

Public Service Company of Colorado

P. O. Box 361, Platteville, Colorado 80651



August 5, 1976
Fort St. Vrain
Unit No. 1
P-76174

Mr. E. Morris Howard, Director
Nuclear Regulatory Commission
Region IV
Office of Inspection and Enforcement
Suite 1000
Arlington, Texas 76012

REF: Facility Operating License
No. DPR-34

Docket No. 50-267

Dear Mr. Howard:

Enclosed please find a copy of Abnormal Occurrence Report No. 50-267/76/24, Preliminary, submitted per the requirements of the Technical Specifications.

Also, please find enclosed one copy of the Licensee Event Report for Abnormal Occurrence Report No. 50-267/76/24.

Very truly yours,

Frederic E. Swart
Superintendent, Nuclear Production

FES/alk

cc: Mr. Roger S. Boyd

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REPORT DATE: August 5, 1976

Abnormal Occurrence 76/24

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OCCURRENCE DATE: July 26, 1976

FORT ST. VRAIN NUCLEAR GENERATING STATION
PUBLIC SERVICE COMPANY OF COLORADO
P. O. BOX 361
PLATTEVILLE, COLORADO 80651

REPORT NO. 50-267/76/24

Preliminary

IDENTIFICATION OF
OCCURRENCE:

On July 26, 1976, two unexpected trips of circulator 1C occurred as follows:

- 1) Repressurizing shutdown buffer recirculator 1D, upset buffer helium control of the Loop 2 primary coolant circulators.
- 2) After placing clearance to remove 1D buffer recirculator from service, suction valve HV-21214 went wide open which again upset buffer helium control of primary coolant Loop 2 circulators.

In the case of the second trip, 1D recirculator drain valve was opened as a requirement of clearance. As a result, some primary coolant was released to the Reactor Building before an alarm was received and condition corrected. There was no unmonitored release of radioactivity outside the Reactor Building, nor any excessive exposure to personnel.

This has been determined to be reportable as an abnormal occurrence per the Fort St. Vrain Technical Specifications, Section 2.1, Part F.

CONDITIONS PRIOR
TO OCCURRENCE:

<u> X </u> Steady State Power	<u> </u> Routine Shutdown
<u> </u> Hot Shutdown	<u> </u> Routine Load Change
<u> </u> Cold Shutdown	<u> </u> Other (specify)
<u> </u> Refueling Shutdown	<u> </u>
<u> </u> Routine Startup	<u> </u>

CONDITIONS PRIOR
TO OCCURRENCE (continued):

The major plant parameters at the time of the event were as follows:

		(1)	(2)	
Power	RTR	98.2 (11.6%)	94.7 (11.2%)	MWth
	ELECT	0.0	0.0	MWe
Secondary Coolant	Pressure	1,980	1,990	psig
	Temperature	588	587	°F
	Flow	733,300	698,900	#/hr.
Primary Coolant	Pressure	460	450	psia
	Temperature	350	347	°F Core Inlet
		741	737	°F Core Outlet
	Flow	725,000	727,000	#/hr.
Circulators	1A	2,100	2,100	RPM
	1B	2,100	2,100	RPM
	1C	2,000	2,100	RPM
	1D	2,000	2,100	RPM

DESCRIPTION OF
OCCURRENCE:

First Event

An equipment operator was directed to return C-2106S, one of two Loop 2 recirculators, to service, by performing the following valve operations (see attached PI 21-3):

<u>Valve Number</u>	<u>Function</u>	<u>Operator Action</u>
V-21250	Recirculator drain.	Close
V-21254	Recirculator drain.	Close
V-21246	Water to Heat Exchanger.	Open
V-21511	Drain to surge tank.	Open
V-21231	Water from heat exchanger.	1/2 Turn Open
HV-21214	Helium Inlet Valve	Removed Tag

DESCRIPTION OF
OCCURRENCE (continued):

The equipment operator then slowly opened V-21382, the recirculator discharge valve. This action caused high buffer-mid-buffer differential pressure on 1C circulator, which resulted in a circulator trip.

Second Event

Plant conditions had been returned to normal following the previous circulator trip. The equipment operator was directed to isolate recirculator 1D as described by a clearance procedure, by performing the following valve operations (see attached PI-21-3):

<u>Valve Number</u>	<u>Function</u>	<u>Operator Action</u>
V-21382	Recirculator Dis-charge.	Closed
V-21511	Drain to Surge Tank.	Closed
V-21246	Seal Water Discharge.	Closed
V-21231	Seal Water Inlet.	Closed
V-21254	Drain Valve.	1/2 Turn Open
V-21250	Drain Valve.	1/2 Turn Open

The equipment operator then isolated and removed the control air from suction valve HV-21214 and proceeded to other duties. Approximately two hours later he returned to the recirculator and helium was still venting from the drain line. He fully opened the drain valve which caused high buffer-mid-buffer differential pressure and circulator LC trip. He then closed the valve and returned to the Control Room. The Reactor Operator notified him that the recirculator suction valve was open. The equipment operator then returned to the recirculator, restored air to the inlet valve, and closed the other drain valve. He was then told to leave the Reactor Building because airborne radiation levels were high.

APPARENT CAUSE
OF OCCURRENCE:

<u>1</u>	Design	_____	Unusual Service Cond. Including Environment
_____	Manufacture	_____	Component Failure
_____	Installation/Const.	_____	Other (specify)
<u>2</u>	Operator	_____	
	Procedure	_____	

ANALYSIS OF
OCCURRENCE:

First Event

The recirculator (C-2106S) had been isolated and depressurized. When being returned to service the operator properly positioned all of the appropriate valves. He then started to pressurize the recirculator containment tank, T-2103S, by slowly opening V-21382. When V-21382 was opened slightly, the helium flow increased rapidly, slightly depressurizing the high pressure separator of 1C circulator. The helium supply pressure remained constant. The pressure decrease increased the buffer-mid-buffer differential pressure to more than +90" water (see 1 on attached curves). This high differential pressure persisted for more than three seconds, which caused the circulator trip. The buffer-mid-buffer pressure differential increased on circulator 1D, but did not reach the trip point.

Second Event

The recirculator containment tank pressures are normally between 10 and 15 psi reactor pressure and are at 25 psi above the bearing water surge tank (reference attached Figure 1). The Equipment Operator did not fully understand or follow the clearance procedure. When the operator removed the air from the inlet valve, it allowed the valve to open. Opening the recirculator containment tank drain valve allowed the water to drain and began venting the tank. The open suction valve and fully opening the drain valve resulted in a high buffer helium flow rate from the buffer return piping, reducing buffer helium return pressures, the Loop 2 bearing water surge tank pressure, and increasing the circulator 1C buffer-mid-buffer differential pressure to more than +90" water. When this persisted for more than three (3) seconds, the circulator tripped, (see attached curves for 1C and 1D circulators). Circulator 1D also had high buffer-mid-buffer differential pressure but the trip of 1C circulator occurred first, which inhibited the trip of circulator 1D, a design feature of the Plant Protective System.

The lowered pressure in the buffer return line of the Loop 2 circulators was of sufficient magnitude to reduce buffer supply pressure below primary coolant pressure, allowing primary coolant to flow down both Loop 2 circulator shafts, into the bearing water and also out of the open containment tank drain valve. The radioactivity in the bearing water reached the low pressure separator and caused a high radioactivity trip of RIS-21251, which monitors the low pressure separator drain. A Health Physics technician reported the portable airborne activity monitors went off scale high at approximately the time circulator 1C tripped. Analysis of primary coolant showed an activity of $2.3 \times 10^{-3} \mu\text{Ci/cc}$. This activity was primarily due to the presence of Kr and Xe. Reactor Building access was restricted until levels return to normal. The Reactor Building exhaust fans operated normally and discharged to the plant stack throughout this incident. None of the four monitors showed any increase in radioactivity.

CORRECTIVE
ACTION:

First Event

The feasibility of adding a small bypass valve to allow slow pressurizing of the tank is being considered. A pressure gauge will be added to each containment tank. No other corrective action is anticipated or required.

Second Event

All personnel that were in the Reactor Building during the occurrence were given whole body counts at the Colorado Department of Health. No measurable increase in radioactive body burdens was indicated. The operator has been admonished for failure to follow the clearance procedure. The recirculator clearance has also been revised and should prevent future misunderstandings.

The feasibility of installing a manual isolation valve at the suction of each recirculator is being studied.

No other corrective action is anticipated or required.

FAILURE DATA/
SIMILAR REPORTED OCCURRENCES:

First Event

Unusual Event Report No. 50-267/75/03A reported a similar occurrence.

Second Event

None

PROGRAMMATIC IMPACT:

None

CODE IMPACT:

None

EVENT 1

01:40
7/26/76

00:26
7/26/76

Hc RETURN CIRC TRIP

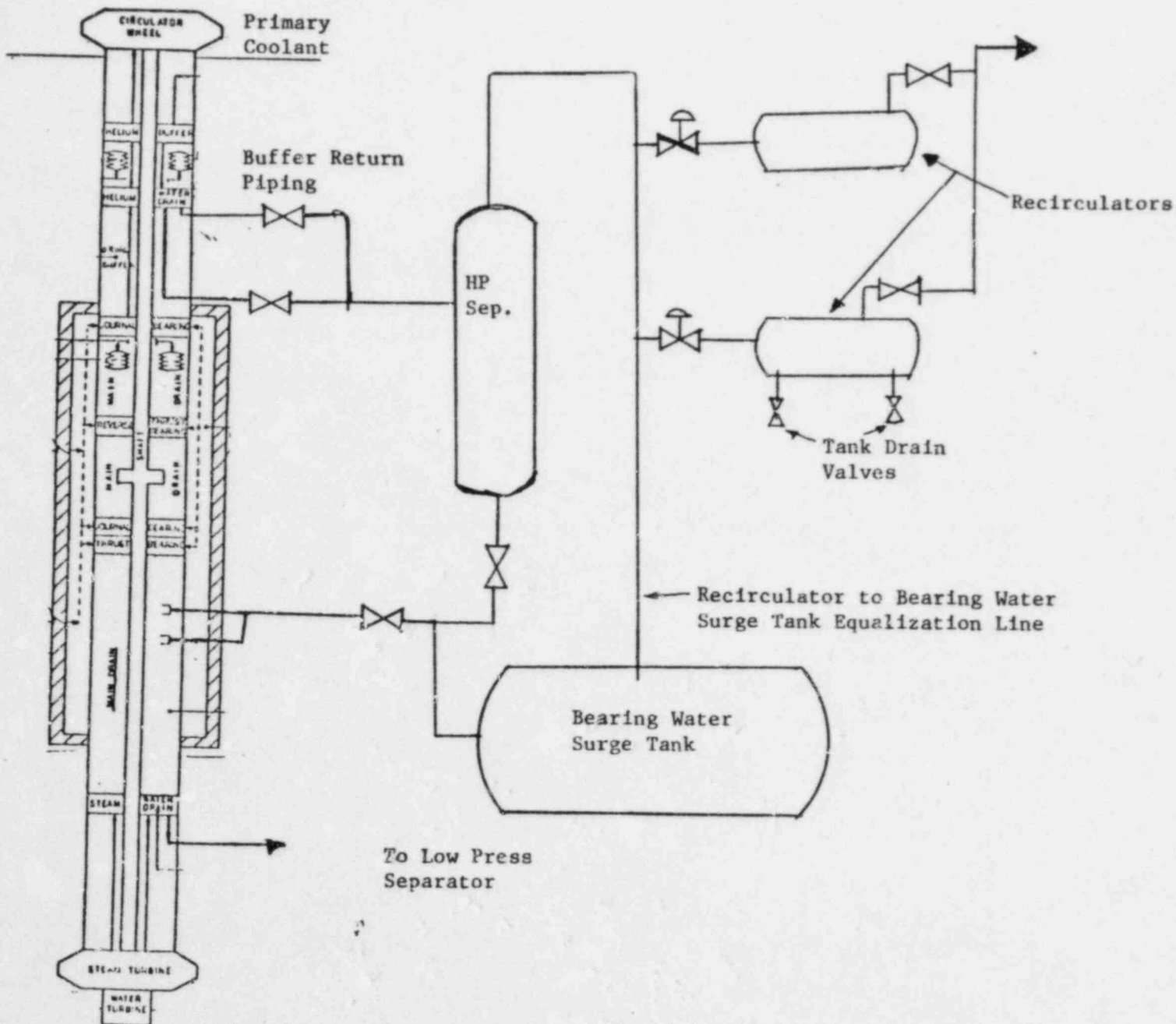
Hc Buffer supply

Buff-410 Buff

CIRCULATOR 1C PARAMETERS @ 7/26/76, 0026

CIRCULATOR	1C	DATE	07-26-76
TEST	PART	TIME	01:40
CHART SPEED	1mm/mm	RANGE	
ALL CHAN	10 MV/MM	100-500 MV	
CHANNEL & SIGNAL	ENG. UNITS		
1 DUFF-MID BUFF AP	-10 → 90	"H2O	
2 BUFF HE SUP FLOW	0 → 10	ACFM	
3 DUFF HE RET FLOW	0 → 6	ACFM	
4 HP SEPARATOR LEV	0 → 70	"H2O	
5 BRG H2O SUP FLOW	0 → 200	GPM	
6 CIRCULATOR SPEED	0 → 12000	RPM	

INSTUMENT NUMBERS



EVENT #2

05:02
RPM
12000
CIRC SPEED

200
GPM
NORMAL BRD
WATER FLOW

70"
INCHES
H.P. Sep Level

CIRC 1C

7/72/1C
41:50
Gould Inc., Instrument Systems Division
Cleveland Ohio Printed in U.S.A.

BRUSH ACCUCHART

ACFM
He RETURN
FLOW

10
ACFM
He BUDGET
SUPPLY

CIRCULATOR 1C
PARAMETERS

+90
INCHES
MID BUDGET
BUT

CIRCULATOR 1C TRIP

12000

RPM

CIRC SPEED

ABNORMAL OCCURRENCE

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EVENT NO. 2

200

GPM

NORMAL BND

WATER FLOW

05:14
7/26/76

70"

Sep Level

H.P.

CIRC 1D

and Ohio Printed in U.S.A.

Inc., Instrument Systems Division

H_c RETURN

Flow

10

ACFN

H_c SUPPLY

Flow

CIRCULATOR 1D
PARAMETERS

+90

Boff - MID/BOTH

-10

Submitted by: William H. Hillyard, Jr.
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Technical Services Supervisor

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H. Larry Brey
Superintendent, Operations

Approved by: Frederic E. Swart
Frederic E. Swart
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