Simulation Facility Braidwood | Scenario No.: **NRC 1** | Operating Test No.: 17-1 NRC

Examiners: _____ Applicant: _____ SRO

_____ _____ ATC

_____ _____ BOP

Initial Conditions: IC-21

Turnover: Unit 1 is at 100% power, steady state, equilibrium xenon, BOL. Online risk is green. Instrument maintenance is currently testing 1A SG Level channel 1LT-517. Tech Spec 3.3.1 condition A and E and 3.3.2 condition A and D have been entered.

Event No.	Malf. No.	Event Type*	Event Description
Preload	IMF RP02A IMF RP02B IMF RX02A 0 IRF RP30 out IRF ZDI1CV8112 OPEN IRF RX047A BYPASS IRF RX047B BYPASS IRF RX047C BYPASS		Reactor trip breaker A fails to open Reactor trip breaker B fails to open Fails 1LT-517 to zero percent Fails K-607 relay to fail multiple phase A valves Cause 1CV-8112 to stay open Bypass SG low 2 level trip Bypass SG low 2 AF pump start Bypass SG low 2 turbine trip
1		N-BOP	Perform 1BwOS EH-M1
2	IMF RX22A 0000	TS-US	Failed PZR pressure channel 1PT-457 low
3	IRF TC19 OPEN IMF TC17B	C-BOP, US	Trip of the 1B EH pump
4	IMF SLIM6pwrFail_t IMF d11mod133c11f open	I-ATC, US	Automatic makeup relay actuation
5	IMF RD02B08	C-ATC, US TS-US	Dropped rod B08
6	None	R-ATC, US	Down Power to recover rod.
7	IMF RX06C 100 5 min	I-BOP, US T-US	1A SG Level channel 1LT-519 fails high
8	IMF RD02H08	M-ALL	Dropped rod H08
9	IMF RD09 8	C-ATC	Auto rod speed failed at 8 steps/minute
10	Preload Relay failure	C-ALL	1CV8100 fails to close
11	IMF TH12C	C-ALL	PZR safety 1RY8010C opens

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

SCENARIO OVERVIEW

Unit 1 is at 100% power, steady state, equilibrium xenon, BOL. Online risk is green. Instrument maintenance is currently testing 1A SG Level channel 1LT-517. Tech Spec 3.3.1 condition A and E and 3.3.2 condition A and D have been entered.

After completing shift turnover and relief, the BOP and RO will perform 1BwOS EH-M1 "UNIT ONE PUMP OPERABILITY SURVEILLANCE".

After completing 1BwOS EH-M1, pressurizer pressure channel 1PT-457 fails low. This causes the Unit Supervisor to enter TS 3.3.1 conditions A, E and K and 3.3.2 conditions A and D.

After making the Tech Spec declaration, the unit 1B EH pump will trip and the 1A EH pump will not auto start because the relay failed after testing it. The BOP will respond to the trip alarm and manually start the 1A EH pump to restore EH pressure before the turbine trips on low EH pressure.

Once the 1B EH pump trip has been addressed, the 1FK-111 controller will lose power and an automatic makeup will begin sporadically due to a failure in the ovation logic and relaying. This will require the RO to stop the automatic makeup by placing the make up control system to stop to prevent possibly changing boron concentration in the RCS.

After stopping the automatic make up, rod B08 will drop to the bottom of the core. Rods will initially step out to respond to the transient. The operator will receive numerous alarms related to an actual dropped rod and place rod control in manual. The unit supervisor will enter 1BwOA ROD-3, RESPONSE TO A DROPPED OR MISALIGNED ROD and enter TS 3.1.4 condition B. This will require power to be reduced to less than 75% power within 2 hours.

After the ramp down to recover the dropped rod has commenced *or* while preparing to ramp, 1A SG level channel, 1LT-519, fails high. Ovation will detect the second failure in the SG causing the system to take an ALT ACTION and swap the controller to manual. The crew will have to manually adjust the 1A SG level controller to restore the 1A SG level and stabilize the plant per 1BwOA INST-2, OPERATION WITH A FAILED INSTRUMENT CHANNEL UNIT 1. The US will enter Tech Spec 3.0.3, 3.3.1 condition A and E and 3.3.2 condition A and D

After the 1B SG steam generator level failure has been addressed, rod H08 will drop forcing the reactor operator to take action to attempt to manually trip the reactor from both panels. When a reactor trip signal is generated, the reactor will not trip. The resultant transient will cause a Pressurizer safety to stick open. The crew will take actions per 1BwFR-S.1, RESPONSE TO NUCLEAR GENERATION/ATWS. Automatic rod control speed will fail to 8 steps per minute, and the RO will manually insert the control rods to add negative reactivity. After reducing power to less than 5%, the crew will transition to 1BwEP-0, REACTOR TRIP OR SAFETY INJECTION, during which the crew will identify the stuck open pressurizer safety requiring safety injection. The crew will isolate the seal leakoff flow due to 1CV8112 sticking open and the failure of K-607 relay. This will lead the crew to 1BwEP-1, LOSS OF PRIMARY OR SECONDARY COOLANT ON UNIT1 due to the stuck open safety.

Completion criteria is transition to 1BwEP ES-1.2, POST LOCA COOLDOWN AND DEPRESSURIZATION UNIT 1.

Critical Tasks

1. Insert negative reactivity into the core by initiating RCCA insertion at greater than or equal to 48 steps per minute prior to completion of step 1 of 1BwFR-S.1.
   (Westinghouse – CT-52) (K/A number – 000029EA1.09 importance – 4.0/3.6)
2. Close containment isolations Phase A valves before exiting 1BwEP-0.
   (Westinghouse – CT-11) (K/A number – 000103-A2.03 importance – 3.5/3.8)

Simulation Facility Braidwood | Scenario No.: **NRC 2** | Operating Test No.: **17-1 NRC**

Examiners: _____ Applicant: _____ SRO

_____ _____ ATC

_____ _____ BOP

Initial Conditions: IC-31

Turnover: Unit 1 is operating at 90% power, steady state, equilibrium xenon. 1PT-455 has been OOS for calibration for the past 4 hours. LCO 3.3.1 condition A, E and K, 3.3.2 condition A and D and 3.3.4 condition A have been entered. Expect 1PT-455 back in 6 hours. Following completion of turnover, restore Unit 1 to full power. Operators have been briefed and are standing by for any field operations required.

Event No.	Malf. No.	Event Type*	Event Description
Preload	IMF RP01 IOR ZDIRT2 Normal IMF RD05G13 15 IMF RD05H12 15 IMF RD05H14 8 IMF RD05J13 25 IRF RX032A BYPASS IRF RX032B BYPASS IRF RX032C BYPASS IRF RX032D BYPASS IRF RX014A BYPASS IRF RX017A BYPASS		Failure of Rx to auto trip 1PM05J RX trip switch failed Stuck rod G13 Stuck rod H12 Stuck rod H14 Stuck rod J13 Bypass 1PT-455 functions
1	None	R-ATC, US N-BOP	Ramp unit 1 to 100% power
2	IMF CV05inc RAISE IMF CV05dec -	I-ATC, US	Failure of 1PK-131 setpoint high
3	IOR ZDI1OG02PA TRIP DOR ZDI1OG02PA NAC	C-BOP, US	1A GS exhauster fan trips
4	IRF EP09 325 TRGSET 1 “EDE142==0” TRG 1 “IMF ED07B” IRF EP09 348 390	C-BOP, US TS-US	Degraded bus voltage resulting in a loss of bus 142
5	IMF TH11A 100	C-ATC, US TS, US	1RY455A PORV opens
6	IMF TC03remf	M-ALL	Turbine trip with failure of auto Rx trip
7	Preload	C-ATC, US	Manually trip the reactor
8	Preload	C- ATC, US	Four stuck rods, requiring emergency boration
9	IMF ED15C IMF EG08A	M-ALL	Loss of Offsite Power 1A DG Failure Loss of all AC

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

SCENARIO OVERVIEW

Unit 1 is operating at 90% power, steady state, equilibrium xenon. 1PT-455 has been OOS for calibration for the past 4 hours. LCO 3.3.1 condition A, E and K, 3.3.2 condition A and D and 3.3.4 condition A have been entered. Expect 1PT-455 back in 6 hours. Following completion of turnover, restore Unit 1 to full power. Operators have been briefed and are standing by for any field operations required.

After completing shift turnover and relief, The US and ATC will commence a ramp to 100% power per the pre-job brief and REMA provided in turnover. The BOP will program the turbine to ramp up to 100% power to restore full power operations.

After sufficient ramping is completed for the evaluation, 1PK-131 slim controller setpoint will fail high causing the letdown pressure high alarm and high letdown pressure. The ATC will take manual control of the 1PK-131 to restore normal letdown parameters.

After the 1PK-131 failure has been addressed, 1B GS exhaust fan trips and the BOP will start the 1A GS exhaust fan to prevent water intrusion into the main generator oil system.

After the 1B GS exhaust fan failure, a degraded bus voltage will occur. Bus 141 and 142 voltage will drop to 3900 volts and will bring in annunciator 1-21/22-C7 and require the operator to open breakers 1412/1422. Per BwAR 1-21/22-C7 with voltage below 3990 volts the operator is required to open the SAT feed breakers to the ESF busses, if no operator action occurs the bus voltage remains at 3900 volts for 310 seconds and then the SAT feed breakers will automatically open. When the 4 KV ESF busses are de-energized the 1A DG will pick up bus 141. The 1B DG will start, and bus 142 will be faulted. TS 3.8.1 condition A and D and 3.8.9 condition A applies.

After the degraded bus voltage and Tech Specs have been addressed, the PZR PORV 455A will fail open. The operator will attempt to close the valve manually and will not be able to. This will require the block valve 1RY8000A to be closed. The US will evaluate TS and enter 3.4.11 condition B.

After the PORV failure and Tech Specs have been addressed, a trip of the main turbine will occur. The reactor does not automatically trip and the manual trip switch at 1PM05J is disabled. The crew should trip the reactor from 1PM06J and complete immediate actions of 1BwEP-0, REACTOR TRIP OR SAFETY INJECTION UNIT 1. When the reactor trips, one control bank rod and three shutdown bank rods will not fully insert. The crew will transition to 1BwEP ES-0.1, REACTOR TRIP RESPONSE UNIT 1, and initiate emergency boration for the stuck rods.

Once the crew has initiated emergency boration, a loss of all offsite power will occur and the 1A DG will trip resulting in a loss of all AC power to Unit 1. The crew will transition to 1BwCA-0.0, LOSS OF ALL AC POWER UNIT 1. **The crew must restore power to Unit 1 within 10 minutes**. After power is restored to Bus 141, and bus 141 loads are energized a transition will be made to either 1BwCA-0.1, LOSS OF ALL AC POWER RECOVERY WITHOUT SI REQUIRED UNIT 1, or 1BwCA-0.2, LOSS OF ALL AC POWER RECOVERY WITH SI REQUIRED UNIT 1.

Completion criteria: The scenario ends following restoration of bus 141.

Critical Tasks

1. Perform a manual reactor trip at 1PM06J before transitioning out of 1BwEP-0. (Westinghouse – CT-1) (K/A number - 000029EA1.08 importance - 4.5/4.5)
2. Cross-tie an ESF bus to opposite unit within 10 minutes of Loss of All AC per UFSAR. (Westinghouse – CT-24) (K/A number - 000055EA2.03 importance – 3.9/4.7)

Simulation Facility: Braidwood		Scenario No.: **NRC 3**	Operating Test No.: **17-1 NRC**
Examiners:		Applicant:	SRO
			ATC
			BOP

Initial Conditions: IC-31

Turnover: Unit 1 is at 90% power, steady state, equilibrium xenon, BOL. Online risk is green. Following completion of turnover, the crew will perform a PMT using 1BwOSR 3.7.4.1 "MAIN STEAM SYSTEM ISOLATION 1MS018A-B-C-D VALVE TRAVEL AND INDICATION 18 MONTH SURVEILLANCE."

Event No.	Malf. No.	Event Type*	Event Description
	IMF CV32B TRGSET 1 "ZLO1SI01PA(3) = = 1" IMF CV01A (1 0) IMF FW35B IMF RP51 out		1B CV pump auto start failure 1A CV pump trips on 1A SI pump start 1B HD pump fails to start SI relay 610 fails 1A and 1C RCFC slow start
1	Normal	N-BOP T-US	Perform PMT on 1MS018B
2	RX15dec	C-ATC, US T-US	1PK-455 set point fails low
3	IMF FW35C	C-BOP, US	1C HD pump fails
4	Preload	R-RO,US	HD turbine run back
5	IMF CV02A	C-BOP, US	0A PW pump trips
6	IMF RH05C 0 60	T-US	RWST level channel 1LT-932 fails low
7	IMF d11mod133c11f normal IMF d6mod131c12f alarm	C-ATC	1CV112A diverts to the HUT
8	IOR ZDI1MS001B CLS IMF MS03B 100 IMF MS03F 100 IMF MS03J 100	M-ALL	1B MSIV fails closed
9	Preload	C-ALL	Loss of CV
10	Preload	C-ALL	1A and 1C RCFC did not swap to low speed

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

SCENARIO OVERVIEW

Unit 1 is at 90% power, steady state, equilibrium xenon, MOL. Online risk is green. Following completion of turnover, the crew will perform a PMT on 1MS018B per 1BwOSR 3.7.4.1 “MAIN STEAM SYSTEM ISOLATION 1MS018A/B/C/D VALVE TRAVEL AND INDICATION 18 MONTH SURVEILLANCE.”

After completing shift turnover and relief, the BOP performs PMT using 1BwOSR 3.7.4.1. The 1B SG PORV, 1MS018B, will fail the test due to a broken hydraulic line when the valve is stroked open. The Unit Supervisor will enter Tech Spec 3.7.4 Condition A and Tech Spec 3.6.3 Condition C. 1MS019B will remain closed to comply with TS 3.6.3 Condition C. 1MS018B will remain unavailable for the remainder of the scenario. The crew should inform the SM following the 1MS018B failure.

After the 1MS018B failure has been addressed, 1PK-455, Master Pressurizer pressure controller, will fail to 100% demand position. Both pressurizer spray valves 1RY-455C and B will open and pressurizer pressure will drop. The ATC will take manual action to control 1PK-455 per hard card 1BwPR 1-12-RY and lower demand to close the pressurizer spray valves and energize the variable heaters. Tech Spec 3.4.1 Condition A will apply if pressurizer pressure drops below 2209 psig.

After the 1PK-455 failure has been addressed, the 1C HD pump will trip. The standby 1B HD pump will not start and a HD runback will be initiated by the BOP. The ATC will add negative reactivity per the operator aid for a HD runback.

After a sufficient change in power is completed for the evaluation, the 0A PW pump will trip. The BOP will respond and start the 0B PW pump per BwAR 0-38-A5. The PW pump will be required for stabilizing the plant after the runback.

After the 0A PW pump failure is addressed, RWST level channel 1LT-932 fails low. This US will enter Tech Spec 3.3.2 conditions A and K.

After addressing the Tech Spec for the RWST level channel, 1CV112A will fail to the HUT position requiring the ATC operator to place the control switch for 1CV112A to the VCT position. If VCT level lowers to the automatic make up set point before action is taken, the automatic make up will not occur and manual make up will be required to maintain VCT level.

After the 1CV112A failure is addressed, the 1B MSIV fails closed causing three SG safety valves on the 1B SG to stick open resulting in a faulted SG. SG pressure will drop and a manual reactor trip will be required. The crew will implement 1BwEP-0 “REACTOR TRIP OR SAFETY INJECTION.” When safety injection is actuated, the 1A CV pump will trip. The 1B CV pump must be manually started to establish high head ECCS flow. After determining 1B SG secondary pressure boundary is not intact, the crew will transition to 1BwEP-2 “FAULTED STEAM GENERATOR ISOLATION.” The crew will complete isolation of 1B SG and transition to 1BwEP-1.1 “SI TERMINATION” based on meeting all the criteria for reducing ECCS flow.

Completion criteria is termination of ECCS injection in 1BwEP ES-1.1.

Critical Tasks

1. Manually start the 1B CV pump prior to completion of step 6 of 1BwEP-0.
   (Westinghouse – CT-7) (K/A number - 013000A4.01 importance 4.5/4.8)

2. Isolate 1B Steam Generator prior to completing step 4 of 1BwEP-2.
   (Westinghouse – CT-17) (K/A number - APE040AA1.10 importance 4.1/4.1)