



UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

May 1 1996

Mr. William J. Cahill, Jr.
 Chief Nuclear Officer
 Power Authority of the State of New York
 123 Main Street
 White Plains, NY 10601

SUBJECT: EVALUATION OF JAMES A. FITZPATRICK NUCLEAR POWER PLANT TESTING PROGRAM FOR HOT-ROLLED XM-19 MATERIALS (TAC NO. M93617)

Dear Mr. Cahill:

By letter dated September 13, 1995, you submitted for NRC review an augmented inservice inspection (ISI) program for the James A. FitzPatrick Nuclear Power Plant (FitzPatrick) reactor pressure vessel core shroud repair rod assemblies and a test program for the hot-rolled XM-19 materials from which parts of the repair assemblies are made. These programs were requested by the NRC staff during the last refueling outage to support the licensee's core shroud modification at FitzPatrick. The core shroud was modified by installing 10 tie rod repair assemblies that were equally spaced around the core shroud. These repair assemblies were designed to structurally replace the circumferential welds on the core shroud. The tie rods in the repair assemblies were made of hot-rolled XM-19 materials. The hot-rolled XM-19 material is not an NRC-approved material. The proposed test program was established to demonstrate that the XM-19 material used for the tie rods have adequate resistance to intergranular stress corrosion cracking (IGSCC).

Your proposed test program is summarized below:

- (1) CERT type specimens containing a threaded section with the same type of cylindrical geometry as that in the core shroud tie rods will be used in the testing. A crevice condition surrounding the threaded section will also be created during testing.
- (2) The test specimens will be made from two different heats of materials used for the tie rods at FitzPatrick and Oyster Creek plants. The test specimen will be preconditioned in the testing environment for about 7 days, and followed by testing at a slow strain rate of approximately 5×10^{-7} sec⁻¹ until failure.
- (3) The testing will be performed in a simulated boiling-water reactor (BWR) coolant environment of approximately 550°F and about 8 ppm oxygen. The conductivity of the testing environment will be controlled to be maintained at less than 0.75 microsiemens/cm with a goal of 0.5 microsiemens/cm. In addition, hot-rolled XM-19 materials will also be tested in air as a control, and one specimen of sensitized 304 stainless steel tested in a simulated BWR environment to assure the adequacy of the test environment to produce IGSCC.

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- (4) The specimens will be examined on the fracture surface and along the gauge section for the appearance of stress corrosion cracking by light microscope and scanning electron microscopy on a minimum of two metallographic mounts per test specimen.

The NRC staff has reviewed your proposed test program for hot rolled XM-19 materials, and has determined that the test program is adequate for ensuring that the XM-19 materials have adequate resistance to IGSCC, provided that the following conditions are incorporated into your test program:

- (1) The test and control specimens of hot rolled XM-19 materials should be fabricated as to bound the degree of cold work and the surface condition of the fabricated tie rods in the repair assemblies. This should also include the thread geometry and the method of fabricating the threads in the test specimens.
- (2) The crevice conditions of the test and control specimens should duplicate as close as possible the crevice conditions of the tie rods in the repair assemblies.
- (3) The NRC staff recommends that the test and control specimens should be tested in an autoclave environment to simulate both the pressures and temperature of the BWR operating environment and to bound the reactor coolant chemistry at FitzPatrick.
- (4) The NRC staff recommends that a minimum of two specimens from each heat of hot rolled XM-19 materials should be tested in simulated BWR environment, and that the control specimens should include at least one sensitized XM-19 specimen from each heat of hot-rolled XM-19 to ensure the testing condition will produce IGSCC. If sensitized condition of XM-19 material cannot be produced in time to support the test program, the NRC staff recommends that one of the test specimens from each heat should be tested at a slower strain rate of about $5 \times 10^{-8} \text{ sec}^{-1}$ to demonstrate the effect of strain rate on IGSCC.
- (5) You should justify why chloride and sulfate impurities are not considered in the BWR testing environment.

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The NRC staff has not completed its review of your proposed augmented ISI program for the core shroud and its repair assemblies. The NRC staff will issue its evaluation when the NRC staff has finalized its review of the Boiling Water Reactor Vessel and Internals Project proposed core shroud reinspection guidelines.

Sincerely,

ORIGINAL SIGNED BY:

K. R. Cotton, Acting Project Manager
Project Directorate I-1
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket No. 50-333

cc: See next page

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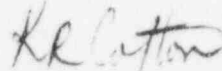
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K. R. Cotton, Acting Project Manager
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