

U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-306/92009 (DRP)

EA 92-067

Docket No. 50-306

License No. DPR-60

Licensee: Northern States Power Company
414 Nicollet Mall
Minneapolis, MN 55401

Meeting Conducted: April 21, 1992

Meeting At: Region III Office, Glen Ellyn, Illinois

Type of Meeting: Enforcement Conference

Inspection Conducted: On site at Prairie Island Nuclear Generating Plant
from February 20 through March 30, 1992.

Inspectors: M. L. Dapas, Senior Resident Inspector

D. C. Kosloff, Resident Inspector

R. L. Bywater, Reactor Engineer

Reviewed By:

M. L. Dapas for
B. L. Jorgensen, Chief
Reactor Projects Section 2A

4/29/92
Date

Approved By:

R. D. Shafer
for
W. D. Shafer, Chief
Reactor Projects Branch 2

4/29/92
Date

Meeting Summary:

Enforcement Conference on April 21, 1992 (Report No. 50-306/92009(DRP))

Areas Discussed: A review of the apparent violations and areas of concern identified during the inspection (documented in Report No. 50-306/92006), and corrective actions taken or planned by the licensee. The enforcement options pertaining to the apparent violations were also discussed with the licensee.

DETAILS

1. Persons Present at Conference

Northern States Power Company

C. J. Blair, Executive Vice President, Power Supply
L. R. Eliason, Vice President, Nuclear Generation
M. B. Sellman, Plant Manager
K. J. Albrecht, General Superintendent, Engineering
H. D. Wadley, General Superintendent, Operations
R. L. Lindsey, Assistant to the Plant Manager
D. J. Lunde, Director, Power Supply Quality Assurance
R. G. Fraser, Superintendent, Systems Engineering-Mechanical

U. S. Nuclear Regulatory Commission

A. B. Davis, Regional Administrator, RIII
W. L. Fornoy, Deputy Director, Division of Reactor Projects, RIII
C. D. Pederson, Director, Enforcement and Investigation Coordination Staff, RIII
B. L. Jorgensen, Chief, Reactor Projects Section 2A, RIII
W. O. Long, Prairie Island Project Manager, NRR
J. G. Luehman, Enforcement Specialist, OE (via telephone)
M. L. Dapas, Senior Resident Inspector, Prairie Island
B. A. Berson, Regional Counsel, RIII
P. R. Pelke, Enforcement Specialist, RIII
D. C. Kosloff, Resident Inspector, Prairie Island
J. A. Lennartz, Reactor Engineer (Examiner), RIII
R. L. Bywater, Reactor Engineer, RIII
W. D. Pegg, Reactor Engineer (Intern), RIII

2. Enforcement Conference

An enforcement conference was held in the NRC Region III office on April 21, 1992. This conference was conducted as a result of the preliminary findings of the inspection conducted on February 20 through March 30, 1992, in which apparent violations of NRC regulations and license conditions were identified. Inspection findings are documented in Inspection Report No. 50-306/92006, transmitted to the licensee by letter dated April 10, 1992.

The purposes of this conference were to: (1) discuss the apparent violations, causes, and the licensee's corrective actions; (2) discuss additional areas of concern; (3) determine if there were any escalating or mitigating circumstances; and (4) obtain any information that would help determine the appropriate enforcement action. The information used by the NRC in conducting the conference is provided as Attachment 1 to this report.

The licensee's representatives disagreed with two of the apparent violations, but were in agreement with the NRC's understanding of the areas of concern. The licensee stated and provided evidence that Section Work Instruction (SWI) O-34, "Conduct of Off-Normal Activities," had been issued for "trial use", and therefore there was no requirement or expectation that this SWI would be used for the reactor coolant system (RCS) draindown evolution. After considering the information provided by the licensee, the NRC concluded there was no clear regulatory requirement for use of the instruction. However, the NRC considered the practice of issuing work instructions or procedures for "trial use" as inappropriate. The licensee also stated that procedure D2, "RCS Reduced Inventory Operation," was not violated by the operators during the draindown evolution because the requirement to have functional electronic level indication when entering reduced inventory was not clearly defined within the procedure. The licensee further stated that the obscurity of this requirement was another example of procedural inadequacy. Thus, the inability of operators to recognize this requirement should not be considered a failure to follow the procedure. The NRC concluded that the operators' failure to ensure that the electronic level indication was operable prior to entering reduced inventory was primarily the result of procedural inadequacy.

The licensee's representatives described the events that led to the apparent violations, including root causes, corrective actions taken, corrective actions in progress, planned corrective actions, and corrective actions being considered. In summary, the corrective actions include installation of a self-limiting drain path, installation of a self-limiting purification path with remote isolation available from the control room, installation of RCS hot leg to cold leg communication paths, installation of steam generator channel nitrogen injection paths, installation of a non-intrusive hot leg level indicator, operator training, revision of operating procedures related to reduced inventory activities, revision of abnormal and emergency procedures related to reduced inventory activities, and development of a written outage planning policy.

The licensee also addressed the safety significance of the interruption of decay heat removal. The information used by the licensee in their presentation at the conference is provided as Attachment 2 to this report.

At the conclusion of the meeting, the licensee was informed that they would be notified in the near future of final enforcement action.

Attachments:

1. NRC Enforcement Conference slide handouts
2. Northern States Power Enforcement Conference slide handouts

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

NORTHERN STATES POWER COMPANY

PRAIRIE ISLAND UNIT 2

ENFORCEMENT CONFERENCE

APRIL 21, 1992

10 A.M.

EA 92-067

REPORT NO. 50-306/92009

REGION III OFFICE

GLEN ELLYN, ILLINOIS

NORTHERN STATES POWER COMPANY
ENFORCEMENT CONFERENCE

Agenda

April 21, 1992

INTRODUCTION:

Mr. A. Bert Davis, Regional Administrator

PURPOSE OF MEETING:

Mr. William Forney, Deputy Director, Division of
Reactor Projects

EXPLANATION OF THE ENFORCEMENT PROCESS:

Ms. Cynthia Pederson, Director, Enforcement and
Investigation Coordination Staff

SUMMARY OF EVENTS AND APPARENT VIOLATIONS:

Mr. Donald Kosloff, Resident Inspector, Prairie Island

LICENSEE PRESENTATION AND DISCUSSION:

Mr. Craig Blair, Executive Vice President, Power Supply
and Staff

CLOSING REMARKS:

Mr. Davis

PURPOSE OF MEETING

DISCUSS THE APPARENT VIOLATIONS ASSOCIATED WITH THE FEBRUARY 20, 1992, INTERRUPTION OF DECAY HEAT REMOVAL DURING REDUCED INVENTORY OPERATIONS AT PRAIRIE ISLAND NUCLEAR GENERATING PLANT UNIT 2, INCLUDING NRC CONCERNS RELATING TO EVENT CAUSES AND CONSEQUENCES.

DISCUSS THE ENFORCEMENT PROCESS.

REVIEW AND DISCUSS THE LICENSEE'S EVALUATION OF THE EVENT AND CORRECTIVE AND PREVENTIVE ACTIONS.

CHRONOLOGY OF EVENTS

February 20, 1992

5:00 - 7:00 p.m.

The Unit 2 reactor was in a cold shutdown condition, approximately 2 days into a scheduled refueling outage. Preparations for draining the reactor coolant system (RCS) were completed. Section Work Instruction SWI-O-34, "Conduct of Off-Normal Activities," was not used during preparations. Draining began at 5:04 p.m. Draining was stopped at about 5:45 p.m. for shift turnover.

7:00 - 9:30 p.m.

Water level in the RCS was being lowered to reactor vessel nozzle centerline elevation per procedure D2, "RCS Reduced Inventory Operation," in preparation for steam generator nozzle dam installation. Reactor core cooling was being provided by one train of the residual heat removal (RHR) system (22 RHR pump in service) and RCS temperature was being maintained at about 133 degrees F. The RCS was sealed and had a nitrogen cover gas overpressure.

The RCS level was being measured using a tygon tube. The new electronic level indication on the Emergency Response Computer System (ERCS) was reading offscale high as expected. An engineer was in the control room during this period performing and verifying RCS level calculations from tygon tube data.

The draindown procedure was proceeding normally.

Approx. 9:00 - 10:50 p.m.

During the draindown, the engineer had a collateral duty to complete final functional testing of the electronic level instrumentation. As the draindown progressed, operators expressed concern that the electronic level instruments were not on scale. The engineer left the control room to enter containment and verify the system's valve lineup. During the engineer's absence, the operators continued the task of correcting tygon tube level for nitrogen overpressure but introduced rounding errors into the calculation.

Supervision of the operators in the control room was only periodic and infrequent.

APPROX. 10:50 p.m.

The shift manager calculated and announced that the time remaining before completion of the draindown was 30 minutes. The calculation used an erroneous conversion number from the plant tank data book.

11:00 - 11:05 p.m.

RHR flow oscillations began to develop and RCS temperature began to decrease. Orders were given to stop the draindown. Loop A and Loop B electronic level instruments came on scale and both instruments indicated that RCS level was below nozzle centerline.

11:10 - 11:20 p.m.

The 22 RHR pump was shut off due to loss of suction head.

Operator entered Abnormal Operating Procedure D2 AOP1, "Loss of Coolant While in a Reduced Inventory Condition," and started charging pumps to supply water to the RCS from the refueling water storage tank (RWST).

11:20 - 11:29 p.m.

Emergency Operating Procedure 2-E4, "Core Cooling Following Loss of RHR Flow," was entered because core exit temperature reached the procedure entry point of 190 degrees F. Non-essential personnel were ordered to evacuate containment and the 21 RHR pump was aligned to take suction from the RWST and discharge to the reactor vessel.

Peak core exit thermocouple temperature during the transient occurred at 11:27 p.m. and was 221.5 degrees F.

When RCS level was restored to the vessel flange level, the RHR system was realigned for normal shutdown cooling operation.

February 21 - 24, 1992

The licensee declared a Notification of Unusual Event and notified the NRC Senior Resident Inspector and the NRC Operations Center.

NRC issued a Confirmatory Action Letter documenting the licensee's commitment to maintain an elevated RCS level until further review and dispatched an Augmented Inspection Team (AIT) to the site.

The AIT monitored the licensee's RCS drain activities.

NRC

ENFORCEMENT CONFERENCE

REGION III

APRIL 21, 1992

NORTHERN STATES POWER COMPANY

PRAIRIE ISLAND'S

UNIT 2

INTERRUPTION OF DECAY HEAT REMOVAL
DURING REDUCED INVENTORY OPERATIONS

FEBRUARY 20, 1992

AGENDA

- | | |
|---------------------------|--------------|
| I. INTRODUCTION | MIKE SELLMAN |
| II. SYSTEMS OVERVIEW | BOB FRASER |
| III. ANALYSIS OF EVENT | DICK LINDSEY |
| IV. LESSONS LEARNED | MIKE WADLEY |
| V. PROCESS IMPROVEMENTS | BOB FRASER |
| VI. ACTION PLAN & SUMMARY | MIKE SELLMAN |

INTRODUCTION

MIKE SELLMAN

PLANT MANAGER

INTRODUCTION

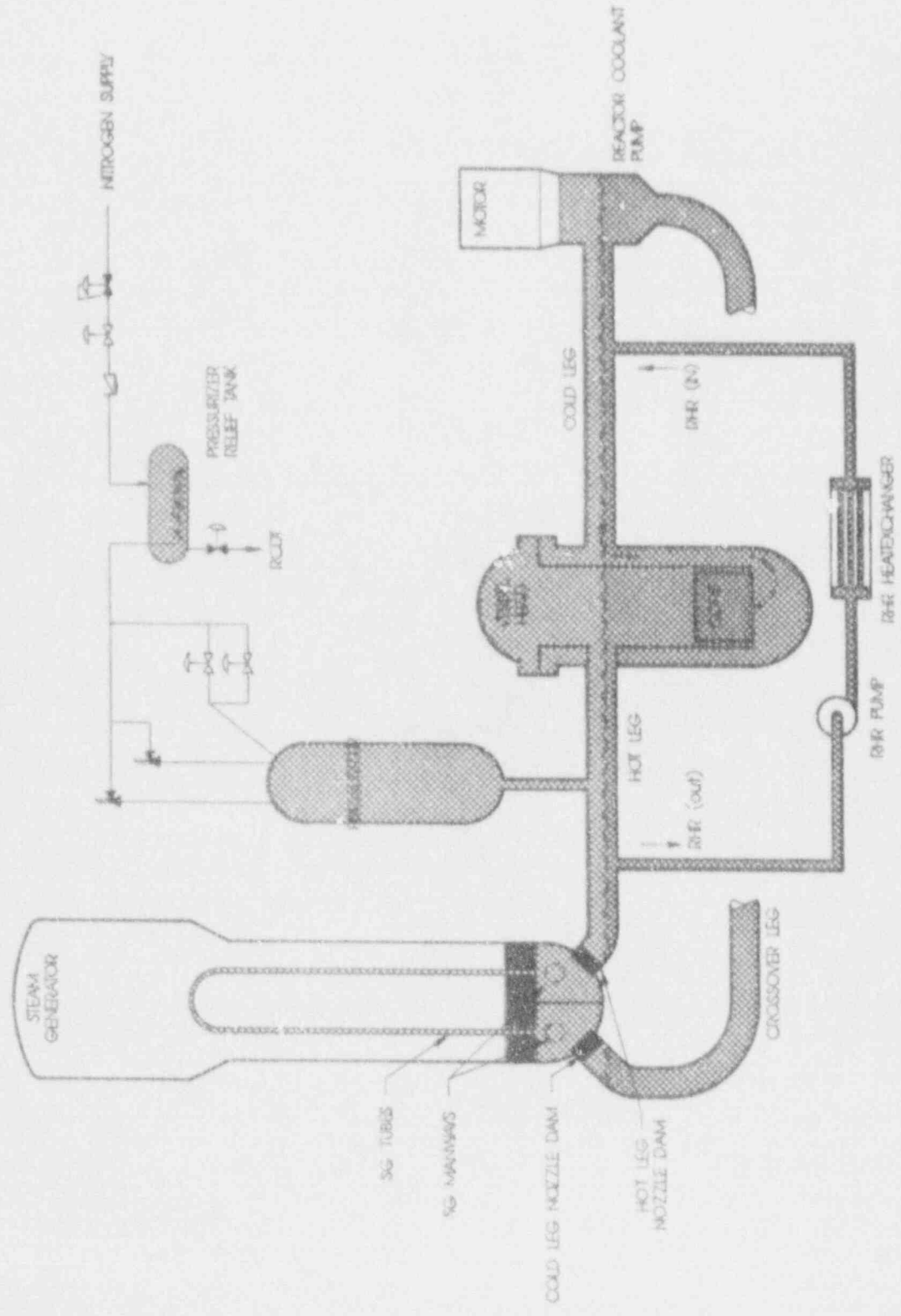
KEY POINTS

- PERFORMANCE WAS NOT ADEQUATE
- CONSEQUENCES AND SAFETY SIGNIFICANCE OF EVENT WERE MINIMAL
- AGGRESSIVE MANAGEMENT RESPONSE
- DEVELOPED COMPREHENSIVE ACTION PLAN
- DEVELOPING AN INTEGRATED SHUTDOWN PHILOSOPHY

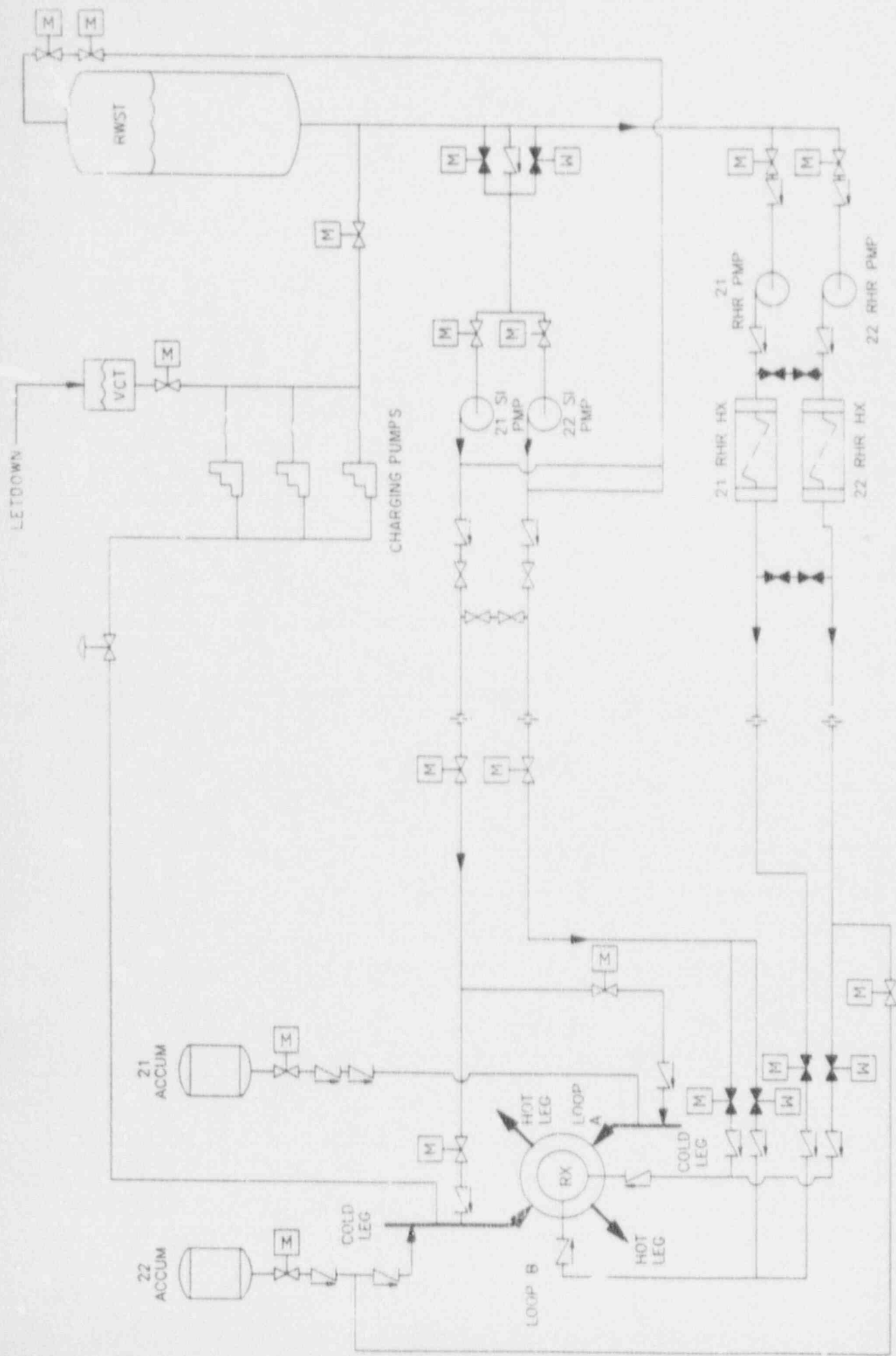
SYSTEMS OVERVIEW

BOB FRASER

SUPERINTENDENT OF MECHANICAL SYSTEMS ENGINEERING



PRAIRIE ISLAND NUCLEAR GENERATING PLANT



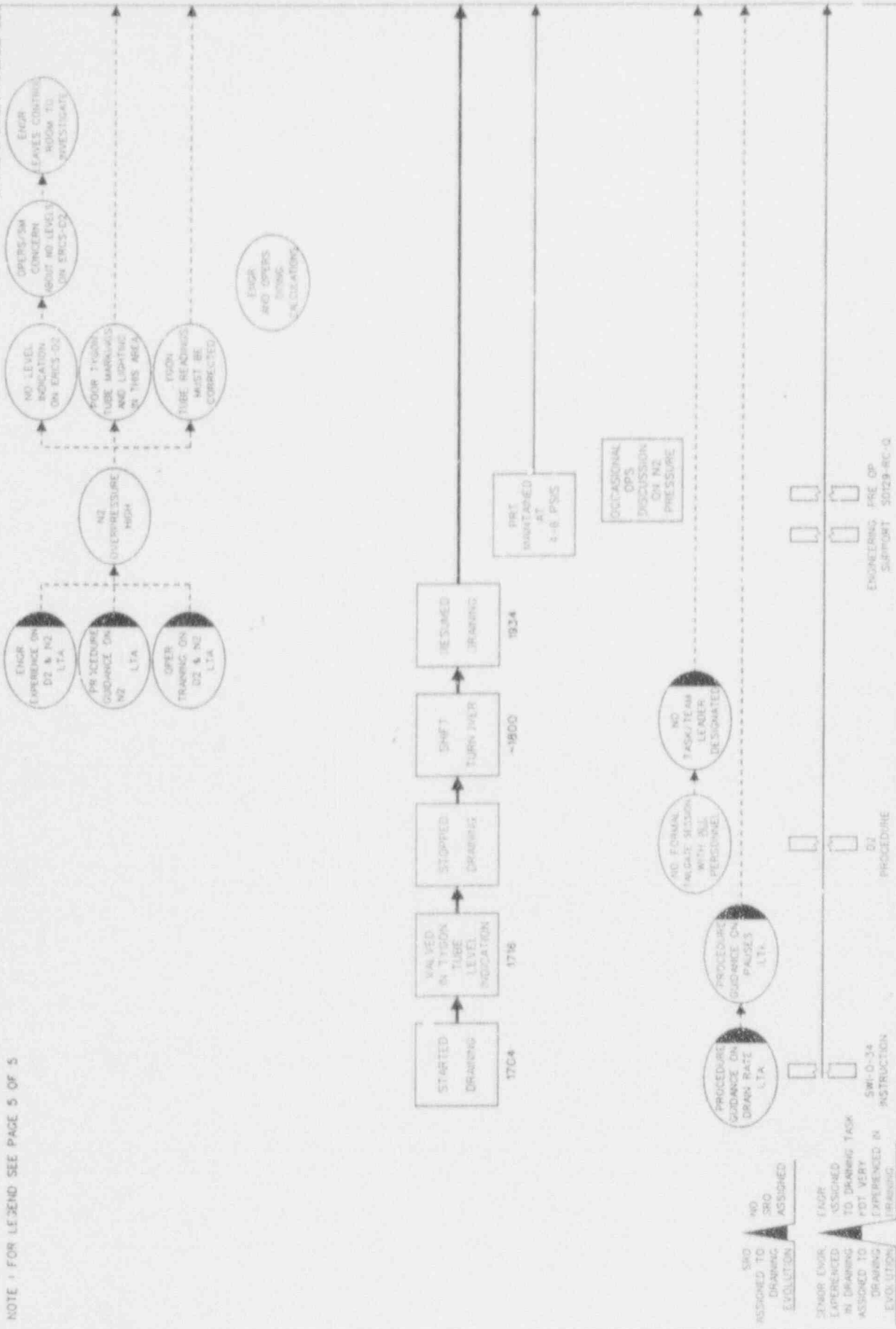
PRAIRIE ISLAND NUCLEAR GENERATING PLANT

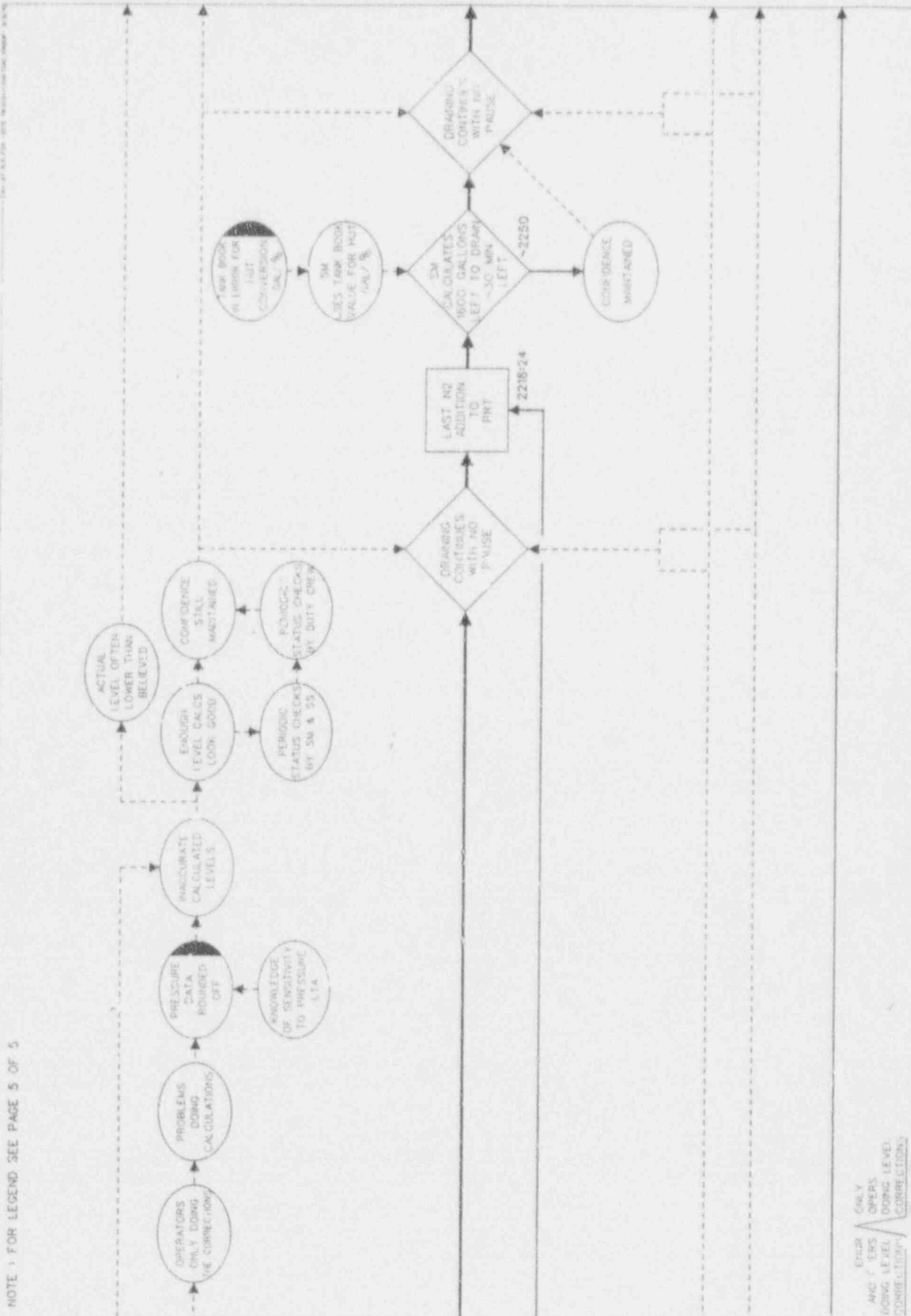
ANALYSIS OF EVENT

DICK LINDSEY

ASSISTANT TO THE PLANT MANAGER

NOTE 1 FOR LEGEND SEE PAGE 5 OF 5



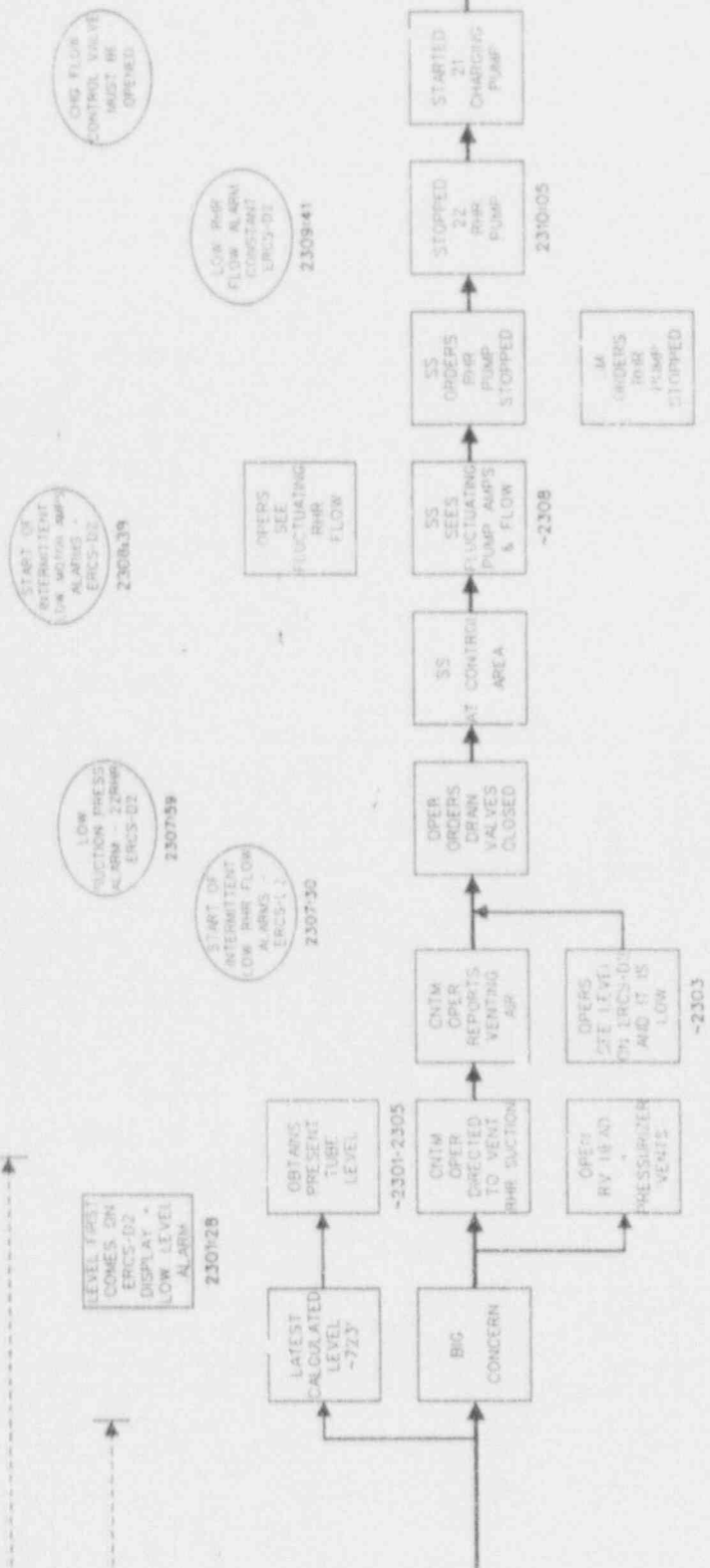


NOTE 1 FOR LEGEND SEE PAGE 5 OF 5

OPERATORS ONLY DOING THE CORRECTIONS
 MARGUARTE CALCULATED LEVELS
 PRE-SOURCE DATA ROUNDED OFF
 PROBLEMS DOING CALCULATIONS
 ACTUAL LEVEL OFTEN LOWER THAN BELIEVED
 CONFIDENCE STILL MAINTAINED
 PERIODIC STATUS CHECKS BY SN & SS
 FOLLOW-UP STATUS CHECKS BY DUTY CREW
 DRAWING CONTROLS WITH NO PAUSE
 DRAWING CONTROLS WITH NO PAUSE
 LAST INQ ADDITION TO PRT
 SM CALCULATES 1000 GALLONS LEFT TO DRAIN
 CONFIDENCE MAINTAINED

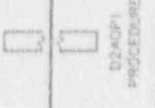
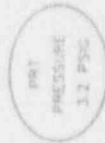
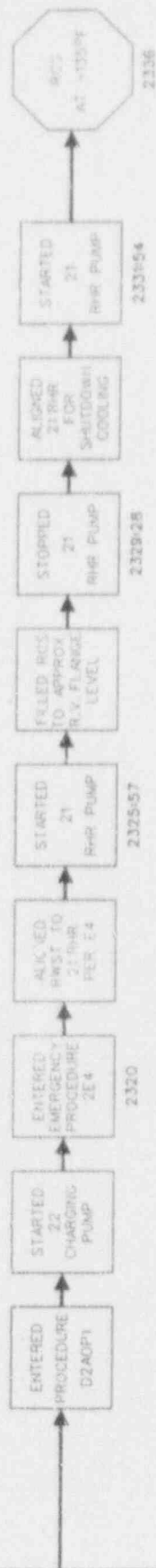
FROM PAGE 1

NOTE - FOR LEGEND SEE PAGE 5 OF 5

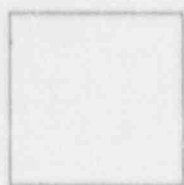


NOTE 1: FOR LEGEND SEE PAGE 5 OF 5

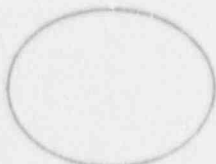
NO. 10000-0000-0000



LEGEND



EVENTS, ACTIONS OR HAPPENINGS



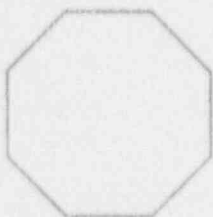
CONDITIONS



PRIMARY EVENTS



SECONDARY EVENTS



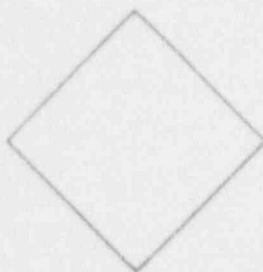
TERMINAL EVENT



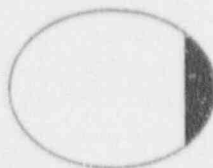
BARRIER



FAILED BARRIER



PRIMARY EFFECTS



CAUSAL FACTOR



CHANGE

LTA = LESS THAN ADEQUATE

ROOT CAUSES OF EVENT

- SUPERVISORY METHODS
- WORK ORGANIZATION/PLANNING
- WRITTEN COMMUNICATIONS
- INTERFACE DESIGN/EQUIPMENT CONDITION
- VERBAL COMMUNICATIONS
- WORK PRACTICES

ANALYSIS OF EVENT

- NO MODE CHANGE
- SUBCOOLED CORE EXIT TEMPERATURE
- DIVERSE MEANS TO ADD WATER
- REDUNDANT POWER SUPPLIES
- REDUNDANT MEANS OF DECAY HEAT REMOVAL
- MINIMAL CONSEQUENCES

LESSONS LEARNED

MIKE WADLEY

GENERAL SUPERINTENDENT PLANT OPERATIONS

IMMEDIATE CORRECTIVE ACTIONS TAKEN

- IMMEDIATE MANAGEMENT RESPONSE
- REMOVED PRESSURIZER MANWAY COVER TO VENT RCS
- DEDICATED A MORE EXPERIENCED SYSTEM ENGINEER TO SUPPORT DRAINDOWN
- DEDICATED A MEMBER OF LINE MANAGEMENT TO OVERSEE DRAINDOWN

SHORT TERM CORRECTIVE ACTIONS

- DELETED LEVEL COMPENSATION FOR RCS PRESSURE FROM ERCS-D2 DISPLAY TO ALLOW ALL LEVEL INSTRUMENTS TO BE REFERENCED TO CONTAINMENT
- ADDED ADMINISTRATIVE CONTROLS FOR ALL INSTRUMENTATION RELATING TO RCS LEVEL
- PRODUCED A NEW PROCEDURE, "REACTOR COOLANT SYSTEM REDUCED INVENTORY OPERATION WHILE VENTED TO CONTAINMENT ATMOSPHERE" FOR ONE-TIME USE
- PRODUCED A NEW PROCEDURE FOR DRAINING THE RCS TO REMOVE NOZZLE DAMS.
- REMOVED ALL DRAINING PROCEDURES FROM THE APPROVED PROCEDURE LIST TO PRECLUDE THEIR USE UNTIL THEY ARE UPGRADED

LESSONS LEARNED

- RCS DRAINDOWN SUPERVISION
- INTEGRATION OF ENGINEERING SUPPORT
- COMMAND/CONTROL OF CRITICAL EVOLUTIONS
- QUESTIONING ATTITUDE

RCS DRAINDOWN SUPERVISION

- PRE GENERIC LETTER 88-17, LOSS OF DECAY HEAT REMOVAL
 - AUXILIARY BUILDING SUPERVISOR
- POST GENERIC LETTER 88-17, LOSS OF DECAY HEAT REMOVAL
 - AUXILIARY BUILDING SUPERVISOR
 - ENGINEER RESPONSIBLE FOR GL IMPLEMENTATION (SRO)
- LAST UNIT ONE RCS DRAINDOWN
 - ENGINEER RESPONSIBLE FOR GL IMPLEMENTATION
- UNIT TWO RCS DRAINDOWN 2-20-92
 - ENGINEER WHO PARTICIPATED IN LAST UNIT ONE RCS DRAINDOWN
- SOER 91-01

INTEGRATION OF ENGINEERING SUPPORT

- ENGINEERING SUPPORT AND THE PLANT ATTENDANT
- ENGINEERING SUPPORT NEEDS TO BE MANAGED
- ENGINEERING SUPPORT IS NOT A SUBSTITUTION FOR OPERATION'S DIRECT SUPERVISION
- OPERATIONAL INSTRUCTION MUST COME FROM OPERATION'S LINE MANAGEMENT

COMMAND/CONTROL OF CRITICAL EVOLUTIONS

- DUTY CREW UTILIZED FOR MANNING
CRITICAL EVOLUTIONS
- MAINTAIN CREW UNITY
- DUTY SHIFT SUPERVISOR HAS ULTIMATE
RESPONSIBILITY
- DUTY CREW TURNS OVER OTHER
RESPONSIBILITIES
- IF SHIFT SUPERVISOR CANNOT TURNOVER
OR SUSPEND ACTIVITIES, THE SHIFT
MANAGER OVERSEES CRITICAL ACTIVITIES

QUESTIONING ATTITUDE

- OVERCONFIDENCE
 - PREVIOUS SUCCESS WITH SIMILAR PROCEDURE AND OVERSIGHT
- EMPOWERMENT
 - PERSONNEL AT PINGP ARE EMPOWERED
 - EMPOWERMENT'S RISKS AND RESPONSIBILITIES
 - FAILURE
 - NOT ALL RESOURCES IN PROPER PROPORTION
 - FEEDBACK
 - EMPOWERED EMPLOYEE MAY FEEL ALONE AND MAY NOT SPEAKUP
 - PROMGTE QUESTIONING ATTITUDE

REACTOR COOLANT SYSTEM DRAINDOWN
PROCESS IMPROVEMENTS

BOB FRASER

SUPERINTENDENT OF MECHANICAL SYSTEMS ENGINEERING

HISTORY OF LOSS OF RHR CAUSES

- OVERDRAINING THE RCS
- UNPLANNED DRAINING OF THE RCS
- LOSS OF ELECTRICAL POWER TO RHR PUMPS
- INADVERTENT CLOSURE OF RHR PUMP SUCTION VALVES

PRAIRIE ISLAND'S ACTIONS IN
RESPONSE TO INDUSTRY EVENTS

- PREDICTIVE MONITORING
- PROGRESSIVE RECOVERY
- PREVENTION OF EVENT

PREDICTIVE MONITORING

- RHR PUMP SUCTION PRESSURE INDICATION AND ALARM
- RHR PUMP MOTOR AMPERAGE INDICATION AND ALARM
- RCS TEMPERATURE INDICATION AND ALARM
- RCS LEVEL INDICATION AND ALARMS
- RHR FLOW INDICATION AND ALARMS

PROGRESSIVE RECOVERY

- ANALYSIS
- PROCEDURES
- PHYSICAL CHANGES
- DEFENSE IN DEPTH

PROGRESSIVE RECOVERY

- ANALYSIS
- PROCEDURES
- PHYSICAL CHANGES
- DEFENSE IN DEPTH

DEFENSE IN DEPTH

- DRAINDOWN WITH RCS INTACT
- STEAM GENERATOR WITH AUXILIARY FEEDWATER PUMP MAINTAINED OPERABLE FOR ALTERNATE HEAT SINK
- ONE SAFETY INJECTION PUMP REQUIRED TO BE OPERABLE (TWO SI PUMPS WERE AVAILABLE)
- TWO CHARGING PUMPS REQUIRED TO BE OPERABLE (THREE CHARGING PUMPS WERE AVAILABLE)
- TWO RESIDUAL HEAT REMOVAL PUMPS REQUIRED TO BE OPERABLE
- ELECTRICAL POWER TO ABOVE EQUIPMENT IS REDUNDANT AND DIESEL GENERATOR BACKED

PREVENTION OF EVENT

- ADMINISTRATIVE CONTROLS ON WORK THAT COULD AFFECT RCS LEVEL
- SUBSTATION WORK CONTROL PROCESS
- RHR SUCTION VALVES ALIGNED SO NO SINGLE FAILURE COULD ISOLATE BOTH RHR PUMP SUCTION PATHS
- RHR HEAT EXCHANGERS NOT CROSS TIED
- MINIMIZE TIME AT REDUCED INVENTORY

FUTURE PREVENTIVE ACTIONS HARDWARE

- SELF LIMITING HOT LEG DRAIN PATH
- SELF LIMITING COLD LEG PURIFICATION PATH
W/REMOTE ISOLATION IN CONTROL ROOM
- RCS HOT LEG - COLD LEG COMMUNICATION
PATHS
- REACTOR HEAD VENT PATH
- STEAM GENERATOR CHANNEL HEAD NITROGEN
INJECTION
- NON-INTRUSIVE HOT LEG LEVEL INDICATION

OTHER ACTIONS UNDER REVIEW

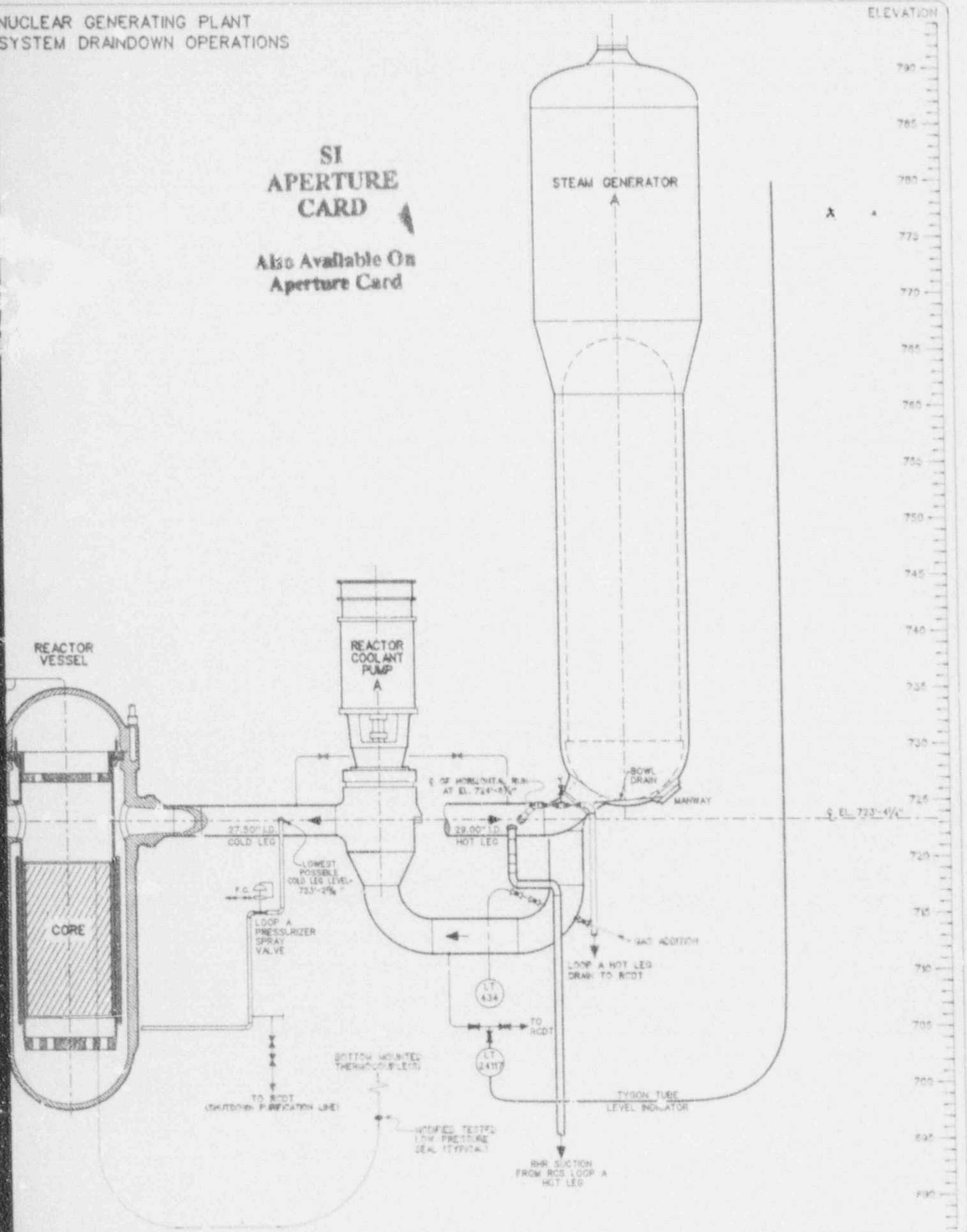
- BOTTOM MOUNTED INCORE THERMOCOUPLES
- HIGH PRESSURE INCORE THIMBLE TUBE SEALS
- RECEIVING TANK LEVEL INDICATION UPGRADE

PROCEDURAL ACTIONS

- DRAINDOWN WITH CAPABILITIES TO KEEP THE RCS INTACT
- PROCEDURES TO SUPPORT NEW DRAINDOWN METHOD
- CONTINUE TO IMPROVE RECOVERY PROCEDURES
- IMPROVE CONTAINMENT CLOSURE PROCEDURE

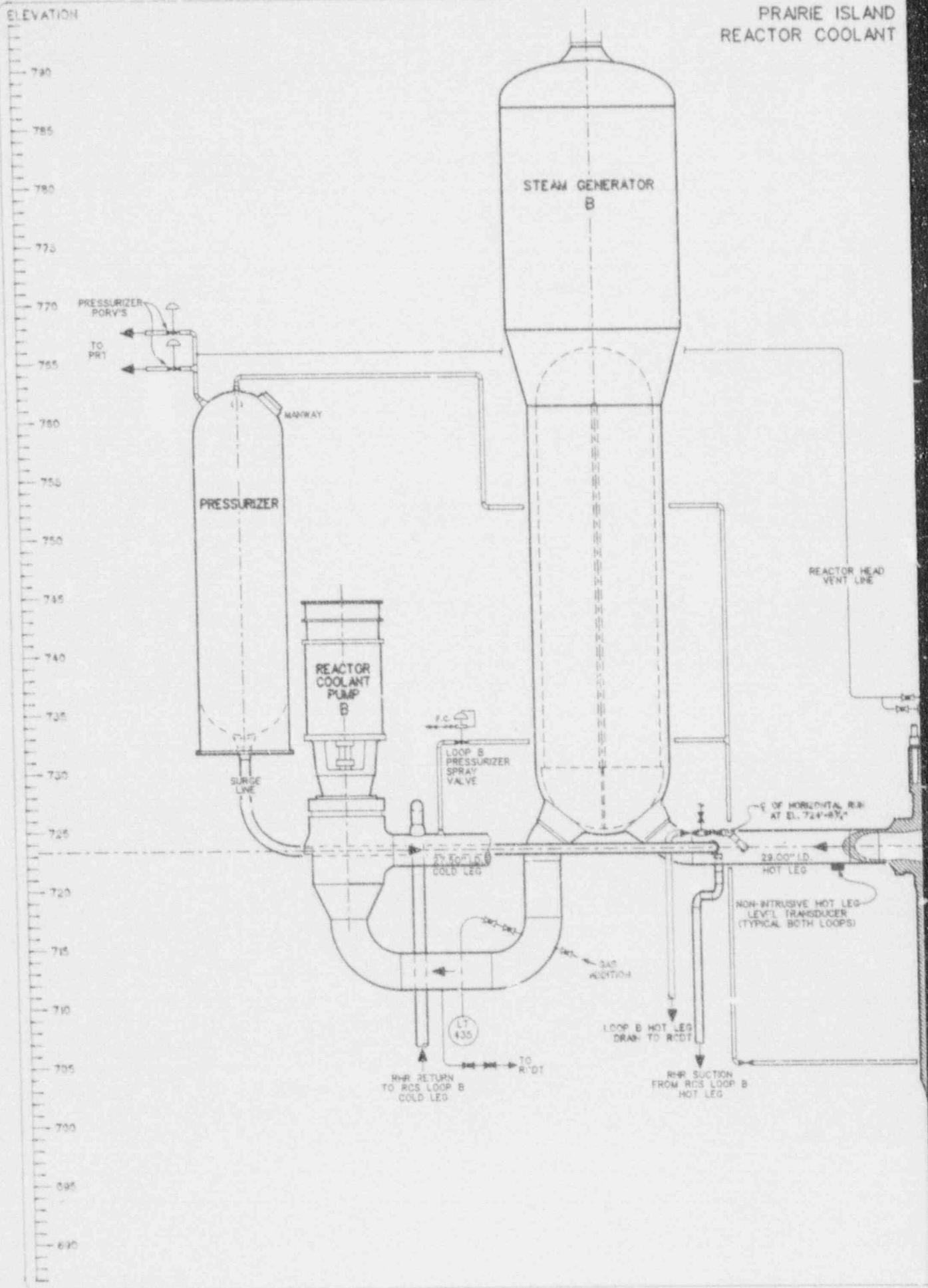
NUCLEAR GENERATING PLANT
SYSTEM DRAINDOWN OPERATIONS

SI
APERTURE
CARD
Also Available On
Aperture Card



9205050200-01

PRAIRIE ISLAND REACTOR COOLANT



ACTION PLAN & SUMMARY

MIKE SELLMAN

PLANT MANAGER

THE PRAIRIE ISLAND EVENT
HAS MADE IT CLEAR THAT BOTH
PREVENTION AND MITIGATION ARE
NECESSARY TO MANAGE
SHUTDOWN RISK

COMPREHENSIVE ACTION PLAN

FOUR BROAD CATEGORIES

- PROCEDURES
- PROCESS IMPROVEMENTS
- MANAGEMENT
- TRAINING

SUMMARY

- PERFORMANCE WAS NOT ADEQUATE
- CONSEQUENCES AND SAFETY SIGNIFICANCE OF THE EVENT WERE MINIMAL
- AGGRESSIVE MANAGEMENT RESPONSE
- DEVELOPED COMPREHENSIVE ACTION PLAN
- DEVELOPING AN INTEGRATED SHUTDOWN PHILOSOPHY

APPARENT VIOLATIONS

- INADEQUATE PROCEDURE FOR DRAINING REACTOR COOLANT SYSTEM (RCS)
- FAILURE TO FOLLOW PROCEDURE FOR DRAINING REACTOR COOLANT SYSTEM (RCS)
- FAILURE TO UTILIZE SECTION WORK INSTRUCTION (SWI-0-34)
- FAILURE TO TRANSLATE DESIGN BASIS FOR RCS LEVEL INDICATION INTO SPECIFICATIONS AND DRAWINGS