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SUBJECT: Forwards safety evaluation of implementation of asummetric fault for control rod 6-3 during Cycle 7. Method for restoring normal operating flexibility can be undertaken w/o affecting plant safety.

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May 4, 1983

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:

The purpose of this letter is to advise the Staff of an action that has been taken at Oconee Nuclear Station in connection with a safety evaluation of the implementation of a bypass of the asymmetric fault for control rod 6-3 during Cycle 7 of Unit 3. This action has been analyzed and although not explicitly addressed in the Oconee Final Safety Analysis Report, it is not considered to present an unreviewed safety question. A description of the evaluation that has been made is attached.

This has been provided to the NRC Staff for information and unless informed to the contrary, is considered by Duke Power Company to be acceptable.

Very truly yours,

A. C. Thies

RLG/php
Attachment

cc: Mr. James P. O'Reilly, Regional Administrator
U. S. Nuclear Regulatory Commission
Region II
101 Marietta Street, NW, Suite 2900
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Mr. J. C. Bryant
NRC Resident Inspector
Oconee Nuclear Station

Mr. John Suermann
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

A001

Attachment

SAFETY EVALUATION OF THE IMPLEMENTATION OF A BYPASS OF THE ASYMMETRIC FAULT FOR CONTROL ROD 6-3 DURING CYCLE 7 OF UNIT 3

On Tuesday, May 3, 1983 the absolute position indication instrumentation for control rod 6-3 in Unit 3 failed. The absolute position indication is one of two redundant methods for monitoring control rod position. In the failure mode that occurred a position of 89% withdrawn was indicated, although it was confirmed by the backup instrumentation that the rod was fully withdrawn in its normal position.

Control rod position within each control rod group is monitored by the Asymmetric Rod Monitor. The Asymmetric Rod Monitor generates two signals. If a rod deviates by more than 7 inches from its group average position then an asymmetric alarm is generated. If this deviation reaches 9 inches then an asymmetric fault is generated. An asymmetric fault with the reactor in auto causes a rod withdrawal inhibit. There is no rod withdrawal inhibit with the reactor in manual. If an asymmetric fault occurs along with an in-limit, with the reactor in auto, then a runback to 60% power is initiated from power levels above 60%. An in-limit is a separate indication of a rod at fully inserted, and indicates a dropped rod. Since the failure mode for rod 6-3 was 89% withdrawn and the other rods at 100% withdrawn (i.e., >9 inches), an asymmetric fault was generated.

As a result of this instrumentation failure, a rod withdrawal inhibit existed with the reactor in auto. Although this in no way presents an unsafe operating condition, it did reduce the capability of the unit to respond to anticipated transients. This was an undesirable operating mode, and as such a method for regaining full operating capability was undertaken.

It was possible to bypass the asymmetric fault generated by rod 6-3 by implementing an "Asymmetric Fault Bypass Switch". The bypass switch defeats generation of the asymmetric fault for each associated control rod. The asymmetric fault signal is used by the ICS in conjunction with an in-limit signal (indicative of a dropped rod) to initiate a runback to 60% power. In the event that a bypassed rod dropped into the core, ICS runback is not assured for all conditions. There is the potential that the ICS would withdraw (rather than insert) rods to recover from the decrease in core power due to the dropped rod.

The FSAR analyzed a dropped rod transient for two cases. In the first case the ICS is assumed to perform as designed and a runback to 60% power occurs. In the second case the ICS does nothing. The case where the ICS does not detect the dropped rod (asymmetric fault bypass) and responds to the decrease in core power by withdrawing rods is not explicitly analyzed. Considering the case where a dropped rod goes undetected as a result of bypassing the fault condition for that rod, it remains highly likely that the fault condition will be generated

for other rods in the same rod group. This would occur since the group average position will reflect the dropped rod position, that is, the group average will significantly decrease. If the group average decreases more than 9 inches from the position of any of the undropped rods in the same rod group, then a fault condition will be generated by that rod, or those rods, and in combination with the in-limit caused by the dropped rod, a runback to 60% power will occur. Since Oconee operates in a rods out mode, the reduction in the group average will be sufficient to cause a fault under most conditions, as shown in the following example.

Assumptions

- o Rod 3 in Group 6 drops from 100% withdrawn
- o There are 8 rods in Group 6
- o Group 6 position at 100% power is normally 100% wd. 100% wd-139 inches

Group average position $\overline{Z} = \dfrac{(7 \times 100\%) + (1 \times 0\%)}{8} \times \dfrac{139 \text{ inches}}{100\%}$

$$\overline{Z} = 122 \text{ inches}$$

Since 139 - 122 = 17 inches is greater than 9 inches, the fault will be generated. The group average position would have to be inserted greater than 52% wd in order for the fault not to be generated. Therefore, the likelihood of any dropped rod not generating an asymmetric fault condition and a subsequent reactor runback is extremely low.

Although it is very unlikely that the event of interest would occur, an analytical effort was undertaken utilizing nuclear and transient thermal hydraulic simulations to determine if the fuel design limits would be exceeded. The analyses are documented in SRC-OS3-NA-83-002-0 and SRC-OS3-SA-83-003-0. The analyses simulated control rod 6-3 dropping into the core during the worst time in Oconee 3 Cycle 7. The analyses are event and cycle specific and include appropriate conservatisms. The results of the analyses demonstrate that there exists a large margin to the fuel design limits. This result is due to the rather moderate increase in core power peaking as a result of the dropped rod.

Implementation of the "Asymmetric Fault Bypass Switch" for control rod 6-3 during Cycle 7 of Unit 3 has been evaluated to determine the potential impact on the plant response. It has been determined that in the event rod 6-3 drops into the core, there is a high probability that the asymmetric fault will be generated due to the change in rod group 6 average position. If the asymmetric fault is not generated, then nuclear and transient thermal hydraulic simulations have demonstrated that there exists a large margin to the fuel design limits. Therefore, this method for restoring normal operating flexibility can be undertaken without affecting plant safety.