Docket File

Docket Nos.: 50-270/287 AUG 0 1 1975

Karl R. Goller, Assistant Director for Operating Reactors, RL

OCONEE 2 & 3 CORE LIFT POTENTIAL WITH HIGHER CORE PRESSURE DROP (TAR-1636)

Plant Name: Oconee Units 2 & 3
Docket Nos.: 50-270/287
Responsible Branch & Project Leader: ORB-1, C. Trammell
Technical Review Branch Involved: Reactor Systems Branch
Core Performance Branch
Review Status: Complete

In accordance with the request from R. A. Purple to F. Schroeder dated June 2, 1974, the Reactor Systems Branch and Core Performance Branch have reviewed the reports which were enclosed with the request. In Duke Power Company's letter of May 23, 1975, a discussion was submitted on the results of flow measurements for Unit 2. A value of 111.5 percent of design flow was observed as compared to a predicted minimum flow at which lift could occur of 112.1 percent design flow; therefore, the predicted lift flow remains greater than measured coolant flow. In addition, a test designed to determine whether or not fuel assembly lift is occurring was conducted in Unit 2 at both full flow and partial flow conditions. The licensee has stated that the test procedure was capable of verifying core lift within ±0.25 inches and that no movement was detected. The licensee has also indicated that no anomalies have been detected by the loose parts monitoring systems currently in use on Units 2 and 3. Since predicted core lift for Unit 3 is 115.1 percent design flow, with measured core flow of approximately 112.4 percent, core lift is also not expected in Unit 3.

For the foregoing reasons, it is concluded that the high reactor coolant flow does not constitute an unsafe condition. Nevertheless, the licensee has considered the mechanical, thermal-hydraulic, and nuclear consequences of operation with reactor coolant flow exceeding the core lift point. The licensee's analysis indicates that, should fuel assembly lift occur, reseating of these lifted assemblies during flow-reducing transients could potentially add reactivity of 0.1 percent $\Delta k/k$ to the system. We agree with the estimate of 0.1 percent $\Delta k/k$ as the maximum amount of reactivity that could be inserted. The effect of a sudden insertion of this reactivity upon core power is a "prompt jump" in power followed by a power rise with a long (~60 seconds) period. The licensee has re-analyzed the 4-pump coastdown and locked-rotor transients to evaluate the potential consequences of such a reactivity insertion. Effects were shown to be less severe for the case which assumed assembly lift because the higher core flow allowed a higher initial DNB ratio at the onset of each transient, thereby compensating for the higher peak neutron power reached during the transient.

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Should lift occur, basic mechanical integrity and geometry will be maintained since:

1. The height of the pad which is used to locate the bottom of the fuel assembly during loading and which engages the bottom plate of the assembly is sufficient to prevent lateral movement.

2. Out-of-pile flow tests in a Babcock and Wilcox hot test loop showed no axial chattering motion when flow lifted the assembly.

3. Oconee 1 post-irradiation inspection of the fuel at the end of a cycle service showed no observable fretting on fuel rods at spacer finger spring locations. Flow was reported to be as high as 109% of design flow.

The licensee has examined the potential effects of core lift upon the remaining events in the FSAR and concludes that the increased flow rate would not cause an increased probability of occurrence of any accident previously analyzed in the Oconee FSAR, nor would safety margins be reduced. Consideration was also given to the possibility of a portion of the core flow bypassing a lifted element; however, the licensee concludes that clearances are not great enough to produce a flow path which would offer less resistance than the existing flow path through the assembly.

Although the foregoing evaluation indicates that we do not believe that the high reactor coolant flow constitutes an unsafe condition, prudence dictates that an increased fuel surveillance program be adopted during each outage for Oconee Units 2 and 3. As a minimum, this surveillance should include an examination and evaluation of the following items:

1. Fuel assembly position prior to removal.

2. Holddown spring force and permanent deflection.

3. Fuel rod fretting at spacer locations.

4. Wear in the fuel assembly pad on the lower core plate.

Anomalies observed, both in the above surveillance program and in the loose parts monitoring program for Oconee Units 2 and 3, should be reported to TR for further review.

Original Signed by
Victor Stello

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for Reactor Safety
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