Omaha Public Power District
1623 Harney Omaha, Nebraska 68102 2247
402 536 4000

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LIC-86-178

Mr. Ashok Thadani, Project Director
PWR Project Directorate #8
Division of PWR Licensing - B
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

References: (1) Docket No. 50-285

(2) Letter LIC-86-024, R. L. Andrews (OPPD) to A. C. Thadani (NRC), January 23, 1986.

(3) Letter LIC-84-124, W. C. Jones (OPPD) to D. G. Eisenhut (NRC), April 25, 1984.

Dear Mr. Thadani:

Pressurized Thermal Shock Submittal

This letter is in response to questions raised by Mr. Lambrose Lois in an April 16 telephone conversation regarding our 10 CFR 50.61 Pressurized Thermal Shock Submittal (Reference 2) for the Fort Calhoun Station. As requested by Mr. Lois, the equations and assumptions used to support this submittal are presented here, in greater detail.

Table 4 of the original submittal demonstrates that the lower longitudinal weld seams, 3-410, are the most limiting. The supporting calculations for the 10 CFR 50.61 submittal are based largely on results from the analysis of surveillance capsule W-265 (Reference 3), removed after Cycle 7 (5.92 EFPY). The Combustion Engineering report on this analysis showed a peak vessel I.D. fluence of 8.8×10^{18} n/cm^2 after Cycle 7 and a projected peak End-of-Life fluence of 4.8×10^{19} n/cm^2. Since this projection, the peak End-of-Life fluence has been significantly reduced through the implementation of low radial leakage fuel management. For Cycles 8 and 9, symmetric core loading patterns were utilized while for Cycle 10 an asymmetric core loading pattern with an even greater flux reduction to the critical welds was implemented. The projections performed for the 10 CFR 50.61 submittal are based on the Cycle 8 pattern which is more limiting than Cycles 9 and 10 and will bound all future cycles. The attached Cycle 8 flux distribution plot, developed using DOT4.3 calculations, was used to conservatively predict a 30% reduction in

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the peak fluence at the reactor vessel I.D.. This fluence reduction factor was applied to all remaining cycles, beginning with Cycle 8 and no credit was taken for azimuthal flux distribution or the additional fluence reduction associated with the Cycle 10 asymmetric core loading pattern. Based on these assumptions, the following EFPY dependent fluence equation was developed:

$$\phi = 8.8 \times 10^{18} + \frac{0.70(EFPY - 5.92)(4.8 \times 10^{19})}{32} \quad n/cm^2$$

Fort Calhoun is currently licensed for operation through the year 2008. Cycle 10 began January 1986 following 7.93 EFPY of operation. Assuming a 77% capacity factor beginning in Cycle 10, the projected end of license life was found to be 25 EFPY. In addition to calculating fluence and the resulting RT_{PTS} for 7.93 EFPY and 25 EFPY, values were also generated for 32 EFPY and 40 EFPY. The table below displays the fluences obtained by this method and used to support the 10 CFR 50.61 submittal.

PREDICTED REACTOR VESSEL I.D. FLUENCES

$\phi = 1.09 \times 10^{19}$ n/cm^2	at 7.93 EFPY
$\phi = 2.88 \times 10^{19}$ n/cm^2	at 25 EFPY
$\phi = 3.62 \times 10^{19}$ n/cm^2	at 32 EFPY
$\phi = 4.46 \times 10^{19}$ n/cm^2	at 40 EFPY

We hope this information is sufficient to resolve Mr. Lois' questions. We remain available to supply further information, if necessary.

Sincerely,

R. L. Andrews
Division Manager
Nuclear Production

RLA/rh

Attachment

cc: LeBoeuf, Lamb, Leiby & MacRae
1333 New Hampshire Avenue, N.W.
Washington, DC 20036

Mr. D. E. Sells, NRC Project Manager
Mr. P. H. Harrell, NRC Senior Resident Inspector

OPPD FT. CALHOUN FLUX REDUCTION PROGRAM

[Flux relative to 4.69E10 n/(cm**2*sec)]