



UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20585-0001

June 24, 1997

PDR: per De Agazio

MEMORANDUM TO: Charles W. Hehl, Director
Division of Reactor Projects
Region I

FROM: Patrick D. Milano, Acting Director *P.D.M.*
Project Directorate I-3
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

SUBJECT: RESPONSE TO TASK INTERFACE AGREEMENT (TIA) REGARDING
VANTAGE-5H ZIRLO FUEL PROBLEMS AT SEABROOK (TAC NO. M98950)

By memorandum dated June 5, 1997, Region I requested that NRR take the lead for review of the fuel rod failures at Seabrook involving the Westinghouse VANTAGE-5H ZIRLO design. NRR was requested to determine if a restart issue existed and to evaluate the North Atlantic's root cause determination of the failures and the adequacy of its efforts to assure the integrity of the core reload during the next cycle.

Reactor Systems Branch (SRXB) staff have participated in two conference calls in which North Atlantic described the fuel failures and the root cause investigation. In addition an SRXB staff member reviewed the Root Cause Report at the plant and met with North Atlantic's staff for in depth discussions of the root cause and the corrective actions. As part of this inspection, aspects of the Cycle 5 operational history and the video tape examinations of the fuel rods were reviewed.

After review of the material available, the NRR staff has not identified any restart concerns related to the reloading of VANTAGE-5H ZIRLO fuel used during Cycle 5 and with fresh VANTAGE-5H ZIRLO fuel for Cycle 6 at Seabrook. This evaluation is based on several factors, including past experience with failed fuel, North Atlantic's root cause investigation of the failed fuel, North Atlantic's proposed corrective actions, and the fuel failure mechanism.

North Atlantic undertook an extensive root cause investigation which included high resolution video examination of failed and non-failed rods, industry research, and examination of manufacturing records. Twelve potential causes were examined in detail to determine the causes that matched the known facts and observations.

The five failed rods were located in four once-burned VANTAGE-5H ZIRLO fuel assemblies which each contained 128 Integral Fuel Burnable Absorber (IFBA) rods. The Cycle 5 core contained 80 first-cycle ZIRLO clad assemblies which had four different IFBA patterns. Of these, there were 12 assemblies with 128 IFBA rods. These 128-IFBA rod assemblies were arranged as one set of four symmetric assemblies and one set of eight symmetric assemblies.

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The four assemblies with failed rods represented two symmetric assemblies from each of the above mentioned 128-IFBA rod assembly sets. The assembly burnups were approximately 26,000 MWD/MTU. The failed fuel rods were IFBA rods located in high power locations adjacent to a thimble tube.

To aid in the root cause determination, North Atlantic removed 10 non-failed fuel rods from the assemblies for examination. The non-failed rods came from locations symmetric to those of the failed rods and some additional non-IFBA rods.

The video examinations revealed a similar crud pattern on the failed and non-failed rods. This pattern was similar to what has been observed at other plants. The sound rods showed no evidence of incipient failure above grid 4 where all the failures were observed on the failed rods. Also, the sound rods showed no evidence of axial cracking between grids 6 and 7, as was observed on the failed rods.

The three most probable causes determined for the fuel rod failures were:

- internal contamination during manufacturing,
- a crud-induced problem, and
- a combination of power history and operational strategy.

The most likely cause is the latter.

North Atlantic has taken appropriate short-term actions to address the areas of concern. The Cycle 6 core has been redesigned to eliminate or greatly reduce the possibility of reoccurrence of fuel failure. The 4 assemblies that contained the failed rods have been replaced with new assemblies instead of reusing the reconstituted fuel assemblies. The remainder of the 128-IFBA rod fuel assemblies will be located in very low power areas on the edge of the core. Cycle 6 does not contain any new 128-IFBA rod assemblies, and the peak power will not be concentrated in a small number of assemblies as it was in Cycle 5. Additional precautionary actions include a slower approach to power and additional attention to core chemistry.

In response to the broader question of fuel failures at other facilities using Vantage 5 fuel, the NRR staff is reviewing the available data and investigating the question for generic implications. We have scheduled a meeting with Westinghouse on this subject for June 24, 1997. Future actions may include an additional Seabrook site visit, as well as other inspections.

This completes our response to this TIA, and we consider this item closed.

cc: J. Johnson, RII
G. Grant, RIII
T. Gwynn, RIV
K. Perkins, WCFO

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