UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-8064

MAR 31 2000

EA 2000-023

Charles M. Dugger, Vice President
Operations - Waterford 3
Entergy Operations, Inc.
17265 River Road
Killona, Louisiana 70066-0751

SUBJECT: WATERFORD 3 PREDECISIONAL ENFORCEMENT CONFERENCE SUMMARY --- NRC INSPECTION REPORT 50-382/99-25

Dear Mr. Dugger:

This refers to the Predecisional Enforcement Conference conducted in the Region IV office on March 20, 2000, between your staff, Region IV personnel, and a representative of the Office of Enforcement. This meeting was held to discuss apparent violations associated with the reactor coolant draindown event which occurred on November 27, 1999. These apparent violations are documented in NRC Inspection Report 50-382/99-25. The attendance list, licensee presentation materials, and NRC handout are enclosed.

The results of our enforcement deliberations will be addressed by separate correspondence. The licensee did not identify any errors in the factual content of the inspection report.

In accordance with Section 2.790 of the NRC's "Rules of Practice," Part 2, Title 10, Code of Federal Regulations, a copy of this letter will be placed in the NRC's Public Document Room.

Should you have any questions concerning this matter, we will be pleased to discuss them with you.

Sincerely,

Ken E. Brockman, Director
Division of Reactor Projects

Enclosures:
1. Attendance List
2. Licensee Presentation Material
3. NRC Handout

Template RGN-002

Docket No.: 50-382
License No.: NPF-38

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bcc to DCD (IE14; IE45)

bcc electronic distribution from ADAMS by RIV:
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DRP Director **(KEB)**
DRS Director **(ATH)**
Senior Resident Inspector **(TRF)**
Branch Chief, DRP/E **(LJS)**
Senior Project Engineer, DRP/E **(GAP)**
Branch Chief, DRP/TSS **(LAY)**
RITS Coordinator **(NBH)**
G. F. Sanborn, D:ACES **(GFS)**
K. D. Smith, RC **(KDS1)**
R. W. Borchardt, OE **(RWB1)**

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KMKennedy;df	PHHarrell	KEBrockman					
3/31/00	3/31/00	3/31/00					

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KMKennedy;df	PHHarrell	KEBrockman					
3/31/00	3/31/00	3/31/00					

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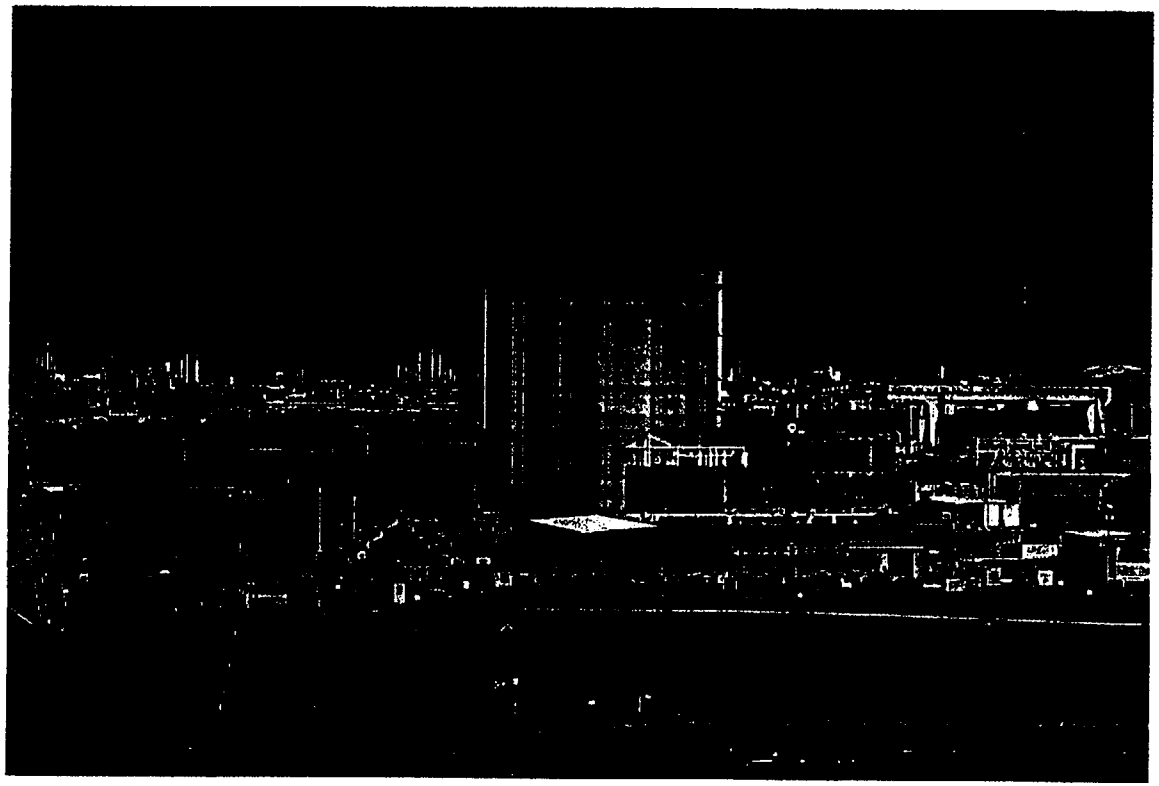
ENCLOSURE 1

List of Attendees

NRC Attendees:	Ellis Merschoff, Regional Administrator Ken Brockman, Director, Division of Reactor Projects (DRP) Gary Sanborn, Director, Enforcement Kriss Kennedy, Senior Project Engineer, Project Branch D, DRP Tom Farnholtz, Senior Resident Inspector, Project Branch D, DRP Terry Reis, Senior Enforcement Specialist, Office of Enforcement Leonard Willoughby, Project Engineer, Project Branch D, DRP Ryan Lantz, Reactor Inspector, Division of Reactor Safety (DRS) William Jones, Senior Reactor Analyst, DRS Breck Henderson, Senior Public Affairs Officer Rachel Carr, Inspector, DNMS Richard Deese, Reactor Inspector, DRS Nancy Salgado, Resident Inspector, Project Branch D, DRP Max Schneider, Resident Inspector, Project Branch B, DRP
Licensee Attendees:	Chuck Dugger, Vice President, Operations Early Ewing, General Manager, Plant Operations Everett "Chip" Perkins, Director, Nuclear Safety Assurance Douglas Ortego, Operations Shift Superintendent Al Wrape, Director, Engineering Randy Douet, Operations Manager Chester Fugate, Technical Support Manager Jerry Holman, Safety Analysis Manager Ed Lemke, Licensing Engineer Alan Harris, Engineering Manager John Sanchez, Mechanical Supervisor Rowdy Oubre, Mechanical Maintenance Technician

ENCLOSURE 2

Entergy Operations, Inc. - Waterford 3

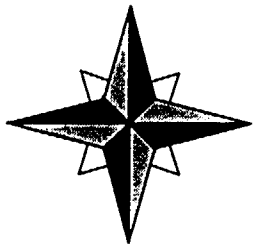


Predecisional Enforcement Conference

LPSI Train B Inoperable

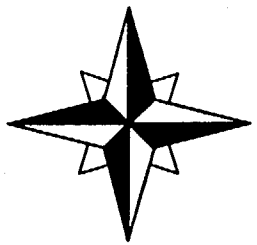
March 20, 2000

Entergy



Agenda

Introduction	C. Dugger
Statement of Apparent Violations	E. Perkins
Low Pressure Safety Injection System Overview	C. Fugate
Reach Rods	R. Douet
Sequence of Events	D. Ortego
Corrective Actions	R. Douet
Safety Significance	J. Holman
Regulatory Perspective	E. Perkins



INTRODUCTION

Chuck Dugger

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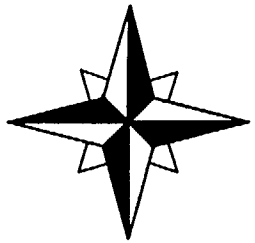


STATEMENT OF APPARENT VIOLATIONS

Chip Perkins

Entergy

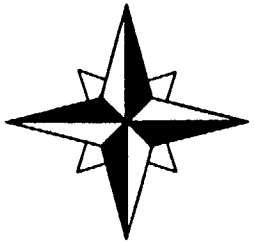
Statement of Apparent Violations

A Technical Specification (TS 3.5.2) Violation occurred:

- Low Pressure Safety Injection Train B system inoperable for more than 72 hours

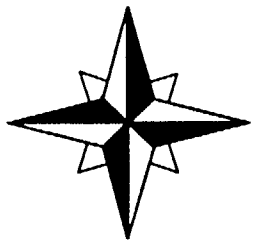
A Technical Specification (TS 6.8.1) Violation occurred:

- Failure to place SI-417B in the procedure-specified position



Topics of Discussion

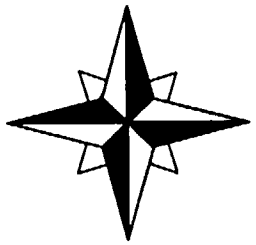
- LPSI System Overview
- Reach Rod Design, Maintenance and Failure
- Sequence of Events
- Safety Significance
- Regulatory Perspective



LOW PRESSURE SAFETY INJECTION SYSTEM OVERVIEW

Chester Fugate

Entergy

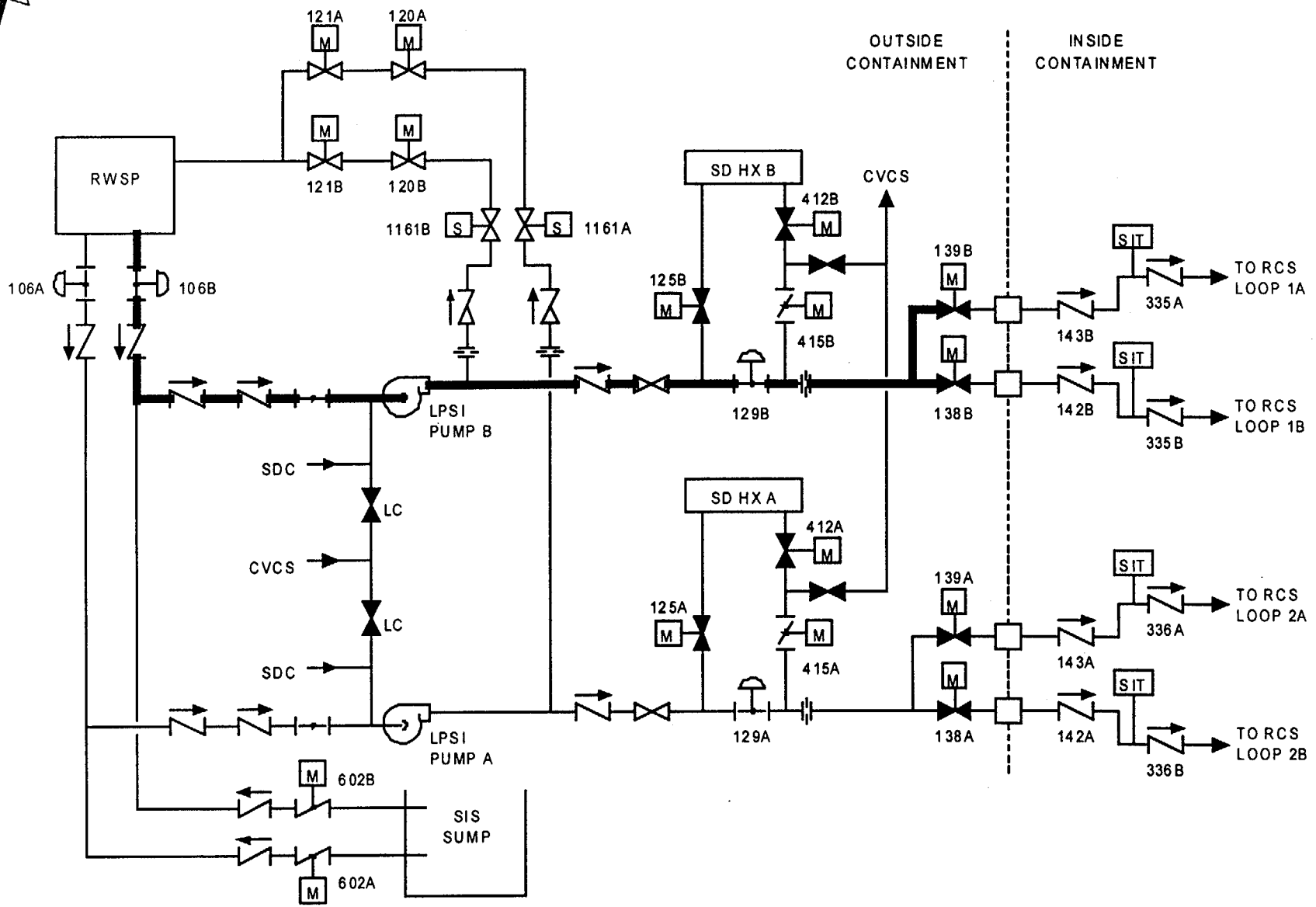


LPSI System Overview

The LPSI System is multi-purpose

- Large Break Loss Of Coolant Accident Injection
- Shutdown cooling
- The LPSI system independent from HPSI
- Two independent, 100% capacity trains

LPSI PUMP B - STANDBY MODE



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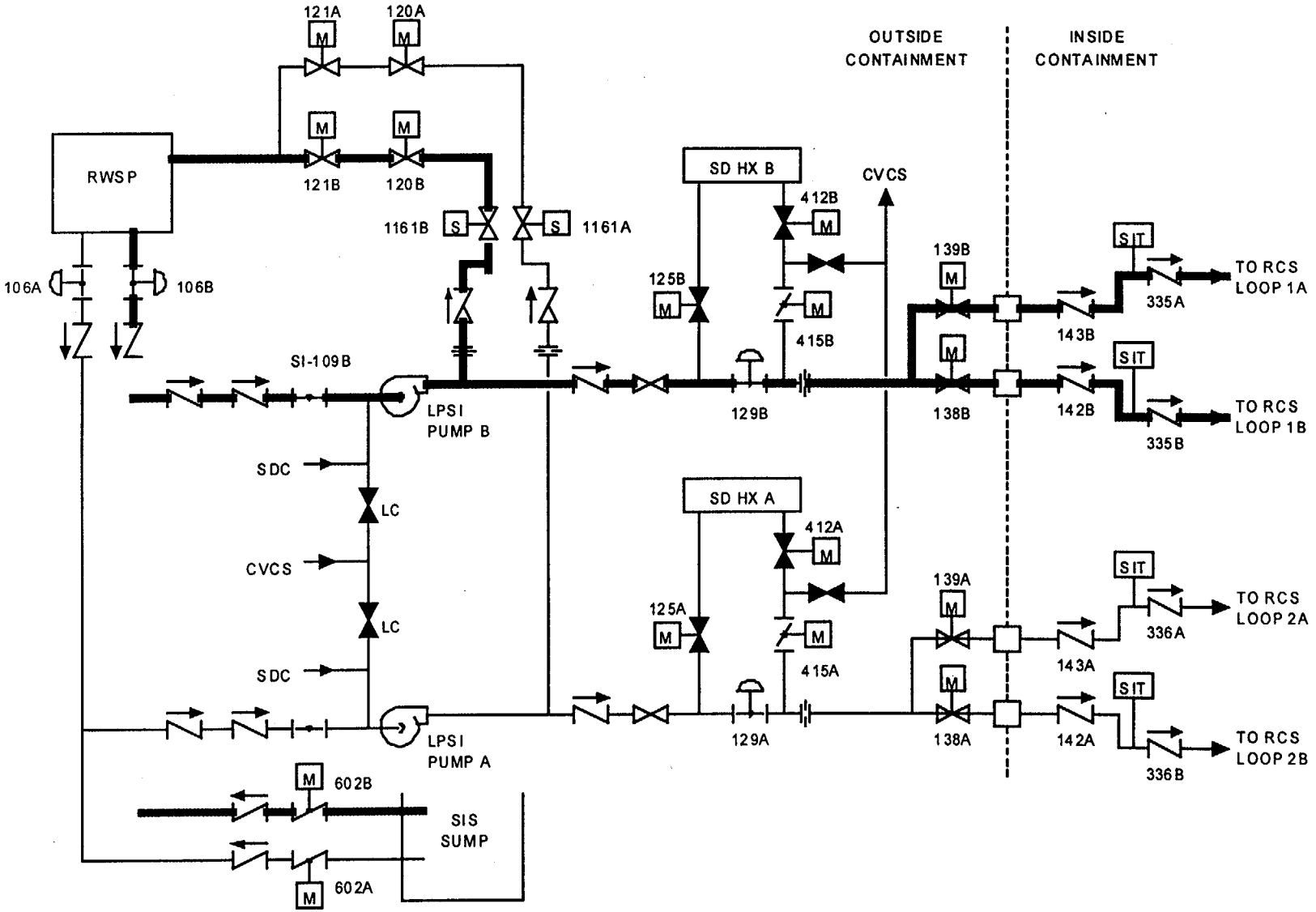
LPSI PUMP B INJECTION MODE



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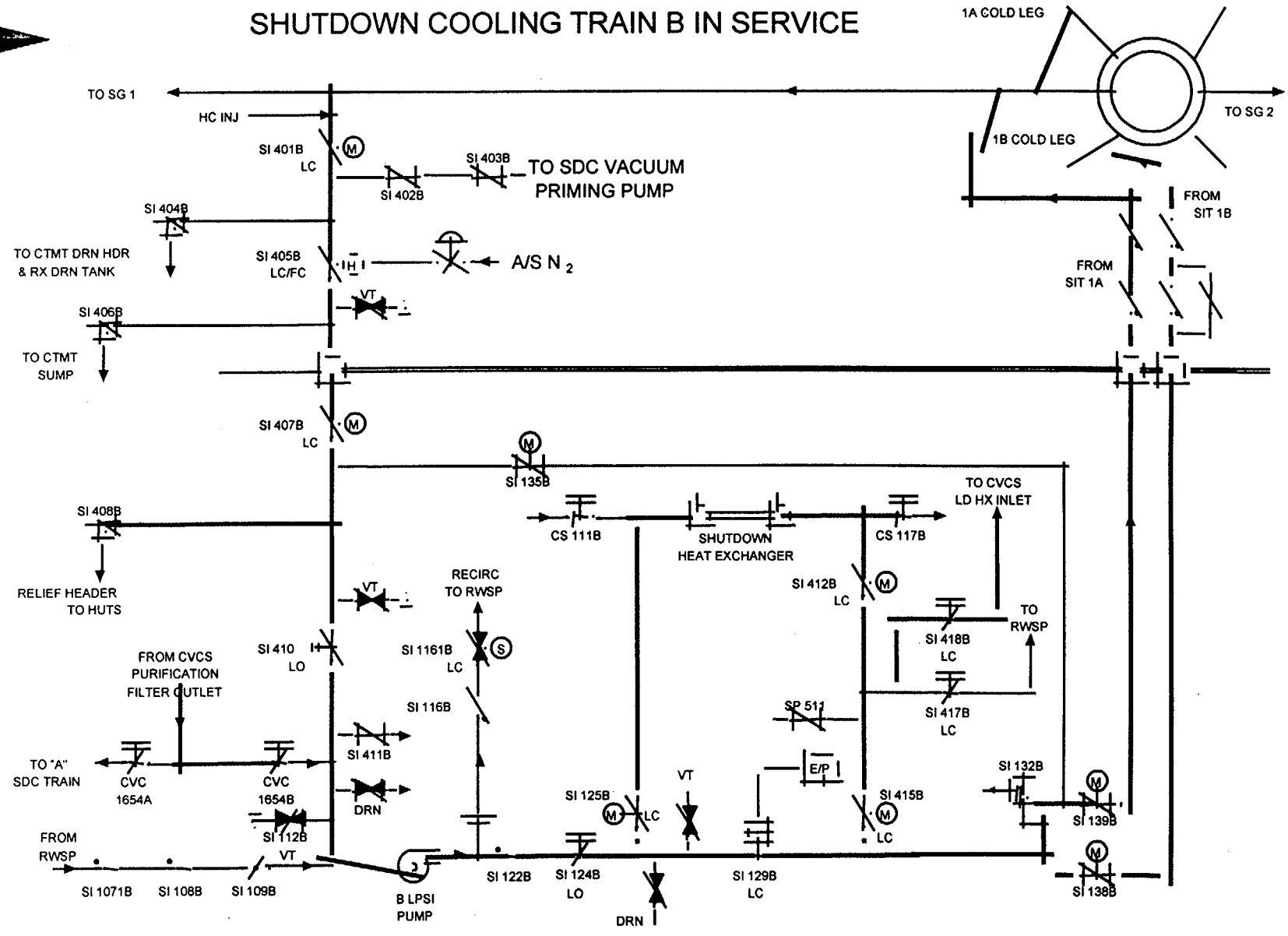
SHUTDOWN COOLING TRAIN B IN SERVICE



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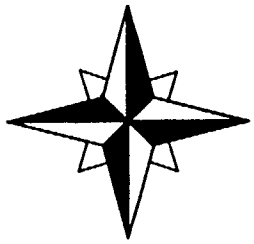
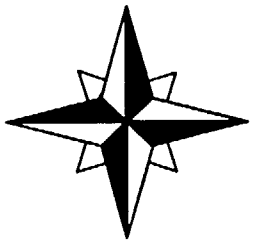


REACH RODS

Randy Douet

Entergy



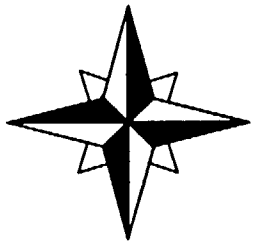
Reach Rods

- **Remote manual actuation of valve**
  - minimize radiation exposure
  - minimize contamination
  - physical location is difficult to access
- **Several configurations**
  - shafts
  - universal joints
  - slip joints
  - gear boxes
  - impactors

Reach Rods

- **Typical Preventive Maintenance for Reach Rods**
  - inspect drive linkage
  - lubricate universal joints
  - check torque setting of friction clutch

- **Preventive Maintenance Inspection**
  - limited to four active, safety-related valves
    - CS-111A & B, CS-117A & B



SEQUENCE OF EVENTS

Douglas Ortego

Entergy

Sequence of Events

November 19, 1999

1627 SI-417B opened for RWSP recirculation (day shift)

1715 RWSP placed on recirc using LPSI Pump B

2235 RWSP recirc secured. SI-417B fails to close due to broken reach rod (night shift)

November 26, 1999

1255 Commenced plant shutdown to repair steam leak

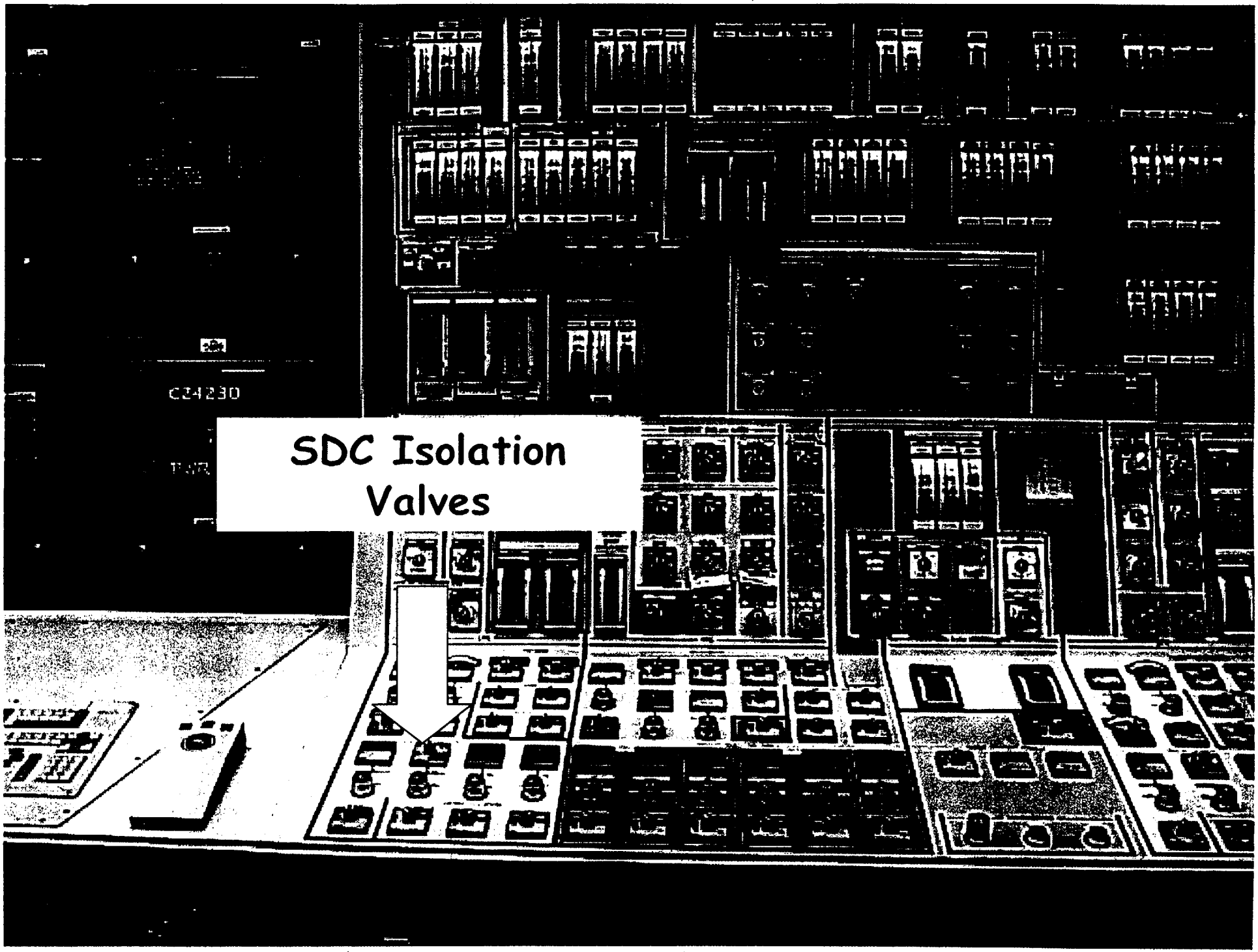
1511 Plant enters Mode 3

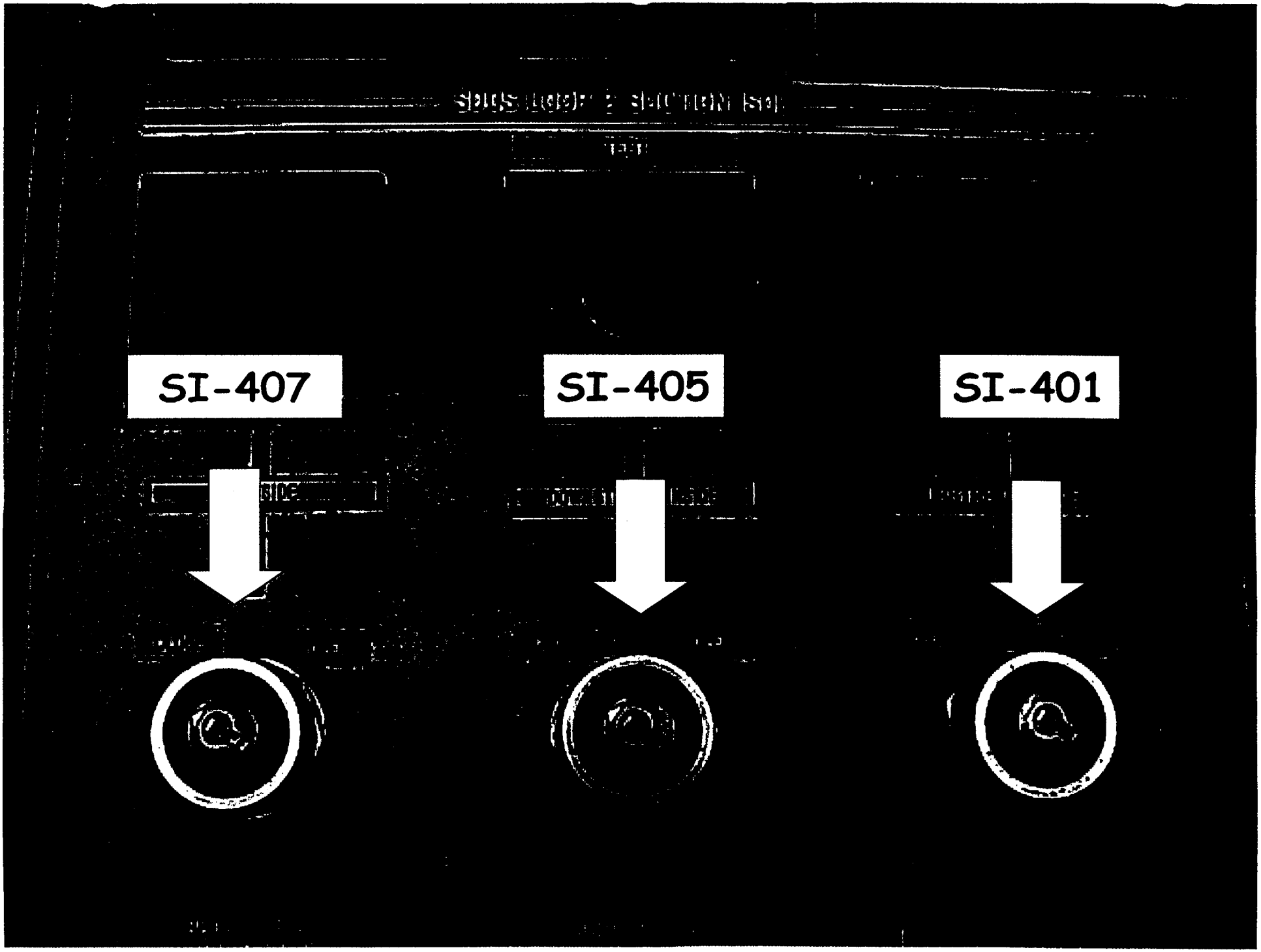
2259 Plant enters Mode 4

Sequence of Events

November 27, 1999

0441	SDC Train B aligned in standby
0447	Valve SI-407B control switch taken to "Open"
	RCS pressure and Pressurizer level begin to drop, RWSP level begins to rise.
	Auxiliary Operator in Safeguards Room B reports LPSI Pump B abnormalities
0448	Pressurizer heaters trip at 28% Pressurizer level
	Valve SI-407B control switch taken to "Close"


SDC Isolation
Valves


SI-407
SI-405
SI-401

Sequence of Events

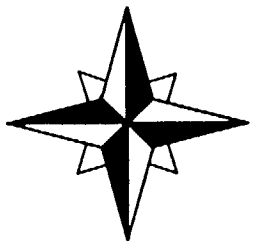
0448	Charging Pump B automatically starts (two Charging pumps now running)
0448	Valve SI-407B indicates closed. Indicated Pressurizer level is 1.9% (bottom of indicating range). RWSP average level 86% and rising
0448	RCP 2B and 1B secured
0449	Indicated Pressurizer pressure is 105 psia
0449	Auxiliary Operator in Safeguards Room B reports hearing another thud and observes LPSI Pump B slow and stop

Sequence of Events

0452	Highest representative core exit thermocouple increased 15° F to 308° F (still subcooled)
0453	RWSP average level peaks at 86.5%
0457	Indicated Pressurizer level is 5% and rising
0507	HPSI Pump A started to make up to the RCS
0509	Charging pump suction shifted to RWSP. HPSI cold leg injection at 100 gpm to each RCS leg
0511	Hot leg injection initiated from HPSI Pump A at 50 gpm
0515	Secured hot leg injection

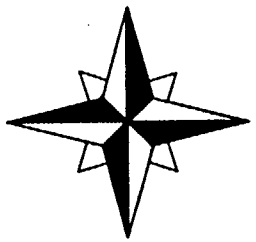
Sequence of Events

0516	Secured cold leg injection. Indicated Pressurizer level is 35%
0521	Core exit thermocouple 296° F and dropping. Plant conditions stable.
0533	Alert declared



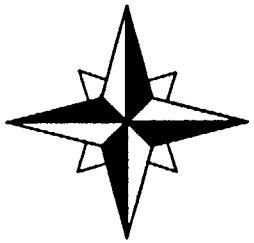
Summary

- RCS experienced a rapid diversion of inventory and pressure for approximately one minute.
- The source was the LPSI/SDC System train B.
- The flow path was into the RWSP.
- The diversion was terminated by closing SI-407B.



Summary

- RCS conditions stabilized during procedurally driven actions in progress to restore inventory and pressure.
- No loss of RCS outside of any system was indicated.
- No radioactive release occurred.
- All fission product barriers were intact.



CORRECTIVE ACTIONS

Randy Douet

Entergy

Corrective Actions - RCS Diversion

CAUSE: SI-417B reach rod uncoupled/valve mispositioned

Immediate/Short Term Actions

- Walked down SDC Train B piping and supports
- Walked down Pressurizer Surge Line piping and supports
- Performed radiological survey of RWSP floor plug
- Performed calibration check of Pressurizer wide range pressure instrument RC-IPT-0102A
- Sampled CCW and RCS for boron and radioactivity

Corrective Actions - RCS Diversion

Immediate/Short Term Actions

- Vented SDC Train B piping
- Performed confirmation run of LPSI B pump and obtained vibration data
- Evaluated Pressurizer Surge Line thermal gradient

RESULTS: RCS diversion bounded. No abnormalities identified. Returned SDC Train B to operable status.

Corrective Actions - RCS Diversion

Long Term Actions

- Revise reach rod operated valve position verification in procedure OP-100-009 - COMPLETE

- Issue an Operational Experience notice to the industry - COMPLETE

Corrective Actions - Reach Rods

CAUSE: Inadequate maintenance

Immediate/Short Term Actions

- Closed SI-407B
- Identified problem with SI-417B and repaired reach rod
- Inspected accessible reach rods on safety related valves for common problems
- Determined reach rod assemblies which have PMC indication to use as an alternative method to verify correct positioning
- Issued a Daily Instruction to Operations Dept. personnel

Corrective Actions - Reach Rods

Long Term Actions

- Expand scope of PM program for reach rods to include all safety-related valves and provide more detailed inspection criteria. - COMPLETE

- Provide procedure for performing maintenance on roto-hammers. No reuse of roll pins. - COMPLETE

Corrective Actions - Reach Rods

Long Term Actions

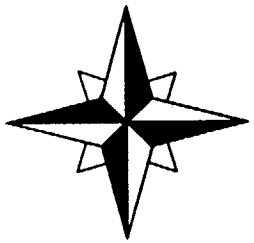
- Inspect and repair identified items on reach rods of safety-related valves.

- Evaluate roll pin adequacy for reach rod operated safety-related valve. - COMPLETE

RESULTS: Inspections identified issues from loose pins to bottomed-out position indicators. No additional failures identified.

Prior Opportunities to Identify

- Bottomed out indicating pin when valve operated on 11/19/99
- Procedure guidance for local verification
- Computer mimic displays - not a missed opportunity
- Indicating counters
- Incomplete actions for CS-117A (1994)
- Inadequate use of information from ANO (1994 - 96)



SAFETY SIGNIFICANCE

Jerry Holman

Entergy

Safety Significance

- Risk during full power was negligible
- RCS diversion had low safety significance

Safety Significance - Full Power

- LBLOCA diversion of LPSI injection flow less than 800 gpm
- LBLOCA probability during 8 days is 1.1×10^{-6}
- LBLOCA with failure of LPSI A is 5.5×10^{-8}
- Actual Peak Linear Heat Generation Rate well below analysis value, so Peak Clad Temperature would be lower than current FSAR Analysis

Safety Significance - RCS Diversion

- Prompt Operator action to isolate
- HPSI injection available
- No predicted RCS voiding
- Core cooling maintained
- Greater than 20 minutes to core uncovery with no Operator action

Safety Significance Risk Assessment

Fail to Isolate AND Fail to Inject

- Fail to isolate

0.1 ⇨ SI-407B fails to close

x 2×10^{-3} ⇨ Operator fails to close SI-405B or SI-401B

$= 2 \times 10^{-4}$

Safety Significance Risk Assessment

- Fail to inject

2×10^{-3} ⇨ Operator fails to start SI

+ 2×10^{-4} ⇨ HPSI A and HPSI B and LPSI A equipment failures

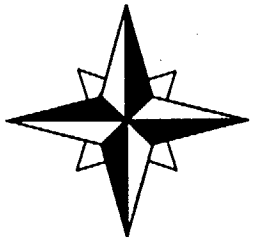
$= 2.2 \times 10^{-3}$

Safety Significance Risk Assessment

Failure to isolate AND Failure to inject

$$(2 \times 10^{-4}) \times (2.2 \times 10^{-3}) = 4.4 \times 10^{-7}$$

Threshold for Low/Medium Significance is 1×10^{-5}



REGULATORY PERSPECTIVE

Chip Perkins

Entergy

Regulatory Perspective

Apparent Violation 1

LPSI Train B inoperable for more than 72 hours (TS 3.5.2)

- Violation was not willful
- Violation was self-revealing
- Violation had low actual safety significance
- Broad, comprehensive, and effective corrective actions completed or in progress to preclude recurrence of the root cause
- Broken reach rod gave false valve position indication

Regulatory Perspective

Apparent Violation 2

SI-417B not placed in the procedure-specified position (TS 6.8.1)

- Valve positioned by handwheel and local indication
- Failure of component resulted in undetected misposition.
- Root cause - broken reach rod gave false indication of valve position
- Procedure/expectation could be improved to detect failures of this type
- Not a separate violation but the same as violation 1

Regulatory Perspective

Conclusion:

- Only one violation occurred
- Under the current regulatory framework, this violation could be considered a Level III
  - Deserving of mitigation due to:
    - Broad and comprehensive corrective actions
    - Low actual safety significance in mode where TS applied
- Due to low safety significance, this should be a Level IV

Regulatory Perspective

Under the Revised Reactor Oversight Process the following evaluation would be made:

- For HFP Large LOCA event, Phase 2 SDP result is Green
  - results in a NCV with no civil penalty

- For actual event during shutdown, PRA evaluation indicates risk significance below the threshold of 1E-5

Table 1 - Estimated Likelihood Rating for Initiating Event Occurrence During Degraded Period (taken from NuReg/CR-5499)

Row	Approx. Freq.	Example Event Type	Est. likelihood Rating		
I	>1 per 1 -10 yr	Reactor Trip Loss of Condenser	A	B	C
II	1 per 10 -10^2 yr	Loss of Offsite Power Total loss of main FW Stuck open SRV (BWR) MSLB (outside cntmt) Loss of 1 SR AC bus Loss if Instr/Cntrl Air Fire causing reactor trip	B	C	D
III	1 per 10^2 -10^3 yr	SGTR Stuck open PORV/SV RCP seal LOCA (PWR) MFLB MSLB inside PWR containment Loss of 1 SR DC bus Flood causing reactor trip	C	D	E
IV	1 per 10^3 -10^4 yr	Small LOCA Loss of all service water	D	E	F
V	1 per 10^4 -10^5 yr	Medium LOCA Large LOCA (BWR)	E	F	G
VI	<1 per 10^5 yr	Large LOCA (PWR) ISLOCA Vessel Rupture	F	G	H
			>30 days	**3-30 d**	**<3 days**
			Exposure Time for Degraded Condition		

Table 2 - Risk Significance Estimation Matrix

Initiating Event Likelihood (from Step 2.2)	Remaining Mitigation Capability (From Step 2.3)							
	1	2	3	4	5	6	7	None
	3 diverse trains OR 2 systems each with redundancy	1 train + 1 system with redundancy OR 2 diverse trains + recovery of failed train	2 diverse trains OR 1 system with redundancy + recovery of failed train	1 train + recovery of failed train OR 1 system with redundancy (automatic initiation or no time contraints)	1 train OR 1 system with redundancy (manual actuation under time constraints)	Recovery of failed train		
A		W	Y					
B			W	Y				
C				W	Y			
D					W	Y		
E						W	Y	
F							W	
G								
H								

Entergy

5.3 CHECKING VALVE POSITION (cont'd)

5.3.8 For valves with remote indicators on the RTGB or local control panels, these indicators may be used to determine actual valve position.

5.3.9 ~~The checking of a valve normally operated by reach rod or other manual remote operator, should be done locally at the valve when possible. The valve position may be checked at the remote position indication if a local check would present a safety or radiation hazard, or otherwise conflict with ALARA or if the valve is not accessible for other reasons.~~ 2

5.3.9 The checking of a remotely operated manual valve (reach rod) should be performed by observation of the post indicator pin or the dial indicator, as applicable, on the remote operator assembly. A valve will be considered properly positioned with no further verification required when the remote handwheel becomes tight or difficult to operate with the post indicator pin or dial indicator indicating the required position. For those remote operators with a post indicator pin, the pin should not be bottomed out or topped out against the valve operator pedestal.

5.3.9.1 If a valve position indicator pin bottoms out or tops out during repositioning or if a dial indicator is not indicating correctly, then perform the following: 4

5.3.9.1.1 Verify valve position by at least one of the following methods:

- Local position indication,
  or
- Computer point indication,
  or
- Verification of system parameters (flow, pressure, etc.)

5.3.9.1.2 Generate a Caution Tag for the valve and hang the tag on the remote handwheel.

5.3.9.1.3 Generate an MAI on the reach rod post indicator.

5.3.9.1.4 Generate a Work Around on the valve position verification.

5.3 CHECKING VALVE POSITION (cont'd)

5.3.8 For valves with remote indicators on the RTGB or local control panels, these indicators may be used to determine actual valve position.

At time of occurrence

5.3.9 The checking of a valve normally operated by reach rod or other manual remote operator, should be done locally at the valve when possible. The valve position may be checked at the remote position indication if a local check would present a safety or radiation hazard, or otherwise conflict with ALARA or if the valve is not accessible for other reasons. 2

5.3.10 When performing valve lineups, personnel should determine Operability of control valves by checking that:

A. Pins are removed from valve operators.

B. Air is available to pneumatically operated valves.

C. MAN-AUTO bypass levers are positioned to "AUTO".

D. All manual overrides are removed.

E. Power is available to control valve solenoids and/or motors. Power from PAC System can be verified by appropriate PAC Channel A(B)(AB)(NS) Condition Abnormal (E-2(E-3)(E-4) (D-4), Cabinet L) Annunciator clear.

5.3.11 Alternate verification techniques of valve positions may be used by the operator where specified by approved procedures or approved by the SS/CRS. Examples include:

- Use of process parameters (flow, pressure)
- Mechanical position indicators

ENCLOSURE 3

PREDECISIONAL ENFORCEMENT CONFERENCE AGENDA

CONFERENCE WITH ENTERGY OPERATIONS, INC. (EOI)

WATERFORD STEAM ELECTRIC STATION, UNIT 3

MARCH 20, 2000

NRC REGION IV, ARLINGTON, TEXAS

1.	INTRODUCTIONS & OPENING REMARKS - NRC	ELLIS MERSCHOFF REGIONAL ADMINISTRATOR
2.	ENFORCEMENT PROCESS - NRC	GARY SANBORN DIRECTOR, ALLEGATIONS AND ENFORCEMENT STAFF
3.	APPARENT VIOLATIONS & REGULATORY CONCERNS - NRC	KEN BROCKMAN DIRECTOR, DIVISION OF REACTOR PROJECTS
4.	LICENSEE PRESENTATION - EOI	CHUCK DUGGER VICE PRESIDENT, OPERATIONS
5.	NRC CAUCUS (APPROXIMATELY 10 MINUTES)	
6.	RESUMPTION OF CONFERENCE	
7.	CLOSING REMARKS - EOI	CHUCK DUGGER VICE PRESIDENT, OPERATIONS
8.	CLOSING REMARKS - NRC	ELLIS MERSCHOFF REGIONAL ADMINISTRATOR

APPARENT VIOLATIONS*

PREDECISIONAL ENFORCEMENT CONFERENCE

ENTERGY OPERATIONS, INC.

WATERFORD STEAM ELECTRIC STATION, UNIT 3

MARCH 20, 2000

**NOTE: THE APPARENT VIOLATIONS DISCUSSED AT THIS PREDECISIONAL ENFORCEMENT CONFERENCE ARE SUBJECT TO FURTHER REVIEW AND MAY BE REVISED PRIOR TO ANY RESULTING ENFORCEMENT ACTION.*

APPARENT VIOLATION

1. Technical Specification 3.5.2 requires that two independent emergency core cooling system (ECCS) subsystems be operable while in Modes 1, 2, or 3 (with pressurizer pressure greater than or equal to 1750 psia or RCS average temperature greater than or equal to 500 degrees F). Each operable ECCS subsystem is required to have an operable HPSI pump, an operable LPSI pump and an operable flowpath. One ECCS subsystem may be inoperable for 72 hours before a plant shutdown is required.

   Contrary to this requirement, from November 19 to November 27, 1999, Low Pressure Safety Injection System Train B was inoperable as a result of Valve SI-417B being in the incorrect, open, position. This condition existed for approximately 7 days, which exceeded the allowed outage time.

THIS APPARENT VIOLATION IS SUBJECT TO FURTHER REVIEW AND MAY BE REVISED

APPARENT VIOLATION

2. Technical Specification 6.8.1.a states, in part, that written procedures shall be established, implemented, and maintained covering the applicable procedures recommended in Appendix A of Regulatory Guide 1.33, Revision 2, dated February 1978.

   Regulatory Guide 1.33, Appendix A, Item 3.d, states, in part, that instructions for startup, shutdown, and changing modes of operation should be prepared for the emergency core cooling system.

   Procedure OP-009-008, "Safety Injection System," Revision 15, Section 8.7, requires, in part, that Valve SI-417B be shut after completion of the evolution to recirculate water in the RWSP using the LPSI pump. Attachment 11.1 of this same procedure requires, in part, that the required position for Valve SI-417B is locked closed.

   Contrary to the above, on November 19, 1999, operators failed to place Valve SI-417B in the locked closed position after they had completed recirculating the refueling water storage pool using Low Pressure Safety Injection Pump B. As a result, on November 27, 1999, as operators were placing shutdown cooling in service, approximately 5000 gallons of reactor coolant was inadvertently transferred from the reactor coolant system to the refueling water storage pool, causing a rapid a loss of level in the pressurizer and a partial depressurization of the reactor coolant system.

THIS APPARENT VIOLATION IS SUBJECT TO FURTHER REVIEW AND MAY BE REVISED