. We agree with this approach and are currently working on a set of acceptance criteria for the TVA test which we will transmit to you in about three weeks from the date of this memorandum.

L. S. Rubenstein, Assistant Director
for Core and Plant Systems, DSI

cc: R. Mattson
D. Eisenhut
R. Houston

Contact: G. Schwenk, DSI:CPB
X-29421

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

AUG 16 1982

Docket Nos.: 50-259/260/296

MEMORANDUM FOR: Gus C. Lainas, Assistant Director for Operating Reactors, Division of Licensing

FROM: Themis P. Speis, Assistant Director for Reactor Safety Division of Systems Integration

SUBJECT: SAFETY EVALUATION OF BROWNS FERRY NUCLEAR PLANT UNITS 1, 2, AND 3 SINGLE LOOP OPERATION

Plant Name:	Browns Ferry Nuclear Plant Units 1, 2 and 3
Docket Numbers:	50-259/260/296
NSSS Supplier:	General Electric
Responsible Branch:	ORB-2
Project Manager:	R. Clark
Review Status:	Complete

Enclosed is the Safety Evaluation Report to permit Browns Ferry Plant Units 1, 2 and 3 to operate on a single loop with power limited to 50%. This completes three actions under multiplant item E-04. (TAC #48131, 48132 and 48133).

Thermal hydraulics and stability analysis sections of the SER will be provided by Core Performance Branch separately.

Themis P. Speis, Assistant Director
for Reactor Safety
Division of Systems Integration

Enclosure: As stated

cc: R. Mattson
R. Capra
T. Marsh
G. Mazetis
N. Lauben
C. Berlinger
L. Phillips
G. Schwenk
Richard Clark
D. B. Vassallo

CONTACT: G. Thomas, X29445

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ENCLOSURE

SAFETY EVALUATION REPORT N-1 LOOP OPERATION

BROWNS FERRY NUCLEAR PLANT UNITS 1, 2, AND 3 (BFNP-1, 2, 3)

1.0 INTRODUCTION

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 availability/outage planning standpoint in the event that maintenance or component unavailability rendered one loop inoperable.

By letter dated March 4, 1982, Tennessee Valley Authority (the licensee) requested changes to the Technical Specification for Single Loop Operation of BFNP-1, 2, and 3. The requested changes would permit BFNP-1, 2 and 3 to operate at up to 50% of rated power with one recirculation loop out of service for unlimited time. While analyses indicate that it may be safe to operate BWRs on a single loop in the range higher than 50% of rated power, the experience (reference letter from L. M. Mills, TVA dated March 17, 1980 to H. Denton, NRC) at Browns Ferry Unit 1 has caused concern about flow and power oscillations. However, because single loop operation at 50% rated power at several plants, including Browns Ferry Plant Unit-1, has shown to result in acceptable flow and power characteristics, we will permit TVA to operate at power levels up to 50% of rated with one loop out of service during Cycle 5.

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If requested, we will reconsider operation at a higher power level for BFNP-1, 2 & 3 with one recirculation loop out of service after staff concerns stemming from Browns Ferry - Unit 1 single loop operation are satisfied.

2 EVALUATION

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

2.1.1 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 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. These results are applicable to Browns Ferry Nuclear Plant Units 2 and 3.

2.1.2 Abnormal Transients

2.1.2.1 a. Idle Loop Startup

The idle loop startup transient was anlayzed, 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. Additionally, the Technical Specifications are being modified to require that, during single loop operation, the suction valve in the idle loop be shut and electrically disconnected. These measures are being taken to preclude startup of an idle loop.

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 inital 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.

2.2 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 muliplier of 0.70 (7x7 fuel), 0.83 (8x8 fuel), 0.82 (8x8R Fuel) 0.82 (P8x8R fuel) (Ref: - NEDE 24236 May 1981) should be applied to the MAPLHGR limits for single loop operation of BFNP 1, 2 & 3.

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

3. 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. During power ascension with Browns Ferry 1 in single loop operation, jet pump flow variations were noted in the active loop above a pump speed of 65 percent of rated flow (about 59 percent of rated power). Whenever TVA tried to increase the power level above this point, they noted variations in jet pump flow, neutron flux, and related parameters. Accordingly, TVA administratively limited Browns Ferry Unit 1 operation to less than 60 percent for the approximately two months the unit operated on a single loop.

While analyses indicate that it should be safe to operate BWRs on a single loop in the range of 85 percent of rated power, the experience at Browns Ferry Unit 1 has raised concerns about authorizing single loop operation for BWRs above 50 percent rated power until there is a better understanding of what may have caused the variations in this facility.

Operating at 50% power with appropriate T-S changes was approved on a long term basis for the Cooper Nuclear Station, Duane Arnold Plant and Peach Bottom Units 2 and 3 (Safety Evaluation Reports (SER) dated December 10, 1981, November 19, 1981 and May 15, 1981 respectively). Authorization of single loop operation for extended periods was also given to Dresden Unit 2 and 3 and Quad Cities Units 1 and 2 (SER July 9, 1981). It was concluded that for operation at 50% power, transient and accident bounds would not be exceeded for these plants.

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 and Peach Bottom and our review of plant comparisons we find this analysis acceptable for BFNP-1, 2 & 3.

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

The staff require 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 0.70 (7x7 fuel); 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-A-1 and NEDO 24236. The Peach Bottom units were allowed to operate with their MAPLHGR values reduced by factors of 0.71, 0.83, and 0.81 for an unlimited period of time for the first three types of fuel listed above.

5. The APRM Scram and Rod Block Setpoints will be Reduced

The licensee proposed to modify the two loop APRM Scram, Rod Block and Rod Block Monitor (RBM) setpoints to account for back flow through half the jet pumps. The changes were based on plant specific anlayses by GE. These setpoints equations will be changed in the BFNP-01, 2 & 3 T-S. The above changes are similar to the Peach Bottom T-S changes and are acceptable to the staff.

6. The Suction Valve in the Idle Loop is Closed and Electrically Isolated .

The licensee will close the recirculation pump suction valve and remove power from the valve. In the event of a loss of coolant accident this would preclude partial loss of LPCI flow through the recirculation loop degrading the intended LPCI performance. The

removal of power also helps to preclude a start up of an idle loop transient.

7. The Equalizer line between the loops will be Isolated

The licensee will close appropriate valves in the cross-tie (equalizer) line between the loops. The previously discussed analysis assumed the two loops were isolated. Therefore, it is required that the cross-tie valve be closed.

8. 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.

9. 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 5%.

10. Provisions to Allow Operation with One Recirculation Loop out of Service

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 (T.S. 1.1A)

3. The MCPR Limiting Condition for Operation (LCO) will be increased by 0.01

4. The Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) limits will be reduced by multiplying 0.70, 0.83, 0.82, and 0.82 for 7x7, 8x8, 8x8R, P8x8R fuel respectively (T.S. reference Table 3.5I)

5. The APRM Scram and Rod Block Setpoints and the RBM Setpoints, shall be reduced to read as follows:

T.S. 2.1.A.1 S _ (.66W + 54% -0.66 Δ W)

T.S. 2.1.A.1* S _ (.66W + 54% -0.66 Δ W) FRP/MFLPD

T.S. 2.1.A.3 S _ (.66W + 42% -.66 Δ W)

T.S. 2.1.A.3* S _ (.66W + 42% -0.66 Δ W)

APRM UPscale _(.66 + 42% -0.66 Δ W)

RBM Upscale _(.66W +40%)

6. The suction valve in the idle loop is closed and electrically isolated until the idle loop is being prepared for return to service.

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

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*In the event that MFLPD exceeds FRP.

8. The core plate delta noise be measured once per shift and the recirculation pump speed will be reduced if the noise exceeds 1 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-1,2,& 3 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.

The approval for single loop operation up to a power level of 50% is authorized during cycle 5 only.

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

2-L

AUG 18 1983

MEMORANDUM FOR: G. C. Lainas, Assistant Director for Operating Reactors, DL

FROM: L. S. Rubenstein, Assistant Director for Core and Plant Systems, DSI

SUBJECT: SINGLE LOOP OPERATION FOR BWRs

Reference: Memorandum from L. S. Rubenstein to G. C. Lainas "Single Loop Operation for BWRs", July 27, 1983.

In my memorandum of July 27, 1983 we agreed with your proposal to issue single loop amendments for Browns Ferry Units 1, 2, and 3 with the proviso that they complete a successful single loop test. The acceptance criteria for the TVA test has been developed by CPB in conjunction with our contractor, ORNL, and are given below:

Test data at three single-loop power levels and flows, one at 50% power, one at minimum pump speed, and one in between are to be taken by moving along the power/flow limit line while maintaining reasonably constant rod position.

1. The first criterion requires that all three DR's shall be less than 0.75.
2. The second criterion requires the trend of the three readings to be taken into account, e.g.:

   a. Suppose all three DRs are the same. If the DR is $<.75$ the test is successful.
   b. Suppose there is a rising trend as power increases: low DR at low flow, higher DR at higher flow/higher power. So long as the 50% power DR is < 0.75, SLO is acceptable up to 50% power.
   c. Suppose there is a decreasing trend as power increases: higher DR at pump minimum, lower DR at 50% flow. Operation is acceptable from minimum pump speed to (probably) 50% flow. Additional measurements would be required for the latter. DR should be extrapolated to lower flows - if > 0.75 is predicted for flows $<$ "the minimum", then operation below such flows should be prohibited.
   d. Suppose DR is low at the extremes and high in the middle. If the middle reading is close to 0.75 it would be hard to assume this bound was not exceeded at some point. Additional test points would be required.

50-259, 260, 296

Contact: G. Schwenk, CPB:DSI
X-29421

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The test should be conducted in the following manner:

1. Chart traces should be taken of neutron noise for a few seconds as each test condition is approached, using paper speeds of about ½ inch/sec. On-line assurance should be obtained that noise is random and does not exhibit a relatively pure sine wave at any frequency in the range 0.2-1 hz. Such a trace as the latter would indicate a dominant mode and approach to instability. The peak-to-peak magnitude of neutron noise should not exceed 15% of the dc level at any time during the tests.

2. The major portion of the criteria are based upon measured decay ratios. These will be determined at Oak Ridge using output data from the tests, and can be available in 3-4 days following the test period. The reactivity coefficients at the time of the test as well as the test data themselves will be required by ORNL to analyze the data.

L. S. Rubenstein, Assistant Director
for Core and Plant Systems, DSI