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Point Beach Nuclear Plant Unit 1
Docket No. 50-266
License No. DPR-24

Response to Request for Additional Information
Fall 2005 Unit 1 (U1R29) Steam Generator Tube Inspection Report

Reference: (1) Letter from NMC to NRC dated February 21, 2006 (NRC 2006-0027)
(2) Letter from NRC to NMC dated June 15, 2006

In Reference 1, Nuclear Management Company, LLC (NMC), submitted the results of the fall 2005 Unit 1 (U1R29) steam generator tube inservice inspections, in accordance with the requirements of Point Beach Nuclear Plant Technical Specification 5.6.8, "Steam Generator Tube Inspection Report." In Reference 2, the NRC staff conveyed a request for additional information (RAI) to complete their evaluation of the subject report. The enclosure provides the NMC response to the staff's questions.

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

for

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Site Vice-President, Point Beach Nuclear Plant
Nuclear Management Company, LLC

Enclosure

cc: Administrator, Region III, USNRC
Project Manager, Point Beach Nuclear Plant, USNRC
Resident Inspector, Point Beach Nuclear Plant, USNRC
PSCW

ENCLOSURE

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
FALL 2005 UNIT 1 (U1R29) STEAM GENERATOR TUBE INSPECTION REPORT

The following information is provided in response to the Nuclear Regulatory Commission (NRC) staff's request for additional information (RAI) regarding Nuclear Management Company (NMC) letter dated February 21, 2006, which submitted the results of the fall 2005 Unit 1 (U1R29) steam generator tube inservice inspections. The NRC staff's request is paraphrased below with the NMC response following.

NRC Request 1:

Indicate if the wear indications identified in steam generator (SG) 'A' were inspected with both bobbin and +Point™ probes. If the wear indications were not inspected with a +Point™ probe, discuss how you concluded the indications were wear.

NMC Response:

Wear indications were identified in SG 'A' at the anti-vibration bars, at the top of tubesheet, and at cold leg supports. Wear indications at the top of tubesheet and at cold leg supports were inspected with both bobbin and +Point™ probes. Wear indications at anti-vibration bars were only inspected with bobbin probe. The conclusion that the anti-vibration bar indications were wear is deduced from location, trending, and both internal and external operating experience. To date, there has been no known crack-like indication found outside the hot leg tubesheet expansion region of any Alloy 600TT tube with proper thermal treatment.

EPRI Pressurized Water Reactor Steam Generator Examination Guidelines, Revision 6, states that "Bobbin coil is capable of sizing volumetric wear, thinning, pitting, and impingement indications. However, it is not capable of differentiating between these indications and cracking. Therefore, when bobbin coil volumetric indications occur in the same region of the SG that cracking has been identified, then the bobbin coil volumetric indications in the overlapping regions shall be examined using techniques that provide for signal characterization such that the appropriate repair criteria can be applied."

Based on this knowledge and a total lack of any crack-like indication ever reported in the Point Beach replacement steam generators, NMC concluded that there was no need to inspect wear indications at anti-vibration bar locations at PBNP with +Point™ for indications where less than 40% through wall was shown. Please note that all bobbin coil indications equal or greater than 40% through-wall were re-inspected by +Point™, including indications at anti-vibration bars.

NRC Request 2:

In Table 1, the historical comparison of wear indications in the anti-vibration bar area of SG 'A' were provided. The percent through-wall (TW) was given for Tube Row 40 Column 42 for 1995, 2001, 2004, and 2005. Discuss why the percent through-wall for this tube was not given for 1998.

NMC Response:

The percent through-wall data for 1998 for Tube Row 40 Column 42 was not included in the historical table because the inspection of this tube in 1998 did not identify a reportable indication.

In 1995, the eddy current vendor reported a 23% through-wall indication at the first anti-vibration bar (AV1) in Row 40 Column 42 of the Unit 1 'A' steam generator. In 1998, a different eddy current vendor inspected the same tube and reported it as "indication not reportable" (INR). In 2001, a third eddy current vendor inspected the tube and reported 13% through-wall. A certain amount of variation is generally expected in eddy current data, partly due to equipment variability and reporting requirements. The indication at Row 40 Column 42 was re-inspected during all Unit 1 SG inspections since 1995. Although the indication in this tube did not meet reportability criteria based on the 1998 inspection, it would have been appropriate to report this tube in Table 1 of our submittal as INR (i.e., an indication with history, but not meeting reporting requirements) to better convey its status and for completeness.

NRC Request 3:

Confirm that a visual inspection was performed (either during Unit 1 Refueling Outage 28 or Unit 1 Refueling Outage 29) at the locations where wear indications were reported at or near the top of the tubesheet and that these inspections indicated that no loose parts or foreign objects were present at these locations.

NMC Response:

Visual inspections were performed at the locations where wear indications were reported at or near the top of the tubesheet. Nineteen wear indications were found in the 'A' SG peripheral hot leg tubes at the top of tubesheet. Secondary side visual inspections were performed of the annulus and no-tube lane of the peripheral tubes during U1R28 and U1R29. The no-tube lane refers to the area between the Row 1 hot and cold legs. No foreign objects that could cause continued wear were found during either inspection. During U1R29, a small ¼ inch steel pin was found and retrieved. The pin was found in the no-tube lane some distance from the damaged peripheral tubes. The size and shape of this part did not match the tube indications. The pin, retrieved during U1R29, could not have caused the peripheral tube damage. Please refer to pages 3 and 5 of NMC letter (Docket 50-266) dated February 21, 2006, for more

information on the visual inspection conclusions and the retrieved loose part. Also, refer to Question 6.

NRC Request 4:

Regarding the "signature tubes", discuss whether both low and high row tubes were screened for potentially having elevated susceptibility to cracking. In addition, discuss the extent to which these "signature tubes" were also inspected with a rotating probe in the tubesheet region.

NMC Response:

Signature tubes have potential elevated susceptibility to tube support plate outside diameter stress corrosion cracking, as mentioned in our February 21, 2006 letter. This susceptibility is in the upper support plate/U-bend region as observed at Seabrook in 2002.

Westinghouse Report Number SG-SGDA-04-15, "Point Beach Unit 1 Model 44F Steam Generators – U-Bend Offsets Study for Identification of Tubes Potentially Susceptible to ODSCC", identified no Row 1 through 8 tubes that exhibited the eddy current signal of potentially elevated residual stress. Therefore, only tubes exceeding the 2-Sigma susceptibility criterion in high rows (Rows 9 through 45) were scheduled and examined. Signature tubes without a distorted support indication are acceptable for continued service. None of the susceptible tubes had distorted support indications reported, and therefore, all the signature tubes were left in service. There was no degradation assessment requirement to screen this population of tubes with a rotating coil in the tubesheet region. However, 10 of the 45 tubes (22%) were sampled as part of the planned 20% rotating probe examination of the hot leg tubesheets. No indications of cracking were present.

NRC Request 5:

Several dents and dings were reported for SG 'A'. Clarify the difference between a dent and a ding. If any of the dents and dings are service induced, discuss the cause. In addition, discuss whether the size of the dents and dings are changing with time.

NMC Response:

Dents (DNT) and dings (DNG) are local reductions (plastic deformation) in the tube diameter. The difference between a dent and a ding is that a dent is a new indication with no history and a ding is an indication with history. For the proposes of trending, *EPRI Interim Guidance on Steam Generator Tube Leak at Comanche Peak Unit 1,* dated April 22, 2003, allows history to begin with the first data collected on optical disk. Collection of historical eddy current data on optical disk for Point Beach Unit 1 commenced with the 1995 in-service inspection. By definition, dings cannot be service

induced, since they are present in history. The three dent indications are reported as dents because the history data is not retrievable, and by default, are reported as dents.

Table 1 summarizes the average reported voltage of all DNG and DNT indication by location for all three of the last Unit 1 steam generator inspections. The data shows a slight positive voltage growth trend. Only dings and dents with a complete history between 2001 and 2005 were used for trending. Small indications not consistently meeting reporting criteria would unconservatively bias the data. Reasons for variations in eddy current data were discussed in the response to Question 2. Tables 2 through 4 provide detailed statistical analysis of the same growth data found in Table 1. These latter tables also suggest a slight growth in the size of dings and dents with generally increasing average, minimum and maximum voltage trend in the data. While most of the data suggests a minor positive voltage growth between inspections, the indications are not considered service induced due to the following;

- all but three of the signals are traceable to history;
- the non-traceable indications have small voltage signals (< 5 volts);
- the support structures are made of non-corrosive materials;
- there is not an increasing trend in the number of DNG and DNT indications;
- the average voltage growth from 2001 is less than 5% which is below the expected repeatability of the bobbin coil;
- the greatest variations are found at structures where mix residual and noise have a greater effect on sizing.

Table 1 DNG/DNT Voltages			
	2001	**2004**	**2005**
Average Voltage All DNG/DNT	6.03	6.15	6.30
Sorted by location			
Average Voltage Free Span	4.56	4.69	4.66
Average Voltage Structures	7.65	7.76	8.10

Note (Tables 2 through 4): Δ(2004-2001) is the difference in voltage between the 2004 inspection data and the 2001 inspection data, while Δ(2005-2001) is the difference in voltage between the 2005 inspection data and the 2001 inspection data.

Table 2 DNG/DNT Voltage Increase for All DNG/DNT during Period			
	Δ(2004-2001)		**Δ(2005-2001)**
Average Growth	0.12		0.27
Standard Deviation	0.59		0.47
Minimum Growth Data Point	-2.87		-1.23
Maximum Growth Data Point	2.43		2.07

Table 2 Note: The 2004 average growth is a 2% increase over the 2001 average voltage (0.12 volts / 6.03 volts), and the 2005 average growth is a 4.5% increase over the 2001 average voltage (0.27 volts / 6.03 volts).

Table 3 DNG/DNT Voltage Increase for DNG/DNT Free Span during Period			
	Δ(2004-2001)		**Δ(2005-2001)**
Average Growth	0.13		0.10
Standard Deviation	0.41		0.35
Minimum Growth Data Point	-1.14		-1.23
Maximum Growth Data Point	1.40		1.15

Table 3 Note: The 2004 average growth is a 2.9% increase over the 2001 average voltage (0.13 volts / 4.56 volts), and the 2005 average growth is a 2.3% increase over the 2001 average voltage (0.10 volts / 4.56 volts)

Table 4 DNG/DNT Voltage Increase for DNG/DNT in Structures during Period			
	Δ(2004-2001)		**Δ(2005-2001)**
Average Growth	0.10		0.45
Standard Deviation	0.74		0.51
Minimum Growth Data Point	-2.87		-0.54
Maximum Growth Data Point	2.43		2.07

Table 4 Note: The 2004 average growth is a 1.3% increase over the 2001 average voltage (0.10 volts / 7.65 volts), and the 2005 average growth is a 5.9% increase over the 2001 average voltage (0.45 volts / 7.65 volts)

NRC Request 6:

Confirm that no known loose parts or foreign objects were left in SG 'A'. If any were, discuss the basis for leaving these parts or objects in service (i.e., with regards to tube integrity).

NMC Response:

Several fine wires (~1/64 inch diameter by ~1/2 inch long) remain in SG 'A'. The small wires were evaluated with help from Westinghouse in their letter WEP-04-092, dated May 14, 2004. These wires are sufficiently small such that, in a turbulent environment producing repeated collisions, their mass is insufficient to generate significant wear in the time frame between SG inspections. The analysis assumed a conservative weight of ~0.1 lbs. The conclusion was that the wires will not adversely affect the steam generators for at least two operating cycles. NMC inspects the SGs at least once every two operating cycles, ensuring that any initiation of wear would be detected promptly. The fine wires are believed to be residue from secondary side moisture separator reheater demisting pads. The pads have since been removed from the moisture separators. However, a few of the small wires remain in the system. Although sludge lancing removes the wires, the sludge pile limits the effectiveness of lancing. Chemical cleaning scheduled for 2008 is expected to remove the sludge pile on the tubesheet and remove any remaining fine wires.

NRC Request 7:

It was indicated that no significant degradation of the swirl vanes, moisture separator, or feedring J-nozzles were found. Discuss whether any degradation was found (other than the minor weld burn noted in two closely spaced J-nozzles).

NMC Response:

Minor degradation was identified, as discussed below. Accessible areas of the steam drum of SG 'A' were visually inspected during U1R29. The following conditions were noted in addition to the minor weld burn noted in the two closely spaced J-nozzles:

Two small areas of magnetite buildup were noted on the outside of two swirl vanes (approximately 2 inch high by 4 inch wide) between the vanes and lower deck supporting plate. Magnetite is the desired form of iron oxide residue on the secondary side, and the small buildup does not effect performance or challenge structural integrity. However, the buildup is unusual and the condition was entered into the corrective action program for trending.

The SG 'A' steam drum also has a slight bow in one of the perforated side plates of the secondary moisture separator. The offset is about ½ inch. The bow is visible in earlier steam drum video and the offset appears unchanged. The plate and welds are not cracked. The plate guides flow through the moisture separator by limiting cross flows. The steam pressure is balanced across the plate and the slight offset does not affect performance or challenge integrity.

NRC Request 8:

Discuss the nature of the SG wrapper modification that led to the plugging of two tubes in 1988.

NMC Response:

The steam generator wrapper modification was performed on both Unit 1 replacement steam generators to improve access to the tubesheet during cleaning and inspection. The modification removed a portion of the wrapper seal plate assembly directly in front of the four secondary side 6 inch tubesheet handholes. A 5-3/4 inch hole saw was used to cut the wrapper and the tubes were protected during cutting. After cutting, sharp edges were blended. However, during one of the cuts, two tubes were inadvertently damaged and subsequently plugged. For more detail on the modification, please refer to NMC letter (Docket 50-266) "Steam Generator Tube In-service Inspection Point Beach Nuclear Plant Unit 1, dated June 9,1988.

NRC Request 9:

Discuss the nature (chemical constituents) of the sludge removed from the SG and the scale on the tubes. If copper (or other species that can affect eddy current data quality) is present, discuss the quality of the eddy current data and whether techniques have been qualified given the levels of interference that exist in your data.

NMC Response:

The analysis of the sludge taken from the Unit 1 SG 'A' during U1R29 is not yet complete. Sludge analysis from sludge samples taken from both Unit 1 steam generators during U1R28 has been provided in Table 5 "Point Beach Nuclear Plant Steam Generator Sludge Sample Analysis from U1R28." The sludge make-up is not expected to have changed significantly during the last cycle. The sludge samples between the steam generators are similar. The copper percent by weight in the scale samples is about 16%. However, the sludge collar analyzed from the top of the tubesheet has a higher copper content.

A review of the Unit 1 data analysis guidelines back to 2001 required both the primary and secondary data analyst to call copper deposits (CUD) when greater than or equal to 1.0 volt with the bobbin coil due to the signal's ability to mask a potential flaw signal. A review of the data management procedures back to 2001 required a motorized rotating pancake coil (MRPC) inspection of all reported CUD signals. A review of the Unit 1 steam generator A and B databases indicated no CUD signals were reported during these recent inspections.

Table 5 - Point Beach Nuclear Plant Steam Generator Sludge Sample Analysis from U1R28													
Major Elements	**Assumed Compound**	**Analyses by Weight Percent (%)**											
		Steam Generator 'B' Samples					**Steam Generator 'A' Samples**						**TTS Collar**
						Average					**Average**		
Iron	Fe_3O_4	77.12	74.35	74.55	73.19	**74.80**	73.90	73.39	73.14	72.65	**73.27**		46.91
Copper	Cu	16.78	15.62	15.88	15.48	**15.94**	16.15	16.07	16.66	15.72	**16.15**		21.76
Zinc	ZnO	4.08	7.13	6.84	7.98	**6.51**	6.94	7.33	7.11	8.09	**7.37**		8.52
Nickel	NiO	0.88	0.93	0.93	0.93	**0.92**	1.07	1.06	1.06	1.07	**1.07**		1.03
Silicon	SiO_2	0.07	0.27	0.19	0.29	**0.21**	0.21	0.32	0.30	0.39	**0.31**		3.52
Calcium	CaF_2	0.00	0.01	0.01	0.02	**0.01**	0.01	0.01	0.01	0.02	**0.01**		0.34
Manganese	MnO	0.67	0.89	0.82	1.02	**0.85**	0.96	1.01	0.92	1.06	**0.99**		2.04
Aluminum	AlOOH	0.24	0.62	0.60	0.87	**0.58**	0.57	0.60	0.60	0.79	**0.64**		14.68
Titanium	TiO_2	0.04	0.04	0.04	0.05	**0.04**	0.04	0.04	0.04	0.04	**0.04**		0.12
Chromium	Cr_2O_3	0.08	0.08	0.08	0.09	**0.08**	0.08	0.08	0.08	0.09	**0.08**		0.68
Magnesium	MgO	0.02	0.04	0.03	0.05	**0.04**	0.04	0.05	0.05	0.06	**0.05**		0.33
Boron	B_2O_3	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**		0.00
Molybdenum	MoO_3	0.02	0.03	0.03	0.03	**0.03**	0.03	0.03	0.03	0.03	**0.03**		0.07
Minor Element	**Assumed Compound**	**Analyses in Part per Million (ppm)**											
Lead	PbO	97	131	104	97		78	114	118	113			713