Ø7-188-91

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT NUCLEAR STATION

UNIT II OPERATIONS

02-LOT-001-259-2-01 Revision 6

TITLE: FEEDWATER SYSTEM

	SIGNATURE	DATE
PREPARER	J. Kaminski	11/29/90
TRAINING SUPPORT SUPERVISOR	J. Lodi for J. LeClair	11-29-90
TRAINING AREA SUPERVISOR	J. Kaminski	11/29/90
PLANT SUPERVISOR/ USER GROUP SUPERVISOR	for D. Tooley	12/10/90

Summary of Pages

(Effective Date: 12/10/90)

Number of Pages: 26

Date	Pages
November 1990	1 - 26

THIS LESSON PLAN IS A GENERAL REWRITE

TRAINING DEPARTMENT RECORDS ADMINISTRATION ONLY

VERIFICATION:

DATA ENTRY

RECORDS

4/3/92 30 pp

ATTACHMENT 6
LESSON PLAN TEMPORARY/PUBLICATION/ADDENDUM CHANGE FORM

The attached change was made to:

Lesson plan title: Feedwater System

Lesson plan number: 02-LOT-001-259-2-01

Name of instructor initiating change: G. Bridges

Reason for the change: add SOER 84-4 to lp sect. (IS 1 - I-G) to protect the entry

Type of change:

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

Disposition:

✓ 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 8/9/91

Training Area Supervisor (or designee): [signature] /Date 8/9/91

ATTACHMENT 6

LESSON PLAN TEMPORARY/PUBLICATION/ADDENDUM CHANGE FORM

The attached change was made to:

Lesson plan title: Feedwater

Lesson plan number: 02-LOT-001-259-2-01

Name of instructor initiating change: MS Churilla

Reason for change: incorporate RFCS FW runback bypass switch per TCO-02-LIC-90-014

Type of change:

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

Disposition:

✓ 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 7/3/91

INSTRUCTIONS:

The instructor should complete the following:

1. Enter the lesson plan title
2. Enter the lesson plan number
3. Enter the name of the instructor initiating the change
4. Enter the reason(s) for the change. Include page numbers affected.
5. Place a check in the space provided to indicate whether the change is a Temporary, Publication or Addendum change.
6. Have the Training Area supervisor indicates the disposition by placing a check in the appropriate space provided.
7. The instructor should sign and date and obtain the approval of the Training Area Supervisor (or designee).

I. TRAINING DESCRIPTION

A. Title of Lesson: Feedwater System

B. Lesson Description: Provide operators with knowledge of the Feedwater System including purpose, general and detailed descriptions, instrumentation, controls, interlocks, operational interrelations and operating procedures.

C. Estimate of the Duration of the Lesson: 3 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: Classroom Lecture

F. Prerequisites:

1. Instructor:
   a. Certified in accordance with NTP-16.
2. Trainee:
   a. In accordance with NTP-10.
   b. In accordance with NTP-11.

G. References:

1. N2-OP-3, Condensate and Feedwater System
2. P & ID 6A through 6E and 8S through 8W
3. Technical Specifications
   a. 3/4.3.9, Plant Systems Activation Instrumentation
4. Operator texts on condensate, condensate demins and feedwater heaters vents and drains
5. Modification - PN2Y86MX098 Reactor feed pumps seal water system
6. Instruction Manual - Automatic Control valves - Valtek Mark One Control Valves - 2FWS-FV55A (B) (N2V03700 Valve 004)
7. Instruction Manual for: Model CPDL Lube Oil Filters Consler Corp. Designed and constructed for General Electric Co.
8. GEK-42681 & GEH-3185 Custom 8000 Induction Motors P.O. - E042B
9. GEK-38232, 38287 Gear Instruction Book (S-239-5)
10. GEK-38288 Lubricating System Instructions
11. GEI-67147C Oil Recommendations for Gear Units
12. GEK-94827 G.E. Zinc Injection System Operation
13. SOER-84-4 (TRR 600801-14) Addendum change 8/6/91.

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. Text
2. Pens, pencils, paper
3. N2-OP-3
4. Feedwater System Operation's Technology
5. Course Evaluation

IV. EXAM AND MASTER ANSWER KEYS

A. Exams will be generated and administered as necessary.

B. Exams and Master Answer Keys will be permanent file in the Records Room.

V. LEARNING OBJECTIVES

A. Terminal Objectives:

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

TO-1.0	Perform lineups of the Reactor Feedwater System.	(2590010101)
TO-2.0	Start a Reactor Feedwater pump.	(2590030101)
TO-3.0	Shutdown a Reactor Feed Pump.	(2590050101)
TO-4.0	Shutdown the Reactor Feedwater System.	(2590110101)
TO-5.0	Perform a single feed pump operation and second pump start.	(2599010101)
TO-6.0	Start the standby feed pump.	(2599040101)
TO-7.0	Respond to a feed pump high vibration.	(2599120101)
TO-8.0	Lineup the (GE) Zip System.	(2569160101)
TO-9.0	Startup the (GE) Zip System.	(2569170101)
TO-10.0	Perform the actions required for a single feedwater pump trip.	(2000270501)
TO-11.0	Perform the actions required for a complete loss of feedwater.	
TO-12.0	(SRO Only) Respond to a Reactor Feedwater Pump Trip.	(3449020403)
TO-13.0	(SRO Only) Direct the actions for a loss of Normal Feedwater or Normal Feedwater System failure.	(3449210503)
TO-14.0	(SRO Only) Direct the manual control of feedwater during a Reactor startup/shutdown.	
TO-15.0	(SRO Only) Direct the actions for a loss of all feedwater.	(3449220503)

B. Enabling Objectives:

EO-1.0 Explain the purpose and function of the Feedwater System.

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

a. Reactor Feedwater Pumps
b. Feedwater Pump Recirculation Flow Control Valves
c. Sixth Point Feedwater Heaters
d. Feedwater Cleanup Piping
e. Reactor Feed Pump Lubricating Oil System
f. Reactor Feed Pump Seal Water and Leakoff
g. GE Zinc Injection Passivation System

EO-3.0 Regarding the Feedwater 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 interrelations

EO-4.0 Describe the interrelationship between the following systems and the Feedwater System.

a. Condensate System
b. Extraction Steam System
c. Heater Vents and Drains
d. Turbine Building Closed Loop Cooling
e. Turbine Sampling System
f. Feedwater Control
g. Instrument Air System
h. Reactor Recirc. System
i. Reactor Water Cleanup System
j. AC & DC Distribution

EO-5.0 For the precautions and limitations listed in N2-OP-3 Condensate and Feedwater System explain the basis for each precaution and limitation.

EO-6.0 Regarding the Feedwater System, determine and use the correct procedure to identify the actions and/or locate information related to the following:

a. Startup
b. Shutdown
c. Normal operations
d. Off-normal operations
e. Annunciator responses

EO-7.0 Given a specific set of plant conditions, determine how feedwater the systems responds.

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

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

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 weekly exams.	
4. Review student learning objectives.		
B. Purpose		EO-1.0
1. Provide makeup water at sufficient pressure and flow to the Nuclear Boiler System to maintain reactor vessel water level during normal and certain abnormal reactor plant conditions.	This is the primary purpose.	
2. Provides feedwater preheating, using feedwater heaters, to increase plant efficiency and minimize thermal stress to the reactor vessel.	Secondary	
3. Provides a means of feedwater cleanup by recirculating water through the condensate cleanup system during plant startup.	Utilizes piping of FWS condensate demins do the "cleanup".	
C. General Description		
1. Systems covered - FWS (Feedwater system), FWL (Lube oil), FWP (pump seal water), FWR (recirc/minimum flow), GEZIP (Zinc Injection System)		

The Feedwater System contains (3) Reactor Feed Pumps, (3) sixth point heaters and piping and valves to connect the suction of the feed pumps to the condensate system and the outlet of the 6th point heaters to the reactor.

Show TP of Figure 1 discuss system flowpaths including suction of feed pumps from condensate; discharge to three 6th point heaters; feed pump minimum flow (recirc); feed pump bypass; tie from reactor water cleanup; 6 reactor vessel inlet lines and cleanup lines, and zinc injection points.

6th point heaters raise temperature to approximately 420°F.

GE Zinc Injection Passivation System injects and monitors zinc ions to the reactor water via the Feed Water System to reduce radiation levels.

II. DETAILED DESCRIPTION

A. Reactor Feedwater Pumps — EO-2.0a

1. (3) 50% capacity
   Motor driven through a step-up gear
   2 stage horizontal centrifugal
   forced lube oil system — AC totally enclosed air-water-cooled (CCS)
   Power Supplies — 1785 to 3337 rpm
   Feedwater Pumps — 18,700 gpm at 2443 feet TDH cooled by (CCS)
   2FWS-P1A • 2NPS-SWG001
   2FWS-P1B • 2NPS-SWG003
   2FWS-P1C • 2NPS-SWG001 or 3

   Capable of running 2 pumps if one power source is lost also during normal operation it allows any 2 pumps to be run from different power supplies.

   Feedwater Pump Space heaters 2NHS-MCC003 — Prevents moisture accumulation in the motor windings during shutdown or standby.

2. The feedwater pumps take a suction on the LP heater strings outlet and discharges high pressure feedwater through the sixth point feedwater heaters to the reactor. The suction lines contain a flow element and an isolation valve in each line. — Flow element controls recirc, valves 2FWS-FV2A, B, C

The discharges of pumps P1A and P1B have a high pressure-low flow feed-water flow control valve (2FWS-LV55A, B). The discharge of all 3 feed water pumps has a high pressure-high flow control valve (2FWS-LV10A, B and C).

Not P1C
Used during startup or shutdown (up to ~15% steam flow)

Used for normal power operation

Each has a limitorque operator which receives 3 phase power from 2FWS-PNL10(A, B,C). PNL10 sends from 0 to 480 VAC at 0 to 60 H_Z power to the limitorque for a varying speed control to the LV10 valves.

TCO-02-LIC-90-041

A low pressure feedpump bypass line with a low pressure flow control valve (2CNM-LV137) is provided to control system flow when the reactor is at low pressure and a condensate booster pump provides sufficient pressure to maintain vessel water level.

These three sets of valves are controlled by the (FWC) system. During times of low flow with the reactor at low pressure, the low flow-low pressure control valve (LV137) is used to supply water directly from the condensate booster pumps, bypassing the reactor feedpumps.

As reactor pressure increases and a reactor feed pump is started, the feedwater flow is regulated by controlling the high pressure-low flow control (LV55A, B) valves. During normal plant operations, the high pressure-high flow control valves (LV10A, B, C) are used to regulate feedwater flow. The system can be operated in single element (water level) or three element control (level, steam flow, feed flow). The three element mode anticipates a level change due to steam flow-feed mismatch.

Point out these valves on TP-1 or P & ID 6.

The system also allows the flow to be manually controlled by the operator.

The valves and their controls are discussed in detail in the feedwater control text.

B. Reactor Feedwater Pump Recirculation (Minimum Flow) 10 inch air operated globe valve-controlled by individual pump suction flow element adjusted to maintain a minimum of 8500 gpm - it returns this water to the main condenser.

Manufacturer's Tech. Manual recommendation is a minimum of 6000 gpm.

EO-2.0b

C. Sixth Point Feedwater Heaters (3) 2 pass 2 zone shell high pressure U-tube heat exchanger inlet and outlet isolation valves relief valve.	Feed-water flows through tubes To isolate for maintenance Protects tube side in an isolated heater relieves to the main condenser	EO-2.0c
Normal at power feed water flowpath is through the three 6th point heaters. There is a bypass line with a motor operated valve (for isolation) which allows feed water flow to bypass the heaters. Heating is supplied by the Extraction Steam System to the shell side of the heater. The three heaters and bypass line discharge to a common line then splits again into (3) lines. (2) lines go to reactor vessel each of these lines contain the following:	4th stage extraction steam and turbine 1st stage drains heats feed water to ~640°F. In the following point out locations on TP-1 or P & ID 6 series prints.	
• MOV 21A, B	Containment isolation	
• Thermal sleeve	(WCS) Reactor Water	
• AOV 23A, B (air operated testable check valve)	Clean-up System leak protection/cont. isol.	
• V12A, B (check valve)	leak protection/inside cont. isol.	
• HCV54A, B (manual valve)	inside cont. isol./for maintenance	

Each of these lines divide into 3 risers to supply the feed water nozzles in the Reactor vessel.

D. Cycle Clean-up Line — EO-2.0d

Third line from 6th point heaters discharge is cycle clean-up - from flow element - branches into 2 lines - "low energy" and "high energy" cycle cleanup lines. Low energy - for clean-up/flushing can pass full condensate demin system flow with 2 condensate & condensate booster pumps running this line has its own shut off valve (MOV112) and 2 low pressure flow control valves that dump this water back to the condenser.

low energy = no feed pumps running
high energy = feed pump running

Point out locations on TP-1 or P & ID 6

High energy - returns feed water at operating temp. and pressure to the main condenser this line has a shut off valve then splits to 3 flow control valves which go into each condenser to a sparger to spray the returned feedwater into the condenser.

This is not a normal configuration-requires special evaluation and procedures.

E. Reactor Feed Pump Lubricating Oil System (FWL) — EO-2.0e

1. Cools and lubricates the feedpump bearings and step up gear.

   3 complete systems each contain; reservoir-370 gallons max.

   Suspended below the step-up gears.

   2 pumps which take a suction on strainers in the reservoir.

   a. Main pump - gear tooth type positive displacement driven by the step-up gear.

      Connected to the low speed gear.

      Both pumps discharge to a common header.

   b. Auxiliary pump - motor driven screw type positive displacement.

      Aux. pump - primes main pump, prelubes all bearings and gears, and acts as a back-up to the main pump.

2. Common header is protected by a 60 psig relief. Discharge of pumps goes through one of two duplex filters to remove particles (dirt, rust, scale, sand & metal) with a 3-way valve isolating the second filter. Oil then flows through a heat exchanger - cooled by (CCS). The system has a second relief valve which maintains pressure to bearings and gears at 20 psig. This valve is normally open - passes approx. 8 gpm. Oil flows to all bearings and is sprayed by nozzles onto the step-up gears.

   Show TP-2

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/ NOTES
F. Reactor Feed Pump Seal Water and Leak Off (FWP) Supplied by condensate booster pump discharge-passes through a duplex strainer to remove particles then to the pump seals - manufacturer requires min. - of 5 gpm max. 10-12 gpm - 4 psi min. above suction pressure max. 127 psi above pump suction pressure. This water minimizes pump mechanical seal leakage and cools the seals.	(there is a filter bypass)	EO-2.0f
g. The GE Zinc Injection Passivation System taps into the Feedwater System using the differential pressure across the feed pumps to provide a construct flow. This flow is measured and the proper amount of zinc ions are injected using the GEZIP metering pumps into this flowpath.	Used only during normal operations.	EO-2.0g
III. INSTRUMENTATION CONTROLS AND INTERLOCKS		
A. Instrumentation		
1. Feedwater System and pump temperature, valve positions, pressure, flow and amps have indication on panel 851.	Flow and temperatures are also displayed on a local computer display near the feedwater pumps on 250' el. Use the P & ID's to point out electrical components, trace the flowpath, describe system operation and identify system interrelations.	EO-3.0
2. Feed water lube oil.		
One important indication found on P & ID for (CCS) is lube oil and air cooler outlet temperatures.		

3. Seal Water System In plant only indications are the differential pressure between feed pump suction pressure and seal water pressure. The only other indication is the seal water pressure to each seal.	Point these out on P & ID 6C This difference is due to pressure drop across the high pressure heaters.
4. Zinc Analyzer - monitored by chemistry Zinc injection panel only instrumentation is annunciators.	These are in annunciator section of OP and text.
B. Controls	
1. Each reactor feed pump has a 4 position (START-NORMAL AFTER-STOP-PULL TO LOCK) control switch with pump PIC having a separate control switch for each of its power sources.	
2. Controls for all remote operated valves associated with the feed system are located on panel 851 with the exception of:	
a. Feedwater isolation valves (MOV 21A, B)	a through c located on panel 603
b. Feedwater testable check valves (AOV 23A, B)	
c. Feedwater flow control valves	

3. Feed pump lube oil system and seal water systems are totally controlled from in-plant location.
   a. Lube oil pump start switch is mounted locally.
   b. Seal water major controls is a manual plug valve used to control flow of seal water to both seals.

Note:
This switch is rotates abnormal - start is to the left and stop is to the right-the switch springs returns from the right only.

If seal water to a running pump is <4psid Control Room will receive an annunciator and computer point.

C. Interlocks

Feed pump trips

Show TP of LSK

Call upon NLO's to give trips from LSK

1. Reactor water level > high level trip
2. Motor electric fault
3. Sustained bus undervoltage
4. Low bearing oil pressure — <8 psig
5. Suction pressure low - 210 psig — 45 sec. T.D.
6. Suction pressure low - low 190 psig — instantaneous

Aux. Lube Oil Pump Starts

1. Feed pump start
2. Feed pump stops (20 min. time out)
3. Feed pump running and main oil press low <15 psig

Recirc Valves

1. When a feed pump control switch is taken to start the recirc valve opens to ≥ 15% then feed pump starts.
2. Close five minutes after respective pump stops.

Cycle Cleanup

Pressure switches isolate the low energy cycle clean up lines on high pressure (> 800 psig).

IV. System Interrelations

A. (CNM) Condensate
   1. Supply to feed pump suction
   2. Seal water
   3. Cycle clean up lines back to condenser

Have students open their copy of N2-OP-3. Ask students the interrelations of each system listed in the OP then cover the remaining systems.

EO-4.0

B. (ESS) Extraction Steam System - supplies heating steam to 6th point heaters.

C. (HDH) Heater Vents and Drains (High pressure)
   1. Shell side 6th point heater drain to 5th point heater (LV6A)

      OR

   2. Shell side drain to condenser (LV26)
   3. (SVH) Steam vents heater system provide a path for continuous vents and reliefs on the steam side of the 6th point heater.

(P & ID-8S)

D. (CCS) Turbine Building closed loop Cooling System cools feed pump motor air cooler and lube oil cooler.

E. (SST) Turbine Sampling System feed water system sampling.

F. (FWC) Feedwater Control controls feed water system flow control valves to balance system flow and maintain vessel level.

G. (IAS) Instrument Air System air for control of AOV's in the system.

Describe how the valves that are air operated fail and how this affects system operation. Refer to N2-OP-19, Instrument Air System Off-Normal Procedures.

H. (RCS) Reactor Recirc System receives signals from feedwater system to runback recirc when a feed pump trips and vessel level < level 4 (178.3").

I. (WCS) Reactor Water Cleanup System cleanup returns clean water via a thermal mixing tee in the feedwater line.

J. (IHC, PMS) Information Handling - Process Computer alerts CSO of abnormal system operation.

K. AC & DC Distributions - supplies necessary power for control and operation of feedwater system.

L. (RRCS) A FW Runback disable switch is installed on P-603. To be used only for surveillance testing of the RRCS system per OP-36B.

Prevents a spurious signal from causing a FW Level control valve run back.

mchell 7/8/91 TCD.02-LIC-90.014

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/ NOTES
V. Precautions and Limitations	Have students open N2-OP-3 and follow along. Some of the precautions in the procedure are condensate system and some were combined into one for common explanations. Explanations were gathered from tech. manuals, engineers, procedures and operators.	EO-5.0
A. The feedwater pump auxiliary lube oil pumps shall be in operation (or the feedwater pump isolated) prior to starting any condensate pump. This is to supply lube oil protection to each pump in case it should unintentionally be windmilled and also it should unintentionally be windmilled and also primes the main lube oil pump through a small pinhole in the main lube oil pump discharge check value.	Windmilling is true also for the condensate booster pumps.	
B. When feedwater pump motor is at ambient temperature you are allowed 2 starts in succession. When the feedwater pump motor is at operating temperature you are allowed one start with a 30 minute run time or 60 minutes idle time. It is to prevent excessive heating of the motor windings.	Applicable to many motors in the plant. Similarly some plant motors are not rated for continuous duty but for only a certain number of minutes run time.	

C.	Reactor feed pump lube oil temperatures stated in the operating procedure are a requirement for start up and operation of the feedwater pumps. This is to ensure proper lube oil flow to all bearings and gears for motor and pump full load and to prevent damage to bearing shells and seals.	Too high of temperature could cause decreased flow rate. Too low of temp. oil thru the positive displacement pump could cause excessively high pressure.
D.	The Reactor Feedwater Pump Discharge Isolation Valves (2FWS-MOV47A, B, C) and Suction Isolation Valves (2CNM-MOV84A, B, C) cannot be automatically closed the last 2%. This is done manually to limit stress on the limitorque actuator valve stem bushing for the discharge valves and to prevent over torquing the suction valves and thus damaging the seat.	Operating experience.
E.	During plant shutdown when the 2FWS-LV10 valves are not required for use the power supply should be secured. This is to protect the circuitry in 2FWS-PNL10(A, B, C) which is highly sensitive to radio signals or voltage spikes.	Very sensitive electronics in this panel.

VI. System Operation

A. Startup

EO-6.0

Prior to starting a condensate pump the Non-Licensed Operator (NLO) must verify cooling water lined up to and startup the feedwater lube oil pumps locally.

During startup flow is directed back to the main condenser through the low energy cycle cleanup valves to remove corrosion products. As reactor pressure increases a reactor feed pump is started with flow control through the low flow feedwater control valves (LV55A, B).

Basic system operation.

I.A.W. N2-OP-101A and OP-3

The feed pump discharge valves (2FWS-MOV47A, B & C) are verified shut, a second condensate and condensate booster pump is then started.

Verify cooling water valves (2CCS-V207 A(B), 2CCS-V208 A(B) and 2CCS-V206 A(B) are opened/throttled to the Feedwater Pump to be started.

Locally verify that feedwater pump seal water pressure is within the proper band and adjust using manual seal water control valve (2FWP-V35A(B,C).

Verify locally that the lube oil pressure is about 20 psig on 2FWL-PI1A(B) and oil flow through each pump and motor bearing sight glasses.

Total of (5) sight glasses (two are together for pump thrust and journal bearing)

Verify locally that feedwater lube oil filter differential pressure is less than 6 psid on 2FWL-PDIS3A(B).

After Feedwater Pump is started place the Feedwater Aux. Lube Oil Pump Control Switch to Auto and verify the Aux. Lube Oil Pump stops.

During startup, the second feedwater pump will be started at approximately 7% reactor power and greater than 500 psig suction pressure.

B. Normal Operation

1. During normal operation, two of the reactor feedwater pumps will be operating, supplying feedwater to the reactor through the three sixth point feedwater heaters. The high flow feedwater control valves (LV10A-C) will be regulating feedwater flow using a control signal from the Feedwater Control System. (GEZIP will be injecting as necessary to maintain zinc concentration at about 15 ppb.)
2. Periodic checks include seal water pressure, lube oil pressure, lube oil cooler outlet temperature, lube oil filter differential pressure, oil flow through each pump and motor bearing sight glass, suction header is continuously venting, and verify GEZIP panel annunciators are clear.

3. Feedwater pump lube oil filter changeout will be done by a NLO. This includes filling and venting the standby filter and slowly repositioning the inlet and outlet valve gang control handle to place standby filter on line. According to the manufacturer the expected pressure drop is between 2 psid and 8 psid. If D/P reaches 8 psid and internal relief valve may open and internally bypass and filter element.

C. Shutdown

While shutting down either the A or B pump will be last pump running. These pumps are supplied with a high pressure low flow control valve (2FWS-LV55A, B). When any feed pump is shut down the auxiliary lube oil pump is verified to have started and the associated lube oil pump control switch is placed to start. The minimum flow valve will also shut immediately (located on TB 277 North Condenser area by the 1st and 2nd point feedwater heaters).

D. Annunciator Responses

1. There are eight annunciators on the GEZIP panel these include: Metering pump off, tank mixer off, zinc analyzer concentration high or low, feedwater bypass low flow or low temperature, supply tank level low-low or high-high.

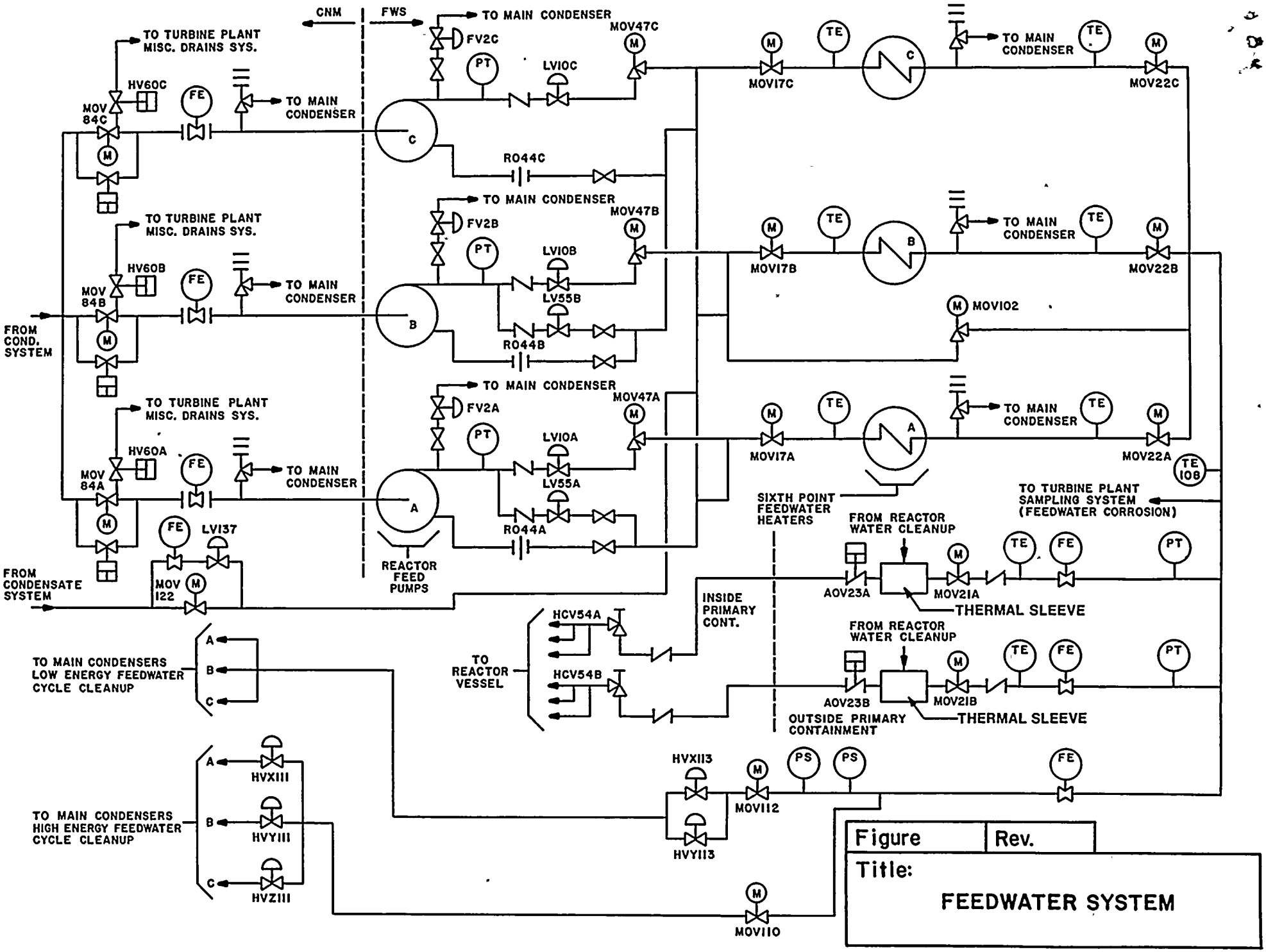
E. Off Normal

EO-7.0

1. Review each of the following off normal responses as specified in N2-OP-3.

a. Loss of Feedwater or Feedwater System Failure.	Operators review actions specified.
b. Intrusion of Demineralizer Resin into Primary System.	Operators review actions specified.
c. Shifting FWS pumps at power when two pumps are in service.	Explain that this is done to minimize the power reduction.
d. Plant startup with single feedpump operation and second pump start.	Explain that this is done when other feed pumps are initially <u>not</u> available.
e. Flooding the reactor head cavity using CNM/FWS.	Explain that this is performed during refuel operations.

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/ NOTES
2. Review N2-EOP-6 sections as applicable.	Explain that these EOP actions are specified in each of the EOP's and will be performed as decided by the SSS.	EO-8.0 TCO-02-LIC-90-77
VII. Technical Specifications		EO-9.0
A. Review Tech. Spec. 3/4.3.9 Plant Systems Activation Instrumentation	Have students review the basis for this specification.	
VIII. SYSTEM HISTORY	Instructor to develop Adendums A and B of applicable mods and events and pass out to trainees.	
A. System Modifications (Adendum A)		
B. Event History/Related Industry Events (Adendum B)		
IX. Wrap UP		
A. Review student learning objectives.	Ask questions relating to objectives to test understanding.	


CNM
FWS
TO MAIN CONDENSER
MOV47C
FV2C
PT
LV10C
HV60C
MOV 84C
FE
TO TURBINE PLANT MISC. DRAINS SYS.
TO MAIN CONDENSER
C
RO44C
MOVI7C
TE
MOV22C
MOV47B
FV2B
LV10B
HV60B
MOV 84B
LV55B
RO44B
B
MOVI7B
MOVI02
FROM COND. SYSTEM
MOV47A
FV2A
LV10A
HV60A
MOV 84A
LV55A
RO44A
A
MOVI7A
MOV22A
TE 108
SIXTH POINT FEEDWATER HEATERS
TO TURBINE PLANT SAMPLING SYSTEM (FEEDWATER CORROSION)
FROM REACTOR WATER CLEANUP
AOV23A
MOV21A
THERMAL SLEEVE
AOV23B
MOV21B
OUTSIDE PRIMARY CONTAINMENT
INSIDE PRIMARY CONT.
REACTOR FEED PUMPS
LVI37
MOV 122
FROM CONDENSATE SYSTEM
HCV54A
HCV54B
TO REACTOR VESSEL
TO MAIN CONDENSERS LOW ENERGY FEEDWATER CYCLE CLEANUP
HVXIII
HVYIII
HVZIII
TO MAIN CONDENSERS HIGH ENERGY FEEDWATER CYCLE CLEANUP
HVXII3
HVYII3
MOVII2
PS
MOVII0
Figure
Rev.
Title:
FEEDWATER SYSTEM