



Nuclear Management Company, LLC
Prairie Island Nuclear Generating Plant
1717 Wakonade Dr. East • Welch MN 55089

November 27, 2000

10 CFR 50.73

U S Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

PRAIRIE ISLAND NUCLEAR GENERATING PLANT

Docket Nos. 50-282
50-306

License Nos. DPR-42
DPR-60

LER 1-00-03

**Flooding from Postulated Failure of Air/Vacuum Valve
Has Potential to Disable Both Trains of Essential Service (Cooling) Water**

The Licensee Event Report (LER) for this occurrence is attached. In this report, we have made one new NRC commitment as indicated in the Corrective Action section statement in bold italics.

This event was reported via the Emergency Notification System in accordance with 10 CFR 50.72, on October 26, 2000. Please contact us if you require additional information related to this event.

Joel P. Sorensen
Site General Manager
Prairie Island Nuclear Generating Plant

c: Regional Administrator - Region III, NRC
NRR Project Manager, NRC
Senior Resident Inspector, NRC
James Bernstein, State of Minnesota

Attachment

IE22

NRC FORM 366 (4-95)			U.S. NUCLEAR REGULATORY COMMISSION			APPROVED BY OMB NO. 3150-0104 EXPIRES 04/30/98				
LICENSEE EVENT REPORT (LER)						ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.				
FACILITY NAME (1) Prairie Island Nuclear Generating Plant (PINGP) Unit 1						DOCKET NUMBER (2) 05000 282		PAGE (3) 1 OF 6		
TITLE (4) Flooding from Postulated Failure of Air/Vacuum Valve Has Potential to Disable Both Trains of Essential Service (Cooling) Water										
EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENCE #	REV #	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									PINGP Unit 2	05000 306
10	26	00	00	-- 03	-- 00	11	27	00	FACILITY NAME	DOCKET NUMBER
OPERATING MODE (9)		1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
POWER LEVEL (10)		100	20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)	
			20.2203(a)(1)		20.2203(a)(3)(i)		<input checked="" type="checkbox"/> 50.73(a)(2)(ii)		50.73(a)(2)(x)	
			20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71	
			20.2203(a)(2)(ii)		20.2203(a)(4)		50.73(a)(2)(iv)		OTHER:	
			20.2203(a)(2)(iii)		50.36(c)(1)		<input checked="" type="checkbox"/> 50.73(a)(2)(v)			
			20.2203(a)(2)(iv)		50.36(c)(2)		<input checked="" type="checkbox"/> 50.73(a)(2)(vii)			
LICENSEE CONTACT FOR THIS LER (12)										
NAME John Stanton						TELEPHONE NUMBER (Include Area Code) 651-388-1121 ext. 4083				
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)										
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS
SUPPLEMENTAL REPORT EXPECTED (14)						EXPECTED SUBMISSION DATE (15)		MONTH	DAY	YEAR
<input checked="" type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE).					NO		01		29	01
ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)										
<p>On October 26, 2000, with the Prairie Island Nuclear Generating Plant (PINGP) Units 1 and 2 operating at 100% power, the engineering staff concluded that the air/vacuum valve on the discharge pipe of each safety-related Cooling Water (essential service water) pump had the potential to fail to close when required. Such a failure would lead to flooding of the Cooling Water pump room in the screenhouse resulting in a common mode failure of the safety-related Cooling Water system and a loss of the ultimate heat sink for both units. While this postulated scenario may not be credible, an operator was stationed in the safety-related Cooling Water pump room to maintain a continuous "flood" watch on the air/vacuum valves until a modification was completed on November 15, 2000, which piped the discharge of the air/vacuum valves out of the pump room and back to the Cooling Water pump suction bay. Activities are in progress to evaluate the credibility, consequences and significance of postulated failures of these air/vacuum valves.</p>										

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TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

EVENT DESCRIPTION

On October 26, 2000, with the Prairie Island Nuclear Generating Plant (PINGP) Units 1 and 2 operating at 100% power, the engineering staff concluded that a condition existed with the potential to degrade the ability of the Cooling Water system to perform its intended safety function and that this condition resulted from a component and its associated failure mode that had not been previously evaluated against the design basis of the Cooling Water¹ system. Each safety-related vertical Cooling Water pump has a 3" valve² which vents air from the pump when it is started. If this valve failed to close after the air is vented, cooling water might have entered the Cooling Water pump room at a sufficient flowrate to flood the room and disable all three safety related Cooling Water pumps.

Questions posed by NRC staff conducting a Safety System Design Inspection of the Cooling Water system identified this situation and prompted PINGP staff to proceed on the basis that this condition is credible. An operability determination, subsequently performed for the Cooling Water system with the information readily available and an assumption that the air/vacuum valve failed to close, could not establish a reasonable expectation that the system with this assumption would still be capable of performing its intended safety function. The absence of a reasonable expectation that the Cooling Water system was operable lead to the conservative decision to immediately declare the Cooling Water system to be inoperable.

CAUSE OF THE EVENT

This event is the result of an initial design deficiency. Two later opportunities to identify and evaluate this initial design deficiency were missed. The first opportunity occurred in 1990 during a single failure analysis of the Cooling Water system, but an earlier Cooling Water system walkdown had failed to capture all system equipment onto plant drawings used in the analysis. The second opportunity occurred in 1995 during a self assessment of the Cooling Water system during which the safety function of the air/vacuum valves was identified. Activities conducted to bring the newly identified air/vacuum valves within the scope of current programs failed to consider if the activities conducted under earlier completed programs were applicable and should also be performed.

Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Equipment", issued on July 18, 1989, required in Recommended Licensee Action IV confirmation that the service water system will perform its intended function in accordance with the licensing basis for the plant. This confirmation was to include a review of the ability to perform the intended safety functions in the event of failure of a single active component.

¹ EIS System Identifiers: BI and KG² EIS Component Identifier: VTV

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The "Single Failure Analysis for the Cooling Water System at the Prairie Island Nuclear Generating Plant Units 1 and 2," dated May 1990, used current plant drawing based upon recently completed Cooling Water system walkdowns to identify components for evaluation. Because the flow diagrams did not accurately reflect the as-built condition of the plant, the air/vacuum valves, which were supplied as a package with the vertical cooling water pumps, were not evaluated.

The Service Water System Operational Performance Inspection self assessment conducted from May through September 1995, identified from a walkdown performed on 8/28/95 that the air/vacuum valves on safety-related vertical Cooling Water pumps 12, 22 and 121 were not identified on drawing NF-39216-1, "Flow Diagram Unit 1 & 2 Cooling Water - Screenhouse," and questioned if these valves performed any safety function and if they should be included in the Inservice Testing program. These valves were brought within the scope of current surveillance and preventive maintenance programs, but consideration was not given to the ramifications of these "new" valves upon earlier completed review and analysis programs.

Also contributing to the failure to identify and evaluate this issue in 1990 and 1995 was the situation arising from the reviews and corrective actions performed for Generic Letter 89-13 and the Service Water Operational Performance Inspection. These activities involved many extensive and significant issues which overshadowed this initial design deficiency and may have contributed to the failure of engineering staff to otherwise identify and evaluate it.

ANALYSIS OF THE EVENT

The Cooling Water system consists of five pumps (two horizontal motor-driven non-safety related pumps, two vertical diesel-driven safety related pumps and one vertical motor-driven safety related pump) feeding a ring header shared by the two reactor units. The header can be automatically or manually separated into two supply headers, A and B, serving respective safety related trains in Units 1 and 2. All three safety related vertical cooling water pumps are located in the same room on the ground floor of the plant screenhouse.

The air/vacuum valve on each Worthington vertical cooling water pump is an APCO Model 146WD 3" Air & Vacuum Valve with Water Diffuser Body, which uses a spherical stainless steel ball float to seat against a hard rubber (Buna N) surface after the air has been purged and water has filled the pump. While complete failure does not appear credible, partial failure resulting in some seepage may be a reasonable consideration. A partial failure might be caused by such conditions as a loss of buoyancy of the float, shape deformation of the float, or damage to the seating surface. Such conditions as these may be the result of normal hydraulic forces within the valve, abnormal transient hydraulic forces, corrosion, design defects, or manufacturing defects. But, while it is possible to postulate failure modes and mechanisms, this does not suffice to make a partial failure in the current application credible. It is

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possible to postulate that because these valves are also used in more severe and demanding applications than the current application, that a large margin exists between required and available performance. As such, this postulated condition requires further analysis to confirm or disprove its credibility.

In addition, further analysis is required to quantify the consequences of a partial failure. Flow under the room doorways and down the floor drains will be a function of room water level while the height of wiring in the 12 and 22 cooling water pump diesel control panels will likely establish the maximum acceptable room water level and thereby the maximum acceptable leakage flow rate into the room.

No failure has actually occurred and the air/vacuum valves are fully functional. These valves are not known to be defective and have functioned successfully in over 700 starts of the cooling water pumps. At all times the air/vacuum valves have been capable of performing their intended function and, therefore, this event is considered to have minimal safety significance and to have had no adverse impact on the health and safety of the public.

This event is being reported pursuant to the following:

- 10CFR50.73(a)(2)(ii)(B), as a condition that is outside the design basis of the plant,
- 10CFR50.73(a)(2)(v)(B), as a condition that alone could have prevented the fulfillment of the safety function of structures or systems that are needed to: (B) remove residual heat and (D) mitigate the consequences of an accident, and
- 10CFR50.73(a)(2)(vii), as an event where a single cause or condition caused at least one independent train or channel to become inoperable in multiple systems or two independent trains or channels to become inoperable in a single system designed to: (B) remove residual heat and (D) mitigate the consequences of an accident.

Regulatory Performance Indicators

This event impacts two of the performance indicators, Safety System Functional Failures and Safety System Unavailability, associated with the Mitigating Systems cornerstone in the Reactor Safety strategic performance area of the risk-informed regulatory oversight process.

Because this event is reportable under 10CFR50.73(a)(2)(v), it represents a safety system functional failure.

This event contributes 2 hours to the Safety System Unavailability of the AFW, RHR, SI and Emergency AC systems, since the cooling water system was INOPERABLE from the time of the plant engineering staff's preliminary determination until OPERABILITY was restored by implementation of a continuous flood watch in the Cooling Water system pump room. These safety systems have the following relationship to the cooling water system. Cooling Water provides a backup safety related water supply for the AFW in the event of a loss of the Condensate tanks and removes heat from the Unit 1 Emergency

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Diesel Generators (D1/D2) and the Component Cooling System heat exchangers. The Component Cooling heat exchangers remove heat from the RHR pump shaft seal water heat exchanger, the RHR pump stuffing box jacket cooler, the SI pump lube oil heat exchanger, and the SI pump mechanical seal water heat exchanger.

Significance Determination

This event falls within the scope of the Power Operations and Shutdown Operations Significance Determination Processes. A risk characterization of this postulated event is currently in progress.

CORRECTIVE ACTION

This issue will be tracked and resolved through the PINGP Corrective Action program under Condition Report 20004760. As part of the resolution of this Condition Report, the discrepancy between the plant's configuration and its design basis will be reconciled.

The following actions have been taken:

- 1) An operator was immediately stationed in the cooling water pump room to maintain a continuous flood watch for water leakage from the discharge of the pump air/vacuum valves and signal for a pump trip on the affected equipment in the event of a failure of any valve to seat. This action was terminated upon the completion of the temporary modification.
- 2) A temporary modification was completed on November 15, 2000, which rerouted the discharge from the air/vacuum valves (CL-53-1, 2CL-53-1, and CL-53-2) on the Cooling Water Pumps (12, 22, and 121 respectively) through a floor manway cover to the Cooling Water Suction Bay.

The following activities are in progress to evaluate the credibility and consequences of postulated failures:

- 1) Evaluate the equipment in the cooling water vertical pump room to identify the vulnerability to flood damage and capability for subsequent restoration.
- 2) Identify the failure modes and effects for this air/vacuum valve.
- 3) Identify industry experience with specific model valve and/or similar valves.
- 4) Evaluate activity results to identify information that is relevant to NRC Significance Determination Process.

(4-95)

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A supplement to this Licensee Event Report will be submitted to communicate the findings of these activities.

PREVIOUS SIMILAR EVENTS

No LERs have been identified for the years 1997 through 2000 that are similar to this issue.