

Draft Submittal

(Pink Paper)

CRYSTAL RIVER AUGUST EXAM 50-302/2003-301

AUGUST 25 - 29, 2003

1. **Operating Test Simulator Scenarios**

Facility: Crystal Unit #3Scenario No.: 1 (NRC)Op-Test No.: 1Examiners: _____

_____Operators: _____

Initial Conditions: The plant is at 21% power preparing to place the turbine on line. 1st stage HP turbine temperature is 376° F.

Turnover: The following equipment is OOS: DHP-1A (12 hours); MUP-1A (12 hours); RWP-1 (24 hours); FWP-7 (32 hours). All required surveillances have been completed. An emergency need for power exists. Substation personnel in switchyard (Unit 5 breaker maintenance).

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N (BOP)	Turbine startup in progress. (OP-203)
2	1	I (SRO)	RM-A6 Gas fails low. SRO TS determination. (TS 3.4.14)
3	2	I (RO) I (SRO)	Turbine header pressure setpoint fails low over three minutes. SRO TS determination. (TS 3.7.4)
4	N/A	R (RO)	Manual power increase.
5	3	C (BOP)	FW-223/224-TE trend up. Requires startup of FWBP-1B and shutdown of FWBP-1A. (OP-605)
6	4	C (RO)	PZR steam space leak, small, 20 gpm. (AP-520)
7	5	C (BOP)	RCV-13, PZR spray block valve, fails to close.
8	6	M (ALL)	PZR steam space leak, large, 160 gpm. (EOP-2, EOP-3)
9	7	C (BOP)	MUP-1C shaft seizure on ES start signal / MUV-73 fails to open automatically. [CT] (EOP-13, Rule 1)
10	8	C (RO)	RCP-1D breaker will not open. [CT]

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Narrative Summary:

The plant is at $\approx 23\%$ power preparing to place the turbine on line. The BOP is to auto synchronize and load the generator (OP-203).

Once the turbine is on and the ICS stations are being placed in automatic RM-A6 Gas monitor will fail low. This will require the SRO to evaluate TS 3.4.14 for RCS leakage detection instrumentation. (No TS actions required due to RM-A6 Particulate monitor being operable).

After the ICS stations are in automatic the turbine header pressure setpoint will fail low over a three minute time period. GVs and TBVs will open, megawatts will increase and header pressure will decrease. The turbine, SG/Rx and TBVs must be taken to manual and header pressure restored. The SRO will evaluate TS 3.7.4 and determine the TBVs are still operable because they will work in manual. Once the plant is stable the power increase will resume. The SRO may have to prompt for the power increase (emergency need for power exists per the turnover sheet).

After the power increase has resumed (5 to 10 %) FW temperature elements on the running FWBP increase. The other booster pump should be started, the running booster pump shutdown and maintenance called to investigate.

At about 30% power a small pressurizer steam leak will occur (20 gpm) that will reduce RCS pressure. The SRO will enter AP-520 and commence diagnosis of the pressure decrease. A complicating factor will be the RCS spray valve block valve will not close. Therefore, RCP-1B will be tripped and then the reactor.

The reactor trip will result in the major transient of a large steam space leak from the pressurizer (160 gpm). This will further decrease RCS pressure to the ES actuation set point. When ES actuates MUP-1C will experience a shaft seizure, leaving only 1 MUP in service (MUP-1B). In addition to the MUP shaft problem, MUV-73 did not open. The BOP must identify this failure and open MUV-73 because it is the source of BWST water to the only running MUP (CT).

The pressure will continue to decrease even with the ES actuation until a loss of SCM occurs. The RO must trip the remaining RCPs within 2 minutes. RCP-1D will not trip and the operator must de-energize the 6900V Aux Bus 3B (open Breaker 3104) to secure RCP-1D (CT).

Once the plant is in EOP-3 and the RCPs are secured this scenario may be terminated.

Procedures used: (ARs not listed)

OP-203	AP-520	EOP-2
OP-204		EOP-3
OP-605	AI-505	EOP-13
OP-501		

SHIFT TURNOVER

A. Initial Conditions:

1. Time in core life – 300 EFPD
2. Shift: ☒ Day ☐ Swing ☐ Mid
3. Rx power and power history – 23%, shutdown for 3 days
4. Boron concentration – 1517 PPMB
5. Xenon – Increasing
6. RCS Activity - See Status Board

B. Tech. Spec. Action requirement(s) in effect:

- T.S. 3.5.2 Condition “A” for DHP-1A. Condition entered 12 hours ago.

C. Clearances in effect:

- DHP-1A for breaker fuse block replacement. Expected return to service in 4 hours.
- MUP-1A shaft replacement due to high vibration. Expected return to service in 24 hours.
- RWP-1 for impellor replacement. Expected return to service in 4 hours.
- FWP-7 motor bearing replacement. Expected return to service in 12 hours.

D. Significant problems/abnormalities:

- An emergency need for power exists due to other generating facilities being unavailable.

E. Evolutions/maintenance for the on-coming shift:

- Continue with turbine startup per OP-203 at step 4.2.18
- Auto Synch is the preferred method for closing output breakers
- Continue power escalation per OP-204
- Dispatcher has requested a minimum 20%/hour power increase.
- Substation personnel are in the switchyard doing routine maintenance on Unit 5 breakers.
- Maintenance to continue work on DHP-1A, MUP-1A, RWP-1 and FWP-7

F. ROs walk down the main control boards and provide the crew with the following data:

RCS Average Temperature	_____	Make-up Tank Level	_____
RCS Pressure	_____	Turbine Load	_____
Pressurizer Level	_____	Turbine Reference	_____

G. Required Emergency Plan Implementation

- ☐ Full Implementation, including all required notifications.
☐ Initial/upgrade classifications - internal notifications.
☒ None

Target Quantitative Attributes – Scenario 1	Actual Attributes
1. Total Malfunctions (5-8)	8
2. Malfunctions after EOP entry (1-2)	2
3. Abnormal Events (2-4)	3
4. Major Transients (1-2)	1
5. EOPs entered requiring substantive actions (1-2)	2
6. EOP contingencies requiring substantive actions (0-2)	2
7. Critical Task (2-3)	2

*Examination Setup/Execution
Scenario 1*

INITIAL CONDITIONS

- A. "Restore" the simulator to IC# 61 developed for this SES.
- B. "Unfreeze" the simulator and ensure the following configuration is setup:

N/A
- C. "Freeze" the simulator and "Execute" NRCEXAM Lesson Plan:

1. "Start" Lesson Plan #30 – (NRC #1)
- D. "Unfreeze" the simulator and "Trigger" Setup Step(s) which will:

See Simulator lesson plan
- E. Tag out the following equipment:
1. Place CIT on DHP-1A C/S in Normal After Stop
 2. Place CIT on MUP-1A C/S in Normal After Stop
 3. Place CITs on MUPs-2A, 3A, 4A and 5A
 3. Place CIT on RWP-1 C/S in Normal After Stop.
- F. Additional Modifications required to the IC.
1. Ensure SPDS selected to NORM/IMB and history traces cleared and history trace selected. Also ensure "A" and "B" SPDS are properly selected for RCS Loops and Primary instruments selected.
 2. Ensure that PICS computer is started in the "SECURE PICS" mode and the CNO/SSO/STA computer are logged onto PICS using "examuser".
 3. Ensure SPDS on CNO/SSO/STA computers displaying correct data for IC.
 4. Ensure Group 59 indicative of current reactor power.
 5. Acknowledge computer and annunciator alarms.
 6. Ensure proper PICS groups displayed on overhead screens.
- G. Ensure copy of OP-203 available and signed off up to step 4.2.18.
Ensure copy of OP-204 available with appropriate steps signed off.
Ensure copy of OP-605 available with appropriate steps signed off.
- H. Freeze the simulator and notify the lead examiner.

Booth Operator Examination Steps

A. EVENT #1 – Normal Evolution – Turbine startup – OP-203/204

Role Play: When directed as the SPO to perform Step 4.2.41 wait 2 minutes and report that the step is complete. (HDV-41, 42, 47 & 48 are open)

[Trigger Step #10: Open HDV-47 & 48 per OP-203]

B. EVENT #2

When directed or after delta Tc is put into auto, fail RM-A6 gas.

[Trigger Step #1: RM-A6 Gas low failure]

C. EVENT #3

When directed or once TS for the RM-A6 failure is addressed, fail the turbine header pressure setpoint.

[Trigger Step #2: Turbine HP setpoint fail low over 3 minutes]

Role play: Notify control room as a Chemistry Tech that FW and OTSG chemistry are in spec.

D. EVENT #4 – Reactivity Manipulation – Manual power increase

E. EVENT #5

When directed or after 5% to 10% manual power increase, insert FWBP temperature element malfunctions.

[Trigger Step #3: FW-223/224-TE (FWBP-1A) trend up]

Role Play: If contacted as the SPO to check FWBP-1A bearing temperatures wait about 2 minutes and report that the bearings are hotter than normal and seem to be heating up further. State that oil levels are normal and you don't know why they are heating up.

Role Play: When contacted as the SPO to partially open FWV-7 wait about two minutes and notify the control room that the valve is about 40% open.

[Trigger Step #9: FWV-7 stroke to 40% open]

F. EVENT #6

When directed or after FWBP-1B is running, insert PZR steam space leak (20gpm).

[Trigger Step #4: PZR steam space leak – small – 20gpm]

G. EVENTS #7, #8, #9 & #10

The remaining events are conditional based on expected plant parameters.

Role Play: If contacted as the SPO to perform EOP-14 Enclosure 1 wait ~23 minutes and report completion.

[Trigger Step #5]

Role Play: If contacted as the PPO to perform EOP-14 Enclosure 2 wait ~15 minutes and report completion.

[Trigger Step #6]

Facility: Crystal Unit #3Scenario No.: 2 (NRC)Op-Test No.: 1

Examiners: _____

Operators: _____

Initial Conditions: The plant is at 100% power.

Turnover: The following equipment is OOS: DHP-1A (12 hours); MUP-1A (12 hours); RWP-1 (24 hours); Offsite Power Transformer (7 hours). SP-321 is due after turnover is complete. All other required surveillances have been completed. Substation personnel in switchyard (OPT repair).

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N (BOP)	Perform SP-321, Enclosure 1.
2	1	I (SRO)	EF-98-LT fails low. SRO TS determination.
3	2	C (BOP) C (SRO)	Gland steam leak / condenser vacuum degradation (OP-607) SRO ODCM determination for RM-A12.
4	3	C (BOP)	ARP-1A trips, <i>ARP-1B will not start.</i>
5	4	R (OAC) I (OAC)	<i>ULD</i> station fails as is / rapid power reduction with <i>SG/Rx Master</i> in hand. (AP-510)
6	5	C (BOP)	40 gpm "A" OTSG tube leak. (EOP-6)
7	6	M (ALL)	Two MSIVs close at 70% power / manual reactor trip [CT]/ tube leak increases to 160 gpm (AI-505, EOP-2)
8	7	C (RO)	RCV-14, PZR spray valve, fails to open.
9	8	C (RO)	PORV fails to close. [CT]

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

#2

Narrative Summary:

Plant is initialized at 100% power. SP-321, Enclosure 1 is required due to the OPT being OOS.

After SP-321 is complete EF-98-LT (EFT level) fails low and ITS 3.3.17 is addressed. Condition A should be entered with the action to restore the channel to operable status within 30 days.

Once TS actions are addressed for EF-98-LT, GSV-6 controller fails causing a loss of GS supply pressure. BOP opens GSV-8 to maintain GS pressure. When GSV-8 is opened a steam leak occurs on the GS line causing one LP turbine seal to lose sealing steam resulting in a vacuum leak. Vacuum lowers, ARP-1B will not start and ARP-1A trips when second stage manifold check valve opens (low vacuum operation). SRO/RO/BOP should recognize that RM-A12 is not available with no ARPs in operation.

Power reduction is commenced per AP-510. ULD station output fails as is. RO will diagnose the problem and receive permission from the SRO to decrease power in manual using the SG/RX master station.

At approximately 90% power a 40 gpm SGTR develops on the "A" OTSG. Crew diagnoses the tube leak using MS line monitor increase and leak rates (RMA-12 is not available due to loss of ARPs). EOP-6 is entered. Power reduction is continued.

At approximately 70% power two MSIVs close (opposite OTSGs). A manual reactor trip is required per AI-505 (CT). Immediate actions of EOP-2 and symptom scan should be performed. Due to the trip the SGTR increases to \approx 280 gpm. After symptom scan is performed SRO should return to the beginning of EOP-6 and continue the plant shutdown.

Condenser vacuum continues to lower until TBVs are lost requiring steaming to atmosphere. Emergency Plan upgrade should be recognized but classification is not required.

When RCS depressurization is attempted RCV-14 (spray valve) fails to open. Crew should use the PORV to decrease subcooling margin. The PORV will fail open requiring the PORV block valve to be closed (CT). RCS cooldown and depressurization is continued using PZR vent valves.

The scenario may be terminated when SCM is minimized and a controlled plant cooldown is in progress.

Procedures used: (ARs not listed)

OP-204	AP-510	EOP-2
OP-607		EOP-6
	AI-505	EOP-13
SP-321		EOP-14

SHIFT TURNOVER

A. Initial Conditions:

1. Time in core life – 300 EFPD
2. Shift: ☒ Day ☐ Swing ☐ Mid
3. Rx power and power history – 100% for 40 days
4. Boron concentration – 1107 ppmb
5. Xenon – Equilibrium @ -2.4% $\Delta K/K$
6. RCS Activity - See Status Board

B. Tech. Spec. Action requirement(s) in effect:

- T.S. 3.5.2 Condition “A” for DHP-1A. Condition entered 12 hours ago.
- T.S. 3.8.1 Condition “A” for the OPT. Condition entered 8 hours ago.

C. Clearances in effect:

- DHP-1A for breaker fuse block replacement. Expected return to service in 4 hours.
- MUP-1A shaft replacement due to high vibration. Expected return to service in 24 hours.
- RWP-1 for impellor replacement. Expected return to service in 4 hours.
- Offsite Power Transformer oil leak. Expected return to service in 4 hours.

D. Significant problems/abnormalities:

- None.

E. Evolutions/maintenance for the on-coming shift:

- Perform SP-321, Enclosure 1 after turnover is complete.
- Continue power operations.
- Maintenance to continue work on DHP-1A, MUP-1A, RWP-1 and the OPT.

F. ROs walk down the main control boards and provide the crew with the following data:

RCS Average Temperature	_____	Make-up Tank Level	_____
RCS Pressure	_____	Turbine Load	_____
Pressurizer Level	_____	Turbine Reference	_____

2/6

Target Quantitative Attributes – Scenario 2	Actual Attributes
1. Total Malfunctions (5-8)	8
2. Malfunctions after EOP entry (1-2)	2
3. Abnormal Events (2-4)	2
4. Major Transients (1-2)	1
5. EOPs entered requiring substantive actions (1-2)	2
6. EOP contingencies requiring substantive actions (0-2)	1
7. Critical Task (2-3)	2

***Examination Setup/Execution
Scenario 2***

INITIAL CONDITIONS

- A. "Restore" the simulator to IC# 62 developed for this SES.
- B. "Unfreeze" the simulator and ensure the following configuration is setup:
None
- C. "Freeze" the simulator and "Execute" NRCEXAM Lesson Plan:
1. "Start" Lesson Plan #31 – (NRC #2)
- D. "Unfreeze" the simulator and "Trigger" Setup Step(s) which will:
See Simulator lesson plan
- E. Tag out the following equipment:
1. Place CIT on DHP-1A C/S in Normal After Stop
2. Place CIT on MUP-1A C/S in Normal After Stop
3. Place CITs on MUPs-2A, 3A, 4A and 5A
3. Place CIT on RWP-1 C/S in Normal After Stop.
4. Place CITs on breakers 4900, 4902, 3211 and 3212.
- F. Additional Modifications required to the IC.
1. Ensure SPDS selected to NORM/IMB and history traces cleared and history trace selected. Also ensure "A" and "B" SPDS are properly selected for RCS Loops and Primary instruments selected.
2. Ensure that PICS computer is started in the "SECURE PICS" mode and the CNO/SSO/STA computer are logged onto PICS using "examuser".
3. Ensure SPDS on CNO/SSO/STA computers displaying correct data for IC.
4. Ensure Group 59 indicative of current reactor power.
5. Acknowledge computer and annunciator alarms.
6. Ensure proper PICS groups displayed on overhead screens.
- G. Freeze the simulator and notify the lead examiner.

Booth Operator Examination Steps

A. **EVENT #1 – Normal Evolution – SP-321, Enclosure 21**

B. **EVENT #2**

When directed or after the completion of SP-321, fail EF-98-LT.

[Trigger Step #1: "A" EFIC Train EFT Level low]

C. **EVENT #3 & #4**

When directed or once TS for the EFT level transmitter is addressed initiate a loss of Gland Steam due to GSV-6 failing closed caused by a faulty pressure controller.

[Trigger Step #2: Loss GS, GSV-6 & 38 Fail closed, Vacuum Leak, ARP-1A Trip]

When GSV-8 is opened, GSV-38 fails closed simulating a steam leak at GSS-11 (Gland Steam Strainer #11), causing a loss of sealing steam and vacuum decreases.

[Conditional on GSV-8 amber light]

Role Play: Once GSV-8 is opened contact the Control Room as the SPO and report discovery of a steam leak at GSS-11 (GS to "A" LP turbine generator end seal). The seal is at a negative pressure.

When directed or at ~97% power ARP-1A trips as vacuum lowers.

[Conditional on Rx power < 97%]

Note: ARP-1B fail to start is part of the Setup step(s).

D. **EVENT #5**

When directed or at 95% power ULD demand fails as is.

[Trigger Step #3: ULD demand fails as is]

E. **EVENT #6**

When directed or at 90% power a ~40 gpm "A" SGTR develops.

[Trigger Step #4: OTSG Tube Leak, 40 gpm]

F. **EVENT #7**

When directed or at 70% power two MSIVs close and the tube leak increases to ~280 gpm. Vacuum degradation increases.

[Trigger Step #5: Two MSIVs close, tube leak increase to 280 gpm, vacuum lost (tube leak increase and loss of vacuum conditional on Rx power $\leq 10\%$)]

Role Play: If contacted as the SPO to perform EOP-14 Enclosure 1 wait ~23 minutes and report completion.

[Trigger Step #6]

5/6

Role Play: If contacted as the PPO to perform EOP-14 Enclosure 2 wait ~15 minutes and report completion.

[Trigger Step #7]

G. EVENT #8 & #9

When crew attempts to open RCV-14 to minimize SCM RCV-14 will not open. When the PORV is opened the valve fails open.

Note: RCV-14 failure is conditional based on Rx power and was triggered during the setup step.

Note: RCV-10 failure is conditional based on PORV switch position and was triggered during the setup step.

Facility: Crystal Unit #3Scenario No.: 3 (NRC)Op-Test No.: 1

Examiners: _____

Operators: _____

Initial Conditions: The plant is at 60% power. Power decrease in progress to perform trouble shooting on the "B" MFWP governor.

Turnover: The following equipment is OOS: DHP-1A (12 hours); MUP-1A (12 hours); RWP-1 (24 hours). All required surveillances have been completed. Substation personnel in switchyard (Unit 5 breaker maintenance).

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N (RO)	Continue power decrease to approximately 50% power. (OP-204)
2	1	I (SRO)	MS-112-PT fails low. SRO TS determination. (TS 3.3.11)
3	2	C (RO)	"B" MFWP governor fails as the plant is brought through the feedwater MBVs. (OI-09)
4	3	I (RO)	Selected turbine header pressure transmitter fails high over 2 minutes. (OP-501)
5	4	C (BOP)	SW leak into the RW system. (AP-330)
6	5	R (RO)	Turbine remains in manual. Rapid power reduction required for <i>FWP-2A oil</i> leak. (AP-510)
7	6	M (ALL)	"A" OTSG steam leak in containment. (EOP-2, EOP-5)
8	7	C (RO)	EFV-56 fails as is. [CT]
9	8	C (BOP)	"B" Train RBIC fails to actuate automatically/manually and MUV-258 fails to close. [CT]

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

NUREG-1021, Draft Rev. 9

#3

Narrative Summary:

Plant is initialized at 60% power. Power decrease is in progress to perform trouble shooting on the "B" MFWP governor.

After power decrease is commenced MS-112-PT, the "B" OTSG pressure transmitter for the "C" EFIC Channel, fails low resulting in a Half-Trip of both "A" and "B" EFIC Trains for EFW, MSLI and MFWI. TS 3.3.11 Condition A and D are entered per Table 3.3.11-1. The CNO/PPO should be directed to bypass the "C" EFIC cabinet and contingency actions should be formulated. Once the channel is bypassed the EFIC Half-Trip can be reset.

When required TS actions are addressed the power decrease should continue. When FWV-29, "B" MBV, leaves its open seat the "B" MFWP governor will fail 20% open. The RO may attempt manual control of the MFWP (not effective) and control valves to restore MFW flow. If control valves are used the MBV will freeze in position due to >10% flow error. This will result in a FW overfeed and subsequent plant trip. The RO should immediately obtain permission to trip the "B" MFWP. Use of the RCS spray valve will be required. AP-545 will be entered and additional actions taken per the AP.

Once the "B" MFWP is secured, the EFIC MFW isolation switches selected to BOTH, and the plant is stable the selected turbine header pressure transmitter will fail high over 3 minutes. The Turbine, SG/RX and associated TBVs must be taken to manual. The TBV should be closed. OP-501 is utilized to select the alternate transmitter. The TBVs and the turbine can now be placed back in automatic.

An SW leak into the SW heat exchanger occurs. AP-330 is entered and actions taken. The leak is sized such that the crew will be able to exercise the majority of the steps in the AP and isolate the leak.

After the leak is isolated the SPO will report an un-isolable oil leak on FWP-2A. When the power reduction is started, per AP-510, the turbine will not respond in automatic. The turbine must be taken to manual and the power reduction resumed. When the plant reaches < 12% reactor power the turbine will be tripped.

When the turbine is tripped a steam leak on the "A" OTSG will occur. This will require a reactor trip and entry into EOP-2.

When the "A" OTSG is isolated an EFIC actuation will occur, if it hasn't already, due to the loss of both MFWPs. EFV-56 (EFP-2 to "A" OTSG control valve) will fail as is (open). Both channels of EFIC must be taken to manual permissive and the associated block valve closed. (CT)

The "B" Train RBIC fails to actuate automatically. MUV-258 fails to close. Manual isolation of MUV-258 is required. (CT) The operator may elect to manually actuate "B" Train RBIC or manually actuate components. A manual RBIC will not cascade up to LPI and HPI. The SRO and BOP should discuss which option to take. Either option is acceptable.

This scenario may be terminated when ES actions have been taken and EFW flow has been controlled.

Procedures used: (ARs not listed)

OP-204	AP-510	EOP-2
OP-501	AP-330	EOP-5
	AP-545	EOP-13
	AI-505	EOP-14

SHIFT TURNOVER

A. Initial Conditions:

1. Time in core life – 300 EFPD
2. Shift: ☒ Day ☐ Swing ☐ Mid
3. Rx power and power history – 60%, previously 100% for 40 days
4. Boron concentration – 1125 ppmb
5. Xenon – Equilibrium @ -2.4% $\Delta K/K$
6. RCS Activity - See Status Board

B. Tech. Spec. Action requirement(s) in effect:

- T.S. 3.5.2 Condition “A” for DHP-1A. Condition entered 2 hours ago.

C. Clearances in effect:

- DHP-1A for breaker fuse block replacement. Expected return to service in 4 hours.
- MUP-1A shaft replacement due to high vibration. Expected return to service in 24 hours.
- RWP-1 for impellor replacement. Expected return to service in 4 hours.

D. Significant problems/abnormalities:

- FWP-2B governor oscillations.

E. Evolutions/maintenance for the on-coming shift:

- Continue power decrease to approximately 50% power and shutdown FWP-2B.
- Maintenance to continue work DHP-1A, MUP-1A and RWP-1.
- Substation personnel are in the switchyard doing routine maintenance on Unit 5 breakers.

F. ROs walk down the main control boards and provide the crew with the following data:

RCS Average Temperature	_____	Make-up Tank Level	_____
RCS Pressure	_____	Turbine Load	_____
Pressurizer Level	_____	Turbine Reference	_____

G. Required Emergency Plan Implementation

- ☐ Full Implementation, including all required notifications.
☐ Initial/upgrade classifications - internal notifications.
☒ None

Target Quantitative Attributes – Scenario 1	Actual Attributes
1. Total Malfunctions (5-8)	8
2. Malfunctions after EOP entry (1-2)	2
3. Abnormal Events (2-4)	3
4. Major Transients (1-2)	1
5. EOPs entered requiring substantive actions (1-2)	2
6. EOP contingencies requiring substantive actions (0-2)	2
7. Critical Task (2-3)	3

**Examination Setup/Execution
Scenario 3**

INITIAL CONDITIONS

- A. "Restore" the simulator to IC# 63 developed for this SES.
- B. "Unfreeze" the simulator and ensure the following configuration is setup:
1. None
- C. "Freeze" the simulator and "Execute" NRCEXAM Lesson Plan:
1. "Start" Lesson Plan #32 – (NRC #3)
- D. "Unfreeze" the simulator and "Trigger" Setup Step(s) which will:
- See Simulator lesson plan
- E. Tag out the following equipment:
1. Place CIT on DHP-1A
 2. Place CIT on MUP-1A C/S in Normal After Stop
 3. Place CITs on MUPs-2A, 3A, 4A and 5A
 4. Place CIT on RWP-1 C/S in Normal After Stop.
- F. Additional Modifications required to the IC.
1. Ensure SPDS selected to NORM/IMB and history traces cleared and history trace selected. Also ensure "A" and "B" SPDS are properly selected for RCS Loops and Primary instruments selected.
 2. Ensure that PICS computer is started in the "SECURE PICS" mode and the CNO/SSO/STA computer are logged onto PICS using "examuser".
 3. Ensure SPDS on CNO/SSO/STA computers displaying correct data for IC.
 4. Ensure Group 59 indicative of current reactor power.
 5. Acknowledge computer and annunciator alarms.
 6. Ensure proper PICS groups displayed on overhead screens.
- G. Freeze the simulator and notify the lead examiner.

Booth Operator Examination Steps

A. EVENT #1 – Normal Evolution – Power decrease

B. EVENT #2

When directed or soon after the power decrease is started input the failure of MS-112-PT.

[Trigger Step #1: MS-112-PT fail low]

Role Play: When contacted as the PPO to bypass the “C” EFIC Channel wait about 3 minutes then trigger the step.

[Trigger Step #2: “C” EFIC Channel bypass]

C. EVENT #3

“B” MFWP governor failure is conditional on FWV-29 leaving its open seat. This malfunction is in the setup step.

D. EVENT #4

When directed or after the plant has been stabilized input the header pressure transmitter failure.

[Trigger Step #4: Selected TB header PT fail high and EHC pulser fail to work in ICS/Auto]

E. EVENT #5

When directed or after the plant has been stabilized input the SW leak.

[Trigger Step #5: SW leak into SWHE-1A]

Role Play: When contacted as the PPO to rotate the SWHEs per AP-330 wait three to five minutes and report that SWHE-1A has been isolated.

[Trigger Step #6: Remove SW leak into SWHE]

F. EVENT #6

When directed or after AP-330 has been exited then:

[Turbine failure is included in setup step and conditional on SW Surge Tank alarm]

Role Play: Report as the SPO that there is an oil leak on the “A” MFWP. State that the leak is about 2 gallons a minute and there is no way to isolate it.

G. EVENT #7, 8 & 9

“A” OTSG steam leak, EFV-56 failure as is, “B” Train RBIC fail to actuate and MUV-258 failure to close.

[Failures included in setup step(s)]

Role Play: If contacted as the SPO to perform EOP-14 Enclosure 1 wait ~23 minutes and report completion.

[Trigger Step #7]

Role Play: If contacted as the PPO to perform EOP-14 Enclosure 2 wait ~15 minutes and report completion.

[Trigger Step #8]

Facility: Crystal Unit #3Scenario No.: 4 (NRC)Op-Test No.: 1

Examiners: _____

Operators: _____

Initial Conditions: The plant is at 100% power.

Turnover: The following equipment is OOS: EDG-1A (6 hours); MUP-1A (12 hours). RWP-1 has vibration in the alert range but is available. CFT-1B pressure is high and needs to be vented after turnover. All required surveillances have been completed. Substation personnel in switchyard (Unit 5 breaker maintenance).

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N (BOP)	Vent CFT-1B. (OP-401)
2	1	C (BOP) C (SRO)	RWP-2B trips. (OI-09) SRO TS determination. (TS 3.8.1)
3	2	I (RO)	Selected "A" OTSG level transmitter slowly fails high / SASS module will not transfer. (OP-501)
4	3	C (BOP) C (SRO)	"A" ES Bus is lost due to troubleshooting activities associated with the "A" EDG breaker. (AP-770) SRO TS determination. (TS 3.0.3)
5	N/A	R (RO)	Manual power decrease. (AP-510)
6	4	C (RO) R (RO)	RCP-1D sheared shaft. Manual runback and FW re-ratio required. (AP-545)
7	5	C (RO)	ASV-27 malfunction. Loss of both MFWPs. (OI-09)
8	6	M (ALL)	Turbine fails to trip. [CT] (EOP-2)
9	7	C (BOP)	EFP-3 diesel trips after start.
10	8	C (BOP)	ASV-5 fails to open. [CT] (EOP-4)

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Narrative Summary:

Scenario #4

Plant is initialized at 100% power. RWP-2B is running due to vibration in the alert range for RWP-1. CFT-1B needs to be vented after turnover is complete.

After CFT-1B is vented RWP-2B fails due to an SW leak into its oil cooler. RWP-2A is started and runs normally. SW is isolated to RWP-2B's oil cooler. TS 3.7.9 Condition A and TS 3.8.1, required Action B2 are now applicable.

Once ITS actions are addressed SP-1A-LT2 ("A" OTSG Operating Range Level transmitter) slowly fails high. SASS does not transfer and the RO must take manual control of the "A" MFWP, at a minimum. Additional stations may be taken to manual to place the unit in TRACK. After the plant is stable OP-501 will be used to select a good level transmitter. Due to an internal SASS module failure the transfer of control to the alternate transmitter is unsuccessful. "A" Train MFW must continue to be controlled in manual.

The "A" 4160V ES bus is lost due to troubleshooting activities associated with the "A" EDG breaker. A relay technician has shorted out the over current relay for the bus and it will take approximately four hours to repair. RWP-1 should be started and monitored. AP-770 will be entered and additional actions taken, including MUP recovery. (CT) TS 3.8.9 and TS 3.0.3 (loss of both safety related RWPs) are now applicable. A plant shutdown should be started using AP-510.

At approximately 80% power RCP-1D experiences a sheared shaft. Since the breaker will not open a manual runback is required. The operator may elect to open RCP-1D's breaker to initiate an automatic plant runback. MFW must still be controlled and re-ratioed in manual. AP-545 will be entered.

Once the plant is stabilized the plant shutdown should continue. A few minutes later ASV-27 experiences a control malfunction. Both MFWPs will start oscillating and MFW flows will be erratic. The decision should be made to trip the reactor and MFWPs and allow EFW to control flow to the OTSGs. The MFWPs will trip within 3 minutes if the decision to trip the reactor has not been made.

After the reactor trip the turbine will fail to trip. The RO will close all MSIVs (CT) per the Immediate Actions of EOP-2. The BOP should trip the MFWPs (if not already tripped) and verify the EFW actuation. A symptom scan will be performed after the Immediate Actions of EOP-2 have been verified by the SRO and RO.

EFP-3 diesel will overspeed and trip after EFW is initiated. ASV-5 will not open when commanded by EFIC. The BOP should attempt to open ASV-5. (CT) The BOP may attempt to open ASV-204 however this valve will only open approximately 2% (amber light) and will not pass sufficient steam for EFP-2 to operate. The SRO may elect to enter EOP-4 at this time or may wait until symptoms are apparent.

The scenario may be terminated when FWP-7 is started and controlled EFW flow to each OTSG is achieved.

Procedures used: (ARs not listed)

OP-401	AP-510	EOP-2
OP-501	AP-770	EOP-4
		EOP-13
	AI-505	EOP-14

SHIFT TURNOVER

A. Initial Conditions:

1. Time in core life – 300 EFPD
2. Shift: ☒ Day ☐ Swing ☐ Mid
3. Rx power and power history – 100% for 40 days
4. Boron concentration – 1107 ppmb
5. Xenon – Equilibrium @ -2.4% $\Delta K/K$
6. RCS Activity - See Status Board

B. Tech. Spec. Action requirement(s) in effect:

- T.S. 3.8.1 Condition B entered 6 hours ago for EDG-1A. SP-321 completed 5 hours ago.

C. Clearances in effect:

- EDG-1A for troubleshooting breaker 3209 spurious trip. Expected return to service in 4 hours.
- MUP-1A shaft replacement due to high vibration. Expected return to service in 24 hours.

D. Significant problems/abnormalities:

- RWP-1 was shutdown due to excessive vibration. RWP-1 is available but should not be run until further evaluation.

E. Evolutions/maintenance for the on-coming shift:

- Vent CFT-1B due to high pressure from nitrogen addition after turnover is complete.
- Maintenance to continue work on Breaker 3209 and MUP-1A.
- Substation personnel are in the switchyard doing routine maintenance on Unit 5 breakers.

F. ROs walk down the main control boards and provide the crew with the following data:

RCS Average Temperature	_____	Make-up Tank Level	_____
RCS Pressure	_____	Turbine Load	_____
Pressurizer Level	_____	Turbine Reference	_____

G. Required Emergency Plan Implementation

- ☐ Full Implementation, including all required notifications.
☐ Initial/upgrade classifications - internal notifications.
☒ None

Target Quantitative Attributes – Scenario 1	Actual Attributes
1. Total Malfunctions (5-8)	8
2. Malfunctions after EOP entry (1-2)	2
3. Abnormal Events (2-4)	3
4. Major Transients (1-2)	1
5. EOPs entered requiring substantive actions (1-2)	2
6. EOP contingencies requiring substantive actions (0-2)	2
7. Critical Task (2-3)	3

Examination Setup/Execution
Scenario 4

INITIAL CONDITIONS

- A. "Restore" the simulator to IC# 64 developed for this SES.
- B. "Unfreeze" the simulator and ensure the following configuration is setup:
None
- C. "Freeze" the simulator and "Execute" NRCEXAM Lesson Plan:
1. "Start" Lesson Plan #33 -- (NRC #4)
- D. "Unfreeze" the simulator and "Trigger" Setup Step(s) which will:
See Simulator lesson plan
- E. Tag out the following equipment:
1. Place CIT on EDG-1A start pushbutton
2. Place CIT on Breaker 3209 C/S
3. Place CIT on MUP-1A C/S in Normal After Stop
4. Place CITs on MUPs-2A, 3A, 4A and 5A
5. Place Caution Tag on RWP-1 C/S in Normal After Stop stating that the pump has high vibrations
- F. Additional Modifications required to the IC.
1. Ensure SPDS selected to NORM/IMB and history traces cleared and history trace selected. Also ensure "A" and "B" SPDS are properly selected for RCS Loops and Primary instruments selected.
2. Ensure that PICS computer is started in the "SECURE PICS" mode and the CNO/SSO/STA computer are logged onto PICS using "examuser".
3. Ensure SPDS on CNO/SSO/STA computers displaying correct data for IC.
4. Ensure Group 59 indicative of current reactor power.
5. Acknowledge computer and annunciator alarms.
6. Ensure proper PICS groups displayed on overhead screens.
- G. Freeze the simulator and notify the lead examiner.

Booth Operator Examination Steps

A. EVENT #1 – Normal Evolution – Vent CFT-1B per OP-401

B. EVENT #2

When directed or after venting CFT-1B input the failure on RWP-2B.

[Trigger Step #1: SW cooler leak on RWP-2B]

Role Play: If contacted as the PPO to investigate the pump trip wait about 1 minute and report water coming from the motor cooler area. Recommend isolating SW to the motor. Estimate flow at about 30 gpm.

If directed to isolate SW to RWP-2B

[Trigger Step #2: SW isolation to RWP-2B motor cooler]

If directed to open the DC knife switch for RWP-2B breaker

[Trigger Step #3: Open RWP-2B DC knife switch]

C. EVENT #3

When directed or once RWP-2A has been started and TS actions addressed input the “A” OTSG level transmitter failure.

[Trigger Step #4: SP-1A-LT2 (“A” OTSG LT) fail high over 3 minutes and internal SASS failure]

D. EVENT #4

When directed or after the plant has been stabilized with FW in manual input the over-current fault on the “A” ES 4160V bus.

[Trigger Step #5: Over-current fault on the “A” ES 4160V bus]

Role Play: Shortly after insertion of the failure contact the control room as a Relay Tech and report you shorted out part of the over-current sensing equipment (CTs) while troubleshooting the EDG breaker causing the trip of breaker 3211. Some relays and wiring damaged and estimate at least 4 hours to repair.

Role Play: If contacted as the PPO to check out RWP-1 report that the pump appears to be okay.

Role Play: If contacted as the PPO to energize MUV-62 and MUV-69 wait about 2 minutes and report completion.

[Trigger Step #6: Energize MUV-62 and MUV-69]

Role Play: If contacted as the PPO to manually open MUV-73 wait about 2 minutes and report completion.

[Trigger Step #7: Open MUV-73]

Role Play: If contacted as the PPO to DE-energize MUV-62 and MUV-69 wait about 2 minutes and report completion.

[Trigger Step #8: DE-Energize MUV-62 and MUV-69]

E. EVENT #5 – Normal Evolution – Manual power decrease

F. EVENT #6

When directed or after MUP-1C is operating, TS has been addressed and a power decrease is started insert the RCP-1D shaft failure. *Don't insert above about 85% power or a reactor trip will probably occur.*

[Trigger Step #9: RCP-1D shaft shear]

G. EVENT #7

When directed or after the runback is complete and FW re-ratioed insert the ASV-27 malfunction.

[Trigger Step #10: ASV-27 malfunction, MFWPs trip 2 minutes later]

Role Play: If contacted as the SPO to check out ASV-27 then acknowledge. Do not report back as the plant will trip within 3 minutes.

H. EVENT #'s 8, 9 & 10

Turbine fails to trip, EFP-3 diesel trip on overspeed, ASV-5 fails as is, ASV-204 fails at 2%

[Failures included in setup step(s)]

Role Play: If contacted as the SPO to perform EOP-14 Enclosure 1 wait ~23 minutes and report completion.

[Trigger Step #11]

Role Play: If contacted as the PPO to perform EOP-14 Enclosure 2 wait ~15 minutes and report completion.

[Trigger Step #12]