07-186-9

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT NUCLEAR STATION

UNIT II OPERATIONS

02-LOT-001-201-2-01 Revision 6

TITLE: CONTROL ROD DRIVE HYDRAULIC SYSTEM

	SIGNATURE	DATE
PREPARER	J.W. Pendlebury	12/13/90
TRAINING SUPPORT SUPERVISOR	F.A. Peeling for J. LeClair	12-14-90
TRAINING AREA SUPERVISOR	J. Kaminski	12/12/90
PLANT SUPERVISOR/ USER GROUP SUPERVISOR	[illegible] for MJC	12-14-90

Summary of Pages

(Effective Date: 12-14-90)

Number of Pages: 27

Date	Pages
December 1990	1 - 27

THIS LESSON PLAN IS A GENERAL REWRITE

TRAINING DEPARTMENT RECORDS ADMINISTRATION ONLY:

VERIFICATION: ____

DATA ENTRY: ____

RECORDS: ____

39 5/3/86

ATTACHMENT 6

LESSON PLAN TEMPORARY/PUBLICATION/ADDENDUM CHANGE FORM

The attached change was made to:

Lesson plan title: Control Rod Drive Hydraulics

Lesson plan number: 02-LOT-001-201-2-01

Name of instructor initiating change: Peter A. McSparran

Reason for the change: Update lesson plan to include a discussion of SOER 80-6. (See Pg 27 of Lesson plan Section VII. A

Type of change:

1. Temporary change ____
2. Publication change ____
3. Addendum change X

Disposition:

X 1. Incorporate this change during the next scheduled revision.

____ 2. Begin revising the lesson plan immediately. Supervisor initiate the process.

____ 3. To be used one time only.

Approvals:

Instructor: [signature] /Date 7/2/91

Training Area Supervisor (or designee): [signature] /Date 7/2/91

I. TRAINING DESCRIPTION

A. Title of Lesson: Control Rod Drive Hydraulic System

B. Lesson Description: This lesson contains information pertaining to the Control Rod Drive Hydraulics 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: Estimated at 5.0 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 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 NTP-10.

G. References:

1. Technical Specifications
2. Operations Procedure N2-OP-30
3. Operations Procedure N2-OP-97
4. Emergency Operating Procedures

II. REQUIREMENTS

A. AP-9, Administration of Training

B. NTP-10, Training of Licensed Operator Candidates

III. TRAINING MATERIALS

A. Instructor Materials

1. Classroom
2. Transparency Package
3. Overhead Projector
4. TR
5. Technical Specifications
6. Trainee Handouts: Control Rod Drive Hydraulics Op Tech
7. Lesson Plan: Control Rod Drive Hydraulics 02-LOT-001-201-2-1 Rev. 6
8. Operations Procedure N2-OP-30
9. Operations Procedure N2-OP-97
10. Emergency Operating Procedures

B. Trainee Materials

1. Handouts (can include text, drawings, objectives, procedures, etc.)
2. Pens, pencils, paper
3. Technical Specifications
4. Trainee Handouts: Control Rod Drive Hydraulics Op Tech
5. Operations Procedure N2-OP-30
6. Operations Procedure N2-OP-97
7. Emergency Operating Procedures

IV. EXAMS AND MASTER ANSWER KEYS

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 completion of this lesson, the trainee will have gained the knowledge to operate and perform the following actions:

TO-1.0	Respond to a CRD System Failure (SDV high (level)	2000100501
TO-2.0	Perform the Actions Required for a CRD System Failure (Pump trip)	2000340401
TO-3.0	Perform the Actions Required for a Stuck/ Inoperable Control Rod	2000360401
TO-4.0	Perform the Actions Required for a Mispositioned Control Rod	2000390401
TO-5.0	Perform the Actions Required for a Control Rod Drift	2000490501
TO-6.0	Perform Lineups on the CRD Hydraulic System	2010010101
TO-7.0	Place the CRD System in Service	2010020101
TO-8.0	Monitor the CRD System	2010110101
TO-9.0	Perform the Actions Required to Correct an Accumulator Trouble at Panel P603.	2019330101
TO-10.0	Perform CRD Speed Adjustment	2010140101
TO-11.0	Perform CRD Pump Changeover at Panel P603	2019060101
TO-12.0	Perform CRD Stabilizing Valve Changeover at Panel P603	2019070101
TO-13.0	Increase CRD System Flow to The Reactor the After Reactor is Shutdown.	2019160501
TO-14.0	Perform the Scram Accumulator Check Valve Leakage Test.	2019180501
TO-15.0	Perform the SDV Vent and Drain Valve Scram Response Test.	2019190501
TO-16.0	Place the CRD System in CRD Layup	2019290401
TO-17.0	Shutdown the CRD System to Standby Readiness	2019300101
TO-18.0	Respond to a CRD High Temperature	2019310101
TO-19.0	(SRO ONLY) Monitor the Control Rod Drive System	2010110103
TO-20.0	(SRO ONLY) Direct the Actions Required for a Stuck Rod	3449240503

TO-21.0 (SRO ONLY) Direct the Actions Required for an Inability to Drive Control Rods 3449250503

TO-22.0 (SRO ONLY) Respond to a Control Rod Drift 3449740403

B. Enabling Objectives:

EO-1.0 Explain the purpose and function of the Control Rod Drive Hydraulic System.

EO-2.0 Describe the interrelationship of the following systems to the Control Rod Drive Hydraulic System.

a. Control Rod Drive Mechanism
b. Condensate System
c. Condensate Storage Tanks
d. Reactor Building Closed Loop Cooling System
e. Normal and Emergency Station Electric Power Systems
f. Reactor Recirculation System
g. Instrument Air System
h. Reactor Manual Control System
i. Reactor Protective System (RPS)
j. Redundant Reactivity Control System

EO-3.0 Regarding the Control Rod Drive Hydraulic System, 1)-locate the correct drawing and 2)-use drawings to perform the following:

a. Identify electrical and mechanical components
b. Trace the flowpath of fluids or electricity
c. Identify interlocks and setpoints
d. Describe system operation
e. Locate information about specific components
f. Identify system interrelationships

EO-4.0 Given a specific set of plant conditions, determine how the system responds.

EO-5.0 Describe the purpose and principle of operation of each of the following Control Rod Drive Hydraulic System components:

a. CRD pump suction filters and strainers
b. CRD pumps
c. CRD pump minimum flow

d. CRD pump discharge filters
e. Recirc. Pump seal
f. Pump runout RO
g. Flow Control Valves
h. Pressure Control Station
i. Charging, Cooling, Drive, and Exhaust Water Headers
j. Stabilizing Valves
k. Pressure Equalizing Valves
l. Hydraulic Control Unit
m. Scram Inlet and Outlet valves
n. Directional Control Valves
o. CRD Accumulator
p. Scram Discharge Volume
q. Instrumented Drain Volume

EO-6.0 Describe the initiations, trips and alarms for the Control Rod Drive Hydraulic System.

EO-7.1 Given N2-OP-30, Control Rod Drive Hydraulics, use the procedure to identify the appropriate actions and/or locate information related to:

a. Startup
b. Normal Operations
c. Shutdown
d. Off-Normal Operations
e. Procedures for Correcting Alarm Conditions

EO-7.2 Given N2-OP-97, Reactor Protection System, use the procedure to identify the appropriate actions to manually insert the Control Rods as part of the Alternate Rod Insertions Off Normal Procedure (H.2.4).

EO-8.0 State the power supplies to the following components:

a. CRD pumps
b. Pressure Control Valve
c. Scram Valve Solenoids
d. Backup Scram Solenoids
e. Scram Discharge Volume Vent and Drain valve Solenoids
f. RRCS/ARI valves

EO-9.0 Given the following parameter, state the normal value for that parameter:

a. CRD Pump amps
b. Charging water pressure
c. Drive water differential pressure

EO-10.0 Given the Control Rod Drive Hydraulic System P&IDs, trace the following flowpaths, include in your discussion any system automatic functions (ie., trips, bypasses, valve movements to return system to normal operational status)

a. Response of a Scram signal
b. CRD Cooling flow
c. CRD Mechanism venting
d. Air flows to actuate system operations
e. SDV vent and drain flowpaths
f. CRD insert flow
g. CRD Withdraw flow
h. Scram flow

EO-11.0 State how FCV 6A/B and PCV-101 fail on loss of motive power.

EO-12.0 Given a drawing of an HCU, identify all major components.

EO-13.0 Explain how rod speed is adjusted.

EO-14.0 Describe how the Control Rod Drive Hydraulic System is utilized during the performance of the EOP's.

EO-15.0 Identify the seven risers on an HCU.

EO-16.0 Explain the basis for each precaution and limitation listed in N2-OP-30 .

EO-17.0 Given Technical Specifications, identify the appropriate actions and/or locate information relating to limiting conditions for Operation, bases, and Surveillance requirements for the Control Rod Drive Hydraulic System.

EO-18.0 Given a specific set of plant conditions, describe the immediate operator actions required.

VI. LESSON CONTENT

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/NOTES
I. INTRODUCTION		
A. Introduction		
1. Have students fill out TR.		
2. Explain Purpose of Course Evaluation and how to use it.		
3. Explain Method of Evaluation	Describe daily quizzes and weekly exams.	
4. Review Student Learning Objectives		
B. Purpose The CRDH System provides reactor grade water at pressures above reactor pressure for driving, cooling, scramming functions related to the operation of the CRDs. The system also provides purging and cooling water to the Reactor Recirculation pump seals.	Show CRDM Figure 1 CRDM and explain what support the CRDH System must provide.	EO-1.0 EO-2.0a
C. General Description Major components are the pumps, FCVs, PCV, HCUs, filters, and piping. Some components are system components, some are dedicated to the CRDM, and hence there are 185 of them and they are found on the HCUs.	Overview system Describe basic flowpath Show Figure CRDH One Line Diagram	

LESSON CON	LIVERY NOTES	CTIVES/ TES
II. DETAILED DESCRIPTION		
A. Pump suction sources	This section of the LP was written to be taught with P&ID 30 A-C.	EO-3.0
1. Pump suction is from 1 of 2 sources. Objective is to try to get the cleanest water possible. Injection will be into the reactor vessel, through tight tolerance CRD mechanisms, or into tight tolerance Recirc. Pump seals.		
2. Preferred suction is from upstream of LV 105 of CMN, through PCV 104, which maintains a downstream pressure of 25 lbs.	Reference P&ID 4A suctions at CST B. Water to be used is de-aerated in condenser. (High Quality)	EO-2.0b, 2.0c & EO-4.0
3. If that pressure should drop, at 20 lbs. (the head of CST B) the supply from downstream of LV 105 is available.	If CST level increases, suction source shifts.	
B. CRD Pump suction Filters and Strainers		
1. The CRDH pumps have two suction filters to protect the pump from foreign material.	Close tolerance within Mechanism requires very particle free water.	EO-5.0a
2. One filter is in service, one valved out.		
3. The filters are disposable elements.	Strainers take out the big chunks.	
4. A Y strainer is located upstream of each filter.		
5. A bypass line with a Y strainer is available.		
C. Pump Suction pressure switches		
1. Pump suction pressure switches protect the pump from cavitation of the suction strainers or if the filters become plugged.	Review with the students what would happen if the strainers became plugged.	EO-6.0 EO-4.0

2. Switches set at 25 In Hg. to trip CRD pumps.		
D. Pump suction relief valves		
1. Relief lifts at 40 lbs.		
2. Relief is to protect low pressure suction piping.		
E. Control Rod Drive Hydraulic Pumps		
1. The CRDH provides the driving force for normal CRD movement, cooling and charging the HCU Accumulators.	Motive force for the system. How would the system respond with both pumps operating? (Preview for N2-OP-97 H.2.4)	EO-4.0 EO-7.2
2. Two 100% capacity pumps are 10 stage centrifugal, motor driven pumps.		
3. One pump operating, other in standby		
4. Each pump has an oil cooler to maintain pump temperature, cooled by RBCLC.	Oil is in Speed reducer Investigate if CST is isolated.	EO-2.0d EO-2.0c
5. Minimum flow bypass line has a restricting orifice to provide a continuous flow to the CST from the running pump to prevent immediate pump overheating if the discharge path is blocked.	Review the operator indications if line were to plug.	EO-4.0
6. Power supplies to the pumps are: P1A 2NNS-SWG014 P1B 2NNS-SWG015	An optional exercise would be to cover the applicable Electrical prints. EO-3.0 If they are covered.	EO-5.0b, EO-2.0d EO-5.0c, EO-2.0e
7. Pump amps indicated in the Control Room on AM-RDS A51 0-50 amps normal 38-39 if running AM-RDS B51 0-50 amps normal 38-39 if running		EO-8.0a EO-9.0

LESSON CO	LIVERY NOTES	CTIVES/ TES
F. CRD Pump Discharge Filters		
1. Two redundant full flow pump discharge filters	Review with students the indications/actions for a high dP	EO-5.0d EO-4.0
2. One filter normally in service with the other in standby.		
3. Hi dP Alarm at 20 psid		
G. Reactor Recirc Pump Seal Purge		
1. CRD System supplies a continuous flow to each RR pump seal to minimize crud buildup by keeping the seal clean, by supplying clean filtered water continuously to the seal.		EO-5.0e EO-2.0f
H. Reactor Sample Station		
1. A continuous sample flow is taken from the CRD System and monitored.		
I. Charging Water Header		
1. CRDH pump discharge header supplies water to the charging water header for charging the water side of the scram accumulators.	Charging Wtr. Press. R600 1320 psi Review with students the Surv. Proc. to monitor check valves:	EO-9.0 EO-4.0
2. The 185 scram accumulators float at the CRDH pump discharge header pressure, this pressure is independent of reactor pressure.	N2-OSP-RDS-CS001 Scram Accumulator Check Valve Reverse Flow Test N2-OSP-RDS-R001 Scram Accumulator Check Valve Leakage Test.	

LESSON CO	LIVERY NOTES	CTIVES/ TES
3. During a scram, the scram accumulators discharge to the CRDMs, causing a pressure decrease in the charging water header, allowing CRDH pumps to approach runout, increasing flow into charging water header.		EO-10.0a EO-5.0f
4. A series of restricting orifice's prevents excessive pump flow during the scram.		
5. The flow sensing system upstream of the charging header senses the high flow condition, and closes the flow control valve, further increasing flow to the charging water header.	CRD Sys. Flow C12 R606 63gpm FCV is AOV, fail shut on loss of air.	EO-5.0g EO-2.0g EO-11.0
6. The charging water header connects downstream of the flow element, so flow in the charging water header creates a high flow signal causing the FCV to shut, diverting most flow to charging header.		
7. The FCV has a mechanical stop preventing the valve from shutting completely thus maintaining a small flow to the reactor via the cooling water lines.	Approximately 14gpm	
J. Flow Controls Station		
1. The flow control station automatically controls system flow during all modes of operation using one of the two flow control valves.	Review 63 gpm setpoint Review the indications and actions for loss of cooling.	EO-4.0

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/NOTES
2. Normally a constant flow of 63 gpm is maintained.		
3. The drive and cooling water PCV is adjusted for the required differential pressure. Flow is automatically maintained constant if reactor pressure changes. Drive and cooling water differential pressures and flows are maintained.		
4. The FCV remains closed when accumulators charged.		
K. Drive Water/Cooling Water Pressure Control Station		
1. The pressure control station is located just downstream of the drive water header connecting the flow control station of the two cooling water headers.	PV-101 powered from 2NHS-MCC008 Valve Fails as is on Loss of Power	EO-5.0h EO-8.0b EO-11.0 EO-4.0
2. The pressure control station consists of: a. A constant position motor MOV b. Two sets of Stabilizing Valves c. Manual bypass valve d. Inlet and Outlet isolation valves		
3. Drive water header pressure is maintained at 260 psid above reactor pressure; cooling water pressure is maintained 30 psid above reactor pressure by the PCV.	Drive Wtr Diff Press R602 260 psi Drive Wtr Flow C12 R604 0 gpm Cool Wtr Diff Press R603 30 psi Cooling Wtr Flow R605 63 gpm	EO-9.0 EO-5.0i EO-4.0
4. During CRD movement the stabilizing valves maintain the constant drive water pressure.	Review with students the actions for a stuck rod	

LESSON CO...	...LIVERY NOTES	...ECTIVES/ ...TES
5. Drive water header pressure is important since the speed of the CRDM movement is dependent on drive pressure.	Review why this statement is true	
6. Stabilizing valves maintain the flow constant; the appropriate valve closes to compensate for changes in cooling water flow.	Stabilizing Valves controlled by RXMC	EO-5.0j EO-2.0h
a. Both solenoid valves in the on-line assembly are open (energized) when control rods are not being moved, bypassing water to the cooling water header.		
b. During control rod movement, the stabilizing valve compensates for the water being diverted to the drive header. The stabilizing valves are adjusted to provide the flow required for insertion or withdrawal. Insertion flow is 4 gpm, withdrawal flow is 2 gpm.	Difference if flow rate has to do with the differential volume of the piston.	
c. By compensating for intermittent drive header flows the stabilizing valves maintain constant drive water pressure and flow.		
L. Exhaust Water Header and Pressure Equalizing Valves		

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/ NOTES
1. The interconnecting two exhaust water headers provide a buffer for CRDM return flow. The headers receive water from a moving CRDM and direct the water to the latched CRDMs through their HCU where 8 psid lifts the SOV 121 valve disc. The small amount of water which enters each stationary <Latched> CRDM leaks past the graphitar seals and into the reactor vessel.	Carefully review flowpath on P&ID.	EO-5.0i EO-5.0k
2. The cooling water headers are connected to the exhaust water headers by two pressure equalizing valves. The two pressure equalizing valves: a. Repressurize the exhaust water header following a scram, and thus, b. Prevent high differential pressure across the operating CRDMs following a scram c. Equalizing valves open at approx. 80 psid.	Remember that pressure is critical for rod speed. Review the results of higher than anticipated differential pressure.	EO-5.0k EO-4.0
M. Hydraulic Control Units		
1. The 185 HCU's are divided into Banks A, B, C, and D. Each HCU includes all the equipment and controls to actuate one CRDM during normal and scram operations.	Review Figure of HCU and identify all major components.	EO-5.01 EO-12.0

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/NOTES
2. The HCUs perform 3 functions: a. The HCUs store energy and control valving necessary to scram. b. The HCUs have the valving necessary to insert and withdraw a CRDM in either continuous or discrete steps. c. HCUs have 4 SOVs that control normal directional movement of the CRDMs responding to timed signals from the RXMC. The scram accumulator and scram valves interconnect with the RPS system to cause a reactor scram.		EO-10.0b
3. The HCUs have 4 SOVs that control normal directional movement of the CRDMs responding to timed signals from the RXMC. The scram accumulator and scram valves interconnect with the RSP System to cause a reactor scram.	Show diagram of 4 valve manifold, showing the flowpath and the place of the throttle valves. Find the vent valves one the print, and review with the students the results of opening the valves.	EO-2.0h EO-13.0 EO-10.0c EO-14.0
4. Within the 4 SOV manifold, are throttle valves which are used to adjust rod drive speeds.		
5. The Insert and Withdrawal lines go to the CRDM, with vent valves on each of the lines.		

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/NOTES
6. Each HCU has seven hydraulic risers: a. Insert — I b. Cooling — Can c. Exhaust — Eat d. Scram discharge — Sally's e. Drive — Delicious f. Charging — Cake g. Withdraw — Wednesday		EO-15.0
7. The inlet and outlet scram valves control the water flow during scram insertion. The valve bodies serve as junction points between the manifold and the risers.		EO-2.0i EO-2.0h EO-5.0m EO-5.0n
8. 4 normally de-energized DCVs are mounted on the manifold to direct drive water and exhaust water to and from the CRDM for		
9. The scram springs are spring to open, air to close. They are held shut by instrument air supplied through the scram pilot air valves. The pilot valves supplies air to both the Inlet and Outlet scram valves. The spring preload in the outlet valve is greater than of the inlet valve to allow the outlet valve to open first, preventing the pressure from the scram accumulators from creating a back pressure.	Review why the outlet valves should open first, and why they do open first. <Damage to the drives occur when the inlet is pressurized, balooning the tubes, when the outlet is restricted.	EO-16.0

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/NOTES
The outlet valve connects the withdrawal riser to the scram discharge riser. Water from above the drive piston is discharged into the SDV. The inlet valve opens the insert riser to the charging water header and the scram accumulator, applying pressure to the CRDM.		
10. The scram pilot valve is a solenoid valve with two solenoids normally energized from separate channels of RPS. Air is normally supplied to the scram valves, keeping them shut. When both solenoids are de-energized, air is vented from the scram valve accumulators and the scram valve opens.	Review drawing of Instrument Air interface.	EO-10.0d EO-2.0i EO-8.0c
11. The scram accumulator is a piston type water accumulator, pressurized by a cylinder of N2 gas. The piston separates the gas from the water and is sealed by O-rings. The accumulator provides the energy to scram the reactor if the reactor pressure is low. When the accumulator is fully charged the piston is in the full down position with the piston side full of water and the gas side pressurized. There is adequate water capacity in the scram accumulator to fully scram the reactor at low pressure conditions.	Review drawing of CRDM Review Pascals Law. Calculate the forces to lift the drive back into the core. Calculate the energy contained in the accumulator.	EO-5.0o

If reactor pressure should exceed the accumulator pressure or charging pressure a ball check valve in the inlet port shifts, allowing reactor vessel pressure to complete the scram stroke.		
12. The accumulator nitrogen volume is placed below the water volume. The possibility of exists of water leaking past the seals, and fill the nitrogen volume. To prevent this, the water level between the Nitrogen cylinder and the accumulator is monitored, as well as the Nitrogen pressure.	Review the consequences of overpressurizing the nitrogen volume, or overfilling the water volume. Review how the proper nitrogen and water volumes are determined and maintained.	
N. Scram Discharge Volume		
1. The SDV receives and contains the water exhausted from all CRDMs during a scram, thereby limiting the loss of water from the reactor vessel prior to RPS reset.	Review with students that the SDV is an extension of the RPV, and if the SDV were to rupture with a scram signal in, it represents an unisolable leak.	EO-5.0p EO-4.0
2. The SDV piping connects to each HCU and drains to an instrument volume. The piping is sized to contain all the water discharged from the CRDMs during the scram, independent of the instrument volume. During the scram the backpressure does not exceed 65 psig.		EO-5.0q

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/NOTES
3. After the scram is completed, water leaking past the CRDM seals flows until the SDV is pressurized to reactor pressure.	Review with the students the Control Rod indications of a rod with differential pressure vice no pressure <scram signal vs. normal pressure>.	
4. The SDV vent and drain are normally open, maintaining the SDV empty. The vent and drain valves are air-operated, spring to close glove valves held open by normally energized dual solenoid instrument Air Valves.	Review with students the results of SDV failure to isolate.	EO-10.0e EO-10.0d EO-4.0
5. When a scram is initiated, the SDV instrument air valves are de-energized, bleeding off the operators to the SDV vent and drain valves causing them to shut, thus preventing excessive loss of reactor coolant.	If P&ID is used, review the flowpath in detail.	
6. When the SDV is unisolated, the water drains to the RBED sump.		
7. Two backup scram valves, normally de-energized solenoid valves actuated by RPS, provide a redundant means of venting air from the 185 scram pilot valves and the SDV vent and drain valves. Both RPS channels must trip to energize either valve. Either valve will vent air from all 185 scram valves and the SDV vent and drain valves.		EO-10.0d EO-8.0d

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/NOTES
8. Two Redundant Reactivity Control System Alternate Control Rod Insertion valves provide this same function as the backup scram valves except they are energized from the RRCS-ARI System.	If RRCS has been covered, review the setpoints of the system trips.	EO-10.0d EO-2.0j EO-8.0f
9. Level Switches activate when water in the SDV exceeds 3 gallons to provide an annunciator. Switches also activate if level exceeds 16.5 inches to provide a Rod Withdrawal Block. Other level switches activate when water in the SDV exceeds 43.4 inches by level transmitter on 48.5 inches by float switch to cause reactor scram. 4 SDV High Water level trip bypass switches are located on panel P603. The mode switch must be in the Shutdown or Refuel position to allow manual bypass of this trip. This bypass allows the operator to reset the RPS scram relays so that the SDV can be drained.		EO-2.0i

III. INSTRUMENTATION, CONTROLS, AND INTERLOCKS

A. Control Room Indicators

This information will be reinforced when the students go into C.R. or Simulator. EO-9.0

	Indication	Designation	Normal Val
1.	Pump Amps	AM 2RDS A51	38-40 amps

2.	Pump Amps	AM 2RDS B51	38-40 amps	
3.	CRD Sys Flow	C12 R606	63 gpm	
4.	Drive Wtr Diff Press	C12 R602	260 psi	
5.	Drive Wtr Flow	C12 R604	0 gpm	
6.	Cooling Wtr Diff Press	C12 R603	30 psi	
7.	Cooling Wtr Flow	C12 R600	63 gpm	
8.	Charging Wtr Press	C12 R600	1320 psi	
9.	CRD Pump 1A/B	Red-on, Green-off lens		
10.	Drive Wtr Press MOV	Red-open,Green-closed lens		Valve indications
11.	CRD Sys. A FCV FV6A/B	Red-open,Green-closed lens		
12.	SDV vent AOVs 124/ 132	Red-open,Green-closed lens		
13.	SDV drains AOVs 123/130	Red-open,Green-closed lens		
14.	SDV A vent & drain pilots SOV154	Red-open,Green-closed lens		
15.	SDV B vent & drain pilots SOV154	Red-open,Green-closed lens		

B. Control Room Controls

1. The CRD Flow control permits remote control of the FCV. The Controller is a direct reading inst. with an adjustable setpoint.

2. Both CRD pump switches are 4 position spring - return-to-normal, Start-Stop-Pull to Lock.

C. System Interlocks

1. CRDH Pumps
   Trip on low suction pressure of 25 inches Hg. Abs.

IV. SYSTEM OPERATION

A. Normal Operation

1. During normal operation the CRDH requires no operator action. Monitor the following parameters for normal operation.
   a. Drive Water header differential pressure
   b. Drive Water flow
   c. Charging Water header pressure
   d. Cooling water header differential pressure
   e. Cooling water flow

2. Cooling Flowpath

   Normal system flow is cooling flow
   Follow path on spring

   EO-10.b

   a. Flowpath is through the pumps as usual
   b. Flow is through the cooling water lines to the HCU
   c. Flow is to the CRDM through the insert line.
   d. "Flow is up through the CRDM and into the bypass region of the core.

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/ NOTES
3. Rod Insertion		EO-10.0f EO-2.0h
a. When a CRDM is selected for insertion, the RXMC sends signals to the HCU and Stabilizing Valves. In receipt of an insert signal HCU DCV SOV123 and SOV121 open. Simultaneously, the Stabilizing Valve for insert closes to maintain flow.		
b. If the operator has not selected the continuous insertion mode of operation, after the CRDM has moved slightly more than 1 notch DCV SOV123 and SOV121 shut and DCV SOV120 opens for the settle function and the CRDM collet fingers engage a notch on the index tube, locking the CRDM in position. When using the continuous insert mode the CRDM is driven until the mode is discontinued. Then the settle function caused the rod to latch at the next notch position.	Ratchet action on index tube.	

LESSON CO	LIVERY NOTES	CTIVES/ OTES
4. Rod withdrawal - in receipt of a rod withdrawal signal, the insert DCVs SOV123 and SOV121 open for a sort time to take the weight of the CRDM off the collet fingers. The insert DCVs SOV123 and SOV121 shut, and immediately the withdrawal DCVs SOV122 and SOV120 open simultaneously. The stabilizing valve shuts, after the insert DCVs shut and the withdrawal DCVs open, the stabilizing valve shuts to compensate for 2 gpm of drive flow. The settle function then occurs at the end.		EO-10.0g EO-2.0h
5. Scram function - The scram signal results in deenergizing the scram pilot valve solenoids and energizing the scram backup valves. This causes the air pressure on the scram valves to bleed off, opening the scram inlet and outlet valves. This vents the water above the CRDM drive piston of the SDV and applies water at high pressure <1400 psi> from the scram accumulator to the underside of the CRDM drive piston. This action provides a high initial acceleration and provides a large margin of force to overcome friction.	Ratchet scram	EO-10.0h EO-10.0a EO-2.0i

Following the scram, the system flow will be diverted to the accumulators to recharge them. Pump flow is limited to 200 gpm by the restricting orifice.

V. SYSTEM INTERRELATIONS

Instructor may conduct as a question and answer session to review previous material.

A. Control Rod Drive Mechanism
B. Condensate System
C. Condensate Storage Tanks
D. Reactor Building Closed Loop Cooling System
E. Normal/Emer Station Electric Power Systems
F. Reactor Recirculation System
G. Instrument Air System
H. Reactor Manual Control System
I. Reactor Protective System (RPS) EO-2.0
J. Redundant Reactivity Control System

VI. DETAILED SYSTEM REFERENCE REVIEW

A. Technical Specifications EO-17.0
1. 3/4.1.3.1 CR Operability
2. 3/4.1.3.2 CR Maximum Scram Insertion Times
3. 3/4.1.3.3 CR Average Scram Insertion Times
4. 3/4.1.3.4 Four Rod Group Scram Insertion Times
5. 3/4.1.3.5 CR Scram Accumulators

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/ NOTES
B. Procedures		EO-15.0
1. N2-OP-30 CRD System		EO-7.1a
a. Precautions and Limitations		EO-7.1b
b. Startup Procedures		EO-7.1c
c. Normal Operation		EO-7.1d
d. Shutdown Procedure		EO-7.1e,
e. Off Normal Procedure		EO-10.0c
f. Procedure for Correction Alarm Conditions	No need to cover all.	EO-18.0
		EO-7.2
2. N2-OP-97		
a. H.2.4 Manually Insert Control Rods		EO-14.0
3. N2-EOP-6 EOP Support Procedure		
a. 14.0 Alternate Control Rod Insertions	Review Procedures 14.1 to 14.6	
4. N2-OSP-RDS Surveillance Procedures	Relay to students the purpose of each procedure, and emphasize what is checked.	
a. N2-OSP-RDS-CS001 Scram Accumulator Check Valve Reverse Flow Test		
b. N2-OSP-RDS-M001 SDV Vent and Drain Valve Position Verification		
c. N2-OSP-RDS-Q001 SDV Vent and Drain Valve Operability Test		
d. N2-OSP-RDS-R001 SDV Vent and Drain Valve Position Indicator Verification		
e. N2-OSP-RDS-R001 Scram Accumulator Check Valve Leakage Test		

f. N2-OSP-RDS-R@001 SDV Vent and Drain Valve Scram Response Test <50% Rod Density>

VII. RELATED PLANT EVENTS

A. Refer to: ~~Addendum A and review related events with class <if applicable>~~ SOER 80-6

Discuss SOER 80-6 and the Unit 2 response.

VIII. SYSTEM HISTORY

A. Refer to Addendum B and review related modifications with class <if applicable>

IX. WRAP-UP

A. Review the Learning Objectives

b. Ask for Student Class Evaluation Forms

INTERNAL CORRESPONDENCE
FORM 112-2 R 02-83 55-01-013

NIAGARA MOHAWK

FROM P. Babilonia PB / R. E. Jenkins

R. E. Jenkins

DISTRICT Nine Mile Point Unit 2

DATE June 7, 1988 FILE CODE NMP25335

SUBJECT SOER 80-06; IEB 80-17 and Supplements 1-5; SIL 331 and Supplements 1-4

TITLE: Partial Failure of Control Rods to Insert Resulting from Water Collection in the Scram Discharge Volume

EXECUTIVE SUMMARY

PROBLEM STATEMENT

Water accumulation in the scram discharge volume can lead to a failure of BWR control rods to fully insert on a scram signal.

CONCLUSION

NMP2 is in direct compliance with eight of the 10 recommendations. SOER recommendation #6 advises 2 Scram Discharge Instrument Volume vent valves be placed in parallel to ensure the venting process. NMP2 has two valves in series to provide redundant isolation of primary system water during a scram. The SOER recommendations would adversely affect the isolation function reliability. In addition, NMP2 Plant Shutdown procedure N2-OP-101C envokes a hold point, on scram recovery, until the vent valves are verified open.

SOER Recommendation #5 advises that vent and drain lines be separate from each other and from other systems' drainage. The SDV vent and drain lines are dedicated lines that discharge to common drain headers for other systems as well. However, a vacuum breaker (RV102) prevents water backup into the SDIV. Therefore, NMP2 is in compliance with the Safety Evaluation Report - BWR scram discharge system.

ACTION REQUIRED

No additional action required.

DETAILED DISCUSSION

BACKGROUND

While in the process of normal shutdown, at the Browns Ferry 3 plant, a manual scram resulted in a partial failure to insert 76 control rods. Two additional manual scrams followed by an automatic scram were required prior to attaining all rods in.

This potential exists because water accumulated within the Scram Discharge Volume (SDV) piping in such a way as to remain undetected by the Scram Discharge Instrument Volume (SDIV) instrumentation.

DETAILED EVALUATION

1. INPO SOER 80-06, Recommendation #1

RECOMMENDATION: The SDIV instrumentation can indicate the absence of water in the SDV; when, in fact, the SDV is essentially full. The SDIV water detection instrumentation should provide reliable, direct indication of water in the SDV.

NMPC RESPONSE: The accumulation of water in the SDV is detected by six level switches and four level transmitters. Level switches LS126 and LS129 actuate at greater than 3 gallons, to indicate that the Scram Discharge Volume is not completely empty. Level switches LS125 and LS127 provide a rod block signal when the water level exceeds 16.5 inches in the SDV. Level switches LSX, Y 11A, B will actuate when the water in the SDV exceeds 48.5 inches. These level switches are interconnected with the trip channels of the RPS and will initiate a reactor scram on high water level in the SDV. Level transmitters LTX*12A, 12B and LTY*12A, 12B back up LSX, Y 11A, 11B and trip at 43.4 inches. These transmitters ensure detection and trips on high water level in the SDV by interconnection with the level switches and the RPS.

SDIV level instrumentation should provide reliable indication of SDV inventory since SDV piping is continuously sloped, with no dips or humps, into the SDIV piping as described in response #3 and #8. Therefore, NMP2 is in full compliance with this recommendation.

CONCLUSION: The multiple, diverse and independent scram discharge level instruments satisfy the intent of this recommendation. No additional action required.

2. INPO SOER 80-06, Recommendation #2

RECOMMENDATION: Ensure that adequate procedures exist regarding action to be taken if water is detected in the SDV system when it should be free of water.

NMPC RESPONSE: The line up of the SDV per N2-OP-30 requires all level switches in the system to be lined up for detection of abnormal situation. The LS126 and LS129 alert the operator on Panel P603 "SDV LEVEL HIGH" on 3 gallons of water in the SDV. The LS125 and LS127 will provide a rod withdrawal block signal to RPS at 18 gallons. The LSX, Y 11A, B in connection with LTX, Y 11A, B will provide a scram signal to RPS and an alarm on Panel P603 "RPS A (B) DISCH VOLUME HIGH LEVEL TRIP" at 43.4 inches.

Operating procedure N2-OP-97 contains annunciator responses for high SDV level alarms and trips. In addition should water levels reach scram levels without appropriate plant response, operators are directed to the Emergency Operation Procedures (EOPs). Nine Mile Point Unit 2 EOP's adequately address a failure to scram, the most severe consequence of SDV water accumulation.

CONCLUSION: NMP2 operating procedures adequately identify actions to take if SDV water accumulation takes place.

3. INPO SOER 80-06, Recommendation #3

RECOMMENDATION: Any obstruction of the SDV-SDIV line, whether by solid matter or by a water trap, should be guarded against. Possible ways of guarding against a solid obstruction or water trap in the line include:

> Enlarge the diameter of the line connecting the SDV to the SDIV as close as practical to the internal diameter of the SDV headers and repipe with care to eliminate locations where solids would be expected to accumulate such as dips or humps in the line, internal roughness at weld points, diameter changes, etc. Consider relocation of the SDIV to a lower level in the plant to allow for increased pitch in the line between the remote SDV and the SDIV.

NMPC RESPONSE: The Unit 2 SDV consists of 14, 8-inch diameter headers that are sized to contain the water volume discharged from all CRD mechanisms during a reactor scram, independent of the instrument volume. Above the scram level trip elevation, a minimum scram discharge volume of 3.34 gallons per drive is specified through the system design specifications (GE document No. 22A7 690 Rev. 3). Preoperational test N2-POT-30 verified the actual SDV per drive to be 4.7 gallons. The SDV headers drain into the 12-inch diameter SDIV piping, which is a vertical extension of the SDV. This design should prevent a solid obstruction or water trap in the SDV-SDIV piping.

CONCLUSION: The SDV to SDIV junction enlarges in the direction toward the SDIV. The noted concern is specifically addressed by the NMP2 design. No action required.

4. INPO SOER 80-06, Recommendation #4

RECOMMENDATION: Ensure that all horizontal portions of vent lines actually have sufficient slope to assure drainage without trapping water.

NMPC RESPONSE: NMP2 SDV vent and drain lines are sloped to avoid tripping the scram level instruments due to insufficient drainage (1/8 inch per foot minimum per GE design Spec. 22A7690 and as-built RCI drawing Nos. NMP-022, SH3 and NMP-021, SH1).

CONCLUSION: The NMP2 design already adequately addresses this concern. No additional action is required.

5. INPO SOER 80-06, Recommendation #5

RECOMMENDATION: The possibility that steam or water from other drains into the CRW drain system could interfere with operation of the SDV-SDIV system by inducing a suction or producing a pressure should be guarded against. A possible way of doing this is to: Isolate the vent and drain lines from each other and from other CRW drainage, by running them as dedicated lines directly to the reactor building equipment drain sump.

NMPC RESPONSE: The vent and drain lines are isolated from each other with dedicated lines directed to separate drain headers in the reactor building equipment drain system. The Unit 2 CRD system is in compliance with the Safety Evaluation Report - BWR Scram Discharge System, Operational Criterion 5. The objection of this criterion is to preclude water backup into the SDIV which could cause a spurious scram. A vacuum breaker (RV102) on the SDV vent line precludes water from being siphoned back into the SDIV. The setpoint of the vacuum breaker is 0 psig.

Neither the vent line nor the drain line is completely separated from other systems' drainage, because they discharge to common drain headers. However, there is only a small possibility of backfilling the SDV from the Reactor Building Drain Tanks. The RB equipment drain tanks are located in the Reactor Building at elevation 175 ft. The SDV is located in the Reactor Building at elevation 261 ft. The RB drain tanks have overflow lines which are directed to floor drains on elevation 175' in the RB.

If in the very unlikely event that water does manage to backup into the SDV, level switches would actuate alarms in the control room. Per Operating Procedure N2-OP-79, the operator would then take appropriate actions dependent upon the actual amount of water in the SDIV. With increasing level in the SDV, an automatic scram will be initiated. The automatic scram is initiated before the required SDV capacity (unfilled volume large enough to accept discharge water from a full scram) is threatened.

CONCLUSION: Although the NMP2 design does not completely separate the SDIV drain and vent from all other drains to the sump, the possibility of backing up water to the SDIV is very remote and monitoring of water level in the SDIV and specifying operator actions to alarm conditions assure the ability to scram will not be compromised. No additional actions required.

6. INPO SOER, Recommendation #6

RECOMMENDATION: Install a redundant vent valve to guard against failure of the SDV vent valve to open.

NMPC RESPONSE: Unit 2 SDV design satisfies the SER safety criterion 2, which states that no single active failure results in uncontrolled loss of reactor coolant. The redundant vent and drain valve (in series) configuration complies with this criterion. And additional solenoid-operated pilot valve controls the redundant vent and drain valve. The vent and drain system is, therefore, sufficiently redundant to avoid a failure to isolate the SDV due to single failure (Re: FSK-36-1G).

To comply with the SOER recommendation vent valves would have to be placed in parallel. This would reduce the reliability in establishing SDV isolations during a scram.

SDV vent and drain valve positions are displayed at P603 in the control room. Per the scram recovery procedure (N2-OP-101C), these valves are verified open after resetting the scram. In fact, the procedure prohibits continuing the recovery until these valves are verified open.

CONCLUSION: Although the SOER design recommendation is not directly implemented, current procedures adequately address the noted concern. No action required.

7. INPO SOER 80-06, Recommendation #7

RECOMMENDATION: Excessively slow drainage of the SDV should be guarded against since, if successive and closed-spaced scrams are necessary as in the Browns Ferry 3 case, it may be difficult to achieve them if the SDVs are essentially full of water from the preceding scram. After one scram has been attempted, the readiness of the system for a possibly needed next scram should not be limited by the SDV-SDIV drain time. One way of achieving this objective is to ensure that the SDIV drain line capacity is sized to allow prompt drainage and install redundant SDIV drain valves.

NMPC RESPONSE: The NMP2 Control Rod Drive System does comply with the Safety Evaluation Report - BWR Scram Discharge System safety Criterion 2 to ensure that the SDIV drain line capacity is sized to allow prompt drainage from the SDIV.

CONCLUSION: NMP2 meets the applicable specification for this concern. No additional actions required.

8. INPO SOER 80-06, Recommendation #8

RECOMMENDATION: In some plants each SDV header bank consists of 2 or more header pipes connected together, in parallel, to form the desired volume. The possibility that one header could fail to drain even though the other parallel header has drained should be guarded against. Ways of achieving this include:

- Ensure that the design provides an adequate slope for all headers in each bank.

NMPC RESPONSE: Design Criterion 8 of the SER requires that system piping geometry (i.e. pitch, line size, orientation) be such that the system drains continuously during normal plant operation. All SDV piping is required to be continuously sloped from its high point to its low point with minimum slope of 1/8" per foot. Reference drawing NMP-027 Sheet 1 and NMP-019 Sheet 3.

9. INPO SOER 80-06, Recommendation #9

RECOMMENDATION: Ensure the procedure is adequate to cover specific measures that should be taken in the event of delayed scram or incomplete scrams.

NMPC RESPONSE:

The Operations Department has emergency procedures. In the event of failure to scram, the RQ emergency procedure addresses actions to be taken to reduce reactor power. The RQ procedure is a step by step emergency procedure enumerating steps that should be taken in case of failure to scram, including resetting the scram, draining the SDIV and liquid poison injection.

CONCLUSION: NMP2 emergency procedures address the concern. No additional action required.

10. INPO SOER 80-06, Recommendation #10

RECOMMENDATION: Ensure redundant means to close off the drain and vent pathways during a scram to prevent loss of reactor coolant water.

NMPC RESPONSE: When a reactor scram occurs a signal from the RPS closes multiple, redundant vent and drain valves, collecting reactor water. Lights in the main control room indicate the position of these valves. Redundant vent and drain valves assure against loss of reactor coolant from the SDV following a scram.

CONCLUSION: The NMP2 SDV vent and drain valve arrangement satisfies the SOER recommendation. No additional action required.

REFERENCES

DWG No. FSK-36-1 series
GE DWG No. 791E406TY
FSAR Section 4.6 "Functional Design of Reactivity Control Systems" Vol. 12

Manuals:

GEK-83310 Vol. III Part 3

DISTRIBUTION

Standard OEA

OEA COMMITTEE APPROVED
DATE: 6/8/88 88-78

PB/REJ/mjd
(0685u)

INPO/NSAC SIGNIFICANT OPERATING EXPERIENCE REPORT

DECEMBER 19, 1980

PARTIAL FAILURE OF CONTROL RODS TO INSERT

REFERENCE: UNIT - BROWNS FERRY 3
DOC NO/LER NO: 50-296/80-24
NSSS/AE - GE/TVA
NSCA 20/INPO 3, Analysis of Incomplete Control Rod Insertion at Browns Ferry 3

DESCRIPTION:

While in the process of performing a normal shutdown for maintenance, a manual scram resulted in a partial failure to insert of 76 control rods, associated with the east Scram Discharge Volume (SDV). Two additional manual scrams followed by an automatic scram were required prior to attaining all rods in.

The details of this event are described in the INPO/NSAC report referenced above.

SIGNIFICANCE:

The potential exists for water to accumulate within the Scram Discharge Volume (SDV) piping in such a way as to remain undetected by the Scram Discharge Instrument Volume (SDIV) instrumentation. This water accumulation may, in turn, result in premature pressurization of the SDV and thus affect control rod motion upon a scram.

RECOMMENDATIONS:

Since designs and conditions vary from plant to plant, it is recognized that any one set of specific recommendations can not apply to all BWR plants. Therefore, these recommendations are presented as objectives which should be attained, with examples of possible ways to achieve these objectives. It is understood these examples do not necessarily represent all the acceptable ways of achieving the objectives It should be noted that many of the examples are the same as specific fixes which have been proposed by others in the following documents:

*RED -IMMEDIATE ATTENTION
YELLOW - PROMPT ATTENTION
GREEN - NORMAL ATTENTION

1. <u>Guard Against Accumulation of Undetected Water In the SDV</u>

The SDIV instrumentation can indicate the absence of water in the SDV; when, in fact, the SDV is essentially full. The SDIV water detection instrumentation should provide reliable, direct indication of water in the SDV.

2. <u>Ensure Adequacy of Procedures on Detection of Water</u>

Ensure that adequate procedures exist regarding action to be taken if water is detected in the SDV system when it should be free of water.

3. <u>Guard Against Obstruction Or Trapping In The SDV-SDIV Connector Pipe.</u>

Any obstruction of the SDV-SDIV line, whether by solid matter or by a water trap, should be guarded against. Possible ways of guarding against a solid obstruction or water trap in the line include:

- Enlarge the diameter of the line connecting the SDV to the SDIV as close as practical to the internal diameter of the SDV headers and repipe with care to eliminate locations where solids would be expected to accumulate such as dips or humps in the line, internal roughness at weld points, diameter changes, etc. Consider relocation of the SDIV to a lower level in the plant to allow for increased pitch in the line between the remote SDV and the SDIV.

-or-

- Install separate SDIVs for the two header banks, so that the line from each header bank to its SDIV will be relatively short, straight, and as close as practical to the same internal diameter as the SDV headers themselves.

4. <u>Guard Against Trapping In The Vent Line</u>

Any location or configuration favorable to trapping water in the vent line should be avoided. Possible ways of doing so include:

- Put vent valves in vertical, not horizontal pipe runs, and ensure that all horizontal portions of vent lines actually have sufficient slope to assure drainage without trapping.

5. <u>Guard Against Interference From CRW Drain System</u>

The possibility that steam or water from other drains into the CRW drain system could interfere with operation of the SDV-SDIV system by inducing a suction or producing a pressure should be guarded against. A possible way of doing this is to:

- Isolate the vent and drain lines from each other and from other CRW. drainage, by running them as dedicated lines directly to the reactor building equipment drain sump.

6. Guard Against The Possibility Of The Vent Not Opening

Failure of the SDV vent valve to open should be guarded against since such failure could interfere with the SDV draining freely. Possible ways of doing this include:

- Install a redundant vent valve

-or-

- Cross connect the vents on the two header system.

7. Guard Against Excessively Slow SDV Drainage

Excessively slow drainage of the SDV should be guarded against since, if successive
and close-spaced scrams are necessary as in the Browns Ferry 3 case, it may be difficult to achieve them if the SDVs are essentially full of water from the preceeding scram. After one scram has been attempted, the readiness of the system for a possibly needed next scram should not be limited by the SDV-SDIV drain time. One way of achieving this objective is:

- Ensure that the SDV vent valves open when the scram is re-set by installing redundant valves and ensure that the SDV vent lines are clear.

- Ensure that the SDIV drain line capacity is sized to allow prompt drainage and install redundant SDIV drain valves.

8. Guard Against Trapping in Individual Headers

In some plants each SDV header bank consists of 2 or more header pipes connected together, in parallel, to form the desired volume. The possibility that one header could fail to drain even though the other parallel header has drained should be guarded against. Ways of achieving this include:

- Ensure that the design provides an adequate slope for all headers in each bank.

9. Ensure That Failure To Scram Procedures Are Adequate

Procedures, adequate for guidance of operators and shift engineers in the event of failure to scram, should be provided. These procedures should specify under what circumstances specific measures should be taken in the event of delayed scrams or incomplete scrams.

[illegible]

10. <u>Guard Against Uncontrolled Release of Reactor Coolant To The Reactor Building</u>

Failure to close on signal of a single vent valve or single drain valve can result in loss of reactor coolant to the reactor building sump. Redundant means to close off the drain and vent pathways during a scram should be considered.

INFORMATION CONTACT: Dick Baker (INPO) (404) 953-7616
- or -
Miles Leverett (NSAC) (415) 855-2936

Please return the enclosed postcard to ensure receipt.

10. <u>Guard Against Uncontrolled Release of Reactor Coolant To The Reactor Building</u>

Failure to close on signal of a single vent valve or single drain valve can result in loss of reactor coolant to the reactor building sump. Redundant means to close off the drain and vent pathways during a scram should be considered.

INFORMATION CONTACT: Dick Baker (INPO) (404) 953-7616
- or -
Miles Leverett (NSAC) (415) 855-2936

Please return the enclosed postcard to ensure receipt.

[illegible]