March 1, 2005

Mr. Daniel J. Malone
Site Vice President
Palisades Nuclear Plant
Nuclear Management Company, LLC
27780 Blue Star Memorial Highway
Covert, MI 49043-9530

SUBJECT: PALISADES PLANT - REVIEW OF PALISADES STEAM GENERATOR TUBE INSPECTION REPORTS FOR THE SPRING 2003 OUTAGE (TAC NO. MC2747)

Dear Mr. Malone:

By letters dated April 22, 2003 (ML031190626), April 13, (ML041100667), June 28, (ML041890415), and December 1, 2004 (ML043430446), Nuclear Management Company, the licensee, submitted information pertaining to their 2003 steam generator (SG) tube inspections at Palisades Nuclear Plant.

The U. S. Nuclear Regulatory Commission (NRC) staff has completed its review of the spring 2003 Palisades Nuclear Plant SG tube inservice inspection report and related submittals. The NRC staff has reviewed the information provided by the licensee and concludes that the licensee provided the information required by their technical specifications and that no additional follow-up is required at this time. The NRC staff's review of the report is enclosed.

Sincerely,

/RA/

David H. Jaffe, Acting Project Manager, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-255

Enclosure: Review of 2003 Steam Generator Tube Inspection Report

cc: See next page

March 1, 2005

Mr. Daniel J. Malone
Site Vice President
Palisades Nuclear Plant
Nuclear Management Company, LLC
27780 Blue Star Memorial Highway
Covert, MI 49043-9530

SUBJECT: PALISADES PLANT - REVIEW OF PALISADES STEAM GENERATOR TUBE INSPECTION REPORTS FOR THE SPRING 2003 OUTAGE (TAC NO. MC2747)

Dear Mr. Malone:

By letters dated April 22, 2003 (ML031190626), April 13, (ML041100667), June 28, (ML041890415), and December 1, 2004 (ML043430446), Nuclear Management Company, the licensee, submitted information pertaining to their 2003 steam generator (SG) tube inspections at Palisades Nuclear Plant.

The U. S. Nuclear Regulatory Commission (NRC) staff has completed its review of the spring 2003 Palisades Nuclear Plant SG tube inservice inspection report and related submittals. The NRC staff has reviewed the information provided by the licensee and concludes that the licensee provided the information required by their technical specifications and that no additional follow-up is required at this time. The NRC staff's review of the report is enclosed.

Sincerely,
/RA/
David H. Jaffe, Acting Project Manager, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-255

Enclosure: Review of 2003 Steam Generator Tube Inspection Report

cc: See next page

DISTRIBUTION:

PUBLIC	RidsOgcRp
PDIII-1 Reading	RidsAcrsAcnwMail
RidsNrrDlpmDpr	RidsNrrDlpmLpdiii2 (LRaghavan)
RidsNrrPMDJaffe	RidsNrrLATHarris
LLund	EDuncan, RGN-III
MMurphy	YDiaz

Attachment Accession No.: ML050560010
Package Accession No.: ML050610439
ADAMS Accession No.: ML050540564

OFFICE	PDIII-1/(A)PM	PDIII-1/LA	PDIII-1/SC
NAME	DJaffe	THarris	LRaghavan
DATE	03/1/05	03/1/05	03/1/05

OFFICIAL RECORD COPY

REVIEW OF THE 2003 STEAM GENERATOR TUBE INSPECTION REPORT

PALISADES NUCLEAR PLANT, NUCLEAR MANAGEMENT COMPANY

DOCKET NO. 50-255

By letters dated April 22, 2003 (ML031190626), April 13, (ML041100667), June 28, (ML041890415), and December 1, 2004 (ML043430446), Nuclear Management Company, the licensee, submitted information pertaining to their 2003 steam generator (SG) tube inspections at Palisades Nuclear Plant (Palisades).

Palisades has two Combustion Engineering Model 2530 replacement SGs. There are 8,219 mill annealed Alloy 600 tubes in each SG. The tubes have an outside diameter of 3/4-inch and a wall thickness of 0.042-inch. The tubes are supported at various locations by stainless steel eggcrate lattice type tube supports, diagonal straps and vertical straps. The SG tubes were expanded through the full depth of the tubesheet using an explosive process.

The licensee provided the scope, extent, methods and results of their SG tube inspections in the documents referenced above. In addition, the licensee described corrective actions (i.e., tube plugging or repair) taken in response to the inspection findings.

Based on a review of the documents provided through June 28, 2004, the U. S. Nuclear Regulatory (NRC) staff prepared a request for additional information (RAI) which was forwarded to the licensee, in a letter dated September 2, 2004 (ML042370450), shortly before their fall 2004 SG tube inspections. Given that the fall 2004 SG tube inspections would be conducted prior to the licensee being able to respond to this RAI, the NRC staff factored these questions into the discussions it had with the licensee during the fall 2004 refueling outage regarding the results of the ongoing tube inspections. A summary of these discussions are attached, herein. These discussions focused on the scope of examinations and the criteria used for determining when supplemental rotating probe examinations would be performed (e.g., for free span differential signals and for indications previously attributed to wear). The NRC staff's questions arose, in part, since plants with mill annealed tubing frequently inspect 100 percent of the tubes with a bobbin coil. In addition, many plants with mill annealed tubing in recirculating SGs also inspect the following regions with a rotating probe each outage: expansion transition region of 100 percent of the tubes, all dents/dings greater than 5 volts, the U-bend region of 100 percent of the tubes in rows 1 and 2 (and in some cases higher row tubes), and all wear scars (regardless of previous rotating probe results). Aspects of the licensee's original 2003 inspection scope differed from that typically seen at other plants with mill annealed tubing. The licensee subsequently responded to the RAI on the 2003 outage by letter dated December 1, 2004 (ML043430446).

Based on a review of the information provided, the NRC staff concludes that the licensee provided the information required by their technical specifications. As discussed above, the NRC staff identified several questions related to the 2003 inspections at Palisades. Based on information provided during the fall 2004 outage phone call and the December 1, 2004, RAI response, the NRC staff determined that no additional followup is required on the 2003 outage inspections. The NRC staff will review the reports that the licensee submits pertaining to its fall 2004 SG tube inspections when these reports are submitted.

Attachment: Summary of Conference Calls

ENCLOSURE

SUMMARY OF CONFERENCE CALLS WITH NUCLEAR MANAGEMENT COMPANY

REGARDING THE FALL 2004 STEAM GENERATOR TUBE INSPECTIONS AT PALISADES

DOCKET NO. 50-255

The U. S. Nuclear Regulatory Commission (NRC) staff participated in a series of conference calls with Nuclear Management Company to discuss the fall 2004 outage steam generator tube inspection activities at the Palisades Nuclear Plant. These calls were held on August 31, September 30, October 7, and October 8, 2004. The issues discussed during the call include the following discussion points, which were emailed to the licensee:

1. Discuss any trends in the amount of primary-to-secondary leakage observed during the recently completed cycle.

2. Discuss whether any secondary side pressure tests were performed during the outage and the associated results.

3. Discuss any exceptions taken to the industry guidelines.

4. For each steam generator (SG), provide a description of the inspections performed including the areas examined and the probes used (e.g., dents/dings, sleeves, expansion-transition, U-bends with a rotating probe), the scope of the inspection (e.g., 100 percent of dents/dings greater than 5 volts and a 20 percent sample between 2 and 5 volts), and the expansion criteria. Also, discuss the extent of the rotating probe inspections performed in the portion of tube below the expansion transition region.

5. For each area examined (e.g., tube supports, dent/dings, sleeves, etc), provide a summary of the number of indications identified to-date of each degradation mode (e.g., number of circumferential primary water stress corrosion cracking (PWSCC) indications at the expansion transition). For the most significant indications in each area, provide an estimate of the severity of the indication (e.g., provide the voltage, depth, and length of the indication). In particular, address whether tube integrity (structural and accident induced leakage integrity) was maintained during the previous operating cycle. In addition, discuss whether any location exhibited a degradation mode that had not previously been observed at this location at this unit (e.g., observed circumferential PWSCC at the expansion transition for the first time at this unit).

6. Describe repair/plugging plans.

7. Describe in-situ pressure test and tube pull plans and results (as applicable and if available).

8. Provide the schedule for SG-related activities during the remainder of the current outage.

ATTACHMENT

9. Discuss the following regarding loose parts:

- what inspections are performed to detect loose parts
- a description of any loose parts detected and their location within the SG
- if the loose parts were removed from the SG
- indications of tube damage associated with the loose parts
- the source or nature of the loose parts if known

Palisades has two Combustion Engineering replacement SGs with mill-annealed Alloy 600 tubes. The SG tubes are supported by ferritic stainless steel eggcrate tube supports, and are explosively expanded into the full depth of the tubesheet.

August 31, 2004, Conference Call

On August 31, 2004, the staff of the Steam Generator Integrity and Chemical Engineering Section participated in a conference call with Nuclear Management Company to discuss the inspection scope for the fall 2004 SG tube inspections at the Palisades Nuclear Plant. The licensee provided a document (dated August 31, 2004), summarizing much of the information discussed during the conference call, which is contained in Attachment 1. Additional information (including clarifying information) provided during the call is summarized below.

With respect to the scope of bobbin inspections:

– The licensee planned to conduct a bobbin inspection of 50 percent of the inservice tubes, tube-end-hot to tube-end-cold, in both SGs. The licensee indicated that they did not believe it was necessary to conduct a bobbin inspection of 100 percent of the tubes because: (1) the active damage mechanisms were limited to six occurrences of PWSCC in the top-of-tubesheet sludge area, and wear at the vertical straps and diagonal bars; (2) there has been no PWSCC detected in the eggcrate support regions; (3) the operating temperature of 583 EF is the lowest in the industry for Combustion Engineering SGs; and (4) outside diameter stress corrosion cracking at the eggcrate supports typically has a multicycle incubation period.

  The NRC staff provided feedback regarding the bobbin inspection scope. The NRC staff expressed a concern that, given the age of the SGs, the tube material, and industry operating experience, it was likely that tube cracking will continue to occur. In addition, widespread cracking is frequently preceded by a handful of outliers (i.e., larger indications) which could be missed, given an inspection scope that does not include 100 percent of the tubes.

– The licensee stated that if a new active damage mechanism is detected, the bobbin inspection would be expanded in accordance with Electric Power Research Institute (EPRI) Pressurized-Water Reactor (PWR) Steam Generator Examination Guidelines, Rev. 6.

With respect to the scope of the licensee's random rotating probe inspections:

– The licensee planned to conduct a rotating probe inspection of 100 percent of the inservice tubes in the hot-leg top-of-tubesheet region, with an inspection range of +3/-8 inches. The licensee stated that a deeper tubesheet inspection is not warranted for this outage because: (1) during previous inspections, indications have been found in only two tubes in the region below the top-of-tubesheet area, thereby indicating no new degradation concerns; and (2) the licensee had not received the Westinghouse written report on a C* Alternate Repair Criteria (ARC) study, which may suggest that SG tubesheet inspections greater than 8 inches in depth may be necessary to ensure structural and leakage integrity. The licensee states that they expect to receive the Westinghouse report on the C* ARC study around September 10, 2004.

  The NRC staff provided feedback regarding the licensee's inspection scope in the hot-leg top-of-tubesheet region. The NRC staff expressed a concern that tubesheet inspections to a tubesheet depth of 8 inches may not be sufficient to assure structural and leakage integrity, given the recent industry laboratory test results related to this issue (i.e., C* testing). The NRC staff indicated that this issue may not be a technical concern for this outage if a small number of indications are detected in this region. However, it would be a concern if a larger number of indications are detected. The NRC staff stated that discussions on this issue would continue after inspection results are obtained.

– The licensee plans to conduct a rotating probe inspection of 100 percent of the in-service rows 1 through 3 U-bends in SG-A (licensee denoted as E-50A) and Rows 1 and 2 in SG-B (licensee denoted as E-50B). The licensee stated that it was not necessary to inspect, with a rotating probe, the U-bend area of Row 3 tubes because no degradation has been found in this area in SG-B.

With respect to the criteria used to determine when freespan differential indications are to be inspected with a rotating probe:

– The licensee stated that a complex inspection strategy is used, which incorporates a comparison of the bobbin signal to the signal generated during the preservice inspection. A change in the signal is defined as: (1) greater than 10 percent change in phase angle; (2) greater than 0.3 volts change; and (3) any signal characteristic that warrants additional inspection.

– The licensee stated that freespan differential indications can mask other degradation as well as be a problem unto themselves.

– The licensee's historical records showed that freespan differential indications were originally termed as "manufacturing burnish marks" by the eddy current analysts.

– The licensee stated that, during previous inspections, none of the freespan differential indications have changed, and none have been plugged.

With regard to the scope of rotating probe examinations at wear scars:

– The licensee stated that 100 percent of all bobbin signals at eggcrate supports are inspected using a rotating probe, at every outage.

– With regard to special interest inspections:

– Rotating probe inspections the square bend region of tubes surrounding tube R99C140 in SG-B is due to a deep wear scar from a tie bar, found in 1998 or 1999, in tube R99C140. The tube was plugged. At the time, the surrounding tubes were not stabilized, but it was concluded that the plugged tube could become severed and possibly cause damage to the adjacent tubes. Therefore, the adjacent tubes should be inspected with a rotating probe at a future date. The fall 2004 inspection will be the first time the surrounding tubes have been inspected with a rotating probe.

September 30, 2004, Conference Call

In support of this conference call, the licensee provided a two page summary of the scope, status, and results of their on-going tube inspections. This summary (dated September 30, 2004) is contained in Attachment 2. In addition to the material provided in the summary, the following information was provided by the licensee:

– Prior to the start of the refueling outage, the licensee observed no measurable primary-to-secondary leakage. The leak rate measurements were near the threshold of detection (approximately $1x10^{-5}$ gallons per day).

– Of the wear indications detected to-date, the one in SG-A measured 40 percent through-wall and the one in SG-B measured 42 percent through-wall.

– Approximately 100 possible loose parts were identified in each SG as a result of the eddy current examination. A foreign object search and retrieval effort was scheduled for both SGs.

– The rotating probe inspections performed at the top of the tubesheet on the cold-leg side of the SG were concentrated on tubes in the periphery and were performed to assist in locating loose parts and loose parts related tube damage.

– With respect to the scope of rotating probe (+Point™) inspection of dents/dings that exceeded 5 volts, the licensee identified the following indications for examination:

Dent Location	SG-A	SG-B
Square Bend	113	125
Straight Leg	31	39

– Approximately 110 to 120 distorted support indications were detected and 11 non-quantifiable indications were detected. Non-quantifiable indications are located in the

- freespan region of the tube. Most of these indications were identified in previous outages. All will be examined with a rotating probe equipped with a +Point™ coil.

- For the tubes that were not expanded for the full depth of the tubesheet, the tubes will be inspected, the existing rolled region will be re-rolled, and the tubes will be plugged.

- Based on the current results, no in-situ pressure testing or tube pulls were planned.

- With respect to exceptions taken to industry guidelines, the licensee indicated that they have Combustion Engineering mechanical plugs installed, which can not be inspected with eddy current techniques. As a result, they inspected these plugs visually. These plugs are fabricated from thermally treated Alloy 690.

- With respect to exceptions taken to industry guidelines, the licensee stated that the 0.590 inch diameter bobbin probes used in the U-bend regions resulted in a reduced fill factor. However, the licensee believes that the fill factor of these probes continue to meet the guidelines in Appendix H of the EPRI PWR Steam Generator Examination Guidelines, Revision 6.

October 7, 2004, Conference Call

Following the September 30, 2004 call, the licensee informed the NRC that they found an axial indication in each of the two SGs. Each of the axial indications was associated with a small ding. As a result of detecting these indications, the scope of the bobbin coil examinations was increased from 50 percent to 100 percent of the tubes. This information was communicated to the NRC staff on October 4, 2004, in a three page summary (dated October 2, 2004), and is contained in Attachment 3.

Since the information provided to the staff did not address expansion of the rotating probe examinations of larger voltage dents/dings, the staff requested another phone call with the licensee. This call took place on October 7, 2004. In support of this conference call, the licensee provided a two page summary of the scope, status, and results of their on-going tube inspections which was similar to the one provided in support of the September 30, 2004, call. This summary (dated October 6, 2004) is contained in Attachment 4. The licensee also provided a sketch of their steam generator along with their naming conventions. This information is also contained in Attachment 4, which can be found at the above ADAMS Accession Number. In addition to the material provided in the summary, the following information was provided by the licensee:

- Palisades uses the bobbin probe to screen dings that are less than or equal to 5 volts for degradation.

- Some of the axial indications detected during the outage are in the straight leg region of the tube (from the top of the tubesheet to the diagonal bars)

- Of the 6 axial indications detected, all were detected with the bobbin (as non-quantifiable or distorted support indications). One of the axial indications in SG-A was associated with a ding (since the ding is less than 2 volts in magnitude it would normally

not be recorded as a ding) and one of the axial indications in SG-B was associated with a ding (2.1 volts). All of the axial indications are short (less than 0.27 inch in length). The +Point™ voltages associated with these indications are approximately 0.5 volts. All of the indications initiated from the outside diameter of the tube (i.e., outside diameter stress corrosion cracking). At least one of the indications was on the cold-leg side of the SG (i.e., near the seventh cold-leg tube support).

– The scope of the rotating probe examinations of the dings (greater than 5 volts) in the straight leg region of the tubes (hot- and cold-leg) was increased from 25 percent to 100 percent.

– The one circumferential indication detected in a tack weld near the end of the tubesheet initiated from the inside diameter of the tube (i.e., PWSCC).

– At the time of the call, sludge lancing and eddy current data acquisition and analysis were complete.

– At the time of the call, the inspection equipment was partially removed from SG-A and still installed in SG-B.

Since axial indications were found on the hot- and cold-leg side of the SG and since some of the axial indications were in low voltage (i.e., less than 5 volt) dent/dings, the NRC staff inquired about the need to expand the scope of the rotating probe examinations performed at large voltage (greater than 5 volt) dents/dings in the square bend region. The NRC staff asked this question given the bobbin coil's limited sensitivity at detecting degradation (axial and circumferential) at larger voltage dents and dings. The staff was concerned that the licensee may not have an adequate technical basis for ensuring tube integrity for the period of time between inspections. The licensee indicated that all dents/dings greater than 5 volts in the square bend region would be inspected within a 60 effective full power month timeframe consistent with industry guidance. As a result of the staff's comments, the licensee indicated that they would verify that their inspection scope was adequate for ensuring tube integrity.

October 8, 2004, Conference Calls

During these conference calls, the licensee informed the staff that upon further review they had discovered that they had not performed rotating probe examinations of all dents/dings greater than 5 volts in a 60 effective full power month timeframe. As a result of these findings, the licensee decided to inspect all dents and dings in the square bend region greater than 5 volts in SG-B and to inspect all dents and dings in the square bend region in SG-A that had not been inspected within the 60 effective full power month timeframe. This would result in approximately 300 dents/dings greater than 5 volts in the square bend region of SG-A not being inspected with a rotating probe in 2004. The licensee indicated that the adequacy of this inspection scope for ensuring tube integrity was still being verified.

Upon finishing their evaluations, the licensee elected to expand the scope of their rotating probe examinations in SG-A to include 100 percent of the dents/dings greater than 5 volts in the square bend region.

Upon completion of the inspections (on October 9 or October 10), the licensee informed the staff that no additional indications were found as a result of the rotating probe examinations.

Attachments: As stated

Palisades Plant

cc:

Robert A. Fenech, Senior Vice President
Nuclear, Fossil, and Hydro Operations
Consumers Energy Company
1945 Parnall Rd.
Jackson, MI 49201

Arunas T. Udrys, Esquire
Consumers Energy Company
1 Energy Plaza
Jackson, MI 49201

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

Supervisor
Covert Township
P. O. Box 35
Covert, MI 49043

Office of the Governor
P. O. Box 30013
Lansing, MI 48909

U.S. Nuclear Regulatory Commission
Resident Inspector's Office
Palisades Plant
27782 Blue Star Memorial Highway
Covert, MI 49043

Michigan Department of Environmental Quality
Waste and Hazardous Materials Division
Hazardous Waste and Radiological
Protection Section
Nuclear Facilities Unit
Constitution Hall, Lower-Level North
525 West Allegan Street
P.O. Box 30241
Lansing, MI 48909-7741

Michigan Department of Attorney General
Special Litigation Division
525 West Ottawa St.
Sixth Floor, G. Mennen Williams Building
Lansing, MI 48913

Manager, Regulatory Affairs
Nuclear Management Company, LLC
27780 Blue Star Memorial Highway
Covert, MI 49043

Director of Nuclear Assets
Consumers Energy Company
Palisades Nuclear Plant
27780 Blue Star Memorial Highway
Covert, MI 49043

John Paul Cowan
Executive Vice President & Chief Nuclear
Officer
Nuclear Management Company, LLC
700 First Street
Hudson, WI 54016

Jonathan Rogoff, Esquire
Vice President, Counsel & Secretary
Nuclear Management Company, LLC
700 First Street
Hudson, WI 54016

Douglas E. Cooper
Senior Vice President - Group Operations
Palisades Nuclear Plant
Nuclear Management Company, LLC
27780 Blue Star Memorial Highway
Covert, MI 49043