UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

OF DISPOSITION OF INDICATION NEAR CORE SPRAY NOZZLE 23A

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT NUCLEAR STATION UNIT NO. 1

DOCKET 50-220

1.0 INTRODUCTION

Under IE Bulletin 80-13, Niagara Mohawk Power Corporation (NMPC) visually examines the accessible parts of core spray spargers during each refueling outage with remote underwater television cameras. During the 13th refueling outage in February 1995, it identified a rejectable indication in the Loop A core spray sparger pipe near core spray sparger nozzle 23A. The indication is about 3.5 inches long and runs from the sparger pipe-to-nozzle weld heat affected zone into the sparger pipe. The indication also has several branches. The sparger pipe is of nominal 3.5-inch diameter schedule 40 Type-304 stainless steel.

This is the second indication NMPC identified in the NMP1 core spray spargers. The first indication was found in 1981 in the Loop A sparger pipe near the 26A nozzle, located about 15 inches from the 23A nozzle. NMPC has examined this indication each refueling outage to monitor any growth. To date its size has not changed.

NMPC notified NRC of the newly discovered indication in a teleconference on February 23, 1995. An evaluation of the indication was submitted to NRC on March 6, 1995, followed by a loose parts analysis which was submitted March 14, 1995.

2.0 DISCUSSION AND EVALUATION

NMPC considers intergranular stress corrosion cracking (IGSCC) to be the cause for the following reasons. It determined that the most probable cause of the cracking found earlier in the sparger pipe near nozzle 26A to be IGSCC. The stress state and material at the 23A nozzle are similar to those at the 26A nozzle position. The indication near 23A appears to start near the toe of the sparger pipe-to-nozzle weld where the sparger pipe material may have been sensitized during welding.

To determine whether the indication near nozzle 23A is actively growing, NMPC reviewed videotapes of core spray sparger examinations taken during refueling outages from 1981 to 1993. The review showed that parts of the indication near the 23A nozzle were visible in videotapes recorded in 1981 and 1988. The indications were observed during this review by first studying the 1995 tape and noting the location of the indication relative to features on the sparger

surface and then checking the same location in the earlier examinations. Improvements in photography and experience of the nondestructive examination personnel made identification of the indication possible in 1995.

Detailed comparisons of the indication near nozzle 23A shown in the videotapes showed that it did not propagate noticeably since at least 1988.

The NMPC evaluation of the cracking found near nozzle 26A in 1981 considered that the initial crack propagation may have been due to residual bending moment loads left in the spargers after installation. Propagation after installation is limited because these bending loads are self relieving. Little or no crack growth has occurred in this area as observed during examinations performed in each refueling outage since 1981.

NMPC performed a fracture mechanics analysis to determine if the indication could prevent the sparger from performing its function of providing spray flow to the core. NMPC assumed a growth rate of 5E-5 inch/hour, the maximum expected growth rate for IGSCC cracks. This is a conservative assumption because the ends of the indication do not appear to have propagated since at least 1988. NMPC assumed that growth could occur in any direction and that the sparger is cracked through wall along the entire length of the indication.

NMPC calculated the indication length at the end of the next cycle to be 5.25 inches and found this value to be acceptable. It then analyzed the sparger to determine whether the remaining uncracked ligament could withstand deadweight and seismic loads and the loads resulting from a core spray injection transient. It calculated stress intensity factors in the axial and circumferential directions at the crack tip. The analysis showed that the remaining uncracked ligament can withstand loads associated with a sparger injection transient, and the axial and circumferential stress intensity factors at the indication tip (6.3 and 9.7 ksi-square root inch, respectively) are less than the maximum permitted critical stress intensity factor (150 ksi-square root inch).

NMPC found that the crack growth will not result in severance of the sparger or nozzle at least until the next refueling outage. It calculated the leakage flow through the indication to be less than one gpm, and its impact on the spray flow and distribution negligible. NMPC determined that the indication will not prevent the sparger from providing its design basis flow and distribution to the core before the next refueling outage. It will continue to examine the indication at each refueling outage and will evaluate any propagation as required by IE Bulletin 80-13.

The NRC staff finds the licensee proposed course of action of not repairing the subject core spray sparger nozzle is acceptable. This is based on the following consideration.

The cracking was recorded on videotapes in 1981 and 1988. It was observed to not have propagated noticeably since 1988.

The crack growth rate used in the analysis was a conservative value, especially in view of the visual evidence that the crack has not grown noticeably since 1988. The cracking is similar to that found in nozzle 26A in cause and behavior, and the size of that crack has not changed noticeably since 1981. Growth is not expected since bending loads present are self relieving.

The fracture mechanics analysis showed the indication would not exceed allowable limits before the next refueling outage and that structural integrity would be preserved. Leakage was also found to be within acceptable limits.

NMPC performed a Loose Part Analysis at the NRC staff's request. The analysis was submitted to NRC on March 14, 1995. The subject loose part analysis evaluated the potential impact on plant operation as a result of a separated core spray sparger nozzle. The following areas of concern are discussed in the evaluation: (1) the potential for fuel bundle flow blockage and subsequesnt fuel damage, (2) the potential for interference with control rod operation and (3) the potential for corrosion and chemical reaction with other reactor materials. The subject analysis concluded that the safe reactor operation will not be compromised by the presence of a loose core spray sparger nozzle inside the reactor vessel. NMPC also stated that a more detailed Loose Part Analysis Report including the effect during a design basis accident and its impact on spray distribution and sparger structural integrity will be submitted to NRC by April 30, 1995. The staff finds the licensee's loose parts analysis is acceptable. However, in view of the branching nature of the observed cracking, the staff recommends that the Loose Part Analysis Report to be submitted by April 30, 1995, should also discuss the potential impact on safe operation resulting from loose pipe fragments of various sizes.

3.0 CONCLUSION

The NRC staff concludes that NMPC's evaluation is acceptable and that NMP1 can be safely operated during the 1995-1997 operating cycle.

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