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THREE MILE ISLAND NUCLEAR STATION
UNIT #2 EMERGENCY PROCEDURE 2202-1.5
PRESSURIZER SYSTEM FAILURE

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THREE MILE ISLAND NUCLEAR STATION

UNIT #2 EMERGENCY PROCEDURE 2202-1.5

PRESSURIZER SYSTEM FAILURE

SECTION A Leaking Pilot Operated (electromatic) Relief Valve (RC-R2)

A.1 SYMPTOMS

1. Relief valve discharge line temperature exceeding the normal 130°F. Alarms on computer at 200°F.
2. RC drain tank pressure above normal on the control room radwaste disposal control panel and temperature above normal on the local radwaste disposal control panel.
3. RC System makeup flow above normal for the variable letdown flow and RC pump seal in-leakage conditions.
4. Boric Acid concentration continually increasing in the pressurizer.

A.2 IMMEDIATE ACTIONS

A. Automatic Actions

1. None.

B. Manual Actions

1. Close the Electromatic Relief Isolation Valve, RC-V2.

A.3 FOLLOW-UP ACTION

1. Repair during next shutdown.
2. Limit rate of change on ICS to less than 1% per minute while RCV is closed except for runbacks.

SECTION B Inoperative Pilot operated (electromatic) Relief Valve (RC-R2)

B.1 SYMPTOMS

1. RC System pressure is above 2255 psig and RC-R2 fails to open.
2. RC System pressure is below 2205 psig and RC-R2 fails to close.
3. RC-R2 discharge line temperature is above the 200°F alarm. Computer Point (402)
4. The RC drain tank pressure and temperature are above normal on the control room radwaste disposal control panel 8A.

B.2 IMMEDIATE ACTION

A. Automatic Action

1. For a failed closed RC-R2:
   a. Pressurizer heaters off at 2160 psig. Spray valve RC-V1 is open above 2205 psig.
   b. Reactor trip occurs at 2355 psig.
   c. Pressurizer code relief valves open at 2450 psig.
2. For a failed open RC-R2:
   a. All pressurizer heater banks on full below 2105 psig.
   b. Reactor trips at 1900 psig or variable pressure temperature.
   c. High Pressure Injection is actuated at 1600 psig.

B. Manual Action

1. For a failed close RC-R2:
   a. Shift spray valve RC-V1 to "MANUAL" and open further for additional spray flow.
   b. Insure all pressurizer heaters off above 2160 psig.

c. If reactor power is being changed (except for a runback) stop the power change until pressure is returned to normal.

d. Isolate RC-R2 by closing RC-V2.

2. For a failed open RC-R2:

a. Close Electromatic Relief Isolation Valve (RC-V2).

b. Insure all pressurizer heaters on below 2105 psig.

8.3 FOLLOW-UP ACTION

1. Return system pressure and temperature to normal.

2. Reduce ICS Rate of Change to less than 1% per minute (except for Runbacks.)

SECTION C Leaking Code Relief Valve (RC-R1A or RC-R1B)

C.1 SYMPTOMS

1. Code relief valve discharge line temperature(s) exceeding the computer normal 130°F. Computer alarms at 200°F. Computer Point (403) (404)
2. RC drain tank pressure and temperature above normal on the control room radwaste disposal control panel 8A.
3. RC System makeup flow is above normal for the variable letdown flow and RC pump seal in-leakage conditions.
4. Boric Acid Concentration continually increasing in the Pressurizer.

C.2 IMMEDIATE ACTION

A. Automatic Action

1. None.

B. Manual Action

1. Determine RC leakage according to 2301-303.

C.3 FOLLOW-UP ACTION

1. If RC system identified leakage is in excess of 10 gpm, reduce the leakage rate to within limits within 4 hours or be in HOT STANDBY within the next 6 hours and COLD SHUTDOWN within the following 30 hours.
2. It will be necessary to recirculate the pressurizer through the spray valve to equalize Boron concentration.
3. Place Code Relief Discharge Line temperatures on Analog Trend Recorder.

SECTION D Inoperative Code Relief Valve (RC-R1A or RC-R1B)

D.1 SYMPTOMS

1. Code relief valve(s) fail to open when RC pressure is above 2450 psig.
2. Code relief valve(s) fail to close when RC pressure is below 2325 psig.
3. Code relief valve(s) discharge line temperature is above 200°F alarm.
4. The RC Drain Tank pressure and temperature are above normal on the control room radwaste disposal control panel.
5. RC system makeup flow is above normal for the variable letdown flow and the RC pump seal in-leakage conditions.

D.2 IMMEDIATE ACTION

A. Automatic Action

1. For a fail to open code relief valve:
   a. Reactor trip occurred at 2355 psig.
   b. Spray valve RC-V1 opened above 2205 psig.
2. For a fail to close code relief valve:
   a. Reactor trip occurs at 1900 psig or on variable P/T.
   b. Increased makeup flow.
   c. All pressurizer heaters energized.
   d. Safety Injection is actuated at 1600 psig.

B. Manual Action

1. For a fail to open code relief valve:
   a. Place pressurizer spray valve in "MANUAL" and open further for additional spray flow.

b. Verify pressurizer heaters are "OFF" at plant control panel.

2. For a fail to close code relief valve:

a. Turn all heaters "ON" at plant control panel.

b. Isolate letdown flow at plant control panel by "CLOSING" MU-V376.

c. Open DH-V5A. Start MU-P1A if necessary. Attempt to control pressurizer level using MU-V16B.

d. Manually initiate safety injection if required to maintain pressurizer level.

0.3 FOLLOW-UP ACTION

1. For a fail to open code relief valve:

a. Proceed with cooldown.

2. For a fail to close code relief valve:

a. Hold pressurizer, if possible, at or greater than 220 inches with Safety Injection.

b. Proceed with cooldown.

c. With no pressurizer code safety valve operable, immediately suspend all operations involving positive reactivity changes and place an operable DHR Loop into operation in the shutdown cooling mode.

d. With a pressurizer code safety valve inoperable, either:

1. Restore the inoperable valve to operable status within 15 minutes or

2. Be in Hot Shutdown within 12 hours.

SECTION E Inoperative Pressurizer Heaters

E.1 SYMPTOMS

1. Heater banks fail to energize or de-energize if RC pressure is at heater bank setpoint.

	Bank 1	Bank 2	Bank 3	Bank 4	Bank 5	Units
ON	2150	2145	2135	2120	2105	PSIG
OFF	2160	2155	2155	2140	2125	PSIG

NOTE: Banks 1, 2, and 3 are full on at "ON" setpoint.

2. Pressurizer level Lo-Lo alarm at 80 inches.
3. Pressurizer heater power supply ground alarm.
4. Abnormal console indicating lights for the heating groups.
5. High (2255 psig) or low (2055 psig) pressure alarms.

E.2 IMMEDIATE ACTION

A. Automatic Action

1. For energized heaters and rising pressure:
   a. Pressurizer spray valve (RC-V1) open (red and green console jog button lights).
2. For loss of heaters and decreasing pressure: None.

B. Manual Action

1. If control malfunction is suspected:
   a. Place heater controller in "MANUAL".
2. For energized heaters and rising pressure:
   a. Attempt to de-energize all heaters except Banks 1 or 2. (Groups 12 or 13 respectively).
3. For loss of heaters and decreasing pressures:
   a. Attempt to energize backup heaters from plant control panel.
   b. If a. is unsuccessful, begin reducing unit load.

E.3 FOLLOW-UP ACTION

1. For energized heaters and rising pressure:

   a. Open heater breakers in question at the pressurizer heater control centers except for Banks 1 or 2 (Groups 12 or 13 respectively).

   b. Control RC pressure at the normal 2155 psig set point with the pressurizer spray valve (RC-V1) in "MANUAL".

2. For loss of heaters and decreasing pressure:

   a. Determine cause.

   b. If pressure cannot be maintained with the remaining heaters, continue load reduction to shutdown and possibly cooldown condition.

   c. Close RC-V3 and reopen periodically to maintain spray line temperature greater than 540°F.

SECTION F Malfunction In Pressurizer Level Indication or Control

F.1 SYMPTOMS

1. Disagreement between the console recorder level readouts of more than 12 inches.
2. Rapid change in indicated/recorded level due to loss of compensation or loss of power or d/p cell failure or other malfunction.

F.2 IMMEDIATE ACTION

A. Automatic Action

1. If indication fails low:
   Pressurizer heaters trip @ 80 inches, makeup valve MU-V17 opens, and RC pressure increases.
2. If indication fails high:
   Makeup valve MU-V17 closes.

B. Manual Action

1. When any two of three console recorder level transmitter readouts disagree by more than 12 inches, take manual control of level and then select the third transmitter for indication.
2. Re-energize heaters if tripped due to malfunction.

F.3 FOLLOW-UP ACTION

1. If the switching level transmitters has not rectified the condition, switch to the alternate temperature detector.
2. If pressurizer level recorder indication is lost, select another transmitter or use the computer for level indication.

SECTION G Pressurizer Spray Valve Failure (RC-V1)

G.1 SYMPTOMS

1. Pressurizer spray valve (RC-V1) fails to open when the RC system pressure is greater than 2205 psig.
2. Pressurizer spray valve (RC-V1) is open when the RC System is less than 2155 psig.

G.2 IMMEDIATE ACTION

A. Automatic Action

1. RC system pressure greater than 2255 psig activates RC-R2 electromatic relief and the high pressure alarm.
2. RC-V1 failing open (in auto) causes RC system pressure to stablize at approximately 2100 psig with all heater "on".
3. Failure when manually opened beyond the automatic limit position causes continued pressure drop and alarm at 2055.

B. Manual Action

1. Control RC-V1 opening or closing in "MANUAL" with jog buttons.
2. If the spray valve has failed open, control pressure by closing the pressurizer spray isolation valve (RC-V3).

   NOTE: If the pressurizer spray isolation valve (RC-V3) is closed, it must be periodically cycled to keep the spray line warm. Cycle RC-V3 is open as necessary to stay above RC pressurizer spray line temperature alarm of 540°F. (Computer point 0405).

CAUTION: Do not exeed a ΔT of 410°F between pressurizer temperature and reactor coolant hot leg temperature.

3. Reduce rate of ICS load change to less than 1% per minute.

G.3 FOLLOW-UP ACTION

1. Continue plant operation with reduced rate of load change.
2. Check thermal overload on RC-V1 and reset if necessary.