October 29, 2004

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U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
11555 Rockville Pike
Rockville, Maryland 20852

Palisades Nuclear Plant
Docket 50-255
License No. DPR-20

60-Day Response to Generic Letter 2004-01, "Requirements for Steam Generator Tube Inspections"

On August 30, 2004, the Nuclear Regulatory Commission (NRC) transmitted Generic Letter (GL) 2004-01. Enclosure 1 contains the Nuclear Management Company, LLC (NMC) 60-day response to GL 2004-01 for the Palisades Nuclear Plant.

Summary of Commitments

This letter contains two new commitments and no revisions to existing commitments.

- NMC will submit a license amendment request, which limits the depth of inspection in the tubesheet, 90 days after the NRC approves a methodology applicable to the Palisades Nuclear Plant.
- NMC will perform a full tubesheet inspection with the +Point™ probe or equivalent on at least 3% of the active steam generator tubes on the hot leg side until a license amendment request is approved for the Palisades Nuclear Plant.

I declare under penalty of perjury that the foregoing is true and correct. Executed on October 29, 2004.

Daniel J. Malone
Site Vice President, Palisades Nuclear Plant
Nuclear Management Company, LLC

Enclosure (1)

A115

CC Administrator, Region III, USNRC
Project Manager, Palisades, USNRC
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ENCLOSURE 1
GENERIC LETTER 2004-01
PALISADES NUCLEAR PLANT 60-DAY RESPONSE

Introduction

The steam generators (SG)s that are currently in use at the Palisades Nuclear Plant are replacement Combustion Engineering (CE) SGs, Model 2530. The replacement SGs were installed in the fall of 1990. The tube material is mill annealed Alloy 600 with a 0.75-inch outside diameter and a 0.042-inch tube wall thickness. Each SG has 8219 tubes. The tubes were expanded through the full depth of the tubesheet using an explosive process. The tube bundle is supported by stainless steel eggcrate lattice type supports comprised of horizontal eggcrate supports, vertical straps and diagonal straps. Tube rows 1-18 are u-bends and rows 19-165 are square bends.

Prior to the installation of the SGs, CE advised Consumers Energy that the area around the center stay cylinder region was potentially susceptible to fretting wear at the bat wing locations. As a result, 308 tubes in Steam Generator A and 309 tubes in Steam Generator B were plugged as a preventative measure. After initial service, Steam Generator A was designated "Steam Generator E-50A" and Steam Generator B was designated "Steam Generator E-50B."

After nine cycles of operation, 72 additional tubes in Steam Generator E-50A have been plugged, for a total of 380 tubes plugged. After nine cycles of operation, 54 additional tubes in Steam Generator E-50B have been plugged, for a total of 363 tubes plugged. Steam Generator E-50A has 7839 active tubes with 4.62% of the tubes plugged. Steam Generator E-50B has 7856 active tubes with 4.42% of the tubes plugged.

Nuclear Regulatory Commission (NRC) Requested Information

Within 60 days of the date of this generic letter, addressees are requested to provide the following information to the NRC:

1. *Addressees should provide a description of the SG tube inspections performed at their plant during the last inspection. In addition, if they are not using SG tube inspection methods whose capabilities are consistent with the NRC's position, addressees should provide an assessment of how the tube inspections performed at their plant meet the inspection requirements of the TS in conjunction with Criteria IX and XI of 10 CFR Part 50, Appendix B, and corrective action taken in accordance with Appendix B, Criterion XVI. This assessment should also address whether the tube inspection practices are capable of detecting flaws of any type that may potentially be present along the length of the tube required to be inspected and that may exceed the applicable tube repair criteria.*

Nuclear Management Company (NMC), LLC Response

1. A description of the latest SG tube inspections performed at Palisades during the 2004 refueling outage is provided below. NMC will finalize this data in the detailed description of the inspections, including the inspection results, which will be submitted in the 12-month steam generator submittal for the 2004 refueling outage, as required by Technical Specification 5.6.8.b.

   Table 1 describes the Palisades SG active damage mechanisms and Table 2 describes the Palisades SG potential degradation mechanisms. For each active or potential degradation mechanism, the tables include the location in the steam generator, the authorized probe, the inspection scope and the Electric Power Research Institute (EPRI) examination technique specification sheet (ETSS) or equivalent used for the inspection.

Table 1
Palisades Steam Generator Active Degradation Mechanisms

Degradation Mechanism	Location	Authorized Probe	Inspection Scope	ETSS
Structure Wear in SG E-50A/B	Vertical strap Diagonal bars Eggcrates	Bobbin With optional +Point™ Confirmation	100% full length, including previous indications both SGs	#96004.1 #96004.3 (Bobbin sizing) #96910.1
Axial ODSCC in SG E-50A	Non-dented eggcrate intersections	Bobbin	100% Bobbin full length in both SGs	#96008.1
Axial ODSCC in SG E-50A	Freespan	Bobbin	100% full length Bobbin in both SGs	#96008.1
Axial ODSCC in SG E-50B	Freespan dings ≤ 5	Bobbin	Freespan dings ≤ 5 volts in full length 100% Bobbin in both SGs	(W) SG-99-03-005

Table 2
Palisades Steam Generator Potential Degradation Mechanisms

Degradation Mechanism	Location	Authorized Probe	Inspection Scope	ETSS
Axial PWSCC in SG E-50A	Rows 1-3 U-bends	Mid freq range +Point™ High freq range +Point™	100% Row 1- 3 U-bends SG E-50A using mid-range coil *	#96511.2 #99997.1
Axial PWSCC in SG E-50B	Rows 1&2 U-bends	Mid freq range +Point™ High freq range +Point™	100% Row 1 & 2 U-bends SG E-50B using mid-range coil *	#96511.2 #99997.1
Axial ODSCC in SG E-50A/B	Hot leg TTS expansion transition & sludge pile	+Point™	100% from 3" above to 8" below TTS, both SGs	#20409.1
Circumferential ODSCC in SG E-50A/B	Hot leg TTS expansion transition & sludge pile	+Point™	100% from 3" above to 8" below TTS, both SGs	#21410.1

Axial PWSCC in SG E-50A/B	Hot leg TTS expansion transition and expanded tubesheet	+Point™	100% from 3" above to 8" below TTS, both SGs	#20511.1
Axial ODSCC in SG E-50A/B	Freespan dings > 5 volts	+Point™	100% freespan dings > 5 volts in both SGs	#22401.1
Potential MBMs in SG E-50A/B	All	Bobbin	100% full length, both SGs	#96008.1
Circumferential PWSCC in SG E-50A	Rows 1-3 U-bends	Mid freq range +Point™ High freq range +Point™	100% Row 1-3 U-bends in both SGs using mid-range coil *	#96511.2 #99997.1
Circumferential PWSCC in SG E-50B	Rows 1&2 U-bends	Mid freq range +Point™ High freq range +Point™	100% Row 1&2 U-bends in both SGs using mid-range coil *	#96511.2 #99997.1
Circumferential PWSCC in SG E-50A/B	Hot leg TTS expansion transition and expanded TS	+Point™	100% from 3" above to 8" below TTS, both SGs	#20510.1
Axial PWSCC in SG E-50A/B	"Dented" eggcrates	+Point™	100% dented eggcrates in both SGs	#96703.1
Tube Wear (loose parts) in SG E-50A/B	TTS periphery & tube lane	Bobbin +Point ™	100% full length Bobbin plus FOSAR in both SGs 100% from 3" above to 8" below TTS in both SGs hot legs, outer 2 rows (8%) from 2" above to 2" below in cold legs both SGs.	#96001.1 #21998.1
Pitting in SG E-50A/B	Sludge pile	Bobbin	100% full length Bobbin in both SGs	#96005.2
Oblique PWSCC in SG-E-50A	Rows 4-18 U-bends	Mid freq range +Point™	No examinations were performed in 2004. These are potential areas for examinations (buffer zone) after critical areas in Rows 1-3. Rows 4-18 U-bends 05H to 05C in SG E-50A	NA
Oblique PWSCC in SG E-50A	Rows 4-18 U-bends	High freq range +Point™	Rows 4-18 U-bends 05H to 05C in SG E-50A	NA

Oblique PWSCC in SG-E-50B	Rows 3-18 U-bends	Mid freq range +Point™	No examinations were performed in 2004. These are potential areas for examinations (buffer zone) after critical areas in Rows 1 & 2 Row 3-18 U-bends in SG E-50B	NA
Oblique PWSCC in SG E-50B	Rows 3-18 U-bends	High freq range +Point™	Rows 3-18 U-bends in SG E-50B	NA

*: Any Row 1, 2 or 3 U-bend with mid-range +Point™ coil noise exceeding the value specified in Westinghouse document MRS-TRC-1521, "Use of Appendix H Qualified Techniques at Palisades Unit 1 for the Fall 2004 S/G Inspection," will be tested with a high frequency +Point™ coil probe.

Appendix:

Three Letter Non Destructive Examination (NDE) Codes

FSD	Freespan differential signal
MBM	Manufacturing burnish mark identified in pre-service inspection
PLP	Possible loose part

Acronyms:

3" above to 8" below TTS	Tubesheet transition zone and tubesheet inspection depth extent defined in 2004 SG Degradation Assessment
FOSAR	Foreign object search and retrieval used on secondary side for visual inspection and loose part removal
Full-length Bobbin	From tube end hot to tube end cold Bobbin inspection extent
ODSCC	Outside diameter stress corrosion cracking
PWSCC	Primary water stress corrosion cracking
TSP	Tube support plate (stainless eggcrate lattice support)
TS	Tubesheet
TTS	Top of tubesheet

The Palisades SG tube inspection methods are not consistent with the NRC's current position as stated in GL 2004-01, relative to inspections performed within the tubesheet. The NRC's position is that full tubesheet inspection must be conducted with the +Point™ probe or equivalent on at least 3% of the active SG tubes if PWSCC may be present. The Technical Specifications for the Steam Generator Tube surveillance Program for the Palisades Nuclear Plant require "surveillance testing of Steam Generator (SG) tubes to ensure that the structural integrity of this portion of the Primary Coolant System (PCS) is maintained." The number of tubes to be inspected each refueling outage is specified as a minimum of 3% from tube end hot to the top support on the cold side. Criteria governing tube expansion based on results of the initial inspection are also provided. NMC

has implemented these requirements by performing Bobbin coil inspections of at least 3% of the SG tubes in each SG for Palisades. NMC then supplements these inspections with +Point™ examinations where past eddy current results at Palisades, or at other similarly designed SGs, indicate that a credible degradation mechanism may exist along the tube that cannot be characterized by the Bobbin probe.

An example of the use of +Point™ examination in the tubesheet area is indicated in Table 2, where this probe was used from three inches above to eight inches below the top of the tubesheet on the hot leg side. The concerns that caused NMC to add this supplemental inspection for Palisades were due to potential circumferential ODSCC in the hot leg expansion transition and sludge pile region and axial PWSCC in the explosively expanded tubesheet region. The selection of the tube length examined was based on the understanding of the height of the sludge pile, input from the Westinghouse Owners Group, previous Palisades' inspection results, and understanding of the subject degradation mechanisms that have occurred with older Combustion Engineering SGs.

Consistent with NMC's approach to use internal operating experience as input to the scoping decision for use of +Point™ in the tubesheet region, a plan to expand the depth of inspection into the tubesheet based on inspection results was adopted. Degradation identified within the tubesheet at Palisades has been limited to a depth of two inches below the top of tubesheet, whereas the inspection zone for the tubesheet extended to a depth of eight inches at the 2004 inspection. Thus, the results did not challenge the depth of inspection and did not indicate a potential for degradation to occur deeper into the tubesheet beyond the region inspected with the +Point™ probes. Furthermore, degradation below the top of tubesheet has been limited to one axial flaw, which was identified in the 2003 refueling outage. This single axial flaw had a severity of 1.67 volts, and a length of 0.280 inches. This constitutes a frequency of only 1 out of 16,438 tubes affected through the 2004 refueling outage. There were no indications identified in the 2004 refueling outage inspection, which inspected 100% of the hot leg side of the tubesheet to a depth of eight inches for 7854 tubes in SG 'A' and 7859 tubes in SG 'B'.

By contrast, compliance with the NRC's position in GL 2004-01 would have resulted in a full tubesheet depth SG inspection of 494 active hot leg side tubes (3% per SG) each refueling outage with the probability of scope expansion being very low. Therefore, the scope of recent inspections, including inspections within the tubesheet, has been sufficient to bound credible degradation and has been consistent with current Technical Specifications and 10 CFR Part 50, Appendix B requirements.

In summary, NMC uses a combination of Bobbin coil and +Point™ probe examinations on at least 3% of the SG tubes in each SG in order to find and characterize degradation mechanisms that may exist at Palisades. The selected tube inspection methods are capable of detecting all flaw types, which are considered credible for the Palisades SGs at this time in life and that may exceed

the applicable tube repair criteria. Prior to each inspection, a degradation assessment is performed to identify all active and potential degradation mechanisms, and a technique validation assessment is performed to verify that the eddy current techniques are capable of detecting the degradation.

NRC Requested Information

2. *If addressees conclude that full compliance with the TS in conjunction with Criteria IX, XI and XVI of 10 CFR Part 50, Appendix B, requires corrective actions, they should discuss their proposed corrective actions (e.g., charging inspection practices consistent with the NRC's position or submitting a TS amendment request with the associated safety basis for limiting the inspections) to achieve full compliance. If addressees choose to change their TS, the staff has included in the attachment suggested changes to the TS definitions for a tube inspection and for plugging limits to show what may be acceptable to the staff in cases where the tubes are expanded for the full depth of the tubesheet and where the extent of the inspection in the tubesheet region is limited.*

NMC Response

2. NMC 's position is that Palisades is in compliance with the Technical Specifications as written, however, as discussed in response to Question 1, NMC is not consistent with the NRC staff's position in the GL, and therefore, corrective actions are necessary.

   NMC has participated with the Combustion Engineering Owners Group (CEOG) to develop WCAP-15720, "NDE Inspection Strategy for Tubesheet Regions in CE Designed Units," dated July 2001, and WCAP-16208-P, "NDE Inspection Length for CE Steam Generator Tubesheet Region Explosive Expansions," dated October 2004, for SG NDE inspection length for CE SG tubesheets. WCAP-15720 was used as a partial basis for tubesheet inspection depth in 2003 and 2004.

   NMC intends to use WCAP-16208-P to determine future maximum tubesheet depth of inspections once the WCAP has been reviewed and approved by the NRC. Once approved, NMC will submit a license amendment to allow use of WCAP-16208-P. In the interim, NMC will perform a full tubesheet inspection with the +Point™ probe or equivalent on at least 3% of the active steam generator tubes on the hot leg side for Palisades.

NRC Requested Information

3. *For plants where SG tube inspections have not been or are not being performed consistent with the NRC's position on the requirements in the TS in conjunction with Criteria IX, XI, and XVI of 10 CFR Part 50, Appendix B, the licensee should submit a safety assessment (i.e., a justification for continued operation based on maintaining tube structural and leakage integrity) that addresses any differences between the licensee's inspection practices and those called for by the NRC's position. Safety assessments should be submitted for all areas of the tube required to be inspected by the TS where flaws have the potential to exist and inspection techniques capable of detecting these flaws are not being used, and should include the basis for not employing such inspection techniques. The assessment should include an evaluation of (1) whether the inspection practices rely on an acceptance standard (e.g., cracks located at least a minimum distance of x below the top of the tube sheet, even if these cracks cause complete severance of the tube) which is different from the TS acceptance standards (i.e., the tube plugging limits or repair criteria), and (2) whether the safety GL 2004-01 assessment constitutes a change to the "method of evaluation" (as defined in 10 CFR 50.59) for establishing the structural and leakage integrity of the joint. If the safety assessment constitutes a change to the method of evaluation under 10 CFR 50.59, the licensee should determine whether a license amendment is necessary pursuant to that regulation.*

NMC Response

3. As discussed previously, the NMC SG tube inspection methods are not consistent with the NRC's current position as stated in GL 2004-01, relative to inspections performed within the tubesheet at Palisades. Therefore, NMC is submitting the following safety assessment.

Safety Assessment

Summary of Inspections

The Technical Specifications for the Steam Generator Tube Surveillance Program for the Palisades Nuclear Plant require "surveillance testing of Steam Generator (SG) tubes to ensure that the structural integrity of this portion of the Primary Coolant System (PCS) is maintained." In recent years, including the recently completed inspection during the 2004 refueling outage, NMC has maintained confidence in the structural integrity of the SG tubes by following the guidelines for tube sample selection and potential scope expansion dictated in EPRI Report TR 1003138, "Pressurizer Water Reactor Steam Generator Examination Guidelines: Revision 6," dated October 2002, and NEI 97-06, "Steam Generator Program Guidelines," dated January 2001. These guidelines exceed the initial sample size requirements and meet or exceed the scope expansion requirements of our Technical Specifications. Furthermore, the EPRI guidelines define minimum acceptable inspection techniques to properly characterize the types of tube flaws that exist in the industry.

NMC's extensive inspection of the SGs during the 2004 refueling outage supports a determination for continued operation. NMC actually performed full tubesheet depth Bobbin coil inspections of 7854 tubes in SG 'A' and 7859 tubes in SG 'B', and performed +Point™ examinations of 7854 tubes in SG 'A' and 7859 tubes in SG 'B' to a depth of eight inches. This significant additional scope of tube inspections provides support for continued operation.

By comparison with the NRC's latest position regarding Technical Specification requirements, 494 tubes per SG would have been required to be inspected full tubesheet depth on the hot leg side. With respect to the lack of +Point™ examination in hot side active tubes below 8 inches, the characteristics of PWSCC in the tubesheet region displayed at the older, similarly designed Combustion Engineering SGs indicate that PWSCC will first appear in the top of the tubesheet and subsequently appear farther down into the tubesheet. NMC's +Point™ inspection program is designed such that it recognizes this phenomenon by using a buffer zone as part of the 8-inch inspection depth into the tubesheet for scope expansion purposes. Indications in this buffer zone would cause deeper inspections into the tubesheet.

Basis

NMC conducted Bobbin coil tubesheet inspections in 2004 on 100% of non-plugged tubes from tube end hot to tube end cold, and conducted +Point™ inspection on 100% of non-plugged tubes on the hot side tubesheet. The depth of inspection with the +Point™ was based on the following criteria:

1) Inspection depth in the tubesheet must consider previous inspection results at Palisades and for similarly designed Combustion Engineering SGs. Degradation mechanisms that are considered credible at Palisades for the age of the SGs must be examined with inspection probes capable of finding and characterizing the extent of potential degradation.

2) Inspection depth in the tubesheet must meet or exceed the value that ensures no pullout of the tube from the tubesheet and that satisfies leakage limits under postulated accident conditions. In the 2004 refueling outage, the value was derived from WCAP-15720, which concluded that a depth of 4.75 inches would satisfy both pullout and leakage under postulated accident conditions.

3) Depth must provide reasonable margin beyond pullout depth to create a "critical area" that could be used for potential scope expansion. The 2004 refueling outage tubesheet inspection depth below the top of the tubesheet was established at eight inches. The distance from the top of the tubesheet to five inches below the top of the tubesheet was defined as a critical area (an area of steam generator tubing which, on the basis of inspection results, engineering evaluation and related experience, is defined by the type, cause and boundary of the degradation) and the length from five to eight inches below the top of the tubesheet was defined as a buffer zone (a tube population immediately adjacent to a defined critical area and equal to 20% of the critical area tube population.) Critical area and buffer zone are from EPRI Report TR 1003138 and NEI 97-06.

As noted above, +Point™ examination of tubes on the hot leg side of the SGs was performed to a depth of at least eight inches during the 2004 refueling outage. No PWSCC indications were identified in the 2004 refueling outage. A single indication in the buffer zone plan, as defined in the 2004 degradation assessment, would have resulted in an increased inspection zone from 8 to 14 inches into the tubesheet for a 20% sample of SG tubes. The expansion would have continued until no further indications were identified.

Furthermore, per the Palisades Steam Generator Chemistry Monitoring Program for primary to secondary leakage, the average total leakage during the operational cycle preceding the 2004 refueling outage was 0.0001 gallons per minute. Normal operational leakage (as defined in the Chemistry Monitoring Program) for Palisades is less than 0.003 gallons per minute (4.32 gallons per day) for primary to secondary leakage, Technical Specification modes 1 and 2. This is well below the Palisades and NEI 97-06 primary coolant system operational leakage performance criterion of 150 gallons per day through any one SG.

Method of Evaluation

The GL also requests licensees to consider whether the inspection program and associated safety assessment, performed for those conditions where tube inspections within the tubesheet are not being performed consistent with the NRC's position, constitute a change to the "method of evaluation" (as defined in 10 CFR 50.59) for establishing the structural and leakage integrity of the tube and/or tubesheet joint. This question stems from NRC's concern that some licensees have established a maximum tubesheet depth of inspection based on criteria such as tube pull out potential and/or limited operational leakage. As noted before, NMC has not established such a maximum inspection depth at this time. In assessing this question, the GL inquires as to whether the safety assessment is redefining the American Society of Mechanical Engineers (ASME) Section III pressure boundary and is using a different method of evaluation to demonstrate the structural and leakage integrity of the revised pressure boundary. NMC has reviewed the NRC's position and concluded that the Palisades inspection approach does not redefine the ASME pressure boundary and is not a change in the method of evaluation per 10 CFR 50.59 based on the following:

1. NMC does not consider the tubesheet inspection program as redefining the ASME Section III pressure boundary. The selection of NDE techniques or extent of inspection does not, by itself, define the limits of the ASME pressure boundary. For example, the GL indicates that current Technical Specifications include language that excludes sections of cold leg tubing from inspection extent. The GL also states that the selection of NDE techniques is not specified in the Technical Specifications, but is governed by the provisions of 10 CFR Part 50 Appendix B, and as such, is not used to define pressure boundary limits. From an integrity assessment perspective neither past NRC approval of alternate repair criteria, nor the suggested changes to the Technical Specification provided in the GL address or indicate that the basis for approval is a redefinition of the pressure boundary.

2. The NRC endorsed the NEI guidance for 10 CFR 50.59 evaluations and the associated 10 CFR 50.59 screening protocol. Section 4.3.8 of NEI 96-07, "Guidelines for 10 CFR 50.59 Implementation," states that methods of evaluation that are not described, outlined or summarized in the Updated Final Safety Analysis Report (UFSAR) are excluded from departure consideration. The tube integrity assessments employed by Palisades consider the entire length of the pressure boundary tubing. Undetected flaws and their impact on tube integrity are addressed. The assessments are consistent with industry standards. The analyses and analysis parameters are not described, outlined or summarized in ASME Section III, ASME Section XI, or in the UFSAR, and therefore would not constitute a change/departure in the method of evaluation per 10 CFR 50.59.

3. This safety assessment was performed in accordance with the provisions of the EPRI Steam Generator Integrity Assessment Guidelines, the structural and accident leakage integrity performance criteria specified in NEI 97-06 and NUREG 1022, "Event Reporting Guidelines 10 CFR 50.72 and 50.73." This ensures margins of safety consistent with the ASME Section III Code and Regulatory Guide 1.121, "Bases for Plugging Degraded PWR Steam Generator Tubes." This also ensures that any potential accident leakage is within safety analysis limits.