

March 22, 2001

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

**PRAIRIE ISLAND NUCLEAR GENERATING PLANT**

Docket Nos. 50-282 License Nos. DPR-42  
50-306 DPR-60

**LER 1-00-04, Revision 1, Inoperability of Safeguards Cooling  
Water (Essential Service Water) Pumps Caused by Unqualified  
Lubricating Water Supply to the Pump Shaft Bearings**

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A revised Licensee Event Report (LER) for this occurrence is attached. A revision is being submitted due to a different understanding of the chronology of the physical configurations of the plant systems involved and because of the determination of causes not known at the time of the original LER.

Note that under the Analysis of the Event, Performance Indicators section, there is a statement that this event contributes time to the Safety System Unavailability of several systems. The "Regulatory Assessment Performance Indicator Guideline," NEI 99-02, Revision 0 does not give clear guidance to determine the amount of time that should be attributed; so Prairie Island continues to work through the Nuclear Energy Institute to establish the amount of time of unavailability for this event.

In the report, we have indicated NRC commitments in the "Corrective Action" section as statements in bold italics. These have been revised since the original LER due to the completion of some corrective actions and the addition of corrective actions resulting from a root cause evaluation. Additionally, Corrective Action 2 was changed from its original: "All safety evaluations which have resulted in downgraded components will be re-reviewed" to "All safety evaluations, not associated with modifications, which have resulted in downgraded components will be re-reviewed. Additionally, a statistical sample of safety evaluations associated with modifications will be reviewed to determine if components were downgraded by the modification process and any downgrades identified will be evaluated for appropriateness." It had been the intent to look only at all safety evaluations not associated with modifications but the corrective

IE22

action was unintentionally overstated in the original. Subsequently, Prairie Island decided to extend the investigation to evaluate modification related downgrades identified by a statistical sampling of all modification related safety evaluations. So the commitment as written in Revision 1 now accurately reflects our intent.

This event was reported via the Emergency Notification System in accordance with 10 CFR Part 50, Section 50.72, on November 1, 2000. Please contact us if you require additional information related to this event.

A handwritten signature in cursive script, reading "Joel P. Sorensen".

Joel P. Sorensen  
Site Vice President  
Prairie Island Nuclear Generating Plant

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

Attachment

NRC FORM 366 (6-1998)				U.S. NUCLEAR REGULATORY COMMISSION				APPROVED BY OMB NO. 3150-0104 EXPIRES 6/30/01					
<b>LICENSEE EVENT REPORT (LER)</b>										ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), 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.			
(See reverse for required number of digits/characters for each block)													
FACILITY NAME (1) <b>PRAIRIE ISLAND NUCLEAR GENERATING PLANT UNIT 1</b>						DOCKET NUMBER (2) <b>05000 - 282</b>			PAGE (3) <b>1 OF 6</b>				
TITLE (4) <b>Inoperability of Safeguards Cooling Water (Essential Service Water) Pumps Caused by Unqualified Lubricating Water Supply to the Pump Shaft Bearings</b>													
EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)				
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER			
11	01	00	00	04	1	3	22	01	Prairie Island U2	05000-306			
									FACILITY NAME	DOCKET NUMBER			
										05000			
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)			
POWER LEVEL (10)		100		20.2203(a) (1)		20.2203(a) (3) (i)		X	50.73(a) (2) (ii)		50.73(a) (2) (x)		
POWER LEVEL (10)		100		20.2203(a) (2) (i)		20.2203(a) (3) (ii)			50.73(a) (2) (iii)		73.71		
POWER LEVEL (10)		100		20.2203(a) (2) (ii)		20.2203(a) (4)			50.73(a) (2) (iv)		OTHER		
POWER LEVEL (10)		100		20.2203(a) (2) (iii)		50.36(c) (1)		X	50.73(a) (2) (v)		(Specify in Abstract below and in Text, NRC Form 366A)		
POWER LEVEL (10)		100		20.2203(a) (2) (iv)		50.36(c) (2)		X	50.73(a) (2) (vii)				
LICENSEE CONTACT FOR THIS LER (12)													
NAME <b>Jack Leveille</b>						TELEPHONE NUMBER (Include Area Code) <b>612-388-1121</b>							
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)													
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX			
SUPPLEMENTAL REPORT EXPECTED (14)								EXPECTED SUBMISSION DATE (15)		MONTH	DAY	YEAR	
YES (IF YES, COMPLETE EXPECTED SUBMISSION DATE)				X				NO					

ABSTRACT LIMIT TO 1400 SPACES, I.E., APPROXIMATELY 15 SINGLE-SPACED TYPEWRITTEN LINES) (16)  
 NCR FORM 366 (6-1998)

On November 1, 2000, at 1:40 PM CST, three safeguards vertical cooling water pumps were declared inoperable for lack of qualified source of lubricating water supply to line shaft bearings. The lubricating water had been originally designated as safety-related but had been downgraded in 1977 and subsequent physical changes did not maintain the original quality level. It was thought at the time that this independent source of water was not necessary for pump operability. Because of the downgrade, continued operation of the water supply could not be assured during certain design basis events and the cooling water pumps were administratively declared inoperable though still functional. Appropriate compensatory measures were developed and put in place. By November 13<sup>th</sup> installation was completed on a temporary modification which restored a qualified lubricating water supply to two of the three pumps, restoring their operability (only two pumps are required to be operable). Another temporary modification restored operability to the third pump at a later date.

**LICENSEE EVENT REPORT (LER)**  
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Prairie Island Nuclear Generating Plant Unit 1	05000 282	00	-- 04 --	1	2 OF 6

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

**EVENT DESCRIPTION**

On November 1, 2000, at 1:40 PM CST, three safeguards vertical cooling water pumps<sup>1</sup> were declared inoperable for lack of qualified source of lubricating water to the pump lineshaft bearings. The lubricating water supply had been originally designated as safety-related but had been downgraded to Quality Assurance Level 3 (QA 3) in 1977 and subsequent physical changes did not maintain the original quality level. Because of this, it was determined that continued operation of the water supply could not be assured during certain design basis events and the cooling water pumps were administratively declared inoperable though still functional. There is no Technical Specifications (TS) action statement in the Limiting Conditions for Operation for this condition, so the plant entered TS 3.0.C (the "motherhood") which allows one hour to prepare for and six hours to place the affected units in hot shutdown conditions and 30 hours to place the affected units in cold shutdown conditions. Appropriate compensatory measures were developed and presented to the NRC by a phone conference beginning at 3:15 PM. At the conclusion of the conference call the NRC granted permission to continue plant power operation for 14 days in order to install a temporary modification which restored a qualified lubricating water supply to two of the three pumps. This temporary modification allowed the plant to return to operation within the TS Limiting Conditions for Operation. Another subsequent temporary modification restored a qualified lubricating water supply to the third pump.

**Background**

In 1977 a safety evaluation was performed which justified downgrading the quality level of the lubricating water supply, based on the belief that the lubricating water supply was unnecessary for operation of these pumps. The reasons for this belief are not completely retrievable. There is reference to a previous conclusion reached by the plant's on-site review committee but documentation of the basis of that conclusion has not been located. It is known that a belief was that this water supply was for flush only and was included to extend the life of the bearings but not necessary to preserve normal bearing life. However, the "lineshaft" bearing water supply is needed for lubrication due to the specific configuration of these pumps, utilizing a sealed lineshaft enclosing tube. Worthington pumps of similar design but without the sealed lineshaft enclosing tube are self-lubricating.

A consequence of this downgrading was that, during system modifications over the years, not all of the design specifications were maintained (e.g., the requirement that the lubricating water supply piping survive a design basis earthquake or that it survive a fire in the area).

The question of the necessity for an external lubricating water supply was asked at least twice over the years. In response, two of the three pumps were informally tested (no documentation can be found) in 1988 with the bearing water supply isolated. The pumps were run for more than

<sup>1</sup> EIIS System Identifier: BI; Component Identifier: P  
NRC FORM 366A (6-1998)

## LICENSEE EVENT REPORT (LER)

## TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Prairie Island Nuclear Generating Plant Unit 1	05000 282	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	3 OF 6
		00	-- 04 --	1	

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

an hour following isolation of the lubricating water supply and water was observed to flow from the packing gland. This reinforced the belief at the time that the pump will supply its own bearing lubrication in the event of a loss of lubricating water. A documented test in May 1988, following overhaul of one of the pumps, did not result in flow from the packing gland; but this result was not interpreted as counter to the prevailing belief but was misinterpreted as indicating that some condition was preventing the ability to observe water flowing from the packing gland.

During the recent NRC Cooling Water Inspection, the plant staff was asked to provide information to support operation of the pumps without the bearing water supply. In response to this request, the plant staff began researching the historical information and evaluating it. An interim operability determination was made based on the historical information and more conclusive information and/or analysis was pursued. This pursuit led to the conclusion on November 1, 2000 that the pumps indeed need the lubricating water supply, which no longer met the necessary qualifications, and, therefore, all three cooling water pumps were declared inoperable. Part of the historical information revealed that the occasions when water was observed to be flowing from the packing gland was due to damaged lineshaft tube casings which allowed water to leak into the lineshaft bearing area and out the packing gland. It was concluded that if the lineshaft were in good condition there would be no water supply to the bearings except from the Filtered Water supply.

While this determination was taking place, it was also identified that the lubricating water supply to the bearings was dependent on an electrical supply. Strainers in the lubricating water supply require backwashing to prevent clogging and the backwash function requires electrical power. However, the power supply is not from a safeguards source and would not have been available in the event of a loss of offsite power (LOOP) event.

### CAUSE OF THE EVENT

As discussed above, the cause of the event was determined to be the incorrect assumption (that the pumps do not require a lubricating water supply) which was incorporated into the safety evaluation and allowed modifications to be performed without maintaining critical original design requirements.

One of the design changes over the years was completed in 1988. This modification utilized a different flow path from the discharge of the cooling water pumps. The new flow path utilized the piping and strainers of a subsystem called the Filtered Water system (which supplied other equipment). This modification also introduced a well water supply into the Filtered Water system to allow a cleaner source of water for the cooling water pump lineshaft bearings. The primary source of lubricating water became the well supply and the backup source was off the discharge from the cooling water header through the strainers of the Filtered Water system. However, the inclusion of these strainers introduced

## LICENSEE EVENT REPORT (LER)

## TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Prairie Island Nuclear Generating Plant Unit 1	05000 282	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	4 OF 6
		00	-- 04 --	1	

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

a new failure mode, the inability to backwash clogged strainers in the event of a loss of offsite power because there was no safeguards power supply to the backwash system.

Several opportunities failed to catch the earlier mistake via different modifications and assessments (e.g., the Design Basis Reconstitution project, the Station Blackout Project, and the self assessment of the cooling water system).

### ANALYSIS OF THE EVENT

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.

### Significance Determination

The NRC Region III letter of February 20, 2001 to the Nuclear Management Company (from John A. Grobe to J. Sorensen) characterized this event "as a White finding (i.e., an issue with low to moderate increased importance to safety)." The Nuclear Management Company agrees with this characterization.

### Performance Indicators Assessments

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 time to the Safety System Unavailability of the auxiliary feedwater (AFW), residual heat removal (RHR), safety injection (SI), and emergency AC systems, because the cooling water system was declared inoperable. These safety systems have the following relationships to the cooling water system. Cooling Water provides a backup safety related water supply for the AFW in

## LICENSEE EVENT REPORT (LER)

## TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Prairie Island Nuclear Generating Plant Unit 1	05000 282	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	5 OF 6
		00	-- 04 --	1	

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

the event of a loss of the condensate tanks and removes heat from the Unit 1 emergency 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.

No failure has actually occurred and, at all times, the cooling water system has been capable of performing its intended safety related function and, therefore, this event is considered to have had no adverse impact on the health and safety of the public.

### CORRECTIVE ACTION

Following the determination of inoperability, compensatory measures were established:

- To provide added confidence that a fire would not adversely impact the Filtered Water system, an hourly fire watch was established for the lower level of the screenhouse. This was an individual other than the dedicated operator (below) for the standby bearing water supply.
- A PRA evaluation was performed to identify accident sequences that had the potential for increased risk. The important equipment in addition to Filtered Water and cooling water were identified. This equipment was on a protected equipment list. These components were only to be removed from service for essential corrective maintenance.
- A dedicated operator was stationed in the screenhouse for the purpose of providing a backup bearing water supply. If the Filtered Water supply of bearing water was lost, an alarm in the control room would have alerted the operator. The control room operator would direct the dedicated operator in the screenhouse to implement the backup bearing water supply. The backup supply consisted of a hose that was connected to the safety related cooling water system, tools to allow connection of the hose to the bearing supply piping, and procedural guidance.
- The dedicated operator was the same operator that was concurrently stationed in the screenhouse for compensatory measures regarding the air/vacuum valve (see LER 1-00-03). This was acceptable because the actions required for the air/vacuum valve would have been immediately upon pump start and consisted only of notification of the control room. Our engineering judgement, based on discussions with a bearing vendor, pump vendor and INPO operating experience, was that the pump would be able to operate for at least an hour without bearing flow. During this time frame, the bearings would degrade (wear down faster), but there would not be catastrophic damage to the pump. Once the standby bearing supply was in place, the pump would have been expected to operate properly.

## LICENSEE EVENT REPORT (LER)

## TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Prairie Island Nuclear Generating Plant Unit 1	05000 282	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	6 OF 6
		00	-- 04 --	1	

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

Modifications have been installed which provide a qualified lubricating water supply to each of the three safeguards cooling water pumps, using the temporary modification process. ***The final disposition of the lubricating water supply will be managed through the design change process.***

1. The safety evaluation that downgraded the water supply has been revised to correct the determination of the quality level required for the water supply; ***the Q-list will also be revised.***
2. ***All safety evaluations, not associated with modifications, which have resulted in downgraded components will be re-reviewed. Additionally, a statistical sample of safety evaluations associated with modifications will be reviewed to determine if components were downgraded by the modification process and any downgrades identified will be evaluated for appropriateness.***
3. ***The related cooling water pump lubricating system design documentation will be reviewed and revised as necessary, including the technical manual.***
4. ***The root cause evaluation determined that several opportunities to catch the inappropriate downgrade made in 1977 were missed. A determination will be made of the fundamental reasons these opportunities were missed.***
5. ***A project has been initiated to continue determining the extent of condition by choosing risk significant systems and performing vertical slice assessments of those systems, in order to determine if additional unrecognized vulnerabilities exist.***

PREVIOUS SIMILAR EVENTS

There have been other events caused by design features that could have prevented completion of safety functions. One of those affecting the safeguards cooling water pumps was reported in Licensee Event Report 1-00-03.