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Mr. Edson G. Case	Duke Power Company Charlotte, North Carolina William O. Parker, Jr.	12/20/77
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DESCRIPTION

Consists of response to NRC request for analysis of the Oconee design for the potential for and consequences of unevaluated moderator dilution incidents..

(2-P)

ENCLOSURE

PLANT NAME: Oconee 1-2-3
RJL 12/29/77

FOR ACTION/INFORMATION

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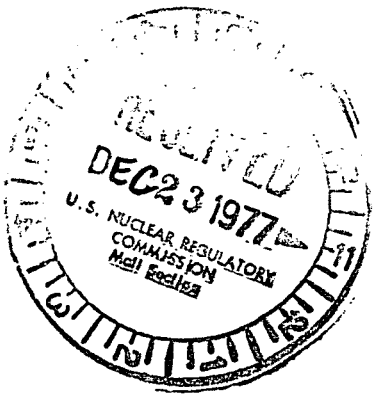
December 20, 1977



Mr. Edson G. Case, Acting Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. A. Schwencer, Chief
Operating Reactors Branch #1

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

Dear Mr. Case:

The following analysis is submitted in response to your request for analysis of the Oconee Nuclear Station design for the potential for and consequences of unevaluated moderator dilution incidents.

The design of the Oconee units contains no unborated water sources, not covered by the FSAR analyses, large enough to create the potential for unplanned moderator dilution criticality. The only unborated liquid volume which could reach the reactor coolant system by the low pressure injection flow path is the content (NaOH) of the caustic mix tank. Although this tank is normally empty, a full tank will be assumed. The volume of this tank is 20 ft^3 with maximum delivery rate by the caustic pump of 2 gpm. Injection of this volume would require the inadvertent opening of three manually operated gate valves in addition to the concurrent operation of the caustic pump. Assuming the pump is operating for another function and assuming a single failure of one of the three valves in series, the contents of the caustic mix tank would still be isolated from the reactor coolant system because of the other two normally closed valves in series. To demonstrate further that this unborated water source does not pose an unsafe condition, analyses have been performed on the core reactivity change for two subcritical conditions assuming that the NaOH liquid is introduced into the reactor coolant system via the low pressure injection flow path as a result of multiple failures of the three isolation valves.

The first condition occurs with the reactor in decay heat removal mode at temperatures between 250°F and cold shutdown and with a full reactor coolant system. The conservative assumptions in the FSAR of 1400 ppm initial boron concentration and 75 ppm/% $\Delta k/k$ boron worth applied to the injection of 20 ft^3 of demineralized water at a rate of 2 gpm result in a reactivity addition rate of $+7.22 \times 10^{-6}$% $\Delta k/k/s$ or an integrated

reactivity addition of +0.033% Δk/k over the 75 minute dilution event. The values are well within the minimum shutdown margin of 1% Δk/k required by the Technical Specifications.

The second condition occurs with the reactor vessel drained to the level of the hot leg and the low pressure injection system functioning for decay heat removal and boron recirculation. Technical Specifications require a boron concentration of 1800 ppm and a 1% Δk/k shutdown margin with all rods out during refueling mode. For this case, the reactivity addition resulting from the assumed injection of the contents of the caustic mix tank would be +0.22% Δk/k over the 75 minute event. Again, this reactivity addition is well within the minimum shutdown margin.

In summary, the only system with potential for unplanned moderator dilution not considered in the FSAR analysis is the caustic mix tank system containing a relatively small amount of unborated NaOH liquid. The probability of an inadvertent injection of the contents of the caustic mix tank into the RCS is very small because of the isolation of the system through multiple valves. However, should multiple valve failures or valve alignment errors occur while the LPI system is operating, the resulting reactivity addition would be very small compared to the minimum subcriticality margin being maintained and such an incident would not result in an inadvertent criticality.

Very truly yours,

William O. Parker, Jr.

GBS:ge