NRC FORM 195 (2-76)

U.S. NUCLEAR REGULATORY COMMISSION

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DOCKET NUMBER: 50-302

FILE NUMBER:

TO: D.A. Butler

FROM: Flordia Power Corp.
St. Petersburg, Flordia
J.T. Rodgers

DATE OF DOCUMENT: 5-4-76

DATE RECEIVED: 5-7-76

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DESCRIPTION
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ENCLOSURE
Introduction of Clad-Creep-Collapse Analysis

(3 Originals Received)

PLANT NAME: Crystal River # 3

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✓ PROJECT MANAGER:	Engle	PROJECT MANAGER :
✓ LIC. ASST. :	Rushbrook	LIC. ASST. :

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HANAUER	✓ SHEWEIL	STELLO	STEPP
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Florida Power
CORPORATION

May 4, 1976

DOCKETED USNRC MAY 7 1976 Mail Section Docket Clerk

RECEIVED MAY 7 1976 U.S. NUCLEAR REGULATORY COMMISSION Mail Section

Dr. D. A. Butler, Chief
Light Water Reactors Branch #4
Director of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

In Re: Florida Power Corporation
Crystal River Unit #3
Docket No. 50-302

Dear Dr. Butler:

Supplementing the report on our replacement Fuel Assembly 3A33 dated 3/26/76, we are forwarding to you the attached two pages titled, "Introduction".

With this submittal, we will have supplied all information requested of us or B&W on this subject for your review and acceptance.

We have been verbally so informed of your acceptance and all necessary clearances have been obtained leading to shipment of this element to Crystal River this week.

Very truly yours,

J. T. Rodgers
Asst. Vice President

JTR/iw
Attachments.

INTRODUCTION

The following information further describes the clad creep-collapse and fuel clad interaction evaluations referenced in the Mechanical Section of the Report on Replacement Fuel Assembly 3A33, dated March 26, 1976.

Clad Creep-Collapse Analysis

The clad creep-collapse analysis was performed in accordance with material properties and design procedures set forth in Topical Report BAW-10084P-A, entitled "Program to Determine In-Reactor Performance of B&W Fuels". The evaluation was completed using the NRC approved CROV creep ovalization analysis code as described in Section 3. of the above referenced report. In addition, the following input conservatisms were introduced:

1. The fuel rod is assumed to contain only 90.9 % TD fuel. This decreases the prepressure level due to densification.
2. The minimum specification prepressure level is used.
3. The mean plus 2σ cladding ovality and mean minus 2σ cladding thickness were used, as determined from manufacturing as-built dimensions.

Results of the analysis indicate a time to collapse >14,000 hours. This is sufficiently greater than the required 10,320 hours associated with the single cycle burn of assembly 3A33.

Fuel Clad-Interaction Analysis

The fuel-clad interaction and fuel swelling affects are addressed in the clad strain analysis. Of the pellet densities used in assembly 3A33, the slightly larger nominal diameter, 90.9% TD pellets represent the limiting fuel clad interaction case at the peak pellet burnup seen by the assembly. (22,600 MWD/MTU with uncertainty included.) This is consistent with the fact that the peak pellet burnup is less than the transition from the 0.16% $\Delta V/V/ 10^{20}$ f/cc rate for the other pellet designs of this assembly. (See Table 1 of the March 26th Report.)

Accordingly, clad strain analyses were performed on the 90.9% TD fuel corresponding to the worst-case specification dimensions and the as-built, two sigma dimensions.

The analyses were performed in accordance with material data and design models set forth in Section 3 of Topical Report BAW-10054, Revision 2, entitled "Fuel Densification Report". This represents the same approach as used in the Crystal River SAR analysis except that the following additional conservatisms were introduced for the 3A33 analyses:

1. Input pellet diameter was set as the nominal OD plus tolerance value (worst case specification analysis).
2. Input clad ID was set as the nominal ID minus tolerance value (worst case specification analysis).
3. Input pellet diameter was set as the mean OD plus the 2σ value (as-built analysis).
4. Input clad ID was set as the mean ID minus the 2σ value (as-built analysis).

The results of the above analyses indicate that the total circumferential strain resulting from fuel clad interaction for the worst-case-specification analysis and the as-built dimensions analysis are 0.80% and 0.48% respectively. This is well below the allowable value of 1.42%.