February 12, 2001

Mr. Joel Sorensen
Site General Manager
Prairie Island Nuclear Generating Plant
Nuclear Management Company, LLC
1717 Wakonade Drive East
Welch, MN 55089

SUBJECT: PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 1 - FOLLOW-UP QUESTIONS FROM THE MEETING ON FEBRUARY 9, 2001, REGARDING THE STEAM GENERATOR EDDY CURRENT TEST RESULTS

Dear Mr. Sorensen:

On February 9, 2001, the NRC staff met with representatives from the Nuclear Management Company, LLC (the licensee) to review recent eddy current test results of Prairie Island Nuclear Generating Plant, Unit 1, steam generators. The discussion focused on the reliability of the licensee's eddy current test and analytic methods in detecting significant tube flaws amidst the full range of noise signals found in the steam generators, and on the detectability of various sizes of circumferential and axial tube cracks, particularly in the U-bend region.

At the meeting's conclusion, the staff indicated that it has some follow-up questions (enclosed), based on upon the licensee's presentation. The staff would appreciate receiving the licensee's responses as soon as possible, so that the staff can consider the significance of this information in a timely manner.

Sincerely,

/RA/

Tae Kim, Senior Project Manager, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-282

Enclosure: Follow-up Questions

cc w/encl: See next page

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cc:

J. E. Silberg, Esquire
Shaw, Pittman, Potts and Trowbridge
2300 N Street, N. W.
Washington, DC 20037

Site Licensing Manager
Prairie Island Nuclear Generating Plant
Nuclear Management Company, LLC
1717 Wakonade Drive East
Welch, MN 55089

Adonis A. Neblett
Assistant Attorney General
Office of the Attorney General
455 Minnesota Street
Suite 900
St. Paul, MN 55101-2127

U.S. Nuclear Regulatory Commission
Resident Inspector's Office
1719 Wakonade Drive East
Welch, MN 55089-9642

Regional Administrator, Region III
U.S. Nuclear Regulatory Commission
801 Warrenville Road
Lisle, IL 60532-4351

Mr. Stephen Bloom, Administrator
Goodhue County Courthouse
Box 408
Red Wing, MN 55066-0408

Commissioner
Minnesota Department of Commerce
121 Seventh Place East
Suite 200
St. Paul, MN 55101-2145

Tribal Council
Prairie Island Indian Community
ATTN: Environmental Department
5636 Sturgeon Lake Road
Welch, MN 55089

Michael D. Wadley
Chief Nuclear Officer
Nuclear Management Company, LLC
700 First Street
Hudson, WI 54016

Nuclear Asset Manager
Xcel Energy, Inc.
414 Nicollet Mall
Minneapolis, MN 55401

FOLLOW-UP QUESTIONS FROM THE FEBRUARY 9, 2001, MEETING
REGARDING RFO-21 UNIT 1 STEAM GENERATOR EDDY CURRENT TEST RESULTS
PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 1

Structural Integrity Analysis

In the February 10, 2001 meeting, you presented two approaches to support a conclusion regarding minimum structurally significant flaws in terms of voltage. Provide an explanation of these approaches, the source and applicability of the data, the burst model(s) used, analyses performed, supporting assumptions, conclusions, and how you arrived at your conclusions.

Describe the performance demonstration program used to estimate the flaw sizing accuracy used in the U-bend structural analysis. This should include the number and type of tube and flaw specimens and the applicability of the data set to the plant-specific conditions (e.g., geometry, flaw signal characteristics, and signal-to-noise ratios), and whether the sizing accuracy represents the performance of the eddy current system (technique plus personnel) against ground truth.

Provide the data base that supports the crack growth rates used in the structural analysis. Discuss why this data base is applicable to the Prairie Island Nuclear Generating Plant (PINGP).

Provide the data base that supports the burst correlation to voltage and flaw length. Discuss why it is applicable to PINGP.

Eddy Current Inspections

Provide a summary of the eddy current setup used by PINGP, Unit 1, for production analysis and for noise studies, highlighting the differences between the two setups. Describe the reasons for using these different setups. Discuss the potential advantages and disadvantages inherent in the different setups and how data and noise levels collected using the two set-ups can be compared.

Discuss the criteria for reinspection and rejection of tubes, the basis for this criteria, and the outcome of all reinspections (e.g., changes in measured parameters).

It is the NRC staff’s understanding that the criteria for reinspection or rejection of tubes is based on the Electric Power Research Institute’s data set used for probe qualification for U-bend inspection. Provide information on the composition of the data set; that is, a description of the types of tubes, flaws, notches, artifacts, etc. Discuss how the data set is representative of the conditions at PINGP.

Discuss and provide the basis for your minimum reliable detection capabilities in terms of tube-by-tube factors such as signal-to-noise ratios and noise parameters, including volts peak-to-peak and vertical maximum. Include this information for tubes inspected with the midrange as well as for tubes inspected with both the midrange and high frequency probes.

ENCLOSURE

Your analysis indicates that reliable detection of flaws with a peak-to-peak response exceeding 1.6 volts is sufficient to ensure that flaws of potential structural integrity significance are detected. Discuss, by example, the detectability of such a flaw in tubes with the most adverse noise conditions existing in the PINGP U-bend apex location. The example should consider a range of flaw vertical maximum voltage values ranging from 25 percent to 50 percent of the peak-to- peak voltage value (1.6 volts). The example should discuss the specific parameters and behaviors of the flaw and noise signals influencing the detectability of the flaw signal.

Discuss if magnetically biased eddy current probes have been considered to address the noise levels in the U-bends.

<u>Dents, Flow Slot Hour-glassing, and Secondary Side Inspections</u>

Provide a summary of the location and magnitude of tube dents that are in the PINGP, Unit 1, steam generators. Discuss how the number and size of these dents have changed over time.

Discuss the PINGP experience with dents or U-bend restrictions of eddy current probes. Provide in this context your definition of a dent.

Provide the methods, results, acceptance criteria, and conclusions relative to detection of flow slot hour-glassing.

<u>Root-cause Analysis</u>

Discuss the results of your hindsight reviews of eddy current data performed on row 1 and row 2 tubes.

Provide a complete description of the location in the steam generators of the U-bend circumferential indications found in the February 2001 outage at PINGP.

Provide a summary of the corrective actions taken at PINGP to address the potential for U-bend indications (based on the Indian Point Unit 2 experience) as well as to address the specific U-bend indications detected in the February 2001 outage at PINGP. Provide a summary of actions taken to determine the root cause of the circumferential indications detected in the February 2001 outage at PINGP.

<u>Conclusion</u>

Discuss how the data, analysis, and evaluations provided for the above questions can be used to support the acceptability of the steam generators at PINGP for the upcoming operating cycle.