MAR 2 1 2005

L-PI-05-006
10 CFR 50.73

U S Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Prairie Island Nuclear Generating Plant Unit 2
Docket 50-306
License No. DPR-60

LER 2-04-01, Revision 1, Unit 2 Shutdown Required by Technical Specifications Due to Two Trains of Containment Cooling Inoperable

Supplement 1 to the Licensee Event Report (LER) for this occurrence is attached. This event was reported via the Emergency Notification System in accordance with 10 CFR Part 50, Section 50.72, on November 17, 2004. The original LER was submitted on January 17, 2005. The supplement is provided (as discussed in the original LER) to provide additional information pertaining to the cause of this event and planned corrective actions.

The supplement also revises the applicable reporting criteria for this event based on additional engineering evaluations that have been performed. Subsequent evaluation has determined that the as-found condition did not result in the loss of any safety function, thus, this event did not meet the reporting criterion of 10 CFR 50.73(a)(2)(v). Additionally, this event is not reportable per 10 CFR 50.73(a)(2)(i)(B) as operation or condition prohibited by Technical Specifications, since subsequent evaluation has determined the containment function was not lost and all Technical Specification required actions were complete within their required completion times.

Summary of Commitments

This letter contains no new commitment and completes the existing commitment from the original LER. Specifically, NMC has completed its commitment to submit a supplement to this Licensee Event Report.

IE22

Please contact us if you require additional information related to this event.

Joseph M. Solymossy
Site Vice President, Prairie Island Nuclear Generating Plant
Nuclear Management Company, LLC

Enclosure

cc: Administrator, Region III, USNRC
Project Manager, Prairie Island, USNRC
Resident Inspector, Prairie Island, USNRC
Glenn Wilson, State of Minnesota

ENCLOSURE

LICENSEE EVENT REPORT 2-04-01
REVISION 1

5 pages follow

NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION
(6-2004)

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

APPROVED BY OMB NO. 3150-0104 EXPIRES 6-30-2007

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Prairie Island Nuclear Generating Plant Unit 2	05000 306	1 of 5

TITLE (4)

Unit 2 Shutdown Required by Technical Specifications Due to Two Trains of Containment Cooling Inoperable

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
11	17	04	04	-- 01 --	1	3	21	05	FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	1
POWER LEVEL (10)	100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply) (11)

	20.2201(b)		20.2203(a)(3)(ii)		50.73(a)(2)(ii)(B)		50.73(a)(2)(ix)(A)
	20.2201(d)		20.2203(a)(4)		50.73(a)(2)(iii)		50.73(a)(2)(x)
	20.2203(a)(1)		50.36(c)(1)(i)(A)		50.73(a)(2)(iv)(A)		73.71(a)(4)
	20.2203(a)(2)(i)		50.36(c)(1)(ii)(A)		50.73(a)(2)(v)(A)		73.71(a)(5)
	20.2203(a)(2)(ii)		50.36(c)(2)		50.73(a)(2)(v)(B)		OTHER
	20.2203(a)(2)(iii)		50.46(a)(3)(ii)		50.73(a)(2)(v)(C)		Specify in Abstract below or in NRC Form 366A
	20.2203(a)(2)(iv)	X	50.73(a)(2)(i)(A)		50.73(a)(2)(v)(D)		
	20.2203(a)(2)(v)		50.73(a)(2)(i)(B)		50.73(a)(2)(vii)		
	20.2203(a)(2)(vi)		50.73(a)(2)(i)(C)		50.73(a)(2)(viii)(A)		
	20.2203(a)(3)(i)		50.73(a)(2)(ii)(A)		50.73(a)(2)(viii)(B)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Jeff Kivi	651.388.1121

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
Erosion	BK	FCU	W351	Y	Erosion	BK	FCU	W351	Y

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO				

ABSTRACT

On November 17, 2004, Prairie Island Nuclear Generating Plant (PINGP) Staff entered Unit 2 containment to investigate suspected leakage of the 23 containment fan coil unit (CFCU). The 23 CFCU was suspected to be leaking based on control room indication of condensate pot level and Sump A run times. The investigation identified two leaks on the 23 CFCU and also identified one leak on the 22 CFCU. The leaking CFCUs were isolated. Since the leaks affected one of two CFCUs in each of the two trains of containment cooling, and those CFCUs were isolated, both trains of containment cooling were declared inoperable and PINGP Technical Specification Limiting Condition of Operability (LCO) 3.0.3 was entered. The leaks could not be repaired in time to exit LCO 3.0.3 before a plant shutdown was required and a plant shutdown was initiated and completed.

Repair of the leaks on the 22 and 23 CFCUs was completed on November 18, 2004 and Unit 2 returned to power operation on November 19, 2004.

EVENT DESCRIPTION

On November 17, 2004, Prairie Island Nuclear Generating Plant (PINGP) Staff entered Unit 2 containment to investigate suspected leakage of the 23 containment fan coil unit[1] (CFCU). The 23 CFCU was suspected to be leaking based on control room indication of condensate pot level and Sump A pump[2] run times. The investigation identified two leaks on the 23 CFCU and also identified one leak on the 22 CFCU. The cause of the lack of control room indication of the leak on 22 CFCU has been attributed to two potential causes: (1) level transmitter sensing line blockage and/or venting issue, and (2) fan coil unit collection tank drain control valve to Sump A leak-by.

The leaking CFCUs were isolated. Since the leaks affected one of two CFCUs in each of the two trains of containment cooling, and those CFCUs were isolated, both trains of containment cooling were declared inoperable and PINGP Technical Specification Limiting Condition of Operability (LCO) 3.0.3 was entered. The leaks could not be repaired in time to exit LCO 3.0.3 before a plant shutdown was required, thus, a plant shutdown was initiated and completed.

EVENT ANALYSIS

The containment cooling system[3] is a closed system in containment. Integrity of the tubes in the CFCUs is required for containment integrity. The CFCU tubes are American Society of Mechanical Engineers (ASME) Code Class 2 and support two safety functions: (1) circulating cooling water for containment cooling in the event of a loss of coolant accident (LOCA) or main steam line break in containment, and (2) serving as a containment boundary during the first hours of a LOCA when containment pressure will exceed the pressure of the cooling water in the CFCUs.

The leakage was identified at H-bends in the faces of the affected CFCUs. The faces are multi-pass heat exchangers. The H-bends are brazed copper elbows which redirect cooling water flow through the CFCU faces.

Each CFCU has four faces and each unit has four CFCUs. Thus, there are 32 faces between Unit 1 and Unit 2. The original faces were supplied by Westinghouse. Subsequently, 24 of the faces have been replaced with a new design Aerofin coil. The eight remaining faces are original design, but are replacement faces that were installed in the 1988 to 1993 time frame. The leaks on the 22 and 23 CFCUs were all on Westinghouse design faces (the Aerofin coils do not have H-bends).

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[1] (EIIS Component Identifier: FCU)
[2] (EIIS Component Identifier: P)
[3] (EIIS System Identifier: BK)

Impact on Safety System Functional Failure Performance Indicator

The CFCUs contain an air-to-water heat exchanger supplied with water from the cooling water system in order to remove containment heat. In this event, three of the tubes in the heat exchanger portion of 22 and 23 CFCUs were found to have pin-hole leaks - one leak on 22 CFCU and two leaks on 23 CFCUs. The leaks would not have impacted the ability of the fan coil unit to provide its containment heat removal function following any accident. However, the leaks would adversely impact the ability of the CFCUs to maintain the containment boundary following an accident. The design accident pressure for the containment structure is 46 psig. Due to head losses in the piping and high elevation of the FCU cooling water lines, the cooling water system can experience negative pressures in the return piping from the CFCUs. As a result, the leaks in the 22 and 23 CFCU H-bends represent a potential failure to maintain the containment boundary function following a postulated accident. To assure that the CFCU maintained their containment boundary function, the leaking CFCUs were isolated, rendering them incapable of performing their heat-removal function. However, subsequent evaluation has shown that the 21 CFCU, alone, is capable of performing the required containment cooling function with the plant conditions at the time of the event, so the safety function was not lost as a result of isolating 22 and 23 CFCUs.

An engineering assessment (see SAFETY SIGNIFICANCE, below) has determined that the leaks found in the 22 and 23 CFCUs did not result in loss of any safety function, thus, this event is not reportable per 10 CFR 50.73(a)(2)(v)(C) as a Unit 2 Safety System Functional Failure (SSFF). The SSFF reported in revision 0 of this LER is hereby retracted.

SAFETY SIGNIFICANCE

An assessment of the effects of CFCU tube leak(s) occurring either prior to or during a Loss of Coolant Accident evaluated the potential effect on CFCU heat removal, containment flooding, dose consequences and cooling water system[4] performance. The primary purpose for the assessment was to provide reasonable assurance that tube leaks occurring during post-accident mitigation would not preclude the CFCUs from performing their required design functions. The assessment concluded that given three FCU tube leaks the system would be able to perform the required design functions. This assessment is equally applicable to conclude that the required safety functions were not lost during the time frame that the tube leaks existed. Based on this assessment, the health and safety of the public was not affected.

[4] (EIIS System Identifier: BI)

CAUSE

Nuclear Management Company, LLC, (NMC) conducted an apparent cause evaluation (ACE) to determine why the CFCU leaks occurred. The ACE concluded that the apparent cause of the CFCU leaks was the design of the H-bends, which causes turbulent flow, which, in turn, causes erosion in the areas where the joint brazing of the H-bend appears flawed. The presence of erosion was indicated by smooth, deposit free grooves. The erosion occurred around braze material that had overflowed from the brazed joints onto the internal surfaces of the H-bends. The buildup of material caused flow disruptions in the H-bends, resulting in grooving and eventual leak formation in the copper base material. Corrosion may also have contributed to the failures. Some corrosion of the braze material that was exposed to the inside diameter surface was observed. Any evidence of corrosion of the copper in the damaged areas was removed by the erosion.

Additional evaluation of the cause was conducted by a root cause evaluation (RCE) team in response to a subsequent CFCU leak. This CFCU leak was confirmed on January 11, 2005, and affected the 21 CFCU (which is an Aerofin coil). The 21 CFCU leak was determined not to be reportable. The RCE concluded that, while destructive testing of the actual coils that leaked would be required to definitively understand the cause of the leak, flow-induced erosion was the most probable cause of the pinhole leaks. Contributing to the erosion is past operation of the CFCUs with flow rates higher than the design flow. This conclusion was based upon review of a vendor laboratory analysis report, a review of work history, a review of operating conditions, discussion with the coil manufacturer and a review of industry Operating Experience.

CORRECTIVE ACTION

Immediate:

1. Unit 2 was shut down per Technical Specification 3.0.3.

Subsequent:

2. The leaking CFCUs were repaired per the ASME Code and Unit 2 was returned to power operation.
3. The operating flows through CFCUs was reduced.

Planned:

4. The Unit 2 CFCU faces will be replaced at the next refueling outage or as soon after that as possible.
5. Remove 21 CFCU repaired tubes for failure analysis, as well as remove a representative sample of Westinghouse and Aerofin tubes, to determine the general condition of FCU tubes.
6. Take action as part of a replacement to ensure operating conditions match design assumptions of FCU coils (i.e., flow), or reconcile such differences in support of long-term coil operation.

7. Implement an adequate condition monitoring and/or Preventive Maintenance program to guard against future leaks.

PREVIOUS SIMILAR EVENTS

No previous unit shutdowns have been completed due to CFCU leakage.