NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Fort St. Vrain, Unit No. 1	0 5 0 0 0 2 6 7	1 OF 1 1

TITLE (4)
Reactor Scram On High Count Rate, Startup Channel 1

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)
											N/A	0 5 0 0 0
0 5	1 6	8 5	8 5	—	0 0 8	—	0 0	0 6	1 4	8 5		0 5 0 0 0

OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
	N	20.402(b)	20.405(c)	XX 50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10)	0 0 0	20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
		20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
		20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
	AREA CODE
Jim Eggebroten, Technical Services Engineering Supervisor	3 0 3 7 8 5 - 2 2 2 4

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
YES (If yes, complete EXPECTED SUBMISSION DATE)	XX NO				

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

On May 16, 1985, at 1215 hours, with the reactor shutdown and depressurized, the Plant Protective System scram circuitry was actuated by an erroneous signal spike on startup channel I. No rod movement occurred, as all rods were fully inserted except for one, which was disabled in preparation for removal.

The Nuclear Regulatory Commission was notified of the event at 1537 hours, on May 16, 1985, pursuant to the requirements of 10 CFR 50.72(b)(2)(ii), "Four Hour Report".

This event is being reported herein pursuant to the requirements of 10 CFR 50.73(a)(2)(iv).

There were no in-core maintenance activities or control rod movements in progress at the time of the incident. Actual core neutron flux levels remained relatively unchanged and an adequate shutdown margin was maintained during the event.

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BACKGROUND:

The Fort St. Vrain instrument and control system incorporates nuclear instrumentation to monitor neutron flux level in the reactor core from shutdown to 150% of full power operation. Nine complete channels are provided: two source range (start up channels), three dual range (wide range logarithmic and power range), three power range, and a control channel. The dual range channels include wide range logarithmic and linear power circuits sharing a single detector. Each source range channel (startup channels I and II) consists of a detector, a locally mounted preamplifier, and a log-count-rate drawer located in the control room. The preamplifier is a silicon transister charge amplifier with feedback and includes pulse shaping circuits and a cable driver at the output. The high voltage supply is adjustable with an upper limit to prevent inadvertent detector overvoltage. The high voltage supply for the startup channel detectors is automatically disconnected when the wide range channels are indicating above a preset power level (approximately 1.0E-2 rated power).

The startup channel neutron detectors are located in wells in the prestressed concrete reactor vessel (PCRV) and extend horizontally inward to a position over the core (see Figure 4). A neutron detector well is illustrated in Figure 1. These wells extend to within a few inches of the cavity liner but do not penetrate the liner nor communicate with the primary coolant system. The preamplifier and various cable connections are located inside an instrument box which is part of the well assembly (see Figure 1 and 2b).

The startup channels provide input to the Plant Protective System (PPS) rod withdrawal prohibit (RWP) and automatic reactor scram functions through a one of two logic scheme. Initiatiation of an RWP will result upon occurrence of the following conditions:

Neutron Countrate

Neutron countrate indication from startup channels I or II is below a set minimum (approximately 5 cps). This prevents startup without adequate neutron flux indication.

Rate Of Neutron Flux Change

High rate of neutron flux rise (short reactor period) from startup channels I or II.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Fort St. Vrain, Unit No. 1	0 5 0 0 0 2 6 7	8 5	— 0 0 8	— 0 0	0 3 OF 1 1

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

Initiation of an automatic reactor scram will result upon occurrence of the following condition:

High Startup Count Rate

During fuel loading operations, high startup channel countrate (approximately 5.0E+4 cps) is provided to scram the reactor in the event of high neutron count rates while performing refueling operations. The function is disabled when the Reactor Mode Switch (RMS) is placed in the "RUN" position only. High startup count rate scrams can be received with the RMS placed in either the "FUEL LOADING" or "OFF" position.

Fort St. Vrain Technical Specification LCO 4.4.1 requires the startup channels be set to trip at ≤ 1.0E+5 cps. Both startup channels are checked daily, functionally tested prior to each startup, and calibrated each refueling cycle in accordance with the requirements of Fort St. Vrain Technical Specification SR 5.4.1.

EVENT DESCRIPTION:

On May 16, 1985, the reactor was in a shutdown, depressurized, and cooled down condition, with control rod drive refurbishment and helium circulator maintenance activities in progress. Core decay heat removal was provided by the "1B" helium circulator and the evaporator-economizer-superheater (EES) section of the Loop I steam generator, both operating on the emergency condensate header. Thirty-six of the thirty-seven control rods were fully inserted into the core with one control rod (Region 34) fully retracted in preparation of removal for refurbishment.

At 1215 hours, May 16, 1985, an automatic reactor scram on "High Startup Countrate" was actuated by startup channel I. Control room operators immediately checked redundant core neutron flux indication on startup channel II and wide range channels III, IV, and V. Core neutron flux level, as indicated on these detector channels, was normal for reactor shutdown conditions. In-core control rod drive work was suspended until the cause of the high countrate signal could be identified.

Results department personnel were dispatched to investigate the situation. Moisture in the instrument box of startup channel I was discovered. This moisture degraded the condition of the preamp power supply connector. The connector was cleaned and indication on startup channel I returned to normal.

The Nuclear Regulatory Commission Operations Center was notified of the event at 1537 hours, May 16, 1985, pursuant to the requirements of 10 CFR 50.72(b)(2)(ii).

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Fort St. Vrain, Unit No. 1	0 5 0 0 0 2 6 7	8 5	— 0 0 8	— 0 0	0 4 OF 1 1

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

ANALYSIS OF EVENT:

This event resulted in automatic actuation of the Fort St. Vrain Plant Protective System scram circuitry. The scram actuation was not part of a preplanned sequence during testing and therefore satisfies the reporting criteria of 10CFR50.72(b)(2)(ii) and 10CFR50.73(a)(2)(iv).

At the time of the event, the reactor was in an extended shutdown (commencing June 23, 1984) for CRD refurbishment. During this refurbishment, each of the thirty-seven control rods will be removed from the core individually and reworked per specific procedures. Prior to removal of control poison from the core, extensive shutdown margin calculations are performed. These calculations verify an adequate shutdown margin (at least 0.01 delta K) will be maintained at a given core configuration. Adequate shutdown margin verification had been completed for the core configuration present at the time of the scram, i.e. thirty-six rods fully inserted, one rod (Region 34) fully retracted. There had been no control rod movement the entire day of May 16, 1985, leading up to the scram signal. After the scram actuated, control room operators checked core neutron flux level on redundant startup channel II and wide range channels III, IV, and V. Normal shutdown indications were observed on these remaining detector channels while startup channel I continued to operate erratically.

No control rod movement occurred as a result of the scram. The fully retracted control rod pair in Region 34 was electrically disconnected and manually locked, thereby prohibiting automatic insertion of the rod pair into the core.

Knowing an adequate shutdown margin had been analytically and physically verified for the present core configuration, and observing normal neutron flux levels on redundant indication, control room operators and Technical Advisors concluded the erratic signal on startup channel I to be invalid and that no immediate corrective action was necessary, e.g. insertion of reserve shutdown material.

The startup channels function to initiate protective action through a one of two logic scheme. Therefore, operation of one startup channel is sufficient to initiate automatic PPS actions.

FSAR Section 14.2.2.7 analyzes the most severe control rod withdrawal accident from source power. In the analysis, the ultimate line of protection is provided by an automatic reactor scram at 140% rated power. This protective action in initiated by the six power channels; independent of either startup channel.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Fort St. Vrain, Unit No. 1	0 5 0 0 0 2 6 7	8 5	— 0 0 8	— 0 0	0 5 OF 1 1

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

This actuation of the PPS scram circuitry was not caused by increased core neutron flux level but by an erroneous signal spike on startup channel I. As of several hours prior to the event, there had been no control rod movement and core neutron flux levels were stable. Core cooling was not interupted by the scram. Therefore, it is concluded that there were no safety consequences as a result of this event.

CAUSE DESCRIPTION:

Moisture leaked into the startup channel I instrument box and resulted in formation of a white mineral-like substance on the preamp power supply connector (see Figure 2a). This degraded the condition of the connection and permitted electrical arcing between the connector pins. Evidence of this arcing was visible. These perturbations in the startup channel power supply eventually produced a signal spike exceeding 5.0E+4 counts per second (see Figure 3). When this occurred, the channel tripped, completed the minimum one of two actuation logic, and initiated a reactor scram on "High Startup Countrate".

The origin of the moisture discovered in the startup channel I instrument box is a small leak in the the reactor building roof. In recent months, a small section of roof near a liquid nitrogen vent has become damaged by winds. It has been determined that the damage has allowed rain water to drip into the reactor building and onto the refueling floor. Once inside the building, this water then trickled down the side of the PCRV onto the electrical conduit of startup channel I. The water followed the conduit and passed through a threaded coupling into the instrument box (see Figure 2b). This was the primary flow path of the roof leak. No other moisture related instrument problems have occurred nor are any expected.

The damaged roof has been temporarily patched while arrangements have been made with the original contractor to have the area permanently repaired. It should be noted that the entire reactor building roof was resurfaced approximately two years ago.

CORRECTIVE ACTION:

Completed Corrective Action

All moisture inside the startup channel I instrument box was removed.

The preamp power supply connector on startup channel I has been replaced with a new connector.

The coaxial cable from the preamp to the PPS circuitry was tested with a Time Domain Reflectometer. The cable was found to be in good operating condition.

The threaded conduit coupling (Figure 2b) has been sealed while roof repairs are being completed.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Fort St. Vrain, Unit No. 1	0 5 0 0 0 2 6 7	8 5	— 0 0 8	— 0 0	0 6 OF 1 1

TEXT *(If more space is required, use additional NRC Form 366A's)* (17)

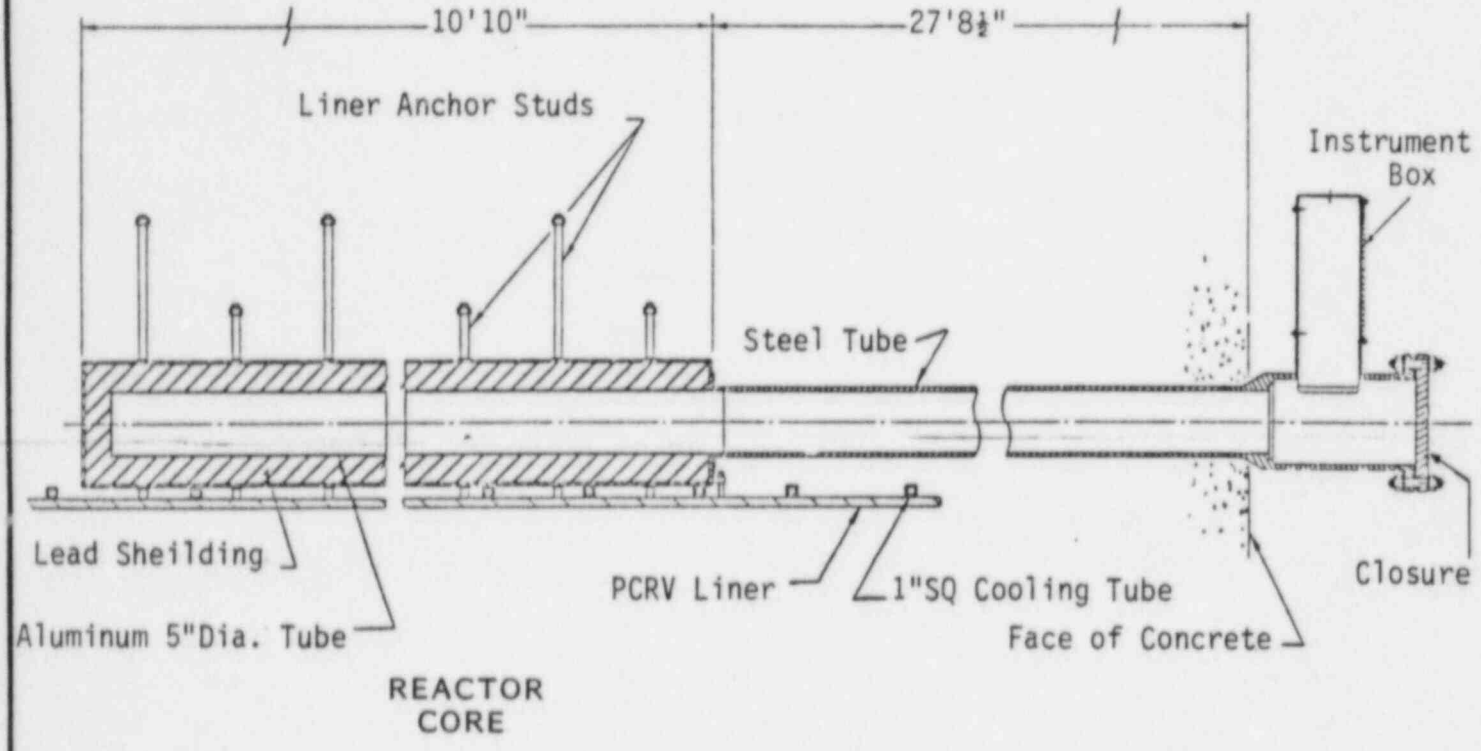
Planned Corrective Action

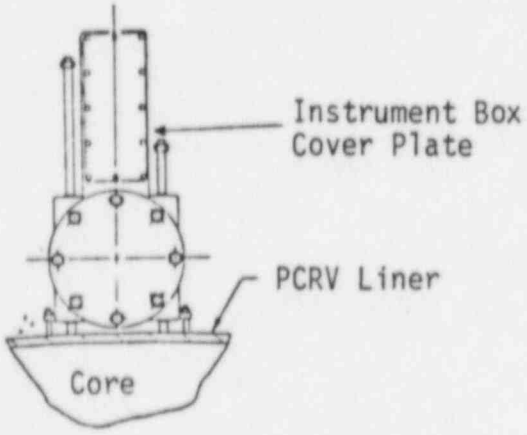
The damaged area of the reactor building roof will be repaired.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Fort St. Vrain, Unit No. 1	0 5 0 0 0 2 6 7	8 5	— 0 0 8	— 0 0	0 7 OF 1 1

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

FIGURE 1.

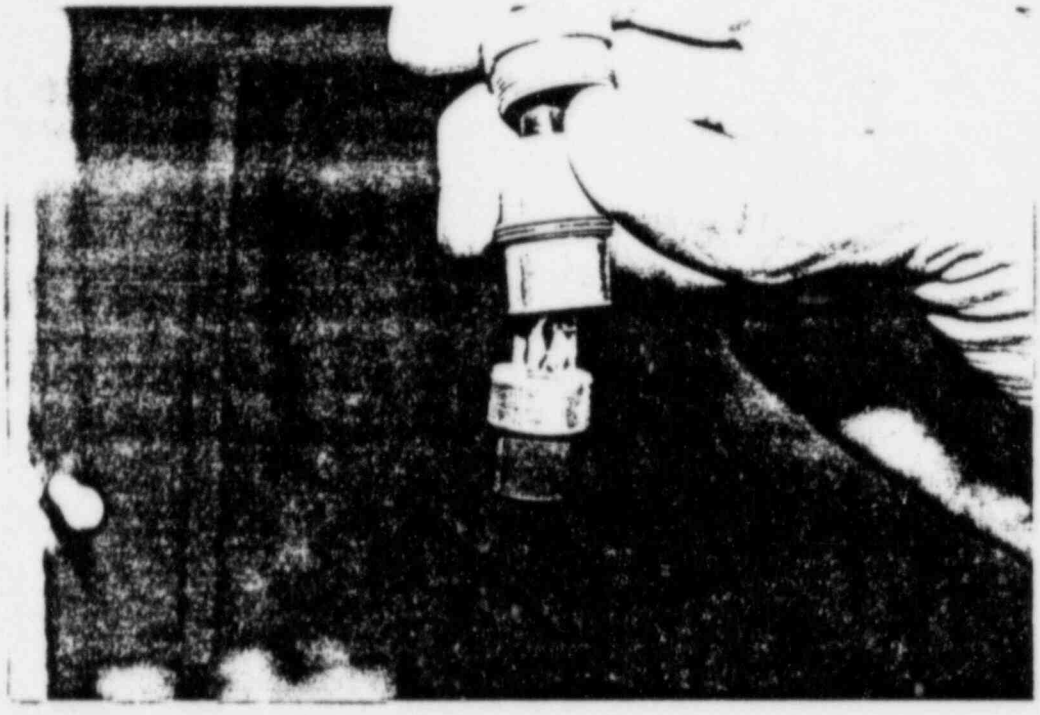




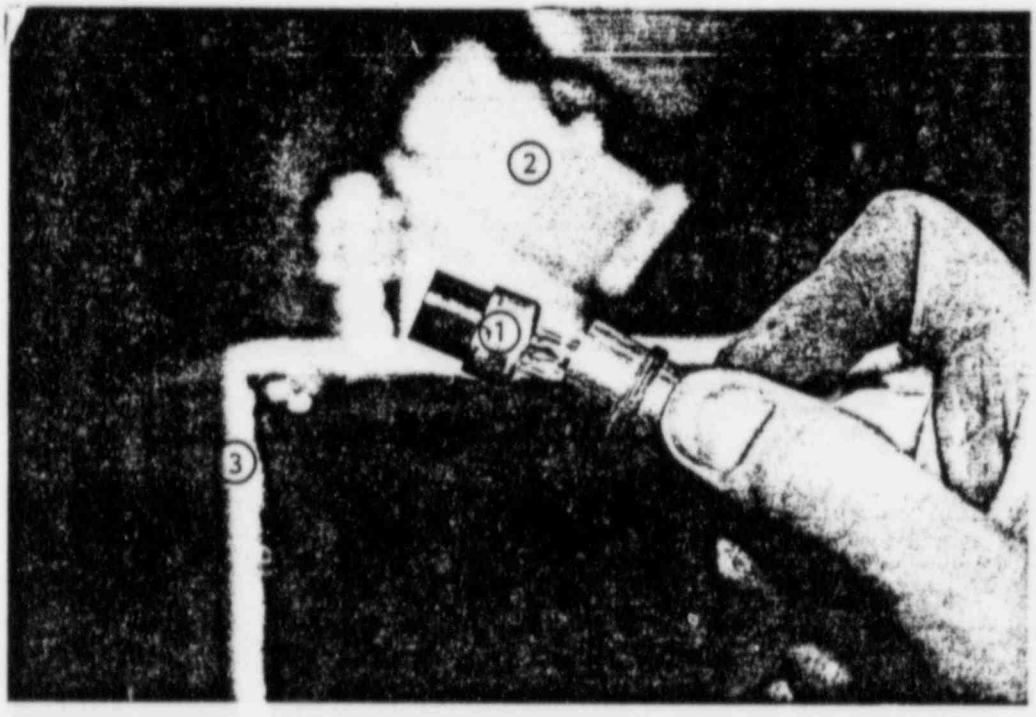
FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Fort St. Vrain, Unit No. 1	0 5 0 0 0 2 6 7	8 5	— 0 0 8	— 0 0	0 8 OF 1 1

TEXT *(If more space is required, use additional NRC Form 366A's)* (17)

FIGURE 2.



a. Preamp power supply connector

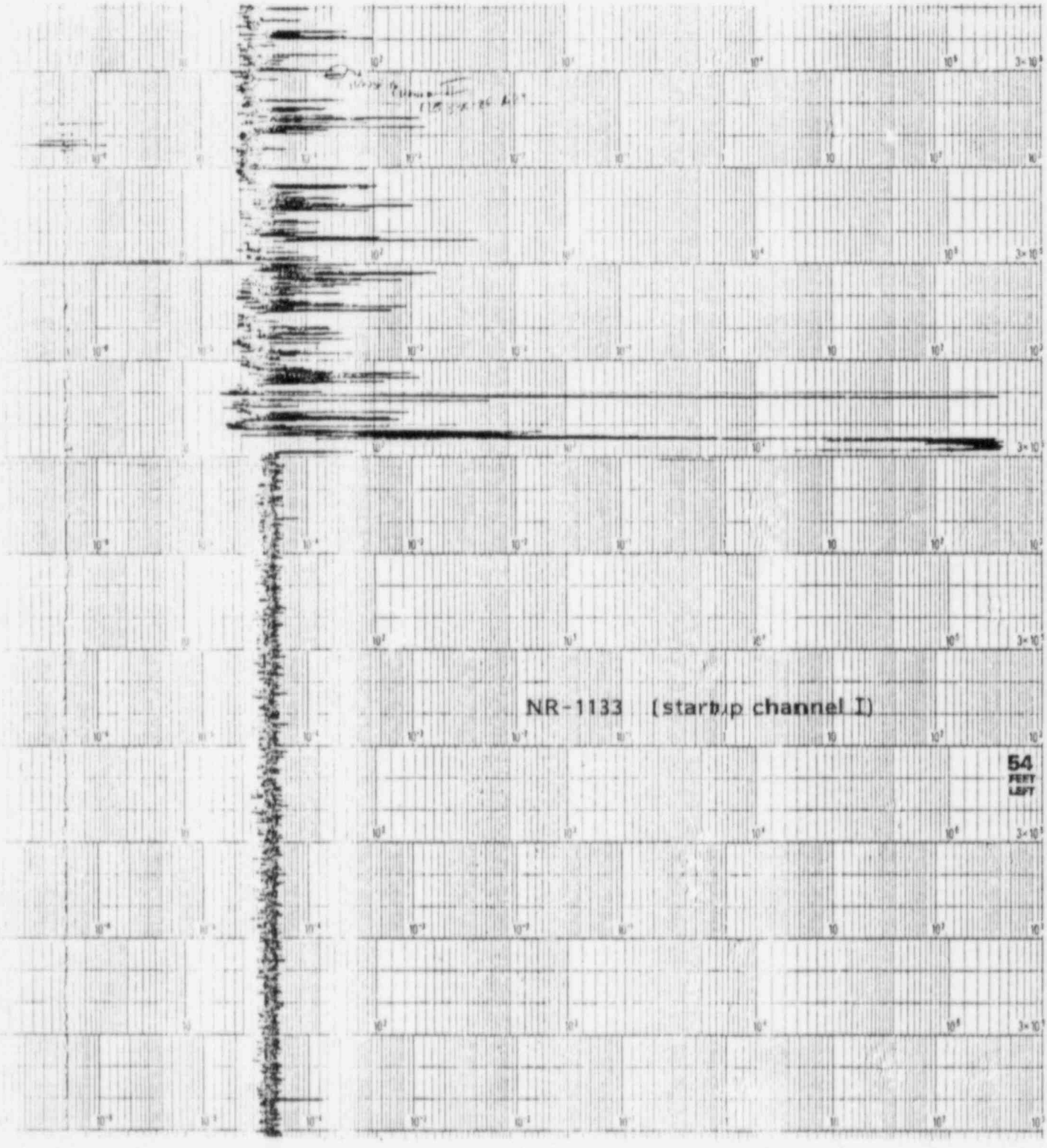


b. (1) Preamp power supply connector (2) Threaded conduit coupling (3) Instrument box

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Fort St. Vrain, Unit No. 1	0 5 0 0 0 2 6 7	8 5	— 0 0 8	— 0 0	0 9 OF 1 1

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

FIGURE 3.

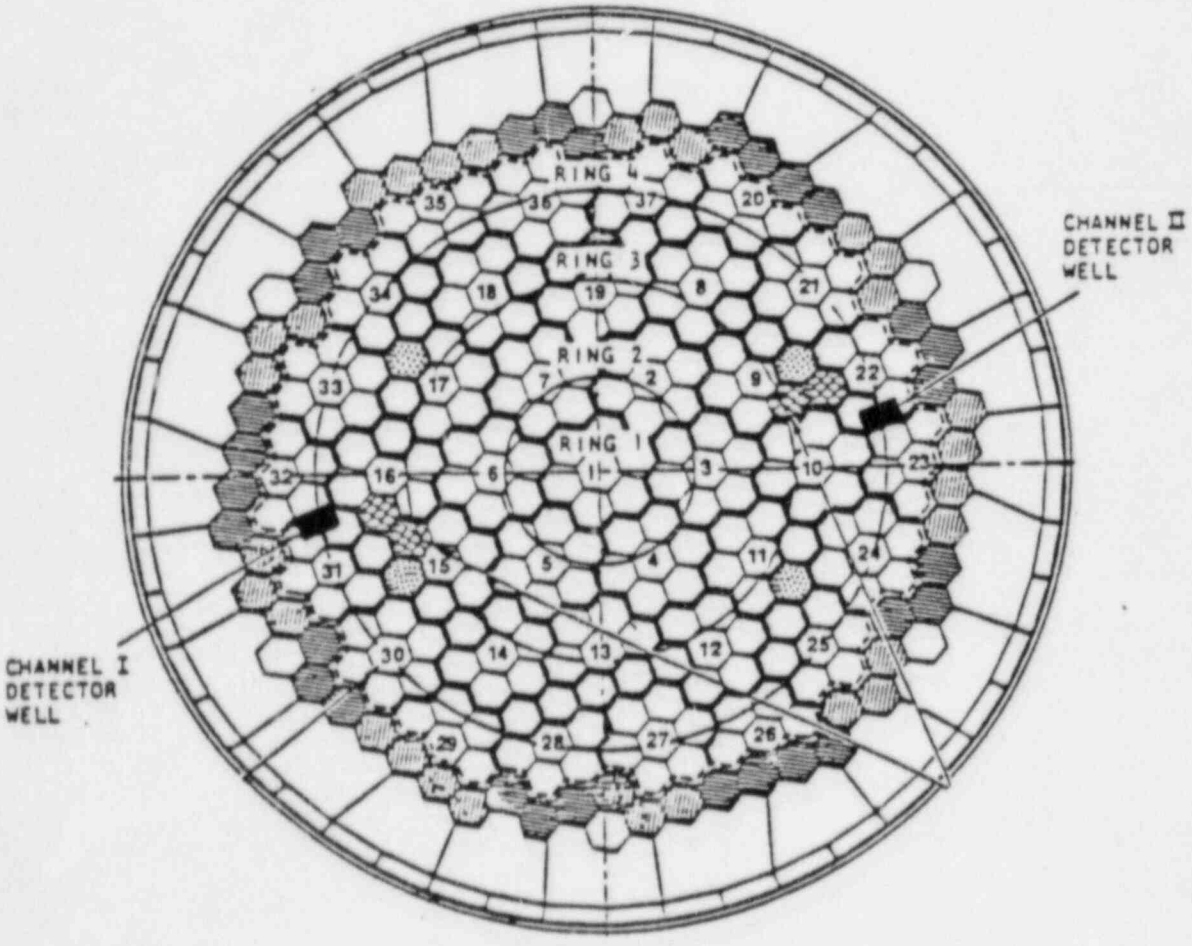


* Approximate time of scram

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Fort St. Vrain, Unit No. 1	0 5 0 0 0 2 6 7	8 5	— 0 0 8	— 0 0	1 0 OF 1 1

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

FIGURE 4.



(Top View Of Reactor)

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Fort St. Vrain, Unit No. 1	0 5 0 0 0 2 6 7	8 5	-- 0 0 8	— 0 0	1 1 OF 1 1

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

Jim F. Hill
Techical Services Technician

Jim Eggebroten
Technical Services Engineering Supervisor

Licensing Review By:

Jim Gramling
Jim Gramling
Nuclear Licensing-Operations Supervisor

C. H. Fuller
Station Manager

J. W. Gahm
Manager, Nuclear Production

Public Service

Public Service
Company of Colorado

16805 WCR 19 1/2, Platteville, Colorado 80651

June 14, 1985
Fort St. Vrain
Unit No. 1
P-85203

Regional Administrator
Region IV
U. S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 1000
Arlington, TX 76011

ATTN: Mr. E. H. Johnson

Docket No. 50-267

SUBJECT: Licensee Event Report
85-008, Final Report

REFERENCE: Facility Operating
License No. DPR-34

Dear Mr. Johnson:

Enclosed, please find a copy of Licensee Event Report No. 50-267/85-008, Final, submitted per the requirements of 10 CFR 50.73 (a)(2)(iv).

Sincerely,

J. W. Gahm
Manager, Nuclear Production

Enclosure

cc: Director, MIPC

JWG/djm

85-485

IE-22

ORIGINAL TO REGION IV

1/1