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NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT NUCLEAR STATION

UNIT II OPERATIONS

02-LOT-001-204-2-00 Revision 2

TITLE: REACTOR WATER CLEANUP SYSTEM

	SIGNATURE	DATE
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*- This is a duplicate of the master which was misplaced 8/1/91

Summary of Pages

(Effective Date: 8/15/91)

Number of Pages: 46

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February 1991	1 - 46

THIS LESSON PLAN IS A GENERAL REWRITE

TRAINING DEPARTMENT RECORDS ADMINISTRATION ONLY:

VERIFICATION: ______ ______

DATA ENTRY: ______ ______

RECORDS: ______ ______

MASTER CONTROLLED DOCUMENT

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I. TRAINING DESCRIPTION

A. Title of Lesson: Reactor Water Cleanup System

B. Lesson Description: This lesson contains information pertaining to the Reactor Water Cleanup System. The scope of the training is defined by the learning objectives and in general covers the knowledge required of a Licensed Control Room Operator.

C. Estimate of the Duration of the Lesson: 2 hours

D. Method of Evaluation, Grade Format, and Standard of Evaluation: Written exam, passing grade of 80% or greater.

E. Method and Setting of Instruction: This lecture/facilitated discussion should be conducted in the classroom.

F. Prerequisites:

1. Instructor:
   a. Certified in accordance with NTP-16.
2. Trainee:
   a. Initial License Candidate - In accordance with the eligibility requirements of NPT-10
   b. Licensed Operator Requal - In accordance with the requirements of NTP-11

G. References:

1. SD-37, Reactor Water Cleanup System Description
2. N2-OP-37, Reactor Water Cleanup System
3. GEK-8333, RWCU Operation and Maintenance Instruction
4. GE SIL 436, Mode "B" Operation
5. TCO-02-LOT-90-102
6. FSK-26-3.0, Reactor Water Cleanup Fundamental
7. FSK-26-3A through 3M, Reactor Water Cleanup
8. ESK-6WCS01 through 08 and 11
9. ESK-7WCS02
10. NMP2 Technical Specifications

II. <u>REQUIREMENTS</u>

A.	AP-9	Administration of training
B.	NTP-10	Training of Licensed Operator candidates
C.	NTP-11	Licensed Operator requalification training
D.	NTP-12	Unlicensed Operator training

III. <u>TRAINING MATERIALS</u>

A. Instructor Materials:

1. Classroom
2. Lesson Plan
3. TR
4. Transparency package
5. Overhead projector
6. Applicable references
7. Trainee handouts

B. Trainee Materials:

1. Handouts (can include text, drawings, objectives, procedures, etc)
2. Pens, pencils, paper

IV. <u>EXAMS AND MASTER ANSWER KEYS</u>

A. Exams will be generated and administered as necessary.

B. Exams and Master Answer Keys will be on permanent file.

V. LEARNING OBJECTIVES

A. Terminal Objectives:

Upon satisfactory completion of this lesson the trainee will demonstrate the knowledge to:

RO TASKS

TO-1.0	Perform line-ups on the RWCU from the Control Room.	(2040010101)
TO-2.0	Startup the RWCU pump from the Control Room (full flow reject).	(2040020101)
TO-3.0	Return the drained RWCU System to service with the reactor at rated pressure.	(2040060101)
TO-4.0	Perform the normal reject of primary system water to the main condenser hotwell/radwaste.	(2040070101)
TO-5.0	Transfer RWCU return to the Feedwater System.	(2049110101)
TO-6.0	Maximize the RWCU cooling to assist RPV pressure control N2-EOP-RP.	(2049120101)

SRO TASKS

TO-7.0	Direct the actions required for an intrusion of demineralizer resin into the primary system.	(3449330503)
TO-8.0	Respond to a RWCU isolation.	(3449770403)
TO-9.0	Monitor Plant Chemistry to ensure conformance to specifications.	(3410220303)

B. Enabling Objectives:

EO-1.0 Explain the purpose and function of the Reactor Water Clean-up System.

EO-2.0 Regarding the Reactor Water Cleanup System, 1) locate the correct drawing and 2) use the drawing to perform the following:

a. Trace the flowpath of fluids and electricity
b. Describe system operation
c. Identify setpoints and interlocks
d. Identify system interrelationships

EO-3.0 Describe the purpose and function of the following list of major components in the Reactor Water Cleanup System:

a. System inlet taps
b. Regenerative heat exchanger
c. Non-regenerative heat exchanger
d. Filter/demineralizer units
e. Filter/demineralizer flow control valves (FV16)
f. Reject lines and reject flow control valve (FV135)
g. Feedwater return thermal-sleeved connections
h. Feedwater return flow control valve (MOV200)

EO-4.0 State the setpoint and describe the purpose for the following interlocks:

a. WCS containment isolations
b. Reject flow control isolations
c. Filter/demineralizer hold pump automatic starts and stops
d. WCS pump trips

EO-5.0 Describe the interrelationship between the following list of systems and the Reactor Water Cleanup System.

a. Reactor Closed Loop Cooling Water (CCP)
b. Reactor Plant Sampling (SSR)
c. Primary Containment Isolation (ISC)
d. Condensate Storage and Transfer (CNS)
e. Liquid Radwaste System (LWS)
f. Condensate System (CNM)
g. Service and Instrument Air (IAS and SAS)
h. Plant Electrical Distribution
i. Connections with the reactor vessel
j. Redundant Reactivity Control (RRCS)
k. Standby Liquid Control (SLC)

EO-6.0 Explain the basis for the precautions and limitations listed N2-OP-37.

EO-7.0 Regarding the Reactor Water Cleanup System, determine and use the correct procedure to identify the actions and/or locate information related to the following:

a. Start-up
b. Normal operations
c. Shutdown
d. Off normal operations
e. Annunciator response

EO-8.0 Describe how the Reactor Water Cleanup System is utilized during the performance of the EOP's.

EO-9.0 Given NMP2 Technical Specifications and a set of plant conditions, determine the appropriate bases, limiting condition for operation, limiting safety system setting, and/or action statement as applicable.

I. INTRODUCTION

A. Introduction

1. Have trainees fill out the TR.
2. Explain the purpose of the Course Evaluation and how to use it.

Note: Introduce trainee to objectives. Show layout of text and explain that text has more information than they are responsible for.

Note: This lesson plan combines lecture, facilitated discussion and classroom activities. At the end of the week, your performance will be evaluated by a written examination which you must pass with an 80% or better grade.

3. Review student learning objectives.

Note: There will be a quiz after completion of the material.

B. System Purposes

1. Removes Fission products, corrosion products, and other soluable and insoluable impurities. — EO-1.0
   a. Minimizes fouling of Heat Transfer surfaces
   b. Fewer impurities to become activated which reduces Beta/Gamma Radiation levels.
2. Provides for Reactor Coolant removal during all modes of plant operation.

NOTE: Coolant removal is known as "Flow Rejection"

3. In an emergency, the WCS System can be used to aid in Reactor Vessel Pressure Control.
   NOTE: As directed by the EOP's only

C. The System is Designed to:
1. Minimize system heat loss from the reactor
2. Enable a major portion of the system to be serviced while in operation
3. Prevent the removal of Reactivity Control Material introduced into the Reactor by Standby Liquid Control System.

D. System Flow Path
1. 3 Inlet water taps
   Use TP 1 to illustrate system flowpath — EO-2.0a
   a. One from each Recirc. Pump suction line
   b. The third from vessel bottom head drain line
2. 2 Reactor Water Cleanup Pumps provide motive force
3. Through the tube side of the Regenerative Heat Exchanger
4. Through the tube side of the Non-regenerative Heat Exchanger
5. Normally flows through filter/demins next
   a. Can bypass filter/demins to reject or,
   b. Bypass directly to shell side of Regenerative Heat Exchanger.
6. After filter/demins flow to reject or Regenerative Heat Exchanger (shell side).

7. Water is returned to the Reactor via Feed Water Lines.

II. DETAILED DESCRIPTION

A. System Inlet Piping

1. Suction from "A" Recirc. Loop (EO-3.0a)
   a. Suction side of Recirc. Pump
   b. Via Isolation Valve 2WCS-MOV105
2. Suction from "B" Recirc. Loop
   a. Suction side of Recirc. Pump
   b. Via Isolation Valve 2WCS-MOV104
3. Suction from Reactor Vessel Bottom Head
   a. Via Bottom Head Drain Line
   b. Via Isolation Valve 2WCS-MOV101
4. Recirc. Loop Suctions join after MOV104 and 105 and pass through MOV103.
5. Down stream of MOV103 the bottom head suction ties in.
6. Next flow passes through Inboard and Outboard Containment Isolation Valves MOV102 and MOV112.

B. Reactor Water Cleanup Pumps

1. Two 50% capacity pumps supply system flow
2. Single-stage, Centrifugal Pumps with Mechanical seals.
3. 600 VAC 150 hp induction motor
4. Rated at 460 GPM

   NOTE: Flow rate is equivalent to 1% of Reactor inventory per hour.
5. Pump cooling provided by CCP
6. Pump discharge supplies Seal Flushing Water
7. 13 feed of water required NPSH is supplied by pumps being 50 feet below normal vessel water level.
8. Normally both pumps are running
9. P1A powered by 2NJS-US5
10. P1B powered by 2NJS-US6
11. Both pumps are located on the 215 foot elevation of the Reactor Building in separate shielded rooms.
12. Manual suction (V27 and V28) and discharge (V30) valves are normally locked open.
13. Pump normally discharges to RHX

    NOTE: With MOV111 (100% bypass) open, can discharge directly to the Return Header.

C. Regenerative Heat Exchanger

1. Heat exchanger used to recover heat
   a. Reactor water into WCS is cooled by cleaned water returning to the Reactor

   EO-3.0.b

b. Reduces cycle heat loss

c. Hot influent on tube side

d. Cool effluent on shell side

2. Single-pass, counterflow shell and u-tube heat exchanger

3. Reduces Reactor water from nominal 534°F to about 233°F

4. Shell side heats return water to a nominal 120°F to about 500°F

5. Both shell and tube sides are designed for 1410 PSIG and 500°F

a. Both sides have vent and drain lines

b. Over pressure protection relief valves for both sides

6. Located in shielded heat exchanger room on 306 foot elevation of the Reactor Building

D. Non-regenerative Heat Exchanger

1. Reduces water temperature further EO-3.0c

a. Low enough to prevent resin damage

b. From about 233°F to 120°F

2. Reactor Water on tube side

3. CCP on shell side

4. Higher temperatures are seen by NRHX during reject operations
   a. Due to reduced RHX efficiency
   b. Rejected water does not cool influent to RHX
5. Single-pass, counterflow, shell and u-tube heat exchanger
6. Shell side designed for 370°F and 150 PSIG
   a. Relief valve protected
   b. Vent and drain lines
7. Tube side rated for 575°F and 1410 PSIG
   a. Relief valve protected
   b. Vent and drain lines
8. Located in Reactor Building on Elevation 306 foot (same room as RHX)

E. Filter/Demineralizers

1. Removes soluable and insoluable impurities from Reactor Water — EO-3.0d
   a. ION exchange for soluable
   b. Mechanical filtering for insoluable
2. 2 Filter/demin units
   a. 2 Vessels per unit
   b. Each unit can handle 50% WCS flow
   c. Units and vessels are piped in parallel

3. Pressure precoat filter/demins

4. Uses finely ground, non-regenerable mixed cation and anion resin

NOTE: Flow through vessel holds resin cake in place.

5. Vertical, cylindrical vessel

NOTE: Same design as SFC filter/demins.

   a. Divided in two by a horizontal tube sheet
   b. Filter septae drop down through tube sheet

6. Vessels are located in separate shielded rooms on the 328 foot elevation of the Reactor Building

7. Inlet and outlet strainers
   a. One set for each filter/demin
   b. Minimizes resin introduction into the Reactor Vessel in case of a septae failure
   c. Piped to be flushed to LWS

8. Each vessel has an Outlet Flow Control Valve (EO-3.0e)
   a. FV16A, B, C, and D
   b. Maintains constant flow through vessel with varied pressure drop across that vessel.

F. Precoat System

1. Designed to rapidly apply a resin coat to the filter/demin septae

2. Each filter/demin unit has it's own precoat system
3. Panel P187 controls filter/demin's 4A and 4B and their Precoat System
4. Panel P188 controls 4C and 4D and their Precoat System
5. Precoat Pumps (P12A and P12B)
   a. Take a suction from precoat tank
   b. Deliver a resin slurry to filter/demin
   c. Resin builds up on septae and water is returned to Precoat Tank
   d. P12A powered from 2NHS-MCC008
   e. P12B powered from 2NHS-MCC009
   f. Located in shielded room Reactor Building 328 foot elevation
6. Precoat Tank (TK11A and TK11B)
   a. Provides for resin addition to filter/demins
   b. Sized for precoating one filter/demin
   c. Motor driven agitator for mixing slurry
   d. Receives CNS water to mix slurry
   e. Located in the same room as the precoat pumps

G. Holding Pump (P6A, B, C, and D)

1. Starts automatically to maintain flow through filter/demin.
   a. When normal process flow is disrupted or,
   b. When vessel is taken out of service.
   c. Flow keeps resin cake from dropping off
2. P6A and P6B powered from 2NHS-MCC008
3. P6C and P6D powered from 2NHS-MCC009
4. All pumps are located in a shielded room adjacent to the filter/demin vessel rooms on the 328 foot elevation of the Reactor Building.

H. Reject Line — EO-3.0f

1. Removes water from the Reactor Vessel to Control Reactor Vessel Level.
   a. During startup when control rod drive water is filling vessel and no steam is produced to carry this water away.
   b. Also during heatup, WCS is in full reject to prevent thermal stratification of feed lines.

   NOTE: From 200°F until Reactor Power exceeds 20%.
2. Reject line taps between filter/demins and RHX

3. Water is rejected to condenser (normal) or LWS.
4. FV 135 maintains reject flow rate
5. Restricting oriface reduces WCS pressure by 800 PSI
   a. Piping downstream is not rated for normal Reactor pressure
   b. Flows about 90 GPM 100°F
6. Isolation valves (MOV106 for LWS and MOV107 for condenser) are down stream of restricting oriface.
7. Relief valve on LWS line relieves to condenser line to prevent overpressurizing LWS line.

I. WCS Outlet Piping
1. After exiting the shell side of the RHX, the Reactor water is returned via the feed lines.
2. Thermal - Sleeved tees EO-3.0g
   a. Dissipates thermal stresses due to difference in feed and WCS return temperatures.
   b. Returned to both feed lines via thermal tees
3. System pressure is controlled by 2WCS-MOV200 when flow is returned to the feed lines. EO-3.0h
   a. MOV200 is a motor operated valve that was wired to be throttleable.

b. The adjustment is very course.

Note: Care must be taken when adjusting flow with MOV200.

III. INSTRUMENTS, CONTROLS, AND INTERLOCKS

A. Instrumentation: All indications are on P602 in the Control Room.

Note: For detail on indicators listed see table 2. For indicators outside the Control Room, see table 3.

1. Pressure
   a. Regenerative heat exchanger inlet pressure (PI116)
2. Temperature
   a. Cleanup system temperature (TI1114)
   b. 5 temperature selector switch for TI1114
      1) Temperature from the reactor (TE117)
      2) Temperature from regen heat exchanger (TE137)
      3) Temperature from non-regen heat exchanger (TE132)
      4) Temperature to the reactor (TE123)
      5) Temperature from bottom head drain (TE114)
3. Flow
   a. Cleanup system inlet flow (*FI67X)
   b. Bottom head drain flow (FI134)
   c. Reject flow (FI602)
   d. Individual filter/demineralizer flows (FI16A, B, C, and D)

4. Differential flow
   a. E31-R620A and B on P632 and P642 indicate difference in flow into and out of WCS.

Note: More detail to be given in the discussion of interlocks.

B. Controls
   1. Located on P602 in the Control Room

Note: Use P&ID 37 and/or transparency # to illustrate how controls affect system operation
Seal in valve - switch to open - valve will full stroke to open even if switch is released.

EO-2.0b

      a. 2WCS-P1A and P1B (Start-Stop-Normal After)
      b. Recirc suction isolation valves (Open-Shut)
         1) MOV104 from recirc loop "B"
         2) MOV105 from recirc loop "A"

- Seal in valves

      c. Vessel bottom head suction MOV101 (Open-Shut)
      d. Containment isolation valves (keylock Open-Shut)
         1) MOV102 inboard
         2) MOV122 outboard
      e. Recirc suction throttle valve MOV103 (Open-Shut-Throttle with position indicator)

Throttleable Valve - valve will stop stroking if switch is released.

      f. Flow control valves
         1) FV135
            a) Has it's own flow controller FIC135

b) Control WCS reject flow up to the max allowed by downstream restricting oriface.

2) MOV108 — Throttleable Valve

a) Open-Shut-Throttle control

b) Bypasses the restricting oriface to increase the reject flow rate beyond restricting oriface limits.

3) MOV110

a) Open-Shut-Throttle control — Throttleable valve

b) Filter/demin bypass throttle valve

c) Controls system flow when no filter/demins are in service and WCS return is to the feedwater lines.

d. Aids flow control when two WCS pumps are running with 1 filter/demin in service.

e. Aids flow control when manipulated filter/demins.

g. Reject isolation valves — Seal-in valves

1) MOV106 reject to LWS

2) MOV107 reject to the condenser

3) Both valves are Open-Shut and deenergized when not in use. — Note: These valves are de-energized for Appendix "R" fire reasons.

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/ NOTES
h. Heat exchanger bypass valve MOV111	Throttleable valve	
1) Open-Shut-Throttle control		
2) Was used to circulate reactor water to prevent stratification during hot no-flow conditions.	Note: Mode "B" operation is no longer allowed - see GE SIL #436.	
i. Regenerative heat exchanger discharge isolation valve MOV109	Seal-in valve	
1) Open-Shut control		
2) Originally it was the return to feedwater throttle valve		
j. Return to feedwater pressure control valve MOV200	Throttleable Valve	
1) Open-Shut-Throttle control		
2) Used to control WCS system pressure when return is to the reactor		
3) Valve adjustment is coarse	Note: This is due to conversion of an isolation MOV to a throttle valve.	
C. Interlocks	Use drawing 761E423AF to illustrate	EO-2.0c
1. WCS isolations		EO-4.0a
a. This includes group 6 and 7 containment isolations.	Group 6 = MOV112 Group 7 = MOV102	

LESSON CONTENT	DELIVERY NOTES
b. High ambient temperatures	Ambient temperatures indicate leakage of a high temperature fluid (ie Reactor water/steam) into the space.
1) Rx. Bldg. RWCU Pmp Room A	
a) E31-N601A on P632 for Div I	Div I isolates MOV112
b) E31-N601B on P642 for Div II	Div II isolates MOV102
c) 135°F is tech spec limit for the trip point.	
d) Actual setting is 131.5°F	
2) Rx. Bldg. RWCU Pmp Room B	
a) E31-N601C on P632 for Div I	P632 is Div I leak detection panel
b) E31-N601D on P642 for Div II	P642 is Div II leak detection panel
c) 150°F is tech spec limit for the trip point	
d) Actual setting is 146°F	
3) Rx. Bldg. RWCU Hx Room	
a) E31-N601E on P632 for Div I	
b) E31-N601F on P642 for Div II	
c) 135°F is tech spec limit for the trip point	
d) Actual setting is 131.5°F	
4) Rx. Bldg. SFP HX Room B	Considered part of the pipe chase.
a) E31-N619A on P632 for Div I	
b) E31-N619B on P642 for Div II	
c) 135°F is tech spec limit for the trip point	

d) Actual setting is 131.5°F

5) Rx. Bldg. Radioactive pipe chase

a) 266 foot elevation

i) E31-N620A on P632 for Div I

ii) E31-N620B on P642 for Div II

b) 292 foot elevation

i) E31-N621A on P632 for Div I

ii) E31-N621B on P642 for Div II

c) 305 foot elevation

i) E31-N622A on P632 for Div I

ii) E31-N622B on P632 for Div II

d) 135°F is the tech spec limit for the trip point

e) Actual setting is 131.5°F

c. High WCS differential flow

Note: Indicates a leakage of Reactor Water from WCS.

1) Between inlet flow and return plug reject flows

2) 150.5 GPM is the setpoint

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/ NOTES
3) 45 second time delay to allow system startup		
d. Low-low reactor vessel water level	Note: On loss of vessel level, likely non-essential leakage sources are isolated.	
1) 108.8 inches		
e. SLS initiation	Q: Why is WCS isolated on SLS initiation?	
1) MOV112 shuts if SLS Pump "A" starts	A: To prevent removal of shutdown chemicals from Reactor Water.	
2) MOV102 shuts if SLS Pump "B" starts		
3) Isolations also occur if an RRCS initiation occurs.	Q: Why is WCS isolated for high temperature out of NRHX?	
4) Div I RRCS shuts MOV112 and Div II RRCS shuts MOV102.	A: Protects the Filter/Demin Resin	
f. High outlet temperature from tub side of NRHX		
1) 140°F		
2) Only MOV112 shuts		
3) Not a true isolation. This is a protective action.		
2. Reject Flow Control Valve (FV135) shuts on		EO-4.0b
a. Low pressure upstream (5 PSIG) and,	Note: Prevents draining WCS	
b. High pressure downstream (140 PSIG)	Note: Protects low pressure reject piping.	

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/ NOTES
3. The holding Pump (P6A, B, C, or D) for a given filter/demin vessel starts automatically if the flow through that vessel drops below 90% of normal flow (<153 gpm).	Q: Why does the holding pump start on Reduced Vessel Flow? A: Maintains the filter cake on the Septae.	EO-4.0c
4. WCS Pumps (P1A and P1B) trip on: a. Low flow 1) 70 GPM 2) 15 minute time delay to allow startup b. Anytime MOV102 or MOV112 shut 1) This is instantaneous 2) Protects pump from loss of suction head.		EO-4.0d
IV. SYSTEM INTERRELATIONS A. Reactor Building Closed Loop Cooling Water (CCP) 1. Cooling for HRHX 2. Cooling for WCS pumps	NOTE: Locate tie points on P&ID-37	EO-2.0d EO-5.0a
B. Reactor Plant Sampling System (SSR) 1. Samples filter/demin influent 2. Samples filter/demin effluent		EO-5.0b
C. Primary Containment Isolation System (ISC) 1. Provides auto closure signals to MOV102 and MOV112		EO-5.0c

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/NOTES
D. Condensate Storage and Transfer (CNS)		EO-5.0d
1. Mixing water to precoat and Resin Feed Tanks		
2. Filter/demin backwash water supply		
E. Liquid Radwaste System (LWS)		EO-5.0e
1. Can receive WCS reject		
F. Condensate System (CNM)		EO-5.0f
1. Condenser can receive WCS Reject		
G. Service Air System (SAS)		EO-5.0g
1. Filter/demin backwash and air scrub air supply		
H. Instrument Air System (IAS)		
1. Valve operations air		
2. All AOV's in the WCS System fail shut on a loss of air.		
3. This means that on loss of IAS, filter/demins isolate & reject flow control valve (FV135) shuts.		

I. Plant Electrical Distribution — EO-5.0h

1. WCS Pumps (P1A and P1B)
   a. P1A from 2NJS-US5
   b. P1B from 2NJS-US6
   c. 120VAC control power from 2VBS-IPNLB102 and 2SCA-IPNL201
2. Valve control power
   a. 2BYS-IPNLA101
3. Filter/demin instrument and control 120VAC/125VDC
   a. 2SCA-IPNL200 and 2SCA-IPNL201 (120VAC)
   b. 2BYS-IPNLA101 and 2BYS-IPNLB102 (125VDC)
   c. 2NHS-MCC008 and 2NHS-MCC009
4. Holding Pumps (P6A, B, C, and D)
   a. P6A and P6C from 2NHS-MCC008
   b. P6B and P6D from 2NHS-MCC009
5. Precoat Pumps (P12A and P12B)
   a. P12A from 2NHS-MCC008
   b. P12B from 2NHS-MCC009

J. System Interconnections

1. Physical piping connections to and from the Reactor vessel — EO-5.0i
   a. Inlet from Reactor Recirc. Loops "A" and "B"
   b. Inlet from bottom head drain line

c. Outlet to feed lines

K. Functional Interrelationships — EO-5.0j

1. Standby Liquid Control System (SLS)
   a. Relay K7 in the SLS injection pump start circuit causes WCS to isolate.
   b. WCS isolates when SLS initiates to prevent the removal of boron from the reactor by the WCS filter/demins.
2. Redundant Reactivity Control System (RRCS) — EO-5.0k
   a. Initiation of RRCS starts the SLS System.
   b. It also isolates WCS (for the same reason as above).

V. PRECAUTIONS AND LIMITATIONS — EO-6.0

1.0 When RWCU is being used to reject water, non-regenerative heat exchanger outlet temperature must be monitored. As reactor temperature and pressure increase, reject flow must be reduced to maintain heat exchanger outlet temperature less than 130°F. If heat exchanger outlet temperature is allowed to increase to 140°F, a cleanup system isolation will result.

Rejected Water Does Not Pass Through RHX
1. This reduces RHX Heat Removal Ability
2. Places more load on NRHX
   a. Overload NRHX causes outlet temperature to rise
   b. 140°F causes WCS isolation to protect resin

LESSON CONTENT	DELIVERY NOTES
2.0 Do not exceed the maximum non-regenerative heat exchanger closed cooling water (CCP) exit temperature of 180°F.	Limit is Based on Design Heat Loading of NRHX on CCP
3.0 Do not exceed the maximum non-regenerative heat exchanger shell side pressure of 150 psig.	Shell side design pressure limit
4.0 Maintain CCP to the RWCU pumps anytime the pumps are in operation or pump temperature is greater than 130°F.	Provides cooling for pump running or process water heating.
5.0 2WCS-MOV106 and 2WCS-MOV107 (Appendix R Valves) will be energized only when RWCU is being operated in blowdown.	Smart Fire Causes MOV106 and MOV107 to Fail Open 1. Loss of Condenser Vacuum 2. Loss of condenser as a heat sink
6.0 When venting high temperature water, the water may flash to steam. Exercise extreme caution during these operations. Always slowly throttle open vent valves.	Personnel Hazard
7.0 Do not return the RWCU system to operation following actuation of the Standby Liquid Control System as it will remove the Sodium Pentaborate from the reactor water.	Removal of Shutdown Chemical can Cause a Restart Accident
8.0 The heatup rate of the RWCU pumps should not exceed 10°F per minute.	Limits Pump Thermal Stress

LESSON CONTENT	DELIVERY NOTES
9.0 All RWCU areas should be considered high radiation areas. Contact radiation protection prior to entering these areas.	Cleanup System Concentrates Activated Corrosion Products and Fission Products and N-16 Gamma Radiation is Present
10.0 Remove all filter/demineralizers from service per Section F.2.0 prior to starting or stopping a RWCU Recirculation Pump.	Abrupt Flow Changes Cause: 1. Release of soluable and insoluable impurities 2. (Extreme) cause resin cake break through a. Clogs outlet strainers b. Requires backwash/precoat of filter/demin
11.0 All evolutions causing changes in RWCU flow should be made slowly. Rapid changes in flow fan result in filter/demineralizer breakthrough. This may cause plugging of the filter/demineralizer effluent strainers and will require removal of the filter/demineralizer from service and backwash of the strainers.	Same Reasoning s Precaution #10.0
12.0 Monitor Filter Demineralizer effluent conductivity. Backwash and precoat F/D if the following guidelines are exceeded:	WCS filter/demin operational limits
a. If RWCU is operating with FW return and outlet conductivity approaches 0.1 mho/cm.	0.1 micromho/cm is Tech Spec RCS limit
b. If RWCU is operating with full reject to condenser and outlet conductivity approaches inlet conductivity.	Ensures filter/demin is removing some impurities (water is not returning to the RPV)

12.1 The Chemistry Department will sample RWCU daily and advise that a F/D be backwashed and precoated if the influent sample silica count exceeds 100 ppb and the effluent sample of an individual F/D exceeds 50 ppb silica.

The silica count determines resin exhaustion

- High silica count is a precurser to chloride break-through
- Conductivity still applies because it is continuous

12.2 When WCS System is isolated and unavailable for continuous conductivity monitoring per Tech. Spec. 3/4.4.4.c, alternate sampling must be performed. See OP-17 and Tech. Spec. 3/4.4.4.c.

Alternate sampling is required by Tec. Spec. for verification of reactor water chemistry.

13.0 Rapid loss of RWCU flow may result in the filter media being dropped from the septa. Following an RWCU isolation or RWCU pump trip it is good practice to backwash and precoat the filter/demineralizers prior to restoring the system to service.

The Hold Pump May Not Start Fast Enough to Maintain Flow

1. Since cake may be disturbed filter/demins should be backwashed and precoated
2. Limits downtime since outlet strainers are not clogged.

(If filter/demins placed in service with disturbed resin cake, can cause resin to plug outlet strainer.)

3. Prevents process flow through filter/demin with bare sepate

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/ NOTES
14.0 Anytime operations are being performed at Panel 2WCS-IPNL187 and 2WCS-IPNL188 the operator at the local panels should remain in direct voice communication with the Main Control Room.	Due to WCS Sensitivity 1. Allows Control Room to directly supervise 2. Allows communications with operator monitoring differential flow (Allows faster response to help prevent high differential flow isolation.)	
15.0 Prior to resetting an isolation of the RWCU system, the cause of the isolation must be determined and corrected.	Prevents Second Isolation 1. First isolation required 4 hour NRC notification 2. Second isolation would require a second notification (NRC notifications are not good.)	
16.0 Always precoat the filter/demineralizers prior to pumping water through them. Pumping through bare filter septor may cause them to corrode and/or plug.	Manufacturer's Precaution	
17.0 Do not attempt to backwash more than one filter/ demineralizers at the same time. The filter/ demineralizers share a common drain path to Phase Separator. Attempting to backwash two filter demins simultaneously may result in restriction to flow and a poor backwash.	Common Drain Line is Sized for Backwash of One Filter/Demin at a Time. 1. 2 at a time slows flow 2. Backwash is a timed function 3. Less flow for given time prevents proper backwash.	

18.0 Prior to backwash of RWCU filter/demineralizers notify Radiation Protection that a backwash will be performed.

Required Heads Up to Rad. Protection

1. Movement of large amount of contaminated material
2. Not an every day occurrence

19.0 RWCU shall be operating in total reject to main condenser when Reactor Water Temperature is greater than or equal to 200°F and Reactor Power is less than 20%.

Prevents Stratification of Water Temperature in Feed Lines

1. Caused by temperature difference
   a. Between WCS outlet and feed
   b. Large difference occurs between 200°F and 20%.
2. Stratification causes thermal stress on feed lines.

20.0 Observe all precautions to limit radiation exposure and the spread of contamination. Water from leakage or drain/vent operations should be treated as contaminated. Whenever possible, make provisions to contain the source of the water.

Due to High Contamination Potential of Water and Resin

21.0 Do not change valve position indication light bulbs on the filter/demineralizer control panels, 2WCS-IPNL187 & 2WCS-IPNL188 when they are energized this will cause fuses to blow and a possible shutdown of a cleanup filter.

Light Socket Design Allows Shorting When Bulb is Installed

1. Fuse blows
2. Possible loss of micro processor power

22.0 When changing system flow; i.e., starting/stopping pumps, changing lineups, adding/removing F/D's from service; station an operator at PNL's 2CEC*PNL632/642 to monitor the differential flow meters so that a system isolation may be avoided.

Isolation Requires NRC Notification

1. Differential flow isolation has 45 seconds time delay.
2. May have time to correct condition prior to isolation.
3. Also can correct condition if differential flow approaches setpoint.

23.0 Do not simultaneously open 2WCS-MOV107 and 2WCS-MOV106 as a loss of condenser vacuum could occur.

Allows a Path for Air Introduction

1. LWS Receiving Tank is vent to atmosphere
2. Condenser is at a vacuum

25.0 During single Rx. Recirculation Loop Operation (1 loop isolated) maintain WCS System Flow below 500 gpm to ensure adequate NPSH is available to the pump (2WCS-P1A,B). Only one pump should be in operation with the other isolated in standby. The second pump can be started for pump swap.

This is a Pipe Size Limitation

1. Each Recirc. Loop tap is a 4" line for an 8 inch total flow diameter.
2. Reducing flow area by 1/2 requires reducing flow by 1/2
3. Single WCS pump limit during Single Recirc. Loop Operations.

26.0 Notify SSS prior to any manipulation of those valves listed in Attachment 2.

Review LER 89-033 (Attachment #1)

LESSON CONTENT	DELIVERY NOTES	ECTIVES/ NOTES
27.0 The Chemistry Department should be notified to isolate their sample lineups from the WCS Demineralizer influent and effluent sample points if the WCS system is isolated or shutdown for ≥ 30 minutes.	Sampling Causes WCS Inventory Loss 1. This allows introduction of air into WCS 2. Air gathers in flow transmitter sensing lines 3. Amplifies flow inaccuracies and oscillations 4. Has caused high differential flow isolation	
28.0 When starting up the WCS system, venting is required if the WCS system has been isolated or shutdown for ≥ 30 minutes.	Goes Along With Precaution No. 27.0 1. Venting removes air from WCS piping 2. Read LER 89-031 (Attachment #2)	
29.0 Mode "B" operation of the WCS system, (utilizing the WCS system to prevent thermal stratification of the reactor vessel during periods when no recirc. flow and feed flow are available), is prohibited due to thermal stress on the Feedwater System. (GE SIL #436)	Review GE SIL #436 Highlight temp difference causes excessive thermal stress and the conditions causing the use of Mode "B" operation unlikely.	
VI. SYSTEM OPERATION		
A. Startup 1. Normally the system is started with the RPV cold and depressurized. 2. Provisions and procedures exist to start WCS with the RPV hot and pressurized.	Details are found in Section E of N2-OP-37	EO-7.0a

3. After electrical and valve lineups, a WCS pump is started to fill the system.
   a. Must fill quickly since pump trip occurs if system flow is <140 gpm for 15 min.
   b. Fill rate is controlled by manual discharge isolation valve.
4. When the system is filled it must be vented. There is an extensive vent procedure to ensure no air exists in the system.
5. Filter/demineralizers are now placed in service as necessary.

B. Normal Operation — Details are found in Section F of N2-OP-37 — EO-7.0b

1. Full reject to prevent feedwater stratification — TCO # TCO-02-LOT-90-102
   a. Required when reactor water temperature is >200°F and reactor power is <20%.
   b. Line up system with 1 pump and 1 filter/demin in service.
   c. Cleanup flow is maintained 170 to 175 gpm by the FV16 associated with the filter demin in service.
   d. Cleanup system pressure and position of FV16 is controlled by reject flow control valve FV135.

e. Depending on reject path, clear Appendix "R" holdout on MOV106 (LWS) or MOV107 (main condenser).

f. If filter/demins are not in service or are being manipulated, the filter/demin bypass valve MOV110 is throttled to maintain system flow.

2. Full return to feedwater

a. Normal flowpath when reactor power is above 20%.

b. FV135, MOV106 and MOV105 are all shut.

c. Cleanup system back pressure is controlled by MOV200.

1) MOV200 has a 10 second stroke time which makes control very course.

2) Be cautious and slow when manipulating MOV200.

3) MOV200 is throttled until WCS pump discharge pressure is 250 psi above RPV pressure.

d. System flow is controlled by the number of filter/demins in service (170 to 175 gpm flow per filter demin in service) as long as MOV110 is shut.

C. Shutdown — Details are found in Section G of N2-OP-37 — EO-7.0c

1. Remove all filter/demins from service (one at a time)
2. Stop the WCS pumps (P1A and P1B)
3. Isolate pumps if necessary and have sample lineup secured if required.

D. Offnormal — Details are found in Section H of N2-OP-37 — EO-7.0d

1. Reduction from 2 pump to one pump operation
2. Placing a cold WCS pump in service with the WCS system hot
   a. All preparations are done outside of the Control Room.
   b. After the pump is started, it is warmed up locally.
3. Flow rejection — TCO # TCO-02-LOT-90-102
   a. This flowpath is used to control RPV level when shutdown and when starting up <200°F. It is also used to control RPV temp/press when directed by N2-EOP-RP.

b. The lineup allows a combination of return to feedwater and rejection.
c. Cleanup system pressure is controlled by MOV200.
d. System flow is controlled by FV16's and MOV110.
e. Reject flow is controlled by FV135 and, if necessary, MOV108 to maintain:
   1) NRHX outlet temperature
   2) RPV level
   3) RPV pressure

4. Restoration after an isolation (ESF actuation)
5. Maximizing RWCU System cooling
   a. As directed by EOP's (N2-EOP-RP)
   b. As directed by N2-OP-31 for a loss of shutdown cooling.
6. Removal of hydraulic lockup of AOV's
7. Additional system venting instructions
8. Overriding filter/demin full level element

E. Annunciator Response — EO-7.0e

1. Review Section I of N2-OP-37
2. Special attention should be given to the annunciators on P603 in the Control Room.

F. EOP utilization of WCS — EO-8.0

1. Review N2-EOP-6 Attachment 11 — Removal of WCS isolations
2. Review N2-EOP-6 Attachment 19 — Boron injection using WCS
3. N2-EOP-RP directs use of RWCU for pressure control per N2-OP-37 Section H.5.0

VII. TECHNICAL SPECIFICATIONS — EO-9.0

A. Review the Following Technical Specifications for:

		LCO	SR
1.	Isolation Actuation Instrum.	3.3.2	4.3.2
2.	Reactor Coolant Chemistry	3.4.4	4.4.4
3.	Rx Coolant Specific Activity	3.4.5	4.4.5
4.	Primary Containment Leakage	3.6.1.2	4.6.1.2
5.	Primary Containment Isolation Valves	3.6.3	4.6.3

VII. SYSTEM HISTORY

A. System Modification

1. PN2Y87MX023

a. Old Design

1) 2WCS*MOV200 was seal in Open or Shut

2) 2WCS*MOV109 was throttleable

b. New Design

1) 2WCS*MOV200 is throttleable

2) 2WCS*MOV109 is seal in Open or Shut

c. Why was this done

1) MOV200 is downstream of the flow transmitters

2) Throttling MOV200 maintains a more constant press on the flow transmitters.

3) Minimizes oscillations in indicated flow when the Reactor is depressurized.

2. PN2Y87MX119
   a. Old Design
      1) 2WCS-V400 was installed to maintain a constant non-vacuum pressure on flow element/transmitter.k
      2) Prevented flashing and erratic indications

         Note: Due to Condenser Vacuum
      3) This was a temporary fix
      4) Also flow transmitter was downstream FV135
   b. New Design
      1) Removed V400
      2) Moved 2WCS*FE126 upstream of FV135
      3) FV135 now supplies back pressure
   c. Why was this done
      1) Vacuum and pressure oscillation caused erroneous flow readings
      2) Back pressure helped
      3) Removed temporary valve and used installed FV135
3. PN2Y87MX167 (PN2Y88MX065)

   Note: PN2Y87MX167 covered *FT67Y and tubing reroute for *FT67X. PN2Y88MX065 completed all FT's after initial good results.
   a. Old design
      1) 2WCS*FT67X and Y and 2WCS*FT69X and Y had Flex Hose Sensing Lines

2) Also high points in sensing lines that were hard to vent

b. New design

1) Replaced flex hose with rigid tubing

2) Rerouted lines to eliminate entrapped air

c. WHY was this done

1) Flex hoses caused noisy flow readings

2) Lines trapped air which amplified hose.

3) Erroneous flow readings that caused transmitter failures and WCS isolations on high differential flow.

B. LER's

Have each student read a paragraph of the event description. After each paragraph, have the class pick key points of that paragraph to be listed on the board to aid in analysis of the event.

After reading the event description use a guided class discussion to determine:

1. Probable root cause
2. Recommended corrective actions (as if you were the licensee)
3. Relevance to NMP2 (ie. is the event described, a concern at NMP2?).
4. Actions that can be taken to prevent this event from happening at NMP2.

Instructor Note: Use of OEA response to these (NOTICE/SOER/SIL etc.) may be useful for the discussion of items 3 and 4 above.

1. LER 88-002
   a. Initial conditions
      1) WCS isolated
      2) Reactor in cold shutdown
   b. Event
      1) WCS unisolated
      2) Preparations made to start WCS pump
      3) WCS isolates on high differential flow

Note: By Tech. Spec. 3.3.2 due to a failed flow instrument

Note: This is an engineer safety features (ESF) actuation.

c. Cause
   1) Suction flow transmitter calibration shift
   2) WCS design deficiency

Note: The CAL shift caused the high differential flow trip and the design allows air to be trapped in the transmitter sensing lines which is thought to have caused the calibration shift.

d. Corrective actions
   1) Calibrate flow transmitter
   2) Information sent to WCS trouble-shooting task force

2. LER 88-015
   a. Initial conditions
      1) Reactor at 100% power
      2) Reactor Building Glycol Heating (HVG) shutdown for repairs
      3) Reactor Building Ventillation (HVR) placed in off normal lineup by N2-OP-52

NOTE: Lineup has HVR in recirc and Standby Gas Treatment running to maintain Reactor Building negative pressure.

   b. Event
      1) Received high temp alarms for WCS A and B Pump and Heat Exchanger Rooms.
      2) WCS isolates on high "A" Pump Room temp.
   c. Cause
      1) HVR design deficiency

2) Off normal ventilation mode draws air from WCS rooms but supplies no cooling air
3) Air is drawn in via doorway
4) Curtain on door restricts flow

d. Corrective actions
1) Reduced WCS room temperatures
2) Returned WCS to service
3) HVR procedure change to supply normal HVR during off normal ventilation lineup
4) Engineering analysis of HVR off normal lineup

3. LER-88-048

a. Initial conditions
1) 35% Reactor Power
2) Mode switch in run

b. Event
1) Attempted to swap from full reject to normal return
2) Hi differential flow trip
3) Attempted to stabilize flow
4) Timer timed out and WCS isolated

c. Cause
1) Erratic flow indication problems

2) Flow perturbations caused by transient

3) Root cause is design deficiency

d. Corrective actions

1) MOD PN2Y88MX044

Note: Not yet accomplished. Meant to improve reject flow control.

2) MOD PN2Y88MX065

Note: Removed flex hoses from flow transmitter sensing lines.

3) N2-OP-37 revised to add additional warnings and requirements

4) Engineering evaluation of flow oriface accuracy

4. LER 90-005 (1st event)

a. Initial conditions

1) Reactor at 4% power

2) Mode switch in startup

b. Event

1) 2WCS-FV16D found 15% open during rounds

NOTE: Required to be at least 20% open by N2-OP-37. FV16D is flow control valve for filter/demin 4D

2) CSO informed, tried to adjust FV135

NOTE: FV135 is reject flow control valve. Since in full reject, shutting down on FV135 should allow FV16D to open.

3) Flow did not change as expected

4) Controller for FV16D found in manual

5) Operator took local control to adjust FV16D

6) WCS isolated on high differential flow

c. Cause

1) Not yet determined

d. Corrective action

1) Pending cause determination

5. LER [159] RWCU Area High Temp. Sensor Inop
   - Direct students to read LER [159]
   - Refer to tech spec for action

a. Installed incorrectly in Exhaust Duct vice on pump room wall.

b. Trip channel Inop. Tech Spec 3/4 3.2

c. Notification per 10CFR50.73 a, 2, c, b

6. LER [50] Failed Relay Isolates RWCU

a. RWCU outboard isolation closes.

b. NRHX out Hi temp trip relay de-energized (tripped)

c. Relay failed due to excessive cycling in low flow conditions. Physical layout in HX room allowed for piping conductance from RHX to trip sensor. Sensor moved.
   - Not a problem at U-2 layout different, element close to NRHX outlet away from the RHX piping.

X. WRAP-UP

A. Review the Student Learning Objectives

Event 2 - WCS Blowdown to Phase Separator LER 89-33

An operator on rounds discovered a leak in the WCS Valve Room. Due to radiological conditions the operator was not able to enter the room to determine the source of the leak.

The operator informed the Control Room of the leak. Since the D WCS filter/demin was in service, the SSS directed that the D filter/demin be secured and isolated in an attempt to secure the leak. The operator involved decided to take the additional and prudent action of depressurizing the filter vessel by opening the inlet strainer blowdown valves. The operator did not adequately log this action, nor did he inform the CSO of this action, nor was this information turned over to the on-coming operator.

When the source of the leak was determined not to be the D filter/demin, the next shift decided to put D filter/demin back in service. When the filter/demin was unisolated reactor water had a direct path from the Reactor to the phase separator via the open strainer blowdown valves. The increase in WCS flow to the non-regenerative heat exchanger exceeded the capability to CCP to remove heat from WCS, causing WCS to isolate on high non-regenerative heat exchanger outlet temperature (140°F).

An operator took action to depressurize a reactor water cleanup filter/demin by opening the filter/demin inlet strainer blowdown valves. The operator did not adequately log this action, nor did he inform the CSO of this action, nor was this information turned over to the on-coming shift.

Lesson Learned

1. It is required to notify the SSS and CSO of off-normal system configurations.

2. N2-OD1-5.01, LOG MAINTENANCE, provides instruction for the maintenance of operations log books to ensure day-to-day shift evolutions are properly documented. Section 2.6 specifically states that valve or electrical lineups not in accordance with approved procedures are to be logged, along with the reason for this configuration.

3. N2-OD1-3.01, SHIFT TURNOVER GUIDELINES, provides BUILDING TURNOVER CHECKLISTS. These checklists have provision to annotate system configurations that are out-of-normal.

LER 89-31

I. DESCRIPTION OF EVENT

On October 13, 1989, at 1746 hours, Nine Mile Point Unit 2 (NMP2) experienced the actuation of an Engineered Safety Feature (ESF), specifically, isolation of the Reactor Water Cleanup (WCS) system on an erroneous high differential flow signal. At the time of the event, the plant was in "HOT SHUTDOWN" (Operational Condition 3) with reactor temperature at approximately 418 degrees Fahrenheit and reactor pressure at approximately 307 pounds per square inch gauge.

Following a reactor scram, which occurred earlier in the day (LER 89-35), the Reactor Water Cleanup system had been secured per Operating Procedure N2-OP-101C "Plant Shutdown".

While attempting to restart the WCS system to normal operation, an isolation signal occurred causing closure of WCS inlet flow valve 2WCS*MOV102 (containment isolation) and tripping of WCS pump 2WCS*P1B. Because of plant conditions at the time of the WCS system startup, the evolution differed from normal system startup. The WCS system return flowpath to the Reactor Pressure Vessel (RPV) via Feedwater system (FWS) could not be utilized due to potential stratification problems in the FWS system piping. This condition exists when reactor coolant temperature is greater than or equal to 200 degrees Fahrenheit and the plant is less than 20 percent power. This condition requires the full reject mode of operation to be used. This involves discharging the WCS system to the main condenser (Condensate system) or the Liquid Radwaste system. The cleanup system is designed to isolate when the differential flow between system inlet and outlet flow exceeds 150.5 gallons per minute for 45 seconds.

At 1732 hours on October 13, 1989, the WCS system Division II pump 2WCS*P1B was started in accordance with Operating Procedure N2-OP-37 "Reactor Water Cleanup System". The differential flow meters located at Control Room Panels 632 (Division I) and 642 (Division II) immediately began exhibiting erratic output (excessive indicator movement with intermittent upscale and downscale indication). At 1746 hours, while establishing a 170-175 gpm flow to the main condenser, the Division II isolation occurred. An immediate investigation was then started as to the cause of the trip.

II. CAUSE OF EVENT

The root cause of the event was determined to be equipment malfunction with procedure deficiency as a contributing factor.

A combination of events created the conditions resulting in the cleanup system isolation:

- Leaking drain valves on three flow transmitters caused air introduction into the instrument sensing lines which contributed to flow perturbations.

- One cleanup flow transmitter was damaged and reading erroneously.

- Operating procedure did not require sampling from the cleanup system to be secured which contributed to lost inventory leading to flow perturbations on system startup.

III. ANALYSIS OF EVENT

This event is reportable under the requirements of 10CFR50.73 (a) (2) (iv), which requires the licensee to report "Any event or condition that resulted in the manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System (RPS)". The Reactor Water Cleanup isolation function is an ESF function which is part of the Primary Containment and Reactor Vessel Isolation Control System.

The NMP2 Final Safety Analysis Report, Section 5.4.8 states: "The WCS System is classified as a primary power generation system (not an engineered safety feature), a small part of which is part of the Reactor Coolant Pressure Boundary (RCPB) up to and including the outside isolation valve. The other portions of the system are not part of the RCPB and can be isolated from the Reactor. The WCS System may be operated any time during planned reactor operations or it may be shutdown, if water quality is within the Technical Specification limits".

A WCS System isolation does not impair the station's capability to achieve a safe shutdown condition. The WCS isolation function operated as designed with no other transients or inoperable systems contributing to the event.

IV. CORRECTIVE ACTIONS

The following corrective actions were taken:

1. Issue Work Requests (WR) 165129, 165130, 165131, and 165132 to troubleshoot/recalibrate the Reactor Water Cleanup system flow transmitters.

2. Replace out of calibration Reactor Water Cleanup system flow transmitter 2WCS*FT67Y (WR#165131).

3. Replace/repair leaking drain valves located on the instrument sensing lines.

4. Operating Procedure N2-OP-37 "Reactor Water Cleanup" will be revised to include the following steps:

   A. Direct the Chemistry Department to secure their sampling lineups from the WCS system anytime the system is shutdown for periods of time equal to or great than 30 minutes.

   B. Vent the WCS system from its high points on any system startup when system has been idle for periods of time equal to or greater than 30 minutes. This will assure that the system is full and will minimize flow disturbances.

ATTACHMENT #3

LER ENCLOSURE

[159] Susquehanna 1 Docket 50-387 LER 88-018

One channel of RWCU System area high temperature isolation instrument found inoperable.

EVENT DATE: 082488 REPORT DATE: 092388 NSSS: GE TYPE: BWR

(NSIC 210563) on 8/24/88, it was discovered that the RWCU Pump Room ambient temperature sensor, was not installed per design. The sensor was discovered to have been installed in a location in which it would not have detected a RWCU steam leak in the RWCU Pump Room area. The installation error was discovered during a walkdown of the Steam Leak Detection System. The walkdown had been initiated in response to recent problems identified on the MSL DT trip logic. Root cause of this event was attributed to a lack of installation detail on the design documents for the Steam Leak Detection System. The ventilation drawing used for identification of instrument location for the sensor was vague and did not clearly show the mounting location. This resulted in the temperature sensor being installed inside the main steam tunnel exhaust duct instead of being installed on the wall of the RWCU Pump Room. The event has been determine to be reportable per 10CFR50.73(A)(2)(I)(B), in that one trip logic channel for the RWCU Pump Room RWCU leak detection ambient temperature trip logic has been inoperable prior to 8/24/88 and would not have been able to perform its design function. A new temperature instrument was installed in the proper location within the RWCU Pump Room and the original temperature instrument was left as a spare device in the MSL Exhaust Duct.

Not a problem at NMP2, Sensor installed correctly.

[50] FERMI 2 Docket 50-341 LER 88-034

Isolation of Reactor Water Cleanup System due to suspected relay failure.

EVENT DATE: 083188 REPORT DATE: 093088 NSSS: GE TYPE: BWR

(NSIC 210620) The Reactor Water Cleanup System (RWCU) outboard isolation valve. Closed and caused the RWCU Pumps to trip. Plant personnel discovered that K-142 was de-energized but no reason for this could be determined. The isolation signal was reset, MOV-112 was opened and the RWCU System was returned to service. An investigation by Engineering Personnel was initiated. The closure of MOV-112 was caused by contacts 3-4 on Relay K-142 closing upon de-energization of the relay. The cause of the de-energization is under investigation. Two relays (GE Model CR120A) in the valve isolation circuit have been replaced and the previously installed relays will be evaluated. Relay K-142 has been sent to General Electric for analysis. Relay K-160 will be sent to an independent laboratory for analysis. A revision to this report will be submitted within 60 days of the receipt of the results of both analyses.

Not a problem at NMP2, Relay tripping caused by NRHX out Temp. Sensor being too close to the RHX and falsely tripped due to piping conductance. NMP2 sensor located close to NRHX.