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P. A. Morris, Director, DRL  
THRU: D. J. Skovholt, AD/RO, DRL

NIAGARA MOHAWK POWER CORPORATION - NINE MILE POINT REACTOR METALLURGICAL PROBLEMS - DOCKET NO. 50-220

This memorandum updates to June 8, 1970, information on the investigation of the metallurgical problems associated with the cracking of a core spray nozzle safe end on the Nine Mile Point reactor vessel.

On May 1, 1970, Niagara Mohawk Power Corporation (NMP) filed a report, "Reactor Primary System Investigation at Nine Mile Point Nuclear Station", which provided detailed metallurgical information concerning the cracked core spray nozzle safe end. This report cites the following pertinent considerations and conclusions relative to the failure of the safe end and the applicability of this experience to other similar components within the plant:

1. The failure of the core spray nozzle safe end was the result of intergranular, stress corrosion cracking of furnace-sensitized, 304 stainless steel.
2. It was found that excessive stresses, about six times code allowable, existed at the failure location because of an inadequately designed pipe suspension system. The failure location was the high point of a U-bend in the core spray piping and was a region of stagnant water and the possibility of gas entrapment existed.
3. The non-destructive examination of all other furnace-sensitized stainless steel safe ends by radiographic and ultrasonic techniques did not show any cracking. However, shallow intergranular attack was detected by dye penetrant techniques on the exterior 20 of 34 safe ends. Dye penetrant also showed indications on several non-load bearing components within the reactor vessel.
4. The other core spray nozzle safe end was also removed for detailed metallurgical examination. During removal, it was noted that a substantial gas bubble was trapped by the U-bend of this system. Subsequent examinations of this safe end showed intergranular penetration of up to 0.01 inch on both the inside and outside surfaces.

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On May 5, 1970, NMP met with the Sensitized Stainless Steel Subcommittee of the Advisory Committee on Reactor Safeguards, its consultants, and the regulatory staff to discuss the safe end failure at Nine Mile Point, the results of the material investigations and stress analyses, and NMP's planned corrective action.

On May 11, 1970, NMP submitted two reports dealing with further results on the material examinations and plans for the restoration of the Nine Mile Point reactor to service. Their plans for restoration to service are summarized as follows:

1. Both core spray nozzle safe ends would be replaced with non-sensitized material designed such that gas accumulation will not occur. The emergency condenser nozzle safe end, from which several metallurgical samples had been taken, would likewise be replaced.
2. All piping systems would be rehung, in accordance with the findings of NMP's consultant on stresses (Teledyne), to keep stresses as low as possible and in all cases within code allowable.
3. During the first heatup, NMP and Teledyne would examine all piping to assure expected performance and proper support.
4. A continuing surveillance program, which included examination of all furnace-sensitized safe ends within a year of restart, was specified by NMP.

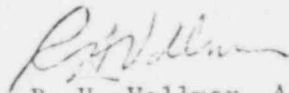
On June 1 and 2, 1970, NMP and the General Electric Company met with the Sensitized Stainless Steel Subcommittee of the Advisory Committee on Reactor Safeguards, its consultants, and the regulatory staff to discuss the status of the Nine Mile Point reactor and the investigations being conducted and to review the data taken by General Electric during its program of accelerated corrosion testing on samples of sensitized and unsensitized stainless steels.

NMP stated that they planned on having the Nine Mile Point reactor ready for service by June 15, 1970, and that it was their belief that system integrity and safety was assured. The sensitivity of leak detection was increased such that 0.5 gpm leak could be detected in 90 minutes or less. NMP also stated that it was their belief that all piping and safe end stresses were within code allowable.

The General Electric Company reviewed the results of their accelerated corrosion tests on stainless steels. It was disclosed that:

1. Only samples that had been highly sensitized showed signs of stress corrosion attack.
2. Only samples under constant loaded stress, as opposed to residual stress, were subject to attack and failure. <sup>experienced</sup> ?
3. Water chemistry, halide and oxygen concentrations, was found to primarily influence the time to failure for sensitized materials.

We are currently conducting an evaluation of the findings at Nine Mile Point and NMP's proposal for restoration of the Nine Mile reactor to service. We have informed all other facility licensees of the metallurgical problems at Nine Mile Point and requested them to examine their facility systems for potential similar problems.



R. H. Vollmer, Acting Chief  
Operating Reactor Branch #2  
Division of Reactor Licensing