NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT NUCLEAR STATION

Ø7-189-91

UNIT II OPERATIONS

02-REQ-001-212-2-00 Revision 5

TITLE: REACTOR PROTECTION SYSTEM

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PREPARER	[illegible]	4/10/90
TRAINING SUPPORT SUPERVISOR	[illegible] for JAL	4-10-90
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Summary of Pages

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5/4/49

I. TRAINING DESCRIPTION

A. Title of Lesson: Reactor Protection System

B. Lesson Description: Provide a system review of the Reactor Protection System for licensed operators.

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

D. Method of Evaluation, Grade Format, and Standard of Evaluation: Open reference written exam $\geq$80%.

E. Method and Setting of Instruction: Classroom

F. Prerequisites:

1. Instructor:
   a. Instructor shall be qualified for the material being delivered in accordance with NTP-16, Rev. 3 Attachment A.
   b. Qualified in instructional skills as certified by NTP-16.
2. Trainee:
   a. Meet eligibility requirements per 10CFR55, or
   b. Be recommended for this training by Operations Superintendent, his designee, or Training Superintendent.

G. References:

1. N2-OP-97, "Reactor Protection System"
2. GE Elementary 807E166TY sheets 1-12

II. REQUIREMENTS

A. Requirements for Class

1. AP-9.0, "Administration of Training"
2. NTP-11, "Licensed Operator Retraining and Continuing Training"

III. TRAINING MATERIALS

A. Instructor Materials:

1. Overhead Projector
2. Copy of this Lesson Plan
3. N2-OP-97 Reactor Protection System
4. GE Elementary 807E166TY sheets 1-12

B. Trainee Materials:

1. N2-OP-97
2. GE Elementary 807E166TY sheets 5, 6, 7, 8, 9

IV. EXAM AND MASTER ANSWER KEYS

Exams and master answer key(s) field with the official records.

V. LEARNING OBJECTIVES

A. Terminal Objectives:

TO-1	2009020401	Perform the actions required for a loss of RPS channel.
TO-2	2010130101	Scram the reactor manually and take immediate actions.
TO-3	2019250101	Perform post scram recovery actions IAW N2-OP-101C
TO-4	2120010101	Energize the RPS system (power supplies 2VBB and UPS 3A/B)
TO-5	2120090101	Shift the RPS bus to the alternate power supply
TO-6	2129050201	Perform the RPS Weekly Turbine Value Cycling Test N2-OSP-RPS-W001
TO-7	3410180303	Apply Tech. Spec. directions for Safety Limits, LCO's and Limiting Safety System Settings (SRO only).
TO-8	3410430303	Authorize placement of RPS channel in the test or tripped position (SRO only).
TO-9	3410440303	Authorize bypass of RPS channel from a trip condition (SRO only).
TO-10	3449230503	Direct the actions required for a loss of a RPS channel (SRO only).

B. Enabling Objectives:

EO-1.0 State the purpose for the Reactor Protection System.

EO-2.0 State the difference between a scram and a half scram.

EO-3.0 List the power supplies to the RPS trip systems, scram pilot valve solenoids and backup scram valve solenoids.

EO-4.0 State the purpose of the following major components:

a. Scram Pilot Valves
b. Scram Valves
c. Backup Scram Valves
d. Scram Discharge Volume (SDV) Isolation Pilot Valves
e. SDV High Water Level Bypass Switches
f. Reactor Scram Reset Logic Switches
g. Discharge Volume Isolation Test Switches
h. hydraulic Control Unit (HCU) Rod Scram Test Switches
i. Pilot Scram Valve Solenoid Indicating Lights
j. RPS Trip System
k. RPS Trip Channel
l. Channel Sensor Relays
m. Electrical Protection Assemblies (EPA)
n. Reactor Mode Switch
o. RPS Power Source Select Switch

EO-5.0 For the automatic scram functions of the RPS:

a. List all signals which would cause the automatic scram function.
b. State the setpoint at which each signal will cause the automatic scram function.
c. State when and how the automatic scram function is bypassed, either automatically or manually.
d. State the logic for the signal in the RPS (i.e. three of four valves must close, etc.)

EO-6.0 State the two methods available for manual scram.

EO-7.0 Describe the effects on the RPS system of a loss of an RPS MG.

EO-8.0 Explain the purpose of the 10-second time delay prior to scram reset.

EO-9.0 List the three anticipatory scrams, how they are sensed, bypassed and what event(s) each anticipate.

EO-10.0 (SRO ONLY) Given Technical Specifications, identify the appropriate actions and/or locate information relating to limiting conditions for operation, bases and surveillance requirements for the Reactor Protection System.

EO-11.0 Given Operating Procedure 97, Reactor Protection System, use the procedure to identify the appropriate actions and/or locate information related to:

a. Startup
b. Normal Operation
c. Shutdown
d. Off-Normal Procedures
e. Procedures for correcting alarm conditions
f. Precautions

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/ NOTES
I. INTRODUCTION		
A. Greet Class	Complete required paperwork.	
B. Review Learning Objectives	Show TP of Objectives to students.	
C. Purpose The Reactor Protection System automatically initiates a reactor scram to: 1. Preserve the integrity of the fuel cladding. 2. Preserve the integrity of the reactor coolant system. 3. Minimize the energy which must be absorbed during a loss of coolant accident; 4. Prevent inadvertent criticality.		EO-1.0
II. GENERAL DESCRIPTION		
A. System consists of two independent and identical <u>trip systems</u>.	Trip System A and B.	
B. Each trip system is divided into two independent and identical trip channels.	Channels A1, A2, B1, B2.	
C. Each RPS channel receives an input from at least one independent sensor for each critical parameter.		
D. "One-out-of-two-taken-twice" logic: 1. Two trip systems which control power to a group (A or B) of solenoids on scram pilot valves, each contain two trip channels.	Show Figure 10 and discuss 1 out of 2 twice logic.	EO-4.0 EO-5.0

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/ NOTES
2. At least one of two channels in <u>each</u> trip system must de-energize to cause a scram.		
3. "<u>Half-scram</u>"--if any one trip system trips, the A or B solenoids of the scram pilot valves will be de-energized, but no scram will occur.	Review General Electric SIL 471 and NMP response with class. (Copy of this can be found in the L.P. folder)	EO-2.0
E. During normal rector operation all sensor trip contacts are closed, the bypass contacts are open, and the channel sensor relays are energized.		
F. Each HCU has: 1. One three-way, 120 VAC, dual-coil, solenoid-operated pilot scram valve. 2. One air operated exhaust valve. 3. Two air operated scram valves. Energization of either coil of the pilot scram valves allows instrument air to hold the exhaust and scram valves closed.	Show Figure 5A "Scram Valve Arrangement" and discuss operation.	
G. De-energization of <u>both</u> coils causes the pilot valve to change position and allow the air to bleed off from the scram valve. The opening of the scram valves causes the rods to insert into the core.		

H. Two backup scram valves (normally de-energized, DC solenoid-operated valves) provide a backup means of bleeding air from the scram valves:

1. When <u>both</u> trip systems trip, the backup scram solenoids energize shifting the valves to block the instrument air supply.
2. The pilot air header bleeds down and the scram valves open, causing insertion of all control rods.

I. Scram Discharge Volume:

1. Receives water from the overpiston area of the CRDM's when the scram outlet valves open.
2. The Instrument volume (vertical section of the SDV) has two 120 VAC, dual solenoid-operated pilot valves (normally energized open).
3. De-energization of a channel sensor relay in one channel of <u>both</u> trip systems will cause the pilot valves to de-energize venting air from the SDV air operated vent and drain valves (2 each) which will cause them to close by spring pressure. This isolates the SDV from its vent path and drain path.

III. POWER SUPPLIES

EO-3.0

A. RPS Trip System

Show Figure 1 "RPS Power Supply" and discuss power distribution.

1. Trip systems A and B are powered from 10KVA UPS's.
2. 2VBB-UPS3A supplies trip system A and 2VBB-UPS3B supplies trip system B.
3. Power is supplied to each trip systems' sensor logic, scram trip logic and status lights.
4. Each UPS is 10KVA, 120 VAC, single phase.
5. RPS trip system A is fed from UPS 2VBB-UPS3A:
   a. Which is normally powered by 600 VAC, 2 LAT-PNL 100,
   b. And receives backup power from 125 VDC, 2BYS-SWG001C.
      1) The associated battery charger 1C1 is fed from 2NJS-US6.
   c. The alternate source to the UPS is from 600 VAC, 2NJS-PNL500.
6. Trip system B is fed from UPS-2VBB-UPS3B:
   a. Which is normally powered by 2NJS-PNL402.
   b. And receives backup power from 2BYS-SWG001B.

Note: 2BYS-BAT1B is capable of supplying power to the UPS for up to 2 hrs.

1) The associated Battery Charger 1B1 is fed from 2NJS-US6.

c. The alternate source to the UPS is 2NJS-PNL600.

7. Two Electrical Protection Assemblies (EPA), in series, connects each UPS to its associated distribution panel.

Q: Why do we use EPA's? — EO-4.0

A: Separate the qualified and un-qualified portions of the power distribution.

a. These disconnect the RPS circuits whenever voltage deviates from 120V by more than ± 10% and whenever frequency drops below 60 HZ by 5%.

b. EPA's require local manual reset if tripped.

B. Scram Pilot Valve Solenoids — EO-4.0

1. Power supply to the scram pilot valve solenoids is from two high-inertia motor generator (MG) sets.

Show Figure 2 "Scram Pilot Power Supply" and discuss distribution.

2. 2RPM-MG1A feeds the A solenoid valves and 2RPM-MG1B the B solenoid valves.

Q: What indications are there if you lose an MG? — EO-7.0

3. The MG is a 3 phase induction motor driving a 120 VAC, 60 HZ, 1 phase synchronous generator.

A: Scram pilot solenoids for that channel de-energize (white lights out at 603) due to EPA's tripping.

4. A flywheel mounted on the MG shaft helps control MG Set voltage and frequency (by utilizing inertia) during input power deviations.

   Q: How can power be restored if an MG set is tripped. — EO-4.0

   A: Transfer to alternate power supply and reset the EPA's. — EO-7.0

5. MG1A power supply:
   a. 2NHS-MCC008
   b. Alternate power for the A solenoids from 2LAT-PNL100 via 2RPM-PNL1A.
6. MG1B power supply:
   a. 2NHS-MCC009
   b. Alternate power for the B solenoids from 2LAS-PNL400 via 2RPM-PNL1B.
7. Alternate power is used when the MG is out of service for maintenance. Only one alternate may be selected at a time.
8. Power for the backup scram valve solenoids comes from 2BYS*SWG002A and 2B switchgear (Div. I and II Battery Buses).

IV. DETAILED DESCRIPTION

A. Reactor Mode Switch

1. 4 position keylock switch located on Control Room Panel 603.

   Use 807E166TY Sh. 5 to show operation of Reactor Mode Switch. — EO-4.0

2. When in SHUTDOWN position the RPS trip systems are de-energized for 10 seconds causing a scram. This position will also bypass the MSIV closure scram and allows bypassing the SDV High Water Level Trip.

Q: What is the function of the 10 second time delay.

A: Ensures all control rods fully inserted into the core prior to bypassing the signal.

3. In REFUEL, the following functions are in effect: APRM setdown functions are in operation,the scram functions for MSIV closure are bypassed, and the SDV High Water Level trip can be bypassed.
4. In STARTUP, criticality and heatup are allowed with APRM setdown scram functions in operation, and the scram functions for MSIV closure bypassed.
5. In RUN the IRM scram functions are bypassed.

V. RPS PARAMETERS, INPUTS, SETPOINTS, LOGIC, AND BASES

A. Turbine Stop Valve Closure

Use 807E166TY Sheets 5-9 for the following discussion. — EO-4.0, EO-5.0, EO-9.0

1. When 3 of 4 turbine stop valves are not full open above 30% reactor power a scram is initiated.

Q: Where is 30% power sensed?

A: First stage turbine pressure

2. Inputs to the RPS come from valve stem position switches on the four turbine stop valves.

Show Figure 6 "TSV Closure Logic" and discuss operation.

3. 5% closure signal inputs a trip signal.

4. Turbine stop valve closure scram initiates a scram earlier than either the high neutron flux or vessel high pressure resulting from the closure. Anticipatory scram.

Q: If TSV's 3 and 4 close will you receive a half-scram.

A: Yes

B. Turbine Control Valve Fast Closure — EO-9.0

1. When the turbine control valves trip closed above 30% reactor power, a scram is initiated.

2. Inputs to the RPS come from pressure switches N005A-D, located in the electro-hydraulic control system (EHC) emergency trip system (ETS) lines.

3. Each pressure switch (4) provides an input to one RPS channel and actuates at an EHC trip oil pressure of 530 psig decreasing.

4. Actuation of one pressure switch in <u>each</u> RPS trip system will cause a reactor scram.

5. ETS fluid pressure was chosen as the input for this scram because the turbine control valves are normally throttled at different power levels, thus control valve position is not an appropriate variable.

6. TCV fast closure initiates a scram earlier than either high neutron flux or vessel high pressure resulting from closure.

7. Classified as an anticipatory scram.

C. Turbine Stop Valve and Control Valve Closure Bypass

Delivery notes: Use 807E166Ty Sheet 9 to Show how the bypass works.

1. Permits reactor operation with turbine valves closed at low power level (<30% power).
2. Inputs to RPS come from pressure transmitters mounted on each of the first stage pressure taps.
3. Actuation of at least one trip unit in each RPS trip system will cause bypass of the turbine stop valve and control valve closure scrams.

D. Scram Discharge Volume High Water Level

1. A scram is initiated by high level in SDV instrument volume to insure sufficient volume exist for the scram water.
2. Inputs to the RPS come from 4 non-indicating float switches and 4 level transmitters sensing instrument volume level. Float switch setpoint is $\leq$48.5 inches while transmitter setpoint is $\leq$43.4 inches.
3. Each switch and transmitter provides an input into one RPS channel.
4. Actuation of at least one switch or transmitter in each RPS trip system will cause a reactor scram.

5. The purpose of this scram is to insure sufficient capacity to receive the water displaced by the control rod drive pistons during a scram.

E. Scram Discharge Volume High Level Bypass

Using 807E166TY sheet 5, show how the SDV High level can be bypassed.

1. Since high SDV level results from each scram, this bypass allows the resetting of the scram channels (provided all other scram signals are clear or bypassed) and subsequent draining of the SDV.
2. Four bypass switches are provided, on panel 603, one for each channel.
3. In order for the SDV High Level Bypass switches to bypass the scram signal, the reactor mode switch must be in either SHUTDOWN or REFUEL.
4. The bypass switches provide a rod block signal to the RXMC when this scram is bypassed.
5. With the signal bypassed the scram reset can be accomplished. With the logic reset SDV vent and drain valves reopen and the volume drains.

F. Main Steamline Isolation Valve Closure

1. A scram is initiated if 3 of 4 Main Steam lines become isolated with the mode switch is run.
2. Inputs to RPS come from the eight MSIV position switches mounted on the MSIV's (HYV6A-D nd HYV7A-D) when the valve is 8% closed.
3. The logic is arranged such that any combination of MSIV closures resulting in three main steamlines being isolated (inboard or outboard valve closed) causes a reactor scram.
4. One main steamline can be isolated completely without tripping either trip system. Two main steamlines isolated may result in a half scram if it is the correct combination.
5. MSIV closure initiates a scram faster than the high neutron flux or high vessel pressure resulting from the closure.
6. Classified as an anticipatory scram.

G. MSIV Closure Bypass

1. This permits reactor operation with main steamlines isolated at low power levels.

Q: Will 2 out of 4 Mainsteam lines isolated generate a scram signal?

A: Yes, 2 mainsteam lines may result in a half scram if you have the right combination.

Use Figures 4A, 4B, and 6A to show how this logic works.

EO-9.0

2. Bypass sensor relays are energized when the reactor mode switch is placed in any position other than RUN, bypassing this scram function.

H. High Drywell Pressure

1. If drywell pressure increases to 1.68 psig, a reactor scram occurs.
2. The logic is arranged such that a high pressure signal from at least one transmitter in each RPS trip system will cause a reactor scram.

I. High Reactor Pressure

1. Reactor pressure ≥1037 psig will cause a scram.
2. Inputs to RPS comes from four pressure transmitters sensing steam dome pressure. Each provides an input into one RPS channel trip unit.
3. This scram is never bypassed.

J. Low Reactor Water Level

1. Level ≤159.3 (L3) causes a scram.
2. One instrument per channel.
3. This scram signal is never bypassed.

K. Main Steamline High Radiation

1. Radiation levels ≥3 times normal full power background will cause a scram.

2. Inputs from 4 gamma sensitive ion-chambers (one per channel).
3. Detectors are geometrically arranged downstream of the outboard MSIV's so that each detector senses all four steamlines.
4. The logic is arranged such that a high radiation signal from at least one monitor in each RPS trip system will cause a reactor scram.
5. An inoperative signal from a monitor (i.e. module unplugged or low voltage) also causes a scram signal from that monitor.
6. This scram is initiated to limit the release of fission products from a gross fuel failure.

L. Neutron Monitoring System

Use 807E166TY Sheet 5 to show the NMS logic.

1. During startup and low power ops, eight IRM's provide inputs to RPS. During power range operation, six APRM's provide inputs to the RPS.
2. NMS scrams are necessary to protect the fuel against excessively high power generation rates.
3. Two IRM's and two APRM's provide the inputs to each RPS channel. (APRM E and F are used by two channels.)

4. At least one monitor in each trip system must sense high neutron flux or an INOP condition to cause a reactor scram. (See Table 1 in N2-OLT-35 for setpoints.)
5. When the reactor mode switch is placed in RUN, the IRM logic is bypassed.
6. A non-coincident protection logic may also be used (shorting links removed). This adds the SRM scram function, and makes all NMS scrams non-coincident. (i.e. any one instrument sensing high flux will cause a scram).

M. Manual Scram — Show operation using 807E166TY Sheet 5. — EO-6.0

1. 4 pushbuttons on panel 603. One for each RPS channel. Each pushbutton is armed by turning its collar clockwise.
   a. At least one pushbutton in each RPS trip system must be armed and depressed to initiate a scram.
2. Mode switch in shutdown will open a contact in all four RPS channels causing a scram.

Note: Also energizes a time delay which seals in the scram signal for 10 seconds.

N. Scram Reset — Show scram reset using 807E166TY Sheets 5 and 9.

1. Four keylock reset switches on panel 603.
2. When the reset switches are turned to reset:
   a. Reset contacts close.
   b. Reset sensor relays K19A-D will energize.

c. Reset sensor relay contacts K19A-D close.

d. Channel sensor relays K14A-D energize (if cause of scram has cleared).

e. Channel sensor relay contacts K14A-D close to seal in the reset. (Assumes all scram signals are cleared or bypassed.)

3. This reset is prevented for 10 seconds following a scram to allow all rods to fully insert. EO-8.0

VI. INSTRUMENTATION AND CONTROL

A. Indications

1. 2 groups of 4 white indicating lights on panel 603, one group on either side of the full core display.

2. The normally lit lights are each associated with one of the four rod groups in trip system A or B.

3. The lights extinguish as a result of de-energization of the associated group of solenoids.

4. This shows which RPS trip system (A or B) has tripped.

B. RPS Power Source Selector Switch

1. Located on control rod test panel (P610)

Q: What is the effect of cycling the RPS

EO-4.0

2. Three position switch
   a. NORMAL - RPS M-G sets A and B supplying power to solenoids
   b. ALT - A-supply from 2 LAT-PNL100 for "A" solenoids, "B" solenoids from MG 1B
   c. ALT - B-supply from 2 LAS-PNL 400 for "B" solenoids, "A" solenoids from MG 1A
3. A half scram will occur whenever this switch is operated, however, the trip system channel sensor relays will not de-energize (i.e. only a power loss to solenoids).

power source selector switch.

A: Causes a 1/2 scram by tripping the EPA's.

C. MSIV and Turbine Stop Vale Closure Test Switches — EO-4.0
   1. These switches are located in the Control Room on panel 609 and 611.
   2. Allow for testing of the MSIV or turbine stop valve scram sensor logic circuits.

D. Discharge Volume Isolation Test Switches — EO-4.0
   1. Depressing both switches (S2A,B) will de-energize both solenoids on the SDV isolation valve pilot valves, closing the SDV vent and drain valves (pushing one only de-energizes the A or B solenoid so no valves will reposition).

E. Rod Scram Test Switches — Show Figure 5B, and discuss test switch operation. — EO-4.0

1. Two, 2 position toggle switches located on each CRDH-HCU.
2. Used for testing of the individual coil of the scram pilot solenoid valve and surveillance testing of individual control rod scram lines.
3. Placing both switches to TEST de-energizes both solenoids, causing that particular rod to scram.

F. Interlocks

1. SDV Bypass
   a. Allows resetting of RPS logic following a scram.
   b. Enables draining of the SDV, (i.e. once the scram is reset the vent and drain valves reopen).
   c. Prevents rod withdrawal by inserting a rod block whenever scram function is bypassed.
2. MSIV Closure Bypass
   a. Bypassed when reactor mode switch is not in RUN.
3. Turbine Stop and Control Valve Closure Bypass
   a. Automatically bypassed at less than 30% reactor power (129.6 psig first stage pressure).

4. Neutron Monitoring Bypass
   a. IRM upscale and inoperative trips and APRM setdown scram are bypassed in the RUN mode.
   b. Removal of shorting links:
      1) Inserts the SRM upscale scram function and
      2) Makes the scram logic for the Neutron Monitoring System non-coincident (i.e., any NMS instrument trip causes a scram).

VII. SYSTEM OPERATION — EO-5.0

A. Normal Operation (No Scram)
   1. Scram logic system reset.
   2. Scram Pilot Valve solenoids energized.
   3. Backup Scram Valve solenoids de-energized.
   4. SDV vent and drain valves open (discharge valve isolation valves solenoids energized).
   5. Power from 2VBB-UPS3A, B for sensors and logic and 2RPM-PNL1A, B for pilot scram valve solenoids.

B. Startup Operation
   1. Scram logic is reset.
   2. SDV high water level bypass switches in NORMAL.

3. Reactor mode switch in STARTUP/HOT STANDBY.
4. IRM scram functions in effect.
5. Setdown APRM scram function in effect.
6. MSIV closure scram bypassed.
7. TSV and TCV closure trip bypassed.

C. Non-Coincident Logic
1. Used when required by Technical Specifications.
2. SRM scram signal is inserted ($\leq$ 2 X 10^5 cps).
3. Any single NMS trip signal causes scram.

D. Reactor Scram

Use 807E166TY Sheet 9 and Figure 5A to show logic and sequence of events. EO-4.0 EO-5.0

1. Sensor relay contact opens.
2. Channel sensor relays (K14) are de-energized.
3. Scram pilot valve solenoids de-energize.
4. Scram pilot valve changes position.
5. Air flow to the exhaust pilot valve is blocked and valve is vented.
6. Exhaust pilot valve vents open.
7. Scram inlet and outlet valves open.
8. CRDH accumulator pressure and/or reactor pressure is then applied to the below piston area of the CRDM.
9. Exhaust from the over-piston area is discharged into the SDV as the control rods are driven into the reactor core.

10. Backup scram valves energize and bleed off the scram pilot valve air header to drive rods with failed scram pilot valves into the core.
11. SDV isolation valve solenoids de-energize, causing the SDV vent and drain valves to close, isolating the SDV.
12. An additional scram signal is caused by the SDV high level.

E. Transfer to Auxiliary Power

1. If power is lost from an M-G set, power is lost to that set (A or B) of solenoids resulting in a half-scram (Channel sensor relays do not de-energize).
2. The power source selector switch at panel 610 is positioned to supply power from the alternate source.
3. Only one set of solenoids can be selected to an alternate source at one time.
4. Normal operation may be continued with one RPS-MG set out of service.

Note: If the power loss in one channel is coincident with a half scram in the opposite channel, all rods will scram. However, the scram discharge volume vent and drain valves and the backup scram valves do not reposition until the scram discharge volume fills to the scram trip point.

VIII. SYSTEM INTERRELATIONS

A. <u>Instrument Air System (IAS)</u>

Supplies 70-75 psig air for scram inlet and outlet, exhaust pilot and SDV vent and drain valves.

B. Control Rod Drive Hydraulic (CRDH) - Provides motive force for initiation of control rod insertion during a reactor scram.

C. Reactor Manual Control System (RXMC) - Provides rod block when the SDV high level scram signal is bypassed.

D. Reactor Recirculation System (RRS) - When >30% power, RPS supplies signals for EOC-RPT.

E. Redundant Reactivity Control System (RRCS) - Controls 8 DC powered valves called ARI valves that provide alternate means to depressurize the scram air header.

IX. PROCEDURE REVIEW

Review N2-OP-97 with emphasis on precautions and off-normals.

Cover any other portions of the procedure that the class desires. — EO-11.0

X. Technical Specifications

A. 2.2 Limiting Safety System Settings

B. 3/4.3.1 RPS Instrumentation

C. 3/4.8.4.4 RPS Power Supply Monitoring

Provide a review of the action statements and the bases.

XI. RELATED PLANT EVENTS

See Attachment II

Rev. any new material to this lesson plan.

XII. WRAP UP

A. Review the student learning objectives.

ATTACHMENT I

LIST OF FIGURES

ATTACHMENT II

RELATED PLANT EVENTS

1. NMP2 LER 86-10 Rev. 1 Quarter Core Scram

   On 11-23-86 Unit 2 was in its initial fuel load with the mode switch in "Refuel". At about 1108 25% of the control rods received a full scram signal with all the group 2 control rod scram solenoid valves de-energized. At the time of the one-quarter scram, channel B of the RPS was de-energized per surveillance procedure N2-ISP-NMS-W-007, "APRM channel function test". Thus, all the rods in the core were in a "half scram" condition with channel B scram solenoid valves in the de-energized open condition. At 1108 the Group 2 channel A scram solenoid valves suddenly de-energized creating a full scram condition for that group of rods. Group 2 rods represent 25% of the total number of rods in the core. All other groups remained in the "half scram" condition with channel B scram solenoid valves de-energized. The one quarter scram condition lasted about one minute and ended when the group 2 channel A scram solenoid valves suddenly re-energized. The cause of the event can not be positively determined.

2. NMP2 LER 86-19 Recurrence of SDV High Level Reactor Scram Event due to Ineffective Correction Actions

   While in cold shutdown on 12-15-86, a reactor scram signal on scram discharge volume (SDV) high level was received following a preplanned scram for post maintenance testing. After placing the mode switch in shutdown the operator verified that there were no active scram signals present and reset the preplanned scram without bypassing the SDV high level trip function as required by the procedure. Several seconds later the SDV high level trip and subsequent scram occurred. The intermediate cause of this event is personnel error due to the operator's failure to adhere to the scram recovery procedure. However, procedural deficiencies and the operator's lack of adequate understanding of a similar event contributed to this event. Therefore, the root cause is the ineffective implementation of corrective actions taken for the LER 86-01 event. The scram recovery procedure has been revised to clearly require that the SDV high level trip be bypassed on every scram. Training modification recommendations have been submitted to change simulator SDV system programming to better simulate actual plant responses and to upgrade training of Licensed Reactor Operators in 10CFR50.72 requirements. A "Lessons Learned" book is now in effect.

3. NMP2 LER 87-10 Spurious Reactor Scram Signal Due to Technician Error

On February 2, 1987 at 1058 with the reactor at 0% power, all rods inserted and the mode switch in "Shutdown" Nine Mile Point Unit 2 experienced a scram signal due to a low reactor water level signal. This signal was generated as a result of an Instrument and Control (I&C) Technician, who while performing a surveillance procedure, instantaneously opened an instrument valve on a differential pressure indicator (personnel error). This opening of the valve initiated a pressure spike on the instrument lines which subsequently caused a scram signal to occur. All equipment operated as designed. Corrective action was taken by the Operations Department to place a "Hold-Out" tag on the valve. This hold out tag will prohibit all personnel from operating the valve. In addition, a TMR (Training Modification Recommendation) was written to request the Training Department to review this event with the Instrument and Control Technicians during ongoing training to prevent this problem from recurring in the future, the I&C Department revised their procedures.

4. NMP2 LER 89-13 Violation of Tech. Specs. due to Personnel Error

On April 6, 1989 at 2110 hours, it was determined that Unit 2 had been in violation of Technical Specifications (TS) during the performance of the surveillance procedure for average power range monitoring (APRM), (N2-ISP-NMS-W@007). The violation was a failure to have inoperable channels (or the associated trip system) in the tripped condition as required by Technical Specification 3.3.1, Action (A). At the time of this determination, Unit 2 was in power operation (Mode 1) at 49 percent power. The root cause for this event was personnel error. The performer of shift checks-mode 1 (N2-OSP-LOG-S001) made an incorrect assumption regarding use of the main steam radiation monitor acceptance criteria. The subsequent review by the assistant station shift supervisor was inadequate. A contributing cause was the procedure instructions for the use of acceptance criteria were open for interpretation. The corrective actions taken for this event were: 1) A work request was written to troubleshoot and repair main steam line radiation monitor "C" 2) Operations Surveillance procedure N2-OSP-LOG-S001 was changed to eliminate confusion which contributed to the event 3) Operations instructions (night notes) were written to immediately increase attention in performance and review of surveillance procedures, especially logs.