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NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT NUCLEAR STATION

UNIT II OPERATIONS

02-LOT-001-205-2-00 Revision 6

TITLE: RESIDUAL HEAT REMOVAL (RHS)

	SIGNATURE	DATE
PREPARER	[signature]	3/26/91
TRAINING AREA SUPERVISOR	[signature]	3/26/91
TRAINING SUPPORT SUPERVISOR	[signature] for J. LeClair	4-2-91
PLANT SUPERVISOR/ USER GROUP SUPERVISOR	[signature] for D. Dooley	4/2/91

Summary of Pages

(Effective Date: 4/2/91)

Number of Pages: 62

Date	Pages
February 1991	1 - 62

THIS LESSON PLAN IS A GENERAL REWRITE

TRAINING DEPARTMENT RECORDS ADMINISTRATION ONLY:

VERIFICATION _____

DATA ENTRY _____

RECORDS: _____

5/3/34 65

ATTACHMENT 5
LESSON PLAN TEMPORARY/PUBLICATION/ADDENDUM CHANGE FORM

The attached change was made to:

Lesson plan title: Residual Heat Removal

Lesson plan number: 02-LOT-001-205-2-00

Name of instructor initiating change: P. Walsh

Reason for the change: Add SOER 87-02 to reference list (Pg 5)

Type of change:

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

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 7/30/91

Supervisor Operations Training (or designee): [signature] /Date 7/30/91

I. TRAINING DESCRIPTION

A. Title of Lesson: Residual Heat Removal (RHS)

B. Lesson Description: This lesson contains information pertaining to the Residual Heat Removal (RHS) 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: 8 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
   b. Licensed Operator Requal - In accordance with the requirements of NTP-11

G. References:

1. Technical Specifications
   a. 3/4.3.3 ECCS Activation Inst.
   b. 3/4.5.1 ECCS ECCS (Operating)
   c. 3/4.5.2 ECCS (Shutdown)
   d. 3/4.3.2 Isolation Activation Inst.
   e. 3/4.6.3 Primary Containment Isolation Valves
   f. 3/4.4.9.1 RHR Hot Shutdown
   g. 3/4.4.9.2 RHR Cold Shutdown
   h. 3/4.6.2.2 Suppression Pool and Drywell Spray
   i. 3/4.6.2.3 Suppression Pool Cooling
   j. 3/4.9.11 Refueling Operations

2. Procedures

   a. NMP2-EOP's

   b. N2-OP-31 Residual Heat Removal

   c. N2-OP-35 Reactor Core Isolation Cooling

   d. N2-EOP-6

3. NMP-2 USAR

   a. Design Basis, Vol. 13, Ch. 5, Pg. 5.9-17
   Vol. 13, Ch. 6, Pg. 6.3-6
   Vol. 16, Ch. 7, Pg. 7.4-1

4. Flow Diagrams

   FSK 27-7A Residual Heat Removal
   FSK 27-7B Residual Heat Removal
   FSK 27-7C Residual Heat Removal
   FSK 27-7D Residual Heat Removal
   FSK 27-7E Residual Heat Removal
   FSK 27-7F Residual Heat Removal
   FSK 27-7G Residual Heat Removal
   FSK 27-7H Residual Heat Removal
   FSK 27-7J Residual Heat Removal
   FSK 27-7K Residual Heat Removal
   FSK 27-7L Residual Heat Removal
   FSK 27-7M Residual Heat Removal
   FSK 27-7N Residual Heat Removal
   PID 31A-G Residual Heat Removal
   PID 35-C Reactor Core Isolation Cooling
   P&ID63C-1 Reactor Building Equip. and Floor Drains
   P&ID63D-1 Reactor Building Equip. and Floor Drains

5. Electrical Lineup

ESK	5RHS01	RHR Pump 1A
	5RHS02	RHR Pump 1B
	5RHS03	RHR Pump 1C
	5RHS04	RHR Pump 1A
	5RHS05	RHR Pump 1B
	6RHS01	RHR Water Leg Pump
	6RHS02	2RHS*MOV1A
	6RHS03	2RHS*MOV1C
	6RHS04	2RHS*MOV2A
	6RHS05	2RHS*MOV8A
	6RHS06	2RHS*MOV9A
	6RHS07	2RHS*MOV12A
	6RHS08	2RHS*MOV15A & B
	6RHS09	2RHS*MOV22A & B
	6RHS10	2RHS*MOV23A & B
	6RHS11	2RHS*MOV24A & B
	6RHS12	2RHS*MOV24C
	6RHS13	2RHS*MOV25A & B
	6RHS14	2RHS*MOV26A & B
	6RHS15	2RHS*MOV27A & B
	6RHS16	2RHS*MOV32A & B
	6RHS17	2RHS*MOV33A & B
	6RHS18	2RHS*MOV37A & B
	6RHS19	2RHS*FV38A
	6RHS20	2RHS*MOV40A
	6RHS21	2RHS*FV38C
	6RHS22	2RHS*MOV115 & MOV116
	6RHS23	2RHS*MOV113
	6RHS24	2RHS*MOV142
	6RHS25	2SWP*MOV33A
	6RHS26	2RHS*MOV4A & B
	6RHS27	2RHS*MOV4C
	6RHS28	2RHS*MOV67A
	6RHS29	2RHS*MOV1B
	6RHS30	2RHS*MOV2B

	6RHS31	2RHS*MOV8B
	6RHS32	2RHS*MOV112
	6RHS33	2RHS*MOV12B
	6RHS34	2RHS*FV38B
	6RHS35	2RHS*MOV9B
	6RHS36	2SWP*MOV33B
	6RHS37	2RHS*MOV40B
	6RHS38	2RHS*MOV67B
	6RHS39	2RHS*MOV104
	6RHS40	2RHS*MOV149
	6RHS41	2RHS*MOV30A
	6RHS42	2RHS*MOV30B
	6RHS43	2RHS*MOV80A & B
	7RHS01	Shts. 1, 2, 3 ERF Computer Inputs
	7RHS02	Steam Line Drain Solenoids
	7RHS03	Steam Line Drain Solenoids
	7RHS04	Steam Line Drain Solenoids
	7RHS05	Steam Line Drain Solenoids
GE	807E170TY	Shts. 1-23, 5A, 21A-C, 22A-B, 12A, 13A Residual Heat Removal Electrical Elementary
GE	807E154TY	Shts. 5, 12, 13
GE	807E152TY	Shts. 1A, 3B, 12 NSSSS Elementary Diagrams

6. Instruction Manuals

   GE 90425 RHR Heat Exchangers

7. Nine Mile Point 2 Licensing Issues

8. NMP-14810. Subject IE Bulletin 80-12:
   IE Circular 81-11; IE Notices 80-20 and 81-09

9. NMP2 L1172, September 30, 1988 Nuclear Regulatory Bulletin 88-04 Response

10. Other

    a. GE SIL 284; Operation of RHR Heat Exchangers in the Steam Condensing Mode

    b. GE SIL 388; RHR Valve Misalignments During SDC Operation

    c. GE SIL 357; Control or RPV Temperature/Pressures During Shutdown

d. GE SIL 406; In-Core Instrumentation Protection
e. SOER 87-02 | 2/13/91

II. REQUIREMENTS

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. TRAINING MATERIALS

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

TO-1.0	Perform lineups on the RHR System.	(2050010101)
TO-2.0	Fill and vent the RHR System.	(2050020101)
TO-3.0	Startup the RHR System in the Shutdown Cooling mode.	(2050030101)
TO-4.0	Operate a RHR heat exchanger.	(2050050101)
TO-5.0	Operate the Containment Spray System.	(2050150101)
TO-6.0	Respond to a loss of the RHR System (Shutdown Cooling).	(2059010501)
TO-7.0	Startup the steam condensing mode of the RHR System.	(2059300101)
TO-8.0	Perform RPV/Containment Service Water Flooding from the Control Room.	(2059330101)
TO-9.0	Perform RHR suppression pool alternate fill from the Control Room.	(2059350401)
TO-10.0	Perform RHR Emergency Fill from the Control Room.	(2059370401)
TO-11.0	Throttle LPCI injection flow from the Control Room.	(2059380101)
TO-12.0	Perform RHR alternate shutdown cooling from the Control Room.	(2059390101)
TO-13.0	Control reactor water level using RHR with RWCU isolated.	(2059440401)
TO-14.0	Perform the actions required for an automatic initiation of LPCI.	(2059450101)
TO-15.0	Direct the operation of the shutdown cooling mode of the RHR System. (SRO Only)	(2059050103)
TO-16.0	Direct the operation of the steam condensing mode of the RHR System. (SRO Only)	(2059060103)

B. Enabling Objectives:

EO-1.0 Explain the purpose and function of each of the 5 modes of RHS System Operation, the system's 3 additional capabilities, and the system design basis.

EO-2.0 Describe the purpose and function of each of the following major components of the RHS System:

a. Sup pool suction strainers (2RHS*STR1A/B/C)
b. Sup pool suction valves (2RHS*MOV1A/B/C)
c. S/D cooling isolation valves (2RHS*MOV112 & 113)
d. S/D cooling suction valves (2RHS*MOV2A & B)
e. RHS Pumps (2RHS*P1A/B/C)
f. Jockey Pump (2RHS*P2)
g. Min. flow valves (2RHS*MOV4A/B/C)
h. RHS HX's (2RHS*E1A/B)
i. HX inlet valves (2RHS*MOV9A/B)
j. HX bypass valves (2RHS*MOV8A/B)
k. HX outlet valves (2RHS*MOV12A/B)
l. HX steam isolation valves (2RHS*MOV22A/B)
m. HX steam isolation bypass valves (2RHS*MOV80A/B)
n. HX pressure regulators (2RHS*PV21A/B)
o. HX pressure regulator bypass valves (2RHS*MOV23A/B)
p. HX condensate level control valves (2RHS*LV17A/B)
q. HX condensate drain to RCIC System isolation valves (2RHS*MOV32A/B)
r. HX condensate drain to sup pool isolation valves (2RHS*MOV37A/B)
s. Full flow test return valves (2RHS*FV38A/B/C)
t. Sup pool return isolation valves (2RHS*MOV30A/B)
u. Sup chamber spray isolation valves (2RHS*MOV33A/B)
v. S/D cooling return isolation valves (2RHS*MOV40A/B)
w. S/D cooling return inbd. testable check valves (2RHS*AOV39A/B)
x. S/D cooling return check bypass valves (2RHS*MOV67A/B)
y. RPV head spray valve (2RHS*MOV104)
z. LPCI injection valves (2RHS*MOV24A/B/C)

aa. LPCI injection inboard testable check valves (2RHS*AOV16A/B/C)

bb. Drywell spray isolation valves (2RHS*MOV15/25 A & B)

cc. Flow elements (2RHS*FE14A/B/C)

EO-3.0 Regarding the RHS System;

a. Locate the correct drawing and

b. Use the drawings to perform the following:

- Identify electrical and mechanical components
- Trace the flowpath of fluids or electricity
- Identify interlocks and setpoints
- Describe system operation
- Locate information about specific components
- Identify system interrelations

EO-4.0 Describe the interrelationship of the following list of systems with the RHS System:

a. Suppression pool (sup pool)

b. Reactor vessel (RPV)

c. Reactor Recirculation System (RCS)

d. Containment System (PSC)

e. Reactor Core Isolation Cooling System(ICS/RCIC)

f. Condensate Storage and Transfer System (CNS)

g. Radioactive Liquid Waste System (LWS)

h. Low Pressure Core Spray System (CSL)

i. Reactor Water Sampling (SSR)

j. Instrument Air System (IAS)

k. Containment Isolation System (ISC)

l. Remote Shutdown System (RSS)

m. ECCS Leak Detection

n. Reactor Building Closed Loop Cooling Water (CCP)

o. Spent Fuel Pool Cooling and Cleanup (SFC)

p. Service Water System (SWP)

q. Standby 4160 Switchgear System (ENS)

r. Standby Motor Control Center System (EHS)

EO-5.0 Describe the purpose and state the setpoint/sequence of the following alarms and interlocks:

a. LPCI manual initiation sequence

b. LPCI automatic initiation setpoints/sequence

c. Primary Containment Groups 4 and 5 isolation setpoints

d. System valve interlocks:

- S/D cooling suction valves (*MOV2A/B)
- Test return valves (*FV38A/B/C)
- Sup pool spray valves (*MOV33A/B)
- Drywell spray valves (*MOV15A/B and *MOV25A/B)
- Sup pool suction valves (*MOV1A/B/C)
- HX pressure regulator bypass valves (*MOV23A/B)
- LPCI injection valves (*MOV24A/B/C)
- Min. flow valves (*MOV4A/B/C)

e. RHS pump/valve interlocks

EO-6.0 Explain the basis for each precaution and limitation listed in N2-OP-31.

EO-7.0 Regarding the RHS System, determine and use the correct procedure to identify the actions required for and/or locate information related to the following evolutions in all 5 modes of system operation:

a. Startup

b. Normal operations

c. Shutdown

d. Off normal/N2-EOP-6 Operations

e. Annunciator response

f. Applicable surveillance

EO-8.0 Given a specific set of plant conditions, determine how the RHS System responds.

EO-9.0 Describe how the RHS System is utilized during the performance of the EOP's.

EO-10.0 Given NMP2 Technical Specifications and a set of plant conditions, determine the appropriate Bases, Limiting Conditions of Operation (LCO's), Limiting Safety System Settings (LSSS's), and/or action statement as applicable. (SRO ONLY)

VI. LESSON CONTENT

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/ NOTES
I. INTRODUCTION		
A. Course Requirements and Administration		
1. TR Completion	Pass TR around the classroom and explain how to fill it out if necessary.	
2. Course evaluation	Pass out Course Evaluation sheets to each trainee. Explain the value of a completed form and who reviews them.	
3. Method of evaluation	Explain that course completion is dependent upon passing the written exam with a grade of 80% or better.	
B. Objectives	Cover terminal and enabling objectives with the trainees. Emphasize that the exam will be objective based.	
	NOTES TO INSTRUCTOR:	
	1. P&ID references will be shown in parentheses throughout the LP. This is included so that the instructor may optionally have trainees follow along in the P&ID's during the lesson.	EO-1.0 EO-1.0
	2. TP's and text figures use corresponding numbers.	
	3. All valve number prefixes "2RHS" unless otherwise noted.	

C. Purpose

1. The Residual Heat Removal System (RHS) operates in five different modes, each having a specific purpose.

a. The Low Pressure Coolant Injection (LPCI) mode restores and maintains the desired water level in the reactor vessel following a Loss of Coolant Accident (LOCA).	Show TP-3 and refer trainees to Fig-3. Use sketch to emphasize key points.	
b. The Containment Spray Cooling mode condenses steam and reduces pressure in the drywell and the free air volume of the suppression chamber following a LOCA.	Show TP-7 and refer trainees to Fig-7. Use stress functional performance.	EO-1.0
c. The Shutdown Cooling mode removes decay heat from the core following a reactor shutdown. The B RHS Loop has a head spray line that could be used in conjunction with the Shutdown Cooling Mode.	Show TP-5/refer trainees to Fig-5. Use to stress key points.	EO-1.0
d. The Reactor Steam Condensing mode condenses reactor steam and returns the condensate to the reactor vessel through the Reactor Core Isolation Cooling (ICS) System.	Show TP-4/refer trainees to Fig-4. Use to stress functional flowpath.	EO-1.0

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/ NOTES
e. The Suppression Pool Cooling mode removes heat from the suppression pool water volume following safety-relief valve blowdown, prolonged Reactor Core Isolation Cooling System operation, or during post-accident conditions.	Show TP-6/refer trainees to Fig-6. Use to emphasize key points.	EO-1.0
2. The RHS System has three additional capabilities:	Show TP's as indicated below, using to emphasize additional capabilities.	
a. It can be used to flood the containment or RPV, if required, for long term post-accident recovery operations.	Show TP-1/refer to Fig -1.	EO-1.0
b. It can also augment the Spent Fuel Cooling and Cleanup System (SFC) if additional cooling capacity is required.	Show TP-8/refer to FIG-8	EO-1.0
c. It has a full flow test capability to return the water to the Suppression Pool.	Show TP-1/refer to FIG-1.	
3. Design Basis		
a. To deliver water with 3 pumps from the suppression pool to the bypass region inside the shroud through three separate reactor vessel penetrations to provide inventory makeup following large pipe breaks.	From USAR Section 6.3.1.2.3	EO-1.0
b. To provide coolant inventory makeup following a small break and ADS initiation.		EO-1.0

LESSON CONTENT	DELIVERY NOTES
D. General Description/Flowpath	Show TP-1 and discuss system flowpaths, components, interconnections and instrumentation. There are controls at the Remote Shutdown Panel for operating Shutdown Cooling and Suppression Pool Cooling.
1. RHS consists of three independent loops.	
2. Each pump is provided with a suction path from the suppression pool via *MOV1's.	
3. Pump discharge can be either to the reactor vessel or back to the suppression pool.	To RPV via *MOV24's (PID-31A&B) and air testable checks *AOV16's (PID-31A). To sup pool via full flow test returns *FV38 and *MOV30's.
4. A and B loops have heat exchangers cooled by the Service Water System.	*E1A&B (PID31D&E)
5. A and B loops can also take suction from the Reactor Recirculation System or the spent fuel pool skimmer surge tank.	From RRS via *MOV112, 113 (PID31A) and *MOV2's (PID31F) From SFC via *V254 and *V255 (PID31F or 38A)
6. A and B loops can discharge into the Reactor Recirculation System, Spent Fuel Cooling System, or to the drywell and suppression pool spray cooling rings.	To RRS via *MOV40's and *AOV39's (PID31A&B). To DW spray ring via *MOV15's & 25's (PID31A&B). To Sup Pool spray ring via *MOV33's (PID31C).
7. Heat exchangers can condense steam from the reactor and discharge the condensate to the ICS pump suction or to the suppression pool during steam condensing mode.	From RCIC Stm. line via *MOV32's & *PV21's (PID31D&G). To RCIC suction via *LV17's and *MOV32's (PID31D&E) To sup pool via *MOV37's and MOV30's (PID31C&D)

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/ NOTES
II. DETAILED SYSTEM DESCRIPTION		
A. Suction Piping (Loop A discussed)	Show TP-2A and assist trainees in identifying components as necessary.	
1. Normal suction is from the suppression pool.		EO-4.0.a
a. A strainer removes particles that may damage the RHS pump seals or clog the containment or suppression pool spray nozzles.	Located in the sup. pool (PID31C, F& G).	EO-2.0.a
b. Even if the strainer is 50% clogged, it can still provide adequate NPSH to the RHS pump.	Corresponds to 0.65 psid pressure drop across (USAR6.3.2.2 page 6.3-8) strainer.	
c. Suppression pool suction isolation valve MOV-1A is normally open.	(PID31C F&G) *MOV1A: 2EHS*MCC103C #20A *MOV1B/C: 2EHS*MCC202D #17A/20c	EO-2.0.b EO-4.0.r
d. Relief valve RV-61A is set at 200 psig, relieves back to suppression pool.	*RV61B setpoint 200 psig *RV61C setpoint 105 psig	
2. Shutdown Cooling suction		
a. The suction originates at the suction line of reactor recirculation pump A.	(PID 31A)	EO-4.0.c
b. Valves inside the primary containment:		
1) MOV-112 is normally closed motor operated gate valve	(PID31A)*MOV112: 2EHS*MCC303D #20D	EO-2.0.c EO-4.0.r
2) RV-152 between MOV-112 & 113. Setpoint 1240 psig. Located in the D.W.	Relieves to D.W. floor drains.	

c. Valves outside the primary containment:		
1) MOV-113, normally closed motor operated gate valve	(PID 31A) *MOV113: 2EHS*MCC103C #21A	EO-2.0.c EO-4.0.r
2) Relief valve RV-110, is set at 200 psig, relieves to the suppression pool.	(PID31F)	EO-4.0.a
3) Shutdown cooling suction valve MOV-2A is a normally closed motor operated butterfly-type valve.	(PID31F)*MOV2A: 2EHS*MCC103C #20B *MOV2B: 2EHS*MCC303D #17B	EO-2.0.d EO-4.0.r
3. Branch Lines		
a. Upstream of MOV-2A a branch line provides a connection between RHS and the Spent Fuel Cooling and Cleanup System via two normally locked shut valves.	(PID31F and 38A) See System Interrelations section for details.	EO-4.0.o
b. Downstream of MOV-2A a branch line permits Low Pressure Core Spray System testing with suction taken from the reactor vessel when a spool piece is installed.	(PID31F) See System Interrelations section for details.	EO-4.0.h
B. RHS Pumps P1A, B, C		
1. The RHS pumps are three stage, vertical centrifugal motor-driven pumps.		EO-2.0.e
a. The pump has a rated capacity of 7,450 gpm at a discharge pressure of 134 psig for P1A & B, 147 psig for P1C.		

2. Mechanical seals prevent leakage of water along the pump shaft. — EO-2.0.e
   a. Cooling of the seals is accomplished by directing pump discharge water to the seals via a centrifugal separator, which removes solids, and a seal cooler.
   b. The seal cooler is cooled by RBCLCW with a manual backup supply from plant service water. — EO-4.0.n
   c. A Shaft bushing is installed to limit leakage along the shaft in the event of a mechanical seal failure.
3. Each RHS pump is driven by an induction motor. — EO-2.0.e
   a. The motor is designed to accelerate the pump to full speed and rated flow with the discharge path open within 27 seconds of receiving an initiation signal.
   b. Power supply-pump A 2ENS*SWG101, Div. I pumps B and C 2ENS*SWG103, Div. II. — EO-4.0.q

C. RHS Jockey Pump	(PID 31G)	
1. The RHS jockey pump supplies water to the discharge headers of RHS B and C to keep them full and pressurized to avoid water hammer upon system initiation.		EO-2.0.f
2. Loop A RHS is maintained full and pressurized by CSL jockey pump.	(PID 32A)	EO-4.0.h
3. Power supply 2EHS*MCC303D #20A.		EO-4.0.r
D. RHS Discharge Piping		
1. Minimum Flow Bypass Line		
a. Minimum flow valve MOV-4A/B/C open automatically on low flow signal to provide a flowpath for pump discharge when flow is less than 1400 gpm at *FE14's.	(PID31B, E & F) Bypasses water to the sup pool. *MOV4A: 2ENS*MCC103C #20C *MOV4B/C: 2ENS*MCC303D #17C/17D (PID31A, B & C)	EO-2.0.q EO-4.0.r
2. RHS Heat Exchanger (Loop A & B only)		EO-2.0.h
a. The RHS heat exchanger is a single pass shell and U-tube heat exchanger using Station Service Water on the tube side for cooling.		EO-4.0.p

1) Its heat transfer capacity, 150 x 10^6 BTUs per hour, is based on providing sufficient heat removal in the Shutdown Cooling mode 20 hours after "all rods in" with RPV temp 125°F and service water temp 10°F below it's maximum temperature. — EO-2.0.h

2) Its also rated for steam condensing heat removal with max service water temp. 1.5 hrs after "all rods in". — EO-2.0.h

3) The HX shell is vented to the Suppression Pool through two motor operated isolation valves, MOV-26A/B and 27A/B. — EO-4.0.a, EO-4.0.r

Valve	Operator Pwr Supply	Optical Isolator
*MOV26A	2EHS*MCC103C #21C	2SCA*PNL104A #8
*MOV26B	2EHS*MCC303D #19B	2SCA*PNL304B #6
*MOV27A	2EHS*MCC103C #21D	2SCA*PNL104A #8
*MOV27B	2EHS*MCC303D #19C	2SCA*PNL304B #6

4) The heat exchanger inlet valve MOV9A/B is a normally open motor operated valve used to supply water to the shell side of the heat exchanger. — EO-2.0.i, EO-4.0.r

*MOV9A: 2EHS*MCC103C #19B
*MOV9B: 2EHS*MCC303D #16B

5) The heat exchanger is provided with a normally open motor operated bypass valve (MOV-8A/B). — EO-2.0.j, EO-4.0.r

*MOV8A: 2EHS*MCC103C #19A
*MOV8B: 2EHS*MCC303D #16A

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/ NOTES
6) Heat exchanger outlet valve MOV12A/B is a normally open motor operated valve.	*MOV12A: 2EHS*MCC103C #19C *MOV12B: 2EHS*MCC303D #16C	EO-2.0.k EO-4.0.r
b. Steam to heat exchanger for steam condensing isolated by MOV-22A/B and bypass valve MOV-80A/B. Heat exchanger steam pressure controlled by pressure regulator PV-21A/B and warmup bypass valve MOV-23A/B.	A:2EHS*MCC103C B:2EHS*MCC303D *MOV22 #17A #14A *MOV80 #23A #22A *MOV23 #17B #14B	EO-4.0.r EO-2.0.l EO-2.0.m EO-2.0.n EO-2.0.o
c. The heat exchanger shell side outlet line has a branch for the return of condensate to the suction of the ICS pump using heat exchanger level control valve LV17A/B and MOV-32A/B a motor operated valve which isolates the heat exchanger outlet from ICS pump suction, or drains to sup pool via *MOV37's.	*MOV32A: 2EHS*MCC103C #18A *MOV32B: 2EHS*MCC303D #15A *MOV37A: 2EHS*MCC103C #18C *MOV37B: 2EHS*MCC303D #15C	EO-4.0.e EO-2.0.p EO-2.0.q
3. RHS Discharge Branch Headers (Loops A & B)		
a. Suppression Pool Cooling Return		EO-2.0.r EO-4.0.a
1) Normally closed full flow test valve (FV38A/B) is throttled for flow testing. It is also used for suppression pool cooling.	*FV38A/B: 2EHS*MCC103C #23D/303D #18C	EO-2.0.s EO-4.0.r

2) The suppression pool return isolation valve MOV-30A/B is normally open and provides a flowpath to the suppression pool for full flow testing, min. flow.	*MOV30A/B: 2EHS*MCC103C #23C/303D #20B	EO-2.0.t EO-4.0.r
b. Suppression Pool Spray Line		
1) Above the water line in the Suppression Pool is a spray ring which is used by RHS loops A and B.		
2) The spray line is isolated by normally shut MOV-33A/B.	*MOV33A/B: 2EHS*MCC103C #18B/303D #15B	EO-2.0.u EO-4.0.r
c Shutdown Cooling Return Line		
1) This line returns water to the A or B reactor recirculation pump discharge piping.		
2) The header is provided with an outboard isolation valve MOV40A/B and an inboard isolation valve AOV39A/B.	*MOV40A/B: 2EHS*MCC103C #18D/MCC303D #15D	EO-4.0.r EO-2.0.v
a) AOV39A/B is an air operated testable check valve.		EO-2.0.w
b) Normally shut testable check bypass valve MOV-67A/B is provided to allow system piping warmup prior to going to shutdown cooling operation.	*MOV67A/B: 2EHS*MCC103C #22A/MCC303D #21C	EO-2.0.x

d.	Head Spray Line (Loop B only) Isolation Valve MOV-104	*MOV104: 2EHS*MCC103C #20D	EO-2.0.y EO-4.0.r
e.	LPCI Injection Line		
	1) <u>All three RHS loops</u> have LPCI injection lines.		
	2) LPCI injection valve MOV-24A/B/C opens automatically during LPCI initiation or it can be opened from the Control Room on PNL601.	*MOV24A/B/C: 2EHS*MCC103C #17C/303D #14C/303D #19A	EO-2.0.z EO-4.0.r
	3) An inboard containment air-operated testable check valve, AOV-16A/B/C is provided on the LPCI line.		EO-2.0.aa
	4) LPCI piping enters Rx vessel and empties inside the core shroud over the fuel bundles.		
f.	Drywell Spray Line		
	1) There are two drywell spray rings.		
	2) Each drywell spray line is provided with two isolation valves (MOV15A/B and MOV25A/B).	*MOV15A/B: 2EHS*MCC103C #19D/303D #16D	EO-2.0.bb EO-4.0.r

III. INSTRUMENTATION, CONTROLS AND INTERLOCKS

A. Instrumentation

1. Temperature - Measured at various points in system and SW cooling the RHS Heat Exchangers. Sent to recorder on PNL601, E12-R601. See Annunciator Response section for alarms.

PT1 - HX1A RHR Inlet
PT2 - HX1B RHR Inlet
PT3 - HX1A RHR Dischg.
PT4 - HX1B RHR Dischg.
PT5-HX1A SWP Outlet (2SWP*TE12A)
PT6-HX1B SWP Outlet (2SWP*TE12B)
PT7-HX RHR Radwaste Outlet

EO-3.0

2. Pressures

a. Pump Suction - activates alarm on PNL601.

Hi: >200 psig at *PT 3A/B/C (PID 31 F/E/G)
Low: <6 psig at *PT 3A/B/C

b. Shutdown Cooling suction line - alarm at >171 psig at *PT111 (PID31F).

Isolation occurs at 128 psig RPV Steam Dome Press; add static height of RPV level to 128 psig = 171 psig.

c. Pump Discharge - permissive to ADS

Setpoint: 125 psig at *PT 5A/B/C or *PT6A/B/C

d. LPCI Injection Valves - differential pressure - open permissive (130 psid)

Sensed at *PDT24A/B/C. Senses D/P between RPV press (taps into a NSS press. XMTR sensing line) and LPCI injection header pressure.

e. Steam Supply - Steam condensing Mode - close pressure control bypass valve at 465#.

Sensed at *PT75A/B or *PT76A/B (PID31D/G) Prevents HX overpressure during warmup.

f. RHS HX Inlet - controls pressure controller (steam) in steam condensing mode.

Sensed at *PT21A/B (PID31D/G). Electrical signal controlled by controller at P601 (PIC21A/B), converted to an air signal for valve operator by *I/P21A/B.

3. Flow - Monitor flow in modes:		
a. LPCI at P601 *FI/4A/B/C	LPCI Flow monitored at *FE14A/B/C (PID31C/B/B)	EO-2.0.cc
b. S/D Cooling at P601 *F14A/B and Rem S/D PNL *FI60A/B	S/D Cooling flow sensed at *FE14A/B (PID31C/B)	EO-3.0
c. SP Cooling at P601 *FI14A/B and Rem S/D PNL *FI60A/B	SP Cooling flow sensed at *FE14A/B (PID31C/B)	
d. Containment Spray		
1) Sup chamber spray at P601 *FI64A/B	Sensed at (PID 31C) *FE64A/B; *FT64A/B	
2) Drywell spray at P601 *FI63A/B	Flow elbows (PID 31A & B) *FT 63A/B	
e. Min. flow valve control (*MOV4A/B/C) close > 1400 gpm; Open < 1400 gpm	Sensed at *FE14A/B/C; *FT86A/B/C; *FS86A/B/C	
f. SWP flow to HX's at P601 (2SWP*FI13A/B)	Sensed at 2SWP*FE13A/B; 2SWP*FT13A/B (PID11C/P) 7400 GPM Nominal	
4. Level - Indicated on P601 at *LI28A/B RHS HX Level - Cross - connection to level controller in steam condensing mode.	Sensed at *LT28A/B (PID31D/E); *LIC28A/B and *PIC114 together control *LV17A/B via *I/P17A/B. Hx level controls C/D rate. The higher the level, the less surface area of tubes exposed, the lower the C/D rate.	EO-3.0
5. Conductivity - Indicated on P601 at Recorder R611A/B (*CI11A/B) Alarm and indication on PNL 601-RHS HX discharge	Sensed *CE11A/B (PID 31D/E). Alarm setpoint >9umho/cm (Annunciator #601450/650). Condensate flushed to sup. pool via *MOV37A/B when conductivity > alarm setpoint.	EO-3.0

B. Controls

1. Pressure

a. RHS HX pressure controller allows 0-600 psig control in steam condensing mode.

Sensed at *PT114 (PID31D); *PIC114 @ P601. 0-600 psig thumbwheel setpoint adjustment.

EO-3.0

b. Condensate pressure in RCIC return line regulated by HX outlet control valves (*LV17A/B), which also regulate level.

Sensed at *PT114 (PID31D). If condensate from HX lined up to RCIC pump suction via *MOV32A/B, suction pressure controller (*PIC114) output will override level controller (*LIC28A/B) output if pressure > thumbwheel setpoint.

2. Manual Initiation

a. Pushbuttons on PNL 601

1) Div. I = LPCI A & LPCS

2) DIV. II = LPCI B & C

EO-3.0
EO-5.0.a

C. Interlocks

1. Automatic Initiation Setpoints

a. Level 1 = 17.8"

b. High Drywell Pressure = 1.68#

EO-3.0
EO-5.0.b

2. Primary Containment Isolation

a. Gp 4: RHS Sampling and Radwaste Discharge.

Setpoints: L3(159.3"), Hi D.W. press (1.68 psig)

Sampling: *SOV35A/B, *SOV36A/B

Radwaste: *MOV142 & *MOV149

EO-3.0
EO-5.0.c

b. Gp 5: Shutdown Cooling and Head Spray

*MOV112 & 113; *MOV40A/B & *MOV67A/B *MOV104. See section 5 below for setpoints.

3. System Valve Interlocks: Prevent inadvertant reactor vessel draining
   a. S/D cooling suction valves (*MOV2A/B) cannot be opened unless all the following are met. — EO-5.0.d
      1) SP suction valves (*MOV1A/B) fully closed.
      2) Test return valve (*FV38A/B) closed
      3) SP spray valve (MOV33A/B) closed
   b. Test return valves (*FV38A/B) and suppression pool spray valves (*MOV33A/B) cannot be opened unless shutdown cooling system suction valve (*MOV2A/B) is shut. — EO-5.0.d
   c. SP suction valves (*MOV1A/B) cannot be opened unless the S/D cooling suction valves (*MOV2A/B) are closed. — EO-5.0.d
4. RHS Pump/valve Interlocks — EO-5.0.e
   a. Pump starting is prohibited unless:
      1) There is a S/D cooling suction flowpath or — S/D cooling suction flowpath: *MOV112, *MOV113 and MOV2A/B open
      2) There is a suction from the Suppression Pool — Sup. Pool Suction flowpath: *MOV1A/B open
   b. Loss of suction flowpath will cause a pump trip

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/ NOTES
5. Valve Interlocks		
a. S/D cooling isolation valves, head spray valve, S/D cooling return and bypass valves shut on: 1) High Rx pressure of 128# 2) Low vessel level of 159.3" 3) High RHS area temp of 135°F 4) High Rx Building Temp (130.2°F) 5) High Rx Building Pipe Chase temp (135°F)	Isolation: Group 5	EO-5.0.c
b. In steam condensing: Pressure control bypass valve (*MOV23A/B) closes at 465 psig HX pressure.	This prevents HX overpressure during system startup warmup phase.	EO-5.0.d
c. LPCI injection valve (*MOV24A/B/C) cannot be opened unless D/P across valve is <130 psid.		EO-5.0.d
d. Test return valve (*FV38A/B/C) cannot be opened during a LOCA unless the LPCI injection valve (*MOV24A/B/C) is shut.		EO-5.0.d
e. SP spray valve (*MOV33A/B) during a LOCA unless: 1) Injection valve is shut <u>and</u> 2) A high drywell pressure exists. 3) It will auto shut when the high drywell pressure clears.		EO-5.0.d

4) If open, it will auto shut on a LPCI initiation.

f. Both Drywell spray valves cannot be simultaneously opened unless:

1) Initiation signal is sealed in and

2) High drywell pressure exists, and

3) Associated LPCI injection valve is shut

One or the other may be opened at any time (either MOV-15 or 25) EO-5.0.d

Prevents spraying the drywell unless it is absolutely necessary to prevent damage to equipment.

Because adequate core cooling is the #1 priority.

IV. SYSTEM INTERRELATIONS

A. Suppression Pool

1. Each RHS pump may take its suction from the suppression pool Flow may also be returned to the suppression pool from each loop through the minimum flow lines or the test return lines.

2. The heat exchanger vents and RHS System relief valves discharge to the suppression pool.

Discuss the system interrelations with trainees. Solicit maximum input from trainees by having them develop a list of systems while you copy it on the white board. Ask them how each system interrelates with RHS. Show TP-1 to reinforce key points. EO-4.0.a

Sup. pool level must be maintained between 199'6" and 201' elev.

B. Reactor Vessel

1. Each RHS loop is connected to a LPCI nozzle on the reactor vessel.

2. Inside the reactor vessel, piping directs flow inside the shroud over the core.

EO-4.0.b

C. Reactor Recirculation System (RRS) — EO-4.0.c

1. The A and B RHS pumps may take suction from the A loop of the Reactor Recirculation (RR) System, upstream of the RR pump suction isolation valve.
2. Both RHS loops use this suction path for the shutdown cooling mode of operation, and discharge back into their respective recirculation loop.

D. Containment System (PSC) — EO-4.0.d

1. Redundant containment spray spargers allow condensation of steam following a leak inside the containment volume.

A and B loop have their own spray ring for D.W. spray, but they share one spray ring for sup chamber spray.

E. Reactor Core Isolation Cooling System (ICS) — EO-4.0.e

1. In the steam condensing mode, condensed reactor steam from either or both RHS heat exchangers is directed to the ICS pump suction.

Also, the steam supply to the HX's comes from the RCIC turbine steam supply line.

2. In the shutdown cooling mode, flow may be directed to the ICS head spray nozzle from the B loop of RHS to aid in steam condensation and promote more uniform cooling of the reactor pressure vessel.

(PID-35C) This is only done to increase C/D rate as needed.

F. Condensate Storage and Transfer System (CNS) — EO-4.0.f
Fittings are provided in RHS System piping close to each RHS primary containment isolation valve to permit the flushing of all parts of the system piping with pure water from the CNS System.

G. Radioactive Liquid Waste System (LWS) — EO-4.0.g
Prior to and following operation of the RHS System in the shutdown cooling mode, the piping is flushed to LWS.

Prior to operation, this flushing is continued to warm up RHS piping until temperature and conductivity specifications are met.

H. Low Pressure Core Spray System (CSL) — EO-4.0.h

1. RHS A loop discharge piping kept filled and pressurized with water by CSL jockey pump when the system is in its normal standby lineup.
2. CSL and RHS loop A have a common test return line to SP
3. CSL pump can take a suction from RHS (using a spool piece).

For full flow spray pattern testing with RPV head removed.

I. Reactor Water Sampling (SSR) — EO-4.0.i

1. RHS process water samples can be drawn from the A and B heat exchanger shell side effluent piping.

J. Instrument Air System (IAS) — EO-4.0.j

1. The Steam pressure control valves and the heat exchanger condensate outlet control valves are operated by instrument air.

	2. Loss of the IAS System prevents operation of the RHS System in the steam condensing mode.	Due to loss of control air for HX level control vales *LV17A/B and HX press. control valves *PV21A/B.	
K.	Containment Isolation System (ISC)		EO-4.0.k
	1. Containment Isolation System (ISC) Groups 4 and 5 can initiate automatic closure of several Residual Heat Removal System valves.		
L.	Remote Shutdown System		EO-4.0.l
	Control of various RHS System pumps and valves for operation of shutdown cooling and suppression pool cooling mode of RHS.	See Text Table 6 for a list of Remote Shutdown Panel (2CES*PNL405) control switches.	
M.	ECCS Leak Detection		EO-4.0.m
N.	Reactor Building Closed Loop Cooling Water (CCP)		EO-4.0.n
	Reactor Building Closed Loop Cooling Water is the normal supply of cooling water to the RHS pump seal coolers.	SWP is backup supply (see P. below).	
O.	Fuel Pool Cooling and Cleanup (SFC)		EO-4.0.o
	The RHS A and B loops can be lined up to augment the SFC System.	Also can be a temporary replacement if SFC is S/D for maintenance.	
P.	Service Water System (SWP)		EO-4.0.p
	1. The SWP provides cooling water to the RHS Heat Exchangers, and the RHS Pump Room and Heat Exchanger Room unit coolers.		
	2. Service water is available to the RHS pump seal coolers for manual backup cooling.		
	3. It also provides the water supply for containment flooding operations.	Fire water is another source of water if SWP is not available.	

Q. Switchgear, Standby 4160V System (ENS) — EO-4.0.q
The division I and II buses of the ENS System provide power to the RHS pumps: division I for RHS pump A, division II for RHS pumps B and C.

R. Motor Control Center Standby System (EHS) — EO-4.0.r
The standby motor control centers provide power to the RHS motor operated valves and the pneumatically operated valve solenoids: division I for RHS loop A, division II for RHS loops B and C.

Also, Div II supplies RHS Jockey Pump.

V. PRECAUTIONS AND LIMITATIONS

A. Do not exceed 130°F RHR HX service water outlet temperature. — Prevent bio fouling of heat transfer surfaces. — EO-6.0

B. This system shall be kept full of water and pressurized to prevent piping damage due to water hammer. — Jockey pumps (RHS and CSL) perform this function. — EO-6.0

C. Observe the following RHR pump motor start limitations: — Prevent heat damage to pump motor windings. — EO-6.0

1. Two starts in succession from ambient temperature after which a 60 minute wait is required prior to subsequent start attempts.
2. One start from rated temperature (established after 30 minutes run time), after which a 60 minute wait is required prior to subsequent start attempts.

D. Observe the following RHR Pump limitations:		EO-6.0
1. Maximum full load current, 126 amps	Prevent damage to motor.	
2. Pump runout flow, 8400 gpm	Prevent damage to pump and motor.	
3. Maximum winding temperatures, 311°F	Prevent damage to motor.	
4. Maximum bearing temperatures, 194°F	Prevent damage to bearings.	
5. maximum continuous ambient temperature, 148°F	Prevent damage to motor.	
6. Pump rated flow, 7450 gpm	Prevent damage to motor.	
E. With both reactor recirculation pumps idle, reducing RHR Shutdown Cooling flow can result in RPV thermal stratification. This can cause water surface temperature to rise above boiling, resulting in pressurization of the vessel or the venting of steam. This can be prevented by the following:		EO-6.0
1. Do not throttle RHR Shutdown Cooling injection flow below rated flow unless there is a recirculation pump running in the opposite loop.	This S/D cooling flow along with recirc flow will prevent stratification.	
2. Control RHR Shutdown Cooling injection temperature by throttling the amount of RHR flow through the heat exchanger. If the HX bypass valve is full open and less cooling is required, throttle RHR HX service water flow by throttling the service water outlet valve (2SWP*MOV33A or B).	This will control C/D rate without affecting flow through the RPV.	
3. Refer to H.10.0, Loss of Shutdown Cooling.		

F.	Observe the following limitations when operating in the Steam Condensing mode with discharge lined up to RCIC:		EO-6.0
	1. Maximum RCIC suction temperature, 140°F	Provide adequate NPSH to RCIC pump.	
	2. Maximum RCIC suction pressure, 75 PSIG	Prevent damage to RCIC pump suction piping.	
G.	When operating in the Steam Condensing mode, RHR Heat Exchanger shell side shall not exceed 500 psig or 480°F.	Prevent exceeding design pressure and temperature in the HX's.	EO-6.0
H.	Manually initiating LPCI A will also initiate LPCS.	Same manual initiation pushbutton.	EO-6.0
I.	All applicable evolutions described in this procedure shall be monitored and controlled in accordance with Radiation Protection procedures.		EO-6.0
J.	The duty cycle of ECCS MOV's is five (5) cycles (open and shut) per hour. Operate the available standby ECCS if this MOV duty cycle is exceeded.	Valve op motors not designed for continuous duty.	EO-6.0
K.	Prior to starting an RHR Pump, verify RBCLC or Service Water lined up to provide seal water cooling.	Prevent damage to pump seals.	EO-6.0
L.	Suppression Chamber Air Temperature should be maintained $\leq$ 103°F. Suppression Pool Bulk Water Temperature should be maintained $\geq$ 70°F.	Maintain temp. > RTT for penetration joints.	EO-6.0
M.	Do not operate RHS pump in minimum flow condition for an extended period of time.	Prevent excess hydraulic stress on components & pump.	EO-6.0

N.	Do not secure or place a LPCI System in MANUAL mode unless, by at least two independent indications, (1) misoperation in AUTOMATIC mode is confirmed, or (2) adequate core cooling is assured. "Misoperation" includes both inappropriate initiation of a LPCI System and continued operation of a LPCI System beyond automatic trip setpoints. If a LPCI System is placed in MANUAL mode, it will not initiate automatically. Make frequent checks of the initiating or controlling parameter. When MANUAL mode is no longer required, restore the LPCI System to AUTOMATIC/STANDBY per Steps G.2.0 and E.1.0.	Prevents securing an injection source that is needed to maintain adequate core cooling. Also ensures that system will inject manually if needed at a later time.	EO-6.0
O.	Suppression chamber pressure should be maintained between 14.2 and 15.45 psia. If not, follow Technical Specification 3.6.1.5 as applicable.	Limits peak pressure following DBA LOCA to 39.75, which is less than 45 psig design pressure.	EO-6.0
P.	Prior to opening 2RHS*MOV112 and 2RHS*MOV113, verify 2RHS*MOV1A(B) is shut and 2RHS*MOV2A(B) is open. This will preclude draining the RPV to the suppression pool and exceeding the D/P rating of 2RHS*MOV2A(B).		EO-6.0

LESSON CONTENT	DELIVERY NOTES	ECTIVES/ NOTES
Q. Do not run an RHR pump in the shutdown cooling mode simultaneously with a Reactor Recirculation Pump in the same loop as damage to the recirculation pump could occur.	The RHR pump would dead-head the Recirc. pump and cause damage to it.	EO-6.0
R. When in shutdown cooling, do not exceed 100°F/HR RPV cooldown rate.	To prevent exceeding cyclic stress limits of RPV	EO-6.0
S. To protect radwaste tanks, control coolant discharge temperatures to $\leq$150°F while discharging to radwaste.		EO-6.0
T. Alternate shutdown cooling should only be used if normal shutdown cooling cannot be established and it is determined that alternate shutdown cooling is required.		EO-6.0
U. If an RHR pump trips while performing Drywell/Suppression Chamber Spray and flow is required to be restored immediately, it will be necessary to perform emergency refill per Section H.8.0 prior to resuming pump operation.	Prevent system damage due to water hammer on emergency startup.	EO-6.0
V. If LPCI operation is required during suppression pool pumpdown (A or C loops), the applicable steps of the pumpdown procedure should be completed as quickly as possible. (Due to manual valve operations, full injection flow would be hindered.)	Adequate core cooling always takes precedence over other system functions.	EO-6.0
W. Suppression Pool pumpdown shall not be down when maintaining Reactor water level with the RHR System per Section H.11.0 of this procedure.	Keeping the core covered is more important.	EO-6.0

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/ NOTES
X. All ALARA practices shall be observed to minimize personnel exposure and spread of contamination.		EO-6.0
Y. All effluents from systems are to be treated as contaminated. Necessary provisions to contain leakage shall be made when breaking connections or draining lines.		EO-6.0
Z. If radiation monitor SWP23A(B) becomes unavailable or is INOP, ensure radiation monitor SWP146A(B) is on line and operating properly. If radiation monitor SWP146A(B) also becomes unavailable or is INOP, contact Chemistry to perform 12 hour grab samples as per Technical Specification 3.3.7.5.	*SWP23A/B are RHS HX outlet monitors. *SWP146A/B are SWP return to discharge bay monitors.	EO-6.0
A.' During a refueling outage, total drive flow through the jet pumps should be less than 5700 gpm when incore instrumentation is not fully surrounded (all four corners) by fuel and/or blade guides to preclude incore instrumentation from damage due to flow induced vibration. This includes RHR Shutdown Cooling and Recirculation Drive Flow.	This overrides the requirement to maintain 7450 gpm S/D cooling flow per the procedure.	EO-6.0

LESSON CONTENT	DELIVERY NOTES	ECTIVES/ NOTES
VI. SYSTEM OPERATION		
A. STARTUP		EO-7.0.a
1. Perform electrical, valve and instrument L/U's.	Per tables in N2-OP-31	
2. Fill and vent loops as required.	Depends on status of "HIGH POINT VENT LEVEL" annunciators	
3. Depress "LPCI "A" LPCS" and LPCI "B"/"C" pushbuttons	Verify white "SEAL IN" light goes out.	
4. Reset Group IV and V SDC isolation signals	Depress Inbd & Outbd MSIV & DRN Valve Manual Isol. Reset pushbuttons.	
5. Place RHR Pump 1A/B/C control switch in AUTO		
6. Reset RHR A/B/C Out of Service Pushbutton	By depressing the INOP window engraved as such.	
7. Place HX 1A/B Air Control Valve switches to "OFF"	For RHS*LV17A/B and *PV21A/B.	
B. Normal Operations		
1. Standby	Show TP-1. Trace through TP-1 while discussing standby status of various system valves. Refer trainees to FIG-1.	EO-7.0.b
a. RHS is in standby status ready for LPCI or Containment Spray initiation.		
b. The shell and tube sides of the heat exchangers are flushed with pure water and kept filled to minimize possible corrosion or fouling of heat transfer surfaces.		
c. Heat exchanger inlet, outlet, and bypass valves are fully open.		

	d. Each pump's suppression pool suction valve is open.		
	e. RHS and CSL water leg pumps are running continuously to keep the loops filled.		
	f. The shutoff valve for flow return to the suppression pool, MOV-30A/B is open.		
	g. Minimum flow valves are open (MOV4A, B and C).		
	h. All other remotely operated valves in the various subsystem flowpaths are closed.		
	i. Pumps A, B, and C control switches are in Normal.		
	j. The suppression pool is filled to its normal operating level.	199.5' to 201'	
2.	Shutdown Cooling Mode (SDC)	Show TP-5 and briefly show flowpath.	EO-7.0.b EO-8.0 EO-9.0
	a. The SDC mode can be initiated when steam dome pressure is less than 128 psig. It is used to complete the reactor cooldown and maintain the reactor in a cold shutdown condition.		
	b. B loop is preferred to loop A because of it's ability to be flushed and warmed without the extensive operation of manual valves.	Show TP-2A and TP-2B to show the difference due to extra MOV's in Loop B.	

c. If SDC mode fails, operator can use Alt. SDC IAW N2-OP-31.

3. Steam Condensing Mode

Show TP-4 and refer trainees to FIG-4. Use figure to emphasize key points.

EO-7.0.b
EO-8.0
EO-9.0

a. The Steam Condensing mode provides a heat sink for the reactor when the main condenser is not available.

1) This mode can be used to maintain the reactor at or near operating temperature.

2) This mode can be used to cool the reactor from hot shutdown conditions to a temperature within the capacity of the Shutdown Cooling mode (350°F).

4. Suppression Pool Cooling Mode

Show TP-6 and refer trainees to FIG-6. Use figure to emphasize key points.

EO-7.0.b
EO-8.0
EO-9.0

a. The suppression pool cooling mode is used to reduce suppression pool temperatures following reactor blowdown via safety relief valves, operation of ICS (or after a loss of coolant accident).

LESSON CONTENT	DELIVERY NOTES	ECTIVES/ NOTES
5. Fuel Pool Cooling Using RHS Heat Exchanger a. This mode of operation is used when an excessive heat load is present in the fuel pool or normal fuel pool cooling is not available to remove decay heat from the spent fuel.	Show TP-8 and refer trainees to Fig-8. Use figure to stress key points.	EO-7.0.b
6. Low Pressure Coolant Injection Mode a. Following LOCA, LPCI mode of RHS initiates automatically on high drywell pressure (1.68 psig) and/or tripple-low level (17.8 inches) with 1 out of 2 twice logic. b. All three pumps auto start, taking suction from the suppression pool. c. Heat exchanger bypass valves MOV-8A/B open or remain open (sealed in for ten minutes). d. Injection valves, MOV-24A/B/C, open when the 130 psid differential pressure interlock is satisfied.	Show TP-3 and refer trainees to Fig-3. Use sketch to emphasize key points.	EO-7.0.b EO-8.0 EO-9.0

e. If the LOCA is a small break LOCA which does not depressurize the Rx., High Pressure Core Spray should provide sufficient core cooling. If not, LPCI injection will be delayed until ADS can depressurize the Rx vessel.

7. Containment Spray

a. After a LOCA, primary containment pressure increases due to the release of steam from the break and the accumulation of noncondensible gases.

b. The drywell is provided with two spray headers supplied from RHS loops A and B while a single suppression chamber spray header is serviced by both loops.

1) This mode is manually initiated by the operator and manually secured by the operator.

2) RHS loop A or B must have its LPCI injection valve shut, a high drywell pressure signal present, and a LOCA signal sealed in to permit drywell spray initiation.

Show TP-7 and refer trainees to Fig-7. Use sketch to stress key points.

EO-7.0.b
EO-8.0
EO-9.0

c. Drywell spray water cools the drywell air and condenses the steam.

8. Suppression Pool Spray

Continue on TP/Fig-7.

EO-7.0.b
EO-8.0
EO-9.0

a. The suppression pool sprays can be initiated without a LOCA signal present. However, if a LOCA occurs, and a LPCI initiation signal is received, the suppression pool spray valve will shut.

b. With a sealed in initiation signal present, the valves can be reopened if a high drywell pressure (1.68 psig) signal is present and the respective LPCI injection valve is shut.

c. The valve will automatically close when the high drywell signal clears.

EO-7.0.c

9. Containment or RPV Flooding

This is performed as directed by the EOP's.

EO-7.0.d
EO-8.0
EO-9.0

Service water system connects to RHS B loop downstream of the heat exchanger outlet valve. Valves MOV-116 and MOV115 are opened to admit an inexhaustible supply of water from Lake Ontario into the RHS System to flood the RPV or containment as directed by the EOP's.

C. Shutdown - Each mode has a unique shutdown procedure.	Discuss shutdown of applicable modes as required. Care must be taken to S/D ECCS modes IAW EOP's.	EO-7.0.c EO-8.0 EO-9.0
D. Off Normal/N2-EOP-6 Operations		
1. LPCI Injection Throttling (Attachment 3) by either:		
a. Remove seal-in ckt. from 2RHS*MOV24A/B/C	By lifting and taping leads for contacts A5 & A7 in: *MOV24A: 2EHS*MCC103C in rear of cubicle 17C *MOV24B: 2EHS*MCC303D in rear of cubicle 14C *MOV24C: 2EHS*MCC303D in rear of cubicle 19A	
b. OR utilize HX A/B bypass valve by shutting HX inlet or outlet valve (*MOV9A/B or *MOV12A/B) and throttling HX bypass valve (*MOV8A/B) as required.	A or B loops only. Can only be used after 10 minutes following LPCI auto initiation signal due to the *MOV 8's are interlocked open for 10 minutes.	
2. RHR Service Water crosstie (Attachment 5)		EO-7.0.d
a. Provides alternate source of RPV injection water from Service Water System (SWP).	Per N2-EOP-RPV, C1 and C4 should LPCI "B" be unavailable.	EO-9.0
b. Provides SWP for containment flooding	Per N2-EOP-C6	
c. Provides SWP for primary containment spray	Per N2-EOP-PC sections PCP, PCH and DWT if RHR A and B are unavailable AND LPCI B is unavailable or not required.	
d. Take RHR P1B to PTL, shut *MOV8B and shut *MOV12B		

	e. Open SWP injection valves *MOV115 & *MOV116		
	f. Inject to PRV via the following as directed by EOP's:		
	1) Open *MOV24B		
	2) Open *MOV40B	By lifting leads and installing jumper.	
	3) Open *MOV104	By lifting leads and installing jumper.	
	g. Inject to Drywell via the following as directed by EOP's:		
	1) Open sup. pool spray isolation valve	*MOV33B	
	2) Open D.W. spray isolation valves *MOV15B & MOV25B		
	3) Open Sup. pool cooling isolation valve *FV38B		
	h. To stop injection as directed by EOP's, shut injection valves, and return system lineup to normal.		
3.	RHR Firewater System Crosstie (Attachment 6)		EO-7.0.d
	a. Provides alternate injection source into RPV from FWP.	Per N2-EOP-RPV section RL, N2-EOP-C1 and C4	EO-9.0
	b. Provides alternate containment spray source from FWP.	Per N2-EOP-PC sections PCP, PCH, and DWT	
	c. Provides alternate containment flooding source from FWP.	Per N2-EOP-C6	

d. Connect FWP to RHR Loop A or B via CNS connection.	At test connection between the two CNS header isolation valves.	
e. Commence injection, spray or flooding via appropriate valves.		
f. To stop injection, spray or flooding, shut appropriate valves and disconnect FWP from test connection.		
4. ECCS Keep Fill Pump Injection (Attachment 7)		EO-7.0.d
a. Provides alternate source of injection water to RPV or containment via jockey pumps.	To support N2-EOP-RPV section RL and N2-EOP-C1; C4 or C6.	EO-9.0
b. Shut jockey pump discharge valve to unaffected loop		
c. Open injection valve to associated loop		
d. Shut jockey pump recirc valve to maximize flow		
e. To stop injection, shut injection valve and return system lineup to normal		
5. Condensate Transfer Injection (Attachment 8)		EO-7.0.d
a. Provides alternate source of injection water to RPV or to the containment via CNS connections.	To support N2-EOP-RPV section RL and N2-EOP-C1, C4 and C6. (RPV press < 195 psig for RPV injection)	EO-9.0
b. Open CNS connection to affected RHS loop		
c. Open affected RHS injection valve		

d. To stop injection, shut injection valve, CNS valves and return system lineup to normal.		
E. Annunciator Responses	Refer trainees to Op-31 section I.1 through through I.54 and cover key annunciator response procedures. Solicit maximum trainee response as to the reason behind the steps and their sequence.	EO-7.0.e EO-8.0 EO-9.0
1. [RHR A/B/C INJ VLV 23A/B/C OPEN PERMISSIVE] (601447/647/617)	Setpoints: <130 psid @ *PDT24A/B/C	
2. [RHR A/B HT EXCH 1A/B OUTLET COND HIGH] (601450/650)	Setpoint: >9 umho/CM @ *CE11A/B	
3. [RHR A/B SYSTEM ACTUATED] (601451/651)	Syst. A: LPCI A Manual or Auto Initiation (K18A) Syst. B: LPCI B or C Auto or Man. Initiation (K18B or K21)	
4. [RHR SHUTDOWN CLG HDR PRESS HIGH] (601452)	Setpoint: >171 psig @ *PT111	
5. [RHR HT EXCH 1A/B CLG WTR OUT1 TEMP HIGH] (601453)	Setpoint: >100°F @ SWP*TE12A/B (Service Water Temp.)	

6.	[RHR HT EXCH 1A/1B INLET TEMP HIGH] (601454)	Setpoint:	≥ 420°F @ *TE10A/B (RHR Water Temp.)
7.	[RHR PUMP ROOM A/B TEMPERATURE HI-HI] (601457)	Setpoint:	>131.5°F @ *TS1608 A/B/C/D (GP5 Isol)
8.	[RHR PUMP 1A/B/C SUCTION PRESS ABNORMAL] (601458/657/619)	Setpoint:	<6psig or >200 spig @ *PT 3A/B/C
9.	[RHR A/B/C HIGH PT VENT LEVEL LOW] (601459/658/620)	Setpoint:	Header Low Level @ *LS77A/B/C
10.	[DIVISION II RHR DRYWELL PRESS HIGH] (601602)	Setpoint:	>1.68 psig @ B22-N094 B(F)
11.	[DIVISION II RHR REACTOR WATER LEVEL LOW] (601603)	Setpoint:	<17.8 inches (L1) @ B22-N091 B(F)
12.	[RHR PUMP 1A/B/C DISCH PRESS ABNORMAL] (601446/646/616)	Setpoint:	<70 psig or > 475 psig @ *PT7A/B/C
13.	[RHR B WTR LEG PMP 2 DISCHG PRESS LOW] (601659)	Setpoint:	<60 psig @ *PT133

F. Applicable Surveillances

1. N2-OSP-RHR-@ 001 "Drywell Spray Nozzles Air Test"

   a. SR 3.4.9.2 RHR, Cold S/D
   b. LCO 3.4.9.2 RHR, Cold S/D
   c. LCO 3.5.2 ECCS, S/D
   d. LCO 3.6.2.2 Depressurization Systems, Sup. Pool and D.W. Spray
   e. LCO 3.9.11.1 RHR and Coolant Circulation, High Water Level
   f. LCO 3.9.11.2 RHR and Coolant Circulation, Low Water Level

   Performed at least once every 5 years. EO-7.0.f

   RHR loop is isolated and drained. CNS connection is disconnected and low pressure air compressor is connected. Each spray nozzle for the D.W. spray ring under test is visually inspected for obstruction. Then the ring is pressurized with air from the compressor and a streamer at the end of a pole is held in front of each nozzle to check for air flow. EO-10.0

2. N2-RHS-CS001 "RHR System Loop A Cold S/D Valve Operability Test"

   a. SR 4.0.5 Inservice Inspection
   b. SR 4.6.3.3 Primary Containment Isolation Valves
   c. LCO 3.4.9.2 RHR, Cold S/D
   d. LCO 3.5.2 ECCS, S/D
   e. LCO 3.9.11.1 RHR and Coolant Circulation, High Water Level
   f. LCO 3.9.11.2 RHR and Coolant Circulation, Low Water Level

   EO-7.0.f

   Performed at least every 92 days if in operational condition 4. Provides for stroke time testing of *MOV112, *MOV113, *MOV40A, *MOV24A, *MOV23A, *MOV80A and *MOV22A. Also provides for exercise testing of *MOV67A, *AOV39A, and AOV16A. EO-10.0

3.	N2-OSP-RHS-CS002 "RHR Loop B/C Cold S/D Valve Operability Test"	Same frequency as CS001. Same valve as for CS001, except for B loop and except for *MOV112 and *MOV113 stroke time tests.	EO-7.0.f
	a. Same SR's as CS001		EO-10.0
	b. Same LCO's as CS001		
4.	N2-SOP-RHS-CS003 "RHR Head Spray Check valve Operability Test"	Performed every 92 days when in operational condition 4. Provides for a forward flow exercise test on *V143.	EO-7.0.f
	a. SR 4.0.5 Inservice Inspection		EO-10.0
5.	N2-OSP-RHS-M001 "RHR Discharge Piping Fill (LPCI) and Valve Lineup Verification"	Performed at least once every 31 days. Provides for valve lineup verification and verifying that discharge piping is full for each loop of RHR System.	EO-7.0.f
	a. SR 4.5.1.a.1 ECCS-Operating		
	b. SR 4.5.1.a.2 ECCS-Operating		
	c. SR 4.6.2.2.a Sup. Pool and D.W. Spray		
	d. SR 4.6.2.3.a Sup. Pool and D.W. Spray		
	e. SR 4.5.2.1 ECCS - S/D		
	f. LCO 3.5.1 ECCS - Operating		
	g. LCO 3.6.2.2 Depressurization Systems, Sup. Pool and D.W. Spray		
	h. LCO 3.5.2 ECCS - Shutdown		
6.	N2-OSP-RHS-Q001 "RHR System Loop A Valve Operability Test"	Performed at least every 92 days when RHR Loop A is required to be operable. Provides for stroke time testing for: *MOV1A, *MOV2A, *MOV4A, *MOV30A, *FV38A, *MOV26A, *MOV27A, *MOV32A, *MOV37A, *MOV33A, *MOV15A, *MOV25A, *SOV35A, *SOV36A, *SOV70A, *SOV71A, *SOV72A, and *SOV73A.	EO-7.0.f
	a. SR 4.0.5 Inservice Inspection		EO-10.0
	b. SR 4.6.3.3 Primary Containment Isolation Valves		
	c. LCO 3.6.3 Primary Containment Isolation Valves		

	d. LCO 3.5.1 ECCS - Operating e. LCO 3.5.2 ECCS - Shutdown		
7.	N2-OSP-RHS-Q002 "RHR System Loop B Valve Operability Test" a. Same SR's as for Q001 b. Same LCO's as for Q001	Performed at least every 92 days. Provides for stroke time testing for *MOV115, *MOV116, *SOV126, *MOV1B, *MOV2B, *MOV4B, *MOV30B, *FV38B, *FV38C, *MOV26B, *MOV27B, *MOV32B, *MOV37B, *MOV33B, *MOV15B, *MOV25B, *SOV35B, *SOV36B, *MOV142, *MOV149, *SOV70B, *SOV71B, *SOV72B, and *SOV73B. Also provides for exercise test of *AOV150.	EO-7.0.f EO-10.0
8.	N2-OSP-RHS-Q003 "RHR System Loop C Valve Operability Test" a. Same SR's as for Q001 b. Same LCO's as for Q001	Performed at least every 92 days when RHR Loop C is required to be operable. Provides for Stroke Time Testing of *MOV1C and *MOV4C.	EO-7.0.f EO-10.0
9.	N2-OSP-RHS-Q004 "RHR System Loop A Pump and Valve Operability Test" a. SR 4.0.5 Inservice Inspection b. SR 4.5.1.b.2 ECCS - Operating c. SR 4.5.2.1 ECCS - Shutdown d. SR 4.6.2.2.b Sup. Pool and Drywell Spray e. SR 4.6.2.3.b Sup. Pool Cooling f. SR 6.8.4.a Primary Containment Isolation Valves	Performed at least once every 92 days. Provides for stroke time testing of *MOV12A, *MOV8A and *MOV9A. Provides for system integrity walkdown and pump flow and D/P operational test, and Sup. Pool Spray, Sup. Pool Cooling Flow test. Also provides for forward and reverse exercise flow test of *V1. Provides for reverse flow exercise test of *V47 and *V48, and forward exercise flow test of *V7.	EO-7.0.f EO-10.0

	g. LCO 3.5.1 ECCS - Operating h. LCO 3.5.2 ECCS - Shutdown i. LCO 3.6.2.2 Sup. Pool and Drywell Spray j. LCO 3.6.2.3 Sup. Pool Cooling		
10.	N2-OSP-RHS-Q005 "RHR System Loop "B" Pump and Valve Operability Test and System Integrity Test" a. SR 4.0.5 - Inservice Inspection b. LCO 3.5.1/SR 4.5.1.b.2 ECCS - Operating c. LCO 3.5.2/SR 4.5.2.1 ECCS - Shutdown d. LCO 3.6.2.2/SR 4.6.2.2.b Sup. Pool and Drywell Spray e. LCO 3.6.2.3/SR 4.6.2.3.b Sup. Pool Cooling f. SR 6.8.4.a Primary Containment Isolation Valves	Performed at least once every 92 days. Provides for stroke time testing of *MOV8B, *MOV9B, and MOV12B; forward exercise flow test of *V2 and *V8; reverse exercise flow test of *V60 and *V61; operability check of *MOV4B; pump flow, D/P and vibration test; Sup. Pool Spray and Sup. Pool Cooling Operational Flow Test; System Integrity walkdown.	EO-7.0.f EO-10.0
11.	N2-OSP-RHS-Q006 "RHR System Loop C Pump and Valve Operability Test and System Integrity Test" a. SR 4.0.5 - INSERVICE Inspection b. LCO 3.5.1/SR 4.5.1.b.2 - ECCS Operating c. LCO 3.5.2/SR 4.5.2.1 - ECCS Shutdown	Performed at least once every 92 days. Provides for pump flow, D/P and vibration test; system integrity walkdown; valve operability test for *MOV4C; forward exercise flow test for *V3 and *V9; reverse exercise flow test for *V17 and *V18.	EO-7.0.f EO-10.0

	d. SR 6.8.4.a - Primary Containment Isolation Valves (PCIV's)		
12.	N2-OSP-RHS-R001 "Div 2 ECCS Functional Test"	Performed at least once every cycle.	EO-7.0.f
	a. SR 4.3.3.2 ECCS Logic System Functional Tests	Provides for time response test of LPCI B and C ($\leq$ 20 seconds); emergency operating sequence functional test of LPCI B and C.	EO-10.0
	b. SR 4.3.3.3 ECCS Response Time		
	c. SR 4.5.1.c ECCS System Functional Test - Operating		
	d. SR 4.5.2.1 ECCS System Functional Test - Shutdown		
	e. SR 4.3.3.1 - 1.b.1.i ECCS Act. Inst. Operability Tests		
13.	N2-OSP-RHS-R003 "RHR VPI Verification"	Performed at least once every 18 months.	EO-7.0.f
	a. SR 4.0.5 - Inservice Inspection	Provides for VPI verification for all RHR (Loops A, B, and C) remotely operated and/ or indicated valves, including PCIV's.	EO-10.0
	b. SR 4.3.7.5 - 1.16 Channel calibration Requirements for PCIV VPI's.		
14.	N2-OSP-RHS-R004 "A RHR VPI Verification"	Performed at least once every 18 months.	EO-7.0.f
	a. LCO 3.4.9.2 RHR-Cold Shutdown	Provides for VPI verification for RHR Loop A remotely operated and/or indicated valves, including PCIV's.	EO-10.0
	b. LCO 3.9.11.1 RHR and Coolant Circulation, High Water Level		
	c. LCO 3.9.11.2 RHR and Coolant Circulation, Low Water Level		
	d. SR 4.0.5 Inservice Inspection		
	e. SR 4.3.7.5-1.16 Channel Calibration Requirements for PCIV VPI's		

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/ NOTES
15. N2-OSP-RHS-R005 "RHR System Loop B/C VPI Operability Test" a. LCO 3.4.9.2 RHR - Cold Shutdown b. LCO 3.9.11.1 RHR and Coolant Circulation, High Water Level c. LCO 3.9.11.2 RHR and Coolant Circulation, Low Water Level d. SR 4.0.5 Inservice Inspection e. SR 4.3.7.5 - 1.16 Channel Calibration Requirements for PCIV VPI's	Performed at least once every 18 months. Provides for VPI verification for RHR Loops B & C remotely operated and/or indicated valves, including PCIV's.	EO-7.0.f EO-10.0
16. N2-OSP-RHS-R@001 "RHR Loop A Pressure Isolation Valve Leakage Test" a. SR 4.0.5 Inservice Inspection b. SR 4.4.3.2.2 RCS Leak Rates	Performed at least every 18 months in op. cond.'s 1, 2 and 3, and prior to returning an affected valve to service following repair or replacement. Provides for leak rate testing on *MOV24A, *AOV16A, *MOV40A, *AOV39A & *MOV67A.	EO-7.0.f EO-10.0
17. N2-OSP-RHS-R@002 "RHR Loop B Pressure Isolation Valve Leakage Test" a. SR 4.0.5 Inservice Inspection b. SR 4.4.3.2.2 RCS Leak Rates	Performed at least every 18 months in op. cond. 1, 2 and 3 and prior to returning an effected valve to service following repair, maintenance or replacement. Provides instructions for performing leak rate test on *MOV24B, *AOV16B, *MOV40B, *AOV39B, *MOV67B, and *MOV104.	EO-7.0.f EO-10.0

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/ NOTES
18. N2-OSP-RHS-R@003 "RHR Loop C Pressure Isolation Valve Leakage Test" a. SR 4.0.5 Inservice Inspection b. SR 4.4.3.2.2 RCS Leak Rates	Performed at least every 18 months in op. cond. 1, 2 and 3 and prior to returning an effected valve to service following repair or replacements. Provides instructions for performing leak rate test on *AOV16C and *MOV24C.	EO-7.0.f EO-10.0
19. N2-OSP-RHS-R@004 "RHR Steam Condensing Pressure Isolation Valve Leakage Test" a. SR 4.0.5 Inservice Inspection b. SR 4.4.3.2.2 RCS Leak Rates	Performed at least every 18 months in op. cond. 1, 2 and 3, and prior to returning affected valve to service following repair or replacement. Provides for leak testing *MOV22A, *MOV23A, *MOV80A, *MOV22B, *MOV23B, and *MOV80B.	EO-7.0.f EO-10.0
20. N2-OSP-RHS-R@005 "RHS Pressure Isolation Valve Leakage Test" a. SR 4.0:5 Inservice Inspection b. SR 4.6.1.2.d.3 Primary Containment Leak Rates	Performed at least every 18 months in op. cond. 1, 2 and 3 and prior to returning affected valve to service following repair or replacement. Provides for leak testing *MOV142, *MOV149, *SOV35B, *SOV36B, *SOV35A, and *SOV36A.	EO-7.0.f EO-10.0
VII. TECHNICAL SPECIFICATIONS A. 3/4.3.3; ECCS Actuation Instrumentation B. 3/4.5.1; ECCS - Operating C. 3/4.5.2; ECCS - Shutdown D. 3/4.3.2; Isolation Actuation Instrumentation	Cover the applicable test specs with trainees, including the bases and surveillance requirements. Also cover Tech Spec Interpretation Memo's (TSIM's) applicable as listed. Solicit maximum trainee response as to the bases for each LCO.	EO-10.0

E. 3/4.6.3: Primary Containment Isolation Valves

F. 3/4.9.1; RHR Hot Shutdown

G. 3/4.9.2; RHR Cold Shutdown

H. 3/4.6.2.2; Suppression Pool and Drywell Spray

I. 3/4.6.2.3; Suppression Pool Cooling

J. 3/4.9.11; Refueling Operations

VII. HISTORY

A. System Modifications

Cover applicable system mods dated 5/88 to present. Discuss what drove the mod. to completion and what improvements were made as a result. See Addendum I.

B. Event History/Related Industry Events

Discuss one or two NMP-U2 events and/or industry related events applicable to the RHS System. See Addendum II.

Addendum I: System Modifications

A. Conduit Reroute
   1. REMOVED CONDUIT SUPPORT
   2. REROUTED CONDUIT

MODNO PN2Y87MX009 was made due to the interference of the conduit and its support with thermal growth of a pipe in the RHS System.

B. CHANGE ROTOR POSITION ON VALVE 2RHS*MOV67B
   1. CHANGED DRAWING ESK6RHS38
   2. TO ALLOW TORQUE SEATING THE VALVE

MODNO PN2Y87MX021 was necessary to allow torque seating the valve. The mod actually changed the limit switch development on the ref drwg.

C. ADD A SECOND ANNUNCIATOR FOR RHR STEAM TRAP
   1. ADDED SECOND ANNUNCIATOR
   2. CHANGED WIRING

MODNO PN2Y87MX125 was necessary to prevent annunciator window RHS STEAM TRAP TROUBLE from always being in alarm. Used to be one annunciator for both divisions. Now one annunciator for each division.

D. REMOVE PIPE SUPPORT TO ALLOW THERMAL EXPANSION
   1. REMOVED PIPE SUPPORT
   2. ALLOWS THERMAL EXPANSION

MODNO PN2Y87MX176 was necessary to allow proper clearance for thermal expansion of piping.

E. REMOVE PIPE SUPPORT TO PREVENT BINDING
   1. REMOVE PIPE SUPPORT
   2. ALLOW PIPE TO MOVE FREELY

MODNO N2Y87MX194 was necessary because the original pipe support configuration had 2 adjacent pipe supports pulling in opposite directions.

LESSON CONTENT	DELIVERY NOTES
F. PROVIDE FLANGED CONNECTIONS BETWEEN VALVE 2RHS*MOV1B AND LINE 2RHS-024-332-2 1. PROVIDED FLANGE CONNECTION BETWEEN VALVE AND PIPE 2. VALVE CAN NOW BE REMOVED WITHOUT REMOVING PIPING	MODNO N2Y87MX196 was necessary to make valve removal easier.
G. ADD SECOND ISOLATION DRAIN VALVE IN SERIES WITH 2RHS*V405 1. ADDS SECONDS DRAIN ISOLATION VALVE	MODNO PN2Y87MX031 was necessary because SSER 3 requires double isolation valves on vent, drain and test connections located inside the containment isolation valves in closed loop systems.

Addendum II

A. LER MODIFIED CASE STUDY

Using the modified case study format, discuss the events described in LER #89-010 "Actuation of Engineered Safety Feature (ESF) Due to Unknown Cause".

1. Plant conditions
   a. Mode switch in shutdown
   b. S/D C/D to 116°F
   c. Rx Pwr 0%
2. Related Surveillance: N2-OSP-ENS-M001 (Monthly Functional Test of the 4160V Emergency Loss and Degraded Voltage).
3. Sequence of Events:
   a. K/L switch for ckt TSAA-2ENSB24 at switchgear 2ENS*SWG103 cubicle 3 placed to on
   b. Annunciator 852240 and comp. pt. ENSEC02 received as required
   c. Operator at switchgear reported that ind. lamp did not light (L2-2ENSY05)
   d. 3-5 sec. Later, 2ENS*SWG103 tripped
   e. 2EGS*EG3 auto-start and synch. to bus in 10 sec.

Have each student read a paragraph of the event description (reference document Page 2 and 3). 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.

REF DOC
LER #89-010

After reading the event description use a guided class discussion to determine the following without further reference to the LER:

1. Probable root cause.
2. Recommended corrective actions.
3. Relevance to NMP2 today.
4. Actions that can be taken to prevent this event from happening again at NMP2.

f. Auto load shed of the following loads being used:
   1) 2RHS*P1B, aligned for S/D cooling
   2) 2SWP*P1B & D

g. Loss of normal Rx. Bldg. vent, which resulted in subsequent isolation and auto-start of SGTS.

After finalizing the class generated list, compare the class's findings with those in the LER.

INSTRUCTOR NOTE: Use of LER document may be useful for the discussion of items 1 through 4 above.

FILE CODE NMP49028

B. LER MODIFIED CASE STUDY

Using the modified case study format, discussion the events described in LER #89-004 "ESF Actuation Due to Personnel Error and Procedural Deficiency".

1. Plant conditions
   a. Mode switch in shutdown
   b. S/D C/D all rods in
   c. Rx. Pwr 0%
2. Related Surveillance: N2-ESP-ENS-M731, "Monthly Channel Functional Test of LPCS/LPCI Pumps A, B, and C(Normal and Emergency Power) Auto Start Time Delay Relays".
3. Sequence of Events:
   a. "Power Availability Test Switch" for LPCS was placed in TEST, but was forgotten for LPCI P1A.
   b. CSO and test director failed to recognize
   c. Simulated LOCA signal was generated
   d. LPCI P1A auto-start
   e. Injection valve (2RHS*MOV24A) auto-opened
   f. Vessel injection occurred
   g. Operators verified adequate core cooling
   h. LPCI P1A taken to PTL

Have each trainee read a paragraph of the event description (reference document Page 2 and 3). 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.

REF DOC LER #89-004

After reading the event description use a guided class discussion to determine the following without further reference to the LER:

1. Probable root cause.
2. Recommended corrective actions.
3. Relevance to NMP2 today.
4. Actions that can be taken to prevent this event from happening again at NMP2.

After finalizing the class generated list, compare the class's findings with those in the LER.

INSTRUCTOR NOTE: Use of LER document may be useful for the discussion of items 1 through 4 above.

FILE CODE NMP46294

C. LER MODIFIED CASE STUDY

Using the modified case study format, discuss the events described in LER #90-011 "Shutdown Cooling System Isolation Due to Inadequate Procedure Development".

1. Plant conditions"
   a. Mode switch in shutdown
   b. S/D C/D all rods in
   c. Rx Pwr 0%
   d. S/D cooling in operation on RHS Loop "B"
2. Related Surveillance: N2-ESP-RPS-SA@744, "Six Month Reactor Protection System (RPS) Vital Buss Power Monitoring Instrument Functional Test"
3. Sequence of Events:
   a. Vital bus 2VBS*ACB1A was tripped
   b. DIV I 1/2 scram and isol. signals as expected
   c. 2RHS*MOV40B closed unexpectedly (DIV II pwr supply)
   d. 2RHS*P1B manually tripped by operator
   e. Loss of S/D cooling

Have each student read a paragraph of the event description (reference document Page 2 and 3 of 8). 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 the following without further reference to the LER:

1. Probable root cause.
2. Recommended corrective actions.
3. Relevance to NMP2 today.
4. Actions that can be taken to prevent this event from happening again at NMP2.

After finalizing the class generated list, compare the class's findings with those in the LER.

INSTRUCTOR NOTE: Use of LER document may be useful for the discussion of items 1 through 4 above. Also, refer to ref. document page 7 and 8 for a sketch of the work area.

REF DOC
LER
NUMBER
90-011

FILE CODE
NMP67573

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/ NOTES

D. SOER MODIFIED CASE STUDY

Using the modified case study format, discuss the events described in SOER #87-2 "INADVERTANT DRAINING OF REACTOR VESSEL TO SUPPRESSION POOL AT BWR's".

1. Plant conditions:
   a. Mode switch in SHUTDOWN
   b. COLD S/D
   c. Rx. Pwr. 0%
2. Related Surveillance: N/A
3. Sequence of Events:
   a. Discuss sequence for whichever events you choose from this SOER
   b. Instructor may pick one or more events at his discretion

Have each trainee read a paragraph of the event(s) description (reference document Pages 2-5). 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.

REF DOC SOER #87-2

After reading the event description use a guided class discussion to determine the following without further reference to the SOER:

1. Probable root cause.
2. Recommended corrective actions.
3. Relevance to NMP2.
4. Actions that can be taken to prevent this event from happening at NMP2.

After finalizing the class generated list, compare the class's findings with those in the SOER.

INSTRUCTOR NOTE: Use of SOER document may be useful for the discussion of items 1 through 4 above. Also, refer to the SOER ref documents for sketches of the work areas.

FILE CODE NMP N/A