

REACTOR TRIP OR SAFETY INJECTION

A. PURPOSE

This procedure provides actions to verify proper response of the automatic protection systems following manual or automatic actuation of a reactor trip or safety injection, assess plant conditions, and direct the operator to the appropriate recovery procedure.

B. SYMPTOMS OR ENTRY CONDITIONS

1. Reactor Trip

- a) Any reactor trip
- b) Rapid decrease in neutron level indicated by nuclear instrumentation.
- c) All shutdown and control rods are fully inserted. Rod bottom lights are lit.

2. Safety Injection

- a) Any safety injection

<u>STEP</u>	<u>ACTION/EXPECTED RESPONSE</u>	<u>RESPONSE NOT OBTAINED</u>
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NOTE: STEPS 1 THROUGH 22 (REACTOR TRIP/AUXILIARY FEEDWATER) ARE IMMEDIATE ACTION STEPS.

NOTE: THE STEPS OUTLINED WITH BOXES ARE TO BE DONE IF A LOSS OF OFFSITE AC HAS OCCURRED.

NOTE: FOLDOUT PAGE SHOULD BE OPEN.

NOTE: NOTIFICATION OF DCS, DTA, AND IMPLEMENTATION OF EMERGENCY PLAN, (EPIP 1.1) SHOULD BE PERFORMED AS SOON AS POSSIBLE.

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|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ① | <u>Verify Reactor Trip</u> <ul style="list-style-type: none"><li>- Rod bottom lights lit</li><li>- Reactor trip breakers open</li><li>- Rod position indicators zero</li><li>- Neutron flux decreasing</li></ul> | Manually trip reactor.<br><u>IF</u> reactor will <u>not</u> trip,<br><u>THEN</u> go to CSP-S.1, "Response to Nuclear Power Generation/ATWS."                    |
| ② | <u>Verify Turbine Trip</u> <ul style="list-style-type: none"><li>a. Turbine stop valves shut</li></ul>                                                                                                           | a. Manually trip turbine.                                                                                                                                       |
| ③ | <u>Verify Safeguards Buses Energized</u> <ul style="list-style-type: none"><li>a. Safeguards buses normal voltage<br/>(A05, A06, B03, B04)</li></ul>                                                             | a. Try to restore power to safeguards buses.<br><u>IF</u> no bus can be energized,<br><u>THEN</u> go to EOP-5, "Loss of All AC Power," Step 3 (safeguards bus). |

<u>STEP</u>	<u>ACTION/EXPECTED RESPONSE</u>	<u>RESPONSE NOT OBTAINED</u>
④	<u>Check if SI is Actuated</u> <ul style="list-style-type: none"><li>- Low primary coolant pressure</li><li>- Low steam generator pressure</li><li>- High containment pressure</li><li>- Manual pushbutton</li></ul>	Check if SI is required. <u>IF</u> SI is required, <u>THEN</u> manually actuate. <u>IF</u> SI is <u>not</u> required, <u>THEN</u> go to EOP-0.1, "Reactor Trip Response."
⑤	<u>Verify Diesels Start</u>	Start Diesels
⑥	<u>Verify Feedwater Isolation</u> <ul style="list-style-type: none"><li>a. Feed regulator valves shut</li><li>b. Feed regulator bypass valves shut</li><li>c. Steam generator main feed pumps tripped</li><li>d. Steam generator blowdown isolation valves shut</li></ul>	<ul style="list-style-type: none"><li>a. Shift to manual and shut valves.</li><li>b. Shift to manual and shut valves.</li><li>c. Manually trip pumps.</li><li>d. Manually shut valves.</li></ul>

<u>STEP</u>	<u>ACTION/EXPECTED RESPONSE</u>	<u>RESPONSE NOT OBTAINED</u>
⑦	<u>Verify Containment Isolation</u>	
	a. Verify closed indications on isolation status panel (App. "A", Sect. 1&2)	a. Press containment isolation manual pushbutton  <u>OR</u> Shut the valves.
	b. Control room ventilation to 100% recirculation	b. Initiate control room recirculation (Mode 2).
	c. Verify manual valves shut:	
	1) Auxiliary charging CV-323A	1) Shut valve
	2) Any valve which may be open under administrative control with a designated operator.	2) Shut valve(s)
	d. Isolate radwaste steam from affected unit:	
	- Unit 1 affected - Shut SA-9	
	- Unit 2 affected - Shut SA-10	
⑧	<u>Verify Auxiliary Feedwater Pumps Running</u>	Manually start pumps.
⑨	<u>Verify SI Pumps Running</u>	Manually start pumps.
⑩	<u>Verify RHR Pumps Running</u>	Manually start pumps.

<u>STEP</u>	<u>ACTION/EXPECTED RESPONSE</u>	<u>RESPONSE NOT OBTAINED</u>
(11)	<u>Verify SW Pumps Running</u> a. At least four SW pumps running	a. <u>IF</u> less than four pumps start, <u>THEN</u> start additional pumps, <u>or</u> verify non-essential service water loads isolated (Appendix "A", Section 3).
(12)	<u>Verify Containment Accident Fans Running</u>	Manually start fans (W1A1, W1B1, W1C1, W1D1)
(13)	<u>Verify Safeguards 60 V Bus Lockout Relays Tripped</u> a. See Appendix "A", Section 4.	a. Trip non-essential loads per Appendix "A", Section 4.
(14)	<u>Verify Generator Output and Field Breakers Open</u>	<u>IF</u> one minute has elapsed, <u>THEN</u> manually trip generator output and field breakers.
(15)	<u>Verify Auto Bus Transfer</u>	Manually transfer buses
(16)	<u>Ensure Proper Valve Positions</u> a. MOV-826A, B, C open (BAST to SI suction) b. MOV-852A, B open (core deluge) c. MOV-2907, 2908 open (containment vent coolers)	a. <u>IF</u> valves are <u>not</u> open, <u>THEN</u> manually open <u>or</u> ensure flow from RWST. b. Manually open valves. c. Manually open valves.

<u>STEP</u>	<u>ACTION/EXPECTED RESPONSE</u>	<u>RESPONSE NOT OBTAINED</u>
(17)	<u>Check If Main Steam Line Isolation is Actuated</u>	
- a.	<u>IF</u> high steam flow, and RCS temperature <543°F <u>THEN</u> verify that affected loop has isolated.	a. Manually shut main steam isolation valve.
b.	<u>IF</u> high-high steam flow, <u>THEN</u> verify affected loop has isolated.	b. Manually shut main steam isolation valve.
c.	<u>IF</u> containment pressure >15 psig, <u>THEN</u> verify both main steam isolation valves shut.	c. Manually shut both main steam isolation valves.
(18)	<u>Check If Containment Spray is Required</u>	
a.	<u>IF</u> containment pressure has gone above 25 psig, <u>THEN</u> verify: <ul style="list-style-type: none"><li>- Containment spray pumps start</li><li>- Spray pump discharge valves open (MOV-860A, B, C, D)</li><li>- NaOH addition after two minutes</li></ul>	a. Manually start pumps and align valves as required.
b.	<u>IF</u> containment spray is actuated <u>and</u> a large loss of coolant has <u>not</u> occurred, <u>THEN</u> transfer controllers to manual and shut the spray additive tank discharge valves (MOV-836A, B) prior to the elapse of two minutes.	

<u>STEP</u>	<u>ACTION/EXPECTED RESPONSE</u>	<u>RESPONSE NOT OBTAINED</u>
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NOTE: USE VISUAL VERIFICATION RATHER THAN INSTRUMENTATION PRIOR TO ISOLATING A FAULTED SI PATH.

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|----|--------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ①9 | <u>Verify SI Flow</u>                                              |                                                                                                                                                                                           |
|    | a. RCS pressure <1550 psig                                         | a. Go to Step 20, (auxiliary feedwater).                                                                                                                                                  |
|    | b. Verify high-head SI flow                                        | b. Manually start pumps and align valves as necessary.                                                                                                                                    |
|    | c. RCS pressure <140 psig                                          | c. Go to Step 20, (auxiliary feedwater).                                                                                                                                                  |
|    | d. Verify RHR pump flow                                            | d. Manually start pumps and align valves as necessary.                                                                                                                                    |
| ②0 | <u>Verify Auxiliary Feedwater Flow Isolated to Unaffected Unit</u> | Isolate auxiliary feedwater flow to unaffected unit.                                                                                                                                      |
| ②1 | <u>Verify Total Auxiliary Feedwater Flow at Least 200 gpm</u>      | Manually start pumps and align valves as appropriate.<br><u>IF</u> total auxiliary feedwater flow remains <200 gpm, <u>THEN</u> go to CSP-H.1, "Response to Loss of Secondary Heat Sink." |
| ②2 | <u>Verify CCW Pumps Running</u>                                    | Turn switch to off and then on to manually start pumps.                                                                                                                                   |

<u>STEP</u>	<u>ACTION/EXPECTED RESPONSE</u>	<u>RESPONSE NOT OBTAINED</u>
23	<u>Check RCP Seal Cooling</u> a. CCW flow to RCP is normal. b. Seal injection normal.	a. <u>IF</u> all CCW to an RCP is lost, <u>THEN</u> trip the RCP. b. Verify adequate power available to run one charging pump.  <u>and</u> Start one charging pump at minimum speed for seal injection.
24	<u>Verify RCS Temperature Stable at or Trending to 547°F</u>	<u>IF</u> RCS temperature <547°F <u>and</u> decreasing, <u>THEN</u> : a. Stop dumping steam b. <u>IF</u> cooldown continues, <u>THEN</u> control total feed flow. Maintain total feed flow >200 gpm until level >5% in at least one steam generator. c. <u>IF</u> cooldown continues, <u>THEN</u> close main steam isolation valves.  <u>OR</u> <u>IF</u> RCS temperature >547°F <u>and</u> increasing, <u>THEN</u> - Dump steam to condenser  <u>OR</u> - Use atmospheric steam dump



<u>STEP</u>	<u>ACTION/EXPECTED RESPONSE</u>	<u>RESPONSE NOT OBTAINED</u>
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CAUTION: IF OFFSITE POWER IS LOST AFTER SI RESET, THEN MANUAL ACTION MAY  
REQUIRED TO RESTART SAFEGUARDS EQUIPMENT.

NOTE: AFTER SI RESET REINITIATION OF SI WILL NOT OCCUR AS LONG AS ANY SI  
SIGNAL IS CONTINUOUSLY PRESENT.

25	<u>Reset SI</u>	Go to Step 27 (instrument air).
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CAUTION: DO NOT OPEN ANY CONTAINMENT ISOLATION VALVE WITHOUT DUTY SHIFT  
SUPERINTENDENT AUTHORIZATION.

26	<u>Reset Containment Isolation</u>	
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CAUTION: REESTABLISHING INSTRUMENT AIR TO CONTAINMENT COULD CAUSE LOSS OF  
INSTRUMENT AIR HEADER PRESSURE TO THE OTHER UNIT IF NOT DONE  
CAUTIOUSLY.

27	<u>Reestablish Instrument Air to Containment</u>	
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|----|-----------------------------------------------------------------|----------------------------------------------|
| a. | Start other compressor, if<br>available.                        |                                              |
| b. | Open instrument air<br>isolation valves, CV-3047<br>or CV-3048. | b. Manually hold open valves<br>if required. |

<u>STEP</u>	<u>ACTION/EXPECTED RESPONSE</u>	<u>RESPONSE NOT OBTAINED</u>
28	<u>Check Pressurizer Pressure Control</u>	
- a.	Pressurizer pressure stable between 1950 and 2050 psig	<p>a. <u>IF</u> pressurizer pressure &lt;1950 psig <u>and</u> decreasing, <u>THEN</u>:</p> <ol style="list-style-type: none"><li>1) Verify pressurizer spray valves shut. <u>IF not</u> shut, <u>THEN</u> manually shut. <u>IF</u> valves can <u>not</u> be shut, <u>THEN</u> stop RCP(s) supplying failed spray valves.</li><li>2) Verify pressurizer PORV's shut. <u>IF not</u> shut, <u>THEN</u> manually shut. <u>IF</u> any PORV can <u>not</u> be shut, <u>THEN</u> manually shut its block valve. <u>IF</u> block valve can <u>not</u> be shut, <u>THEN</u> go to EOP-1, "Loss of Reactor or Secondary Coolant."</li></ol> <p><u>OR</u></p> <p><u>IF</u> pressure &gt;2050 psig, <u>and</u> increasing, <u>THEN</u>:</p> <ol style="list-style-type: none"><li>1) Verify pressurizer heaters off. <u>IF not</u> off, <u>THEN</u> manually turn off.</li><li>2) Control pressure using pressurizer spray, auxiliary spray, or PORV in this preferred order, as necessary.</li></ol>

<u>STEP</u>	<u>ACTION/EXPECTED RESPONSE</u>	<u>RESPONSE NOT OBTAINED</u>
29	<u>Check if RCP's Should Be Stopped</u>	
	a. Verify at least one SI pump running with flow.	a. Go to Step 30 (secondary integrity).
	b. RCS pressure >1350 psig.	b. <u>IF</u> RCS pressure is decreasing uncontrollably, <u>THEN</u> stop all RCP's.
30	<u>Check Secondary System Integrity</u>	
	a. Both steam generator pressures being controlled	a. Go to EOP-2, "Faulted Steam Generator Isolation."
	<u>and</u>	
	Not completely depressurized	
31	<u>Check if Steam Generator Tubes are Intact</u>	
	a. No condenser air ejector RMS alarms	a. Go to EOP-3, "Steam Generator Tube Rupture."
	b. No steam generator blow-down RMS alarms	b. Go to EOP-3, "Steam Generator Tube Rupture."
	c. No main steam line RMS alarms	c. Go to EOP-3, "Steam Generator Tube Rupture."

<u>STEP</u>	<u>ACTION/EXPECTED RESPONSE</u>	<u>RESPONSE NOT OBTAINED</u>
32	<u>Check if RCS is Intact</u>	
	a. No containment radiation alarms	a. Go to EOP-1, "Loss of Reactor or Secondary Coolant."
	b. Containment pressure <3 psig	b. Go to EOP-1, "Loss of Reactor or Secondary Coolant."
	c. No containment recirculation sump "B" or keyway level.	c. Go to EOP-1, "Loss of Reactor or Secondary Coolant."
33	<u>Check If SI Should be Terminated</u>	
	a. RCS subcooling based on core exit thermocouples >15°F	a. Do not stop SI pumps. Go to Step 35 (status trees).
	b. Secondary heat sink 1) Total feedwater flow to intact steam generators >200 gpm	b. <u>IF</u> both conditions <u>not</u> satisfied, <u>THEN</u> do not stop SI pumps. Go to Step 35 (status trees).
	<u>OR</u>	
	2) Narrow range level in at least one intact steam generator >5%	
	c. RCS pressure >1600 psig <u>and</u> stable or increasing	c. Do not stop SI pumps. Try to stabilize RCS pressure with normal spray. Go to Step 35 (status trees).
	d. Pressurizer level >5%	d. Do not stop SI pumps. Go to Step 35 (status trees).
34	<u>Go to EOP-1.1, "SI Termination"</u>	

STEP      ACTION/EXPECTED RESPONSE                      RESPONSE NOT OBTAINED

35      Initiate Monitoring of  
Critical Safety Function  
Status Trees

CAUTION:    IF CST LEVEL IS <4 FEET, THEN ALTERNATE WATER SOURCES FOR AUXILIARY  
FEEDWATER PUMPS MAY BE NECESSARY.

36      Control Feed Flow to Maintain  
Steam Generator Levels Between  
5% and 50%

IF level in any steam generator continues to increase uncontrollably, THEN go to EOP-3, "Steam Generator Tube Rupture."

37      Verify No Secondary Radiation  
Alarms

IF conditions appear to indicate a steam generator tube rupture, THEN, go to EOP-3, "Steam Generator Tube Rupture."

- No condenser air ejector RMS alarms
- No steam generator blow-down RMS alarms
- No main steam line RMS alarms

38      Verify No Auxiliary Building  
Radiation Alarms

Evaluate cause of abnormal conditions. IF the cause is a loss of RCS inventory outside containment, THEN go to EOP-5.1, "LOCA Outside Containment."

39      Verify No Pressurizer Relief  
Tank Alarms

Evaluate cause of abnormal conditions.

- Level/temperature/pressure

STEP    ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

CAUTION:    IF RCS PRESSURE DROPS BELOW 140 PSIG AT ANY TIME, THEN RHR PUMPS  
MUST BE MANUALLY RESTARTED TO SUPPLY WATER TO THE RCS.

40    Check if RHR Pumps Should  
be Stopped

a.    RCS pressure >140 psig

a.    Go to EOP-1, "Loss of Reactor  
or Secondary Coolant."

b.    IF RCS pressure is stable  
or increasing, THEN stop  
RHR pumps

b.    IF pump does not stop because  
of SI signal, THEN go to  
pullout.

STEP    ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

NOTE: DIESEL GENERATOR CAPABILITY IS 2850 KW CONTINUOUS, 3050 KW FOR 30 MINUTES.

NOTE: - AVOID SERVICE WATER ISOLATION BY MAINTAINING FOUR SERVICE WATER PUMPS RUNNING IF POSSIBLE.

41    Load Diesels

- |                                                |                                                                                                                            |
|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| a. Restart a CCW pump if needed.               |                                                                                                                            |
| b. Restart an instrument air compressor.       |                                                                                                                            |
| c. Verify Diesel voltage and frequency normal. | c. If necessary, take manual control per OP-11A, "Emergency Diesel Operation," and control the output to 4160 V and 60 Hz. |
| d. Secure unnecessary plant equipment.         |                                                                                                                            |

42    Prepare to Start Charging Pumps

- |                                                           |                              |
|-----------------------------------------------------------|------------------------------|
| a. Verify adequate Diesel capacity to run charging pumps. | a. Shed non-essential loads. |
|-----------------------------------------------------------|------------------------------|

STEP      ACTION/EXPECTED RESPONSE                      RESPONSE NOT OBTAINED

NOTE: LETDOWN ORIFICE ISOLATION VALVES (AOV-200A, B, C) SHUT WITH LOSS OF ALL CHARGING PUMPS.

43      Verify Charging Flow

- a. At least one charging pump running.
  
- b. Establish charging and seal injection flow as necessary.

a. Perform the following:

- 1) IF CCW flow to RCP(s) thermal barrier is lost, THEN isolate seal injection to affected RCP's before starting charging pumps.
  
- 2) Start charging pumps, as necessary.

44      Check if Diesels Should Be Stopped

- IF safeguards buses are energized by offsite power, THEN stop Diesels.

45      Return to Step 28 (Pressurizer PORV's)

- END -



1.0 A CONTAINMENT ISOLATION SIGNAL WILL SHUT THE FOLLOWING ISOLATION VALVES  
(A BRIGHT LIGHT ON THE SAFEGUARDS ISOLATION MONITOR PANEL INDICATES WHEN  
EACH VALVE IS IN THE SAFEGUARDS POSITION).

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		<u>Train</u>
CV-371	Letdown line isolation	A & B
CV-371A	Letdown line isoaltion	
SC-966A & SC-951	Sample line isolation (pressurizer steam)	A & B
SC-966B & SC-951	Sample line isolation (pressurizer steam)	A & B
SC-966C & SC-955	Sample line isolation (hot leg)	A & B
RC-538	Gas analyzer isolation from pressurizer relief tank	A
RC-539	Gas analyzer isolation from pressurizer relief tank	B
WL-1003A	RCDT pump suction isolation	A
WL-1003B	RCDT pump suction isolation	A
WL-1721	RCDT pump common suction isolation	B
WL-1698	RCDT pump suction line to -19'3" sump	A
CV-1296	Auxiliary charging line isolation	A
WL-1723	Sump "A" to -19'3" sump isolation	A
WL-1728	Sump "A" to -19'3" sump isolation	B
WL-1786	Vent header isolation from RCDT	A
WL-1787	Vent header isolation from RCDT	B
WL-1788	Gas analyzer isolation from RCDT	A
WL-1789	Gas analyzer isolation from RCDT	B

		<u>Train</u>
CV-313 & CV-313A	Reactor coolant pump seal return line isolation	A & B
RC-508	Reactor makeup water to PRT	A & B
SI-846	Accumulator nitrogen fill isolation	A & B
CC-769	Component cooling water return from excess letdown heat exchanger	A & B
CV-3200B	R211/R212 radiation monitor supply	B
CV-3200C	R211/R212 radiation monitor supply	A
CV-3200A	R211/R212 radiation monitor supply	A & B
CV-3047	Instrument air isolation	A & B
CV-3048	Instrument air isolation	A & B
SV-4852	Shifts control room ventilation to 100% recirculation (Mode 2)	A & B
CV-2083	Blowdown sample isolation	A & B
CV-2084	Blowdown sample isolation	A & B
CV-2042	Blowdown isolation	A & B
CV-2045	Blowdown isolation	A & B

2.0 A CONTAINMENT VENTILATION ISOLATION SIGNAL WILL SHUT THE FOLLOWING ISOLATION VALVES (A BRIGHT LIGHT ON THE SAFEGUARDS ISOLATION MONITOR PANEL INDICATES WHEN EACH VALVE IS IN THE SAFEGUARDS POSITION)

HV-3244	Containment purge supply isolation	A
HV-3245	Containment purge supply isolation	B
HV-3212	Containment purge exhaust isolation	A
HV-3213	Containment purge exhaust isolation	B

3.0 COOLING LOADS ISOLATED IF LESS THAN FOUR OR SIX SERVICE WATER PUMPS START

3.1 Train "A"

- 3.1.1 SW-2816, service building air conditioning
- 3.1.2 SW-2930A, spent fuel pit heat exchanger
- 3.1.3 AOV-LW-61, service water to overhead condensers of blowdown evaporators and steam generator blowdown tank vent condensers.

3.2 Train "B"

- 3.2.1 1SW-2880, Unit 1 turbine building feeder (Unit 1 SI only)
- 3.2.2 2SW-2880, Unit 2 turbine building feeder (Unit 2 SI only)
- 3.2.3 SW-2817, water treatment area
- 3.2.4 AOV-LW-62, service water from overhead condensers of blowdown evaporator and steam generator blowdown tank vent condenser and R11/R12 pump
- 3.2.5 SW-2930A, spent fuel pit heat exchanger

4.0 NON-ESSENTIAL EQUIPMENT STRIPPED FROM SAFEGUARDS BUSES-B03/B04 LOCKOUTS

- 4.1 Component cooling water pumps are tripped if safety injection is coincident with an undervoltage on the safeguards buses.
- 4.2 Pressurizer heater backup groups "C" and "D" and the control group "E".
- 4.3 Electric fire pump (Unit 1 SI only) (1B03).
- 4.4 480 volt bus tie breakers B52-15C, B52-16C, B52-18C (B52-26C, B52-39C, B52-40C).
- 4.5 Auxiliary and service building motor control centers (Unit 1 - 1B31, B43; Unit 2 - 2B31, B21, B33)
- 4.6 Service air compressor K3A (Unit 1 SI only) (1B04)  
Service air compressor K3B (Unit 2 SI only) (2B04)
- 4.7 Turbine building crane (Unit 2 SI only).