Facility: _Cook Plant Unit 1 & Unit 2_ Scenario No.: COOK08-03 Op-Test No.: Sets 1, & 2

Examiners: _____ Operators: _____
_____ _____
_____ _____

Initial Conditions: IC-35 (960), MOL; 78% power, 1135 ppm Boron, 8 GWD, 567°F Tave
CBD @ 194 steps, 818 MW.

Turnover: West CTS Pump has been out of service for 5 hours for breaker refurbishment.

Event No.	Malf. No.	Event Type*	Event Description
1		N-BOP	Perform Pressurizer Heater Capacity Test for 21PHC Heaters **Note: Direct BOP to Perform**
2	RCR20 @ 6	C-RO TS	PRZ PORV (NRV-153) Leak by (6 gpm) **NOTE: Time compression may be used as the procedure requires a 15 minute wait time after unisolating each PORV.**
3		R-RO	Raise Turbine and Reactor Power
4	RX05A @ 0	I-RO TS	Controlling Pressurizer Level Channel (NLP-151) fails LOW
5	FW41A to 100%	I-BOP	Hotwell Level Transmitter CLC-10 fails HIGH.
6	RX24C to 100% Ramp over 10 sec	C-BOP	FRV-220 Feedwater Control Valve Controller Fails OPEN in Auto
7	RC23B @ 40 5 min ramp	M-ALL	SGTR on #22 SG (400 gpm)
8a	RP10A RP11C	C-RO	Train A Safety Injection signal failure to actuate in AUTO or Manual mode (PRZ panel only)
8b	RP10B RP11B RP11D	C-RO C-BOP	Train B Safety Injection signal failure to actuate in AUTO or Manual mode

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

Event 1 occurs as the crew is directed to perform Pressurizer Heater Capacity Test prior the power escalation.

Note: Time compression may be used during Event 2 as the procedure requires a 15 minute wait time after unisolating each PORV.

Event 2 occurs following the Pressurizer Heater Test. Pressurizer PORV NRV-153 drifts partially open. The crew will need to close Block valve (NMO-153) to stop NRV-153 leakage. Crew will be required to address PORV Technical Specifications.

Event 3 begins after the Pressurizer PORV failure. The crew is directed to begin raising power to 100%.

Event 4 occurs following a short power escalation. The controlling Pressurizer Level channel NLP-151 fails LOW. Charging flow control valve (QRV-251) opens to raise charging flow which causes actual pressurizer level to rise. Pressurizer water level low control alarm comes in, a letdown isolation occurs, all pressurizer heaters will de-energize. The RO will need to take manual control of the Pressurizer Level controller and restore level. The crew should implement an Abnormal Operating Procedure, stabilize the plant, trip bistables, select an operable channel, and restore level control to auto.

Event 5 occurs when Hotwell Level Transmitter CLC-10 fails HIGH. The high failure will cause the Condensate Makeup valve (CRV-55) to fully close and the Condensate Letdown Valve (CRV-155) to fully open causing a lowering of hotwell level. The BOP will be required to take manual control of the Hotwell Level Controller and return hotwell level to a normal band. The nonfailed hotwell level input may be selected for subsequent auto control.

Event 6 is the failure of the controller for #22 SG Feed Reg Valve to 100% in AUTO. The BOP will be required to take manual control of FRV-220 and return SG level to the normal band. The controller will NOT be able to be placed back in AUTO.

Event 7 – 8 (Major Event) involves a Steam Generator Tube Rupture. The SGTR will build in to 400 gpm over 5 minutes. The crew will perform a Reactor Trip and Safety Injection. As the crew performs the actions of E-0, Safety Injection signal will fail to AUTO actuate. Train A Safety Injection can be actuated only from the SIS panel switch. The crew should identify the Steam Generator Tube Rupture on #22 SG. The crew will transition to E-3 to isolate #22 SG. The scenario will terminate when the crew has completed the cooldown, depressurization, and terminated SI.

Critical Tasks

Manually actuate at least one train of SI before completion of E-0, Step 5.
Isolate #22 Steam Generator
Cooldown RCS
Depressurize RCS to stop #22 SGTR leakage

Procedures

E-0, Reactor Trip or Safety Injection
E-3, Steam Generator Tube Rupture

Op-Test No.: Sets 1, & 2 Scenario No.: COOK08-03 Event No.: 1

Event Description: **Perform Pressurizer Heater Capacity Test**

Time	Position	Applicant's Actions or Behavior
	US	Directs the performance of 02-OHP-4030-STP-040, Pressurizer Heater Capacity Test on Train A – 21PHC (Step 4.2)
	BOP	1. Verifies Group C Heater Breakers are Open 2. Checks Supply transformer breaker Closed and verifies 0 amps. 3. Closes the Heater Breakers and records current.
	BOP	Place the heaters in position directed by SRO.

Op-Test No.: Sets 1, & 2 | Scenario No.: COOK08-03 | Event No.: 2

Event Description: **PRZ PORV (NRV-153) Leak by (3 gpm)**

Time	Position	Applicant's Actions or Behavior
	RO	Recognizes Ann. Panel 208, Drop 24, PRESSURIZER PORV DISCH TEMP HIGH which is indicative of PZR PORV leakage.
Note:	**Procedure 02-OHP-4022-002-009 is written to identify the leaking valve and isolate it. The crew may determine that the Acoustic Monitor provides indication as to which valve is leaking and so may directly isolate the applicable PORV.** **Time compression may be used as the procedure requires a 15 minute wait time after unisolating each PORV. If required Provides indications to the Crew the Indications remain the same for PORV NRV-151 & NRV-152**	
	US	May Direct operator action per 02-OHP-4022-002-009, Leaking PORV: • Manually close All PORV Block valves • Reopen Block Valves and Monitor PRT/Temperatures to determine which PORV is Leaking.
	RO	Performs actions as directed by US: • Closes PORV Block Valves as directed. • Monitors PORV Discharge Temperatures • Monitors PRT.
Note:	**The crew may elect to implement 02-OHP-4022-002-020, Excessive Reactor Coolant Leakage.**	
	US	May Direct operator action per 02-OHP-4022-002-020, RCS Leakage: • Check PRZ Level and adjust Charging as required. • Check VCT Level • Determine RCS Leakrate • Check PRZ PORV and Safety Valve Leakage
	US	Refers to TS LCO: • TS 3.4.11 Pressurizer Power Operated Relief Valves (PORVs). Condition A1 Closes Block Valve 2-NMO-153 within 1 hour with power maintained to block valve. May Refer to TS (LCO): • TS 3.4.13, RCS Operational LEAKAGE, if leak is not isolated.
	RO	Monitors PRZ pressure control system and ensures pressure remains at normal conditions (~2235 psig).

Op-Test No.: Sets 1, & 2 Scenario No.: COOK08-03 Event No.: 3

Event Description: **Raise Turbine Load/Reactor Power to 100%**

Time	Position	Applicant's Actions or Behavior
	RO	Calculates the dilution required per 02-OHP-4021-005-002, Attachment 9, Boration or Dilution Volume Determination.
	RO	Briefs crew on reactivity plan for power escalation.
	US	Reviews reactivity plan.
	US	Directs RO to commence Power Escalation in accordance with 02-OHP-4021-001-006.
	RO	Performs DILUTION: batch add OR Continous: • Place RC Makeup Blend control switch in STOP • Place RC Makeup Blend Control Mode switch in DILUTE or ALT DILUTE • Set desired batch on BA batch controller • Place RC Makeup Blend control switch in START
	RO	Commences escalation: • Raises turbine load (reactor power) using the DCS HMI. • Maintains Tave/Tref deviation within limits by dilution and turbine load adjustments. • Ensures Axial Flux Difference (AFD) is maintained within target band by manual control rod movement as needed.
	BOP/RO	Acts as peer checker for RO during blender operations and RO verifies appropriate reactivity feedback.
	BOP	Monitors and maintains main electrical generator temperatures within limits per: • 02-OHP-4021-059-001, Generator Stator Cooling Water System • 02-OHP-4021-080-003, Generator Hydrogen Gas System

Op-Test No.: Sets 1, & 2 Scenario No.: COOK08-03 Event No.: 4

Event Description: **Pressurizer Level Channel (NLP-151) Fails Low**

Time	Position	Applicant's Actions or Behavior
	RO	Recognizes and reports annunciators on Panel #208 (Drops 4 and 5) indicative of a pressurizer (PRZ) level instrument failure.
	RO	Places 2-QRV-251, Charging Flow Controller OR PRZ Level Controller to manual and manually adjusts output to restore charging header flow and seal injection to normal.
	US	Enters and directs actions of 02-OHP-4022-013-010, Pressurizer Level Instrument Malfunction procedure.
	RO/BOP	Performs the following actions as directed: 1. Restores PRZ level using 2-QRV-251 or level controller 2. Reports 2-NLP-151 has failed 3. Ensures PRZ level control is in manual 4. Places PRZ Level CTRL selector switch in Ch 2 & 3 position 5. Places PRZ Level REC selector switch in 2 or 3 position 6. Restore Letdown per 02-OHP-4021-003-001 7. Cycle PRZ Heaters to restore control 8. Nulls and returns 2-QRV-251 and PRZ Level Controller back to auto
	US	Initiates actions to trip bistables associated with 2-NLP-151 PZR Level Failure per Attachment A of 02-OHP 4022.013.010.
	US	Refers to TS (LCO): • TS 3.3.1, Reactor Trip System (RTS) Instrumentation (Table 3.3.1-1) o Function 9, *Pressurizer Water Level - High.* Condition D • TS 3.3.3 Post Accident Monitoring (Minimum channels are met). • TS 3.3.4 Remote Shutdown Instrumentation. Condition A

Op-Test No.: Sets 1, & 2 Scenario No.: COOK08-03 Event No.: 5

Event Description: **Hotwell Level Transmitter CLC-10 fails High**

Time	Position	Applicant's Actions or Behavior
	BOP	Acknowledges and reports alarms on Ann. Panel 216 as applicable: • Drop 2, CONDENSER A HOTWELL LEVEL LOW • Drop 12, CONDENSER B HOTWELL LEVEL LOW • Drop 22, CONDENSER C HOTWELL LEVEL LOW
	BOP	Identifies that Hotwell level controller CLC-10 is failed as indicated by: • Condensate Makeup valve (CRV-55) fully closed • Condensate Letdown Valve (CRV-155) fully open • Lowering of hotwell level on CLC-30
	US/BOP	Places Hotwell level control in manual and lowers controller output to close the Condensate Letdown Valve & open the Makeup valve.
	BOP	Performs one of the following: • Maintains Hotwell level in manual **-OR-** • Selects CLC-30 as the controlling channel and places controller back to Auto.

Op-Test No.: Sets 1, & 2 Scenario No.: COOK08-03 Event No.: 6

Event Description: **FRV-220 Feedwater Control Valve Controller Fails Open in Auto**

Time	Position	Applicant's Actions or Behavior
	BOP	Acknowledges and reports Ann. Panel 213, Drop 32, STEAM GEN 2 WATER LVL HI DEVIATION., which is indicative of the Feedwater Control Valve Controller Failure.
	US/BOP	Places 2-FRV-220 in manual and lowers controller output to match feed/steam flows and return SG 22 level to program.
	BOP	Maintains SG 22 level near program with 2-FRV-220 in manual.

Op-Test No.: Sets 1, & 2 | Scenario No.: COOK08-03 | Event No.: 7/8

Event Description: **SGTR on #22 SG**
Automatic SI Failure

Time	Position	Applicant's Actions or Behavior
	RO/BOP	Perform the following: • Recognizes and reports excessive charging flow demand as indicated by: o Lowering Pressurizer level o Lowering Pressurizer pressure o PRZ level deviation alarm • Recognize SG leakage based on RMS alarm on 2905 (SJAE) monitor.
	US	May enter and direct operator actions per 02-OHP-4022-002-020, Excessive RCS Leakage (or 02-OHP-4022-002-021 SG Tube Leakage): • Raise charging flow and isolate letdown • Start the second CCP • Maintain VCT level
	RO	Recognizes and reports RCS leak rate greater than the capacity of charging pump **-OR-** unable to maintain Pressurizer level/VCT level
	US	Directs RO/BOP to manually trip the reactor and perform the immediate actions of E-0, Reactor Trip or Safety Injection (based on RCS leak rate beyond charging system capability, may also initiate SI).
	US	Directs RO/BOP to perform the immediate actions of E-0, Reactor Trip or Safety Injection.
	RO/BOP	Performs the immediate actions of E-0: 1. Checks reactor trip 2. Checks turbine trip 3. Checks power to AC emergency buses 4. Checks safety injection status (Manually initiate if required)
	US	Ensures immediate actions of E-0 are completed
	RO/BOP **Critical Task #1**	**Check Safety Injection Actuated:** • **Manually Actuate SI (Train A)** **-OR-** • **Manually Start ECCS Equipment and Actuate Phase A (Train B)**
	RO/BOP	Check Systems in Proper Emergency Alignment: • Manually align Train B ECCS equipment for SI per E-0, Attachment A
	US	Directs subsequent actions of E-0: • Directs BOP to isolate AFW flow to SG #22 when NR Level > 13%.
	RO/BOP	Performs manual actions of Attachment A in E-0 as directed by US.

Op-Test No.: Sets 1, & 2 Scenario No.: COOK08-03 Event No.: 7/8

Event Description: **SGTR on #22 SG**
Automatic SI Failure

Time	Position	Applicant's Actions or Behavior
	US	Completes all actions of E-0 through step 18 (Check If SG Tubes Are Intact).
	US	Announces transition to E-3, Steam Generator Tube Rupture (step 18 of E-0).
	US	Directs actions of E-3, Steam Generator Tube Rupture.
	US/BOP	Identifies SG #22 as ruptured
	US/BOP **Critical Task #2**	**Manually closes the following valves for SG #22:** • **2-FMO-221, TDAFP Discharge (may be performed in E-0, Step 8)** • **2-FMO-222, MDAFP Discharge (may be performed in E-0, Step 8)** • **2-MRV-220, SG Stop Valve** • **2-MRV-221, SG Stop Valve Dump Valve** • **2-MRV-222, SG Stop Valve Dump Valve** • **2-MRV-223, PORV** • **2-MCM-221, TDAFP Steam Supply** **Note: The following should be checked closed (Not Critical)** • 2-FRV-220, Feedwater Reg. Valve • 2-FMO-202, Feedwater Isolation Valve • 2-DCR-320, Blowdown Isolation Valve • 2-DCR-302, Blowdown Sample Valve
	BOP	Closes 2-DRV-407, SG Stop Valve Drain Valve
	US/BOP **Critical Task #3**	**Directs RCS Cooldown to required core exit temperature:** **_____°F**
	RO/BOP **Critical Task #3**	**Commence cooldown at maximum rate using Manual Steam Dump Operation –OR- INTACT (3) SG PORVs** **Monitor RCS Thermocouple readings for target temperature** **Stop RCS cooldown when TCs < required temperature:** **_____°F**
	US	Directs operator action to maintain TCs < required temperature (provide band)

Op-Test No.: Sets 1, & 2 Scenario No.: COOK08-03 Event No.: 7/8

Event Description: **SGTR on #22 SG**
Automatic SI Failure

Time	Position	Applicant's Actions or Behavior
	RO/BOP	Performs the following as directed: • Resets SI and Containment Isolation Phase A • Establish Control Air to Containment • Stop RHR Pumps
	US **Critical Task #4**	**Directs RCS Depressurization to minimize break flow:** • **Normal spray if RCPs are running**
	RO **Critical Task #4**	**Commence depressurization using Normal Spray as directed:** • **Monitor RCS pressure, PRZ level, and RCS Subcooling** • **Stop RCS depressurization based upon:** **(Criteria Used):**_____
	US	Check if ECCS flow should be terminated
	US/RO	Terminate Safety Injection: • Stop Both SI Pumps • Stop 1 CCP • Isolate BIT
	US/RO	Establish normal charging flow
	US	Verify ECCS flow NOT required
TERMINATE SCENARIO		

Task	Elements	Results
#1 **Manually Actuate/Align one train of Safety Injection**	**Cueing:** • **Check SI Actuated "Safety Injection Actuated" Status Light LIT (E-0, Step 5.a)** **-OR-** • **Check BOTH CCP leakoff valve "Safety Injection Signal" white lights - LIT** **Performance Indicators:** **Before transitioning from E-0:** • **Manually Actuate SI (Train A)** **-OR-** • **Manually Start ECCS Equipment and Actuate Phase A (Train B)** **Performance Feedback:** • **ECCS flow is indicated to at least one train (as indicated by flow on cold leg BIT injection flowmeters)** • **One Train of Phase A Isolation is complete per E-0 Attachment A** .	**SAT / UNSAT**

#2
 	
Isolates Flow To and From The Ruptured Steam Generator
	Cueing:
	• **Isolate Flow From Ruptured SG (E-3, Step 3)**
	• **If Ruptured SG … Then Close AFW Valves to Affected SG (E-0, Step 7.b.3), RNO)**
	• **Check Feed Flow To Ruptured SG Isolated (E-3, Step 4.b)**
	
	Performance Indicators:
	Prior to RCS cooldown to preclude transition to ECA-3.1, Loss of Reactor Coolant –Subcooled Recovery Desired:
	• **Isolates SG22:**
	  o **Manually Closes SG PORV**
	  o **Trips SG 22 Stop Valve closed**
	  o **Closes SG 22 Stop Valve dump valves**
	  o **Isolates TDAFP Steam Supply from SG #22**
	  o **Isolates AFW to #22 SG when level is > 13%**
	
	Performance Feedback:
	• **Stable or rising pressure in the ruptured SG.**
	• **No feedwater flow to the ruptured SG.**
		SAT / UNSAT

Task	Elements	Results
#3 **Establishes and Maintains RCS Target Temperature**	**Cueing:** • **Initiate RCS Cooldown (E-3, Step 7)** **Performance Indicators:** **Performs RCS cooldown, establishes and maintains CETC temperatures below target temperature. Temperature must be maintained within limits to prevent transition from E-3 due to either:** • **Loss of subcooling (high temp.)** • **CSF transition (low temp.)** **Performance Feedback:** • **RCS temp. less than target temp.**	**SAT / UNSAT**
#4 **Depressurize RCS**	**Cueing:** • **Depressurize RCS Using Normal Spray… (E-3, Step 17)** **Performance Indicators:** **Depressurizes RCS using PRZ Spray (NRV-163 & NRV-164):** • **Final RCS conditions must meet SI termination criteria** • **Ruptured SG inventory remains below 44ft. (RCLSG2)** **Performance Feedback:** • **RCS pressure lowering** • **PRZ level rising**	**SAT / UNSAT**

Setup:

1. Reset to IC- 35 (960), MOL; 78% power, 1135 ppm Boron, 8 GWD, 567°F Tave, CBD @ 194 steps, 807 MW.
2. Reset control rods and check group step counters
3. Place Master Annunciator Silence pushbutton lockout ring in LOCKOUT position
4. Advance chart recorder paper & clear chart recorder memory
5. Update PPC Chart Recorders VCT 20-70, PWR 70 - 100%, Tave/Tref 565-575°F
6. Activate the following remote function to place West CTS Pump OOS:
   - CSR08 **IRF CSR08**
7. Place RED clearance tags on the following switches positioned as indicated:
   - West CTS Pump C/S - PTL
8. Go to **RUN** and acknowledge/clear alarms
9. Verify/Activate the following (pre-load) malfunctions:
   - RP10A **RP10A,** Train A Safety Injection fails to AUTO actuate
   - RP10B **RP10B,** Train B Safety Injection fails to AUTO actuate
   - RP11B **RP11B,** Train B Safety Injection fails to MANUAL actuate (SIS)
   - RP11C **RP11C,** Train A Safety Injection fails to MANUAL actuate (PRZ)
   - RP11D **RP11D,** Train B Safety Injection fails to MANUAL actuate (PRZ)

Scenario:

EVENT #1

No Additional Actions

EVENT #2

After the crew has performed the Pressurizer Heater Test Insert the following:

- **IRF RCR20,** Pressurizer PORV (NRV-153) Leak by of 6 gpm

RCR20

EVENT #3

No Additional Actions

EVENT #4

After appropriate power change, insert the following:

- **IMF RX05A,** Pressurizer Level Channel 1 (NLP-151) fails LOW

RX05A

If directed to trip bistables for NLP-151 use:

Override ZLOSTMC2[6] to ON to simulate opening cabinet door

ZLOSTMC2[6]

(Override Lights/Relays – RX Flux panel)

Remote		Bistable
RPR041	RPR041	**LS-459A**

Override ZLOSTMC2[1] to ON to simulate lifting Test Rack

ZLOSTMC2[1]

Delete Override ZLOSTMC2[6] to simulate closing cabinet Door

ZLOSTMC2[6]

EVENT #5

IMF FW41A, Final Value **100,** to fail Hotwell Level Transmitter (CLC-10) High

FW41A

EVENT #6

IMF RX24C, Final Value **100,** Ramp Time **10 sec**, to fail Feedwater Control Valve (FRV-220) OPEN in AUTO.

RX24C

EVENT #7 - 9

IMF RC23B, Final Value **40**, Ramp Time **5 min**, to cause a 400 gpm SGTR on SG22

RC23B

If contacted as Radiation Protection, report that the requirements of 12-THP-6010-RPP-706, Gaseous Monitor Alarm Response have been met.

If contacted as Chemistry to evaluate SG Blowdown sample line activity per 12-THP-4030-002-208, Primary to Secondary Leakage – report back after some delay that leakage appears to be > 50 GPM on the #22 SG.

Local actions after entry into E-0:

- Locally stop U2 Ice Condenser AHUs MRF **CHR01** to OFF

  CHR01

- Place PACHMAS in service – MRF **CHR02 or 03** with 10 min delay.

  CHR02 OR CHR03

  (both have 10 minute delay built in)

- U1 has aligned CR vent for U2 SI, Fan **2-HV-AS-1** is running.

If directed to secure EDG jacket water pumps select **OFF** then **AUTO**

Remote	**OFF**	**AUTO**
EGR 03A	EGR03A	EGR03A
EGR 03B	EGR03B	EGR03B
EGR 04A	EGR04A	EGR04A
EGR 04B	EGR04B	EGR04B