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 FACIL: 50-269 Oconee Nuclear Station, Unit 1, Duke Power Co.  
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 RECIP. NAME: DENTON, H.R. RECIPIENT AFFILIATION: Office of Nuclear Reactor Regulation, Director  
 STOLZ, J.F. Operating Reactors Branch 4

DOCKET #  
05000269

SUBJECT: Forwards response to 841019 request for average & max pin enrichment valves for Gadolinia lead test assemblies. Application for amend to License DPR-38, revising Tech Spec Section 5.3.1.4 will be submitted.

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October 26, 1984

Mr. Harold R. Denton, Director  
Office of Nuclear Reactor Regulation  
U. S. Nuclear Regulatory Commission  
Washington, D. C. 20555

Attention: Mr. John F. Stolz, Chief  
Operating Reactors Branch No. 4

Subject: Oconee Nuclear Station  
Docket Nos. 50-269, -270, -287

Dear Sir:

On October 19, 1984, a conference call was held between Duke and B&W personnel, and members of the NRC/ONRR staff on the subject of the present enrichment of four Gadolinia Lead Test Assemblies (LTAs) to be reinserted in Oconee Unit 1, Cycle 9. Values for average and maximum pin enrichments for the LTAs at EOC 8 (or BOC 9) were provided to the NRC by B&W during the conversation and the same information, in writing, was requested by your office. Attachment 1 contained herein is Duke's response to this request. Additionally, the staff requested that Duke submit an amendment request to revise Technical Specifications 5.3.1.4. Duke expects to submit this proposed technical specification change in the near future.

Very truly yours,

*H. B. Tucker / ASB*

Hal B. Tucker

RFH:slb

Attachments

cc: Mr. James P. O'Reilly, Regional Administrator  
U. S. Nuclear Regulatory Commission  
Region II  
101 Marietta Street, NW, Suite 2900  
Atlanta, Georgia 30323

Mr. J.C. Bryant  
NRC Resident Inspector  
Oconee Nuclear Station

Ms. Helen Nicolaras  
Office of Nuclear Reactor Regulation  
U. S. Nuclear Regulatory Commission  
Washington, D. C. 20555

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Attachment 1

Duke Power Company  
 Oconee Nuclear Station  
 Analysis of Gadolinia LTA Effective Enrichment

The Oconee 1 Technical Specifications state in section 5.3.1.4 that fuel rods "shall not exceed an enrichment of 3.5 percent of U-235". Cycle 8 of Oconee Unit 1 contained four gadolinia lead test assemblies (LTAs) that differ from this specification because they each contained 196 fuel rods with annular fuel at 4.0 wt% U-235. To show that this specification will not be violated for cycle 9 operation, the effective U-235 enrichment for the annular fuel rods at BOC 9 was computed by determining the percentage of U-235 to the total amount of remaining uranium metal.\* The respective number densities of U-235, U-236 and U-238 were obtained from PDQ calculations. From PDQ edits at the end of cycle 8 (or BOC9) the effective assembly average enrichment for the annular fuel only was calculated as 2.475 at.% U-235. The least burned annular fuel pin in the gadolinia LTA has an effective enrichment of 2.574 at.% U-235. The above numbers do not reflect weighting by mass of the different uranium isotopes. When mass weighting is included, the effective pin average and minimum burned pin enrichments become 2.445 wt % and 2.543 wt %, respectively. The values reported by telephone conversation were therefore conservative since no mass weighting was included. The formulas for computing the effective enrichments are as follows:

With No Mass Weighting

$$\text{atom \% U-235} = \left( \frac{N^{U-235}}{N^{U \text{ Total}}} \right) \times 100$$

where  $N^{U-235}$  = number density of U-235 at EOC 8 for annular 4 wt % fuel rods only.

$N^{U \text{ Total}}$  = total combined number density of uranium metal at the EOC 8 for annular fuel rods only

With Mass Weighting

$$\text{wt \% U-235} = \left( \frac{N^{U-235} M^{U-235}}{N^{U-235} M^{U-235} + N^{U-236} M^{U-236} + N^{U-238} M^{U-238}} \right) \times 100$$

where  $N^{U-235}$ ,  $N^{U-236}$ ,  $N^{U-238}$  are the respective number densities of U-235, U-236, and U-238 at EOC 8 for annular fuel only.

$M^{U-235}$ ,  $M^{U-236}$ ,  $M^{U-238}$  are the respective atomic masses of the above uranium isotopes.

Based on the above calculational procedures, the effective U-235 enrichments for the annular fuel rods in the gadolinia LTAs is within the current technical specification limit for cycle 9 operation of Oconee Unit 1.

\*NOTE: The weight percent of U-235 is computed with respect to uranium metal and not  $UO_2$  to be consistent with the definition of PDQ input number densities.