DOCKET FILE

NOV 3 0 1973

Docket No. 50-259

Tennessee Valley Authority
ATTN: Mr. James E. Watson
Manager of Power
818 Power Building
Chattanooga, Tennessee 37401

Change No. 2
License No. DPR-33

Gentlemen:

By letter dated August 14, 1973, you referenced Supplement No. 6 to NEDM-10735, which was transmitted with General Electric Company's (GE) letter dated August 11, 1973. Supplement No. 6 includes technical specification changes related to postulated effects of fuel densification. Your letter dated October 25, 1973 provided information concerning the effect of the technical specification changes on the power level of Browns Ferry Nuclear Plant, Unit 1. Additionally, in a letter dated November 1, 1973, you concluded that the new gamma curves for maximum Average Planar Linear Heat Generation submitted by GE's letter dated October 25, 1973 (I. Stuart to V. Moore) are applicable to the Browns Ferry fuel design. The proposed changes would add certain limiting conditions for operation and surveillance requirements.

We have determined in the Regulatory staff's SER Supplement No. 5, dated November 8, 1973, that the changes are acceptable and that they do not involve a significant hazards consideration. Moreover, the Regulatory staff has concluded that if these technical specification limitations are met, there is reasonable assurance that operation of the Browns Ferry Nuclear Plants will not result in undue risk to the health and safety of the public.

Accordingly, pursuant to Section 50.59 of 10 CFR Part 50, the Technical Specifications appended to Facility Operating License No. DPR-33, dated June 26, 1973, are changed as shown in the enclosed Attachment A.

Sincerely,

Original signed by
Voss A. Moore

Voss A. Moore, Assistant Director
for Boiling Water Reactors
Directorate of Licensing

Enclosure:
Attachment A - Change No. 2 to the Technical Specifications (Appendix A)

OFFICE ▶						
SURNAME ▶						
DATE ▶						

cc: Mr. Robert H. Marquis
General Counsel
629 New Sprankle Building
Knoxville, Tennessee 37919

Honorable William J. Baxley
Attorney General
State of Alabama
Montgomery, Alabama 36104

Honorable Henry H. Caddell
Assistant Attorney General
State of Alabama
Montgomery, Alabama 36104

Mr. Frank L. Parker
Environmental and Water Resources Engineering
Vanderbilt University
Nashville, Tennessee 37235

Ira L. Meyers, M.D.
State Health Officer
State Department of Public Health
State Office Building
Montgomery, Alabama 36104

Mr. Thomas Lee Hammons
Chairman, Limestone County Board of Revenue
Athens, Alabama 35611

Dr. Cecil Thomas, Nuclear Engineer
303 Power Building
Chattanooga, Tennessee 37401

Mrs. Maude S. Miller, Librarian
Athens Public Library
South and Forrest
Athens, Alabama 35611

Mr. Hans L. Hamester (2)
ATTN: Joan Sause
Office of Radiation Programs
Environmental Protection Agency
Room 647A East Tower
Waterside Mall
401 M Street, S. W.
Washington, D. C. 20460

Mr. Shepard N. Moore
Environmental Protection Agency
1421 Peachtree Street, N. E.
Atlanta, Georgia 30309

bcc: J. R. Buchanan, ORNL
Thomas B. Abernathy, DTIE

Distribution:
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M. Jinks (w/4 encl)
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F. Williams
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W. Butler
ACRS (16)

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SURNAME▶	HSmith:nb	FWilliams	JStolz	VAMoore		
DATE▶	11/28/73	11/29/73	11/30/73	11/30/73		

ATTACHMENT A

CHANGE NO. 2 TO THE TECHNICAL SPECIFICATIONS
(APPENDIX A)
TENNESSEE VALLEY AUTHORITY
DOCKET NO. 50-259

TABLE OF CONTENTS

Page ii - Section 3.5/4.5 add:

LIMITING CONDITIONS FOR OPERATION

Section 3.5 add:

I. Average Planar LHGR

During steady state power operation, the average linear heat generation rate (LHGR) of all the rods in any fuel assembly, as a function of average planar exposure, at any axial location, shall not exceed the maximum average LHGR shown in Figure 3.5.1.

J. Local LHGR

During steady state power operation, the linear heat generation rate (LHGR) of any rod in any fuel assembly at any axial location shall not exceed the maximum allowable LHGR as calculated by the following equation:

$$LHGR_{max} \leq LHGR_{d} \left[1-\left({}^{\Delta P}/_{P}\right) max \left({}^{L}/_{LT}\right)\right]$$

$LHGR_d$ = Design LHGR = 18.5 KW/ft

$({}^{\Delta P}/_{P})$ max = Maximum power spiking penalty = 0.036

LT = Total core length = 12 ft

L = Axial position above bottom of core

SURVEILLANCE REQUIREMENTS

Section 4.5 add:

I. Average Planar LHGR

Daily during reactor power operation, the average planar LHGR shall be checked.

J. Local LHGR

Daily during reactor power operation, the local LHGR shall be checked.

3.5 BASES

Add the following pages:

149a - 149d (appended hereto)

3.5.I Average Planar LHGR

This specification assures that the peak cladding temperature following the postulated design basis loss-of-coolant accident will not exceed the 2300°F limit specified in the Interim Acceptance Criteria (IAC) issued in June 1971 considering the postulated effects of fuel pellet densification.

The peak cladding temperature following a postulated loss-of-coolant accident is primarily a function of the average heat generation rate of all the rods of a fuel assembly at any axial location and is only dependent secondarily on the rod to rod power distribution within an assembly. Since expected local variations in power distribution within a fuel assembly affect the calculated peak clad temperature by less than ±20°F relative to the peak temperature for a typical fuel design, the limit on the average linear heat generation rate is sufficient to assure that calculated temperatures are within the IAC limit.

The maximum average planar LHGR shown in Figure 3.5.1 is the same as that shown on the curve labeled "γ" (gamma) on Figures 1 & 2 forwarded by letter of October 25, 1973 from GE (I. Stuart) to AEC (V. Moore) replacing Figures 4-9F1 and 4-9F2 of GE topical "Fuel Densification Effects on General Electric Boiling Water Reactor Fuel," NEDM-10735, Supplement 6, August 1973 and is the result of the calculations presented in Section 4.3.4 of the same report. These calculations were made to determine the effect of densification on peak clad temperature and were performed in accordance with the AEC Fuel Densification Model for BWR's which is attached to NEDM-10735, Supplement 6 as

Appendix B.

The possible effects of fuel pellet densification were: (1) creep collapse of the cladding due to axial gap formation; (2) increase in the LHGR because of pellet column shortening; (3) power spikes due to axial gap formation; and (4) changes in stored energy due to increased radial gap size. Calculations show that clad collapse is conservatively predicted not to occur currently or during the next power operation cycle. Therefore, clad collapse is not considered in the analyses. Since axial thermal expansion of the fuel pellets is greater than axial shrinkage due to densification the analyses of peak clad temperature do not consider any change in LHGR due to pellet column shortening. Although, the formation of axial gaps might produce a local power spike at one location on any one rod in a fuel assembly, the increase in local power density would be on the order of only 2% at the axial mid-plane. Since small local variations in power distribution have a small effect on peak clad temperature, power spikes were not considered in the analysis of loss-of-coolant accidents. Changes in gap size affect the peak clad temperature by their effect on pellet clad thermal conductance and fuel pellet stored energy. The pellet-clad thermal conductance assumed for each rod is dependent on the steady state operating linear heat generation rate and the gap size. As specified in the AEC Fuel Densification Model for BWR's, the gap size was calculated assuming that the pellet densified from the measured pellet density to 96.5% of theoretical density. For the most critical rod, the two standard deviation lower bound on initial pellet density was assumed. For the other 48 rods in the bundle the two standard deviation lower bound on the initial mean "boat" pellet density was assumed.

The curves used to determine pellet-clad thermal conductance as a function of linear heat generation are based on experimental data and predict with a 95% confidence that 90% of the population exceed the predictions.

3.5.J Local LHGR

This specification assures that the linear heat generation rate in any rod is less than the design linear heat generation even if fuel pellet densification is postulated. The power spike penalty specified is based on the analysis presented in Section 3.2.1 of the GE topical report NEDM-10735 Supplement 6, and assumes a linearly increasing variation in axial gaps between core bottom and top, and assures with a 95% confidence, that no more than one fuel rod exceeds the design linear heat generation rate due to power spiking.

4.5.I & J Average and Local LHGR

The LHGR shall be checked daily to determine if fuel burnup, or control rod movement has caused changes in power distribution. Since changes due to burnup are slow, and only a few control rods are moved daily, a daily check of power distribution is adequate.

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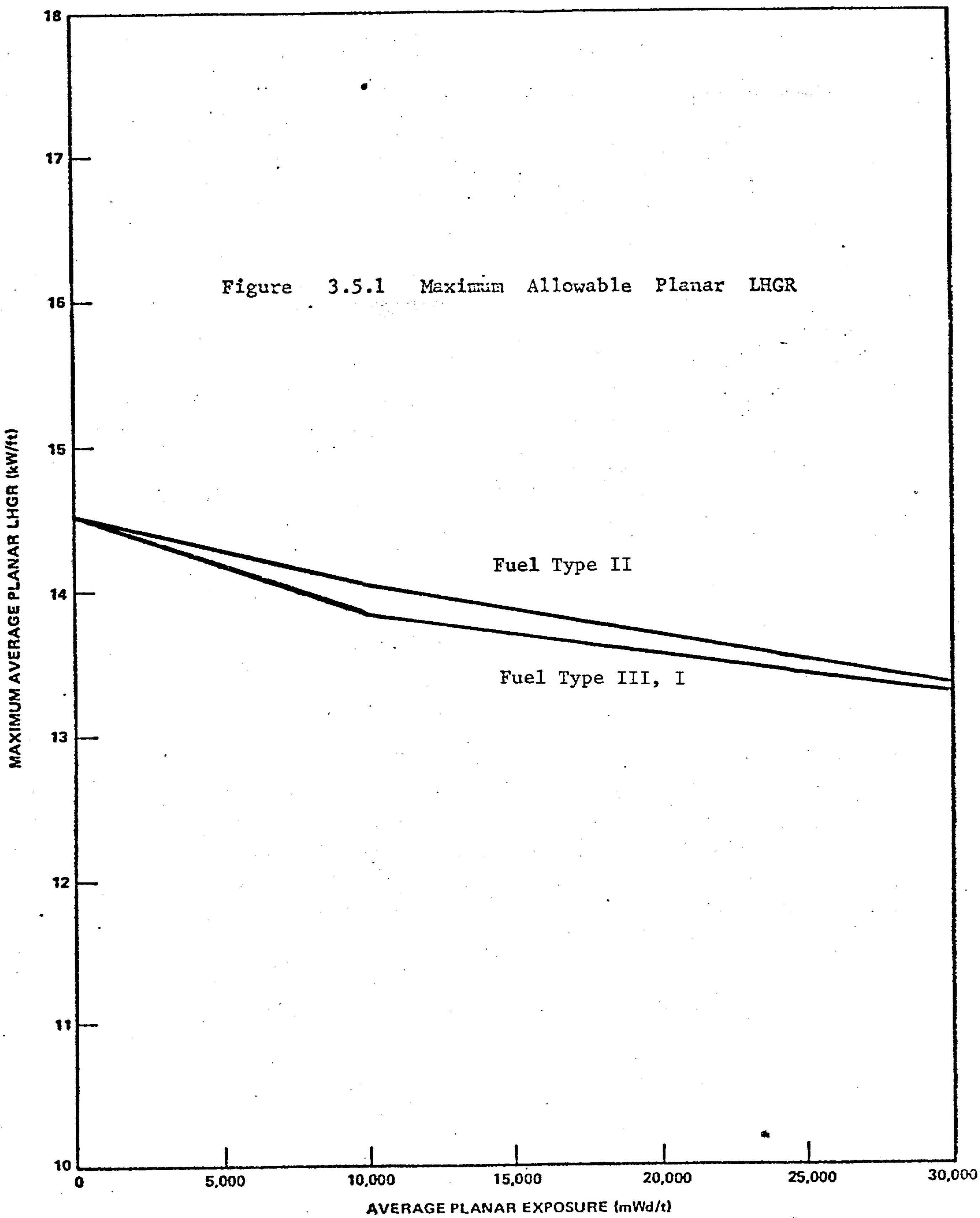

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