

Facility: Cook Plant Unit 1 & Unit 2Scenario No.: COOK04-01Op-Test No.: Set 1Examiners: _____

_____Operators: _____

Initial Conditions: IC-26 (933), BOL2: 78% power, 4 GWD, 1079 ppm Boron, Xenon building in, U2 Aux steam

Turnover: Thunderstorm Warning with 2CD EDG OOS; Shift Hotwell Pumps then Raise power to 99%.

Event No.	Malf No.	Event Type*	Event Description
1		N	Start South Hotwell pump and Stop North Hotwell Pump
2		R	Raise Reactor Power and Turbine Load
3	RX05A @ 0	I-RO	Controlling Pressurizer Level Channel (NLP-151) fails LOW
4	RX17F @ 1200	I-BOP	#22 SG Pressure Instrument (MPP-222) fails HIGH
5	CC01A CC02B	C-RO	East CCW pump trips on overcurrent West CCW pump fails to AUTO start
6	SW07A	C-BOP	Main Turbine Oil Cooler Controller (WRV-970) fails LOW
7	RC01B @ 50	M	RCS Loop 2 Large Break LOCA
8	RP07A RP07B	C-BOP	Both trains of Main Steamline Isolation fails to AUTO actuate
9	RP16A RP16B	C-RO	Both trains of CTS/Phase B isolation fails to AUTO actuate

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

Summary

The scenario starts with the plant at 78% power. The crew is directed to start the South Hotwell Pump and shutdown the North Hotwell Pump. After the Hotwell pumps have been swapped, the crew is required to raise power to 99% for continued operations.

The first event will involve the controlling Pressurizer Level channel instrument (NLP-151) failing LOW. This results in charging flow rising, pressurizer level rising, pressurizer heaters OFF, and letdown isolation. RO will be required to restore normal letdown and charging flow conditions. Crew will be required to implement AOP actions to stabilize the plant and trip Bistables.

The second event will involve the #22 SG Pressure instrument (MPP-222) failing HIGH. This will result in the opening of #22 SG PORV (MRV-220) releasing steam to the atmosphere. BOP will be required to manually close the #22 SG PORV. Crew will be required to implement AOP actions to stabilize the plant, trip bistables, and declare #22 SG PORV Radiation Monitor Inoperable.

The third event will involve an overcurrent trip of the East CCW pump with failure of the West CCW pump to AUTO start. This will result in a loss of CCW flow until the West CCW pump is started. RO will be required to manually start the West CCW pump.

The fourth event will involve the Main Turbine Oil Cooler Controller failing LOW in AUTO. This will result in the loss of adequate cooling to the Main Turbine Oil Cooler and temperature alarms. BOP will be required to take manual control of WRV-970 and restore temperature control to the Main Turbine Oil Cooler.

The main event will involve a RCS Loop 2 LBLOCA. The unit will trip and a Safety Injection will actuate. The CTS/Phase B and the Main Steamline Isolation circuits will fail to automatically actuate requiring manual actuations. The crew will transition from E-0 to E-1. A transition may be made to FR-P.1 but the crew will return to E-1 and then to ES-1.3. The scenario will terminate when the crew has aligned RHR and CTS to the containment sump.

Critical Tasks

Initiate Containment Spray/Phase B Isolation
Transfer to Cold Leg Recirculation

Procedures

E-0, Reactor Trip or Safety Injection
E-1, Loss of Reactor or Secondary Coolant
ES-1.3, Transfer to Cold Leg Recirculation

(Rev. 1, 1/18/2004)

Op-Test No.: Set 1 Scenario No.: Cook 04-01 Event No.: 1 Page 1 of 11Event Description: **Swap Hotwell Pumps (Start South and Stop North)**

Time	Position	Applicant's Actions or Behavior
	US	Directs actions of 02-OHP 4021.054.001, Attachment 2, Operation of Hotwell (HW) and Condensate Booster (CB) Pumps to start the South and stop the North HW pumps.
	BOP	Performs the following to swap HW pumps as directed: <ol style="list-style-type: none"> 1. Places the following switches in neutral: <ul style="list-style-type: none"> · Standby CB pump · Standby TACW pump 2. Starts the South HW pump 3. Monitors HW discharge pressure and flow 4. Directs AEO to close South HW pump disch vent valve (2-C-117S) 5. Directs AEO to close South HW pump Seal Quench throttle valve (2-C-119S) 6. Stops the North HW pump 7. Directs AEO to open North HW pump disch vent valve (2-C-117N) 8. Directs AEO to throttle North HW pump seal package quench valve (2-C-119N) 9. Places the following control switches in auto: <ul style="list-style-type: none"> · Standby CB pump · Standby TACW pump · Standby Hotwell pump
	US	Directs the following actions to realign condensate system: <ul style="list-style-type: none"> · Start the South HW pump · Stop the North HW pump · Notify chemistry of condensate system configuration change.

Op-Test No.: Set 1 Scenario No.: Cook 04-01 Event No.: 2 Page 2 of 11Event Description: **Raise Turbine and Reactor Power (If required)**

Time	Position	Applicant's Actions or Behavior
	RO	Calculates primary water addition per 02-OHP 4021.005.001, Attachment 6, 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: <ul style="list-style-type: none"> ▪ Place RC Makeup Blend control switch to STOP ▪ Place RC Makeup Blend Mode switch in DILUTE ▪ Set desired batch on PW batch controller ▪ Place PW pump in RUN ▪ Place RC Makeup Blend control switch in START
	RO	Commences power escalation: <ul style="list-style-type: none"> · Raises turbine load (reactor power) using the load limiter. · 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.
	US	Acts as reactivity manager by peer checking RO during blender operations and by verifying appropriate reactivity feedback.
	BOP	Monitors and maintains main electrical generator temperatures within limits per: <ul style="list-style-type: none"> · 02-OHP 4021.059.001, Generator Stator Cooling Water System · 02-OHP 4021.080.003, Generator Hydrogen Gas System

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	<p>Performs the following actions as directed:</p> <ol style="list-style-type: none"> 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	<p>Refers to Tech Specs (TS):</p> <ul style="list-style-type: none"> • TS 3.3.1.1 <u>RTS Instrumentation</u> (Table 3.3-1, *Action 7) • TS 3.3.3.5 <u>Remote Shutdown Instrumentation</u> • TS 3.3.3.6 <u>Post Accident</u> (Minimum channels met) <p>*Identifies requirement to trip associated bistables within 1 hour of pressurizer level channel failure.</p>

Op-Test No.: Set 1 Scenario No.: Cook 04-01 Event No.: 4 Page 4 of 11Event Description: **SG Pressure Channel MPP-222 Fails HIGH**

Time	Position	Applicant's Actions or Behavior
	BOP	Recognizes and reports annunciators on Panel #214 which are indicative of a steam generator #22 water level control / pressure instrument failure (Drop 22).
	BOP	Verifies SG 22 MFW Reg. Valve controlling level in AUTO (44%) Places SG 22 PORV (2-MRV-223) in MANUAL and closes valve
	US	Enters and directs actions of 02-OHP 4022.013.012, Steam Generator Pressure Instrument Malfunction procedure.
	BOP	Performs the following actions as directed: <ol style="list-style-type: none"> 1. Verifies SG 22 level at program 2. Verifies SG 22 PORV closed 3. Verifies MFP ΔP controller proper operation in AUTO 4. Reports 2-MPP-222 has failed
	US	Initiates actions to trip bistables associated for 2-MPP-222 per Attachment B-3 of 02-OHP 4022.013.012. Declares rad monitor 2-MRA-2701 inoperable
	US	Refers to the following Tech Specs (TS): <ul style="list-style-type: none"> · TS 3.3.2.1 <u>ESFAS Instrumentation</u> (Table 3.3-3, *Action 14) · TS 3.3.3.1 <u>Radiation Monitoring Instrumentation</u> (Table 3.3-6) · TS 3.3.3.6 <u>Post Accident</u> (Minimum channels met) · TS ATR LEFM-1 <u>EIS Event</u> (OHP-4021-011-001) *Identifies requirement to trip associated bistables within 1 hour of steam pressure channel failure.

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Event Description: **2E CCW Pump Trips (Standby 2W CCW Pump Fails to Auto Start)**

Time	Position	Applicant's Actions or Behavior
	RO	Recognizes and reports CCW annunciators on Panel #204 indicative of CCW pump trip (Drops 84, 93).
	RO	Recognizes and reports that running (2E) CCW pump has tripped and standby (2W) CCW pump failed to auto start.
	RO	Manually starts 2W CCW pump in accordance with CCW ARPs. (NOTE: May attempt 1 restart of 2E CCW pump per ARP.)
	US	May refer to the actions of 02-OHP-4022.016.001, CCW Malfunction procedure.
	RO	Performs the following 02-OHP-4022.016.001 actions if directed: <ol style="list-style-type: none"> 1. Ensures at least one CCW pump is running 2. Checks CCW surge tank level stable 3. Checks CCW flow to RCPs normal 4. Checks CCW Hx outlet temperature normal
	US	Declares 2E CCW Pump inoperable and refers to Tech Spec 3.7.3.1, <u>Component Cooling Water System</u> . Enters action statement to restore 2E CCW pump to operable status within 72 hours (or be in HSB within next 6 hrs and CSD within following 30 hrs).

Op-Test No.: Set 1 Scenario No.: Cook 04-01 Event No.: 6 Page 6 of 11Event Description: **Main Turbine Oil Cooler Controller (WRV-970) fails LOW**

Time	Position	Applicant's Actions or Behavior
	BOP	Recognizes and reports Main Turbine annunciators on Panel #218 indicative of oil temperature problem (Drops 9).
	BOP	Recognizes and reports that 2-WRV-970 failed CLOSED in AUTO.
	US	Enters annunciator response action, and directs operator actions to place 2-WRV-970 controller to manual and restore cooling.
	BOP	Takes manual control of 2-WRV-970 and stabilizes MT temperatures.
	US	Directs operator to monitor turbine temperatures for signs of bearing damage.

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Event Description: **RCS Loop 2 Large Break LOCA; MSLI actuation failure to AUTO actuate; CTS/Phase B Isolation failure to AUTO actuate.**

Time	Position	Applicant's Actions or Behavior
	US	Recognizes automatic reactor trip/safety injection and directs RO/BOP to perform the immediate actions of E-0, Reactor Trip and Safety Injection.
	RO/BOP	Perform 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
	US	Ensures immediate actions of E-0 are completed
	RO/BOP	Reviews E-0 Foldout Page Criteria.
	US	Directs subsequent actions of E-0.
	<u>RO</u> Critical Task #1	Performs the following actions as directed: <ul style="list-style-type: none"> • Checks CTS actuated - NO • Checks cntmt isol phase B actuated – NO • Manually Actuate CTS/Phase B • Stops all RCPs (May be stopped when RCS Pressure <1300 psig) • Verifies CEQ fans running • Verifies CEQ fan suction dampers open • Verifies CEQ fan CCW valves open • Dispatches operator to locally secure ice condenser AHUs • Starts all hydrogen igniters (after AHUs are secure)
	BOP	Manually Isolate the Steam Lines
	BOP	Manually controls AFW flow to maintain SG narrow range levels 13% [24%] - 50% once one SG narrow range level is > 13% [24%].

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Event Description: **RCS Loop 2 Large Break LOCA; MSLI actuation failure to AUTO actuate; CTS/Phase B Isolation failure to AUTO actuate.**

Time	Position	Applicant's Actions or Behavior
	RO	Checks all ECCS pumps running
	BOP/RO	Obtains Attachment A of E-0 and performs the following: <ul style="list-style-type: none"> • Places 2-HV-ACRF-1, (non-running) control room pressurization fan in stop • Places 2-HV-ACR-DA-1, c/r vent intake damper to ISOL • Places cntmt hydrogen sample bypass switches to bypass: <ul style="list-style-type: none"> · Train A · Train B
	CREW	Completes all actions of E-0 through step 23 (Check If RCS Is Intact).
	US	Announces transition to E-1, Loss Of Reactor Or Secondary Coolant (at step 23 of E-0).
	RO/BOP	Reviews E-1 Foldout Page Criteria (see NOTE regarding cold leg switchover criteria).
<p>NOTE: When RWST level lowers to < 25% then the crew must immediately Transition to ES-1.3, Transfer To Cold Leg Recirculation. See Page 10 of 13 for applicants actions or behavior associated with ES-1.3, Transfer To Cold Leg Recirculation.</p>		
	US	Directs actions of E-1, Loss Of Reactor Or Secondary Coolant.
	Crew	Enter FR-P.1, Imminent Pressurized Thermal Shock Condition if conditions are met.
	US	Determines that FR-P.1 is not applicable after verifying RCS Pressure is <300 psig and RHR heat exchanger flow is >400 gpm
	US	Returns to E-1 step in effect.

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Event Description: **RCS Loop 2 Large Break LOCA; MSLI actuation failure to AUTO actuate; CTS/Phase B Isolation failure to AUTO actuate.**

Time	Position	Applicant's Actions or Behavior
	BOP	Maintains SG narrow range levels 26% - 50%.
	RO	Check if ECCS flow should be reduced (No PZR Level).
	RO/BOP	Performs the following as directed: <ol style="list-style-type: none"> 1. Resets both trains of Safety Injection 2. Stops running Emergency Diesel Generators (EDGs) 3. Dispatches operator to secure EDG jacket water pumps
	RO/BOP	Performs the following as directed <ol style="list-style-type: none"> 1. Check cold leg recirculation capability 2. Check Auxiliary Building conditions NORMAL
	US	Check if transfer to cold leg recirculation is required (RWST <25%) NOTE: When RWST level is less than 25%, then transition to ES-1.3

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Event Description: **RCS Loop 2 Large Break LOCA; MSLI actuation failure to AUTO actuate; CTS/Phase B Isolation failure to AUTO actuate.**

Time	Position	Applicant's Actions or Behavior
<p><u>Applicants actions or behavior associated with</u> ES-1.3, Transfer To Cold Leg Recirculation.</p>		
	US	Announces transition to ES-1.3, Transfer To Cold Leg Recirculation when RWST level < 25% per: <ul style="list-style-type: none"> • E-0, Foldout Page, Criteria 3 • E-1, Foldout Page, Criteria 5 • E-1, Step 13
	US	Directs actions of ES-1.3,. Transfer To Cold Leg Recirculation
	RO/BOP	Checks CCW return flow on each RHR Hx at 3000-3500 gpm.
	RO/BOP	Checks the following prior to switching over to cold leg recirc: <ul style="list-style-type: none"> • RWST level < 20% • Cntmt water level > MIN RECIRC LEVEL
	<u>US/RO</u> Critical Task #2	Directs/Performs switchover as follows: NOTE: If RWST level < 9% then stop CCPs and SI pumps. <ol style="list-style-type: none"> 1. Stops and lockout East CTS pump 2. Stops and lockout East RHR pump 3. Checks East CTS and East RHR pumps stopped 4. Initiates valve closure: <ul style="list-style-type: none"> • 2-IMO-310, East RHR pump suction • 2-IMO-215, East CTS pump suction from RWST 5. Stops and lockout West CTS pump 6. Stops and lockout West RHR pump 7. Checks West CTS and West RHR pumps stopped 8. Initiates valve closure: <ul style="list-style-type: none"> • 2-IMO-320, West RHR pump suction • 2-IMO-225, West CTS pump suction from RWST

Op-Test No.: Set 1 Scenario No.: Cook 04-01 Event No.: 7/8/9 Page 11 of 11

Event Description: **RCS Loop 2 Large Break LOCA; MSLI actuation failure to AUTO actuate; CTS/Phase B Isolation failure to AUTO actuate.**

Time	Position	Applicant's Actions or Behavior
	<p><u>US/RO</u></p> <p>Critical Task #2</p>	<p>Continues to direct/perform switchover as follows:</p> <p>9. Restores control power to 2-ICM-305, Recirc sump to east RHR/CTS pumps</p> <p>10. Checks 2-ICM-305 open interlock:</p> <ul style="list-style-type: none"> • 2-IMO-310 fully closed • 2-IMO-215 fully closed <p>11. Opens 2-ICM-305</p> <p>12. Starts:</p> <ul style="list-style-type: none"> • East RHR pump • East CTS pump <p>13. Restores control power to 2-ICM-306, Recirc sump to west RHR/CTS pumps</p> <p>14. Checks 2-ICM-306 open interlock:</p> <ul style="list-style-type: none"> • 2-IMO-320 fully closed • 2-IMO-225 fully closed <p>15. Opens 2-ICM-306</p> <p>16. Starts:</p> <ul style="list-style-type: none"> ▪ West RHR pump ▪ West CTS pump <p>17. Checks at least one RHR pump running on the recirc sump</p> <p>18. Resets CTS actuation</p> <p>19. Closes spray additive tank valves:</p> <ul style="list-style-type: none"> • 2-IMO-202, outlet valve • 2-IMO-204, outlet valve • 2-IMO-212, eductor supply valve • 2-IMO-222, eductor supply valve
<p><u>TERMINATE SCENARIO</u></p>		

**CRITICAL TASK SUMMARY
(COOK04-01)**

Task	Elements	Results
<p style="text-align: center;">#1</p> <p style="text-align: center;">Actuate Containment Spray</p>	<p><u>Cueing:</u> Containment pressure > 2.9 psig:</p> <ul style="list-style-type: none"> • CNTMT SPRAY ACTUATED alarm • LOWER CNTMT PRESS HI-HI alarm • E-0, step 5, Check CTS not required <p><u>Performance Indicators:</u></p> <ul style="list-style-type: none"> • Manually actuate or align: Train A CTS or Train B CTS. • One train of CTS must be in service prior to exceeding a Red Path on the Containment (Z) CSFST (containment pressure of 12 psig). <p><u>Performance Feedback:</u></p> <ul style="list-style-type: none"> • At least one train of Containment Spray is Operating • CTS Run Lights Lit and Amps Indicated • SLM-9A or SLM-9B Lights Lit as required 	<p style="text-align: center;">SAT / UNSAT</p>
<p style="text-align: center;">#2</p> <p style="text-align: center;">Establish Cold Leg Recirculation Flow</p>	<p><u>Cueing:</u> Switchover Criteria = RWST <25%</p> <ul style="list-style-type: none"> • E-0 Foldout Page, Criteria 3 (switchover criteria) • E-1 Foldout Page, Criteria 5 (switchover criteria) • E-1, Step 13, Check For Transfer To CL Recirc. <p><u>Performance Indicators:</u></p> <ul style="list-style-type: none"> • At least one train of RHR/CTS running aligned to the containment sump. • CTS and RHR pumps stopped for no longer than 5 minutes during switchover. • No total interruption of ECCS flow (CHG and SI) to the RCS during switchover. <p><u>Performance Feedback:</u></p> <ul style="list-style-type: none"> • At least one train of RHR/CTS pumps running / indicating flow with suction aligned to Recirc Sump. 	<p style="text-align: center;">SAT / UNSAT</p>

SIMULATOR INSTRUCTIONS (COOK04-01)

Setup:

1. Reset to IC 26 (933)
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
5. Set Up PPC Point (10 min Avg) and Chart Recorders
6. Start Data Collection Program Save to file _____
7. Go to **RUN** and acknowledge/clear alarms
8. Activate the following (pre-load) malfunctions:
 - **CC02B**, West CCW pump fails to AUTO start
 - **RP07A**, Train A Steamline Isolation fails to AUTO actuate
 - **RP07B**, Train B Steamline Isolation fails to AUTO actuate
 - **RP16A**, Train A CTS/Phase B Isolation fails to AUTO actuate
 - **RP16B**, Train B CTS/Phase B Isolation fails to AUTO actuate
9. Activate the following malfunctions to place **2CD EDG** OOS:
 - **IMF EG10B**
 - **IMF EG06B**
 - **IRF EGR14 RO**
 - **IRF EGR15 RO**
 - **IRF EGR02 RO**
 - **IOV AN01[64] CRYWOLF**
 - **IOV ZLO1012QTCD1 [GRN] OFF**
 - **IOV ZLO1012QTCD2 [GRN] OFF**

Place **RED** clearance tags on the following switches:

- **T21C3**
- **T21D8**
- **CB2DGTCD**
- **2-QT-106-CD1**
- **2-QT-106-CD2**

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SIMULATOR INSTRUCTIONS (COOK04-01)

Scenario Events:

Event #3

1. Trigger (1) **IMF RX05A**, final value **0** (NLP-151 fails LOW) after crew has raised power between 3 to 5%.

Event #4

2. Trigger (3) **IMF RX17F**, final value **1200** (MPP-222 fails HIGH) when crew has recovered from PZR level channel failure.

Event #5

3. Trigger (5) **IMF CC01A** (East CCW pump trip) when crew has recovered from SG Press channel failure.

Event #6

4. Trigger (7) **IMF SW07A** (WRV-970 fails LOW) after crew has recovered CCW flow.

Event #7

5. Trigger (9) **IMF RC01B**, final value **50** (RCS Loop 2 Large Break LOCA):
 - Main Steamline Isolation fails to AUTO actuate
 - CTS/Phase B Isolation fails to AUTO actuate
 -

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SIMULATOR INSTRUCTIONS (COOK04-01)

Response to Crew's Requests:

1. If directed, to trip bistables for **NLP-151** use:

IOV ZLOSTMC2[6] to ON to simulate opening CH 1 cabinet Door
(Override Lights/Relays – RX Flux panel)

Remote	Bistable
RPR041	LS/459A

IOV ZLOSTMC2[1] to ON to simulate lifting Test Rack
DOV ZLOSTMC2[6] to simulate closing cabinet Door

2. If directed, to trip bistables for **MPP-222** use:

IOV ZLOSTMC2[8] to ON to simulate opening CH 3 cabinet Door
(Override Lights/Relays – RX Flux panel)

Remote	Bistable
RPR102	PS/526C
RPR103	PS/526D

IOV ZLOSTMC2[3] to ON to simulate lifting Test Rack
DOV ZLOSTMC2[8] to simulate closing cabinet Door

3. If contacted as AEO or Maintenance to evaluate East CCW pump trip, report back after some 5 min. delay that motor is HOT and breaker has OC trip indication.
4. If contacted as AEO to investigate Main Turbine Operations, report back after some 3 min. delay that parameters are at the high end of the normal band but stable.

Facility: Cook Plant Unit 1 & Unit 2Scenario No.: COOK04-02Op-Test No.: Set 1

Examiners: _____

Operators: _____

Initial Conditions: IC-37 (935), MOL; 99% power, 967 ppm Boron, 8 GWD, Equilibrium Xenon

Turnover: Thunderstorm Warning with 2CD EDG OOS; Swap CB pumps; reduce power

Event No.	Malf. No.	Event Type*	Event Description
1		N	Start Middle CB pump and place North CB pump in standby
2		R	Lower reactor power and turbine load
3	Global 101BAP4	C-RO	Boric Acid Pump Trip when shifting to Fast Speed
4	RX20G @ 5E6	I-BOP	#24 SG Steam Flow Transmitter (MFC-140) fails HIGH
5	NI10B @ 200	I-RO	Power Range NI42 fails HIGH
6	MS16A @ 0	C-BOP	Main Turbine Steam seal controller (SRV-22) fails in AUTO
7	RC02C @ 40 2 min ramp	M	RCS Loop 3 SBLOCA (400 gpm)
8	RP03A RP03B	C-RO	AUTO/MANUAL Reactor trip actuation failure (ATWS)
9	RP10A RP10B	C-RO	AUTO Safety Injection actuation failure

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

Summary

The scenario starts with the plant at 99% power. The crew is directed to start the Middle Condensate Booster Pump and shutdown the North Condensate Booster Pump. After the Condensate Booster pumps have been swapped, the crew is required to lower power to 95% for Main Turbine Control Valve testing.

The first event will occur when the Boric Acid Pump shifts to Fast Speed. The Boric Acid pump will trip requiring the RO to Select the Standby Boric Acid pump to continue the boration and power reduction.

The second event will involve the #24 SG Steam Flow instrument (MFC-140) failing HIGH. This will result in the opening of #24 SG FWRV (FRV-240) to raise feedwater flow. BOP will be required to take manual control and regulate FRV-240. Crew will be required to implement AOP actions to stabilize the plant and trip bistables.

The third event will involve the Power Range N42 detector failing HIGH. This results in automatic control rod insertion. RO will be required to place the rod control switch in MANUAL and identify the failed channel. Crew will be required to implement AOP actions to stabilize the plant, trip Bistables, and defeat the failed channel.

The fourth event will involve the Main Turbine Steam Seal controller (SRV-22) failing in AUTO. This will result in the closing of the Steam Seal Spill valve (SRV-25) and the opening of the Steam Seal Pegging valve (SRV-22) causing a high pressure on sealing steam system. BOP will be required to take manual control, restore sealing steam.

The main event will involve a Failure of the RPS function (ATWS) with SBLOCA event. The reactor must be locally tripped and a manual Safety Injection will be required. The crew will implement FR-S.1 actions until reactor is subcritical. The crew will perform the actions of E-0, then transition to E-1. The scenario will terminate when the crew has transitioned to ES-1.2.

Critical Tasks

Insert Negative Reactivity
Manually actuate Safety Injection

Procedures

E-0, Reactor Trip or Safety Injection
FR-S.1, Response to Anticipated Trip without Scram
E-1, Loss of Reactor or Secondary Coolant

Op-Test No.: Set 1Scenario No.: Cook 04-02Event No.: 1Page 1 of 12Event Description: **Swap Condensate Booster Pumps (Start Middle and Stop North)**

Time	Position	Applicant's Actions or Behavior
	US	Directs actions of 02-OHP 4021.054.001, Attachment 2, Operation of Hotwell (HW) and Condensate Booster (CB) Pumps to start the Middle CB and stop the North CB pumps.
	BOP	Performs the following to swap CB pumps as directed: <ol style="list-style-type: none"> 1. Places the following switches in NEUTRAL: <ul style="list-style-type: none"> · Standby Hotwell pump · Standby TACW pump 2. Starts the Middle CB pump 3. Monitor Condensate flow > 2E6 4. Directs operator to close LP Heater Condensate Bypass valve 5. Places the following switches in AUTO: <ul style="list-style-type: none"> · Standby Hotwell pump · Standby TACW pump 6. Standby TACW pump 7. Stops the North CB pump
	US	Directs the following actions to realign condensate system: <ul style="list-style-type: none"> · Start the North CB pump · Stop the Middle CB pump · Notify chemistry of condensate system configuration change.

Op-Test No.: Set 1 Scenario No.: Cook 04-02 Event No.: 2 Page 2 of 12

Event Description: **Reduce Turbine Load / Reduce Reactor Power**

Time	Position	Applicant's Actions or Behavior
	RO	Calculates boric acid addition per 02-OHP 4021.005.001, Attachment 6, Boration or Dilution Volume Determination.
	RO	Briefs crew on reactivity plan for power reduction.
	US	Reviews reactivity plan.
	US	Directs RO to commence Power Reduction in accordance with 02-OHP 4021.001.003.
	RO	Performs BORATION batch add: <ul style="list-style-type: none"> ▪ Place RC Makeup Bend control switch in STOP ▪ Place RC Makeup Blend Control Mode switch in BORATE ▪ Set desired batch on BA batch controller ▪ Place RC Makeup Blend control switch in START
	RO	Commences power reduction: <ul style="list-style-type: none"> · Lowers turbine load (reactor power) using the load limiter. · Maintains Tave/Tref deviation within limits by boration and turbine load adjustments. Ensures Axial Flux Difference (AFD) is maintained within target band by manual control rod movement as needed.
	US	Acts as reactivity manager by peer checking RO during blender operations and by verifying appropriate reactivity feedback.
	BOP	Monitors and maintains main electrical generator temperatures within limits per: <ul style="list-style-type: none"> · 02-OHP 4021.059.001, Generator Stator Cooling Water System · 02-OHP 4021.080.003, Generator Hydrogen Gas System

Op-Test No.: Set 1Scenario No.: Cook 04-02Event No.: 3Page 3 of 12Event Description: **Boric Acid Pump Trip**

Time	Position	Applicant's Actions or Behavior
	RO	Recognizes and reports annunciators on Panel #209 Drops 37 and 39 (after a time delay) which are indicative of a Boric Acid Pump Trip.
	RO	Verifies that 2-QRV-400 closes and/or stops makeup.
	US	Directs operator actions per 02-OHP-4024 Drops 37 and 39. Directs RO to start Boric Acid Pump #3.
	US	Refers to Tech Specs: 3.1.2.2 <u>Flow Paths – Operating (may be referenced)</u> 3.1.2.6 <u>Boric Acid Transfer Pumps – Operating*</u> (*)Identifies requirement to restore Boric Acid Pump #4 (or EDG source to BA #3) within 72 hours of BA Pump #4 failure.

Op-Test No.: Set 1Scenario No.: Cook 04-02Event No.: 4Page 4 of 12Event Description: **SG #24 Main Steam Flow Transmitter (MFC-140) Fails High**

Time	Position	Applicant's Actions or Behavior
	BOP	Recognizes and reports annunciators on Panel #214 which are indicative of a steam flow instrument failure (Drop 41).
	BOP	Places 2-FRV-240, SG 24 MFW Reg. Valve controller to manual, lowers controller output to match feed flow with operable steam flow channel, and restores SG 24 level to program.
	US	Enters and directs actions of 02-OHP 4022.013.014, Steam Flow Instrument Malfunction procedure.
	BOP	Performs the following actions as directed: <ol style="list-style-type: none"> 1. Restores SG 24 level using manual control of 2-FRV-240 2. Places MFP ΔP controller in manual and maintains pressure 3. Reports 2-MFC-140 has failed 4. Places 2-FS-542C selector switch in channel 2 position 5. Nulls and returns 2-FRV-240 controller to AUTO 6. Returns MFP ΔP controller to auto
	US	Directs actions to trip bistables associated with 2-MFC-140 Steam Flow Failure per Attachment D-1 of 02-OHP 4022.013.014.
	US	Refers to Tech Specs: <ul style="list-style-type: none"> ▪ 3.3.1.1 <u>RTS Instrumentation</u> (Table 3.3-1, Action 7) ▪ 3.3.2.1 <u>ESFAS Instrumentation</u> (Table 3.3-3, Action 14*). (*)Identifies requirement to trip associated bistables within 1 hour of steam flow channel failure.

Op-Test No.: Set 1 Scenario No.: Cook04-02 Event No.: 5 Page 5 of 12Event Description: **Power Range NI42 fails HIGH.**

Time	Position	Applicant's Actions or Behavior
	RO	Recognizes and reports annunciators on Panel #210 which are indicative of a NI instrument failure (Drop 16, 18).
	US	Enters and directs actions of 02-OHP 4022.012.003, Continuous Control Bank Movement procedure.
	RO	Performs the following as directed: <ol style="list-style-type: none"> 1. Checks for no turbine runback 2. Ensures control rods are in manual with no rod motion 3. Checks rod position above low-low rod insertion limit 4. Checks axial flux difference (AFD) within target band 5. Initiates restoration of equilibrium conditions using either: <ul style="list-style-type: none"> • Control rod movement • Turbine load adjustment 6. Identifies failed power range channel
	US	Enters and directs actions of 02-OHP 4022.013.004, Power Range Malfunction procedure.
	US	Directs operator actions per 02-OHP-4022-013-004, Power Range Malf: <ul style="list-style-type: none"> Verify Rod Control switch in MANUAL Places Rod Stop Bypass selector in NI42 position Reduce turbine load to minimize Tave/Tref difference Remove NI42 channel from service
	RO/BOP	Performs actions as directed to remove NI-42 from service <ul style="list-style-type: none"> Place Channel Defeat selector to NI-42 Place Upper Section Channel Current Comparator Defeat Selector to NI-42 Place Lower Section Channel Current Comparator Defeat Selector to NI-42 Place Power Mismatch Bypass selector to NI-42 Verify Delta-T Recorder Selector NOT in Channel 2 Verify Overtemperature Delta-T Recorder Selector NOT in Channel 2 Restore Rod Control to Automatic

Op-Test No.: Set 1 Scenario No.: Cook04-02 Event No.: 5 Page 6 of 12Event Description: **Power Range NI42 fails HIGH.**

Time	Position	Applicant's Actions or Behavior
	US	Directs actions to trip bistables associated with NI-42 Power Range Malfunction per Attachment D of 02-OHP 4022.013.004.
	US	Refers to Tech Specs: <ul style="list-style-type: none">▪ 3.3.1.1 <u>RTS Instrumentation</u> (Table 3.3-1, Action 7) (*)Identifies requirement to trip associated bistables within 1 hour of channel failure.

Op-Test No.: Set 1Scenario No.: Cook 04-02Event No.: 6Page 7 of 12Event Description: **Main Turbine Steam Seal Controller (SRV-22) fails Low**

Time	Position	Applicant's Actions or Behavior
	BOP	Recognizes and reports Main Turbine annunciators on Panel #218 indicative of MT steam sealing problem (Drops 64).
	BOP	Recognizes and reports that 2-SRV-22 failed OPEN in AUTO and 2-SRV-25 failed CLOSED in AUTO.
	US	Enters annunciator response action: Directs operator actions to place 2-SRV-22 controller in manual and restore sealing steam.
	BOP	Takes manual control of 2-SRV-22 and stabilizes Steam Seal Pressure.
	US	Directs operator to monitor main condenser and turbine parameters for proper operation.

Op-Test No.: Set 1Scenario No.: Cook 04-02Event No.: 7/8/9Page 8 of 12

Event Description: **Small Break LOCA inside Containment
RPS Reactor Trip - Failure
Safety Injection Actuation – Auto Failure**

Time	Position	Applicant's Actions or Behavior
	RO/US	Determines that a loss of reactor coolant is occurring based on the following: <ul style="list-style-type: none"> · Pressurizer and VCT level change · Charging and letdown flow mismatch · Containment radiation monitoring trend · Containment pressure rise · Containment sump level rise
	US	Enters and directs actions of 02-OHP 4022.002.020, Excessive Reactor Coolant Leakage procedure.
	RO	Performs the following actions as directed: <ol style="list-style-type: none"> 1. Manually raises charging flow to maintain pressurizer level 2. Manually adjusts seal injection flow (6–12 gpm / each RCP) 3. Reduces/isolates letdown flow to maintain pressurizer level 4. Attempts to determine RCS leak rate
	US	Directs RO to manually trip the reactor and initiate safety injection. Directs RO/BOP to perform the immediate actions of E-0, Reactor Trip or Safety Injection (based on RCS leak rate beyond charging system capability per 02-OHP 4022.002.020).
	RO	Recognizes and reports failure of reactor to manually trip
	US	Directs actions of FR-S.1, Response to Nuclear Power Generation/ATWS: RO drive rods in manually BOP manually actuate AMSAC

Op-Test No.: Set 1 Scenario No.: Cook 04-02 Event No.: 7/8/9 Page 9 of 12Event Description: **Small Break LOCA inside Containment
RPS Reactor Trip - Failure
Safety Injection Actuation – Auto Failure**

Time	Position	Applicant's Actions or Behavior
	RO/BOP Critical Task #1	Performs the immediate actions of FR.S-1: 1. Checks reactor trip Manually insert control rods 2. Manually actuate AMSAC 3. Checks check Turbine Trip
	US	Ensures immediate actions of FR.S-1 are completed
	RO Critical Task #1	Initiate Emergency Boration of RCS (must Insert Negative Reactivity through Inserting Control Rods or Emergency Boration)
	US	Directs subsequent actions of FR.S-1: Local operation of reactor trip breakers or MG set output breakers Isolation of All Dilution paths Verify Reactor subcritical – WR log power < 5% & negative SUR
	US	Performs transition to 2-OHP-4023-E.0, Reactor Trip or Safety Injection (step 20 of FR.S-1)
	US	Ensures immediate actions of E-0 are completed
	RO/BOP	Report immediate actions complete and review foldout pages.
	RO/BOP Critical Task #2	Manually actuate Safety Injection signal

Op-Test No.: Set 1Scenario No.: Cook 04-02Event No.: 7/8/9Page 10 of 12

Event Description: **Small Break LOCA inside Containment
RPS Reactor Trip - Failure
Safety Injection Actuation – Auto Failure**

Time	Position	Applicant's Actions or Behavior
	BOP	Manually controls AFW flow to maintain SG narrow range levels 26% - 50% once one SG narrow range level is > 13%.
	RO/BOP	Performs verification of E-0 Attachment A actions as directed by US.
	CREW	Completes all actions of E-0 through step 23 (Check If RCS Is Intact).
	US	Announces transition to E-1, Loss Of Reactor Or Secondary Coolant (at step 23 of E-0).
	RO/BOP	Reviews E-1 Foldout Page Criteria.
	US	Directs actions of E-1, Loss Of Reactor Or Secondary Coolant.
	BOP	Restore SG narrow range levels >26%, but < 50%.
	US	Checks if SI Termination Criteria is MET: <ul style="list-style-type: none"> ▪ RCS Subcooling <36°F ▪ Secondary Heat Sink (SG >13% or AFW Flow >240x10³) ▪ RCS Pressure rising or stable ▪ Pressurizer Level >19%
	Crew	Transition to ES-1.1, Safety Injection Termination if criteria is met. (ES-1.1 Actions on Next Page. E-1 Actions Are Continued on the Last Page)

Op-Test No.: Set 1Scenario No.: Cook 04-02Event No.: 7/8/9Page 11 of 12

Event Description: **Small Break LOCA inside Containment
RPS Reactor Trip - Failure
Safety Injection Actuation – Auto Failure**

Time	Position	Applicant's Actions or Behavior
NOTE:		
Crew may transition to SI termination if criteria is met. This may involve stopping ECCS pumps and realigning charging until parameters change causing them to restart equipment and return to E-1 or ES-1.2. There are several points of transition to ES-1.2 from ES-1.1. The ES-1.1 Steps are listed below. The Scenario may be terminated upon transition to ES-1.2		
	US	Announces transition to ES-1.1, Safety Injection Termination (at step 6 of E-1).
	RO/BOP	Reviews ES-1.1, Foldout Page Criteria. Monitors RCS Subcooling >36°F and PZR Level >19%, if NOT realign ECCS and GO TO E-1
	US	Directs Actions of ES-1.1
	RO/BOP	Performs the following as directed: <ol style="list-style-type: none"> 1. Resets both trains of Safety Injection 2. Stops one Charging Pump. 3. Resets both trains of Phase A 4. Establishes Control Air to Containment
	CREW	Check if RCS Pressure is stable or Rising If Lowering, Transition to ES-1.2
	RO/BOP	Performs the following as directed: <ol style="list-style-type: none"> 1. Isolate BIT Injection 2. Establish Charging Flow
	CREW	Check if: <ul style="list-style-type: none"> ▪ Pressurizer Level is stable and ▪ RCS Pressure is Stable or Rising If NOT, Transition to ES-1.2

Op-Test No.: Set 1 Scenario No.: Cook 04-02 Event No.: 7/8/9 Page 12 of 12

Event Description: **Small Break LOCA inside Containment
RPS Reactor Trip - Failure
Safety Injection Actuation – Auto Failure**

Time	Position	Applicant's Actions or Behavior
E-1 Actions Continued		
	RO/BOP	Performs the following as directed: <ol style="list-style-type: none"> 1. Resets both trains of Safety Injection 2. Stops RHR pumps if RCS pressure is stable or rising 3. Stops running Emergency Diesel Generators (EDG) 4. Dispatches operator to secure EDG jacket water pumps 5. Opens control air valves to containment 6. Directs chemistry to initiate post accident sampling
	US	Announces transition to ES-1.2, Post LOCA Cooldown & Depressurization (step 12 of E-1).
<u>TERMINATE SCENARIO</u>		

**CRITICAL TASK SUMMARY
(COOK04-02)**

Task	Elements	Results
<p align="center">#1</p> <p align="center">Manually Trip Reactor</p>	<p><u>Cueing:</u></p> <ul style="list-style-type: none"> • Challenge to multiple reactor trip setpoints: <ul style="list-style-type: none"> · Low PRZ pressure reactor trip · Low PRZ pressure safety injection • RX TRIP BKR TRAIN A/B UV TRIP (ATWS) alarms <p><u>Performance Indicators:</u></p> <ul style="list-style-type: none"> • Insert Negative Reactivity through: Inserting Control Rods (Manually or Auto at >48 steps per minute) – OR - Emergency Boration • Must be performed prior to: <ul style="list-style-type: none"> · SG Dryout (<15% wide range level) · SRO Reaching Step 8 of FR-S.1 <p><u>Performance Feedback:</u></p> <p><u>RODS</u></p> <ul style="list-style-type: none"> • RPIs indicate rods - inserting • Rod bottom lights – lit • Neutron flux – lowering <p><u>BORATION (any one of following)</u></p> <ul style="list-style-type: none"> • Boration Flow QFI-420 > 44 gpm • IMO-910 or IMO-911 open • Boration Flow QFC-421 > 36 gpm 	<p align="center"><u>SAT / UNSAT</u></p>

**CRITICAL TASK SUMMARY
(COOK04-02)
continued**

Task	Elements	Results
<p style="text-align: center;">#2</p> <p>Manually Initiate Safety Injection</p>	<p><u>Cueing:</u></p> <ul style="list-style-type: none"> · Safety Injection Actuated Status Light – NOT LIT (E-0 step 4.a) · QMO-225 & QMO-226 Safety Injection Signal Lights – NOT LIT (E-0 step 4.b) · Check RCS Pressure < 1815 psig Flow: BIT - Flow Indicated (E-0, Step 4a RNO) <p><u>Performance Indicators:</u></p> <ul style="list-style-type: none"> · Manually Actuate at least one train of Safety Injection – OR - · Manually align pumps and valves to establish at least one train of high head safety injection flow. · Must be performed while in E-0 before transitioning. <p><u>Performance Feedback:</u></p> <ul style="list-style-type: none"> · BIT flow is indicated to at least one train (as indicated by flow on cold leg BIT injection flow meters) 	<p style="text-align: center;"><u>SAT / UNSAT</u></p>

SIMULATOR INSTRUCTIONS (COOK04-02)

Setup:

1. Reset to IC 37 (935)
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
5. Set Up PPC Point (10 min Avg) and Chart Recorders
6. Start Data Collection Program Save to file _____
7. Go to **RUN** and acknowledge/clear alarms
8. Activate the following (pre-load) malfunctions:
 - **RP03A**, Train A RPS Reactor Trip Breaker fails to open
 - **RP03B**, Train B RPS Reactor Trip Breaker fails to open
 - **RP10A**, Train A Safety Injection fails to AUTO actuate
 - **RP10B**, Train B Safety Injection fails to AUTO actuate

(continued on next page)

**SIMULATOR INSTRUCTIONS
(COOK04-02)**

Setup (Continued):

9. Activate the following malfunctions to place **2CD EDG** OOS:

- **IMF EG10B**
- **IMF EG06B**
- **IRF EGR14 RO**
- **IRF EGR15 RO**
- **IRF EGR02 RO**
- **IOV AN01[64] CRYWOLF**
- **IOV ZLO1012QTCD1 [GRN] OFF**
- **IOV ZLO1012QTCD2 [GRN] OFF**

Place **RED** clearance tags on the following switches:

- **T21C3**
- **T21D8**
- **CB2DGTCD**
- **2-QT-106-CD1**
- **2-QT-106-CD2**

10. Assign the following file to trigger **(9)**:

"boricacid4fast" (@ZLO101BAP4(2) == -1)

Boric Acid Pump #4 FAST speed light lit

(continued on next page)

SIMULATOR INSTRUCTIONS (COOK04-02)

Scenario Events:

Event #3

1. Trigger (9) **ICF 101BAP4**, triggered from Boric Acid Pump #4 FAST speed light lit using trigger file "boricacid4fast" (@ZLO101BAP4(2) == -1)

Event #4

2. Trigger (1) **IMF RX20G**, final value **5E6** (MFC-140 fails HIGH) after crew has swapped the Condensate Booster pumps.

Event #5

3. Trigger (3) **IMF NI10B**, final value **200** (NI42 fails HIGH), when crew has recovered from SG steam flow channel failure. Requires power reduction to < 85%.

Event #6

4. Trigger (5) **IMF MS16A**, final value **0** (MT Steam Seal controller fails LOW) after crew has lowered power by 3 to 5%.

Event #7

5. Trigger (7) **IMF RC02C**, final value **40** (Loop 3 RCS SBLOCA):
 - RPS Reactor Trip fails to AUTO actuate
 - Safety Injection fails to AUTO actuate
 -

(continued on next page)

SIMULATOR INSTRUCTIONS (COOK04-02)

Response to Crew's Requests:

1. If contacted as AEO to investigate Breaker 2-AB-A-1D for #4 boric acid Pump 2-PP-46-4, report that the breaker is tripped. Report that the Motor is hot and has a burnt electrical smell.

2. If directed, to trip bistables for **MFC-140** use:
IOV ZLOSTMC2[6] to ON to simulate opening cabinet Door
(Override Lights/Relays – RX Flux panel)

Remote	Bistable
RPR039	FS/542B
RPR035	FS/540A
RPR036	FS/540B

IOV ZLOSTMC2[1] to ON to simulate lifting Test Rack
DOV ZLOSTMC2[6] to simulate closing cabinet Door

3. If directed, to trip bistables for **NI-42** use:
IOV ZLOSTMC2[7] to ON to simulate opening cabinet Door
(Override Lights/Relays – RX Flux panel)

Remote	Bistable
RPR123	TS/421C
RPR124	TS/421D

IOV ZLOSTMC2[2] to ON to simulate lifting Test Rack
DOV ZLOSTMC2[7] to simulate closing cabinet Door

4. If contacted as AEO to investigate Main Turbine Operations, report back after some 3 min. delay that all parameters are at the high end of the normal band but stable.
5. When directed as AEO to locally trip reactor, wait 2 minutes then insert **IRF RPR145 RO** and **IRF RPR146 RO** to open trip breakers.

Facility: Cook Plant Unit 1 & Unit 2 Scenario No.: COOK04-03 Op-Test No.: Set 2

Examiners: _____ Operators: _____

Initial Conditions: IC-938, 62% power, 150 MWD, 830 ppm Boron

Turnover: Perform ESW Pump Strainer functional test

Event No.	Malf. No.	Event Type*	Event Description
1		N	Perform ESW pump strainer functional test
2	RX23B @ 2	I-BOP	#21 SG Level transmitter fails LOW
3	RCR20 @ 3 101NMO153	C-RO	PRZ PORV (NRV-153) Leak by (3 gpm) NMO-153 fails Partially OPEN
4		R	Reduce reactor power and turbine load for CSD
5	CV16A @ 100	I-RO	VCT Level Transmitter (QLC-451) fails HIGH
6	FW05B	C-BOP	West Main Feed Pump Trip
7	RC17C @ 95	M	PRZ PORV (NRV-153) fails OPEN
8	RP19C	C-RO	Train A K600 Relay failure: CCP to BIT Inlet valve (IMO-255) fails to Auto OPEN and 2CD EDG fails to start
9	RP10B RP11B RP11D	C-RO	Train B Safety Injection signal failure to actuate in AUTO or Manual mode

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

Summary

The Scenario starts with the plant at 62% power. The crew is directed to perform the ESW Pump Strainer functional test. After the ESW Pump Strainer test has been completed, the crew is required to respond to various events.

The first event will involve the #21 Steam Generator Level instrument (BLP-111) failing LOW. This results in a feedwater flow and Steam Generator level rise. BOP will be required to take manual control and restore normal level. Crew will be required to implement AOP actions to stabilize the plant and trip Bistables.

The second event will involve the Pressurizer PORV NRV-153 drifting partially open with the Block valve (NMO-153) failing to close. This will result in the loss of capability to stop NRV-153 leakage. Crew will be required to implement a power reduction to cold shutdown conditions.

The third event will involve the VCT Level instrument (QLC-451) failing HIGH. This will result in the VCT High Level alarm. RO will be required to perform a manual blend to RCS.

The fourth event will involve a trip of the West Main Feed Pump. This will result in a rapid power reduction to less than 60%. RO will be required to control reactivity while BOP lowers turbine load. Crew will be required to monitor plant conditions during power reduction.

The main event will involve the opening of NRV-153 to full open. A unit trip will be required. As the crew performs the actions of E-0, the Train B Safety Injection signal will fail to AUTO/MANUAL actuate. In addition, a K600 relay failure will prevent High Head Injection flow requiring manual actions to align the BIT. The crew will transition to E-1. The scenario will terminate when the crew has transitioned to ES-1.2 for Post LOCA cooldown.

Critical Tasks

Establish injection flow from at least one (1) high head ECCS pump
Stop all running RCPs when RCS pressure is below 1300 psig

Procedures

E-0, Reactor Trip or Safety Injection
E-1, Loss of Reactor or Secondary Coolant

Op-Test No.: Set 2 Scenario No.: Cook04-03 Event No.: 1 Page 1 of 9

Event Description: **Perform ESW pump strainer functional test (East ESW Pump in Service)**

Time	Position	Applicant's Actions or Behavior
	US	Directs the performance of 02-OHP-5030-019-001, ESW Pump Strainer Functional Check. Step 4.2.1
	BOP	<ol style="list-style-type: none"> 1. Place the Control Mode Switch for East ESW strainer to MANUAL 2. Shift Backwash Selector switch to opposite strainer and verify: Proper sequencing of strainer backwash indicating lights Minor lowering in ESW header pressure during backwash cycle 3. Shift Backwash Selector switch to opposite strainer and verify: Proper sequencing of strainer backwash indicating lights Minor lowering in ESW header pressure during backwash cycle
	BOP	Place the Control Mode switch to AUTO Verify local operator observed satisfactory equipment operation.

Op-Test No.: Set 2Scenario No.: Cook 04-03Event No.: 2Page 2 of 9Event Description: **#21 SG Level Channel BLP-111 Fails LOW**

Time	Position	Applicant's Actions or Behavior
	BOP	Recognizes failure of BLP-111 Low and reports associated alarms: Panel #213 Drops 3 and 5 – Level Low
	BOP	Verifies controller for 2-FRV-210 in manual, lowers controller output to match feed flow with steam flow and stabilizes SG 21 level, as required.
	US	Directs actions of 02-OHP 4022.013.013, Steam Generator Level Instrument Malfunction procedure.
	BOP	Performs the following actions as directed: 1. Restores SG 21 level to program (44%), as required 2. Reports 2-BLP-111 has failed
	US	Direct actions to trip bistables per Attachment A-2 of 02-OHP 4022.013.013. Declares level channel input inoperable
	US	Refers to the following Tech Specs (TS): <ul style="list-style-type: none"> · TS 3.3.1.1 <u>RTS Instrumentation</u> (Table 3.3-1, *Action 7) · TS 3.3.2.1 <u>ESFAS Instrumentation</u> (Table 3.3-3, *Action 14) · TS 3.3.3.6 <u>Post Accident Instrumentation</u> (Minimum channels met) *Identifies requirement to trip associated bistables within 1 hour of level channel failure.

Op-Test No.: Set 2Scenario No.: Cook 04-03Event No.: 3Page 3 of 9

Event Description: **Pressurizer PORV (NRV-153) Leakage/Block valve (NMO-153) fails Partially OPEN**

Time	Position	Applicant's Actions or Behavior
	RO	Recognizes indication of partially open PORV and reports annunciators: Panel #208 Drop 23 and 24 - PORV open.
	US	Directs RO to close PORV NRV-153. Directs RO to close NMO-153, PORV Block Valve when the PORV won't CLOSE.
	RO	Attempts to manually close PORV (NMO-153) Block valve. Recognizes / reports loss of NMO-153 indication and failure to CLOSE.
<p>Note: Procedure 02-OHP-4022-002-009 is written to identify the leaking valve and isolate it. The crew has indication as to which valve is leaking and so may reference the procedure as applicable.</p>		
	US	May Direct operator action per 02-OHP-4022-002-009, Leaking PORV: <ul style="list-style-type: none"> Manually close All PORV Block valves
<p>Note: The crew may elect to implement 02-OHP-4022-002-020, Excessive Reactor Coolant Leakage.</p>		
	US	May Direct operator action per 02-OHP-4022-002-020, RCS Leakage: <ul style="list-style-type: none"> Check PRZ Level and adjust Charging as required. Check VCT Level Determine RCS Leakrate Check PRZ PORV and Safety Valve Leakage
	US	Declares PORV 2-NRV-153 and Block Valve2-NMO-153 inoperable, Refers to Tech Spec 3.4.11 and complies with Actions b & e: <ul style="list-style-type: none"> Be in Hot Standby within the next 6 hours and Be in Hot Shutdown within the following 6 hours Refers to Tech Spec 3.4.6.2, RCS Leakage
	RO	Monitors PRZ pressure control system and ensures pressure remains at normal conditions (~2235 psig).

Op-Test No.: Set 2Scenario No.: Cook 04-03Event No.: 4Page 4 of 9Event Description: **Reduce Turbine Load / Reduce Reactor Power**

Time	Position	Applicant's Actions or Behavior
	RO	Calculates boric acid addition per 02-OHP 4021.005.001, Attachment 6, Boration or Dilution Volume Determination.
	RO	Briefs crew on reactivity plan for power reduction.
	US	Reviews reactivity plan.
	US	Directs RO to commence Power Reduction in accordance with 02-OHP 4021.001.003.
	RO	Performs BORATION batch add: <ul style="list-style-type: none"> ▪ Place RC Makeup Bend control switch in STOP ▪ Place RC Makeup Blend Control Mode switch in BORATE ▪ Set desired batch on BA batch controller ▪ Place RC Makeup Blend control switch in START
	RO	Commences power reduction: <ul style="list-style-type: none"> · Lowers turbine load (reactor power) using the load limiter. · Maintains Tave/Tref deviation within limits by boration and turbine load adjustments. · Ensures Axial Flux Difference (AFD) is maintained within target band by manual control rod movement as needed.
	US	Acts as reactivity manager by peer checking RO during blender operations and by verifying appropriate reactivity feedback.
	BOP	Monitors and maintains main electrical generator temperatures within limits per: <ul style="list-style-type: none"> · 02-OHP 4021.059.001, Generator Stator Cooling Water System · 02-OHP 4021.080.003, Generator Hydrogen Gas System

Op-Test No.: Set 2Scenario No.: Cook 04-03Event No.: 5Page 5 of 9Event Description: **VCT Level Transmitter (QLC-451) fails HIGH**

Time	Position	Applicant's Actions or Behavior
	RO	Recognizes indication of VCT Level problem and reports annunciators: Panel #209 Drop 47 – VCT Level High
	US	Directs operator action per 02-OHP-4022-013-017, VCT Level Malf: <ul style="list-style-type: none"> • Restores Divert valve (QRV-303) to VCT position • Trip Interposing Relay in accordance with Attachment A
	RO	Recognizes and reports failure of VCT Level Transmitter (QLC-451). <ul style="list-style-type: none"> • Place Divert valve (QRV-303) in VCT position • Perform MANUAL blend operation to maintain VCT level in band
	US	Refers to the following Tech Specs (TS): <ul style="list-style-type: none"> · TS 3.1.2.2 <u>Reactivity Control Systems</u> Interposing Relay must be actuated for Refueling Water Sequence (4.1.2.2.c)

Op-Test No.: Set 2Scenario No.: Cook 04-03Event No.: 6Page 6 of 9Event Description: **West Main Feed Pump Trip**

Time	Position	Applicant's Actions or Behavior
	BOP	Recognizes indication of MFP trip and reports annunciators: Panel #215 Drop 71 – West MFP Emergency System Tripped.
	US	Directs operator actions per 02-OHP-4022-055-001, Loss of One MFP: <ul style="list-style-type: none"> Manually runback Turbine Load to < 60% Verify Rod Control in AUTO Start AFW pumps Verify Standby Condensate Pumps running Initiate Boration to maintain rods above RIL
	RO	Verify rod control switch in AUTO and functioning properly. Initiate normal or emergency boration flow.
	BOP	Manually runback turbine load to < 60% as directed. Start All AFW pumps. Verify Standby Condensate Booster and Hotwell pumps are running. Raise East MFP Steam supply to Main Steam (2-ARV-11) controller to 95 psig. Verify SG levels are stable at or returning to normal (44%).
	US	Direct operator actions to restore normal system alignment: <ul style="list-style-type: none"> Stop running AFW pumps and align for standby condition Align Condensate system for current plant conditions

Op-Test No.: Set 2 Scenario No.: Cook 04-03 Event No.: 7/8/9 Page 7 of 9

Event Description: **PZR PORV (NRV-153) fails OPEN causing Steam Space LOCA in Containment; Safety Injection Train B Isolation failure to AUTO/MANUAL actuate.**

Time	Position	Applicant's Actions or Behavior
	RO	Recognize and reports abnormal RCS leakage: <ul style="list-style-type: none"> RCS pressure lowering with PZR Heaters ON NRV-153 PORV indicates open
	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: <ol style="list-style-type: none"> Checks reactor trip Checks turbine trip Checks power to AC emergency buses Checks safety injection status
	US	Ensures immediate actions of E-0 are completed Directs subsequent actions of E-0.
	RO/BOP Critical Task #1	Check Systems in Proper Emergency Alignment: <ul style="list-style-type: none"> Manually OPEN IMO-255, CCP to BIT inlet valve OR Train B BIT
	RO/BOP	Check Systems in Proper Emergency Alignment: <ul style="list-style-type: none"> Manually start Both EDGs Manually align Train B ECCS equipment for SI
	US/RO Critical Task #2	Foldout Page – RCP Trip Criteria: <ul style="list-style-type: none"> Stop all RCPs when RCS is < 1300 psig and CCP/SI pump running
	RO/BOP	Performs manual actions of E-0 Attachment A as directed by US.

Op-Test No.: Set 2 Scenario No.: Cook 04-03 Event No.: 7/8/9 Page 8 of 9

Event Description: **PZR PORV (NRV-153) fails OPEN causing Steam Space LOCA in Containment; Safety Injection Train B Isolation failure to AUTO/MANUAL actuate.**

Time	Position	Applicant's Actions or Behavior
	BOP	Manually controls AFW flow to maintain SG narrow range levels 13% - 50% once one SG narrow range level is greater than 13%.
	RO	Checks PRZ PORVs closed – NO
	US	Announces transition to E-1, Loss of Reactor or Secondary Coolant and directs operator actions.
	RO/BOP	Completes actions of E-1 through step 12 (Check if RCS Cooldown and Depressurization is required) as directed.
	BOP	Restore SG narrow range levels >26%, but < 50%.
	US	Checks if SI Termination Criteria is MET: <ul style="list-style-type: none"> ▪ RCS Subcooling <36°F ▪ Secondary Heat Sink (SG >13% or AFW Flow >240x10³) ▪ RCS Pressure rising or stable ▪ Pressurizer Level >19%
	Crew	Transition to ES-1.1, Safety Injection Termination if criteria is met. (ES-1.1 Actions on Next Page. E-1 Actions Are Continued Below)
	US/RO	Verifies RCS pressure is NOT stable or rising
	US	Announces transition to ES-1.2, Post LOCA Cooldown and Depressurization (at step 12).
TERMINATE SCENARIO		

Op-Test No.: Set 2 Scenario No.: Cook 04-03 Event No.: 7/8/9 Page 9 of 9

Event Description: **PZR PORV (NRV-153) fails OPEN causing Steam Space LOCA in Containment; Safety Injection Train B Isolation failure to AUTO/MANUAL actuate.**

Time	Position	Applicant's Actions or Behavior
<p style="text-align: center;">NOTE:</p> <p>Crew may transition to SI termination if criteria is met. This may involve stopping ECCS pumps and realigning charging until parameters change causing them to restart equipment and return to E-1 or ES-1.2. There are several points of transition to ES-1.2 from ES-1.1. The ES-1.1 Steps are listed below. The Scenario may be terminated upon transition to ES-1.2</p>		
	US	Announces transition to ES-1.1, Safety Injection Termination (step 6 of E-1).
	RO/BOP	Reviews ES-1.1, Foldout Page Criteria. Monitors RCS Subcooling >36°F and PZR Level >19%, if NOT realign ECCS and GO TO E-1
	US	Directs Actions of ES-1.1
	RO/BOP	Performs the following as directed: <ol style="list-style-type: none"> 1. Resets both trains of Safety Injection 2. Stops one Charging Pump. 3. Resets both trains of Phase A 4. Establishes Control Air to Containment
	CREW	Check if RCS Pressure is stable or Rising If Lowering, Transition to ES-1.2
	RO/BOP	Performs the following as directed: <ol style="list-style-type: none"> 1. Isolate BIT Injection 2. Establish Charging Flow
	CREW	Check if: <ul style="list-style-type: none"> ▪ Pressurizer Level is stable and ▪ RCS Pressure is Stable or Rising If NOT, Transition to ES-1.2
TERMINATE SCENARIO		

**CRITICAL TASK SUMMARY
(COOK04-03)**

Task	Elements	Results
<p align="center">#1</p> <p>Manually open high head safety injection valves</p>	<p><u>Cueing:</u></p> <ul style="list-style-type: none"> · Check ECCS Flow: BIT - Flow Indicated (E-0, Step 12.a) <p align="center">-OR-</p> <ul style="list-style-type: none"> · Check Systems In Proper Emergency Alignment: ECCS Monitor lights – Proper Status (E-0, Step 15.c) <p><u>Performance Indicators:</u></p> <ul style="list-style-type: none"> · Manually open BIT (outlet/inlet) valves to establish at least one train of high head safety injection flow. · Must be performed while in E-0 before transitioning to E-1. <p><u>Performance Feedback:</u></p> <ul style="list-style-type: none"> · BIT flow is indicated to at least one train (as indicated by flow on cold leg BIT injection flowmeters) 	<p align="center"><u>SAT / UNSAT</u></p>
<p align="center">#2</p> <p>Manually trip all Reactor Coolant Pumps</p>	<p><u>Cueing:</u></p> <ul style="list-style-type: none"> • RCS pressure – less than 1300 psig AND CCPs or SI pumps – at least one running · E-0, Foldout Page, Step 1 · E-0, Step 19 · E-1, Foldout Page, Step 1 · E-1, Step 1 <p><u>Performance Indicators:</u></p> <ul style="list-style-type: none"> · Manually stop all Reactor Coolant Pumps (RCPs) when RCS pressure is less than 1300 psig. · RCPs must be tripped within 5 minutes of the trip criteria being met. <p><u>Performance Feedback:</u></p> <ul style="list-style-type: none"> · RCP ammeters – zero current · RCP trip low flow alarms – lit · RCS loop flow meters – flow lowering 	<p align="center">SAT / UNSAT</p>

SIMULATOR INSTRUCTIONS (COOK04-03)

Setup:

1. Reset to IC 938 @ 65% Power
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
5. Set Up PPC Point (10 min Avg) and Chart Recorders
6. Start Data Collection Program Save to file _____
7. Go to **RUN** and acknowledge/clear alarms
8. Restore Summary File "**COOK04-03**"
9. Verify the following (pre-load) malfunctions:
 - **RP10B**, Train B Safety Injection fails to AUTO actuate
 - **RP11B**, Train B Safety Injection fails to MANUAL actuate
 - **RP11D**, Train B Safety Injection fails to MANUAL actuate
 - **RP19C**, Train B K609 RELAY FAILURE

Assign the following to Trigger 3:

Override NRV-153 RED light ON:

- **IOV ZLO101NRV153[RED] ON**
- Override Panel 208 Drop 23 annunciator ON:
- **IOV AN08[023] CRYWOLF**

Assign the following to Trigger 4:

- **IMF 101NMO153**
- Assign FILE: **NMO153 to CLOSE** (ZLO101NMO153(1) == -1)

(continued on next page)

SIMULATOR INSTRUCTIONS (COOK04-03)

Scenario Events:

Event #2

1. Trigger (1) **IMF RX23B**, final value **2** (BLP-111 fails LOW).

Event #3

2. Trigger (3) **IRF RCR20**, final value **3**, (NRV-153 partially open) when crew has recovered from SG level channel failure.

Event #5

3. Trigger (5) **IMF CV16A**, final value **100** (QLC-451 fails HIGH) when crew has performed a power reduction of 3% to 5%.

Event #6

4. Trigger (7) **IMF FW05B** (West MFP trip) when crew has recovered from the VCT Level channel failure.
 - Prior to trigger activation, call control room and report oil spray (unisolable) coming from West MFP oil pump of approximately 10 gpm.

Event #7

5. Trigger (9) **MMF RC17C**, final value **95** (RCS Steam Space LOCA):
 - Train B Safety Injection fails to AUTO/MANUAL actuate
 -

(continued on next page)

SIMULATOR INSTRUCTIONS (COOK04-03)

Response to Crew's Requests:

1. If directed, to trip bistables for **BLP-111** use:

IOV ZLOSTMC2[7] to ON to simulate opening cabinet Door

(Override Lights/Relays – RX Flux panel)

Remote	Bistable
RPR050	LS/519A
RPR051	LS/519B

IOV ZLOSTMC2[2] to ON to simulate lifting Test Rack

DOV ZLOSTMC2[7] to simulate closing cabinet Door

2. If contacted as AEO to investigate the trip of NMO-153 breaker EZC-D-3D, report that the breaker is tripped.
3. If directed to energize interposing relay for QLC-451 then use:
Remote Function **RPR157** to Trip LBX-112B
4. If contacted as AEO to investigate West MFP Operations, report back after some 3 min. delay that excessive oil spray and residue in the area with the MFP tripped.

Facility: Cook Plant Unit 1 & Unit 2 Scenario No.: COOK04-03a Op-Test No.: Set 2

Examiners: _____ Operators: _____

Initial Conditions: IC-938, 62% power, 150 MWD, 830 ppm Boron

Turnover: Perform ESW Pump Strainer functional test

Event No.	Malf. No.	Event Type*	Event Description
4		N	Perform ESW pump strainer functional test
2	RX23B @ 2	I-BOP	#21 SG Level transmitter fails LOW
3	RCR20 @ 3 101NMO153	C-RO	PRZ PORV (NRV-153) Leak by (3 gpm) NMO-153 fails Partially OPEN
4		R	Reduce reactor power and turbine load for CSD
5	CV16A @ 100	I-RO	VCT Level Transmitter (QLC-451) fails HIGH
6	FW05B	C-BOP	West Main Feed Pump Trip
7	RC17C @ 95	M	PRZ PORV (NRV-153) fails OPEN
8	RP19C	C-RO	Train A K600 Relay failure: CCP to BIT Inlet valve (IMO-255) fails to Auto OPEN and 2CD EDG fails to start
9	RP10B RP11B RP11D	C-RO	Train B Safety Injection signal failure to actuate in AUTO or Manual mode

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

Summary

The Scenario starts with the plant at 62% power. The crew is directed to perform the ESW Pump Strainer functional test. After the ESW Pump Strainer test has been completed, the crew is required to respond to various events.

The first event will involve the #21 Steam Generator Level instrument (BLP-111) failing LOW. This results in a feedwater flow and Steam Generator level rise. BOP will be required to take manual control and restore normal level. Crew will be required to implement AOP actions to stabilize the plant and trip Bistables.

The second event will involve the Pressurizer PORV NRV-153 drifting partially open with the Block valve (NMO-153) failing to close. This will result in the loss of capability to stop NRV-153 leakage. Crew will be required to implement a power reduction to cold shutdown conditions.

The third event will involve the VCT Level instrument (QLC-451) failing HIGH. This will result in the VCT High Level alarm. RO will be required to perform a manual blend to RCS.

The fourth event will involve a trip of the West Main Feed Pump. This will result in a rapid power reduction to less than 60%. RO will be required to control reactivity while BOP lowers turbine load. Crew will be required to monitor plant conditions during power reduction.

The main event will involve the opening of NRV-153 to full open. A unit trip will be required. As the crew performs the actions of E-0, the Train B Safety Injection signal will fail to AUTO/MANUAL actuate. In addition, a K600 relay failure will prevent High Head Injection flow requiring manual actions to align the BIT. The crew will transition to E-1. The scenario will terminate when the crew has transitioned to ES-1.2 for Post LOCA cooldown.

Critical Tasks

Establish injection flow from at least one (1) high head ECCS pump
Stop all running RCPs when RCS pressure is below 1300 psig

Procedures

E-0, Reactor Trip or Safety Injection
E-1, Loss of Reactor or Secondary Coolant

Op-Test No.: Set 2 Scenario No.: Cook04-03 Event No.: 1 Page 1 of 9

Event Description: **Perform ESW pump strainer functional test (East ESW Pump in Service)**

Time	Position	Applicant's Actions or Behavior
	US	Directs the performance of 02-OHP-5030-019-001, ESW Pump Strainer Functional Check. Step 4.2.1
	BOP	<ol style="list-style-type: none"> 1. Place the Control Mode Switch for East ESW strainer to MANUAL 2. Shift Backwash Selector switch to opposite strainer and verify: Proper sequencing of strainer backwash indicating lights Minor lowering in ESW header pressure during backwash cycle 3. Shift Backwash Selector switch to opposite strainer and verify: Proper sequencing of strainer backwash indicating lights Minor lowering in ESW header pressure during backwash cycle
	BOP	Place the Control Mode switch to AUTO Verify local operator observed satisfactory equipment operation.

Op-Test No.: Set 2Scenario No.: Cook 04-03Event No.: 2Page 2 of 9Event Description: **#21 SG Level Channel BLP-111 Fails LOW**

Time	Position	Applicant's Actions or Behavior
	BOP	Recognizes failure of BLP-111 Low and reports associated alarms: Panel #213 Drops 3 and 5 – Level Low
	BOP	Verifies controller for 2-FRV-210 in manual, lowers controller output to match feed flow with steam flow and stabilizes SG 21 level, as required.
	US	Directs actions of 02-OHP 4022.013.013, Steam Generator Level Instrument Malfunction procedure.
	BOP	Performs the following actions as directed: 1. Restores SG 21 level to program (44%), as required 2. Reports 2-BLP-111 has failed
	US	Direct actions to trip bistables per Attachment A-2 of 02-OHP 4022.013.013. Declares level channel input inoperable
	US	Refers to the following Tech Specs (TS): <ul style="list-style-type: none"> · TS 3.3.1.1 <u>RTS Instrumentation</u> (Table 3.3-1, *Action 7) · TS 3.3.2.1 <u>ESFAS Instrumentation</u> (Table 3.3-3, *Action 14) · TS 3.3.3.6 <u>Post Accident Instrumentation</u> (Minimum channels met) *Identifies requirement to trip associated bistables within 1 hour of level channel failure.

Op-Test No.: Set 2Scenario No.: Cook 04-03Event No.: 3Page 3 of 9

Event Description: **Pressurizer PORV (NRV-153) Leakage/Block valve (NMO-153) fails Partially OPEN**

Time	Position	Applicant's Actions or Behavior
	RO	Recognizes indication of partially open PORV and reports annunciators: Panel #208 Drop 23 and 24 - PORV open.
	US	Directs RO to close PORV NRV-153. Directs RO to close NMO-153, PORV Block Valve when the PORV won't CLOSE.
	RO	Attempts to manually close PORV (NMO-153) Block valve. Recognizes / reports loss of NMO-153 indication and failure to CLOSE.
Note: Procedure 02-OHP-4022-002-009 is written to identify the leaking valve and isolate it. The crew has indication as to which valve is leaking and so may reference the procedure as applicable.		
	US	May Direct operator action per 02-OHP-4022-002-009, Leaking PORV: <ul style="list-style-type: none"> • Manually close All PORV Block valves
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: <ul style="list-style-type: none"> • Check PRZ Level and adjust Charging as required. • Check VCT Level • Determine RCS Leakrate • Check PRZ PORV and Safety Valve Leakage
	US	Declares PORV 2-NRV-153 and Block Valve2-NMO-153 inoperable, Refers to Tech Spec 3.4.11 and complies with Actions b & e: <ul style="list-style-type: none"> • Be in Hot Standby within the next 6 hours and • Be in Hot Shutdown within the following 6 hours Refers to Tech Spec 3.4.6.2, RCS Leakage
	RO	Monitors PRZ pressure control system and ensures pressure remains at normal conditions (~2235 psig).

Op-Test No.: Set 2Scenario No.: Cook 04-03Event No.: 4Page 4 of 9Event Description: **Reduce Turbine Load / Reduce Reactor Power**

Time	Position	Applicant's Actions or Behavior
	RO	Calculates boric acid addition per 02-OHP 4021.005.001, Attachment 6, Boration or Dilution Volume Determination.
	RO	Briefs crew on reactivity plan for power reduction.
	US	Reviews reactivity plan.
	US	Directs RO to commence Power Reduction in accordance with 02-OHP 4021.001.003.
	RO	Performs BORATION batch add: <ul style="list-style-type: none"> ▪ Place RC Makeup Bend control switch in STOP ▪ Place RC Makeup Blend Control Mode switch in BORATE ▪ Set desired batch on BA batch controller ▪ Place RC Makeup Blend control switch in START
	RO	Commences power reduction: <ul style="list-style-type: none"> · Lowers turbine load (reactor power) using the load limiter. · Maintains Tave/Tref deviation within limits by boration and turbine load adjustments. · Ensures Axial Flux Difference (AFD) is maintained within target band by manual control rod movement as needed.
	US	Acts as reactivity manager by peer checking RO during blender operations and by verifying appropriate reactivity feedback.
	BOP	Monitors and maintains main electrical generator temperatures within limits per: <ul style="list-style-type: none"> · 02-OHP 4021.059.001, Generator Stator Cooling Water System · 02-OHP 4021.080.003, Generator Hydrogen Gas System

Op-Test No.: Set 2Scenario No.: Cook 04-03Event No.: 5Page 5 of 9Event Description: **VCT Level Transmitter (QLC-451) fails HIGH**

Time	Position	Applicant's Actions or Behavior
	RO	Recognizes indication of VCT Level problem and reports annunciators: Panel #209 Drop 47 – VCT Level High
	US	Directs operator action per 02-OHP-4022-013-017, VCT Level Malf: <ul style="list-style-type: none"> • Restores Divert valve (QRV-303) to VCT position • Trip Interposing Relay in accordance with Attachment A
	RO	Recognizes and reports failure of VCT Level Transmitter (QLC-451). <ul style="list-style-type: none"> • Place Divert valve (QRV-303) in VCT position • Perform MANUAL blend operation to maintain VCT level in band
	US	Refers to the following Tech Specs (TS): <ul style="list-style-type: none"> · TS 3.1.2.2 <u>Reactivity Control Systems</u> Interposing Relay must be actuated for Refueling Water Sequence (4.1.2.2.c)

Op-Test No.: Set 2Scenario No.: Cook 04-03Event No.: 6Page 6 of 9Event Description: **West Main Feed Pump Trip**

Time	Position	Applicant's Actions or Behavior
	BOP	Recognizes indication of MFP trip and reports annunciators: Panel #215 Drop 71 – West MFP Emergency System Tripped.
	US	Directs operator actions per 02-OHP-4022-055-001, Loss of One MFP: <ul style="list-style-type: none"> • Manually runback Turbine Load to < 60% • Verify Rod Control in AUTO • Start AFW pumps • Verify Standby Condensate Pumps running • Initiate Boration to maintain rods above RIL
	RO	Verify rod control switch in AUTO and functioning properly. Initiate normal or emergency boration flow.
	BOP	Manually runback turbine load to < 60% as directed. Start All AFW pumps. Verify Standby Condensate Booster and Hotwell pumps are running. Raise East MFP Steam supply to Main Steam (2-ARV-11) controller to 95 psig. Verify SG levels are stable at or returning to normal (44%).
	US	Direct operator actions to restore normal system alignment: <ul style="list-style-type: none"> • Stop running AFW pumps and align for standby condition • Align Condensate system for current plant conditions

Op-Test No.: Set 2 Scenario No.: Cook 04-03 Event No.: 7/8/9 Page 7 of 9

Event Description: **PZR PORV (NRV-153) fails OPEN causing Steam Space LOCA in Containment; Safety Injection Train B Isolation failure to AUTO/MANUAL actuate.**

Time	Position	Applicant's Actions or Behavior
	RO	Recognize and reports abnormal RCS leakage: <ul style="list-style-type: none"> RCS pressure lowering with PZR Heaters ON NRV-153 PORV indicates open
	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: <ol style="list-style-type: none"> Checks reactor trip Checks turbine trip Checks power to AC emergency buses Checks safety injection status
	US	Ensures immediate actions of E-0 are completed Directs subsequent actions of E-0.
	RO/BOP Critical Task #1	Check Systems in Proper Emergency Alignment: <ul style="list-style-type: none"> Manually OPEN IMO-255, CCP to BIT inlet valve OR Train B BIT
	RO/BOP	Check Systems in Proper Emergency Alignment: <ul style="list-style-type: none"> Manually start Both EDGs Manually align Train B ECCS equipment for SI
	US/RO Critical Task #2	Foldout Page – RCP Trip Criteria: <ul style="list-style-type: none"> Stop all RCPs when RCS is < 1300 psig and CCP/SI pump running
	RO/BOP	Performs manual actions of E-0 Attachment A as directed by US.

Op-Test No.: Set 2 Scenario No.: Cook 04-03 Event No.: 7/8/9 Page 8 of 9

Event Description: **PZR PORV (NRV-153) fails OPEN causing Steam Space LOCA in Containment; Safety Injection Train B Isolation failure to AUTO/MANUAL actuate.**

Time	Position	Applicant's Actions or Behavior
	BOP	Manually controls AFW flow to maintain SG narrow range levels 13% - 50% once one SG narrow range level is greater than 13%.
	RO	Checks PRZ PORVs closed – NO
	US	Announces transition to E-1, Loss of Reactor or Secondary Coolant and directs operator actions.
	RO/BOP	Completes actions of E-1 through step 12 (Check if RCS Cooldown and Depressurization is required) as directed.
	BOP	Restore SG narrow range levels >26%, but < 50%.
	US	Checks if SI Termination Criteria is MET: <ul style="list-style-type: none"> ▪ RCS Subcooling <36°F ▪ Secondary Heat Sink (SG >13% or AFW Flow >240x10³) ▪ RCS Pressure rising or stable ▪ Pressurizer Level >19%
	Crew	Transition to ES-1.1, Safety Injection Termination if criteria is met. (ES-1.1 Actions on Next Page. E-1 Actions Are Continued Below)
	US/RO	Verifies RCS pressure is NOT stable or rising
	US	Announces transition to ES-1.2, Post LOCA Cooldown and Depressurization (at step 12).
TERMINATE SCENARIO		

Op-Test No.: Set 2 Scenario No.: Cook 04-03 Event No.: 7/8/9 Page 9 of 9

Event Description: **PZR PORV (NRV-153) fails OPEN causing Steam Space LOCA in Containment; Safety Injection Train B Isolation failure to AUTO/MANUAL actuate.**

Time	Position	Applicant's Actions or Behavior
NOTE:		
Crew may transition to SI termination if criteria is met. This may involve stopping ECCS pumps and realigning charging until parameters change causing them to restart equipment and return to E-1 or ES-1.2. There are several points of transition to ES-1.2 from ES-1.1. The ES-1.1 Steps are listed below. The Scenario may be terminated upon transition to ES-1.2		
	US	Announces transition to ES-1.1, Safety Injection Termination (step 6 of E-1).
	RO/BOP	Reviews ES-1.1, Foldout Page Criteria. Monitors RCS Subcooling >36°F and PZR Level >19%, if NOT realign ECCS and GO TO E-1
	US	Directs Actions of ES-1.1
	RO/BOP	Performs the following as directed: <ol style="list-style-type: none"> 1. Resets both trains of Safety Injection 2. Stops one Charging Pump. 3. Resets both trains of Phase A 4. Establishes Control Air to Containment
	CREW	Check if RCS Pressure is stable or Rising If Lowering, Transition to ES-1.2
	RO/BOP	Performs the following as directed: <ol style="list-style-type: none"> 1. Isolate BIT Injection 2. Establish Charging Flow
	CREW	Check if: <ul style="list-style-type: none"> ▪ Pressurizer Level is stable and ▪ RCS Pressure is Stable or Rising If NOT, Transition to ES-1.2
TERMINATE SCENARIO		

**CRITICAL TASK SUMMARY
(COOK04-03)**

Task	Elements	Results
<p align="center">#1</p> <p>Manually open high head safety injection valves</p>	<p><u>Cueing:</u></p> <ul style="list-style-type: none"> · Check ECCS Flow: BIT - Flow Indicated (E-0, Step 12.a) <p align="center">-OR-</p> <ul style="list-style-type: none"> · Check Systems In Proper Emergency Alignment: ECCS Monitor lights – Proper Status (E-0, Step 15.c) <p><u>Performance Indicators:</u></p> <ul style="list-style-type: none"> · Manually open BIT (outlet/inlet) valves to establish at least one train of high head safety injection flow. · Must be performed while in E-0 before transitioning to E-1. <p><u>Performance Feedback:</u></p> <ul style="list-style-type: none"> · BIT flow is indicated to at least one train (as indicated by flow on cold leg BIT injection flowmeters) 	<p align="center"><u>SAT / UNSAT</u></p>
<p align="center">#2</p> <p>Manually trip all Reactor Coolant Pumps</p>	<p><u>Cueing:</u></p> <ul style="list-style-type: none"> • RCS pressure – less than 1300 psig AND CCPs or SI pumps – at least one running · E-0, Foldout Page, Step 1 · E-0, Step 19 · E-1, Foldout Page, Step 1 · E-1, Step 1 <p><u>Performance Indicators:</u></p> <ul style="list-style-type: none"> · Manually stop all Reactor Coolant Pumps (RCPs) when RCS pressure is less than 1300 psig. · RCPs must be tripped within 5 minutes of the trip criteria being met. <p><u>Performance Feedback:</u></p> <ul style="list-style-type: none"> · RCP ammeters – zero current · RCP trip low flow alarms – lit · RCS loop flow meters – flow lowering 	<p align="center">SAT / UNSAT</p>

SIMULATOR INSTRUCTIONS (COOK04-03)

Setup:

1. Reset to IC 938 @ 65% Power
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
5. Set Up PPC Point (10 min Avg) and Chart Recorders
6. Start Data Collection Program Save to file _____
7. Go to **RUN** and acknowledge/clear alarms
8. Restore Summary File "**COOK04-03**"
9. Verify the following (pre-load) malfunctions:
 - **RP10B**, Train B Safety Injection fails to AUTO actuate
 - **RP11B**, Train B Safety Injection fails to MANUAL actuate
 - **RP11D**, Train B Safety Injection fails to MANUAL actuate
 - **RP19C**, Train B K609 RELAY FAILURE

Assign the following to Trigger 3:

Override NRV-153 RED light ON:

- **IOV ZLO101NRV153[RED] ON**
- Override Panel 208 Drop 23 annunciator ON:
- **IOV AN08[023] CRYWOLF**

Assign the following to Trigger 4:

- **IMF 101NMO153**
- Assign FILE: **NMO153 to CLOSE** (ZLO101NMO153(1) == -1)

(continued on next page)

SIMULATOR INSTRUCTIONS (COOK04-03)

Scenario Events:

Event #2

1. Trigger (1) **IMF RX23B**, final value **2** (BLP-111 fails LOW).

Event #3

2. Trigger (3) **IRF RCR20**, final value **3**, (NRV-153 partially open) when crew has recovered from SG level channel failure.

Event #5

3. Trigger (5) **IMF CV16A**, final value **100** (QLC-451 fails HIGH) when crew has performed a power reduction of 3% to 5%.

Event #6

4. Trigger (7) **IMF FW05B** (West MFP trip) when crew has recovered from the VCT Level channel failure.
 - Prior to trigger activation, call control room and report oil spray (unisolable) coming from West MFP oil pump of approximately 10 gpm.

Event #7

5. Trigger (9) **MMF RC17C**, final value **95** (RCS Steam Space LOCA):
 - Train B Safety Injection fails to AUTO/MANUAL actuate
 -

(continued on next page)

SIMULATOR INSTRUCTIONS (COOK04-03)

Response to Crew's Requests:

1. If directed, to trip bistables for **BLP-111** use:

IOV ZLOSTMC2[7] to ON to simulate opening cabinet Door

(Override Lights/Relays – RX Flux panel)

Remote	Bistable
RPR050	LS/519A
RPR051	LS/519B

IOV ZLOSTMC2[2] to ON to simulate lifting Test Rack

DOV ZLOSTMC2[7] to simulate closing cabinet Door

2. If contacted as AEO to investigate the trip of NMO-153 breaker EZC-D-3D, report that the breaker is tripped.
3. If directed to energize interposing relay for QLC-451 then use:
Remote Function **RPR157** to Trip LBX-112B
4. If contacted as AEO to investigate West MFP Operations, report back after some 3 min. delay that excessive oil spray and residue in the area with the MFP tripped.

Facility: Cook Plant Unit 1 & Unit 2Scenario No.: COOK04-05Op-Test No.: Set 1Examiners: _____

_____Operators: _____

Initial Conditions: IC-937, 68% power, 150 MWD, 805 ppm Boron

Turnover: Thunderstorm Warnings with 2CD EDG Out of Service for fuel rack repairs; Swap NESW pumps.

Event No.	Malf. No.	Event Type*	Event Description
1		N	Start South NESW pump and Stop North NESW pump
2	RX19A @ 0	I-RO	Turbine Impulse Transmitter (MPC-253) fails LOW
3	CV09 @ 50F	C-RO	Letdown Temperature Controller fails LOW
4	RX21A @ 2	I-BOP	SG Feed Flow Instrument (FFC-210) fails LOW
5	FW12A @ 10	C-BOP	East MFP lube oil leak
6		R	Perform Rapid Power Reduction
7a	ED19 @ 25	M	Electrical Grid Load Rejection
7b	ED01 ED25 EG01	M	Loss of All AC Power (2 min delay)
8	EG08A	C-BOP	2AB EDG Speed Governor failure
9	FW48C	C-BOP	TD AFW pump fails to AUTO start

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

Summary

The crew is directed to start the South NESW Pump and shutdown the North NESW Pump while maintaining reactor power at 68%.

The first event will involve the Turbine Impulse instrument (MPC-253) failing LOW. This results in a control rod insertion. RO will be required to place rod control in manual. Crew will be required to implement AOP actions to stabilize the plant and trip Bistables.

The second event will involve the Letdown Temperature Controller failing LOW in AUTO. This will result in the loss of letdown cooling. RO will be required to take manual control of CRV-470 and restore temperature to normal band.

The third event will involve a failure of #21 Steam Generator Feed Flow instrument (FFC-210) LOW. This will result in a rise in feedwater flow to #21 SG with corresponding SG level rise. The BOP will be required to take manual control of FRV-210. Crew will be required to implement AOP actions to stabilize the plant and trip bistables.

The fourth event will involve an oil leak on the East MFP. This will result in a requirement to shutdown the pump. The Crew will be required to implement a power reduction to lower power to < 60%.

The main event will involve a GRID load rejection leading to a total loss of all AC power. The unit will trip. Failure of the only available EDG will require entry into ECA-0.0 actions. Failure of the TD AFW pump to auto start will require a manual start to restore feedwater flow. The crew will be required to take actions to restore emergency (EP) power. The crew should transition to ECA-0.1 once power has been restored to one Safeguards Bus. The scenario will terminate when the crew has restored emergency power and transitioned to ECA-0.1.

Critical Tasks

Establish AFW (Start TDAFWP)
Restore Emergency Power to Safeguards Bus

Procedures

E-0, Reactor Trip or Safety Injection
ECA-0.0, Loss of All AC Power

Op-Test No.: Set 1 Scenario No.: Cook04-05 Event No.: 1 Page 1 of 10

Event Description: **Start South NESW pump and Stop North NESW pump**

Time	Position	Applicant's Actions or Behavior
	US	Directs operator actions per 02-OHP-4021-020-002, Attachment 1: <ul style="list-style-type: none"> • Start South NESW pump • Stop North NESW pump
	RO/BOP	Reviews procedural precautions and actions in Attachment 1: <ul style="list-style-type: none"> • Pump strainer ΔP does not exceed 100 inches H₂O • Inform Unit 1 Control Room of system alignment change
	RO/BOP	Performs actions per Attachment 1: <ul style="list-style-type: none"> • Start South NESW pump • Close 2-WMO-901 • Stop North NESW pump • Notify Chemistry of the NESW alignment change
	RO/BOP	Reports North NESW pump running and South NESW pump stopped

Op-Test No.: Set 1 Scenario No.: Cook04-05 Event No.: 2 Page 2 of 10

Event Description: **First Stage Turbine Impulse transmitter (MPC-253) fails LOW**

Time	Position	Applicant's Actions or Behavior
	RO/BOP	Recognizes and reports multiple annunciators on Panel 211, 213, and 214 for a Turbine Impulse pressure failure.
	RO	Verifies no runback in progress Places rod control switch in MANUAL Reports failure of MPC-253 instrument
	US	Enters and directs actions of 02-OHP 4022.012.003, Continuous Control Bank Movement procedure.
	RO	Performs the following as directed: <ol style="list-style-type: none"> 1. Checks for no turbine runback 2. Ensures control rods are in manual with no rod motion 3. Checks rod position above low-low rod insertion limit 4. Checks axial flux difference (AFD) within target band 5. Initiates restoration of equilibrium conditions using either: <ul style="list-style-type: none"> • Control rod movement • Turbine load adjustment 6. Identifies failed Turbine First Stage Impulse Pressure Instrument
	US	Directs actions per 02-OHP 4022.013.016, Turbine First Stage Impulse Pressure Instrument Malfunction.
	RO	<ol style="list-style-type: none"> 1. Verifies rod control in manual. 2. Places AMSAC bypass/test switch in BYPASS/TEST 3. Places Steam Dump selector control switches to OFF 4. Reduce Turbine load or Withdraw rods to restore Tave-Tref and AFD
	US	Initiates actions to trip bistables for MPC-253 failure per Attachment A of 02-OHP 4022.013.016.
	RO	Verifies proper bistable tripping per Attachment A.
	US	Refers to Tech Specs: <ol style="list-style-type: none"> 1. TS 3.3.2.1 <u>ESFAS Instrumentation</u> (Table 3.3-3, Action 14) 2. TS 3.2.5, <u>DNB</u> (If Pressure drops <2200 psig) 3. ATR 2-AMSAC-1, <u>ATWS Mitigation System Actuation Circuitry</u> <p>Identifies requirement to trip associated bistables within 1 hour of MPC-253 failure.</p>

Op-Test No.: Set 1 Scenario No.: Cook04-05 Event No.: 3 Page 3 of 10

Event Description: **CVCS Letdown Temperature Controller output fails LOW.**

Time	Position	Applicant's Actions or Behavior
	RO	Recognize and reports annunciator Panel 209 Drop 45 & 8 alarms which indicates a loss of CCW cooling to the letdown heat exchanger.
	US	Directs operator actions to restore proper temperature control for letdown.
	RO	Places 2-CRV-470, Letdown Temperature Control valve, controller to MANUAL Opens 2-CRV-470 and restores letdown temperature to normal Verifies letdown flow diverted to RC Filter
	US	Initiates action to have MTI investigate problem with letdown temperature controller.

Op-Test No.: Set 1 Scenario No.: Cook04-05 Event No.: 4 Page 4 of 10Event Description: **SG 21 Feedwater Flow Transmitter (FFC-210) Fails LOW**

Time	Position	Applicant's Actions or Behavior
	BOP	Recognizes and reports annunciators on Panel #213 Drop 13
	BOP	Verifies 2-FRV-210, SG 21 MFW Reg. Valve controller in manual Lowers controller output to match the operable feed flow channel with steam flow, and Restores SG 21 level to program.
	US	Enters and directs actions of 02-OHP 4022.013.015, Feedwater Flow Instrument Malfunction procedure.
	BOP	Performs the following actions as directed: 1. Restores SG 21 level using manual control of 2-FRV-210 2. Reports 2-FFC-210 has failed 3. Places 2-FS-510-C selector switch in channel 2 position. 4. Nulls and returns 2-FRV-210 controller to auto.
	US	Initiates actions to trip bistables associated with 2-FFC-210 FW Flow Failure per Attachment A-1 of 02-OHP 4022.013.015.
	US	Refers to Tech Specs and Administrative Technical Requirements <ul style="list-style-type: none"> • TS 3.3.1.1 <u>RTS Instrumentation</u> (Table 3.3-1, Action 7). • ATR - AMSAC-1 <u>ATWS Mitigation System Actuation Circuitry</u> • ATR - LEFM-1 <u>Leading Edge Flow Meter</u> <p><i>Identifies requirement to trip associated bistables within 1 hour of feed flow channel failure.</i></p>

Op-Test No.: Set 1 Scenario No.: Cook04-05 Event No.: 5 Page 5 of 10

Event Description: **East Main Feed Pump Lube Oil leak requiring a power reduction < 60%.**

Time	Position	Applicant's Actions or Behavior
	BOP	Recognizes and reports annunciator Panel 215 Drop 28: <ul style="list-style-type: none"> • East FPT Lube Oil tank level low
	US	Directs operator actions to verify system valve lineup and check for leaks.
	US	Informs SM of need to perform a rapid power reduction for East MFP {NOTE: May recommend implementing PMP-6090-PCP-100, Spill Response – Oil, Polluting, and Hazardous Materials.}
	US	Implements procedure 02-OHP-4021.001.003, Power Reduction, or 02-OHP-4022.001.006, Rapid Power Reduction, to reduce reactor power < 60%.
	BOP	References procedure 02-OHP-4021-055-004, Main Feedpump Turbine Shutdown, Attachment 1.

Op-Test No.: Set 1Scenario No.: Cook04-05Event No.: 6Page 6 of 10Event Description: **Reduce Turbine Load / Reduce Reactor Power**

Time	Position	Applicant's Actions or Behavior
<u>Turbine Load Reduction per 02-OHP 4021.001.003, Power Reduction</u>		
	US	Directs RO to commence Power Reduction in accordance with 02-OHP 4021.001.003.
	RO	Performs BORATION batch add: <ul style="list-style-type: none"> ▪ Place RC Makeup Bend control switch in STOP ▪ Place RC Makeup Blend Control Mode switch in BORATE ▪ Set desired batch on BA batch controller ▪ Place RC Makeup Blend control switch in START
	RO	Commences power reduction: <ul style="list-style-type: none"> · Lowers turbine load (reactor power) using the load limiter. · Maintains Tave/Tref deviation within limits by boration and turbine load adjustments. · Ensures Axial Flux Difference (AFD) is maintained within target band by manual control rod movement as needed.
	US	Acts as reactivity manager by peer checking RO during blender operations and by verifying appropriate reactivity feedback.
	BOP	Monitors and maintains main electrical generator temperatures within limits per: <ul style="list-style-type: none"> · 02-OHP 4021.059.001, Generator Stator Cooling Water System · 02-OHP 4021.080.003, Generator Hydrogen Gas System
<u>Turbine Load Reduction per 02-OHP 4022.001.006, Rapid Power Reduction Response</u>		
	US	Directs RO to commence Rapid Power Reduction in accordance with 02-OHP 4022.001.006.
	RO	Commences power reduction: <ul style="list-style-type: none"> · Ensures control rods in auto or manually inserts rods. · Lowers turbine load (reactor power) using the load limiter or operating device.
	US	Acts as reactivity manager by peer checking RO and verifying appropriate reactivity feedback.

Op-Test No.: Set 1 Scenario No.: Cook04-05 Event No.: 7/8/9 Page 7 of 10

Event Description: **Electrical Grid Load Rejection followed by a complete Loss of All AC Power / 2AB Emergency Diesel Generator Failure; Turbine Driven AFW Pump Fails to Auto Start**

Time	Position	Applicant's Actions or Behavior
	CREW	Recognize and report a load rejection event
	US	Implement procedure 02-OHP-4022-001-002, Loss of Load (Load Rejection)
<p>NOTE: Previous failure of MPC-253, First stage Turbine Impulse pressure will cause rods to not function properly in Auto and the steam Dumps to not control correctly in Auto.</p>		
	RO	Verify Panel 2-SML-18 Drop 5 and 10 are CLEAR
	BOP	Verify SG levels are stable or trending to program Verify Main Generator connected to GRID
	US	Directs RO/BOP to perform the immediate actions of E-0, Reactor Trip or Safety Injection.
	RO	Performs the (primary) immediate actions of E-0: 1. Checks reactor trip 2. Checks safety injection status
	BOP	Performs the (secondary) immediate actions of E-0: 1. Checks turbine trip 2. Checks power to AC emergency buses: · Reports that NO AC emergency buses are energized

Op-Test No.: Set 1 Scenario No.: Cook04-05 Event No.: 7/8/9 Page 8 of 10

Event Description: **Electrical Grid Load Rejection followed by a complete Loss of All AC Power / 2AB Emergency Diesel Generator Failure; Turbine Driven AFW Pump Fails to Auto Start**

Time	Position	Applicant's Actions or Behavior
	US	Announces transition to ECA-0.0, Loss Of All AC Power and directs RO/BOP to perform immediate actions for ECA-0.0.
	RO/BOP	Performs the immediate actions of ECA-0:0: <ul style="list-style-type: none"> · Checks reactor trip / turbine trip
	US	Ensures immediate actions are completed and directs subsequent actions of ECA-0.0.
	RO	Checks RCS isolated: <ol style="list-style-type: none"> 1. Checks PRZ PORVs closed: 2. Checks letdown isolation valves closed 3. Checks excess letdown isolation valves closed 4. Places nuclear sampling isolate switches to ISOLATE: <ul style="list-style-type: none"> · Train A · Train B
	BOP Critical Task #1	Checks AFW flow > 240,000 PPH: <ul style="list-style-type: none"> · Manually starts the Turbine Driven AFW Pump
	US	Recognizes that only available EDG is not running and dispatches an operator to locally close 2-QCM-350, RCP seal water return outside containment.
	RO/BOP	Resets SI

Op-Test No.: Set 1 Scenario No.: Cook04-05 Event No.: 7/8/9 Page 9 of 10

Event Description: **Electrical Grid Load Rejection followed by a complete Loss of All AC Power / 2AB Emergency Diesel Generator Failure; Turbine Driven AFW Pump Fails to Auto Start**

Time	Position	Applicant's Actions or Behavior
	RO/BOP	Places the following equipment in pull to lock: <ul style="list-style-type: none"> · MDAFPs · CCPs · RHR pumps · SI pumps · CTS pumps · CCW pumps · NESW pumps
	US	Dispatches an operator to locally establish vital cabinet cooling using Attachment C of ECA-0.0.
	US	Identifies the status of the following off-site power sources: <ul style="list-style-type: none"> · Reserve power – UNAVAILABLE · Emergency power (EP) – AVAILABLE
	US	Directs Restoration of 4KV Power From EP using SUP.009 attachments to energize <u>either</u> pump bus first: <ul style="list-style-type: none"> · Attachment A - to energize Bus T21A from EP · Attachment D - to energize Bus T21D from EP
	BOP Critical Task #2	Energizes T21A (T21D) emergency bus from EP as directed: <ol style="list-style-type: none"> 1. Checks T21A (T21D) bus – <u>not</u> faulted 2. Places DG2AB(CD) supply to bus T21A(D) in pull to lock 3. Verifies breakers open with green targets: <ul style="list-style-type: none"> · Bus 2A(D) supply to bus T21A(D) · 4KV supply to TR21PHA(PHC) 4. Places the west (east) ESW pump in pull to lock 5. Closes 4KV EP supply to bus T21A(D) 6. Ensures EP supply current to Unit 2 remains < 600 AMPS

Op-Test No.: Set 1 Scenario No.: Cook04-05 Event No.: 7/8/9 Page 10 of 10

Event Description: **Electrical Grid Load Rejection followed by a complete Loss of All AC Power / 2AB Emergency Diesel Generator Failure; Turbine Driven AFW Pump Fails to Auto Start**

Time	Position	Applicant's Actions or Behavior
	US	Directs BOP to energize the remaining emergency buses from EP (using SUP.009) while US and RO continue recovery actions of ECA-0.0.
	BOP	Energizes the remaining emergency buses from EP: <ul style="list-style-type: none"> · T21A(D) · T21B · T21C
	RO	Performs the following recovery actions of ECA-0.0 as directed: <ol style="list-style-type: none"> 1. Controls SG PORVs to stabilize SG pressures 2. Checks the following equipment energized: <ul style="list-style-type: none"> · 600V bus(es) associated with energized emergency bus · Control room AHU · Battery charger · CRID inverters 3. Starts available ESW pump (unless header supplied from U-1)
	US	Announces transition to ECA-0.1, Loss Of All AC Power Recovery Without SI Required.
<u>TERMINATE SCENARIO</u>		

**CRITICAL TASK SUMMARY
(COOK04-05)**

Task	Elements	Results
<p style="text-align: center;">#1</p> <p style="text-align: center;">Manually Starts Turbine Driven AFW Pump</p>	<p><u>Cueing:</u></p> <ul style="list-style-type: none"> • Check AFW Flow...Verify TDAFP Running (ECA-0.0, Step 4, RNO) <p><u>Performance Indicators:</u></p> <ul style="list-style-type: none"> • Manually starts the TDAFP from the control room. • AFW flow must be established before SG dryout occurs (<15% WR level). <p><u>Performance Feedback:</u></p> <ul style="list-style-type: none"> • TDAFP speed rising • AFW flow > 240E3 PPH 	<p style="text-align: center;">SAT / UNSAT</p>
<p style="text-align: center;">#2</p> <p style="text-align: center;">Restore Emergency Power</p>	<p><u>Cueing:</u></p> <ul style="list-style-type: none"> • Restore AC Power (ECA-0.0, Step 9.a, RNO a.2) <p><u>Performance Indicators:</u></p> <ul style="list-style-type: none"> • Restores emergency power (EP) to at least one 4KV emergency (pump) bus (i.e., T21A or T21D). • Power should be restored prior to depressurizing intact SGs to 190 psig (ECA-0.0, Step 19). <p><u>Performance Feedback:</u></p> <ul style="list-style-type: none"> • T21A or T21D bus energized • Power available to safeguards equipment. 	<p style="text-align: center;">SAT / UNSAT</p>

SIMULATOR INSTRUCTIONS (COOK04-05)

Setup:

1. Reset to IC 16 (937)
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
5. Set Up PPC Point (10 min Avg) and Chart Recorders
6. Start Data Collection Program Save to file _____
7. Go to **RUN** and acknowledge/clear alarms
8. Activate the following (pre-load) malfunctions:
 - **EG08A**, 2AB EDG Speed Governor Failure
 - **FW48C**, TD AFW pump fails to AUTO start
9. Activate the following malfunctions to place **2CD EDG** OOS:
 - **IMF EG10B**
 - **IMF EG06B**
 - **IRF EGR14 RO**
 - **IRF EGR15 RO**
 - **IRF EGR02 RO**
 - **IOV AN01[64] CRYWOLF**
 - **IOV ZLO1012QTCD1 [GRN] OFF**
 - **IOV ZLO1012QTCD2 [GRN] OFF**

Place **RED** clearance tags on the following switches:

- **T21C3**
 - **T21D8**
 - **CB2DGTCD**
 - **2-QT-106-CD1**
 - **2-QT-106-CD2**
10. Assign to Trigger 15
 - **IMF FW07A**, East FW pump bearing Failure
 - Assign file **EFWPTLO Level Lo** (FWLLOTKA < 32)

(continued on next page)

SIMULATOR INSTRUCTIONS (COOK04-05)

Scenario Events:

Event #2

1. Trigger (1) **IMF RX19A**, final value **0** (MPC-253 fails LOW) after crew has swapped the NESW pumps.

Event #3

2. Trigger (3) **IMF CV09**, final value **50** (Letdown Temp Controller fails LOW) when crew has recovered from turbine impulse channel failure.

Event #4

3. Trigger (5) **IMF RX21A**, final value **2** (FFC-210 fails LOW) after crew has recovered from Letdown temperature controller failure.

Event #5

4. Trigger (7) **IMF FW12A**, final value **10** (E MFP oil leak) after crew has recovered from Feedwater Flow Channel failure.

Event #7

5. Trigger (9) **IMF ED19**, final value **25** (Grid Load Rejection):
 - **IMF ED01 Delay 2 min 10 secs**, Loss of 345 KV Bus 1
 - **IMF ED25 Delay 2 min 10 secs**, Loss of 765/345 KV Transformer Bank No. 4
 - **IMF EG01 Delay 2 mins 10 secs**, Main Generator Trip
 - Loss of Offsite AC Power
 - 2AB EDG Speed Governor fails
 - TD AFW pump fails to AUTO start

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SIMULATOR INSTRUCTIONS (COOK04-05)

Response to Crew's Requests:

1. If directed, to trip bistables for **MPC-253** use:

IOV ZLOSTMC2[6] to ON to simulate opening cabinet Door

(Override Lights/Relays – RX Flux panel)

Remote	Bistable
RPR021	FS/512B
RPR027	FS/522B
RPR039	FS/542B
RPR033	FS/532B
RXR01	PS/505A
RXR03	PS/505C

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

DOV ZLOSTMC2[6] to simulate closing cabinet Door

2. If contacted as MTI investigate Letdown Temp controller, report back after some 5 min. delay that additional testing will be required to identify the problem.

3. If directed to trip bistables for FFC-210 use:

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

(Override Lights/Relays – RX Flux panel)

Remote	Bistable
RPR017	FS-510A
RPR018	FS-510B
(Panel 212 drop 15)	FS-510J

IOV ZLOSTMC2[1] to ON to simulate lifting Test Rack (Already ON from previous bistable)

Delete Override ZLOSTMC2[6] to simulate closing cabinet Door

4. If contacted as AEO to investigate East MFP operations, report unisolable leak adjacent to oil cooler

(continued on next page)

SIMULATOR INSTRUCTIONS
(COOK04-05)
(continued)

5. If directed to locally close 2-QCM-350 then
“SET CVVQCM350 0” (using ISD or JIS)
6. If directed to locally close 2-CCM-453 then
“SET CCVCCM453 0” (using ISD or JIS)
7. If directed act as AEO to perform Attachment C of ECA-0.0 (Cabinet Cooling)
8. If directed to locally close seal injection valves (2-CS-311N, 311S and 307) then activate remote functions:
 - **CVR20** final value **CLOSE**
 - **CVR21** final value **CLOSE**
9. If directed to restore N train battery charger then
MRF EDR21 to train with power

Facility: Cook Plant Unit 1 & Unit 2 Scenario No.: COOK04-05a Op-Test No.: Set 1

Examiners: _____

Operators: _____

Initial Conditions: IC-937, 68% power, 150 MWD, 805 ppm Boron

Turnover: Thunderstorm Warnings with 2CD EDG Out of Service for fuel rack repairs; Swap NESW pumps.

Event No.	Malf. No.	Event Type*	Event Description
1		N	Start South NESW pump and Stop North NESW pump
2	RX19A @ 0	I-RO	Turbine Impulse Transmitter (MPC-253) fails LOW
3	CV09 @ 50F	C-RO	Letdown Temperature Controller fails LOW
4	RX21A @ 2	I-BOP	SG Feed Flow Instrument (FFC-210) fails LOW
5	FW12A @ 10	C-BOP	East MFP lube oil leak
6		R	Perform Rapid Power Reduction
7a	ED19 @ 25	M	Electrical Grid Load Rejection
7b	ED01 ED25 EG01	M	Loss of All AC Power (2 min delay)
8	EG08A	C-BOP	2AB EDG Speed Governor failure
9	FW48C	C-BOP	TD AFW pump fails to AUTO start

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

Summary

The crew is directed to start the South NESW Pump and shutdown the North NESW Pump while maintaining reactor power at 68%.

The first event will involve the Turbine Impulse instrument (MPC-253) failing LOW. This results in a control rod insertion. RO will be required to place rod control in manual. Crew will be required to implement AOP actions to stabilize the plant and trip Bistables.

The second event will involve the Letdown Temperature Controller failing LOW in AUTO. This will result in the loss of letdown cooling. RO will be required to take manual control of CRV-470 and restore temperature to normal band.

The third event will involve a failure of #21 Steam Generator Feed Flow instrument (FFC-210) LOW. This will result in a rise in feedwater flow to #21 SG with corresponding SG level rise. The BOP will be required to take manual control of FRV-210. Crew will be required to implement AOP actions to stabilize the plant and trip bistables.

The fourth event will involve an oil leak on the East MFP. This will result in a requirement to shutdown the pump. The Crew will be required to implement a power reduction to lower power to < 60%.

The main event will involve a GRID load rejection leading to a total loss of all AC power. The unit will trip. Failure of the only available EDG will require entry into ECA-0.0 actions. Failure of the TD AFW pump to auto start will require a manual start to restore feedwater flow. The crew will be required to take actions to restore emergency (EP) power. The crew should transition to ECA-0.1 once power has been restored to one Safeguards Bus. The scenario will terminate when the crew has restored emergency power and transitioned to ECA-0.1.

Critical Tasks

Establish AFW (Start TDAFWP)
Restore Emergency Power to Safeguards Bus

Procedures

E-0, Reactor Trip or Safety Injection
ECA-0.0, Loss of All AC Power

Op-Test No.: Set 1 Scenario No.: Cook04-05 Event No.: 1 Page 1 of 10

Event Description: **Start South NESW pump and Stop North NESW pump**

Time	Position	Applicant's Actions or Behavior
	US	Directs operator actions per 02-OHP-4021-020-002, Attachment 1: <ul style="list-style-type: none"> • Start South NESW pump • Stop North NESW pump
	RO/BOP	Reviews procedural precautions and actions in Attachment 1: <ul style="list-style-type: none"> • Pump strainer ΔP does not exceed 100 inches H₂O • Inform Unit 1 Control Room of system alignment change
	RO/BOP	Performs actions per Attachment 1: <ul style="list-style-type: none"> • Start South NESW pump • Close 2-WMO-901 • Stop North NESW pump • Notify Chemistry of the NESW alignment change
	RO/BOP	Reports North NESW pump running and South NESW pump stopped

Op-Test No.: Set 1 Scenario No.: Cook04-05 Event No.: 2 Page 2 of 10

Event Description: **First Stage Turbine Impulse transmitter (MPC-253) fails LOW**

Time	Position	Applicant's Actions or Behavior
	RO/BOP	Recognizes and reports multiple annunciators on Panel 211, 213, and 214 for a Turbine Impulse pressure failure.
	RO	Verifies no runback in progress Places rod control switch in MANUAL Reports failure of MPC-253 instrument
	US	Enters and directs actions of 02-OHP 4022.012.003, Continuous Control Bank Movement procedure.
	RO	Performs the following as directed: <ol style="list-style-type: none"> 1. Checks for no turbine runback 2. Ensures control rods are in manual with no rod motion 3. Checks rod position above low-low rod insertion limit 4. Checks axial flux difference (AFD) within target band 5. Initiates restoration of equilibrium conditions using either: <ul style="list-style-type: none"> • Control rod movement • Turbine load adjustment 6. Identifies failed Turbine First Stage Impulse Pressure Instrument
	US	Directs actions per 02-OHP 4022.013.016, Turbine First Stage Impulse Pressure Instrument Malfunction.
	RO	<ol style="list-style-type: none"> 1. Verifies rod control in manual. 2. Places AMSAC bypass/test switch in BYPASS/TEST 3. Places Steam Dump selector control switches to OFF 4. Reduce Turbine load or Withdraw rods to restore Tave-Tref and AFD
	US	Initiates actions to trip bistables for MPC-253 failure per Attachment A of 02-OHP 4022.013.016.
	RO	Verifies proper bistable tripping per Attachment A.
	US	Refers to Tech Specs: <ol style="list-style-type: none"> 1. TS 3.3.2.1 <u>ESFAS Instrumentation</u> (Table 3.3-3, Action 14) 2. TS 3.2.5, <u>DNB</u> (If Pressure drops <2200 psig) 3. ATR 2-AMSAC-1, <u>ATWS Mitigation System Actuation Circuitry</u> <p>Identifies requirement to trip associated bistables within 1 hour of MPC-253 failure.</p>

Op-Test No.: Set 1 Scenario No.: Cook04-05 Event No.: 3 Page 3 of 10

Event Description: **CVCS Letdown Temperature Controller output fails LOW.**

Time	Position	Applicant's Actions or Behavior
	RO	Recognize and reports annunciator Panel 209 Drop 45 & 8 alarms which indicates a loss of CCW cooling to the letdown heat exchanger.
	US	Directs operator actions to restore proper temperature control for letdown.
	RO	Places 2-CRV-470, Letdown Temperature Control valve, controller to MANUAL Opens 2-CRV-470 and restores letdown temperature to normal Verifies letdown flow diverted to RC Filter
	US	Initiates action to have MTI investigate problem with letdown temperature controller.

Op-Test No.: Set 1 Scenario No.: Cook04-05 Event No.: 4 Page 4 of 10Event Description: **SG 21 Feedwater Flow Transmitter (FFC-210) Fails LOW**

Time	Position	Applicant's Actions or Behavior
	BOP	Recognizes and reports annunciators on Panel #213 Drop 13
	BOP	Verifies 2-FRV-210, SG 21 MFW Reg. Valve controller in manual Lowers controller output to match the operable feed flow channel with steam flow, and Restores SG 21 level to program.
	US	Enters and directs actions of 02-OHP 4022.013.015, Feedwater Flow Instrument Malfunction procedure.
	BOP	Performs the following actions as directed: 1. Restores SG 21 level using manual control of 2-FRV-210 2. Reports 2-FFC-210 has failed 3. Places 2-FS-510-C selector switch in channel 2 position. 4. Nulls and returns 2-FRV-210 controller to auto.
	US	Initiates actions to trip bistables associated with 2-FFC-210 FW Flow Failure per Attachment A-1 of 02-OHP 4022.013.015.
	US	Refers to Tech Specs and Administrative Technical Requirements <ul style="list-style-type: none"> • TS 3.3.1.1 <u>RTS Instrumentation</u> (Table 3.3-1, Action 7). • ATR - AMSAC-1 <u>ATWS Mitigation System Actuation Circuitry</u> • ATR - LEFM-1 <u>Leading Edge Flow Meter</u> <p><i>Identifies requirement to trip associated bistables within 1 hour of feed flow channel failure.</i></p>

Op-Test No.: Set 1 Scenario No.: Cook04-05 Event No.: 5 Page 5 of 10

Event Description: **East Main Feed Pump Lube Oil leak requiring a power reduction < 60%.**

Time	Position	Applicant's Actions or Behavior
	BOP	Recognizes and reports annunciator Panel 215 Drop 28: <ul style="list-style-type: none"> East FPT Lube Oil tank level low
	US	Directs operator actions to verify system valve lineup and check for leaks.
	US	Informs SM of need to perform a rapid power reduction for East MFP {NOTE: May recommend implementing PMP-6090-PCP-100, Spill Response – Oil, Polluting, and Hazardous Materials.}
	US	Implements procedure 02-OHP-4021.001.003, Power Reduction, or 02-OHP-4022.001.006, Rapid Power Reduction, to reduce reactor power < 60%.
	BOP	References procedure 02-OHP-4021-055-004, Main Feedpump Turbine Shutdown, Attachment 1.

Op-Test No.: Set 1Scenario No.: Cook04-05Event No.: 6Page 6 of 10Event Description: **Reduce Turbine Load / Reduce Reactor Power**

Time	Position	Applicant's Actions or Behavior
<u>Turbine Load Reduction per 02-OHP 4021.001.003, Power Reduction</u>		
	US	Directs RO to commence Power Reduction in accordance with 02-OHP 4021.001.003.
	RO	Performs BORATION batch add: <ul style="list-style-type: none"> ▪ Place RC Makeup Bend control switch in STOP ▪ Place RC Makeup Blend Control Mode switch in BORATE ▪ Set desired batch on BA batch controller ▪ Place RC Makeup Blend control switch in START
	RO	Commences power reduction: <ul style="list-style-type: none"> · Lowers turbine load (reactor power) using the load limiter. · Maintains Tave/Tref deviation within limits by boration and turbine load adjustments. · Ensures Axial Flux Difference (AFD) is maintained within target band by manual control rod movement as needed.
	US	Acts as reactivity manager by peer checking RO during blender operations and by verifying appropriate reactivity feedback.
	BOP	Monitors and maintains main electrical generator temperatures within limits per: <ul style="list-style-type: none"> · 02-OHP 4021.059.001, Generator Stator Cooling Water System · 02-OHP 4021.080.003, Generator Hydrogen Gas System
<u>Turbine Load Reduction per 02-OHP 4022.001.006, Rapid Power Reduction Response</u>		
	US	Directs RO to commence Rapid Power Reduction in accordance with 02-OHP 4022.001.006.
	RO	Commences power reduction: <ul style="list-style-type: none"> · Ensures control rods in auto or manually inserts rods. · Lowers turbine load (reactor power) using the load limiter or operating device.
	US	Acts as reactivity manager by peer checking RO and verifying appropriate reactivity feedback.

Op-Test No.: Set 1 Scenario No.: Cook04-05 Event No.: 7/8/9 Page 7 of 10

Event Description: **Electrical Grid Load Rejection followed by a complete Loss of All AC Power / 2AB Emergency Diesel Generator Failure; Turbine Driven AFW Pump Fails to Auto Start**

Time	Position	Applicant's Actions or Behavior
	CREW	Recognize and report a load rejection event
	US	Implement procedure 02-OHP-4022-001-002, Loss of Load (Load Rejection)
<p>NOTE: Previous failure of MPC-253, First stage Turbine Impulse pressure will cause rods to not function properly in Auto and the steam Dumps to not control correctly in Auto.</p>		
	RO	Verify Panel 2-SML-18 Drop 5 and 10 are CLEAR
	BOP	Verify SG levels are stable or trending to program Verify Main Generator connected to GRID
	US	Directs RO/BOP to perform the immediate actions of E-0, Reactor Trip or Safety Injection.
	RO	Performs the (primary) immediate actions of E-0: 1. Checks reactor trip 2. Checks safety injection status
	BOP	Performs the (secondary) immediate actions of E-0: 1. Checks turbine trip 2. Checks power to AC emergency buses: · Reports that NO AC emergency buses are energized

Op-Test No.: Set 1 Scenario No.: Cook04-05 Event No.: 7/8/9 Page 8 of 10

Event Description: **Electrical Grid Load Rejection followed by a complete Loss of All AC Power / 2AB Emergency Diesel Generator Failure; Turbine Driven AFW Pump Fails to Auto Start**

Time	Position	Applicant's Actions or Behavior
	US	Announces transition to ECA-0.0, Loss Of All AC Power and directs RO/BOP to perform immediate actions for ECA-0.0.
	RO/BOP	Performs the immediate actions of ECA-0:0: <ul style="list-style-type: none"> · Checks reactor trip / turbine trip
	US	Ensures immediate actions are completed and directs subsequent actions of ECA-0.0.
	RO	Checks RCS isolated: <ol style="list-style-type: none"> 1. Checks PRZ PORVs closed: 2. Checks letdown isolation valves closed 3. Checks excess letdown isolation valves closed 4. Places nuclear sampling isolate switches to ISOLATE: <ul style="list-style-type: none"> · Train A · Train B
	BOP Critical Task #1	Checks AFW flow > 240,000 PPH: <ul style="list-style-type: none"> · Manually starts the Turbine Driven AFW Pump
	US	Recognizes that only available EDG is not running and dispatches an operator to locally close 2-QCM-350, RCP seal water return outside containment.
	RO/BOP	Resets SI

Op-Test No.: Set 1 Scenario No.: Cook04-05 Event No.: 7/8/9 Page 9 of 10

Event Description: **Electrical Grid Load Rejection followed by a complete Loss of All AC Power / 2AB Emergency Diesel Generator Failure; Turbine Driven AFW Pump Fails to Auto Start**

Time	Position	Applicant's Actions or Behavior
	RO/BOP	Places the following equipment in pull to lock: <ul style="list-style-type: none"> · MDAFPs · CCPs · RHR pumps · SI pumps · CTS pumps · CCW pumps · NESW pumps
	US	Dispatches an operator to locally establish vital cabinet cooling using Attachment C of ECA-0.0.
	US	Identifies the status of the following off-site power sources: <ul style="list-style-type: none"> · Reserve power – UNAVAILABLE · Emergency power (EP) – AVAILABLE
	US	Directs Restoration of 4KV Power From EP using SUP.009 attachments to energize <u>either</u> pump bus first: <ul style="list-style-type: none"> · Attachment A - to energize Bus T21A from EP · Attachment D - to energize Bus T21D from EP
	BOP Critical Task #2	Energizes T21A (T21D) emergency bus from EP as directed: <ol style="list-style-type: none"> 1. Checks T21A (T21D) bus – <u>not</u> faulted 2. Places DG2AB(CD) supply to bus T21A(D) in pull to lock 3. Verifies breakers open with green targets: <ul style="list-style-type: none"> · Bus 2A(D) supply to bus T21A(D) · 4KV supply to TR21PHA(PHC) 4. Places the west (east) ESW pump in pull to lock 5. Closes 4KV EP supply to bus T21A(D) 6. Ensures EP supply current to Unit 2 remains < 600 AMPS

Op-Test No.: Set 1 Scenario No.: Cook04-05 Event No.: 7/8/9 Page 10 of 10

Event Description: **Electrical Grid Load Rejection followed by a complete Loss of All AC Power / 2AB Emergency Diesel Generator Failure; Turbine Driven AFW Pump Fails to Auto Start**

Time	Position	Applicant's Actions or Behavior
	US	Directs BOP to energize the remaining emergency buses from EP (using SUP.009) while US and RO continue recovery actions of ECA-0.0.
	BOP	Energizes the remaining emergency buses from EP: <ul style="list-style-type: none"> · T21A(D) · T21B · T21C
	RO	Performs the following recovery actions of ECA-0.0 as directed: <ol style="list-style-type: none"> 1. Controls SG PORVs to stabilize SG pressures 2. Checks the following equipment energized: <ul style="list-style-type: none"> · 600V bus(es) associated with energized emergency bus · Control room AHU · Battery charger · CRID inverters 3. Starts available ESW pump (unless header supplied from U-1)
	US	Announces transition to ECA-0.1, Loss Of All AC Power Recovery Without SI Required.
<u>TERMINATE SCENARIO</u>		

**CRITICAL TASK SUMMARY
(COOK04-05)**

Task	Elements	Results
<p align="center">#1</p> <p align="center">Manually Starts Turbine Driven AFW Pump</p>	<p><u>Cueing:</u></p> <ul style="list-style-type: none"> • Check AFW Flow...Verify TDAFP Running (ECA-0.0, Step 4, RNO) <p><u>Performance Indicators:</u></p> <ul style="list-style-type: none"> • Manually starts the TDAFP from the control room. • AFW flow must be established before SG dryout occurs (<15% WR level). <p><u>Performance Feedback:</u></p> <ul style="list-style-type: none"> • TDAFP speed rising • AFW flow > 240E3 PPH 	<p align="center">SAT / UNSAT</p>
<p align="center">#2</p> <p align="center">Restore Emergency Power</p>	<p><u>Cueing:</u></p> <ul style="list-style-type: none"> • Restore AC Power (ECA-0.0, Step 9.a, RNO a.2) <p><u>Performance Indicators:</u></p> <ul style="list-style-type: none"> • Restores emergency power (EP) to at least one 4KV emergency (pump) bus (i.e., T21A or T21D). • Power should be restored prior to depressurizing intact SGs to 190 psig (ECA-0.0, Step 19). <p><u>Performance Feedback:</u></p> <ul style="list-style-type: none"> • T21A or T21D bus energized • Power available to safeguards equipment. 	<p align="center">SAT / UNSAT</p>

SIMULATOR INSTRUCTIONS (COOK04-05)

Setup:

1. Reset to IC 16 (937)
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
5. Set Up PPC Point (10 min Avg) and Chart Recorders
6. Start Data Collection Program Save to file _____
7. Go to **RUN** and acknowledge/clear alarms
8. Activate the following (pre-load) malfunctions:
 - **EG08A**, 2AB EDG Speed Governor Failure
 - **FW48C**, TD AFW pump fails to AUTO start
9. Activate the following malfunctions to place **2CD EDG** OOS:
 - **IMF EG10B**
 - **IMF EG06B**
 - **IRF EGR14 RO**
 - **IRF EGR15 RO**
 - **IRF EGR02 RO**
 - **IOV AN01[64] CRYWOLF**
 - **IOV ZLO1012QTCD1 [GRN] OFF**
 - **IOV ZLO1012QTCD2 [GRN] OFF**

Place **RED** clearance tags on the following switches:

- **T21C3**
 - **T21D8**
 - **CB2DGTCD**
 - **2-QT-106-CD1**
 - **2-QT-106-CD2**
10. Assign to Trigger 15
 - **IMF FW07A**, East FW pump bearing Failure
 - Assign file **EFWPTLO Level Lo** (FWLLOTKA < 32)

(continued on next page)

SIMULATOR INSTRUCTIONS (COOK04-05)

Scenario Events:

Event #2

1. Trigger (1) **IMF RX19A**, final value **0** (MPC-253 fails LOW) after crew has swapped the NESW pumps.

Event #3

2. Trigger (3) **IMF CV09**, final value **50** (Letdown Temp Controller fails LOW) when crew has recovered from turbine impulse channel failure.

Event #4

3. Trigger (5) **IMF RX21A**, final value **2** (FFC-210 fails LOW) after crew has recovered from Letdown temperature controller failure.

Event #5

4. Trigger (7) **IMF FW12A**, final value **10** (E MFP oil leak) after crew has recovered from Feedwater Flow Channel failure.

Event #7

5. Trigger (9) **IMF ED19**, final value **25** (Grid Load Rejection):
 - **IMF ED01 Delay 2 min 10 secs**, Loss of 345 KV Bus 1
 - **IMF ED25 Delay 2 min 10 secs**, Loss of 765/345 KV Transformer Bank No. 4
 - **IMF EG01 Delay 2 mins 10 secs**, Main Generator Trip
 - Loss of Offsite AC Power
 - 2AB EDG Speed Governor fails
 - TD AFW pump fails to AUTO start

(continued on next page)

SIMULATOR INSTRUCTIONS (COOK04-05)

Response to Crew's Requests:

1. If directed, to trip bistables for **MPC-253** use:

IOV ZLOSTMC2[6] to ON to simulate opening cabinet Door

(Override Lights/Relays – RX Flux panel)

Remote	Bistable
RPR021	FS/512B
RPR027	FS/522B
RPR039	FS/542B
RPR033	FS/532B
RXR01	PS/505A
RXR03	PS/505C

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

DOV ZLOSTMC2[6] to simulate closing cabinet Door

2. If contacted as MTI investigate Letdown Temp controller, report back after some 5 min. delay that additional testing will be required to identify the problem.

3. If directed to trip bistables for FFC-210 use:

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

(Override Lights/Relays – RX Flux panel)

Remote	Bistable
RPR017	FS-510A
RPR018	FS-510B
(Panel 212 drop 15)	FS-510J

IOV ZLOSTMC2[1] to ON to simulate lifting Test Rack (Already ON from previous bistable)

Delete Override ZLOSTMC2[6] to simulate closing cabinet Door

4. If contacted as AEO to investigate East MFP operations, report unisolable leak adjacent to oil cooler

(continued on next page)

SIMULATOR INSTRUCTIONS
(COOK04-05)
(continued)

5. If directed to locally close 2-QCM-350 then
“SET CVVQCM350 0” (using ISD or JIS)
6. If directed to locally close 2-CCM-453 then
“SET CCVCCM453 0” (using ISD or JIS)
7. If directed act as AEO to perform Attachment C of ECA-0.0 (Cabinet Cooling)
8. If directed to locally close seal injection valves (2-CS-311N, 311S and 307) then activate remote functions:
 - **CVR20** final value **CLOSE**
 - **CVR21** final value **CLOSE**
9. If directed to restore N train battery charger then
MRF EDR21 to train with power

Facility: Cook Plant Unit 1 & Unit 2 Scenario No.: COOK04-06a Op-Test No.: Set 2

Examiners: _____

Operators: _____

Initial Conditions: IC-17 (936), BOL1: 99% power, 150 MWD, 729 ppm Boron, Xenon building in

Turnover: Swap CCP pumps, then commence power reduction to 80%

Event No.	Malf. No.	Event Type*	Event Description
1		N	Start East CCP and Stop West CCP
2	RX03D @ 630	I-RO	RCS Cold Leg Temperature Instrument (NTP-241) Fails HIGH
3		R	Lower Reactor Power and Turbine Load
4	RX25A @ 100	I-BOP	#21 Main Feed Reg Valve (FRV-210) controller oscillation
5	CV13A	C-RO	East CCP pump trips
6	RX11D @100%	C-BOP	SG PORV Controller Failure
7	ED05H ED05D	M	Loss of Bus T21D due to fault on Bus 2D 2D RCP Bus Fault (Loss of RCS Flow in Loop 1) - momentary
8	RP01A RP01B	C-RO	Reactor Trip (RTA) Fails to AUTO actuate Reactor Trip (RTB) Fails to AUTO actuate
9	FW51 FW46B	C-BOP	TDAFW pump T&TV failure due to blown control power fuse West MD AFW pump fails to start (to cause loss of all FW)

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

Cook Plant Unit 1 & Unit 2
(Rev. 1, 1/18/2004)

NUREG-1021, Revision 8, Supplement 1

Summary

The scenario starts with the plant at 99% power. The crew is directed to start the East Charging Pump and shutdown the West Charging Pump. After the Charging pumps have been swapped, the crew is directed to reduce power to 80%.

The first event will involve the RCS Loop 4 Cold Leg Temperature instrument (NTP-241) failing HIGH. This will result in the AUTO insertion of control rods and a lower trip setpoint value for OPΔT and OTΔT. The RO will be required to take manual control of rods to stop insertion. Crew will be required to implement AOP actions to stabilize the plant and trip bistables.

After a small power change, the next event will involve the #21 SG Main Feedwater Regulating Valve (FRV-210) controller oscillating. This will result in the opening and closing of FRV-210. BOP will be required to take manual control of FRV-210 to restore normal feed flow capability and restore SG level to program. The Crew will be required to implement actions to stabilize the unit. After the SG level is restored to Normal, Maintenance will replace the Failed Controller card and the FRV-210 can be restored to Auto.

The third event will involve the East Charging Pump trip. This will result in the loss of charging and letdown. RO will be required to manually start the West Charging Pump to restore charging flow. Crew will be required to take manual control of charging and restore letdown to stabilize the plant.

The fourth event will involve the failure of the SG #24 PORV Controller. The Controller will fail causing PORV 2-MRV-243 to Fully open. This will also cause Reactor power to slightly rise. The BOP will need to take manual action to close the PORV and the US will need to declare the associated radiation monitor inoperable.

The main event will involve the loss of RCP Bus 2D and Safety Bus T21D requiring a reactor trip. Failure of the Reactor Protection circuit will require a manual reactor trip. As the crew performs the actions of E-0, they should identify the failure to provide adequate feed flow. The crew will transition to ES-0.1 after verifying SI is not required. The CSFST for Heat Sink will indicate RED due to the loss of all AFW. The crew will immediately transition to FR-H.1 and re-establish feedwater flow using the TD AFW pump. The scenario will terminate when the crew has established adequate feed flow.

Critical Tasks

Perform Manual Reactor Trip
Establish AFW flow for Secondary Heat Sink

Procedures

E-0, Reactor Trip or Safety Injection
FR-H.1, Loss of Secondary Heat Sink

(Rev. 1, 1/18/2004)

NUREG-1021, Revision 8, Supplement 1

Op-Test No.: Set 2 Scenario No.: Cook04-06 Event No.: 1 Page 1 of 8

Event Description: Start East CCP and Stop West CCP

Time	Position	Applicant's Actions or Behavior
	US	Directs operator actions per 02-OHP-4021-003-001, Attachment 5: <ul style="list-style-type: none"> • Start East CCP • Stop West CCP
	RO	Reviews procedural precautions and actions in Attachment 5: <ul style="list-style-type: none"> • Maximum charging flow for normal ops is 150 gpm • If charging flow is < 75 gpm, mini-flow valve for running CCP must be OPEN
	RO	Performs actions per Attachment 5, Step 4.2: <ul style="list-style-type: none"> • Start East & West CCP Lube Oil pumps • Place 2-QRV-251 controller in MANUAL • Start East CCP • Place East Lube Oil pump switch in STBY • Stop West CCP • Place 2-QRV-251 controller in AUTO • Verify 2-HV-AES-1 in RUN and 2-HV-AES-2 in AUTO
	RO	Reports East CCP running and West CCP stopped

Op-Test No.: Set 2 Scenario No.: Cook04-06 Event No.: 2 Page 2 of 8Event Description: **Loop 4 RCS Cold Leg Temperature Transmitter (NTP-241) Fails High**

Time	Position	Applicant's Actions or Behavior
	RO	Recognizes and reports multiple annunciators on Panel #211 (RCS RTD failure.) Auto rod motion inward
	RO/BOP	Verifies NO runback in progress Places rod control switch in MANUAL
	US	Directs actions per 02-OHP 4022.012.003, Continuous Control Bank Movement.
	RO	<ol style="list-style-type: none"> 1. Verifies rod control in manual. 2. Verifies rod motion has stopped 3. Verifies Rod position above Low-Low Insertion Limit 4. Verifies AFD within target band 5. Verifies NI power ranges operable 6. Reduce turbine load or Withdraw control rods to minimize Tavg/Tref mismatch 7. Report Tavg channel inoperable due to RCS Loop 4 RTD failure
	US	Direct actions for RCS loop 4 RTD failure per 02-OHP 4022.013.007. <ul style="list-style-type: none"> • Place Tavg Defeat Switch to Loop 4 • Place ΔT Defeat Switch to Loop 4 • Verify $\Delta T/OP\Delta T/OT\Delta T$ recorder selected to Loop 1, 2, or 3. • Restore Rods to Auto when desired.
	US	Initiates actions to trip bistables for RCS loop 4 RTD failure per Attachment D
	RO	Verifies proper bistable tripping per Attachment D.
	US	Refers to Tech Specs 3.3.1.1 <u>RTS Instrumentation</u> (Table 3.3-1, Action 6) and 3.3.2.1 <u>ESFAS Instrumentation</u> (Table 3.3-3, Action 14). Identifies requirement to trip associated bistables within 1 hour of Loop 4 RCS RTD failure.

Op-Test No.: Set 2Scenario No.: Cook04-06Event No.: 3Page 3 of 8Event Description: **Reduce Turbine Load / Reduce Reactor Power**

Time	Position	Applicant's Actions or Behavior
	RO	Calculates boric acid addition per 02-OHP 4021.005.001, Attachment 6, Boration or Dilution Volume Determination.
	RO	Briefs crew on reactivity plan for power reduction.
	US	Reviews reactivity plan.
	US	Directs RO to commence Power Reduction in accordance with 02-OHP 4021.001.003.
	RO	Performs BORATION batch add: <ul style="list-style-type: none"> ▪ Place RC Makeup Bend control switch in STOP ▪ Place RC Makeup Blend Control Mode switch in BORATE ▪ Set desired batch on BA batch controller ▪ Place RC Makeup Blend control switch in START
	RO	Commences power reduction: <ul style="list-style-type: none"> · Lowers turbine load (reactor power) using the load limiter. · Maintains Tave/Tref deviation within limits by boration and turbine load adjustments. · Ensures Axial Flux Difference (AFD) is maintained within target band by manual control rod movement as needed.
	US	Acts as reactivity manager by peer checking RO during blender operations and by verifying appropriate reactivity feedback.
	BOP	Monitors and maintains main electrical generator temperatures within limits per: <ul style="list-style-type: none"> · 02-OHP 4021.059.001, Generator Stator Cooling Water System · 02-OHP 4021.080.003, Generator Hydrogen Gas System

Op-Test No.: Set 2 Scenario No.: Cook04-06 Event No.: 4 Page 4 of 8

Event Description: **Main Feedwater Regulating Valve (FRV-210) controller oscillations.**

Time	Position	Applicant's Actions or Behavior
	BOP	Recognizes and reports failure of #21 SG feedwater flow controller (FRV-210) in AUTO. <ul style="list-style-type: none"> • Abnormal #21 SG level • FRV-210 Controller alarm – in MANUAL
	US	Directs operator action to take manual control and restore #21 SG level to program.
	BOP	Places feedwater controller for FRV-210 in MANUAL Raises Feed flow to recover SG level to program
	US	Reports feedwater controller failure in AUTO and request Maintenance assistance in determining cause and corrective action.
	US/BOP	Coordinates placing FRV-210 in Auto after Maintenance repairs are complete.

Op-Test No.: Set 2 Scenario No.: Cook04-06 Event No.: 5 Page 5 of 8Event Description: **2E Centrifugal Charging Pump (CCP) Trips**

Time	Position	Applicant's Actions or Behavior
	RO	Recognizes and reports multiple annunciators on Panel #207, #208 and #209 which are indicative of a loss of charging capability. <ul style="list-style-type: none"> • Loss of charging flow • Loss of letdown flow • Loss of RCP seal injection flow
	RO	Recognizes and reports that running (2E) CCP has tripped.
	US	Directs RO to start the 2W CCP per annunciator response(s): <ul style="list-style-type: none"> • 02-OHP 4024.208 Drop 20, Charging Flow < Min Set Point • 02-OHP 4024.209 Drop 12, East CCP Motor Overload Trip
	RO	Performs the following as directed: <ul style="list-style-type: none"> • Starts 2W CCP • Adjusts QRV-200 and QRV-251 flow to maintain RCP seal flow and Pressurizer level.
	RO	Places normal letdown back in service in accordance with 02-OHP 4021.003.001, Attachment 13. <ul style="list-style-type: none"> • Place QRV-302 to DIVERT • Adjust Charging (QRV-251) and CCW Flow (CRV-470) • Adjust QRV-301 to 50% output demand • Open QRV-161 or 162 75 GPM Letdown Orifice. • Adjust QRV-301 as required. • Open RV-160 (if 120 gpm letdown is desired) • Adjust QRV-301 and place in Auto at 350 psig. • Place QRV-302 to NORMAL when Letdown temperature is stable.
	US	Declares 2E CCP inoperable and refers to Tech Specs (TS): <ul style="list-style-type: none"> • TS 3.1.2.4, <u>Charging Pumps – Operating</u> • TS 3.5.2, <u>ECCS Subsystems – Tavg > 350°F</u> <p>Enters action statements to restore 2E CCP to operable status within 72 hours.</p>

Op-Test No.: Set 2 Scenario No.: Cook04-06 Event No.: 6 Page 6 of 8

Event Description: **SG PORV Controller Failure**

Time	Position	Applicant's Actions or Behavior
	BOP	Recognize and reports Annunciator #214 Drop 24 that indicates SG #24 PORV 2-MRV-243 has failed Open
	US	Direct operator actions to close SG PORV and monitor Reactor Power
	BOP	Place SG PORV #24 in Manual and Closes PORV.
	US	Declares the SG #24 PORV radiation Monitor 2-MRA-2602 Inoperable
	US	Refers to the following Tech Specs (TS): <ul style="list-style-type: none"> · TS 3.3.3.1 <u>Radiation Monitoring Instrumentation</u> (Table 3.3-6) Action 22B Restore in 7 days.

Op-Test No.: Set 2 Scenario No.: Cook04-06 Event No.: 7/8/9 Page 7 of 8

Event Description: **Loss of Bus T21D due to fault of Bus 2D – Loss of RCS flow in one loop; Failure of RPS Reactor Trip signal to AUTO actuate; Loss of control power to TD AFW pump T&TV & Trip of West MDAFP**

Time	Position	Applicant's Actions or Behavior
	CREW	Recognizes the loss of RCS flow in one loop and the failure of the reactor to automatically trip.
	<u>US/RO</u> <u>Critical Task #1</u>	<ul style="list-style-type: none"> • Direct operator to locally open reactor trip breakers • Manually Trip Reactor
	US	Directs RO/BOP to perform the immediate actions of E-0, Reactor Trip or Safety Injection.
	RO	Performs the (primary) immediate actions of E-0: <ol style="list-style-type: none"> 1. Checks reactor trip 2. Checks safety injection status
	BOP	Performs the (secondary) immediate actions of E-0: <ol style="list-style-type: none"> 1. Verifies turbine trip 2. Checks power to AC emergency buses <ul style="list-style-type: none"> • Reports Loss of 4KV Bus T21D (due to fault) • Trips CD EDG or places T21D8 in PTL to prevent cyclic loading attempts
	US	Ensures immediate actions of E-0 are completed
	US	Announce transition to ES-0.1, Reactor Trip Response.

Op-Test No.: Set 2 Scenario No.: Cook04-06 Event No.: 7/8/9 Page 8 of 8

Event Description: **Loss of Bus T21D due to fault of Bus 2D – Loss of RCS flow in one loop; Failure of RPS Reactor Trip signal to AUTO actuate; Loss of control power to TD AFW pump T&TV & Trip of West MDAFP**

Time	Position	Applicant's Actions or Behavior
	CREW	Recognizes RED path on CSFST for Heat Sink which requires transition to FR-H.1
	US/BOP	Announces transition to FR-H.1, Response to Loss of Secondary Heat Sink per CSFST status.
	RO/BOP	Reviews foldout page for FR-H.1, Response to Loss of Secondary Heat Sink.
	US	Directs actions of FR-H.1, Response to Loss of Secondary Heat Sink.
	US/RO	<ul style="list-style-type: none"> Recognizes one CCP available Verifies Bleed and Feed initiation is not required Verifies RCS pressure remains < 2335 psig
	<u>US/BOP</u> <u>Critical Task #2</u>	Attempts to establish secondary heat sink to one SG: <ul style="list-style-type: none"> Dispatches operator to locally reset TDAFP T&TV and replace fuse. Directs operator to start TDAFP. Verify total feed flow > 240E3 PPH.
	US	Announces transition to ES-0.1, Reactor Trip Response.
TERMINATE SCENARIO		

**CRITICAL TASK SUMMARY
(COOK04-06)**

Task	Elements	Results
<p style="text-align: center;">#1</p> <p style="text-align: center;">Manually Trip Reactor</p>	<p><u>Cueing:</u></p> <ul style="list-style-type: none"> • Challenge to multiple reactor trip setpoints: RCS Loop Flow Low RCP Trip <p><u>Performance Indicators:</u></p> <ul style="list-style-type: none"> • Manually open at least one reactor trip breaker from the control room. • Must be performed prior to: <ul style="list-style-type: none"> · SG Dryout (<15% wide range level) · Exceeding RCS safety valve limit (2485 psig) <p><u>Performance Feedback:</u></p> <ul style="list-style-type: none"> • IRPIs indicate rods - fully inserted • Rod bottom lights – lit • Neutron flux - lowering 	<p style="text-align: center;"><u>SAT / UNSAT</u></p>
<p style="text-align: center;">#2</p> <p style="text-align: center;">Manually Starts Turbine Driven AFW Pump</p>	<p><u>Cueing:</u></p> <ul style="list-style-type: none"> • Check TDAFP Trip and Throttle Valves/Manually Start AFW pump(FR-H.1, Step 4.b.3 & 4.c) <p><u>Performance Indicators:</u></p> <ul style="list-style-type: none"> • Manually starts the TDAFP from the control room. • AFW flow must be established before SG dryout occurs (<15% WR level). <p><u>Performance Feedback:</u></p> <ul style="list-style-type: none"> • TDAFP speed rising • AFW flow > 240E3 PPH 	<p style="text-align: center;"><u>SAT / UNSAT</u></p>

SIMULATOR INSTRUCTIONS
(COOK04-06)

Setup:

1. Reset to IC 17 (936)
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
5. Go to **RUN** and acknowledge/clear alarms
6. Activate the following (pre-load) malfunctions:
 - **RP01A**, RTA fails to AUTO open
 - **RP01B**, RTB fails to AUTO open
 - **FW48C**, Failure of TD AFW pump AUTO start
 - **FW46B**, West MDAFP Trip/Fail to Start
7. Assign file "RxTrip" to event #11:
 - FW51**, TD AFW pump T&TV blown control fuse

(continued on next page)

SIMULATOR INSTRUCTIONS (COOK04-06)

Scenario Events:

Event #2

1. Trigger (1) **IMF RX03D**, final value **630** (NTP-241 fails HIGH) when crew has stabilized the plant after swapping CCPs.

Event #4

2. Trigger (3) **IMF RX25A**, final value **100** (FRV-210 controller oscillation) when crew has recovered from RCS Cold Leg Temperature channel failure after the desired power reduction is performed.

Event #5

3. Trigger (5) **IMF CV13A** (East CCP trip) when crew has recovered from FRV-210 controller oscillation failure.

Event #6

4. Trigger (7) **IMF RX11D**, final value **100** (SG PORV Controller failure) when the crew has restored Charging and Letdown.

Event #7

5. Trigger (9) **IMF ED05H; IMF ED05D** (Loss of T21D Bus):
 - RPS Reactor Trip fails to AUTO actuate
 - TD AFW pump fails to start
 -

(continued on next page)

SIMULATOR INSTRUCTIONS (COOK04-06)

Response to Crew's Requests:

1. If directed, to trip bistables for **NTP-241** use:

IOR ZLOSTMC2[9] to ON to simulate opening cabinet Door
(Override Lights/Relays – RX Flux panel)

Remote	Bistable
RPR137	TS/441G
RPR139	TS/442D
RPR135	TS/441C
RPR138	TS/441H
RPR140	TS/442G
RPR136	TS/441D

IOR ZLOSTMC2[4] to ON to simulate lifting Test Rack

DOR ZLOSTMC2[9] to simulate closing cabinet Door

2. If contacted as MTI investigate SG #21 Feedwater Regulating valve controller, report back that this failure has been previously identified and a replacement Card is Available. Prompt as Shift Manager as required to allow the card to be replaced and the FRV-210 restored to Auto. (Go to Control room to oversee repairs – Use Time Compression if required)
DMF RX25A to simulate replacing the card.
3. If contacted as AEO or Maintenance to evaluate East CCP operations, report back after some 5 min. delay that motor/pump coupling damage is evident.
4. If contacted as AEO or Maintenance to evaluate TD AFW pump T&TV operations, report back after some 2 min. delay that T&TV appears to be functional with NO physical damage evident, but the fuse is blown.
 - **DMF FW51** to replace the blown fuse.

TD AFW Local Operation:

- **IRF FWR78** to **LOCAL**
- **IRF FWR79 40** ramped over 1 min.(provides about 240K flow to SGs)

Facility: Cook Plant Unit 1 & Unit 2Scenario No.: COOK04-06Op-Test No.: Set 2Examiners: _____

_____Operators: _____

Initial Conditions: IC-17 (936), BOL1: 99% power, 150 MWD, 729 ppm Boron, Xenon building in

Turnover: Swap CCP pumps, then commence power reduction to 80%

Event No.	Malf. No.	Event Type*	Event Description
1		N	Start East CCP and Stop West CCP
2	RX03D @ 630	I-RO	RCS Cold Leg Temperature Instrument (NTP-241) Fails HIGH
3		R	Lower Reactor Power and Turbine Load
4	RX25A @ 100	I-BOP	#21 Main Feed Reg Valve (FRV-210) controller oscillation
5	CV13A	C-RO	East CCP pump trips
6	RX11D @100%	C-BOP	SG PORV Controller Failure
7	ED05H ED05D	M	Loss of Bus T21D due to fault on Bus 2D 2D RCP Bus Fault (Loss of RCS Flow in Loop 1) - momentary
8	RP01A RP01B	C-RO	Reactor Trip (RTA) Fails to AUTO actuate Reactor Trip (RTB) Fails to AUTO actuate
9	FW51 FW46B	C-BOP	TDAFW pump T&TV failure due to blown control power fuse West MD AFW pump fails to start (to cause loss of all FW)

* (N)ormal, (R)eactivity,
Cook Plant Unit 1 & Unit 2
(Rev. 1, 1/18/2004)

(I)nstrument, (C)omponent,

(M)ajor

NUREG-1021, Revision 8, Supplement 1

Summary

The scenario starts with the plant at 99% power. The crew is directed to start the East Charging Pump and shutdown the West Charging Pump. After the Charging pumps have been swapped, the crew is directed to reduce power to 80%.

The first event will involve the RCS Loop 4 Cold Leg Temperature instrument (NTP-241) failing HIGH. This will result in the AUTO insertion of control rods and a lower trip setpoint value for OPΔT and OTΔT. The RO will be required to take manual control of rods to stop insertion. Crew will be required to implement AOP actions to stabilize the plant and trip bistables.

After a small power change, the next event will involve the #21 SG Main Feedwater Regulating Valve (FRV-210) controller oscillating. This will result in the opening and closing of FRV-210. BOP will be required to take manual control of FRV-210 to restore normal feed flow capability and restore SG level to program. The Crew will be required to implement actions to stabilize the unit. After the SG level is restored to Normal, Maintenance will replace the Failed Controller card and the FRV-210 can be restored to Auto.

The third event will involve the East Charging Pump trip. This will result in the loss of charging and letdown. RO will be required to manually start the West Charging Pump to restore charging flow. Crew will be required to take manual control of charging and restore letdown to stabilize the plant.

The fourth event will involve the failure of the SG #24 PORV Controller. The Controller will fail causing PORV 2-MRV-243 to Fully open. This will also cause Reactor power to slightly rise. The BOP will need to take manual action to close the PORV and the US will need to declare the associated radiation monitor inoperable.

The main event will involve the loss of RCP Bus 2D and Safety Bus T21D requiring a reactor trip. Failure of the Reactor Protection circuit will require a manual reactor trip. As the crew performs the actions of E-0, they should identify the failure to provide adequate feed flow. The crew will transition to ES-0.1 after verifying SI is not required. The CSFST for Heat Sink will indicate RED due to the loss of all AFW. The crew will immediately transition to FR-H.1 and re-establish feedwater flow using the TD AFW pump. The scenario will terminate when the crew has established adequate feed flow.

Critical Tasks

Perform Manual Reactor Trip
Establish AFW flow for Secondary Heat Sink

Procedures

E-0, Reactor Trip or Safety Injection
FR-H.1, Loss of Secondary Heat Sink

(Rev. 1, 1/18/2004)

NUREG-1021, Revision 8, Supplement 1

Op-Test No.: Set 2 Scenario No.: Cook04-06 Event No.: 1 Page 1 of 8

Event Description: Start East CCP and Stop West CCP

Time	Position	Applicant's Actions or Behavior
	US	Directs operator actions per 02-OHP-4021-003-001, Attachment 5: <ul style="list-style-type: none"> • Start East CCP • Stop West CCP
	RO	Reviews procedural precautions and actions in Attachment 5: <ul style="list-style-type: none"> • Maximum charging flow for normal ops is 150 gpm • If charging flow is < 75 gpm, mini-flow valve for running CCP must be OPEN
	RO	Performs actions per Attachment 5, Step 4.2: <ul style="list-style-type: none"> • Start East & West CCP Lube Oil pumps • Place 2-QRV-251 controller in MANUAL • Start East CCP • Place East Lube Oil pump switch in STBY • Stop West CCP • Place 2-QRV-251 controller in AUTO • Verify 2-HV-AES-1 in RUN and 2-HV-AES-2 in AUTO
	RO	Reports East CCP running and West CCP stopped

Op-Test No.: Set 2 Scenario No.: Cook04-06 Event No.: 2 Page 2 of 8Event Description: **Loop 4 RCS Cold Leg Temperature Transmitter (NTP-241) Fails High**

Time	Position	Applicant's Actions or Behavior
	RO	Recognizes and reports multiple annunciators on Panel #211 (RCS RTD failure.) Auto rod motion inward
	RO/BOP	Verifies NO runback in progress Places rod control switch in MANUAL
	US	Directs actions per 02-OHP 4022.012.003, Continuous Control Bank Movement.
	RO	<ol style="list-style-type: none"> 1. Verifies rod control in manual. 2. Verifies rod motion has stopped 3. Verifies Rod position above Low-Low Insertion Limit 4. Verifies AFD within target band 5. Verifies NI power ranges operable 6. Reduce turbine load or Withdraw control rods to minimize Tavg/Tref mismatch 7. Report Tavg channel inoperable due to RCS Loop 4 RTD failure
	US	Direct actions for RCS loop 4 RTD failure per 02-OHP 4022.013.007. <ul style="list-style-type: none"> • Place Tavg Defeat Switch to Loop 4 • Place ΔT Defeat Switch to Loop 4 • Verify $\Delta T/OP\Delta T/OT\Delta T$ recorder selected to Loop 1, 2, or 3. • Restore Rods to Auto when desired.
	US	Initiates actions to trip bistables for RCS loop 4 RTD failure per Attachment D
	RO	Verifies proper bistable tripping per Attachment D.
	US	Refers to Tech Specs 3.3.1.1 <u>RTS Instrumentation</u> (Table 3.3-1, Action 6) and 3.3.2.1 <u>ESFAS Instrumentation</u> (Table 3.3-3, Action 14). Identifies requirement to trip associated bistables within 1 hour of Loop 4 RCS RTD failure.

Op-Test No.: Set 2Scenario No.: Cook04-06Event No.: 3Page 3 of 8Event Description: **Reduce Turbine Load / Reduce Reactor Power**

Time	Position	Applicant's Actions or Behavior
	RO	Calculates boric acid addition per 02-OHP 4021.005.001, Attachment 6, Boration or Dilution Volume Determination.
	RO	Briefs crew on reactivity plan for power reduction.
	US	Reviews reactivity plan.
	US	Directs RO to commence Power Reduction in accordance with 02-OHP 4021.001.003.
	RO	Performs BORATION batch add: <ul style="list-style-type: none"> ▪ Place RC Makeup Bend control switch in STOP ▪ Place RC Makeup Blend Control Mode switch in BORATE ▪ Set desired batch on BA batch controller ▪ Place RC Makeup Blend control switch in START
	RO	Commences power reduction: <ul style="list-style-type: none"> · Lowers turbine load (reactor power) using the load limiter. · Maintains Tave/Tref deviation within limits by boration and turbine load adjustments. · Ensures Axial Flux Difference (AFD) is maintained within target band by manual control rod movement as needed.
	US	Acts as reactivity manager by peer checking RO during blender operations and by verifying appropriate reactivity feedback.
	BOP	Monitors and maintains main electrical generator temperatures within limits per: <ul style="list-style-type: none"> · 02-OHP 4021.059.001, Generator Stator Cooling Water System · 02-OHP 4021.080.003, Generator Hydrogen Gas System

Op-Test No.: Set 2 Scenario No.: Cook04-06 Event No.: 4 Page 4 of 8

Event Description: **Main Feedwater Regulating Valve (FRV-210) controller oscillations.**

Time	Position	Applicant's Actions or Behavior
	BOP	Recognizes and reports failure of #21 SG feedwater flow controller (FRV-210) in AUTO. <ul style="list-style-type: none"> • Abnormal #21 SG level • FRV-210 Controller alarm – in MANUAL
	US	Directs operator action to take manual control and restore #21 SG level to program.
	BOP	Places feedwater controller for FRV-210 in MANUAL Raises Feed flow to recover SG level to program
	US	Reports feedwater controller failure in AUTO and request Maintenance assistance in determining cause and corrective action.
	US/BOP	Coordinates placing FRV-210 in Auto after Maintenance repairs are complete.

Op-Test No.: Set 2 Scenario No.: Cook04-06 Event No.: 5 Page 5 of 8Event Description: **2E Centrifugal Charging Pump (CCP) Trips**

Time	Position	Applicant's Actions or Behavior
	RO	Recognizes and reports multiple annunciators on Panel #207, #208 and #209 which are indicative of a loss of charging capability. <ul style="list-style-type: none"> • Loss of charging flow • Loss of letdown flow • Loss of RCP seal injection flow
	RO	Recognizes and reports that running (2E) CCP has tripped.
	US	Directs RO to start the 2W CCP per annunciator response(s): <ul style="list-style-type: none"> • 02-OHP 4024.208 Drop 20, Charging Flow < Min Set Point • 02-OHP 4024.209 Drop 12, East CCP Motor Overload Trip
	RO	Performs the following as directed: <ul style="list-style-type: none"> • Starts 2W CCP • Adjusts QRV-200 and QRV-251 flow to maintain RCP seal flow and Pressurizer level.
	RO	Places normal letdown back in service in accordance with 02-OHP 4021.003.001, Attachment 13. <ul style="list-style-type: none"> • Place QRV-302 to DIVERT • Adjust Charging (QRV-251) and CCW Flow (CRV-470) • Adjust QRV-301 to 50% output demand • Open QRV-161 or 162 75 GPM Letdown Orifice. • Adjust QRV-301 as required. • Open RV-160 (if 120 gpm letdown is desired) • Adjust QRV-301 and place in Auto at 350 psig. • Place QRV-302 to NORMAL when Letdown temperature is stable.
	US	Declares 2E CCP inoperable and refers to Tech Specs (TS): <ul style="list-style-type: none"> • TS 3.1.2.4, <u>Charging Pumps – Operating</u> • TS 3.5.2, <u>ECCS Subsystems – Tavg > 350°F</u> <p>Enters action statements to restore 2E CCP to operable status within 72 hours.</p>

Op-Test No.: Set 2 Scenario No.: Cook04-06 Event No.: 6 Page 6 of 8Event Description: **SG PORV Controller Failure**

Time	Position	Applicant's Actions or Behavior
	BOP	Recognize and reports Annunciator #214 Drop 24 that indicates SG #24 PORV 2-MRV-243 has failed Open
	US	Direct operator actions to close SG PORV and monitor Reactor Power
	BOP	Place SG PORV #24 in Manual and Closes PORV.
	US	Declares the SG #24 PORV radiation Monitor 2-MRA-2602 Inoperable
	US	Refers to the following Tech Specs (TS): <ul style="list-style-type: none"> · TS 3.3.3.1 <u>Radiation Monitoring Instrumentation</u> (Table 3.3-6) Action 22B Restore in 7 days.

Op-Test No.: Set 2 Scenario No.: Cook04-06 Event No.: 7/8/9 Page 7 of 8

Event Description: **Loss of Bus T21D due to fault of Bus 2D – Loss of RCS flow in one loop; Failure of RPS Reactor Trip signal to AUTO actuate; Loss of control power to TD AFW pump T&TV & Trip of West MDAFP**

Time	Position	Applicant's Actions or Behavior
	CREW	Recognizes the loss of RCS flow in one loop and the failure of the reactor to automatically trip.
	<u>US/RO</u> <u>Critical Task #1</u>	<ul style="list-style-type: none"> • Direct operator to locally open reactor trip breakers • Manually Trip Reactor
	US	Directs RO/BOP to perform the immediate actions of E-0, Reactor Trip or Safety Injection.
	RO	Performs the (primary) immediate actions of E-0: <ol style="list-style-type: none"> 1. Checks reactor trip 2. Checks safety injection status
	BOP	Performs the (secondary) immediate actions of E-0: <ol style="list-style-type: none"> 1. Verifies turbine trip 2. Checks power to AC emergency buses <ul style="list-style-type: none"> • Reports Loss of 4KV Bus T21D (due to fault) • Trips CD EDG or places T21D8 in PTL to prevent cyclic loading attempts
	US	Ensures immediate actions of E-0 are completed
	US	Announce transition to ES-0.1, Reactor Trip Response.

Op-Test No.: Set 2 Scenario No.: Cook04-06 Event No.: 7/8/9 Page 8 of 8

Event Description: **Loss of Bus T21D due to fault of Bus 2D – Loss of RCS flow in one loop; Failure of RPS Reactor Trip signal to AUTO actuate; Loss of control power to TD AFW pump T&TV & Trip of West MDAFP**

Time	Position	Applicant's Actions or Behavior
	CREW	Recognizes RED path on CSFST for Heat Sink which requires transition to FR-H.1
	US/BOP	Announces transition to FR-H.1, Response to Loss of Secondary Heat Sink per CSFST status.
	RO/BOP	Reviews foldout page for FR-H.1, Response to Loss of Secondary Heat Sink.
	US	Directs actions of FR-H.1, Response to Loss of Secondary Heat Sink.
	US/RO	<ul style="list-style-type: none"> • Recognizes one CCP available • Verifies Bleed and Feed initiation is not required • Verifies RCS pressure remains < 2335 psig
	<u>US/BOP</u> <u>Critical Task #2</u>	Attempts to establish secondary heat sink to one SG: <ul style="list-style-type: none"> • Dispatches operator to locally reset TDAFP T&TV and replace fuse. • Directs operator to start TDAFP. • Verify total feed flow > 240E3 PPH.
	US	Announces transition to ES-0.1, Reactor Trip Response.

TERMINATE SCENARIO

**CRITICAL TASK SUMMARY
(COOK04-06)**

Task	Elements	Results
<p align="center">#1</p> <p align="center">Manually Trip Reactor</p>	<p><u>Cueing:</u></p> <ul style="list-style-type: none"> • Challenge to multiple reactor trip setpoints: RCS Loop Flow Low RCP Trip <p><u>Performance Indicators:</u></p> <ul style="list-style-type: none"> • Manually open at least one reactor trip breaker from the control room. • Must be performed prior to: <ul style="list-style-type: none"> · SG Dryout (<15% wide range level) · Exceeding RCS safety valve limit (2485 psig) <p><u>Performance Feedback:</u></p> <ul style="list-style-type: none"> • IRPIs indicate rods - fully inserted • Rod bottom lights – lit • Neutron flux - lowering 	<p align="center"><u>SAT / UNSAT</u></p>
<p align="center">#2</p> <p align="center">Manually Starts Turbine Driven AFW Pump</p>	<p><u>Cueing:</u></p> <ul style="list-style-type: none"> • Check TDAFP Trip and Throttle Valves/Manually Start AFW pump(FR-H.1, Step 4.b.3 & 4.c) <p><u>Performance Indicators:</u></p> <ul style="list-style-type: none"> • Manually starts the TDAFP from the control room. • AFW flow must be established before SG dryout occurs (<15% WR level). <p><u>Performance Feedback:</u></p> <ul style="list-style-type: none"> • TDAFP speed rising • AFW flow > 240E3 PPH 	<p align="center"><u>SAT / UNSAT</u></p>

SIMULATOR INSTRUCTIONS
(COOK04-06)

Setup:

1. Reset to IC 17 (936)
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
5. Go to **RUN** and acknowledge/clear alarms
6. Activate the following (pre-load) malfunctions:
 - **RP01A**, RTA fails to AUTO open
 - **RP01B**, RTB fails to AUTO open
 - **FW48C**, Failure of TD AFW pump AUTO start
 - **FW46B**, West MDAFP Trip/Fail to Start
7. Assign file "RxTrip" to event #11:
 - FW51**, TD AFW pump T&TV blown control fuse

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SIMULATOR INSTRUCTIONS (COOK04-06)

Scenario Events:

Event #2

1. Trigger (1) **IMF RX03D**, final value **630** (NTP-241 fails HIGH) when crew has stabilized the plant after swapping CCPs.

Event #4

2. Trigger (3) **IMF RX25A**, final value **100** (FRV-210 controller oscillation) when crew has recovered from RCS Cold Leg Temperature channel failure after the desired power reduction is performed.

Event #5

3. Trigger (5) **IMF CV13A** (East CCP trip) when crew has recovered from FRV-210 controller oscillation failure.

Event #6

4. Trigger (7) **IMF RX11D**, final value **100** (SG PORV Controller failure) when the crew has restored Charging and Letdown.

Event #7

5. Trigger (9) **IMF ED05H; IMF ED05D** (Loss of T21D Bus):
 - RPS Reactor Trip fails to AUTO actuate
 - TD AFW pump fails to start
 -

(continued on next page)

SIMULATOR INSTRUCTIONS (COOK04-06)

Response to Crew's Requests:

1. If directed, to trip bistables for **NTP-241** use:

IOR ZLOSTMC2[9] to ON to simulate opening cabinet Door
(Override Lights/Relays – RX Flux panel)

Remote	Bistable
RPR137	TS/441G
RPR139	TS/442D
RPR135	TS/441C
RPR138	TS/441H
RPR140	TS/442G
RPR136	TS/441D

IOR ZLOSTMC2[4] to ON to simulate lifting Test Rack

DOR ZLOSTMC2[9] to simulate closing cabinet Door

2. If contacted as MTI investigate SG #21 Feedwater Regulating valve controller, report back that this failure has been previously identified and a replacement Card is Available. Prompt as Shift Manager as required to allow the card to be replaced and the FRV-210 restored to Auto. (Go to Control room to oversee repairs – Use Time Compression if required)
DMF RX25A to simulate replacing the card.
3. If contacted as AEO or Maintenance to evaluate East CCP operations, report back after some 5 min. delay that motor/pump coupling damage is evident.
4. If contacted as AEO or Maintenance to evaluate TD AFW pump T&TV operations, report back after some 2 min. delay that T&TV appears to be functional with NO physical damage evident, but the fuse is blown.
 - **DMF FW51** to replace the blown fuse.

TD AFW Local Operation:

- **IRF FWR78** to **LOCAL**
- **IRF FWR79 40** ramped over 1 min.(provides about 240K flow to SGs)