Facility : **PBNP** Scenario No.: **2** OP-Test No.: **2000-1**

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Operators: _____
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Initial Conditions: Unit 1 @ 28% Power, MOL, Equilibrium Xe, RCS Cb is 983 ppm. Unit 2 @ 100% Power, BOL. Today is Sunday (present clock time is real time). Normal shift complement with exception of 3rd SRO.

Turnover: OP-1C, "Low Power to Normal Power Operation" completed through step 5.117. Chemistry has just reported Secondary Chemistry Requirements are met after 2 days of clean-up. The DSS directs reactor power raised to 47% upon turnover (post-trip recovery).
I & C has VCT Level Transmitter (LT-141) de-energized for repairs.
G-01 is out of service for annual maintenance. It was taken OOS 2 days ago, and is expected to be returned to service in 3 days. G-02 is aligned to 1AO5 and 2AO5 IAW OI-35A.
A Severe Thunderstorm Watch is in effect for the next 4 hours.

Event No.	Malf. No.	Event Type*	Event Description
1		R/(RO) N/ (ALL)	Perform a normal up-power IAW OP-1C.
2		I/ (RO)	Thot Instrument fails High.
3		I/ (BOP)	Controlling Steam Generator Pressure Transmitter Fails High.
4		C/ (RO)	Drop two control rods (not simultaneously).
5		M/ (ALL)	Anticipated Transient Without Scram (ATWS).
6		C/ (RO)	PORV opens and Fails to Reseat (can be manually isolated).
7		C/(RO/ BOP)	1SI-852A Fails to Open ("A" Train RHR).
8		C/(RO/ BOP)	1CV-313 Fails to Shut (CI Valve).
9		M/ (ALL)	LOCA develops **Inside** Containment. (identification only)

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

Op-Test No: 2000-1 Scenario No: 2 Event No: 1 Page 1 Of 2

Event Description: **Perform Normal Up-power (reactivity manipulation)**

Time	Position	Applicant's Actions or Behavior
The normal up-power brief may be conducted in the classroom at the discretion of the lead examiner to minimize the amount of time in the simulator prior to entering simulator.		
	DOS	Brief crew on evolution including discussion of OP-1C precautions and limitations to commence power escalation
	DOS	Determine rate of continued load escalation to 47 % power and oversee evolution
	DOS	Notify System Control Supervisor and Auxiliary Operators of Load Escalation
	BOP	Verified governor valves are off the valve position limiter (VPL)
	BOP	Move VPL to desired position
	BOP	Select the desired EH control system mode of operation (note that IMP-IN provides the most linear load response and shifts to the selected rate
	RO/BOP	Maintain controls in AUTO as much as possible (blender and turbine controls) - NOTE: Rods will be maintained in manual per procedure until 100% power
	RO	Control Delta Flux in accordance with Figure 1, "Estimated Bank D Position to Control Axial Flux Difference"
	RO	Verify Rod insertion limits are met per ROD 2
	RO	Maintain Tavg within 1.5 F of Tref
	DOS/BOP	Start a heater drain pump per OP-1C

Op-Test No: 2000-1 Scenario No: 2 Event No: 1 Page 2 Of 2

Event Description: **Perform Normal Up-power (reactivity manipulation)**

Time	Position	Applicant's Actions or Behavior

Once power has been raised 5% and/or at the discretion of the Lead Examiner, the next event will be initiated.

Op-Test No: 2000-1 Scenario No: 2 Event No: 2 Page 1 Of 4

Event Description: **Thot Instrument (TE401A) Fails High**

Time	Position	Applicant's Actions or Behavior
	RO	Acknowledge and respond to receipt of annunciator ARB 1C04 1A 3-8, "Reactor Coolant Average Delta T Deviation" as well as numerous other annunciators on 1C04 (such as 3-9, 3-10, 4-7, 4-8, 4-9, 4-10) 1. Operator Actions: - Check for associated alarms - Check Delta T indications - Notify DSS/DOS
	DOS	Order power escalation suspended (hold) or adjusts ramp as necessary to maintain RCS temperature
	RO/BOP	Refer to appropriate ARB(s)
	DOS	Direct entry into AOP-24, "Response to Instrument Malfunctions"
	RO	Identify failure of TE-401A (Thot Red Channel)
	RO/DOS	Identify Failed Instrument and that it is a controlling channel - No control rod motion will occur due to control rods in manual at 28% power - Take charging pump to manual control due to incorrect PZR programmed level - Manually calculates PZR Program Level

Op-Test No: 2000-1 Scenario No: 2 Event No: 2 Page 2 Of 4

Event Description: **Thot Instrument (TE401A) Fails High**

Time	Position	Applicant's Actions or Behavior
	DOS	Direct entry into ICP 10.2, "Removal of Safeguards or Protection Sensor from Service". - Obtain and implement ICP 10.2 - Review precautions and limitations - Identify TS 15.3.5; Table 15.3.5-2, Conditions 5,6 and Table 15.3.5-4, condition 2.b. (need to trip bistable within 1 hour) - Conduct pre-job brief for removing TE-401 from service - Obtain DSS permission - Direct ICP 10.2 Attachment A for TE-401 removal from service

Op-Test No: 2000-1 Scenario No: 2 Event No: 2 Page 3 Of 4

Event Description: **Thot Instrument (TE401A) Fails High**

Time	Position	Applicant's Actions or Behavior
	CREW	Perform actions as directed by DOS from Attachment A for TE-401 removal - Place the rod control selector switch to manual (RO notes it is already in manual) - Place Tavg defeat switch in DEFEAT RED inside C-107 (BOP) - Place Delta T defeat switch in DEFEAT RED inside C-108 (BOP) - Place rod control selector switch in AUTO, unless directed otherwise by DSS (RO)-should remain in MANUAL per OP-1C - Place the following bistables to TRIP inside C-111: (BOP) - Verify alarms and trip status lights are proper (RO) 1. Overpower Rod Stop 2. Overpower Trip 3. Over-temperature Rod Stop 4. Over-temperature Trip 5. High Tavg 6. Low Tavg - Remove TE-401 from scan (BOP)
	DOS	Inform DSS TE-401 removed from service.
	DOS/RO	Return Charging Pump to auto control (may leave in manual due to wind up of charging pump speed controller)
	DOS	Exit AOP-24

Op-Test No: 2000-1 Scenario No: 2 Event No: 2 Page 4 Of 4

Event Description: **Thot Instrument (TE401A) Fails High**

Time	Position	Applicant's Actions or Behavior
	DOS	Order Load Escalation to continue
At the discretion of the lead examiner, continue with the next event.		

Op-Test No: 2000-1 Scenario No: 2 Event No: 3 Page 1 Of 1

Event Description: **Controlling Steam Generator Pressure Channel (PT-468) Fails High**

Time	Position	Applicant's Actions or Behavior
	BOP	Identify failure of PT-468 ("A" S/G Pressure RED Channel)
	BOP	Acknowledge and respond to receipt of annunciator ARB 1C03 1E2 1-2, "Steam Generator A Level Setpoint Deviation" 1. Operator Actions: - Determine cause - Stabilize S/G level - HC-466 ("A" S/G Atmospheric Dump Valve) taken to manual - HC-468 ("A" S/G FRV) taken to manual
	DOS/BOP	Stop power escalation if recommenced
	DOS	Directs entry into AOP-24, "Response to Instrument Malfunctions"
	BOP/DOS	Identify Failed Instrument and that it is a controlling channel
It is not the intent to observe or perform another ICP 10.2, but rather evaluate the BOP identification and crews response to this failure. Once this is complete and plant is stabilized and at the discretion of the lead examiner, proceed to the next event.		

Op-Test No: 2000-1 Scenario No: 2 Event No: 4 Page 1 Of 2

Event Description: **Dropped Control Rod and the Reactor Fails to Trip (ATWS Event)**

Time	Position	Applicant's Actions or Behavior
	RO	Identify Dropped Rod: - E-3 Rod Bottom Light - E-3 IRPI reading zero steps - Power range Rod Drop annunciator ARB 1C04 1A 4-5 - Rod Bottom Rod Drop annunciator ARB 1C04 1A 1-5 - Lowering RCS temperature
	DOS	Direct entry into AOP-6A, "Dropped Rod"
	RO	Continuous action to check only one RCCA Dropped (identifies only one rod dropped)
	RO	Place Rod Bank Selector Switch to Manual (rods are already in manual)
	BOP	Establish Tavg at programmed value - Manually control steam flow as necessary to restore Tavg to programmed temperature using turbine load
Note that at this reduced power, RCS temperature will rapidly approach 540 F which is a reactor trip criteria. Even if the operators are aggressive at running back turbine power, the following limits will be challenged:		
	RO/BOP/DOS	Continuous action to maintain RCS Tavg: - > 540 F - Within 10 F of Tref - **If this cannot be immediately restored a reactor trip is required**
	RO/BOP/DOS	Check Plant System Response - S/G levels stable - Pressurizer Pressure control responding to restore pressure to 1985 psig

Op-Test No: 2000-1 Scenario No: 2 Event No: 4 Page 2 Of 2

Event Description: **Dropped Control Rod and the Reactor Fails to Trip (ATWS Event)**

Time	Position	Applicant's Actions or Behavior
If the plant is stabilized a second rod will be dropped which requires a reactor trip at which time the crew should recognize an ATWS has occurred and take manual action to correct this situation. It is unlikely at low power that the crew will recover.		
	RO/DOS	Recognize a second RCCA has dropped (if applicable)
	DOS	Directs a manual reactor trip based on step 1 of AOP-6A or a Low Pressurizer Pressure First Out, or < 540 F, or > 10F Tavg/Tref difference and entry into EOP-0
It is critical that the RO recognize the reactor did not trip and that the DOS ensures the crew transitions to CSP-S.1		
	RO	Verify Reactor Trip - ***Recognizes reactor trip breakers did not open, all rod bottom lights are not lit, and neutron flux is not lowering*** - Manually trips the reactor - Direct the BOP to deenergize the rod drive motor generator sets - Recognize this did not bring the reactor sub-critical and reports the same to the DOS
	BOP	Deenergize the rod drive motor generator sets - Open 1B52-04B or 1A52-02 **AND** - Open 1B52-05B or 1A52-15
	DOS	***Direct entry into CSP-S.1, "Response to Nuclear Power Generation/ATWS" and associated actions***
ATWS actions are covered in the next event		

Op-Test No: 2000-1 Scenario No: 2 Event No: 5,6,7,8,9 Page 1 of 11

Event Description: **ATWS Event resulting in a LOCA inside containment with complications (PORV fails to reseat after opening, 1SI-852A fails to open and 1CV-313 fails to shut)**

Time	Position	Applicant's Actions or Behavior
	RO/BOP	Carry out immediate actions of CSP-S.1 - Verify reactor trip ***(not tripped, ensures continuous rod insertion)*** - Verify turbine tripped
	DOS	Verify immediate actions have been performed and reviews foldout page criteria with crew
	DOS	When Adverse Containment Conditions apply use bracketed numbers in procedure as long as containment pressure remains above 10 psig
	ROBOP	Verify AFW Actuation - Both motor driven AFW pumps running - S/G levels < (51%) 25%, If NO, go to next step - If Yes, Check Steam Driven AFW pump steam supply OPEN
	RO/BOP	Align Charging pump suction to RWST - OPEN 1CV-112B - SHUT 1CV-112C
	RO/BOP	Initiate emergency boration: - Establish Maximum charging by fully opening HC-142, starting additional charging pumps and adjusting speed as necessary to maintain charging flow < 140 gpm - Start a boric acid transfer pump - Open 1CV-350

Op-Test No: 2000-1 Scenario No: 2 Event No: 5,6,7,8,9 Page 2 of 11

Event Description: **ATWS Event resulting in a LOCA inside containment with complications (PORV fails to reseat after opening, 1SI-852A fails to open and 1CV-313 fails to shut)**

Time	Position	Applicant's Actions or Behavior
	DOS	Recognize SI Verification criteria applies and directs the BOP to perform Attachment A of CSP-S.1 as time permits. Major steps of this attachment include: - Verify Safeguards energized - Verify Feedwater Isolation - Verify Containment Isolation - Check SI Pumps running - Check RHR pumps running - Check CCW pumps-only one running - Verify SW system alignment - Verify Containment Accident Cooling Units running - Check Control Room Fans armed - Check Control Room Ventilation in accident mode - Check if Main Steam Lines can remain open - Verify Spray not required - Check 4160 Vac Safeguards buses both powered by offsite power
	BOP	Check SI, NOT actuated (since it has, Initiate Attachment A as time permits) - *Recognize 1CV-313 did not shut and informs the DOS* - *Recognize 1SI-852A did not open and informs DOS*
	DOS	Once identified, direct 1CV-313 shut and 1SI-852A open

Op-Test No: 2000-1 Scenario No: 2 Event No: 5,6,7,8,9 Page 3 of 11

Event Description: **ATWS Event resulting in a LOCA inside containment with complications (PORV fails to reseat after opening, 1SI-852A fails to open and 1CV-313 fails to shut)**

Time	Position	Applicant's Actions or Behavior
	RO/BOP	Check pressurizer pressure < 2335 psig - Once identified, manually shut the PORV (RC-431C). Recognize it won't shut and Shut PORV Block Valve
	RO/BOP/DOS	Check if the reactor trip breakers have opened and if the turbine has tripped - Dispatch an AO to locally open reactor trip breakers (if not already completed)
	RO/BOP	Stabilize intact S/G level - > (51%) 29% - Control feed flow to maintain intact S/G level between (51%) 29 % to 65 %
	RO/BOP	Verify dilution paths-ALL ISOLATED - Blender via 1CV-111 - Chemical addition pot - VCT drain via P-33 or P-9 - Deboration - -Demineralizer resin change-out operations
	RO	Check RCS cold leg temperature > 543 F - If not, ensure atmospheric dumps and condenser steam dumps are shut, and minimize AFW flow
	RO	Check if uncontrolled cooldown is in progress based on RCS temperature dropping in uncontrolled manner or S/G pressure dropping in an uncontrolled manner - If NO, Proceed to step 18 - If YES, isolate both main steam lines, identify faulted S/G and proceed to step 18

Op-Test No: 2000-1 Scenario No: 2 Event No: 5,6,7,8,9 Page 4 of 11

Event Description: **ATWS Event resulting in a LOCA inside containment with complications (PORV fails to reseat after opening, 1SI-852A fails to open and 1CV-313 fails to shut)**

Time	Position	Applicant's Actions or Behavior
Note that RCPs may be tripped due to RCP vibration and loss of subcooling if the PORV opening is not readily identified and closed		
	RO	Check Core exit thermocouples < 1200 F
	RO	*Verify reactor sub-critical* - *Power range channels < 5%* - *Intermediate range SUR zero or negative*
It is critical that prior to transition out of CSP-S.1 that the reactor is sub-critical (<5% power and IR SUR zero or negative)		
	RO	Check if boration can be stopped - All rods fully inserted - Stop boration
	DOS	Exits CSP-S.1 and directs entry into EOP-O, step 1 RNO
	DOS/RO	Verify Reactor Trip - When the reactor has tripped, re-close rod drive motor generator breakers previously opened (these breakers did not open)
	DOS/RO	Verify Turbine Trip
	DOS/RO	Verify Safeguard buses energized
	DOS/RO	Check if SI is actuated: - Recognize SI has actuated - Check SI – BOTH SI & RHR pumps running

Op-Test No: 2000-1 Scenario No: 2 Event No: 5,6,7,8,9 Page 5 of 11

Event Description: **ATWS Event resulting in a LOCA inside containment with complications (PORV fails to reseat after opening, 1SI-852A fails to open and 1CV-313 fails to shut)**

Time	Position	Applicant's Actions or Behavior
	DOS	Review foldout page criteria with the crew
	DOS/RO	Trip both RCPs if Trip Criteria applies (may or may not apply)
	RO/BOP	Verify feedwater isolation: - Feedwater Regulating and Bypass Valves SHUT - Both main feed pumps tripped - MFP discharge MOVs BOTH SHUT
	BOP/DOS	Verify containment isolation: - ***CI Panels A and B ALL LIGHTS LIT. (identifies 1CV-313 has not shut, if not previously recognized and reports this condition to the DOS)*** - DOS directs 1CV-313 SHUT - 1CC-17 and RS-SA-9 SHUT. - No valves open under administrative control
	RO/BOP	Verify AFW Actuation: - Both motor driven AFW pumps running - S/G levels Both < (51%) 25%, if no goes to step 8 - If yes, steam supply valves to turbine driven AFW pump OPEN.
	BOP	Check both SI pumps running
	BOP/RO	Check both RHR pumps running

Op-Test No: 2000-1 Scenario No: 2 Event No: 5,6,7,8,9 Page 6 of 11

Event Description: **ATWS Event resulting in a LOCA inside containment with complications (PORV fails to reseat after opening, 1SI-852A fails to open and 1CV-313 fails to shut)**

Time	Position	Applicant's Actions or Behavior
	BOP/RO	Check only one CCW pump running
	BOP	Verify Service Water Alignment: - 6 service water pumps running - Service water isolation valves shut (SW-2930A/2930B,2927A, 2927B, 2816, 4479,4478, 2817) - Direct AO to locally check SW-LW-61, SW-LW-62 shut.
	BOP	Verify Containment Accident Cooling Units Running - All accident fans running - 1SW-2907 & 2908 OPEN - Unit 1 Containment Recirc Coolers Water Flow Low Alarm CLEAR
	BOP	Check Control Room Fans Armed: - W-14A & W-13B2 WHITE LIGHT OFF
	BOP	Check Control Room Ventilation IN ACCIDENT MODE: - At least one control room recirc fan RUNNING - Control room damper solenoid valve PURPLE LIGHT LIT
	BOP	Check if Main Steam Lines Can Remain Open, RO/BOP notes both MSIVs SHUT.

Op-Test No: 2000-1 Scenario No: 2 Event No: 5,6,7,8,9 Page 7 of 11

Event Description: **ATWS Event resulting in a LOCA inside containment with complications (PORV fails to reseat after opening, 1SI-852A fails to open and 1CV-313 fails to shut)**

Time	Position	Applicant's Actions or Behavior
	BOP/DOS	Verify proper SI valve alignment: - Unit 1 SI active status panel ALL LIGHTS LIT - ***Identify 1SI-852A has not opened, (if not previously recognized and reports this condition to the DOS)*** - DOS directs 1SI-852A opened - Unit SI-Spray Ready status panel NO LIGHTS LIT
	RO/BOP	Verify containment spray not required: - Recognize containment pressure is rising and if > 25 psig perform continuous RNO actions - Containment Spray actuated, C01 B 2-6 LIT - All containment spray discharge valves OPEN - At least one spray pump running - Shutdown one train of spray by placing spray pump in PULL-OUT and shutting it's associated suction valve. - One spray additive valve verified OPEN
	BOP	Verify SI Flow: - RCS pressure <1400 psig - Check SI pumps flow indicated - RCS pressure < (425) 200 psig , If yes check RHR flow
	RO/BOP	Verify Secondary Heat Sink: - Level in at least one S/G >(51%) 29% - Control pumps and align valves as necessary to maintain S/G level (51%) 29% to 65 %

Event Description: **ATWS Event resulting in a LOCA inside containment with complications (PORV fails to reseat after opening, 1SI-852A fails to open and 1CV-313 fails to shut)**

Time	Position	Applicant's Actions or Behavior
	RO/BOP	Verify RCP Seal Cooling: - Labyrinth seal DP > 20 inches or - Component cooling to RCP thermal barrier-NORMAL
	RO	Verify RCS Temperature Control: - RCS wide range cold leg temperatures less than or equal to 547 AND STABLE - If not stable and trending lower, stop dumping steam and control auxiliary feedwater flow to maintain greater than or equal to 200 gpm until at least one S/G level > (51%) 29% - If not stable and trending higher then stabilize at or below 547 F by dumping steam using atmospheric steam dumps
Note that in the PBNP design CI isolates IA to containment and PORVs will drift shut, masking this problem if not previously identified. However, later in the procedure set, when CI is reset and IA is restored to containment, if not previously identified, RC-431C will re-open.		
	RO/DOS	Check PORVs BOTH SHUT - If not previously recognized, identifies that PORV (RC-431C) failed to SHUT and shuts Block Valve, informs DOS - DOS directs closure of RC-431C and Block Valve once recognized PORV won't shut
	RO	Verify PZR spray valves-BOTH SHUT - Normal spray valves SHUT - Auxiliary spray valves SHUT
	RO	Check if RCPs should remain running - Check RCS subcooling > (60F)30F

Op-Test No: 2000-1 Scenario No: 2 Event No: 5,6,7,8,9 Page 9 of 11

Event Description: **ATWS Event resulting in a LOCA inside containment with complications (PORV fails to reseat after opening, 1SI-852A fails to open and 1CV-313 fails to shut)**

Time	Position	Applicant's Actions or Behavior
	DOS	Inform STA to commence monitoring critical safety functions per CSP-ST.0 (Monitoring already in progress after first transition out of EOP-0 due to ATWS)
Note that although RCS pressure will be below 425 psig, RHR flow will not be greater than 450 gpm, therefore a transition to EOP-1.3 will not occur in next step		
	BOP	Verify Containment sump recirculation not required: - RWST level greater than or equal to 60 % - RCS pressure > (425 psig) 200 psig and RHR flow > 450 gpm
	CREW	Check secondary system Intact
	CREW	Check if S/G tubes are Intact
	CREW	Check if RCS is Intact Inside Containment - Check containment radiation levels NORMAL - Check containment sump A level NORMAL - Check containment pressure NORMAL
	DOS	Transition to EOP-1, "Loss of Reactor or Secondary Coolant"
	DOS	Brief foldout page criteria
	DOS	Recognize Adverse Containment conditions are still applicable
	RO	Check if RCPs should remain running - Check RCS subcooling > (60F) 30 F

Op-Test No: 2000-1 Scenario No: 2 Event No: 5,6,7,8,9 Page 10 of 11

Event Description: **ATWS Event resulting in a LOCA inside containment with complications (PORV fails to reseat after opening, 1SI-852A fails to open and 1CV-313 fails to shut)**

Time	Position	Applicant's Actions or Behavior
	CREW	Check secondary system in tact: - No S/G completely depressurized AND - No S/G trending lower in an uncontrolled manner
	BOP	Stabilize intact S./G level
	BOP	Stabilize intact S/G level - >(51%) 29% - Control feed flow to maintain A S/G between (51%) 29% to 65%
	RO/BOP	Check secondary system radiation normal
	RO	Check PORVs and PORV block valves
If not previously isolated PORV will reopen upon resetting CI and opening IA valves to containment		
	BOP	Reset SI
	BOP	Reset Containment Isolation
	BOP	Reset 1B-03 and 1B-04 non-safeguards lockouts
	BOP	Check 4160Vac safeguards buses both energized by offsite power

Op-Test No: 2000-1 Scenario No: 2 Event No: 5,6,7,8,9 Page 1 of 11

Event Description: **ATWS Event resulting in a LOCA inside containment with complications (PORV fails to reseat after opening, 1SI-852A fails to open and 1CV-313 fails to shut)**

Time	Position	Applicant's Actions or Behavior
	BOP	Reestablish instrument air to containment - start second air compressor - check IA header pressure > 80 psig - Open one and than the other 1IA-3047 and 1IA-3048
Terminate scenario with lead examiner permission at this point. Note that if the RCS cools < 315 F, transition to CSP-P.1, Integrity and terminate scenario at lead examiners discretion. Examinees may be asked to remain in the simulator until any evaluator follow-up questions are answered		