

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Fort St. Vrain, Unit No. 1	DOCKET NUMBER (2) 0 5 0 0 0 2 6 7	PAGE (3) 1 OF 0 5
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TITLE (4)
MANUAL SCRAM DUE TO POWER GRID FLUCTUATION

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)																																									
04	04	88	88	004	00	05	04	88	N/A		0 5 0 0 0																																									
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:15%;">OPERATING MODE (9) N</td> <td colspan="11">THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5 (Check one or more of the following) (11)</td> </tr> <tr> <td rowspan="5">POWER LEVEL (10) 0 7 4</td> <td>20.402(b)</td> <td>20.405(c)</td> <td><input checked="" type="checkbox"/></td> <td>50.73(a)(2)(iv)</td> <td>73.71(b)</td> </tr> <tr> <td>20.405(a)(1)(i)</td> <td>50.36(e)(1)</td> <td><input type="checkbox"/></td> <td>50.73(a)(2)(v)</td> <td>73.71(e)</td> </tr> <tr> <td>20.405(a)(1)(ii)</td> <td>50.36(e)(2)</td> <td><input type="checkbox"/></td> <td>50.73(a)(2)(vi)</td> <td rowspan="3">OTHER (Specify in Abstract below and in Text, NRC Form 355A)</td> </tr> <tr> <td>20.405(a)(1)(iii)</td> <td>50.73(a)(2)(i)</td> <td><input type="checkbox"/></td> <td>50.73(a)(2)(vii)(A)</td> </tr> <tr> <td>20.405(a)(1)(iv)</td> <td>50.73(a)(2)(ii)</td> <td><input type="checkbox"/></td> <td>50.73(a)(2)(vii)(B)</td> </tr> <tr> <td>20.405(a)(1)(v)</td> <td>50.73(a)(2)(iii)</td> <td><input type="checkbox"/></td> <td>50.73(a)(2)(ix)</td> <td></td> </tr> </table>												OPERATING MODE (9) N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5 (Check one or more of the following) (11)											POWER LEVEL (10) 0 7 4	20.402(b)	20.405(c)	<input checked="" type="checkbox"/>	50.73(a)(2)(iv)	73.71(b)	20.405(a)(1)(i)	50.36(e)(1)	<input type="checkbox"/>	50.73(a)(2)(v)	73.71(e)	20.405(a)(1)(ii)	50.36(e)(2)	<input type="checkbox"/>	50.73(a)(2)(vi)	OTHER (Specify in Abstract below and in Text, NRC Form 355A)	20.405(a)(1)(iii)	50.73(a)(2)(i)	<input type="checkbox"/>	50.73(a)(2)(vii)(A)	20.405(a)(1)(iv)	50.73(a)(2)(ii)	<input type="checkbox"/>	50.73(a)(2)(vii)(B)	20.405(a)(1)(v)	50.73(a)(2)(iii)	<input type="checkbox"/>	50.73(a)(2)(ix)	
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LICENSEE CONTACT FOR THIS LER (12)

NAME Mark A. Joseph, Technical Services Supervisor	TELEPHONE NUMBER 3 0 3 6 2 0 - 1 2 0 3
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COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRRDS

SUPPLEMENTAL REPORT EXPECTED (14)

<input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO	EXPECTED SUBMISSION DATE (15) MONTH DAY YEAR
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ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

At 1420 hours on April 4, 1988, with the plant at 74.4% power, an upset on the off-site electrical power grid was experienced. The grid frequency increased to approximately 60.5 Hz causing the turbine load to cycle widely. The primary and secondary systems attempted to follow the turbine swings but the large load changes actuated a Power/Load Unbalance (PLU) circuit which resulted in a turbine trip. The reactor operator manually scrambled the reactor following the turbine trip. The reactor operator established stable core cooling conditions, with the primary and secondary system responding as expected. During the cooldown, the plant experienced an unplanned radioactive gas release from the core support floor vent system safety valve, due to flow restrictions in the vent system. The Nuclear Regulatory Commission was informed by a Notification of Unusual Event.

The electrical power frequency upset was due to a system generation disturbance which caused several western power plants to shutdown.

A manufacturing deficiency was identified in the PLU circuit, which will be corrected during the circulator outage currently scheduled for July 1988. Prior to startup on April 21, 1988, one of the two core support floor vent filters was modified and an in-line strainer was cleaned to reduce the flow restriction through the system. The safety valve setpoint was raised from 5 psig to 10 psig.

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LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME Fort St. Vrain, Unit No. 1	DOCKET NUMBER (2) 0 5 0 0 0 2 6 7 8 8	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
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TEXT (if more space is required, use additional NRC Form 366A's) (17)

DESCRIPTION OF EVENT:

Initial Conditions

Reactor

Reactor Power: 74.4%
Average Core Inlet Temperature: 683 degrees Fahrenheit
Average Core Outlet Temperature: 1448 degrees Fahrenheit
Reactor Pressure: 650 PSIA

Primary Coolant:

"A" Circulator Speed: 7260 RPM
"B" Circulator Speed: 7080 RPM
"C" Circulator Speed: 7155 RPM
"D" Circulator Speed: 7140 RPM

Total Helium Flow: 78.4% at 2735 KPPH

Secondary Coolant:

Loop 1 Feedwater Flow: 791.2 KPPH
Loop 2 Feedwater Flow: 792.8 KPPH

At 1420:14, on April 4, 1988, the plant experienced a frequency fluctuation on the power grid which caused load swings to occur on the turbine. At 1420:20, the first indication in the control room was a "480 volt under-voltage" alarm. The reactor operator noticed erratic indication on both the primary and secondary systems. At 1420:28, the load swings caused a "Power/Load Unbalance" actuation which initiated a fast closure of the turbine control valves, but the actuation signal cleared immediately, cancelling the runback. This sudden actuation and resetting of the PLU circuit caused a dip in the Emergency Trip System (ETS) pressure which caused the turbine to trip and initiate a reactor runback. At 1420:34, "A" and "C" boiler feed pumps began to slow down due to reduction of steam supply so the reactor operator manually scrambled the reactor and began cooldown procedures.

At approximately 1710, a safety valve in the core support floor vent line lifted and allowed unpurified helium to enter the reactor plant ventilation exhaust system, causing an unplanned release. The activity released was approximately 15% of Technical Specification limits and resulted in a total dose of 3.67 E-5 REM at the Exclusion Area Boundary (EAB). A Notification of Unusual Event (NOUE) was initiated.

* Energy Industry Identification System (EIIS) Codes

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1) Fort St. Vrain, Unit No. 1	DOCKET NUMBER (2) 050002167	LER NUMBER (6)			PAGE (3) 03 OF 05
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
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TEXT (If more space is required, use additional NRC Form 365A's) (17)

CAUSE:

The frequency fluctuation on the power grid caused a swing in main turbine control valve positions, resulting in an upset of the plant's primary and secondary systems. The plant control systems responded normally to these disturbances. The reactor operators observed erratic indications on throttle pressure, circulator speed and the Electro-Hydraulic Control (EHC)[*TG] Unit. When the turbine tripped, the steam supply for the boiler feedpumps attempted to transfer from the normal turbine extraction supply to the bypass flash tank. This transfer resulted in an interruption of the steam supply, resulting in a reduction of feedwater flow. In anticipation of degrading conditions, the operator inserted a manual scram. Subsequent investigation revealed that the turbine trip was a result of a faulty installation of the Power/Load Unbalance (PLU) circuit.

The PLU circuit is designed to protect the turbine from an overspeed condition normally due to the sudden loss of electrical load. It does this by comparing the available power to the turbine with the electrical load from the generator. Should power exceed load by 40% within a time period of less than 35 milliseconds, the ETS pressure in the control valves will depressurize and close the valves. It was discovered that the PLU circuit was incorrectly wired such that PLU actuation would occur more frequently than designed. The wiring error occurred during installation at the factory. The purpose of the ETS is to permit opening of the turbine steam valves when pressurized (reset) and rapid closing when depressurized (tripped). It was found that a rapid reset following a trip actuation would drop ETS pressure in the main stop valves and cause them to shut. Closure of the main stop valves initiates a turbine trip. It was the combination of PLU actuation and immediate reset that caused the turbine to trip.

The core support floor vent line safety valve operated as designed to relieve system pressure. System pressure had increased as a result of flow restrictions through the core support floor vent filters and a downstream in-line strainer. When pressure in the vent line reached the 5 psig setpoint of the safety valve, the valve lifted as designed.

ANALYSIS OF EVENT:

The frequency fluctuation had no affect on plant safety functions or cooldown capabilities. The wiring error and PLU circuit action caused the turbine to trip, but the runback and plant cooldown operated as designed. The plant operators took the most conservative response to this event by scrambling the reactor.

* Energy Industry Identification System (EIIS) Codes

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1) Fort St. Vrain, Unit No. 1	DOCKET NUMBER (2) 0500026788	LER NUMBER (6)			PAGE (3)	
		Y.E.R.	SEQUENTIAL NUMBER	REVISION NUMBER		
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TEXT (if more space is required, use additional NRC Form 366A's) (17)

The core support floor vent system safety valve operated to relieve system pressure and directed the release to the exhaust stack filters and radiation monitors as designed. Due to the low primary coolant activity levels and vent system flow limitations, the activity released was significantly below Technical Specification limits.

This event posed no threat to the health and safety of the public.

CORRECTIVE ACTION:

The wiring error in the Power/Load Unbalance circuit will be corrected during the circulator outage currently scheduled for July 1988.


Prior to startup on April 21, 1988, one of the two core support floor vent filters was modified per CN-2775 to reduce the flow restriction through the filter. The downstream in-line strainer was also removed and the strainer filter element cleaned. Special test T-383 was then performed to verify the effectiveness of these corrective actions. An evaluation of system operation concluded that the setpoint of the CSF vent line relief valve should be changed to 10 psig. The new setpoint will provide additional margin against making an unplanned release while still providing the necessary system protection.

* Energy Industry Identification System (EIIS) Codes

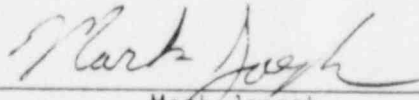
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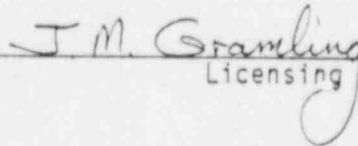
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Brian C. Laws
Results Engineer



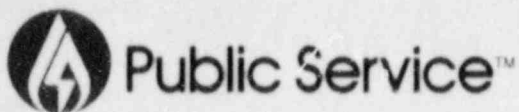
Mark Joseph
Technical Services Supervisor



J.M. Gramling
Licensing



C. H. Fuller
Manager, Nuclear Production



Public Service
Company of Colorado

16805 WCR 19 1/2, Platteville, Colorado 80651

May 4, 1988
Fort St. Vrain
Unit No. 1
P-88157

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Docket No. 50-267

SUBJECT: Licensee Event Report
88-004-00, Final Report

REFERENCE: Facility Operating
License No. DPR-34

Gentlemen:

Enclosed please find a copy of Licensee Event Report
No. 50-267/88-004-00, Final, submitted per the requirements
of 10 CFR 50.73(a)(2)(iv).

If you have any questions, please contact Mr. M. H. Holmes
at (303) 480-6960.

Sincerely,

C. H. Fuller
Manager, Nuclear Production

Enclosure

cc: Regional Administrator, Region IV
ATTN: Mr. T. F. Westerman, Chief
Projects Section B

Director Nuclear Reactor Regulation
ATTN: Mr. A. Calvo, Director
Directorate IV

Mr. J. G. [unclear]
Inspector, FSV

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41