May 21, 1997

LICENSEE: Duke Power Company

FACILITY: Oconee Nuclear Station, Units 1, 2, and 3

SUBJECT: SUMMARY OF THE MAY 14, 1997 MEETING ON THE HIGH PRESSURE INJECTION SYSTEM (TAC NO. M98454)

On May 14, 1997, personnel from the Office for Analysis and Evaluation of Operational Data, Region II, Office of the Executive Director for Operations, and the Office of Nuclear Reactor Regulation met at NRC Headquarters in Rockville, Maryland, with representatives of the Duke Power Company (DPC) management and engineering staffs to discuss technical information related to the High Pressure Injection (HPI) System weld crack, thermal sleeves, Letdown Storage Tank level control and design, system operation, etc., that has been the subject of the recent shut down of Units 2 and 3, and evaluations for continued operation of Unit 1. Enclosure 1 is a list of the individuals who attended the meeting and Enclosure 2 is the handout material that was supplied by DPC.

The topics discussed included the current status of Units 1, 2, and 3; overview history and sequence of events; root cause; corrective actions; technical discussions on nozzles and HPI pumps; and restart issues related to the weld crack issue on Unit 2. Additional topics included a discussion of the loss of HPI pump suction on Unit 3, sequence of events, root cause, contributing factors and observations, and short and long-term corrective actions.

ORIGINAL SIGNED BY:

David E. LaBarge, Senior Project Manager
Project Directorate II-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket Nos. 50-269, 50-270, and 50-287

Enclosures: 1. Attendance List
2. DPC Handout

cc w/encls: See next page

Hard Copy	E-Mail		
Docket File	SCollins/FMiraglia	CCasto, RII	SNewberry
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OFFICE	PM:PDII-2	LA:PDII-2	D:PDII-2			
NAME	DLaBarge:cn	LBerry	HBerkow			
DATE	5/20/97	5/20/97	5/20/97	/97	/97	/97

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

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Units 1, 2, and 3

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ATTENDEES
MEETING WITH DUKE POWER COMPANY
TO DISCUSS RECENT HPI PROBLEMS
MAY 14, 1997

NAME	ORGANIZATION
Chuck Hsu	NRC/AEOD/SPD/RAB
Clay A. Little	Duke/Oconee/Engr/Elect.
Bill McAlister	Duke/Oconee/Maintenance
Duncan Brewer	Duke/General Office/PRA
Edward H. Girard	NRC/Region II/Div. of Reactor Safety
C. B. Cheezem	Duke/NDE
Steve Nader	Duke/Oconee/Mech Systems Engineering
Tim Brown	Duke/Oconee/Mechanical-Civil Engineering/Stress Analysis
Tony McConnell	Duke/Nuclear General Office
Lanny Wilkie	Duke/Oconee/Mod Engineering
Craig Tompkins	Duke/Oconee/Mech./Civil Engineering
David B. Coyle	Duke/Oconee/Mech. Systems
Dave Nix	Duke/Oconee/Reg Compliance
Bill Foster	Duke/Oconee/Safety Assurance
Jack Strosnider	NRC/NRR/DE/EMCB
Tom McLellan	NRC/NRR/DE/ECGB
Nick Fields	NRC/NRR/PECB
Gus Lainas	NRC/NRR/DE
Scott Newberry	NRC/NRR/DSSA
Jim Lyons	NRC/NRR/DSSA/SRXB
Christopher Jackson	NRC/NRR/DSSA/SRXB
Mohammed Shuaibi	NRR/DSSA/SRXB
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Joe M. Davis	Duke/Oconee/Engineering
D. LaBarge	NRC/NRR/DRPE
Brian Sheron	NRC/NRR/DE
Dick Wessman	NRC/NRR/DE
Kamal Manoly	NRC/DE/EMEB
Keith Wichman	NRC/DE/EMCB
Barry J. Elliot	NRC/DE/EMCB
I. Ahmed	NRC/DRCH/HICB
P. Ambros	NRC/Events Assessment
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Kevin Redmond	Duke/Met Lab
Bret Boman	Framatome Technologies
Ken Yoon	Framatome Technologies
Ronnie Lingle	Duke/Oconee/Operations
Louise Lund	NRC/RES/DE/EMEB
Art Deardorff	Structural Integrity Assoc. (w/Duke Power)
George L. Lehmann	GPU Nuclear

Enclosure 1

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James J. McArdle	Duke/NDE
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Robert Hermann	NRC/DE/EMCB
Paul Newton	Duke/Nuclear General Office
Mark Hartzman	NRC/DE/EMEB
Ed Goodwin	NRC/DRPM/PECB
Dan O'Neal	NRC/DSSA/SPSB
Simon Sheng	NRC/NRR/EMCB
B. L. Peele	Duke/Oconee

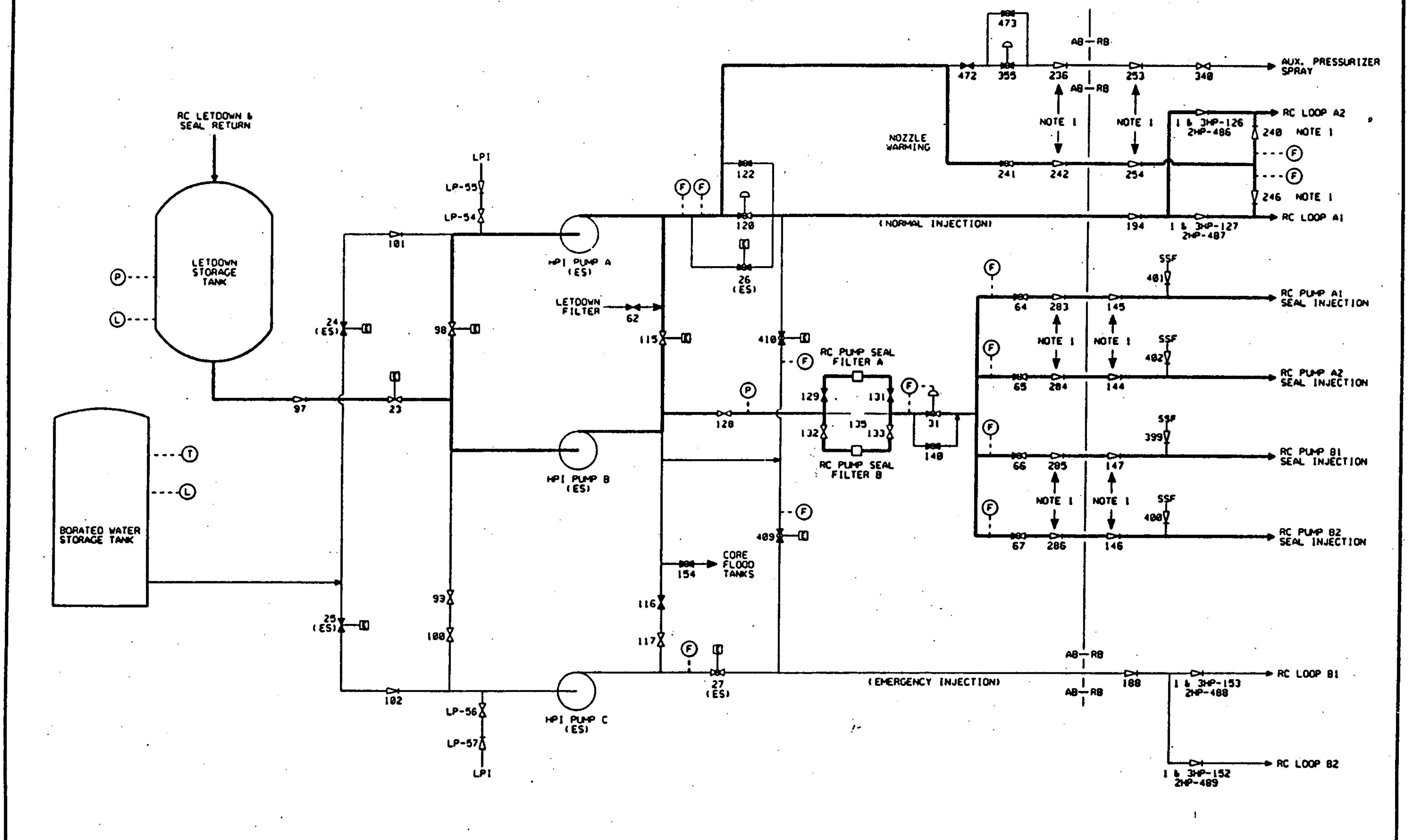
DUKE POWER COMPANY

HANDOUTS

MAY 14, 1997

Enclosure 2

DG. NO. OSFD-101A-1



NOTES:

1. CONTAINMENT ISOLATION STOP CHECK VALVES MAY REPRESENT CHECK/GLOBE VALVE COMBINATIONS. LISTEJ VALVE NUMBERS MAY APPLY TO GLOBE VALVE. SEE OFD FOR FURTHER DETAILS.

TYPICAL FOR UNITS 1, 2, & 3.
ALL VALVES "HP" EXCEPT AS NOTED.

LEGEND

- SHUTOFF VALVE
- FLOW CONTROL VALVE
- CHECK VALVE (ALL TYPES)
- RELIEF VALVE
- NORMALLY OPEN
- NORMALLY CLOSED
- NORMALLY THROTTLED
- F-FLOW
- L-LEVEL
- P-PRESSURE
- T-TEMPERATURE
- E-ELECTRIC
- H-HYDRAULIC
- P-PISTON (PNEUMATIC)
- S-SOLENOID
- DIAPHRAGM (PNEUMATIC)
- (ES)-RECEIVES ENGINEERED SAFEGUARD SIGNAL

ERN:OX001I7Y

THIS DRAWING IS A SUMMARY FLOW DIAGRAM. FOR COMPLETE SYSTEM DESIGN INFORMATION REFER TO FLOW DIAGRAMS LISTED BELOW

OFD-101A-1.2, 2.2, 3.2 LETDOWN STORAGE TANK
OFD-101A-1.3, 2.3, 3.3 HPI PUMPS
OFD-101A-1.4, 2.4, 3.4 HPI TO RC SYSTEM
OFD-101A-1.5, 2.5, 3.5 SSF PORTION
OFD-102A-1.1, 2.1, 3.1 BWST & LPI
OFD-100A-1.1, 2.1, 3.1 REACTOR COOLANT SYSTEM
OFD-100A-1.3, 2.3, 3.3 REACTOR COOLANT PUMPS

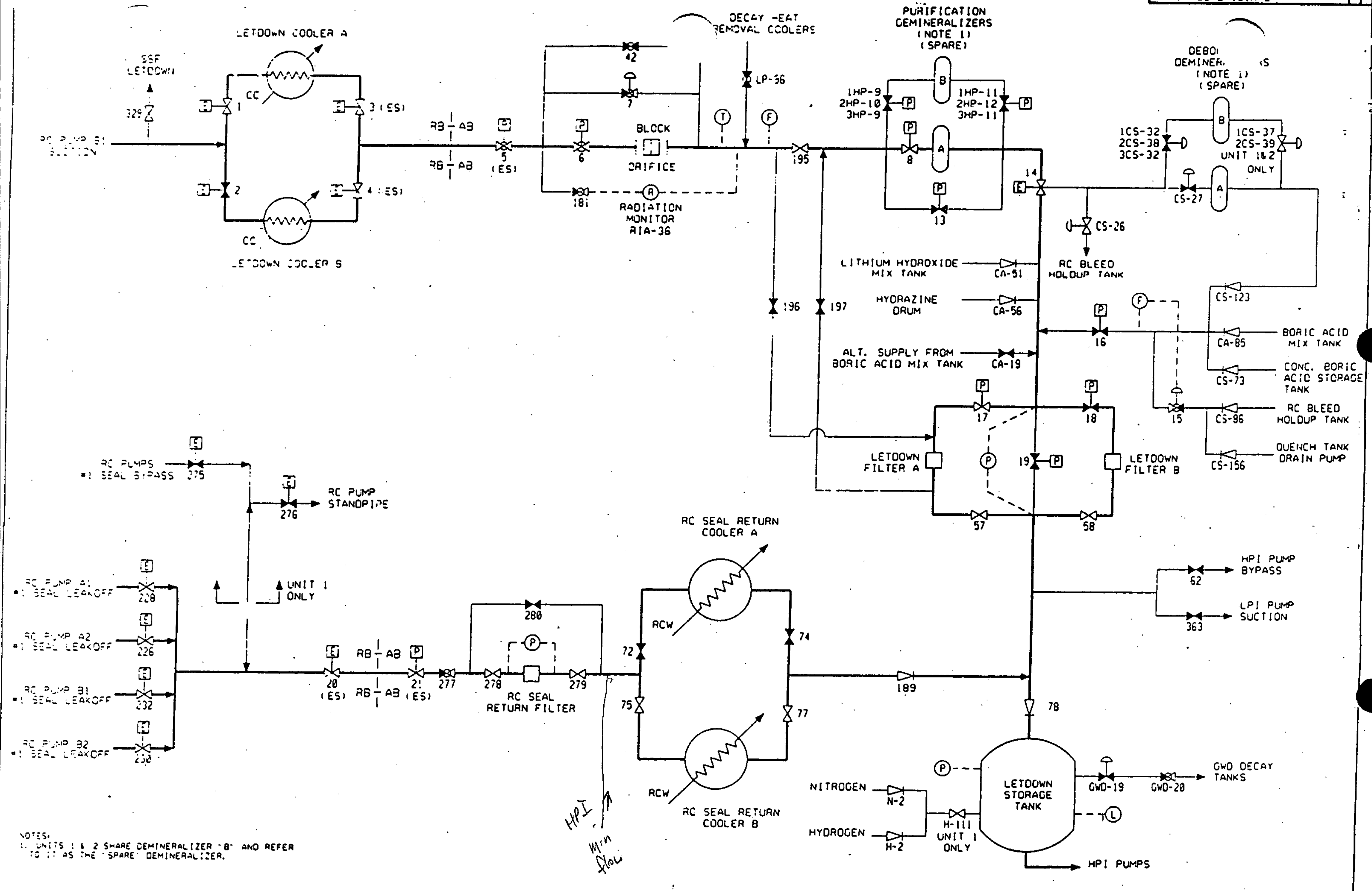
NO.	REVISIONS	DRN	DATE	CHKD	DATE	APPR	DATE
5	PER OE-9502 & OE-9591	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	AS-BUILT PER NSM ON-22975/00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	REV. PER AS-BUILT CONDITIONS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	REDRAWN ON ACAD & MINOR CORRECTIONS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	REVISED PER NSM ON-2004, IHP.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-	DATE: 11-6-87, 4-25-88, EDC 10	---	---	---	---	---	---
ORIG	RELEASED FOR INFORMATION	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

DUKE POWER COMPANY
OCONEE NUCLEAR STATION

SUMMARY FLOW DIAGRAM OF HIGH PRESSURE INJECTION SYSTEM (INJECTION PORTION)

DG. NO. OSFD-101A-1

Enclosure 2



NOTES:
1. UNITS 1 & 2 SHARE DEMINERALIZER "B" AND REFER TO IT AS THE "SPARE" DEMINERALIZER.

ERN: OX001177

TYPICAL FOR UNITS 1, 2, 3
ALL VALVES "HP" EXCEPT AS NOTED.

LEGEND

- SHUTOFF VALVE
- FLOW CONTROL VALVE
- CHECK VALVE (ALL TYPES)
- RELIEF VALVE
- NORMALLY OPEN
- NORMALLY CLOSED
- NORMALLY THROTTLED
- E-ELECTRIC
- H-HYDRAULIC
- P-PISTON (PNEUMATIC)
- S-SOLENOID
- DIAPHRAGM (PNEUMATIC)
- F-FLOW
- L-LEVEL
- P-PRESSURE
- T-TEMPERATURE
- (ES)-RECEIVES ENGINEERED SAFEGUARD SIGNAL

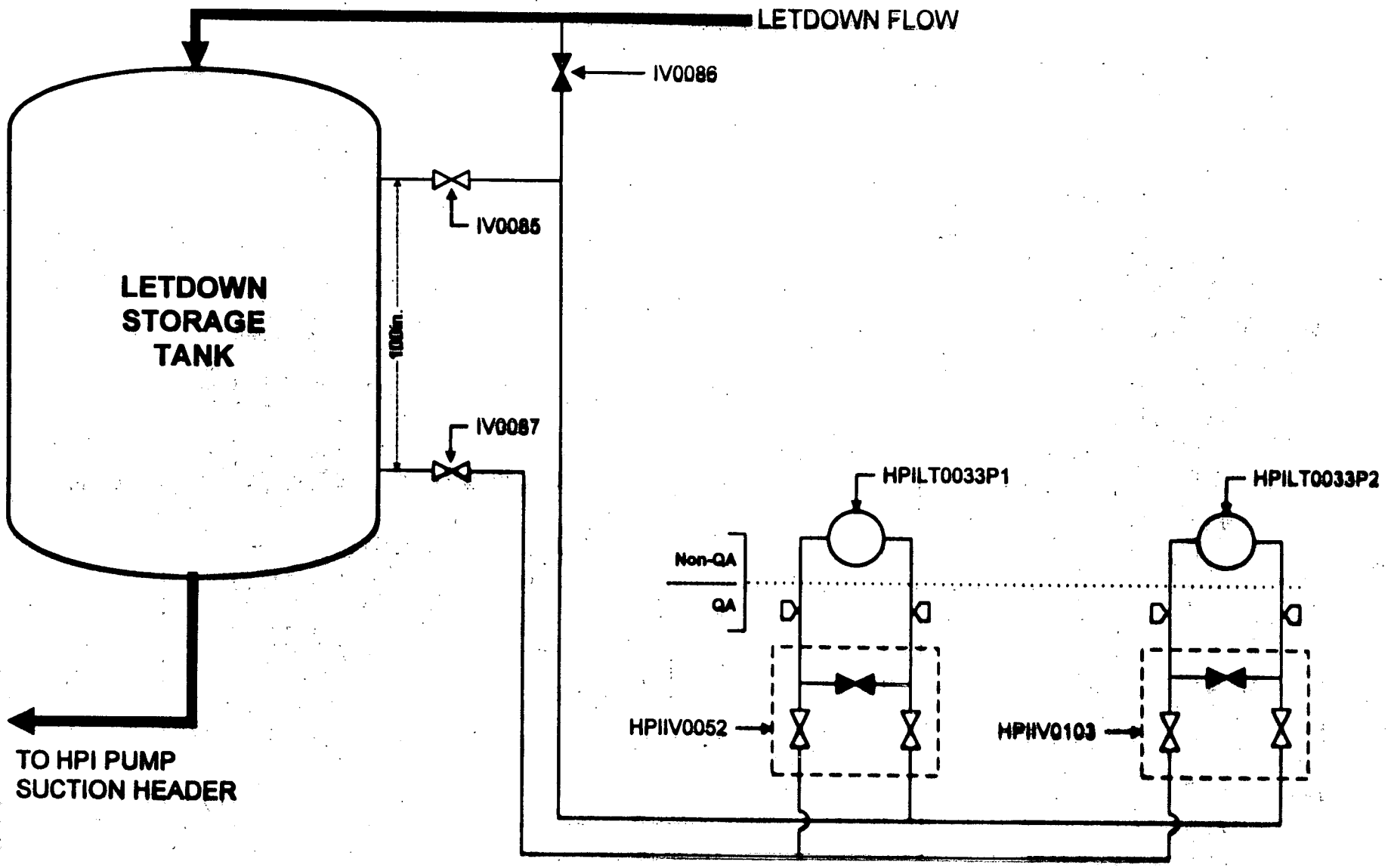
THIS DRAWING IS A SUMMARY FLOW DIAGRAM. FOR COMPLETE SYSTEM DESIGN INFORMATION REFER TO FLOW DIAGRAMS LISTED BELOW.

OFD-100A-1.1, 2.1, 3.1	REACTOR COOLANT SYSTEM
OFD-100A-1.3, 2.3, 3.3	REACTOR COOLANT PUMPS
OFD-101A-1.1, 2.1, 3.1	LETDOWN & RC SEAL RETURN COOLERS
OFD-101A-1.2, 2.2, 3.2	LETDOWN FILTERS & STORAGE TANK
OFD-101A-1.3, 2.3, 3.3	HPI PUMPS
OFD-101A-1.5, 2.5, 3.5	SSF PORTION
OFD-109A-1.1, 2.1, 3.1	PURIFICATION DEMINERALIZERS
OFD-109A-1.2, 2.2, 3.2	DEBORATING DEMINERALIZERS

NO.	REVISIONS
1	REV. PER NSM ON-22939/00
ORIG	ORIGINAL DRAWING RETIRED

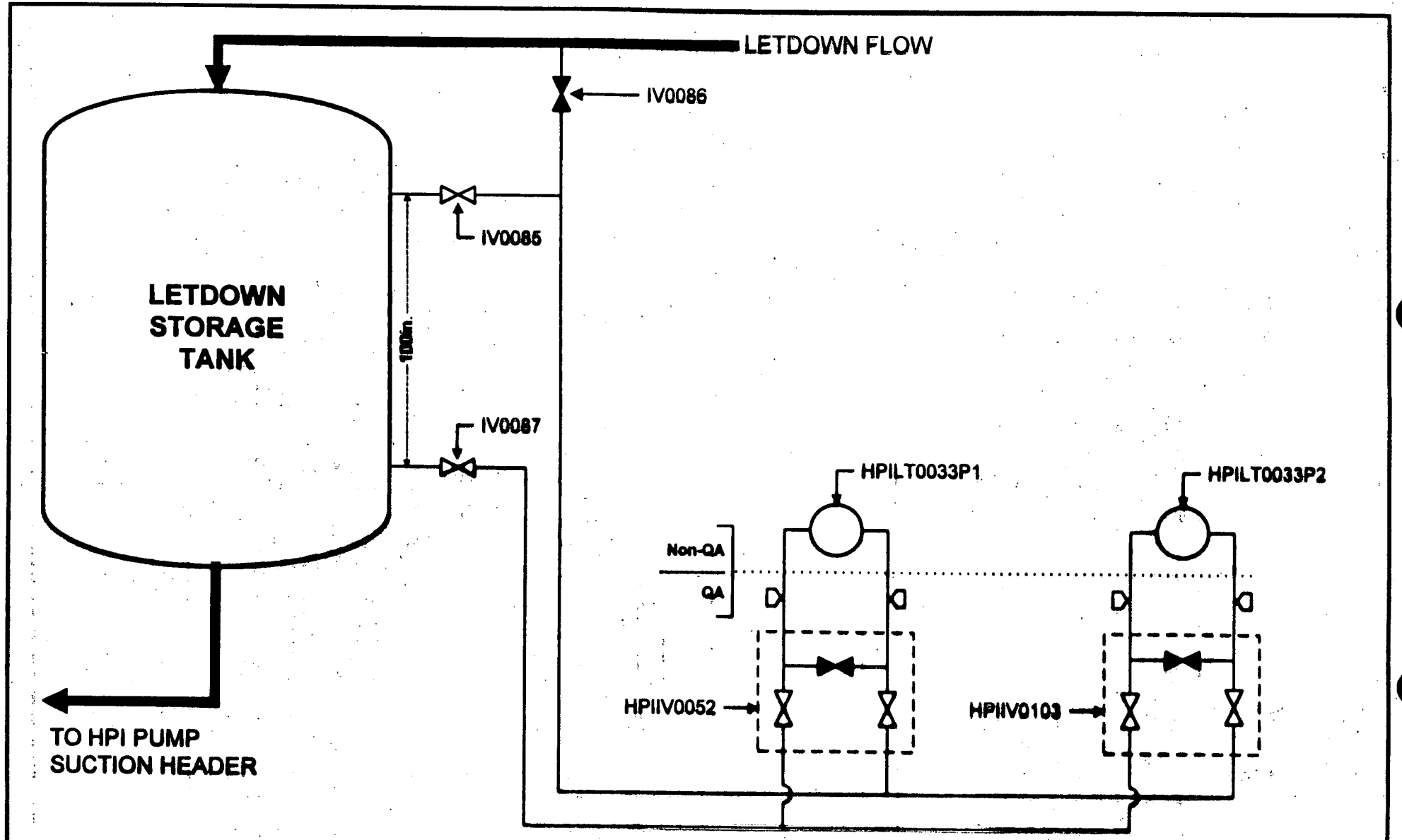
DUKE POWER COMPANY
OCONEE NUCLEAR STATION
SUMMARY FLOW DIAGRAM OF HIGH PRESSURE INJECTION SYSTEM (LETDOWN & SEAL RETURN)

DWG. NO. OSFD-101A-2 REV. 1



NOTE:
SKETCH FOR INFORMATION ONLY

OCONEE NUCLEAR STATION - UNITS 1, 2, & 3		
LETDOWN STORAGE TANK LEVEL INSTRUMENTATION SKETCH		
MAY 12, 1997	FILE: LDSTSKCH.VSD SHEET 1 OF 1	REV. 0



NOTE:
SKETCH FOR INFORMATION ONLY

OCONEE NUCLEAR STATION - UNITS 1, 2, & 3		
LETDOWN STORAGE TANK LEVEL INSTRUMENTATION SKETCH		
MAY 12, 1997	FILE: LDSTSKCH.VSD SHEET 1 OF 1	REV. 0

Oconee Nuclear Station Technical Interface Meeting with NRR

NRC/Duke Meeting

May 14, 1997

Agenda

- Current Plant Status - Joe Davis
- RCS Leak - Joe Davis
  - » Overview, History, and Sequence of Events
  - » Root Cause
  - » Corrective Actions
- Loss of Suction to two HPI Pumps - Jack Peele
  - » Overview and Sequence of Events
  - » Root Cause
  - » Corrective Actions
- Technical Discussion on Nozzles
- Technical Discussion on HPI Pumps
- Clarify Restart Issues - Jack Peele

3

Current Plant Status

- Unit 2:
  - » Progressing toward hot shutdown
  - » 2A1 RCS safe end, thermal sleeve, and pipe to 1st valve replaced
  - » Other HPI nozzle components examined and found acceptable
  - » Significant portions of root cause for RCS leak complete
  - » Monitoring equipment on HPI lines installed
  - » LDST instrumentation modifications complete

4

Current Plant Status

- Unit 3:
  - » Cold Shutdown
  - » 3A1 RCS safe end, thermal sleeve, and pipe to 1st valve being replaced
  - » Examination of HPI nozzle components in complete
  - » Repairs of HPI pumps in progress
  - » LDST modifications in progress
  - » Significant portions of investigation of root cause of loss of suction to HPI pumps complete
  - » SEIT complete and AIT exited on 5/9
- Unit 1:
  - » Operating at 100% Full Power

5

RCS Leak

- System Overview
  - » HPI System serves as high pressure makeup system to RCS
  - » HPI System has two normal and two emergency makeup paths
  - » HPI System interfaces with RCS piping via nozzle components
  - » Nozzle and safe end protected from thermal gradients by thermal sleeve

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RCS Leak

- History of Nozzle Component Failures
  - » Safe end to pipe weld and thermal sleeve failed resulting in RCS leak at Crystal River Plant in early 1982
  - » BWOG issued report in late 1982 with recommendations to owners regarding HPI nozzle components
  - » BWOG report generally recommended:
    - – Inspect and repair/re-roll/replace damaged nozzle components
    - – Implement an augmented ISI plan for nozzle components
    - – Perform analysis on improved designs
  - » Oconee committed to recommendations of BWOG report
  - » NRC endorsed recommendations of BWOG in GL 85-20

7

RCS Leak

- Oconee Actions per BWOG Report:
  - » Actions taken on HPI nozzle components for Units 2 and 3 prior to 1985:
    - 2A2, 3A2: Installed new safe end and thermal sleeve
    - 2B2: Replaced existing thermal sleeve with new design
    - 2A1, 3A1, 3B2: Left as originally installed
    - 2B1, 3B1: Rerolled original thermal sleeve

8

RCS Leak

- Oconee Actions per BWOG Report:
  - » Placed general augmented examination requirements for HPI nozzle components in ASME Section XI ISI Plan per GL 85-20
  - » Performed augmented examinations 1983-1996

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RCS Leak

- Oconee Actions per BWOG Report:
  - » Performed augmented examinations:
    - – 1996 results on Unit 2:
      - 2A1 - thermal sleeve gap degrading
      - 2A2, 2B1, 2B2 - no thermal sleeve gap degradation
    - – 1996 results on Unit 3:
      - 3A1 - thermal sleeve gap degrading
        - » 1984-1985- observed gap degradation
        - » 1989-1996-observed gap degradation
      - 3A2, 3B1, 3B2 - no thermal sleeve gap degradation
    - – Failed to recognize indications of thermal sleeve gap degradation on A1 nozzles

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RCS Leak

- Sequence of Events

Time	Event
4/21/97 2245	Reactor Operator (RO) receives indications of a Reactor Coolant System (RCS) leak. Calculated RCS leakage ~ 1gpm
4/21/97 2337	RCS leakage exceeded Technical Specification Limits for unidentified RCS leakage.
4/22/97 0200	Calculated RCS leakage ~ 2.8 gpm
4/22/97 0215	Reactor Building entry to investigate leak source. Unable to determine exact source of RCS leak.

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RCS Leak

- Sequence of Events

Time	Event
4/22/97 0352	Commenced Reactor Shutdown due to RCS leakage.
4/22/97 1300	Initiated FIP investigation.
4/22/97 1600	Declared Unusual Event on Unit 2 due to RCS leakage in excess of 10 gpm. Unit shutdown/cooldown in progress.
4/23/97 0547	Reactor Building entry determines source of leak from a crack in HPI 2A1 injection line on safe end to pipe weld.

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RCS Leak

- Findings:
  - » A leak occurred in the pipe to safe end connection weld at the 2A1 HPI nozzle
  - » Crack in weld was circumferential, with a portion being through-wall
  - » Crack propagated slowly
  - » Details of crack described in JCO for Unit 1

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RCS Leak

- Root Cause(s)
  - » Ineffective examination program for HPI nozzle components
    - – Inadequate examination procedures
    - – Unclear acceptance criteria
  - » Related finding:
    - – Examination commitments inadequately controlled by the ISI program

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RCS Leak

- Failure Mechanisms
  - » High cycle low / stress thermal fatigue initiated failure in weld
  - » Flow induced vibration contributed to thermal sleeve failure after loosening

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RCS Leak

- Completed Corrective Actions:
  - » Replaced thermal sleeve and safe end with new design for 2A1 HPI normal injection line
  - » Examined other Unit 2 HPI nozzle components
  - » Shut down Unit 3 to examine nozzle components
  - » Replacing thermal sleeve and safe end with new design for 3A1 HPI normal injection line
  - » Installed temporary instrumentation for monitoring of Unit 2 nozzles

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RCS Leak

- Completed Corrective Actions (Continued)
  - » Heightened awareness to RCS leakage rate on Unit 1
  - » All NRC commitments reviewed to identify all augmented inspection requirements
  - » Verified adequacy of most recent NRC-required augmented inpsection

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RCS Leak

- Long Term Corrective Actions
  - » Shut down Unit 1 and perform appropriate examinations
  - » Evaluate warming line flow to reduce effects of thermal stress
  - » Review of Operations procedures to minimize HPI nozzle component thermal stress and fatigue

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RCS Leak

- Long Term Corrective Actions
  - » Improve nozzle component examination program
    - – Adjust frequency of examination program
    - – Develop tracking system for augmented examinations
    - – Develop specific examination procedures for augmented examinations
    - – Improvements complete by September 1997 refueling outage

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RCS Leak

- Summary
  - » Unit 2 weld failed due to thermal fatigue
  - » Thoroughly investigated the event
  - » Reviewed augmented examinations
  - » Augmented examination program improvements will assure integrity of the system is maintained
  - » Instrumented injection lines will aid in understanding of thermal phenomena

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RCS Leak

- Unit 1 JCO Summary
  - » Makeup flow through thermal sleeves is higher than other units
  - » Maintaining increased makeup flow rate
  - » Thermal sleeve is of different design than other units
  - » No indications of loose sleeves in exams completed

RCS Leak

- Unit 1 JCO Summary (continued)
  - » Administrative measures in place to minimize thermal cycles introduced by variations in makeup flow
  - » Increased level of attention to RCS leakage monitoring has been established
  - » Leak before break analyses demonstrate that there is a high level of confidence that the plant can be safely shut down if a leak occurs

Loss of Suction to HPI Pumps

- Agenda
  - » Brief System Description
  - » Sequence of Events
  - » Root Causes
  - » Contributing Factors and Observations
  - » Corrective Actions Complete
  - » Corrective Actions prior to Restart
  - » Long Term Corrective Actions
  - » Summary

3

Loss of Suction to HPI Pumps

- Initial Conditions
  - » Unit 3 being shut down to investigate HPI nozzle components
  - » Decay Heat Removal (3C LPI Pump) in service
  - » Approaching end of Unit 3 cooldown, lost suction to 3A and 3B HPI pumps

4

Loss of Suction to HPI Pumps

- System Description
  - » 3 HPI Pumps, 300 gpm at 3,100 psig
  - » Provides normal makeup and seal injection from LDST
  - » Provides emergency makeup from BWST
  - » Normal Operation is one pump on, one in standby
  - » Standby pump auto starts on low seal injection flow or after some loss of power scenarios
  - » All three pumps start on ES signal
  - » LDST level and pressure manually controlled in band
  - » LDST level instrumentation not used for accident mitigation

5

Loss of Suction to HPI Pumps

- Sequence of Events

Time	Event
(Initial Conditions)	Unit 3 shut down, cool down in progress, 3B HPI pump in RUN, 3A HPI pump in STBY, RCS< 250 F / 300 psig.
5/3/97 0700-0745	RCS cooldown. Indicated LDST level decreases, indicated pressurizer level decreases
5/3/97 0745-0912	RCS cooldown. Indicated LDST level constant, indicated pressurizer level decreases
5/3/97 0913	Low HPI pump discharge pressure alarm
5/3/97 0915	3A HPI pump auto starts (low seal injection flow) and runs intermittently for 17 minutes

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Loss of Suction to HPI Pumps

- Sequence of Events

Time	Event
5/3/97 0917	3B HPI pump secured. 3A HPI pump continues to run.
5/3/97 0921	Opened HP-24 (BWST supply).
5/3/97 0928	Closed HP-24.
5/3/97 0932	3A HPI pump secured. Operators make up to LDST to indicated level of 92". Letdown from RCS isolated. Entered AP for Loss of HPI Makeup.
5/3/97 ~1030	Completed AP for Loss of HPI Makeup. Unit status: RCP running, LPI pump in decay heat removal mode, letdown isolated. Began development of procedure to use 3C HPI pump for RCS makeup.

7

Loss of Suction to HPI Pumps

- Sequence of Events

Time	Event
5/3/97 ~1030	Site VP requests SEIT Team investigation. FIP investigation initiated.
5/3/97 1504	Unusual Event declared.
5/3/97 1515	LDST level instrument reference leg discovered to be empty by I&E. I&E entered procedure to recalibrate instrument and refill reference leg.
5/3/97 1547	NRC notified of event.

8

Loss of Suction to HPI Pumps

- Sequence of Events

Time	Event
5/4/97 1030	Contingency plan for Unit 3 shutdown using 3C HPI pump, and backup contingency plan for using no HPI pumps completed and approved.
5/4/97 1124	Unit 3 cooldown commenced using 3C HPI pump for makeup.
5/5/97 1943	Status: Unit 3 cooldown essentially complete. 3C HPI pump secured.
5/5/97 1946	Secured Unusual Event.
5/5/97 2135	HPI system realigned

9

Loss of Suction to HPI Pumps

- Root Cause of Event:
  - » Design weakness of a common reference leg for LDST level instruments combined with a leaking instrument fitting that resulted in inaccurate LDST level indication
  - » Failure of Control Room team to properly monitor and detect the inaccurate level indications given the existing plant conditions.
- Contributing Cause:
  - » Failure to adequately apply available operating experience

10

Loss of Suction to HPI Pumps

- Cause of Fitting Leak:
  - » Scratches on seating surfaces
  - » Over torquing cap

11

Loss of Suction to HPI Pumps

- Other Issues:
  - » Procedure Problems
    - – Usefulness of AP
    - – Inventory Guidance during Cooldown
    - – Coverage during Contingency Planning
    - – 3C HPI pump procedure omission
  - » Modification Selection

12

Loss of Suction to HPI Pumps

- Other Issues continued:
  - » Configuration and Labeling of Root Valves
  - » Operator Training
  - » Mixed Vendor Fittings / Calibration Practices
  - » Philosophy on Abnormal Procedure Use / Knowledge vs. Rule Based

13

Loss of Suction to HPI Pumps

- Completed Corrective Actions:
  - » Initiated Detailed (FIP) and General (SEIT) event investigation teams
  - » Activated support organizations (OSC, TSC) as necessary to assist plant recovery
  - » Recalibrated and refilled reference leg on LDST level instrument
  - » Re-established operable HPI makeup path
  - » Completed Unit 3 cooldown and depressurization
  - » Revised Unit 1 HP to include 1HP-5 closure

14

Loss of Suction to HPI Pumps

- Completed Corrective Actions:
  - » Completed FIP and SEIT investigations
  - » Established heightened awareness of monitoring of Control Room instrumentation
  - » For Unit 1, verify LDST reference leg weekly; check reference leg tubing fittings for leaks each shift
  - » Reported Unit 3 HPI system past inoperability

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Loss of Suction to HPI Pumps

- Corrective Actions Prior to Restart:
  - » Perform Modifications on Units 2 and 3 to:
    - – add separate reference legs for LDST level transmitters
    - – add a redundant LDST pressure transmitter
  - » Repair, inspect, flush, and test Unit 3 HPI system as required
  - » Assess applicability of this event to other tank level instruments
  - » Short-term Operations training on this event, and on LDST modifications
  - » Improve Abnormal Procedure on Loss of HPI makeup

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Loss of Suction to HPI Pumps

- Long Term Corrective Actions:
  - » Perform modifications on Unit 1 to:
    - – add separate reference legs for LDST level transmitters
    - – add a redundant LDST pressure transmitter
  - » Review and benchmark applicable procedures and make necessary improvements
  - » Review modification selection process to assure proper prioritization in light of this event
  - » Operator simulator training on loss of LDST level

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Loss of Suction to HPI Pumps

- Long Term Corrective Actions:
  - » Improve foreign material and damage inspection work practices for tubing caps and fittings
  - » Modify work practices and develop action plans for addressing "mixed" fittings
  - » Expand our root valve position verification program to include critical root valves outside containment where position is not self-revealing
  - » Examine removed 3A and 3B HPI pumps
  - » Perform root cause of failure to adequately apply OE

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Loss of Suction to HPI Pumps

- Operating Experience Program
  - » Prior to 1986:
    - – OEP managed at each site
    - – NRC documents administered by NGO
  - » 1986:
    - – OEP coordinators centralized at NGO to gather, assess, and disseminate operating experience

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Loss of Suction to HPI Pumps

- Operating Experience Program
  - » 1994 and later:
    - Dedicated staffing with operational focus to provide daily screening of operating experience
    - Significant item ownership and monitoring
    - Corrective actions assigned where appropriate
    - Significant items tracked to completion by owner
    - OEP database available to site personnel by PC
    - Corrective action program requires OE review of appropriate items
    - Daily OE updates to NGD
    - Daily OE reviews by sitemanagement

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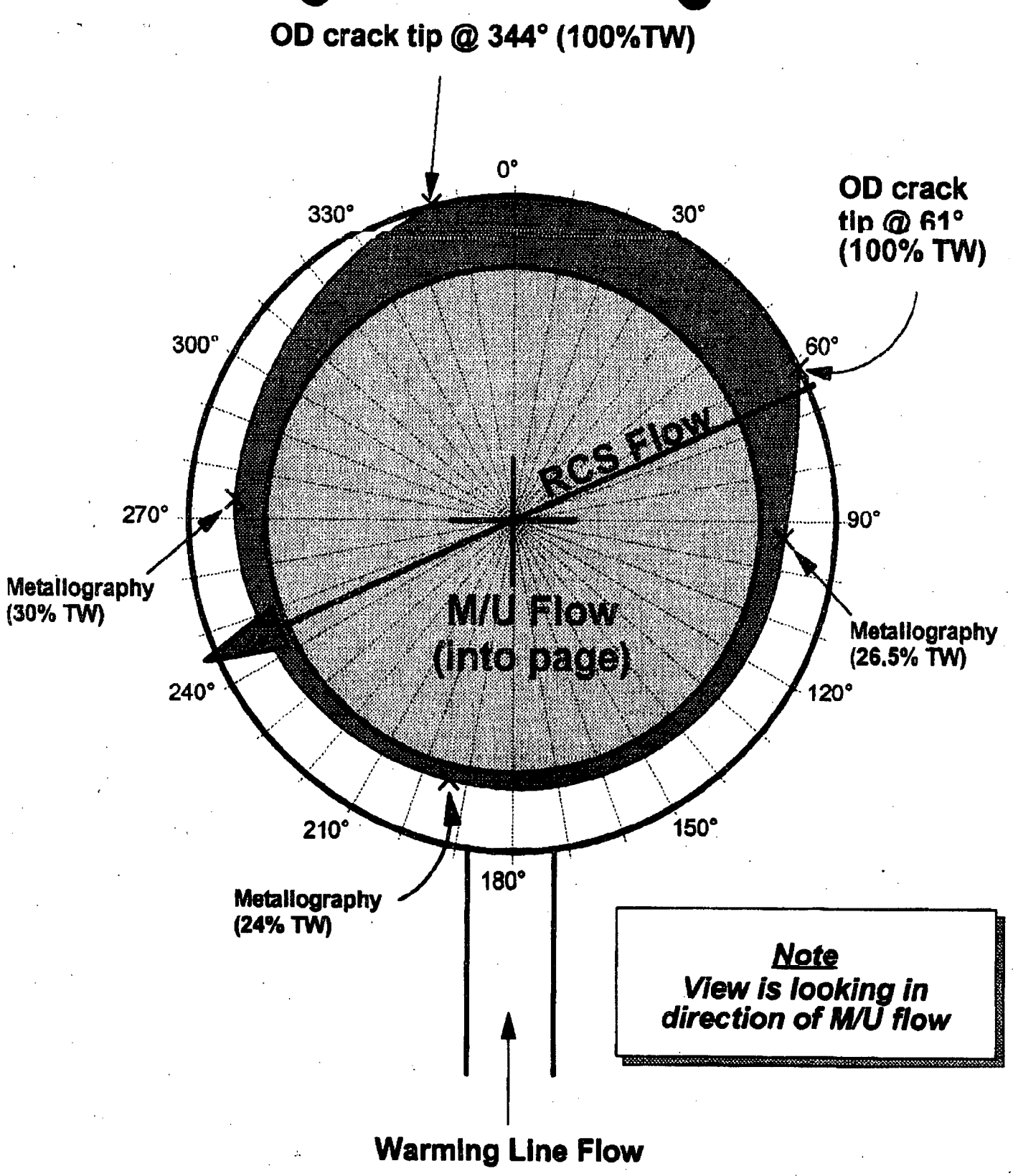
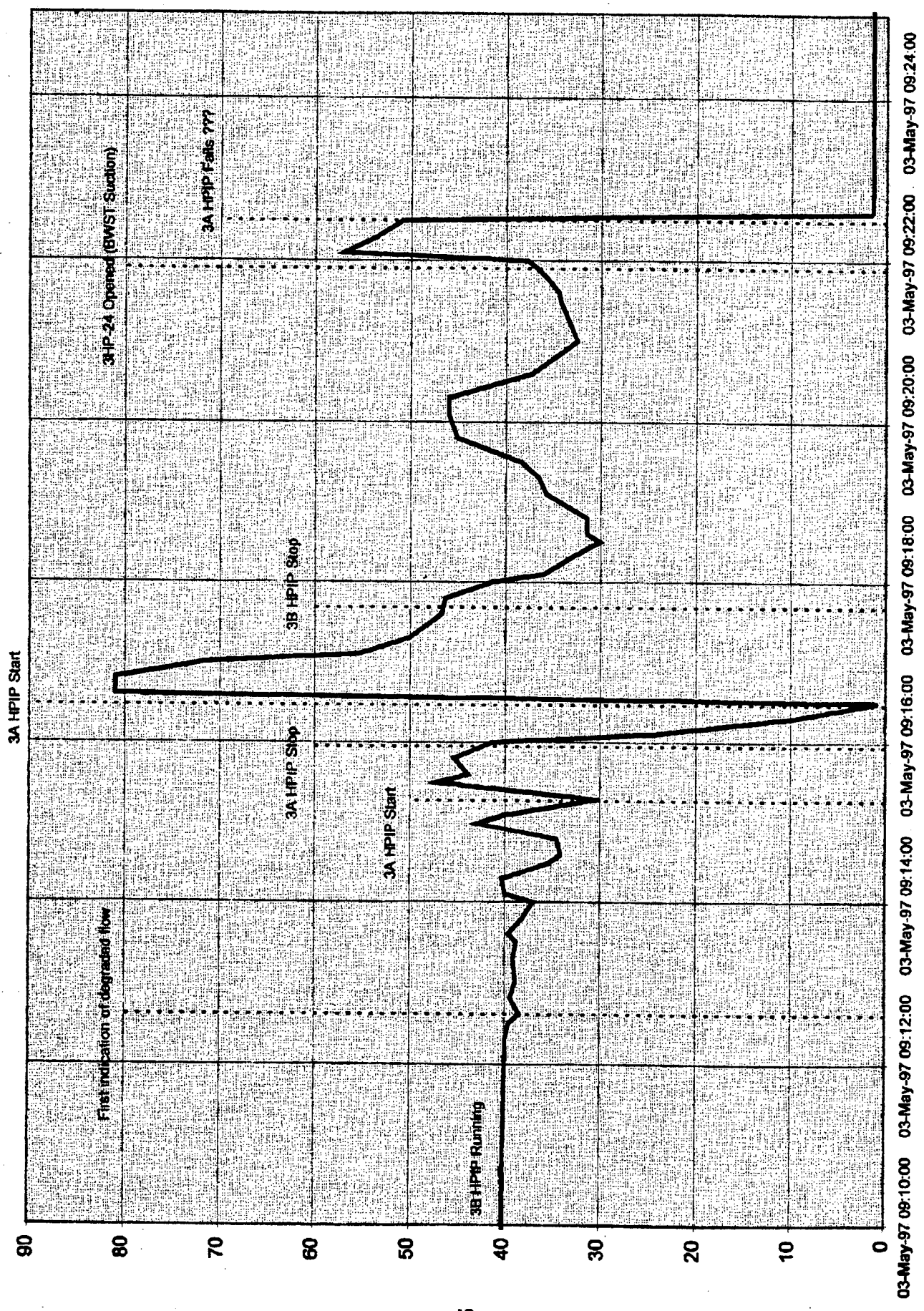
Loss of Suction to HPI Pumps

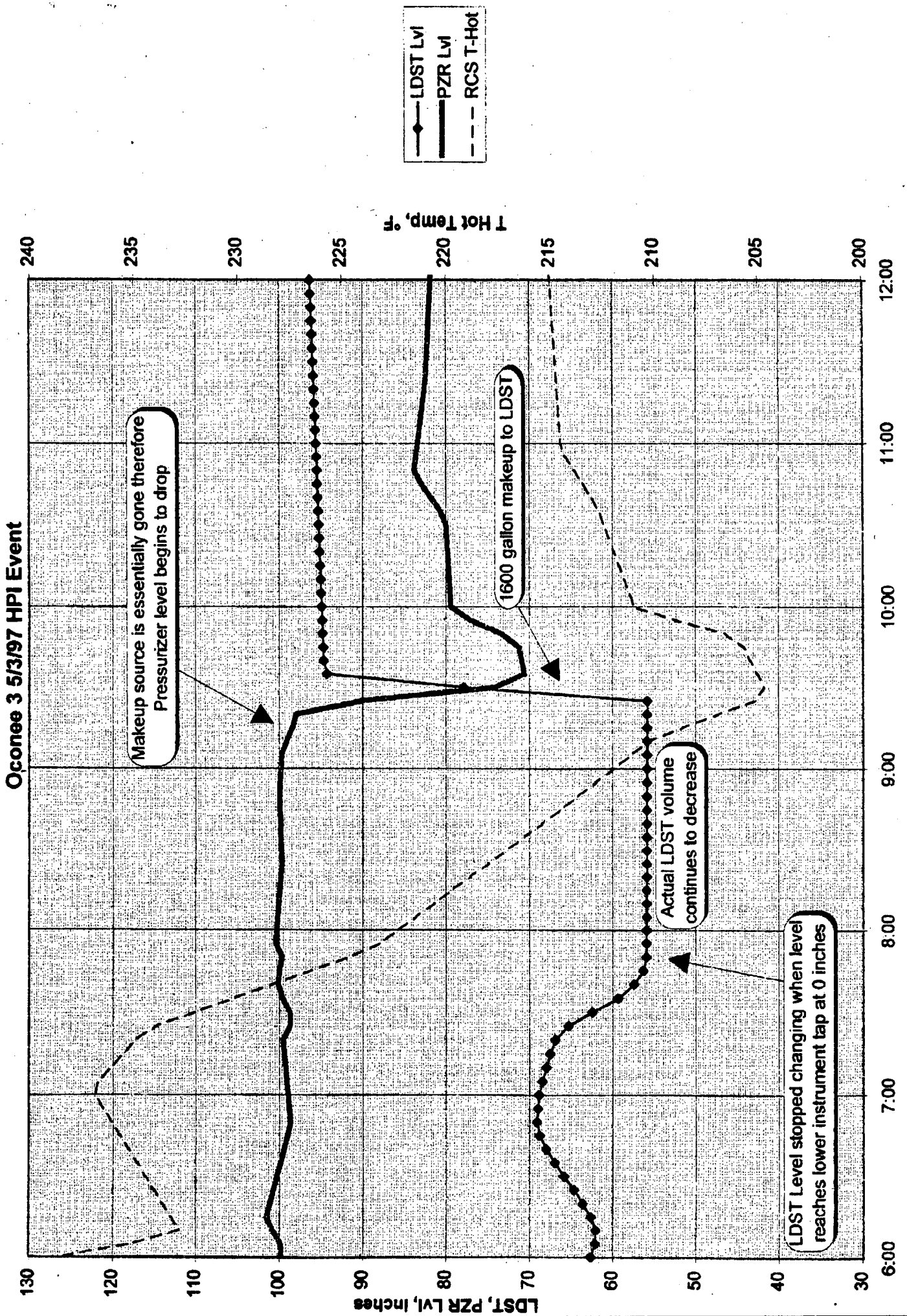
- Summary:
  - » HPI pumps failed due to loss of suction
  - » Thorough investigations completed, root cause well understood
  - » Corrective actions are comprehensive:
    - Address all three units
    - Address other similar instrumentation
    - Focused on prevention of recurrence

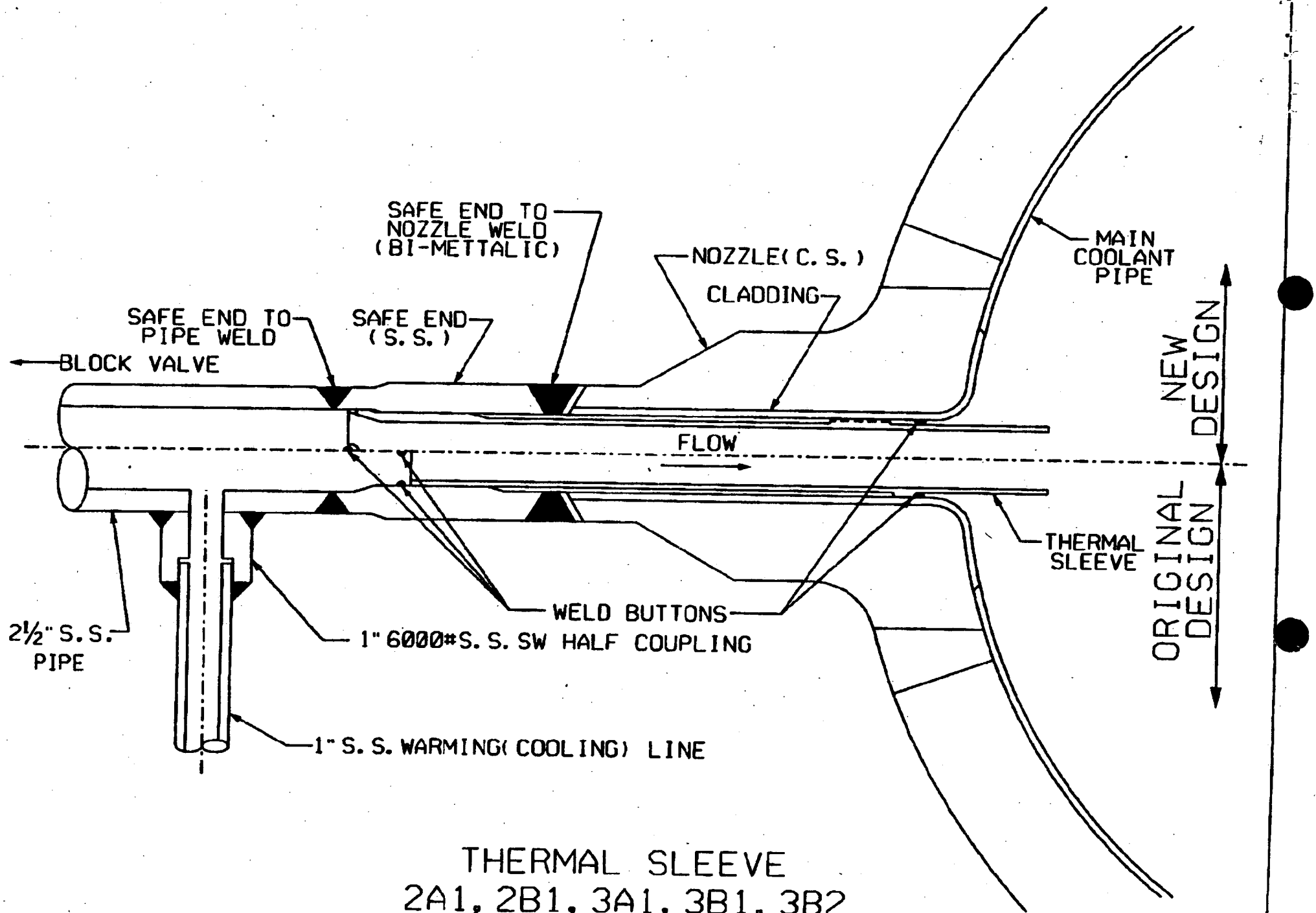
Schedule/NRC Interface

- Unit 2
  - » Restart projected for third week of May
- Unit 3
  - » Restart projected for end of May
- Unit 1
  - » Continuing Operation under JCO until Units 2 and 3 return to steady state power operation
  - » Maintenance outage to perform LDST level inst mod and HPI nozzle inspections
  - » Refueling outage scheduled for early September, 1997
- Coordinate closure of restart issues with Senior Resident Inspector prior to restart

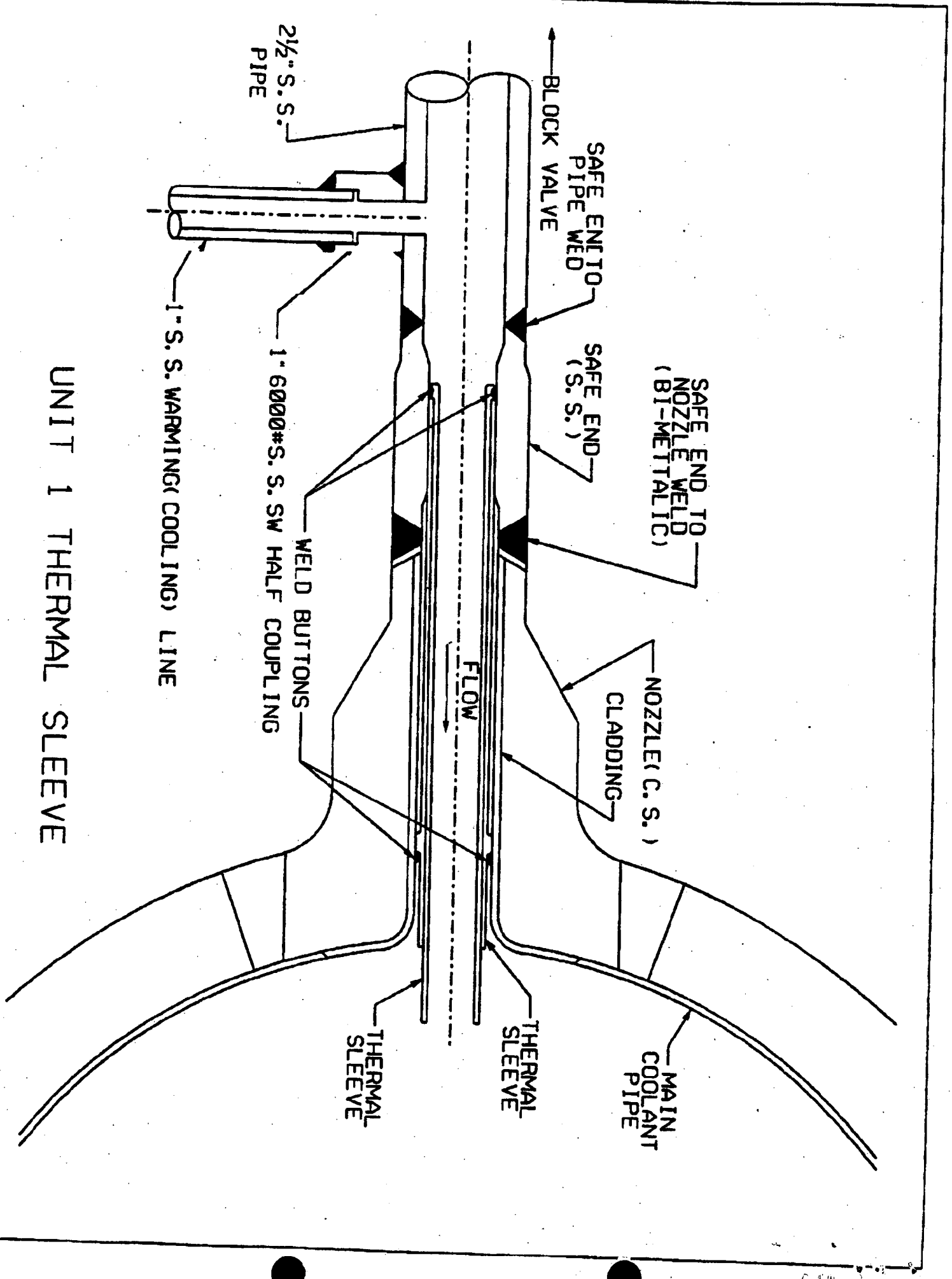

OD crack tip @ 344° (100%TW)
0°
30°
60°
90°
120°
150°
180°
210°
240°
270°
300°
330°
OD crack tip @ 61° (100% TW)
RCS Flow
M/U Flow (into page)
Metallography (30% TW)
Metallography (26.5% TW)
Metallography (24% TW)
Note
View is looking in direction of M/U flow
Warming Line Flow


Oconee 3 HPI Event HPI Total RCP Seal Injection
gpm
90
80
70
60
50
40
30
20
10
0
3A HPIP Start
3HP-24 Opened (BWST Suction)
3A HPIP Fails ???
3B HPIP Stop
3A HPIP Stop
3A HPIP Start
First indication of degraded flow
3B HPIP Running
03-May-97 09:10:00
03-May-97 09:12:00
03-May-97 09:14:00
03-May-97 09:16:00
03-May-97 09:18:00
03-May-97 09:20:00
03-May-97 09:22:00
03-May-97 09:24:00


Oconee 3 5/3/97 HPI Event
LDST Lvl
PZR Lvl
RCS T-Hot
T Hot Temp, °F
LDST, PZR Lvl, Inches
Makeup source is essentially gone therefore Pressurizer level begins to drop
1600 gallon makeup to LDST
Actual LDST volume continues to decrease
LDST Level stopped changing when level reaches lower instrument tap at 0 inches
240
235
230
225
220
215
210
205
200
130
120
110
100
90
80
70
60
50
40
30
6:00
7:00
8:00
9:00
10:00
11:00
12:00



THERMAL SLEEVE
2A1, 2B1, 3A1, 3B1, 3B2



UNIT 1 THERMAL SLEEVE