

Draft Submittal

(Pink Paper)

BROWNS FERRY

EXAM 2002-301

50-259, 50-260, & 50-296

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1. **Operating Test Simulator Scenarios**

BROWNS FERRY NUCLEAR PLANT
INITIAL LICENSE SCENARIO OUTLINE
02NRC-3

Scenario Objective

Evaluate the operators in using the emergency depressurization contingency procedure based on area high radiation.

Scenario Summary

Initial Conditions:

- 100% RTP
- D diesel generator tagged
- 2-SR-3.3.6.1.2(3C), HPCI Rupture Disk, in progress

Events:

- Alternate stator cooling water pumps and notification of 2-SR-3.3.6.1.2(3C) failure
- Slow loss of HP feedwater heating on B string
- Spurious reactor water cleanup system isolation
- 2B reactor feedwater pump trip
- 2A and 2C reactor feedwater pump trip
- RCIC steam leak

Scenario Sequence

- The DUO alternates stator cooling water pumps
- The SRO receives a report that 2-SR-3.3.6.1.2(3C) has failed
- A slow (but slowly increasing) leak develops in B2 high pressure heater
- The reactor water cleanup system spuriously isolates
- 2B reactor feedwater pump trips
- 2A and 2C reactor feedwater pumps trip
- When RCIC is used for level control a leak into secondary containment develops

Event one - Alternate stator cooling water pumps and notification of 2-SR-3.3.6.1.2(3C) failure

The DUO alternates stator cooling water pumps and the SRO receives notification of an SR failure.

Malfunctions required: None

Objective:

Evaluate the DUO in use of normal operating procedures and evaluate the SRO in use of Technical Specification.

Success Path:

- Start 2B stator cooling water pump and stop 2A stator cooling water pump
- Determine T.S. 3.3.6.1 for HPCI failure - not action required, only three switches required

Event two - Slow loss of HP feedwater heating on B string

The crew responds to a slowly increasing leak in B2 high pressure heater.

Malfunctions Required: 1

Objective:

Evaluate the crew on use of Abnormal Operating Instructions in responding to the heater leak.

Success Path:

- Dispatch personnel to heat controls
- Notify Reactor Engineer
- Reduce power to 91% when extractions isolate
- With heater level still rising, reduces power to 79% and isolates feedwater side of heater string

Event three - Spurious reactor water cleanup system isolation

The crew will respond to a spurious isolation of the reactor water cleanup system.

Malfunctions Required: 1

Objective:

Evaluate the BUO on use of Abnormal Operating Instructions in responding to a loss of the reactor water cleanup system.

Success Path:

- Verify isolation valves close
- Check related temperatures
- Notify chemistry and reactor engineer

Event 4 - 2B reactor feedwater pump trip

The crew responds to a spurious feedwater pump trip.

Malfunctions Required: 1

Objective:

Evaluate the BUO on use of Abnormal Operating Instructions in responding to a loss of the reactor feedwater pump.

Success Path:

- Ensure unit is stable
- Dispatch personnel to investigate

Event 5 - 2A and 2C reactor feedwater pumps trip

The crew responds to a sudden loss of reactor feedwater and a low level scram.

Malfunctions Required: 2

Objective:

Evaluate the crew in response to loss of feedwater and inevitable reactor scram.

Success Path:

- Recognize loss of all feedwater
- Manually scram the reactor before auto scram on low level
- Maintain water level with RCIC, HPCI and CRD

Event 6 - RCIC steam leak

The crew will respond to an unisolable RCIC system leak and emergency depressurize due to high area radiation in secondary containment.

Malfunctions Required: 1 (2 if HPCI is initiated)

Objective:

Evaluate the crew on their response to an unisolable leak in the reactor building which leads to emergency depressurizing due to two area above max safe.

Success Path:

- Recognize RCIC leak (alarms) after RCIC initiated
- Recognize RCIC fails to isolate and attempt to manually isolate
- Direct RCIC isolated locally
- Emergency depressurize when two areas above max safe
- Restore RPV level to +2 to +51 inches with condensate, RHR, core spray, HPCI
- Recognize HPCI auto control failure and take manual control (If used)

Scenario Recapitulation

Total Malfunctions	6
Abnormal Events	3
Major Transients	2
EOIs Entered	3
EOI Contingencies	1 (C2)

Page 1 of 1[illegible]

Page 1 of 1[illegible]

Op-Test No.: _____ Scenario No.: 02NRC-3 Event No.: 2Page 1 of 2

Event Description: Slow loss of HP feedwater heating on B string

Time	Position	Applicant's Actions or Behavior
	Crew	Announces "Bypass valves to condenser not closed" alarm
	B/D	Dispatches AUO to JB 32-43 to determine which valve
		Selects ICS screen FWHL
		Announces "B2 heater level high" alarm
		Dispatch personnel to heater level controls per ARP
		Verifies FCV-6-95 open
		Checks B2 Heater shell pressure, drain flow
		Announces B1 and B2 heater extraction isolation
	SRO	Enters 2-AOI-6-1
		Directs power reduced to 91% RTP
		Contacts Reactor Engineer
	BUO	Reduces power to 91% RTP with recirc flow
	B/D	Verifies B1 & B2 extraction valves closed
		Verifies B1 & B2 moisture separator drain pumps tripped
		Verifies B1 & B2 moisture separator drain pump suction valves closed
		Determines heater level still rising and reports to SRO
	SRO	Directs isolating feedwater to B HP heater string
		Directs power reduction to <79%
		Enters GOI-100-12, Power Maneuvering
		Notifies Reactor Engineer of heat isolation and power reduction
	DUO	Isolates feedwater to B high pressure heater string (FCV-3-31 and 76)
		(continued)

Page 2 of 2[illegible]

Page 1 of 1[illegible]

Page 1 of 1[illegible]

Op-Test No.: _____ Scenario No.: 02NRC-3 Event No.: 5Page 1 of 1

Event Description: 2A and 2C Reactor Feedwater Pump Trips

Time	Position	Applicant's Actions or Behavior
	B/D	Recognizes 2A RFP trip and need for reactor scram
	SRO	Directs reactor scram
	BUO	Manually scrams the reactor
		Places mode switch in shutdown
		Checks power lowering
		Verifies all rods in
		Verifies RPV water level being controlled by RFP C
		Recognizes trip of 2C RFP
	SRO	Enters EOI-1 on low reactor water level
		Directs level controlled by RCIC, CRD
		Enters AOI-100-1
	B/D	Uses RCIC for reactor water level control
		Recognizes radiation alarms associated with RCIC operation
		Evacuates the reactor building
	SRO	Enters EOI-3

Op-Test No.: _____ Scenario No.: 02NRC-3 Event No.: 6 Page 1 of 2

Event Description: RCIC Steam Leak

Time	Position	Applicant's Actions or Behavior
	B/D	If HPCI is used, recognizes auto control failure and takes manual control
	SRO	Directs Appendix 8G or restoration of normal drywell control air
	B/D	Restores drywell control air
	Crew	Monitors area radiation levels
	B/D	Recognizes and reports area radiation alarm for RCIC room
		Recognizes and reports high area temperature for RCIC room
		Recognizes RCIC failure to auto isolate and attempts to manually isolate
	SRO	Directs RCIC to be isolated locally
		Determines two area radiation levels above max safe IAW EOI-3
		Directs emergency depressurization
	B/D	Opens and verifies open six ads valves
		Verifies RFP discharge valves closed
	SRO	Directs RPV level be maintained +2" to +51" with LPCI, CS, condensate,
		HPCI
		After EOI-2 entered on high suppression pool water level or temperature
		directs H2O2 analyzers placed in service
		(Continued)

BROWNS FERRY NUCLEAR PLANT
INITIAL LICENSE SCENARIO OUTLINE
02NRC-4

Scenario Objective

Evaluate the operators in using the emergency depressurization (C2) and alternate level control (C1) EOI contingency procedures.

Scenario Summary

Initial Conditions: 79% RTP, 2C RHR pump tagged, 2-SR-3.5.1.7, HPCI Flow Rate Test, in progress.

Events:

- Alternate EHC pumps
- Power ascension
- HPCI steamline breaks during flow rate SR and fails to auto isolate
- SRV-1-22 fails open
- Recirculation pump vibration, seal leakage and scram
- MSIV closure/LOCA

Scenario Sequence

- Alternate EHC pumps
- Continue power ascension at prescribed rate
- HPCI steamline breaks during SR requiring manual isolation and EOI-3 entry
- SRV-1-22 fails open and closes when DUO responds by cycling the valve
- 2A recirc pump develops vibration problems to the point of causing seal failure, requiring pump trip and isolation but the suction valve will not close
- drywell pressure begins increasing
- Power oscillation develop requiring a manual scram
- The MSIVs fail closed due to a fuse failure in the Group I isolation circuit
- The RPV water level drop to below -100" requiring implementation of C1, alternate level control
- When water level reaches TAF (-162") the crew emergency depressurizes and reestablishes normal water level with low pressure systems

Event one -Alternate EHC pumps

The DUO will alternate EHC pumps IAW OI-47.

Malfunctions required: None

Objective:

Evaluate the crew during normal operating evolutions.

Success Path:

- Start 2B EHC pump
- Stop 2A EHC pump

Event two - Power ascension

The crew will raise reactor power at the prescribed rate using recirc flow.

Malfunctions required: None

Objective:

Evaluate the crew during normal operating evolutions.

Success Path:

- Use peer checker
- Raise reactor power at the desired rate

Event three - HPCI steamline break

The crew will respond to a HPCI steamline leak, and failure to auto isolate, in accordance with the Abnormal Operating Instructions and will briefly enter EOI-3.

Malfunctions Required: 2

Objective:

Evaluate the crew in use of Abnormal Operating Instructions during a HPCI steamline break and failure to auto isolate. Evaluate the SRO who will briefly enter EOI-3 and make a technical specification determination.

Success Path:

- Recognize HPCI steamline break - alarms, area temps, area radiation
- Recognize failure of HPCI to auto isolate and manually isolate
- Close FCV-1-55 and FCV-1-56
- Determine unit in 72 hours LCO (TS 3.5.1.D-HPCI and C RHR inop)
- Determine 1 hour to tag a HPCI steamline isolation valve closed (TS 3.6.1.3)

Event 4 - SRV-1-22 fails open

The crew will respond to an SRV failing open using the Abnormal Operating Instructions. The valve will close when cycled.

Malfunctions required: 1

Objective:

Evaluate the crew on Abnormal Operating Instruction usage while responding to an open SRV.

Success Path:

- Recognize SRV open
- Cycle the valve
- Recognize valve close
- Request engineering evaluation of operability

Event 5 - Recirc vibration, seal leakage, power oscillations and scram

The crew will experience 2A recirc pump vibration which leads to seal failure, pump trip and power oscillations requiring a manual scram.

Malfunctions required: 4

Objective:

Evaluate the crew response to an abnormal event (recirc pump vibration, leakage, trip) using the abnormal operating instructions and recognizing power oscillations requiring a scram.

Success Path:

- Recognize pump vibration and dispatch personnel
- Change pump speed
- Recognize seal failure
- Trip and isolate recirc pump
- Recognize failure of suction valve to isolate and dispatch personnel to investigate
- Recognize power oscillations
- Manually scram

Event 6 - MSIV closure/LOCA

When the crew inserts a manual scram the MSIVs close due a fuse failure leaving them with RCIC, CRD and SLC for high pressure level control with an increasing recirc pump piping leak. They will ultimately be required to depressurize due to being unable to maintain RPV level above TAF.

Malfunctions Required: 2

Objective:

Evaluate the crew in recognizing a condition requiring a manual scram (power oscillation) and implementation of the EOIs including contingencies C1 (alternate level control) and C2 (emergency depressurization).

Success Path:

- Recognize MSIV closure
- Control pressure 800-1000 psig with alternate means (SRVs, RCIC)
- Attempt to maintain RPV level +2" to +51"
- Enter EOI-1 and 2
- Initiate suppression pool cooling
- Spray the suppression chamber
- Initiate a cooldown'
- Spray the drywell
 - trip 2B recirc pump
 - stop drywell blowers
- Report CRD pumps tripped
- Send personnel to perform Appendix 7B, RPV Makeup from the SLC Test Tank
- At RPV level -100" to -122" enter C1
- Inhibit ADS
- Stop spraying containment
- Emergency depressurize when RPV level reaches TAF
- Restore RPV level to +2" to +51" with low pressure systems

Scenario Recapitulation

Total Malfunctions:	9
Abnormal Events:	2
Major Transients:	2
EOIs Entered	3
EOI Contingencies	2

Page 1 of 1[illegible]

Page 1 of 1[illegible]

Op-Test No.: _____ Scenario No.: NRC-4 Event No.: 3Page 1 of 1

Event Description: HPCI steam line break

Time	Position	Applicant's Actions or Behavior
	SRO	Directs DUO to continue with 2-SR-3.5.1.7 at Step 7.11
	B/D	Makes plant announcement HPCI to be started
		Responds to reactor building high radiation alarm
	SRO	Enters EOI-3 on HPCI area high radiation and high temperature
	B/D	Determines HPCI area source of high radiation
		Responds to HPCI leak detection high temperature alarm IAW the ARP
		Recognizes HPCI not isolated when required (yellow isolation lights)
	SRO	Directs HPCI manually isolated
	DUO	Manually isolates HPCI steam supply
		Evacuates HPCI area
	SRO	Enters EOI-3 on HPCI area flood level alarms
	B/D	Notifies Rad Con and Fire Protection
		Monitors lowering HPCI area temperatures and radiation levels
	SRO	Directs entry into AOI-664-2B
		Directs FCV-1-55 and 56 closed
		Dispatches personnel to investigate the HPCI leak
	B/D	Opens FCV-1-55 and 56 (9-3)
	SRO	Determines Unit in 72 hours LCO (TS 3.5.1.D - HPCI and C RHR inop)
		Determines 1 hour to isolate and tag either FCV-73-2 or 3 (TS 3.6.1.3)

Page 1 of 1[illegible]

Op-Test No.: _____ Scenario No.: NRC-4 Event No.: 5 Page 1 of 2

Event Description: Recirc vibration, seal leakage, power oscillations and scram

Time	Position	Applicant's Actions or Behavior
	B/D	Announces recirc 2A vibration alarm and consults ARP
		Dispatches AUO to local panel to check vibration
		Monitor s recirc pump temperatures
	SRO	Contact Reactor Engineer
		Directs BUO to reduce speed of 2A recirc pump to reduce vibration
	BUO/DUO	BUO reduces recirc speed and DUO serves as peer checker
	BUO/DUO	Announces recirc A seal leakage alarm
		Identifies seal leakage via instrumentation
		Recognizes lowering pressure on recirc pump A #1 seal
	SRO	Directs crew to watch for signs of increased leakage
	B/D	Acknowledges recirc pump A seal leakoff high alarm and informs SRO
		Recognizes lowering pressure on recirc pump A outboard seal and
		informs SRO
	SRO	When vibration report received or dual seal failure is reported, directs
		A recirc pump tripped and isolated
		Directs actions IAW AOI-68-1
	B/D	Trips recirc pump A and closes the discharge valve
		Dispatches AUO to recirc MG set to control temperatures
		Determines recirc A suction valve will not close and informs SRO
		Directs AUO to attempt to close recirc A suction valve from electrical
		board
		(Continued)

Op-Test No.: _____ Scenario No.: NRC-4 Event No.: 6Page 1 of 4

Event Description: MSIV closure/LOCA

Time	Position	Applicant's Actions or Behavior
	SRO	Directs RPV pressure controlled 800-1000 psig with one or more of:
		• MSRVs (Appendix 11A)
		• RCIC (Appendix 11B)
		Directs RPV level maintained +2 " to +51" with one or more of:
		• RCIC
		• CRD
	B/D	Controls RPV pressure 800 to 100 psig with:
		• MSRVs (Appendix 11A)
		• RCIC (Appendix 11B)
	B/D	Reports MSIV closure to SRO
	SRO	Directs determining cause of isolation
		Directs Appendix 8G and Appendix 12 and H2O2 analyzers placed in service
	B/D	Performs Appendix 8G, Appendix 12 and places H2O2 analyzers in service
	B/D	Attempts to maintain RPV water level +2" to +51" with one or more of:
		• RCIC (Appendix 5C)
		• CRD (Appendix 5B)
		• SLC (Appendix 7B)
	SRO	Directs suppression pool cooling placed in service
	DUO	Places suppression pool cooling in service
	SRO	Directs Appendix 8G performed
	B/D	Performs Appendix 8G
		(Continued)

Op-Test No.: _____ Scenario No.: NRC-4 Event No.: 6Page 2 of 4

Event Description: MSIV closure/LOCA (Continued)

Time	Position	Applicant's Actions or Behavior
	B/D	Monitors containment parameters
	SRO	Enters EOI-2 on drywell pressure and re-enters EOI-1 and directs the following:
		<ul style="list-style-type: none"> • Verify all available drywell coolers in service • Venting IAW Appendix 12 • H2O2 analyzers placed in service
	SRO	Directs commencing a cooldown
	B/D	Verifies all available drywell cooling in service
		Commences a cooldown as directed
	SRO	Determines cannot maintain suppression chamber pressure less than 12 psig and directs suppression chamber sprays
	B/D	Spray the suppression chamber IAW Appendix 17C
	SRO	When suppression chamber pressure exceeds 12 psig or SRO determines drywell temperature cannot be maintained <280F then directs the following:
		<ul style="list-style-type: none"> • Ensure recirc pumps tripped • stop all drywell blowers • drywell sprays IAW Appendix 17B
	B/D	Trips recirc pump B
		Secures drywell blowers

Op-Test No.: _____ Scenario No.: NRC-4 Event No.: 6Page 3 of 4

Event Description: MSIV closure/LOCA (Continued)

Time	Position	Applicant's Actions or Behavior
	B/D	Requests Appendices 16F and 16G
		Sprays the drywell
	SRO	Directs sprays stopped when the affected area reaches 0 psig
	B/D	Stops drywell/suppression chamber sprays when each area reaches 0
		psig
	SRO	Directs maximum CRD injection IAW Appendix 5B
	B/D	Performs Appendix 5B
		Reports 1B CRD pump trip
		Monitors containment parameters
	SRO	Monitors RPV water level and determines level still lowering
		Re-enters EOI-1 at +2" RPV level
		Directs performance of :
		Appendix 5B (CRD)
		Appendix 7B (SLC)
	Crew	Monitors drywell/PSC/and RPV water level
	SRO	Enters C1 at -100" to -122"
		Directs ADS inhibited
	B/D	Closes RFP discharge valves
		Reports 2A CRD pump tripped
		Inhibits ADS (Critical Task)
	SRO	After entering C1 directs ;
		<ul style="list-style-type: none"> Aligning all available injection systems for injection Terminating containment sprays
		(Continued)

Page 4 of 4

Event Description: MSIV closure/LOCA (Continued)

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