ABB

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LD-94-021

Mr. Timothy E. Collins, Acting Chief
Reactor Systems Branch
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: ABB-CE *TechNote* No. 94-03, "Grid-to-Fuel Rod Fretting Wear"

Dear Mr. Collins:

This letter transmits a copy of ABB Combustion Engineering (ABB-CE) *TechNote* 94-03, "Grid-to-Fuel Rod Fretting Wear," for your information. ABB-CE *TechNotes* are issued, from time to time, to our customers in order to provide them with information concerning technical issues of potentially generic interest. In view of recent NRC generic communication involving grid fretting in PWR fuel supplied by other fuel vendors, ABB-CE decided to provide the information in the enclosed *TechNote* to our customers.

If you have any questions on this matter, call me or Mr. Mario Robles of my staff at (203) 285-5215.

Very truly yours,

S. A. Toelle

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Manager
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mr/lw

Enclosure: As Stated

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GRID-TO-FUEL ROD FRETTING WEAR

Summary: This *TechNote* provides information regarding the history of grid-to-fuel rod fretting wear in ABB Combustion Engineering (ABB-CE) PWR fuel and the results of recent fuel inspections performed by ABB-CE. The results of these recent inspections confirm that grid-to-fuel rod fretting wear is not a generic problem for PWR fuel supplied by ABB-CE.

Discussion: A total of seven (7) fuel rod failures attributable to grid-to-fuel rod fretting wear are known to have occurred in ABB-CE fuel fabricated since 1983. Four (4) of these failures have occurred at the bottom grid, one (1) at a middle grid location, and two (2) at the top grid of the fuel assembly.

Of the four (4) grid-to-rod fretting wear failures that occurred at the bottom Inconel grid, one (1) was in a 14x14 fuel rod assembly and three (3) were part of 16x16 fuel rod assemblies. All of the grid-to-rod fretting wear failures at the bottom grids occurred during the first irradiation cycle. Consequently, the cause in all cases is suspected to be improper cell geometry (e.g., a loose cell).

The one (1) grid-to-rod fretting wear failure at a middle Zircaloy-4 grid location occurred in a 16x16 assembly. Rods in the vicinity of the failed fuel rod also had high wear at the same grid location and the failure occurred during the first irradiation cycle. Therefore, the cause of this failure is again believed to have been related to a damaged spacer grid which affected the local cell geometry.

The remaining two (2) grid-to-rod fretting wear failures occurred at the top Zircaloy-4 grid location in two separate Batch K assemblies at Calvert Cliffs Unit 1. Unlike the other grid-to-rod fretting wear failures discussed above, these failures occurred during the third cycle of irradiation. As a result, when these failures were discovered, an extensive investigation of grid-to-rod fretting wear at Calvert Cliffs Units 1 and 2 was performed. This investigation, which was completed in the spring of 1993, involved both visual and eddy current examination of fuel rods from seven Calvert Cliffs Units 1 and 2 fuel assemblies. The evaluation showed that moderate to high grid-to-rod wear occurred only in those Calvert Cliffs fuel assemblies located on the core periphery for a third, 24-month, irradiation cycle.

A plant specific evaluation was performed for Calvert Cliffs Units 1 and 2 to address the effect of the observed wear on fuel performance. This evaluation concluded that the fretting wear would not contribute to a significant increase in the probability, frequency, or consequences of fuel failures during normal or anticipated operational occurrences or postulated accidents. NRC resident inspectors at the Calvert Cliffs units were made aware of the conclusion of this evaluation.

Fuel inspections similar to that in Calvert Cliffs have been recently performed at other ABB-CE designed plants. Specifically, two 16x16 fuel assemblies that had been located on the core periphery for three consecutive cycles were examined, as well as five 14x14 fuel assemblies, four of which had spent one or more cycles on the core periphery. One of the 14x14 fuel assemblies that was inspected had spent four consecutive cycles in the core, with the last two cycles at the core periphery. In contrast to the Calvert Cliffs results, the inspection data from all of these assemblies did not indicate any unusual grid-to-rod wear. Therefore, the wear observed at Calvert Cliffs is not indicative of generic grid-to-rod fretting wear in ABB-CE PWR fuel.

Conclusion: Based on inspections and evaluations performed over the years, grid-to-rod fretting wear is not a generic problem for PWR fuel supplied by ABB-CE. Notwithstanding this determination, ABB-CE continues to develop, on an ongoing basis, more robust fuel designs that decrease the likelihood of any significant grid-to-fuel rod fretting wear.

Contact: Mario Robles (203) 285-5215