April 29, 2004

Mr. Joseph M. Solymossy
Site Vice President
Prairie Island Nuclear Generating Plant
Nuclear Management Company, LLC
1717 Wakonade Drive East
Welch, MN 55089

SUBJECT: SUMMARY OF THE ROOT CAUSE ANALYSIS OF TUBE DENTS IN LOW ROW U-BENDS IN PRAIRIE ISLAND, UNIT 1, STEAM GENERATORS (TAC NO. MB8715)

Dear Mr. Solymossy:

By letters to the U.S. Nuclear Regulatory Commission (NRC) dated April 25, 2003 (ML031250066), and February 20, 2004 (ML040610107), Nuclear Management Company, LLC, submitted information pertaining to the Prairie Island, Unit 1, steam generator tube denting identified in the U-bend region of low row tubes during the 2002 refueling outage inspection.

Enclosed is the NRC staff's evaluation of the above inspection reports. As discussed in the evaluation, the NRC staff did not identify any technical issues that warranted followup action at this time. If you have any further questions, please contact me at (301) 415-8371.

Sincerely,

/RA/

Mahesh Chawla, Project Manager, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-282

Enclosure: As noted

cc/w enclosure: See next page

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SUMMARY OF THE NUCLEAR REGULATORY COMMISSION (NRC) REVIEW OF

ROOT CAUSE ANALYSIS OF

STEAM GENERATOR TUBE DENTING

PRAIRIE ISLAND, UNIT 1

DOCKET NO. 50-282

By letters to the NRC dated April 25, 2003 (ML031250066), and February 20, 2004 (ML040610107), Nuclear Management Company, LLC, (NMC) submitted information pertaining to the Prairie Island, Unit 1, steam generator tube denting identified in the U-bend region of low row tubes during the 2002 refueling outage inspection. The NRC staff requested NMC to submit a summary of the root cause analysis report during a phone call with NMC to discuss the steam generator tube inspection results during the 2002 refueling outage inspection (refer to ML030310571).

In 2001, the U-bend region of all active row 1 and 2 tubes in the Unit 1 steam generators were heat-treated to relieve the stresses in those tubes (which is intended to reduce the susceptibility to cracking). A rotating probe (with a +Point™ coil) and bobbin coil inspection of the U-bend region of the row 1 and 2 tubes was performed both before and immediately after the heat treatment. The purpose of the post-heat treatment inspection was not to re-examine the tube for degradation or denting, but to verify that the heat treatment was applied at the proper location. The heat treatment process used at Unit 1 was similar to that used at other plants.

During the 2002 refueling outage, 28 tubes were identified with dent signals greater than the licensee's 2-volt dent reporting threshold. The dent signals were found near the bottom surface of tube support plate number 7 and the top surface of support plate number 6. Although only 28 tubes were identified with dents greater than 2 volts almost all tubes showed the presence of dent-like signals. No service-induced degradation was identified at these dents. Review of the +Point™ coil data indicated that the geometry deformation is more uniform around the circumference of the tube unlike the geometry pattern for more classical denting which results from corrosion of the carbon steel tube support plate. This latter denting (classical denting) is typically more biased toward the center of the support rather than at the edges. The largest of the dent signals was approximately 6 volts. A comparison of the 2001 eddy current data (both pre- and post-heat treatment) to the 2002 data does not indicate any significant change or growth in the dent signals. Minor changes in the data are attributed to eddy current uncertainties.

The licensee reviewed other maintenance procedures (e.g., sludge lancing) to determine if they may have resulted in tube denting or result in changes to the eddy current signal response at the upper tube supports. Based on this review, the licensee concluded that no other maintenance activities could have resulted in denting or changed the eddy current signal response. A review of the U-bend heat treatment process records was also performed. No off-normal events occurred during the heat treatment process.

Based on their investigations, the licensee concluded that (1) the dent-like tube indications appear to be a result of the heat treatment process; (2) the denting has likely resulted in less

than 1 mil of inside-diameter reduction with a uniform change around the circumference of the tube (assuming the dent-like signals are truly representative of tube deformation); (3) it cannot be conclusively demonstrated that the dent-like signals are either an actual shallow deformation of the tube or an artifact of the high temperature exposure of the crevice deposits; and (4) not all of the dent-like signals are result of the heat treatment process (some of the dents were present prior to the heat treatment).

The licensee concluded that the potential geometric deformation in these dents in the U-bend region are small and would be expected to result in less severe residual stresses than classic denting of similar magnitude. Furthermore, since stress corrosion cracking has not been observed at dents in Unit 1, it is not likely that the new dents would develop stress corrosion cracks during the next cycle. The steam generators at Unit 1 are scheduled to be replaced in the fall of 2004.

Based on the material provided by the licensee, the staff did not identify any issues warranting additional follow-up.

Prairie Island Nuclear Generating Plant, Unit 1

cc:

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