

U. S. NUCLEAR REGULATORY COMMISSION

1-800-4-A-RENTS

ATTACHMENT TO LICENSEE EVENT REPORT NO. 82-022/01X-2

Wisconsin Electric Power Company
Point Beach Nuclear Plant Unit 1
Docket No. 50-266

On October 22, 1982, Unit 1 was shut down for its tenth refueling outage. A normal refueling steam generator eddy current inspection was performed at the beginning of the outage and the results of that inspection were reported in Licensee Event Report No. 82-017/01T. After eddy current testing was completed, sludge lancing was performed as part of normal refueling activities and in preparation for an annular search of the steam generator secondary side. The annular search is done through the handholes using fiberoptics to scan the region above the tubesheet and between the tubes and the steam generator shell.

On November 5, 1982, the annular search of the "A" steam generator identified the following objects, all on the cold leg side:

- one six-inch "C" clamp with swivel pad missing
- one "C" clamp swivel pad
- one three-inch stainless steel hose clamp
- pieces of lockwire along with residual scale and sludge

The "C" clamp was leaning against two tubes which showed definite signs of mechanical damage. A third tube in the area also appeared to have damage although not as severe as the damage to the first two tubes.

The annular search of the "B" steam generator was performed on November 6, 1982 and the following items were found on the hot leg side:

- one rod bar 1/4 inch x 3/8 inch x 58 inches long
- one piece of metal 1-1/4 inches x 2-1/4 inches x 6-1/2 inches
(a second piece identical to the one above was later found as the objects were being removed)
- pieces of weld rod
- pieces of lockwire along with residual scale and sludge

On the cold leg side of the "B" steam generator the only item found was a piece of slag which was originally described as 1/2 inch in diameter and one inch long.

Because of the apparent damage to three tubes on the cold leg side of the "A" steam generator, it was decided to perform an eddy current examination of the cold leg peripheral tubes in both steam generators. All of the hot leg peripheral tubes had been inspected previously through the first tube support plate during the normal eddy current inspection. To verify that there

was no mechanical damage to tubes on the hot leg sides, eddy current tapes of the hot leg peripheral tubes were reexamined with no defects found.

The eddy current inspection was conducted from the cold leg side of both the "A" and "B" steam generators. All outermost peripheral tubes were inspected over the U-bend through the top support plate on the hot leg side. Also, all tubes within the two tube depths of the periphery were inspected through the first tube support plate. The results from this inspection showed the existence of mechanical damage to several tubes. In addition, there were several tubes with signs of degradation which was not related to mechanical damage from foreign objects. Because of these indications, the eddy current inspection program in each steam generator was expanded to include a minimum of 600 additional tubes. This inspection was not required by Technical Specifications, however, the expansion satisfied the Technical Specification requirements for expansion of sample size based upon the number of defect indications found in the initial sample. A total of about 1,000 tubes per steam generator were inspected.

Following are the results of the inspection and action taken:

"A" Steam Generator Cold Leg

<u>Tube</u>	<u>Indication</u>	<u>Location</u>	<u>Action</u>	<u>Comment</u>
R42C29	63%	5" ATS	Plugged	Near "C" clamp
R42C31	Bulge	1/2" ATS	Plugged	Near "C" clamp
R43C33	Bulge	1/2" ATS	Plugged	Near "C" clamp
R43C34	Bulge	1/2" ATS	Plugged	Near "C" clamp
R43C35	Bulge	1/2" ATS	Plugged	Near "C" clamp
R43C36	Bulge	1/2" ATS	Plugged	Near "C" clamp
R35C76	48%	5" ATS	Plugged	
R34C76	Bulge	1/2" ATS	Plugged	
R33C77	Bulge	1/2" ATS	Plugged	
R34C77	Bulge	TTS	Plugged	
R29C82	Dent	2" ATS	Plugged	
R25C85	Dent	1" & 5" ATS	Plugged	
R07C01	41%	First Support	Plugged	
R44C38	32%	TTS	---	Near "C" clamp
R45C39	24%	1/2" ATS	---	Near "C" clamp
R31C78	22%	14" ATS	---	

ATS - Above Tubesheet
ATE - Above Tube End
TTS - Top of Tubesheet

"B" Steam Generator Cold Leg

<u>Tube</u>	<u>Indication</u>	<u>Location</u>	<u>Action</u>	<u>Comment</u>
R01C02	51%	TTS	Plugged	
R01C05	61%	First Support	Plugged	
R23C09	51%	First Support	Plugged	
R36C21	41%	First Support	Plugged	
R01C92	59%	21" ATE	Plugged	

ATS - Above Tubesheet
ATE - Above Tube End
TTS - Top of Tubesheet

The eddy current indications in the "A" steam generator were verified on November 11, 1982 and the indications in the "B" steam generator were verified on November 12, 1982. Mechanical plugging of the above noted tubes was accomplished on November 13 in the "B" steam generator and on November 16 in the "A" steam generator.

Two tubes (R43C32 and R44C35) in the "A" steam generator cold leg had observable damage from the "C" clamp and had been previously plugged. R43C32 was plugged in February 1978 after Unit 1 was shut down with a 130 gpd primary-to-secondary tube leak (refer to Licensee Event Report No. 78-001/01T). R44C35 was plugged in May 1978 after Unit 1 was shut down with a 145 gpd primary-to-secondary leak (refer to Licensee Event Report No. 78-010/01T).

Using fiberoptic photographs to determine defect size, a flow-induced vibration analysis of the two damaged tubes was performed. The defect in the analysis was assumed to be located five inches above the tubesheet, and was assumed to be a notch 1 inch long axially and 62° wide circumferentially. The tube was assumed to be dented and fixed at the first support (conservative for a worst-case analysis).

For anticipated power operating conditions, the maximum resulting fluid-elastic stability ratio was 0.2 compared to the theoretical instability threshold of 1.0. The peak turbulent amplitude was calculated to be less than 1.0 mil and assuming a stress concentration factor of 4.0 the maximum calculated alternating stress in the damaged region would be about 1.0 KSI, which is significantly below the high-cycle fatigue endurance limit of about 14.0 KSI. Thus, from the viewpoint of both the fluid-elastic and the turbulence excitations, the damaged tubes are judged to be structurally stable. Under the influence of normal operating fluid and thermal-mechanical loadings, the damaged tubes are acceptable from the viewpoint of fatigue.

All of the objects were removed from the "B" steam generator on November 16, 1983, except for several pieces of lightweight lockwire which extended between tube columns and appeared to be fixed in the sludge. The 1/4 inch x 3/8 inch x 58 inch rod which was removed was carbon steel and showed no signs of wearing against the tubes. The rod is estimated to have been in the steam generator for at least five years and could possibly have been in the steam generator since before the unit was placed in service in 1970. The two metal blocks (carbon steel) were identified as items used in the wrapper support structure (Item 14 on Westinghouse assembly drawing No. 679J446). The blocks did not show any signs of ever being installed, and a remote visual inspection verified that there were no support blocks missing. Thus, the blocks were extraneous and have been in the steam generator annulus since fabrication.

All of the items were removed from the "A" steam generator on November 24, 1982. The "C" clamp handle had to be cut before the clamp could be maneuvered out of the steam generator. It is believed that the "C" clamp could have fallen into the steam generator in October 1977 when the downcomer flow resistor plate modification was performed. The origin of the hose clamp is unknown. During the retrieval efforts, a pin 1/4 inch in diameter by 1-1/2 inches long was lost from one of the retrieval tools. Attempts to locate the pin were unsuccessful. Because of the small size of the pin, the potential for tube damage is considered insignificant.

A tabulation of the personnel exposure for the retrieval efforts resulted in a total whole body exposure of 32.5 man-rem. Extremity exposure totalled 79.8 man-rem. These doses are based on self-reading pocket dosimeters.

After retrieval of the foreign objects was complete, a visual inspection of the tubes in the annulus area which could have been affected by the foreign objects path was performed using fiberoptics. The fiberoptics, which has a magnification capability of 14X, showed only slight scratches and scraping of a limited number of tubes.

The NRC Resident Inspector has been notified of these findings. This event is reportable in accordance with Technical Specification 15.6.9.A.3. A similar examination of the Unit 2 steam generators was performed in May 1982, and one piece of weld rod was found and removed with no associated tube damage.