

January 23, 1989

Docket No. 50-327

Mr. Oliver D. Kingsley, Jr.  
Senior Vice President, Nuclear Power  
Tennessee Valley Authority  
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Dear Mr. Kingsley:

SUBJECT: HEAT FLUX HOT CHANNEL FACTOR - SEQUOYAH NUCLEAR PLANT, UNIT 1  
(TAC R00451) (TS 88-28)

The Commission has issued the enclosed Amendment No. 95 to Facility Operating License No. DPR-77 for the Sequoyah Nuclear Plant, Unit 1. This amendment is in response to your application dated September 21, 1988, as supplemented by your letter dated October 25, 1988.

The amendment modifies the Sequoyah Nuclear Plant, Unit 1 Technical Specifications. The change revises the limiting condition for operation 3.2.2 and surveillance requirement 4.2.2.2 to reflect a reduction in the heat flux hot channel factor limit from 2.237 to 2.15. The limit shall be 2.15 instead of 2.237 until an analysis in conformance with 10 CFR 50.46, using plant operating conditions and showing that a limit of 2.237 satisfies the requirements of 10 CFR 50.46(b), has been completed and submitted to NRC.

A copy of the Safety Evaluation is also enclosed. Notice of Issuance will be included in the Commission's Bi-Weekly Federal Register Notice.

Sincerely,

Original signed by Rajender Auluck for

Suzanne Black, Assistant Director  
for Projects  
TVA Projects Division  
Office of Nuclear Reactor Regulation

Enclosures:

- Amendment No. 95 to License No. DPR-77
- Safety Evaluation

cc w/enclosures:

See next page

\*SEE PREVIOUS CONCURRENCE

*[Handwritten signature]*  
DFOL  
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OFC	:OSP:TVA/LA*	:OSP:TVA/PM*	:OGC*	:TVA:AD/P	:	:	:
NAME	:MSimms	:JDonohew:as	:	:SBlack	:	:	:
DATE	:12/21/88	:12/24/88	:1/06/89	:1/23/89	:	:	:

Mr. Oliver D. Kingsley, Jr.

-2-

Browns Ferry Nuclear Plant

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

TENNESSEE VALLEY AUTHORITY  
DOCKET NO. 50-327  
SEQUOYAH NUCLEAR PLANT, UNIT 1  
AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 95  
License No. DPR-77

1. The Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment by Tennessee Valley Authority (the licensee) dated September 21 and October 25, 1988, 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 Operating License No. DPR-77 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 95, 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 its date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

*Rajendra Anand*  
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Suzanne Black, Assistant Director  
for Projects  
TVA Projects Division  
Office of Nuclear Reactor Regulation

Attachment:  
Changes to the Technical  
Specifications

Date of Issuance: January 23, 1989

ATTACHMENT TO LICENSE AMENDMENT NO. 95

FACILITY OPERATING LICENSE NO. DPR-77

DOCKET NO. 50-327

Revise the Appendix A Technical Specifications by removing the pages identified below and inserting the enclosed pages. The revised pages are identified by the captioned amendment number and contain marginal lines indicating the area of change. Overleaf pages\* are provided to maintain document completeness.

REMOVE

3/4 2-5

3/4 2-6

3/4 2-7

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INSERT

3/4 2-5

3/4 2-6

3/4 2-7

3/4 2-7a

## POWER DISTRIBUTION LIMITS

### 3/4.2.2 HEAT FLUX HOT CHANNEL FACTOR- $F_Q(Z)$

#### LIMITING CONDITION FOR OPERATION

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3.2.2  $F_Q(Z)$  shall be limited by the following relationships:

$$F_Q(Z) \leq \left[ \frac{2.237^\#}{P} \right] [K(Z)] \text{ for } P > 0.5$$

$$F_Q(Z) \leq \left[ \frac{2.237^\#}{0.5} \right] [K(Z)] \text{ for } P \leq 0.5$$

$$\text{where } P = \frac{\text{THERMAL POWER}}{\text{RATED THERMAL POWER}}$$

and  $K(Z)$  is the function obtained from Figure 3.2-2 for a given core height location.

APPLICABILITY: MODE 1

#### ACTION:

With  $F_Q(Z)$  exceeding its limit:

- a. Reduce THERMAL POWER at least 1% for each 1%  $F_Q(Z)$  exceeds the limit within 15 minutes and similarly reduce the Power Range Neutron Flux-High Trip Setpoints within the next 4 hours; POWER OPERATION may proceed for up to a total of 72 hours; subsequent POWER OPERATION may proceed provided the Overpower Delta T Trip Setpoints (value of  $K_4$ ) have been reduced at least 1% (in  $\Delta T$  span) for each 1%  $F_Q(Z)$  exceeds the limit.
- b. Identify and correct the cause of the out of limit condition prior to increasing THERMAL POWER; THERMAL POWER may then be increased provided  $F_Q(Z)$  is demonstrated through incore mapping to be within its limit.

#### SURVEILLANCE REQUIREMENTS

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4.2.2.1 The provisions of Specification 4.0.4 are not applicable.

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#See Page 3/4 2-7a

## POWER DISTRIBUTION LIMITS

### SURVEILLANCE REQUIREMENTS (Continued)

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4.2.2.2  $F_Q(z)$  shall be evaluated to determine if  $F_Q(Z)$  is within its limit by:

- a. Using the movable incore detectors to obtain a power distribution map at any THERMAL POWER greater than 5% of RATED THERMAL POWER.
- b. Increasing the measured  $F_Q(z)$  component of the power distribution map by 3 percent to account for manufacturing tolerances and further increasing the value by 5% to account for measurement uncertainties.
- c. Satisfying the following relationship:

$$F_Q^M(z) \leq \frac{2.237^{\#} \times K(z)}{P \times W(z)} \text{ for } P > 0.5$$

$$F_Q^M(z) \leq \frac{2.237^{\#} \times K(z)}{W(z) \times 0.5} \text{ for } P \leq 0.5$$

where  $F_Q^M(z)$  is the measured  $F_Q(z)$  increased by the allowances for manufacturing tolerances and measurement uncertainty,  $F_Q$  limit is the  $F_Q$  limit,  $K(z)$  is given in Figure 3.2-2,  $P$  is the relative THERMAL POWER, and  $W(z)$  is the cycle dependent function that accounts for power distribution transients encountered during normal operation. This function is given in the Peaking Factor Limit Report as per Specification 6.9.1.14.

- d. Measuring  $F_Q^M(z)$  according to the following schedule:
  1. Upon achieving equilibrium conditions after exceeding by 10 percent or more of RATED THERMAL POWER, the THERMAL POWER at which  $F_Q(z)$  was last determined,\* or
  2. At least once per 31 effective full power days, whichever occurs first.

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\*During power escalation at the beginning of each cycle, power level may be increased until a power level for extended operation has been achieved and a power distribution map obtained.

#See Page 3/4 2-7a.

POWER DISTRIBUTION LIMITS

SURVEILLANCE REQUIREMENTS (Continued)

e. With measurements indicating

$$\text{maximum over } z \left[ \frac{F_Q^M(z)}{K(z)} \right]$$

has increased since the previous determination of  $F_Q^M(z)$  either of the following actions shall be taken:

1.  $F_Q^M(z)$  shall be increased by 2 percent over that specified in 4.2.2.2.c, or
2.  $F_Q^M(z)$  shall be measured at least once per 7 effective full power days until 2 successive maps indicate that

$$\text{maximum over } z \left[ \frac{F_Q^M(z)}{K(z)} \right] \text{ is not increasing.}$$

f. With the relationships specified in 4.2.2.2.c above not being satisfied:

1. Calculate the percent  $F_Q(z)$  exceeds its limit by the following expression:

$$\left\{ \left( \text{maximum over } z \left[ \frac{F_Q^M(z) \times W(z)}{\frac{2.237\#}{P} \times K(z)} \right] \right) - 1 \right\} \times 100 \quad \text{for } P \geq 0.5$$

$$\left\{ \left( \text{maximum over } z \left[ \frac{F_Q^M(z) \times W(z)}{\frac{2.237\#}{0.5} \times K(z)} \right] \right) - 1 \right\} \times 100 \quad \text{for } P < 0.5$$

2. Either of the following actions shall be taken:
  - a. Place the core in an equilibrium condition where the limit in 4.2.2.2.c is satisfied. Power level may then be increased provided the AFD limits of Figure 3.2-1 are reduced 1% AFD for each percent  $F_Q(z)$  exceeded its limit, or
  - b. Comply with the requirements of Specification 3.2.2 for  $F_Q(z)$  exceeding its limit by the percent calculated above.

#See Page 3/4 2-7a.

POWER DISTRIBUTION LIMITS

SURVEILLANCE REQUIREMENTS (Continued)

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#The limit shall be 2.15 instead of 2.237 until an analysis in conformance with 10 CFR 50.46, using plant operating conditions and showing that a limit of 2.237 satisfies the requirements of 10 CFR 50.46(b), has been completed and submitted to NRC.



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

ENCLOSURE 2

SAFETY EVALUATION BY THE OFFICE OF SPECIAL PROJECTS

SUPPORTING AMENDMENT NO. 95 TO FACILITY OPERATING LICENSE NO. DPR-77

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT, UNIT 1

DOCKET NOS. 50-327

1.0 INTRODUCTION

The Tennessee Valley Authority (TVA), by letters dated September 21 and October 25, 1988, proposed to modify the Sequoyah Nuclear Plant Unit 1 Technical Specifications (TS). The proposed changes are to the Limiting Condition for Operation (LCO) 3.2.2 and Surveillance Requirement (SR) 4.2.2.2 to reflect a reduction in the heat flux hot channel factor limit  $F_0(z)$  from 2.237 to 2.15. This request was submitted in support of a revised upper head injection accumulators (UHIA) isolation level switch setpoint and of a temporary exemption to 10 CFR 50.46(a)(1). The lower  $F_0(z)$  limit will provide additional margin to the calculated peak fuel clad temperature (PCT) for the design basis loss-of-coolant accident (LOCA).

The revised UHI isolation level switch setpoint was approved by the staff in Amendment 86 to the Unit 1 TS. Amendment 86 was issued on October 14, 1988. The temporary exemption to 10 CFR 50.46(a)(1) was granted in the staff's letter dated October 26, 1988.

The information provided in TVA's letter dated October 25, 1988 did not change the substance of the proposed action which TVA submitted in its letter dated September 21, 1988 and which was noticed in the Federal Register on October 5, 1988 (53 FR 34178). The information did not affect the staff's initial determination in that notice.

Background

By letter dated August 15, 1988, TVA requested a change to the Unit 1 TS to revise the UHIA isolation level switch setpoint. The UHIA are discussed in Section 6.3.2 of the Sequoyah Final Safety Analysis Report (FSAR). The UHIA are two pressure vessels, one filled with borated water, the other with pressurized nitrogen. The two vessels are separated by a breakable membrane in the line connecting them. The vessels are pressure equalized and connected in series to the upper head of the reactor vessel. The water bearing accumulator is isolated from the reactor coolant system (RCS) by check valves. If the RCS pressure should fall below the accumulators pressure, the membrane breaks and nitrogen gas forces the borated water into the RCS. The level switch on the borated water accumulator limits the UHIA water injected into the RCS by closing isolation valves. This is to prevent injecting the

non-condensable nitrogen gas into the RCS. The UHIA function is to provide additional water for core cooling during an RCS blowdown.

The change in the UHIA switch setpoint in Amendment 86 resulted in an increase in the range of UHIA water delivered to the RCS during blowdown from 900 to 1,130.5 cubic feet to 850 to 1,130.5 cubic feet. This, as discussed in Amendment 86, resulted in an increased PCT. TVA stated that its calculations showed the PCT remained below the regulatory limit of 2200°F in 10 CFR 50.46.

In reviewing the change for the UHIA level switch setpoint, the staff determined that TVA's calculations of the PCT did not meet the requirements of 10 CFR 50.46(a)(1) for an approved model using plant operating conditions. By letter dated September 19, 1988, TVA submitted a request for a temporary exemption from these requirements of 10 CFR 50.46(a)(1). The staff evaluated the exemption request and found the exemption was warranted. By letter dated October 26, 1988, the Commission granted TVA a temporary exemption from 10 CFR 50.46(a)(1) until May 31, 1989. Specifically, the temporary exemption was granted for a delay in submitting to NRC the emergency core cooling system (ECCS) performance analysis calculated in accordance with an acceptable evaluation model using operating plant conditions until May 31, 1989.

### 3.0 EVALUATION

In support of the TS change on the UHIA level switch setpoint and the temporary exemption, TVA imposed certain operating restrictions for the present operating Cycle 4 of Unit 1 to provide at least 100°F margin between the calculated PCT and the regulatory limit of 2200°F in 10 CFR 50.46(b). TVA stated that at least 100°F PCT margin can be obtained by administratively limiting the steam generator tube plugging (SGTP) to 5 percent and by reducing  $F_0(z)$  from 2.237 to 2.15. As defined in FSAR Section 4.3.2.2.1,  $F_0(z)$  is the maximum local heat flux on the surface of a fuel rod divided by the average fuel rod heat flux. Limiting this ratio minimizes the magnitude of localized "hot spots" along the fuel cladding surface. This in turn helps ensure that the PCT will remain below 2,200°F during a postulated LOCA.

By submittal dated September 21, 1988, TVA provided clarifying evaluations conducted by Westinghouse Electric Corporation (W) which showed that a reduction in  $F_0(z)$  from 2.237 to 2.15 reduces the PCT by 87°F for the limiting imperfect mixing case and by 96°F for the limiting perfect mixing case. As summarized on Page 4 of the W evaluation, this PCT reduction, combined with the reduction obtained by administratively limiting SGTP to 5 percent, results in PCTs of 2,089°F for the limiting imperfect mixing case and 2,067°F for the limiting perfect mixing case. These PCT values provide over 100 degrees of margin to the regulatory limit of 2200°F.

TVA has proposed that the  $F_0(z)$  limit for Unit 1 in LCO 3.2.2 and SR 4.2.2.2 shall be 2.15 instead of 2.237 until an analysis in conformance with 10 CFR 50.46, using plant operating conditions and showing that a limit of 2.237 satisfies the requirements of 10 CFR 50.46(b) that the PCT is less than 2200°F, has been completed and submitted to NRC. Therefore, since the reductions in  $F_0(z)$  discussed above provide additional margin of the PCT to the regulatory PCT limit of 2200°F and the 2.15 limit shall remain in effect until an analysis

for the previously reviewed and accepted 2.237 limit in conformance with 10 CFR 50.46(a)(1) is submitted to NRC, the staff finds the proposed changes to the Unit 1 TS acceptable. The staff notes that, in accordance with 10 CFR 50.46, upon TVA submitting to NRC an analysis in conformance with 10 CFR 50.46, using plant operating conditions and showing that a limit of 2.237 satisfies the requirements of 10 CFR 50.46(b), the TS  $F_Q(z)$  limit of 2.237 is reinstated.

#### 4.0 ENVIRONMENTAL CONSIDERATION

This amendment involves a change to a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes to the surveillance requirements. The staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that this amendment involves no significant hazards consideration and there has been no public comment on such finding. Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement nor environmental assessment need be prepared in connection with the issuance of this amendment.

#### 5.0 CONCLUSION

The Commission made a proposed determination that the amendment involves no significant hazards consideration which was published in the Federal Register (53 FR 39718) on October 5, 1988 and consulted with the State of Tennessee on October 5, 1988. No public comments were received and the State of Tennessee did not have any comments.

The staff has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (2) such activities will be conducted in compliance with the Commission's regulations, and the issuance of the amendments will not be inimical to the common defense and security nor to the health and safety of the public.

Principal Contributor: T. Rotella

Dated: January 23, 1989