



Northern States Power Company

414 Nicollet Mall
Minneapolis, Minnesota 55401-1927
Telephone (612) 330-5500

December 21, 1990

Report Required by
10 CFR Part 50, Section 50.73

Director of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

PRAIRIE ISLAND NUCLEAR GENERATING PLANT
Docket No. 50-282 License No. DPR-42
50-306 DPR-60

Reactor Trip Caused by Inadequate Design
of Main Generator Bus Duct Cooling System

The Licensee Event Report for this occurrence is attached.

This event was reported via the Emergency Notification System on November 21, 1990 and this report satisfies the reporting requirements of 10 CFR Part 50 Section 50.46.

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

for Monica Vik
Thomas M Parker
Manager
Nuclear Support Services

c: Regional Administrator - III NRC
Sr Resident Inspector, NRC
NRR Project Manager, NRC
MPCA
Attn: Dr J W Ferman

Attachment

*LE22
11*

9012260256 901221
PDR ADOCK 05000292
S PDR

LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) Prairie Island Nuclear Generating Plant Unit 1		DOCKET NUMBER (2) 0 5 1 0 0 1 0 2 8 2 1	PAGE (3) OF 0 5
---	--	--	--------------------

TITLE (4) Reactor Trip Caused by Inadequate Design of Main Generator Bus Duct Cooling System

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 NAMES		DOCKET NUMBER(S)									
1	1	2	1	9	0	9	0	0	1	7	0	0	1	2	2	1	9	0	Prairie Island Unit 2	0 5 1 0 0 3 1 0 1 6
												0 5 1 0 0 0 1 1 1								

OPERATING MODE (9) N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 50. (Check one or more of the following) (11)
POWER LEVEL (10) 1 0 0	<input type="checkbox"/> 20.402(b) <input type="checkbox"/> 20.406(a)(1)(III) <input type="checkbox"/> 20.406(a)(1)(II) <input type="checkbox"/> 20.406(a)(1)(III) <input type="checkbox"/> 20.406(a)(1)(IV) <input type="checkbox"/> 20.406(a)(1)(V)
	<input type="checkbox"/> 20.406(a) <input type="checkbox"/> 50.36(a)(1) <input type="checkbox"/> 50.36(a)(2) <input type="checkbox"/> 50.73(a)(2)(I) <input type="checkbox"/> 50.73(a)(2)(II) <input type="checkbox"/> 50.73(a)(2)(III)
	<input checked="" type="checkbox"/> 50.73(a)(2)(iv) <input type="checkbox"/> 50.73(a)(2)(v) <input type="checkbox"/> 50.73(a)(2)(vi) <input type="checkbox"/> 50.73(a)(2)(vii)(A) <input type="checkbox"/> 50.73(a)(2)(vii)(B) <input type="checkbox"/> 50.73(a)(2)(viii)
	<input type="checkbox"/> 73.71(b) <input type="checkbox"/> 73.71(c) OTHER (Specify in Abstract below and in Text, NRC Form 266A)

LICENSEE CONTACT FOR THIS LER (12)

NAME Arne A Hunstad, Staff Engineer	TELEPHONE NUMBER AREA CODE: 6 1 2 3 8 8 - 1 1 2 1
--	---

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	
B	E	L	B	K	R	G	C	B	O	Y

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE) NO

EXPECTED SUBMISSION DATE (15)

MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 words, i.e., approximately fifteen single-space typewritten lines) (16)

On November 21, 1990, Unit 1 was at 100% power. At about 1540 an operator making rounds of the turbine building noticed that No. 11 Bus Duct Cooling Fan was not running and that its supply breaker had tripped. He notified the Control Room of his findings, and he was then instructed to start No. 12 Bus Duct Cooling Fan to re-establish the flow of cooling air through the generator bus ducts. When No. 12 Bus Duct Cooling Fan was started at 1545, the main generator tripped, resulting in a turbine trip/reactor trip.

The turbine building operator had determined that there was no bus duct cooling fan running, but bus duct temperature appeared normal. Actual bus duct temperature was highly elevated, but the temperature sensors are located in the bus duct cooler suction duct such that representative bus duct temperature is not sensed if a fan is not running. When the standby fan was started, hot air in the bus ducts was drawn into the suction duct and past the temperature sensors, which then initiated a generator trip on high temperature of 85°C.

An investigation was begun and the cause of the trip was determined. The unit was returned to service at 1541 the next day.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (F-830), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)

DOCKET NUMBER (2)

LER NUMBER (6)

PAGE (3)

Prairie Island Unit 1

0 | 5 | 0 | 0 | 0 | 2 | 8 | 2 | 9 | 0 | 0 | 1 | 7 | 0 | 0 | 0 | 2 | OF | 0 | 5

TEXT (If more space is required, use additional NRC Form 286A's) (17)

EVENT DESCRIPTION

On November 21, 1990, Unit 1 was at 100% power. At about 1540 an operator making rounds of the turbine building noticed that No. 11 Bus Duct Cooling Fan was not running and that its supply breaker (EISS Component Identifier BKR) had tripped. He notified the Control Room of his findings, and he was then instructed to start No. 12 Bus Duct Cooling Fan (EISS Component Identifier FAN) to re-establish the flow of cooling air through the generator bus ducts (EISS Component Identifier DBUC). When No. 12 Bus Duct Cooling Fan was started at 1545, the main generator (EISS Component Identifier GEN) tripped, resulting in a turbine trip/reactor trip.

The turbine building operator had determined that there was no bus duct cooling fan running, but bus duct temperature appeared normal. Actual bus duct temperature was highly elevated, but the resistance temperature detectors (RTD) are located in the bus duct cooler suction duct (See attached figure) such that representative bus duct temperature is not sensed if a fan is not running. When the standby fan was started, hot air in the bus ducts was drawn into the suction duct and past the resistance temperature detectors, which then initiated a generator trip on high temperature of 85°C.

An investigation was begun and the cause of the trip was determined. The supply breaker for No. 11 Bus Duct Cooling Fan was replaced and the fan was restored to service at 1000 on November 22, 1990. All of the Unit 1 isophase bus work was inspected from the generator transformer to the generator disconnect, no damage was found. Additionally all insulators on the Unit 1 isophase bus work and the bushing to bus connection at the Unit 1 main station auxiliary transformer were inspected and no damage was found.

There were several secondary effects of the trip on balance-of-plant systems:

- One control rod position indicator did not decrease to zero following the reactor trip. The rod position indicator dropped to 22 steps and the rod at bottom light did not light. The signal conditioner card contacts were cleaned, the card was reseated and minor zero adjustment was made. The rod position indicator was returned to service at 2048 on November 21.
- One main feedwater pump suction relief valve lifted and leaked after closing. The valve was replaced and a new relief valve was tested and installed. The valve was returned to service at 2229 on November 21.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (F-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) Prairie Island Unit 1	DOCKET NUMBER (2) 0 5 0 0 0 2 8 2	LER NUMBER (8)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		9 0	0 1 7	0 0	0 3	OF 0 5

TEXT (if more space is required, use additional NRC Form 366A-1) (17)

- One feedwater heater developed a gasket leak due to the slight water hammer resulting from the unit trip. The feedwater heater head bolts were retorqued to eliminate the leakage. The feedwater heater corrective actions were completed on November 21.
- One NIS intermediate range detector did not respond properly. The detector was replaced and tested. The detector was returned to service at 0906 on November 22.
- One main feedwater pump could not be restarted due to a relay misoperation. The relay contacts were cleaned and the relay was inspected; no further problems were found. The relay was returned to service at 1930 on November 22.
- The turbine turning gear did not automatically engage because a bearing oil pressure sensing line was plugged and because of a bad circuit card in the electro-hydraulic control system. The turning gear was manually engaged approximately 2 1/2 hours following the trip. Corrective actions with respect to the plugged sensing line and failed circuit card were completed after the restart of the unit.

The unit was returned to service at 1541 on November 22, 1990.

CAUSE OF THE EVENT

Cause of the event is inadequate design of the bus duct cooling control system.

Installed resistance temperature detectors in the ductwork are used to:

1. Provide a high temperature alarm of 62°C and start the standby bus duct cooling fan, and
2. Trip the main generator on a high temperature of 85°C.

Unfortunately, placement of the bus duct temperature sensors is such that they do not reflect actual temperature in the bus ducts when no fan is running, and there is no annunciation of electrical failure of a running fan. See attached Figure.

Failure of its supply breaker resulted in the loss of No. 11 Bus Duct Cooling Fan.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATIONESTIMATED BURDEN FOR RESPONSE TO COMPLY WITH THIS
INFORMATION COLLECTION REQUEST 500 HRS. FORWARD
COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS
AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR
REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO
THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE
OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REV. NUMBER		
Prairie Island Unit 1	05000282	90	017	004	OF	05

TEXT (if more space is required, use additional NRC Form 305A (1/77))

ANALYSIS OF THE EVENT

This event is reportable pursuant to 10CFR50.73(a)(2)(iv) since this was an unplanned actuation of the reactor protection system. Response of the primary system was as expected. Health and safety of the public were unaffected.

CORRECTIVE ACTION

The supply breaker for No. 11 Bus Duct Cooling Fan was replaced.

The bus work was inspected; no damage was found.

Following consultation with the corporate electrical group, it was determined that the main generator trip from bus duct high temperature was not needed and has been bypassed.

A modification will be made which provides annunciation when both bus duct cooling fans are off.

The problems resulting from secondary effects of the trip were corrected before restart as described above.

Improvements in temperature instrumentation are being studied.

FAILED COMPONENT IDENTIFICATION

General Electric molded case circuit breaker THED136050WL.

PREVIOUS SIMILAR EVENTS

There have been no previous similar events reported at Prairie Island.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)

DOCKET NUMBER (2)

LER NUMBER (6)

PAGE (3)

Prairie Island Unit 1

0 5 0 0 0 | 2 8 2 9 | 0 - 0 1 7 - 0 0 | 0 5 OF 0 5

TEXT IF MORE SPACE IS REQUIRED, USE ADDITIONAL NRC FORM 386A (1/17)

