

December 21, 2001

10 CFR Part 50  
Section 50.73

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

**PRAIRIE ISLAND NUCLEAR GENERATING PLANT**  
Docket No. 50-306 License No. DPR-60

**LER 2-01-05: Manual Reactor Trip on Unit 2, Initiated in Response to a High  
Differential Pressure Between the Turbine Steam Condensers, Caused by an  
Inadvertent Venting of One Condenser While Isolating a Steam Leak**

The Licensee Event Report for this occurrence is attached. In the report, we have made no new NRC commitments. This event was reported via the Emergency Notification System in accordance with 10 CFR Part 50, Section 50.72, on October 31, 2001. Please contact us if you require additional information related to this event.

  
Mano K. Nazar  
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

Attachment

IE22

<b>NRC FORM 366</b> (1-2001)		<b>U.S. NUCLEAR REGULATORY COMMISSION</b>		<b>APPROVAL</b> <b>OMB NO. 3150-0104</b> <b>EXPIRES 6-30-2001</b> <small>Estimated burden: 50 hours. Responses to comply with this mandatory information collection request: 50 hours. Comments regarding burden estimate to the Records Management Branch (T-6) U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to: bjs1@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.</small>						
<b>LICENSEE EVENT REPORT (LER)</b> <small>(See reverse for required number of digits/characters for each block)</small>				<b>DOCKET NUMBER (2)</b> 05000 306		<b>PAGE (3)</b> 1 OF 5				
<b>FACILITY NAME (1)</b> Prairie Island Nuclear Generating Plant Unit 2										
<b>TITLE (4) LER 2-01-05: Manual Reactor Trip on Unit 2, Initiated in Response to a High Differential Pressure Between the Turbine Steam Condensers, Caused by an Inadvertent Venting of One Condenser While Isolating a Steam Leak</b>										
<b>EVENT DATE (5)</b>			<b>LER NUMBER (6)</b>			<b>REPORT DATE (7)</b>			<b>OTHER FACILITIES INVOLVED (8)</b>	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
10	31	01	01	- 05 -	00	12	21	01	FACILITY NAME	DOCKET NUMBER
<b>OPERATING MODE (9)</b>		1		<b>THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply) (11)</b>						
<b>POWER LEVEL (10)</b>		100		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)		<input checked="" type="checkbox"/>	50.73(a)(2)(iv)(A)	
				20.2203(a)(2)(i)		50.36(c)(1)(ii)(A)		50.73(a)(2)(v)(A)		73.71(a)(4)
				20.2203(a)(2)(ii)		50.36(c)(2)		50.73(a)(2)(v)(B)		73.71(a)(5)
				20.2203(a)(2)(iii)		50.46(a)(3)(ii)		50.73(a)(2)(v)(C)		OTHER Specify in Abstract below or in NRC Form 366A
				20.2203(a)(2)(iv)		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)		
<b>LICENSEE CONTACT FOR THIS LER (12)</b>										
<b>NAME</b> Jack Leveille						<b>TELEPHONE NUMBER (Include Area Code)</b> 651-388-1121				
<b>COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)</b>										
CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	
B	SH	V	W255	N						
<b>SUPPLEMENTAL REPORT EXPECTED (14)</b>						<b>EXPECTED SUBMISSION DATE (15)</b>		MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE).					<input checked="" type="checkbox"/>	NO				
<b>ABSTRACT</b> (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)										
<p>On October 31, 2001, at approximately 1409, Unit 2 Reactor was manually tripped from 100% power when 2A/2B Condenser differential pressure reached 2.5 inches Hg.</p> <p>A steam leak on the body of 21 air ejector main steam supply control valve had been identified on October 24, 2001. Plans were made to temporarily repair the steam leak by installing an enclosure box around the valve and its proximate piping and injecting leak sealant. As part of this planning a contingency action plan was developed to isolate the leak if further degradation of the valve occurred.</p> <p>On October 31, 2001, temporary repairs to stop the leak were started by installing an enclosure box and injecting leak sealant. While preparing to inject the last stick of sealant, the enclosure box unexpectedly shifted. Due to a concern that the valve may have degraded further, with a potential for a steam release, the Shift Supervisor made a conservative decision and ordered an immediate evacuation of the Unit 2 Turbine Building.</p> <p>While performing the steps of the contingency action plan to isolate and bypass the control valve, vacuum was lost faster in 2A condenser than in 2B condenser. When the vacuum differential pressure between the condensers reached 2.5 inches Hg the reactor/turbine was manually tripped as required by procedure. The post-trip recovery was normal.</p>										

## LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Prairie Island Nuclear Generating Plant Unit 2	05000 306	01 - 05 - 00			2 OF 5

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

EVENT DESCRIPTION

On October 31, 2001, at approximately 1409, Unit 2 Reactor was manually tripped from 100% power when 2A/2B Condenser differential pressure reached 2.5 inches Hg. The condenser differential pressure had started to increase while attempting to bypass the main air ejector steam supply control valve<sup>1</sup> shortly after isolating the air ejector suction valves.

A steam leak on the body of 21 air ejector main steam supply control valve (CV-31385) had been identified on October 24, 2001. Plans were made to temporarily repair the steam leak by installing an enclosure box around the valve and its proximate piping and injecting leak sealant. As part of this planning a contingency action plan was developed to isolate the leak if further degradation of the valve occurred.

On October 31, 2001, temporary repairs to stop the leak were started by installing an enclosure box and injecting leak sealant. While preparing to inject the last stick of sealant, the enclosure box unexpectedly shifted approximately 1/4-inch down and 1/4-inch to the side. (Subsequent investigation determined that a section of pipe downstream of the valve being repaired had failed. This failure was within the enclosure and adjacent to the valve. The failure was within the enclosure and no steam leak occurred following the failure.) All work was immediately stopped and the control room was notified. Due to a concern that the valve may have degraded further, with a potential for a steam release, the Shift Supervisor conservatively ordered an immediate evacuation of the Unit 2 Turbine Building per Plant Safety Procedure F9, "High Energy Line Break/Leak."

After completing personnel accountability to ensure no one remained in the Unit 2 Turbine Building, the control room initiated additional steps of F9 to enter the area and isolate the control valve per the contingency action plan. While performing the steps of the contingency action plan to isolate and bypass the control valve, condenser vacuum began to decrease. The vacuum in 2A condenser decreased faster than in 2B condenser. When the vacuum differential pressure between the condensers reached 2.5 inches Hg the reactor/turbine was manually tripped as required by procedure. The auxiliary feedwater pumps started automatically. The main steam isolation valves were then manually closed (this was a pre-planned action included in the contingency action plan as a safety measure to ensure the air ejector steam leak did not get worse), resulting in a loss of the normal heat removal path (Steam Generator to Condenser). All safety protection systems functioned as designed, with the exception of intermediate range detector N35, which required the operators to manually energize the source range detectors after the trip.

CAUSES OF THE EVENT

This event occurred as a result of three main sequential causes.

<sup>1</sup> EIS System ID: SH; Component ID: V

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Prairie Island Nuclear Generating Plant Unit 2	05000 306		01 - 05 - 00		3 OF 5

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

1. Erosion of the valve (CV-31385) internals led to the through-wall failure and initial steam leak.
2. Inadequate analysis of the potential effects of the installation of the temporary enclosure box and injection of the sealant allowed excessive stress to be applied to the piping system causing the piping failure.
3. An error in the contingency plan valve alignment provided a path to the atmosphere from 2A Condenser, allowing the differential pressure between the condensers to exceed 2.5 inches Hg.

**CV-31385 Erosion/Steam Leak**

The initial failure that led to the sequence of events that led to the reactor trip was the steam leak on CV-31385. Disassembly of the valve after removal from the system revealed erosion of the valve internals that led to the through wall failure.

**Analysis of Effects of the Temporary Modification**

A Temporary Modification 01T097 was issued to evaluate the effects of performing the repair on CV-31385 to ensure personnel safety and maintain system integrity. The effect of the installation on the structural analysis of the system was only partially evaluated. The vendor calculation did not evaluate the effects of increased stress created on the piping system as a result of the installation of an enclosure around the valve and the injection of leak sealant into the enclosure. A separate engineering evaluation was performed by the plant staff for the temporary removal of a lateral support at the control valve. This evaluation only considered the effects of adding additional dead weight to the system. The cumulative effects of removing a lateral support, installing an enclosure around the valve and injecting leak sealant into it, and the potentially worn pipe wall were not considered in either evaluation. The leak sealant process placed abnormal stress on the line, causing the line to separate and the enclosure to shift.

**Contingency Action Plan**

The contingency action plan did not include closing 2AR 6-1, Inter-Condenser Loop Seal Drain to 2A Condenser Valve. When the main steam supply valve to the air ejectors (2MS-40-1) was closed the loop seal was lost creating an opening to 2A Condenser. Air was then drawn into the condenser through the air ejector discharge line causing vacuum to decrease in condenser 2A faster than 2B thus creating the differential pressure.

**Contributing Causes**

In addition to these main causes, contributing causes were inadequate reviews and approvals of the temporary modification and the contingency plan.

**ANALYSIS OF THE EVENT**

This event is reportable per 10CFR 50.73(a)(2)(iv)(A) as a manual actuation of the reactor protection system (manual reactor trip). The health and safety of the public were unaffected since the plant systems responded to the trip as designed.

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FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
Prairie Island Nuclear Generating Plant Unit 2	05000 306	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	4 OF 5
		01 - 05 - 00			

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

Loss Of Safety Function

There was no loss of safety function involved in this event.

Significance Determination

A sensitivity risk assessment was performed for a May 9, 2001 manual trip on condenser high differential pressure, as documented in Unit 2 LER 2001-04-00. The risk significance of this event is very similar to the May event. Both events involved a reactor trip with a loss of steam dump capability to the condenser. Other equipment unavailable during both events added very little risk significance to these events. Therefore, the risk significance of this event is very low.

CORRECTIVE ACTIONSImmediate Actions

- Replaced CV-31385 valve body.
- Quarantined Maintenance Procedure D93 "Leak Sealant Injection."

Longer-term Actions to Prevent Recurrence

- Evaluate and procure valve and piping that will be less susceptible to erosion.
- Develop a process to address contingency plan preparation, review and approval.
- Perform metallurgical examination to determine cause of pipe failure.
- Inspect/replace the Unit 1 main steam supply valve to the air ejector.
- Evaluate erosion/corrosion monitoring program based on this event to determine if scope of program is adequate.
- Incorporate this event into Air Removal System lesson plans.
- Revise the temporary modification process to address evaluation of calculations performed by vendors.
- Revise D93 to address evaluation of calculations performed for leak sealant process.

FAILED COMPONENT IDENTIFICATION

CV-31385, valve body is an ACF Industries, W-K-M Valve Division, Model 70-18-1BDRT, 1500 lb, 1", carbon steel (ASTM A216-WCB), socket weld component.

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FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
Prairie Island Nuclear Generating Plant Unit 2	05000 306	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	5 OF 5
			01 - 05 - 00		

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PREVIOUS SIMILAR EVENTS

There was a recent manual trip initiated on condenser high differential pressure<sup>2</sup> but the initiating conditions between the events were different.

<sup>2</sup> May 9, 2001, reported as Unit 2 LER 2001-04-00