Scenario No.: 4

Target Quantitative Attributes per Scenario (NRC Form ES-D-1)

Facility: _____Salem_____ Scenario No.: ____ESG-4_____ Op-Test No.: __20-01 NRC__

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions: IC-243: 2% power, BOL; 21 SGFP in service.

Turnover: The crew is directed to continue power ascension to 10% reactor power IAW S2.OP-IO.ZZ-0003 using control rods, steam dumps, and turbine load control.

Critical Tasks:

1. Isolate feed and stem flow to ruptured SG before transition to SGTR-3
2. Cooldown RCS to target temperature so that transition from SGTR-1 does not occur

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	ATC (R) BOP (N) CRS (N)	Continue power ascension to 10% IAW IOP-3 and enter MODE 1.
2	PR0018B	ATC (C) CRS (C,TS)	2PR2 PZR PORV leakage.
3	CW0350E	BOP (C) CRS (C)	High DP across 23A CW Traveling Screen.
4	SG0078C	ATC (C) CRS (C,TS)	23 SG Tube Leak (35 gpm).
5	SG0078C	ALL (M)	23 SG Tube Rupture (650 gpm). **(CT-1 and CT-2)**
6	RP318D1	ALL (I)	21 CFCU fails to start in LOW Speed.
7	PR0019B	ATC (C) CRS (C)	PZR Spray Valve 2PS3 fails to close during depressurization.
		ABs	IOP-3 → AB.PZR-1 → AR.ZZ-10 → AB.CW-1 → AB.SG-1
		EOPs	TRIP-1 → SGTR-1 with depressurization and a failed open spray valve

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

Scenario No.: 4

Target Quantitative Attributes per Scenario (See Section D.5.d)	Actual Attributes	Event No.
1. Total malfunctions (5-8)	6	2-7
2. Malfunctions after EOP entry (1-2)	2	6,7
3. Abnormal events (2-4)	3	2,3,4
4. Major transients (1-2)	1	5
5. EOPs entered/requiring substantive actions (1-2)	1	5 (SGTR-1)
6. Entry into a contingency EOP with substantive actions (≥ 1 per scenario set)	0	NA
7. Preidentified critical tasks (≥2)	2	5
8. Tech Specs exercised (≥ 2)	2	2,4

I. OBJECTIVES

1. Given the order, perform actions to raise reactor power IAW S2.OP-IO.ZZ-0003, Hot Standby to Minimum Load.
2. Given indication of a radiation monitor system malfunction, DIRECT the response to the malfunction in accordance with approved station procedures.
3. Given the order or indications of a CFCU tripping, perform actions as the nuclear control operator to RESPOND to the malfunction, IAW approved station procedures.
4. Given the order or indications of a CFCU tripping, DIRECT the response to the malfunction IAW approved station procedures.
5. Given the failure of SGFP, perform actions as the nuclear control operator to RESPOND to the failure IAW S2.OP-AB.CN-0001.
6. Given the failure of SGFP, perform actions as the nuclear control operator to DIRECT the response to the malfunction IAW S2.OP-AB.CN-0001
7. Given the failure of affecting a Reactor Coolant Pump, DIRECT the response to the failure IAW S2.OP-AB.RCP-0001.
8. Given the order or indications of a reactor trip, perform actions as the nuclear control operator to RESPOND to the reactor trip in accordance with 2-EOP-TRIP-1.
9. Given indication of a reactor trip, DIRECT the response to the reactor trip in accordance with 2-EOP-TRIP-1.
10. Given the order or indications of a safety injection, perform actions as the nuclear control operator to RESPOND to the safety injection in accordance with the approved station procedures.
11. Given indication of a safety injection, DIRECT the response to the safety injection in accordance with the approved station procedures.
12. Given the order or indications of a steam generator tube rupture, perform actions as the nuclear control operator to RESPOND to the tube rupture in accordance with the approved station procedures.
13. Given the order or indications of a steam generator tube rupture, DIRECT the response to the tube rupture in accordance with the approved station procedures.
14. Given the order or indications of a ECCS pump failing to start, DIRECT the response to the malfunction in accordance with approved station procedures
15. Given the order or indications of a PZR PORV malfunction, DIRECT the response to the malfunction in accordance with approved station procedures.

II. MAJOR EVENTS

1. Power Ascension
2. 2PR2 PZR PORV leakage
3. High DP across 23A CW Traveling Screen
4. 23 SG Tube Leak (35 gpm)
5. 23 SG Tube Rupture (650 gpm)
6. 21 CFCU fails to start in LOW speed
7. PZR Spray Valve 2PS3 fails to close during RCS depressurization

III. SCENARIO SUMMARY

1. The crew will take the watch with the unit stable at 2% reactor power during a plant startup, BOL. 21 SGFP is in service and 22 SGFP is not in service. Steam dumps are in Main Steam Pressure Control, Automatic, set at 1000 psig. The crew will be instructed to raise power to 10% and enter Mode 1.
2. The crew will initiate power ascension to 10%, and enter Mode 1, using Main Steam Dumps and control rods IAW **S2.OP-IO.ZZ-0003**, Hot Standby to Minimum Load and S2.OP-SO.MS-0002, Steam Dump System Operation, Attachments 3 or 4.
3. 2PR2 PZR PORV valve will experience leakage. RCS pressure will lower and spray valves will eventually close. Subsequently, OHA E-28, PZR HTR ON PRESS LO, will actuate to alert the crew of lowering RCS pressure. The crew will assess plant conditions and determine that PZR PORV tailpipe temperatures are elevated indicating a leaking PORV. The CRS will enter S2.OP-AB.PZR-0001 and take actions to isolate and identify that 2PR2 is leaking and close the associated block valve, 2PR7. The CRS will evaluate Tech Specs for a leaking PZR PORV and enter TS 3.4.5 action a. After Tech Specs has been evaluated, Event #3 will be entered..
4. OHA K-1, 21-23 A CW SCRNWSH TRBL, will actuate and indications for high differential pressure across 23A CW pump traveling screen. 23A traveling screen will be running in fast speed. CW operator will report that heavy grassing on the screens. The DP across the traveling screen will continue to rise until exceeding the emergency trip criteria of > 8 feet. The will crew will emergency trip 23A CW and enter S2.OP-AB.CW-0001. After the CW pump is removed from service, Event #4 will be entered.
5. 23 SG will experience a 25-30 gpm tube leak. The crew will receive RMS alarms (2R19C, 2R15, and 2R41D) and enter S2.OP-AB.SG-0001. The crew will transfer to a centrifugal charging pump and determine leak rate. The crew will be able to stabilize PZR level. The CRS will evaluate Tech Spec and enter TS 3.4.7.2.c action a. After the CRS evaluates Tech Spec, Event #5 will be entered.
6. The tube leak on 23 SG will worsen to a 650 gpm tube rupture and the crew will manually trip the reactor and actuate SI. The crew will enter EOP-TRIP-1 and perform the following; (1) isolate feed flow to 23 SG (CT#1), and (2) recognize that 21 CFCU failed to start in LOW speed. The crew will block and reset 2A SEC and manually start 21 CFCU in LOW speed. The CRS will transition to EOP-SGTR-1 and isolate the steam side of 23 SG (completes CT#1

actions), cooldown to target RCS temperature (CT#2), and then depressurize the RCS to stop the primary to secondary leakage. When the crew attempts to stop the depressurization, 2PS3 spray valve will fail to close requiring the crew to stop 21 and 23 RCPs. The scenario can be terminated at this point.

7. The scenario may be terminated when the 21 and 23 RCPs are stopped or by direction from the Lead Examiner.

IV. INITIAL CONDITIONS

____ IC-243

PREP FOR TRAINING (i.e. computer setpoints, procedures, bezel covers ,tagged equipment)

Initial	Description
____ 1	VC1and VC4 C/T
____ 2	RCPs (SELF CHECK)
____ 3	RTBs (SELF CHECK)
____ 4	MS167s (SELF CHECK)
____ 5	500 KV SWYD (SELF CHECK)
____ 6	SGFP Trip (SELF CHECK)
____ 7	23 CV PP (SELF CHECK)
____ 8	**21 SGFP is in service**
____ 9	**IOP-3 open and complete up to step 4.3.18, Power Operation. Attachment 4 is marked up.**
___ 10	**Steam Dumps are in MS Pressure Mode and Auto, and S2.OP-SO.MS-0002 is open and marked up to step 5.4.1**
___ 11	**Rod control in manual.**
___ 12	Complete Attachment 2 “Simulator Ready-for-Training/Examination Checklist.”

Note: Tables with blue headings may be populated by external program, do not change column name without consulting Simulator Support group

EVENT TRIGGERS:

Initial	ET #	Description	
	1	EVENT ACTION: COMMAND: PURPOSE:	KCM12AT5 //23A CIRCULATOR-EMERG TRIP <update as needed>
	2	EVENT ACTION: COMMAND: PURPOSE:	QB216PRI //2PS3 PZR SPRAY CONTROL-INCREASE <update as needed>

MALFUNCTIONS:

SELF-CHECK	Description	Delay Time	Initial Value	Ramp Time	Trigger	Severity
_____ 01	PR0018B PZR PORV 2PR2 DEVELOPS LEAK	N/A	N/A	N/A	RT-1	20000
_____ 02	CW0350E 23A CIRC WATER PUMP TRIP -DUE TO FREEZING	N/A	1	00:01:30	RT-2	8.5
_____ 03	SG0078C 23 STEAM GENERATOR TUBE RUPTURE	N/A	N/A	N/A	RT-3	35
_____ 04	RP318D1 21 Fan Coil Low Speed Fails to Start on SEC	N/A	N/A	N/A	N/A	
_____ 05	PR0019B PZR SPRAY VALVE 2PS3 FAILS OPEN	N/A	N/A	N/A	ET-2	

REMOTES:

SELF-CHECK	Description	Delay Time	Initial Value	Ramp Time	Trigger	Condition
_____ 01	RP17D RESET MIMS IMPACT - OHA A38	N/A	N/A	N/A	N/A	RESET
_____ 02	RC05A RCS SYSTEM , BORON CONC RESET	N/A	N/A	N/A	N/A	1573

OVERRIDES:

SELF-CHECK	Description	Delay Time	Initial Value	Ramp Time	Trigger	Condition/ Severity
_____ 01	OHA-H 08 LO ZLOANN_H08 H08 APT L/O RELAY TRIP	N/A	N/A	N/A	N/A	OFF
_____ 02	OHA-H 15 LO ZLOANN_H15 H15 MPT ph 1 TRBL	N/A	N/A	N/A	N/A	OFF
_____ 03	OHA-H 23 LO ZLOANN_H23 H23 MPT ph 2 TRBL	N/A	N/A	N/A	N/A	OFF
_____ 04	OHA-H 31 LO ZLOANN_H31 H31 MPT ph 3 TRBL	N/A	N/A	N/A	N/A	OFF

OTHER CONDITIONS:

	Description
____	1. None

V. SEQUENCE OF EVENTS

1. State shift job assignments.
2. Hold a shift briefing, detailing instruction to the shift: (provide crew members a copy of the shift turnover sheet).
3. Inform the crew “The simulator is running. You may commence panel walkdowns at this time. CRS please inform me when your crew is ready to assume the shift”.
4. Allow sufficient time for panel walk-downs. When informed by the CRS that the crew is ready to assume the shift, ensure the simulator is cleared of unauthorized personnel.

Evaluator/Instructor Activity	Expected Plant/Student Response	SBT LOG	Comment
1. Power Ascension			
Examiner's Note: The crew will be using S2.OP-IO.ZZ-0003, Hot Standby to Minimum Load, to perform the power ascension. Step 4.3.16 provides guidance on raising reactor power using Steam Dumps IAW S2.OP-SO.MS-0002. The crew can use Attachments 3 or 4 of S2.OP-SO.MS-0002 to operate Steam Dumps. The intent is for the crew to enter Mode 1, ≈ 6% Rx power, THEN; proceed to next event.			
Examiner's Note: IF console alarm **RC LOOPS Tavg – Tref DEVIATION** is in at the time the crew takes the watch, the crew will be provided instructions during turnover that verification of Tavg is 541 F once per 30 minutes until alarm is reset in Control Room Narrative Log is being performed by the extra NCO. This alarm will clear during the power ascension into Mode 1.			
	CRS directs power ascension using Main Steam Dumps in MS Pressure Control and control rods.		

Evaluator/Instructor Activity	Expected Plant/Student Response	SBT LOG	Comment
Examiner's Note: The CRS will direct the crew in the order in which to raise Rx power by withdrawing control rods or raising steam dump demand first.			
	PO raises steam dump demand IAW S2.OP-SO.MS-0002, section 5.4 using Attachments 3 or 4.		
	RO withdraws control rods at the specified increments to maintain Tave on program.		
Examiner's Note: Program Tavg at 10% Rx power is about 549 F. During simulator runs, Steam Dump pressure setting was about 982 psig for a Rx Power of 5.4%.			
	RO announces when NIS indicates 5% Reactor Power and RECORDs time of Mode 1 entry in Control Room Narrative Log.		
Proceed on to next event when Reactor Power is 6% or by direction from Lead Examiner.			
2. 2PR2 PZR PORV Seat Leakage:			
Simulator Operator: Insert **RT-1** on direction from Lead Examiner. **PR0018B, PZR PORV 2PR2 Develops Leak** **Value = 20000**			
	RO announces unexpected OHA alarm for PZR HTR		

Evaluator/Instructor Activity	Expected Plant/Student Response	SBT LOG	Comment
	ON PRESS LO.		
	CRS places power ascension on hold.		
	RO reports PZR PORV tailpipe temperature is rising or elevated.		
	CRS enters S2.OP-AB.PZR-0001, PZR Pressure Malfunction.		
	PO initiates Attachment 1 CAS		
	RO reports POPs is not in service.		
	RO reports PZR Pressure Control Channel has not failed.		
	RO reports Master Pressure Controller has not failed/		
	RO reports a spray valve has not failed open.		
	RO reports a PORV has not failed.		
	RO reports PORV tailpipe temperature is elevated.		
	CRS directs RO to close 2PR6 and 2PR7		
	RO closes 2PR6 and 2PR7.		
	CRS waits until RCS pressure stabilizes.		
	RO opens 2PR6.		
	RO reports tailpipe temperature is not rising.		

Evaluator/Instructor Activity	Expected Plant/Student Response	SBT LOG	Comment
	RO opens 2PR7.		
	RO reports tailpipe temperature is rising.		
	RO closes 2PR7.		
TS evaluation #1:			
	CRS enters: • **TS 3.4.5 action a (1 hour to close PZR PORV Block Valve with power maintained)** • **TS 3.2.5.b, DNB Parameters IF RCS pressue is below 2200 psia [2185 psig] (Restore the parameter to within its limt within 2 hours)**		
Proceed to next event after CRS evaluates Tech Specs or by direction from Lead Examiner.			
3. High DP Across 23A CW Traveling Screen:			
Simulator Operator: Insert **RT-2** on direction from Lead Examiner. **CW0350E, 23A Circ Water Pump Trip Due to Freezing.** **Value = 1 to 8.5** **Ramp = 1:30**			
	PO reports OHA alarm for High DP.		
	PO reports 23A CW Traveling Screen is running in Fast Speed.		

Evaluator/Instructor Activity	Expected Plant/Student Response	SBT LOG	Comment
	PO reports DP across 23A CW Traveling Screen is > 1 feet and rising.		
Role Play: If CW Operator is dispatched to check on traveling screen status, then state the following: 23A CW Traveling Screen is covered with heavy grass and debris. The shear pin is NOT broken.			
	CRS refers to OHA Alarm procedure or S2.OP-AB.CW-0001		
Examiners Note: S2.OP-AB.CW-0001 Attachment 1 step 9 provides guidance on when to stop or Emergency Trip the CW Pump based on screen DP.			
	The CRS directs stopping 23A CW Pump when screen DP exceeds 6 feet AND/OR Emergency Trips CW Pump when travel screen DP exceeds 8 feet IAW OHA ARP procedure.		
	PO Stops OR Emergency Trips 23A CW Pump.		
	CRS enters S2.OP-AB.CW-0001, CW System Abnormality.		
Proceed on to next event after 23A CW Pump is tripped or by direction from Lead Examiner.			
4. 23 SG Tube Leak:			
Simulator Operator: Insert RT-3 on			

Evaluator/Instructor Activity	Expected Plant/Student Response	SBT LOG	Comment
direction from Lead Examiner. **SG0078C, 23 SG Tupe Rupture.** **Value = 35**			
	RO reports OHA alarm A-6 for 2R15 in Alarm.		
	Subsequently, RO reports 2R53C (MS Line Rad Monitor) and later 2R19C (23 SG B/D Rad Monitor) are in Alarm.		
	RO reports PZR Level is lowering.		
	CRS enters S2.OP-AB.SG-0001, SG Tube Leak		
	CRS directs RO to determine RCS leak rate.		
	PO initiates Attachment 1 CAS.		
	RO reports PZR Level is not stable or rising.		
	RO reports a Centrifugal Charging Pump is not running.		
	CRS directs the RO to place a Centrifugal Charging in service IAW step 3.5.		
	RO performs step 3.5 to transfer to a Centrifugal Charging Pump.		
	Following transfer to Centrifugal Charging Pump, RO reports that PZR Level can be maintained stable.		
	Crew determines RCS leak rate around 20-30 gpm.		

Evaluator/Instructor Activity	Expected Plant/Student Response	SBT LOG	Comment
TS #2 evaluation:			
	CRS enters: • **TS 3.4.7.2.c (primary-to-secondary leakage) action a (be in Hot Standby within 6 hours)**		
Proceed to next event after report of PZR Level status or by direction from Lead Examiner.			
5. 23 SG Tube Rupture (Major Transient):			
Simulator Operator: MODIFY **RT-3** on direction from Lead Examiner. **SG00078C, 23 SG Tube Rutpure Value = 650**			
Isolation of Feed Flow to 23 SG:			
	RO reports leak rate has worsen.		
	RO reports leak rate exceeds make-up capability.		
	CRS directs the action in Attachment 1 CAS to the RO to Trip the Reactor and actuate Safety Injection.		
	RO trips the reactor, confirms the trip and actuates Safety Injection.		
	CRS enters 2-EOP-TRIP-1, Reactor Trip of Safety Injection.		

Evaluator/Instructor Activity	Expected Plant/Student Response	SBT LOG	Comment
	RO continues on with immediate actions of TRIP-1.		
	CRS and RO review immediate actions.		
	PO throttles AFW flow to no less than 22E4 lbm/hr.		
	PO reports that SEC loading is NOT complete for energized ALL Vital Buses.		
6. 21 CFCU fails to start in LOW Speed on SEC signal:			
	PO reports 21 CFCU failed to start.		
	PO blocks 2A SEC.		
	PO resets 2A SEC.		
	RO starts 21 CFCU in LOW Speed.		
5. Cont'd 23 SG Tube Rupture:			
	PO reports that 21 and 22 AFW pumps are running.		
	PO reports 23 SG NR levels are rising.		
Critical Task #1, Part 1 (CT-18): Isolate feed and steam flow to ruptured SG before transition SGTR-3, SGTR with LOCA, occurs. **SAT _____ UNSAT _____**			

Evaluator/Instructor Activity	Expected Plant/Student Response	SBT LOG	Comment
	Critical Task #1 Part 1 - PO closes 23AF21 and 23AF11 valves.		
	If the ruptured SG is known at this point, the PO may request to close the 23AF21 and 23AF11 to isolate feed flow to the ruptured SG.		
	RO reports that containment pressure has remained less than 15 psig.		
	PO reports that 2RP4 does NOT indicate high steam flow coincident with low steam pressure or low-low Tavg.		
	RO reports 2 CCW pump running.		
	RO reports both CCW HX are in Auto.		
	RO reports 2CC131 is open.		
	PO reports all valve groups per Table E are in safeguards positions.		
	RO reports CAV is in AP Mode and not in Maintenance Mode alignment.		
	RO reports 2 switchgear supply and 1 exhaust fan are running.		

Evaluator/Instructor Activity	Expected Plant/Student Response	SBT LOG	Comment
	RO reports ECCS flow as expected for current RCS pressure.		
	PO maintains total AFW flow greater than 22E4 lbm/hr until at least one SG NR level is >9%, then maintains SG NR level 19-33%.		
	RO reports all RCPs are running for RCS temperature control.		
	RO reports RCS Tcolds are stable or tending to 547 F.		
	RO reports both PZR PORVs are closed.		
	RO reports ONLY 2PR6 PZR PORV block valve is open (Note: 2PR7 closed due to seat lekage earlier).		
	RO reports all RCPs are running for RCP trip criteria.		
	RO reports SI initiated and ECCS flow established.		
	RO reports that RCS pressure is not < 1240 psig (1350 psig).		
	PO reports NO SG pressures are dropping in an uncontrolled manner or completely depressurized.		
	RO reports that NR level in 23 SG is rising in an uncontrolled manner.		
2-EOP-SGTR-1 starts here:			
	CRS transitions to EOP-SGTR-1, Steam Generator Tube Rupture.		

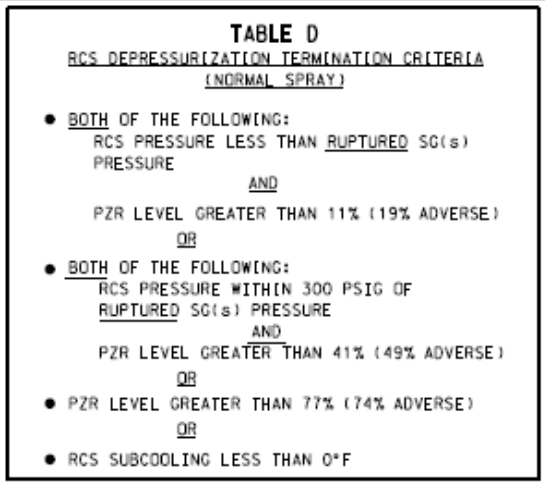
Evaluator/Instructor Activity	Expected Plant/Student Response	SBT LOG	Comment
	RO reports RCP Trip Criteria is NOT met.		
	PO reports NR levels rising in 23 SG.		
	PO sets 23MS10 to 1045 psig.		
	PO reports that 23 SG is ruptured.		
	PO reports that 23 AFW Pump is NOT the only source of feed flow.		
Examiners Note: Steps to stop 23 AFW Pump is only required if 23 AFW Auto Starts. During validation 23 AFW was not required to Auto start.			
	PO lowers 23 AFW pump speed to minimum.		
	PO trips 23 AFW pump		
	CRS dispatches operator to close 23 MS45.		
Simulator Operator: Use **Remote MS06A** to simulate closing 23MS45. Notify CRS when valve is closed.			
	PO reports 23MS18, 23MS7, and 23GB4 are closed.		
Critical Task #1, Part 2 (CT-18): Isolate			

Evaluator/Instructor Activity	Expected Plant/Student Response	SBT LOG	Comment
feed and steam flow to ruptured SG before transition to SGTR-3, SGTR with LOCA, occurs. **SAT _____ UNSAT _____**			
	Critical Task #1 Part 2- PO closes 23MS167 [Critical Task #1 complete]		
	PO reports 23MS167, 23MS18, and 23MS7 are closed.		
	CRS directs WCC to close 2SS333.		
	CRS determines RCS target temperature using Table B (SG press at >1000 psig = 503 F CETs).		
	PO reports steam dumps are available.		
	PO places steam dumps in Manual.		
	PO places steam pressure valve demand to 0%.		
	PO places steam dumps in MS PRESS CONTROL.		
	PO adjusts steam pressure valve demand to cooldown at maximum rate.		
	When Tavg low-low is reached, PO depresses “Bypass Tavg” pushbuttons.		

Evaluator/Instructor Activity	Expected Plant/Student Response	SBT LOG	Comment
Critical Task #2 (CT-19): Cooldown RCS to target temperature so that transition from EOP-SGTR-1, Steam Generator Tube Rupture, does not occur. **This CT is broken down into two (2) Parts; Part 1 - establishing RCS cooldown and then Part 2 – stops the RCS cooldown by placing the MS PRESS in Auto and maintains RCS temperature.** **SAT_____ UNSAT_____**			
	Critical Task #2 Part 1 - PO dumps steam using steam dumps on intact SGs.		
	CRS continues on in EOP-SGTR-1.		
	RO reports hottest CETs are not less than RCS cooldown target temp.		
	PO maintains AFW flow > 22E4 lbm/hr until one SG NR level is > 9%, then maintain between 19% and 33%.		
	RO reports power is available to both PZR PORV stop valves.		
	RO reports both PZR PORVs are closed.		

Evaluator/Instructor Activity	Expected Plant/Student Response	SBT LOG	Comment
	RO resets SI, Phase A, and Phase B isolation.		
	PO resets each SEC and associated control centers.		
	RO opens 21 and 22 CA330s.		
	RO reports RHR suction is aligned to the RWST.		
	RO stops both RHR pumps.		
	RO reports hottest CETs are not less than RCS target temp.		
	Crew **waits** until hottest CETs are less than RCS target cooldown temp.		
	RO reports hottest CETs less than RCS target cooldown temp.		
Examiner's Note: It will take approx. **5 mins** to reach the RCS target temperature.			
Critical Task #2 Part 2 (CT-19): Cooldown RCS to target temperature so that transition from EOP-SGTR-1, Steam Generator Tube Rupture, does not occur. **SAT_____ UNSAT_____**			

Evaluator/Instructor Activity	Expected Plant/Student Response	SBT LOG	Comment
	Critical Task #2 Part 2 - PO stops the cooldown by placing MS Pressure Control in Auto. [Critical Task #2 complete]		
	CRS directs PO to dump steam to maintain CET temp. less than required.		
	PO reports ruptured SG pressure is stable or rising.		
	RO reports RCS subcooling is greater than 20 F.		
	RO reports normal PZR spray is available		
7. RCS depressurization using PZR Spray Valves:			
	RO reports PZR Spray Valves are available.		
	CRS reviews depressurization termination criteria IAW Table D.		
Examiner's Note: Table D Depressurization Criteria below:			

Evaluator/Instructor Activity	Expected Plant/Student Response	SBT LOG	Comment
			
	RO opens BOTH PZR Spray Valves.		
	RO reports RCS pressure is lowering.		
	RO reports when depressurization termination criteria is met IAW Table D.		
PZR Spray Valve 2PS3 fails to close:			
	RO closes both PZR Spray Valves.		
Simulator Operator: Ensure **ET-2** is TRUE. This will insert malfunction to prevent 2PS3 Spray Valve from closing. **ET-2, 2PS3 Spray Valve Open Lamp**			
	RO reports 2PS3 Spray Valve failed to close.		

Evaluator/Instructor Activity	Expected Plant/Student Response	SBT LOG	Comment
	CRS directs RO to stop 21 and 23 RCPs		
	RO stops 21 and 23 RCPs.		
	RO reports RCS pressure is NOT dropping in uncontrolled manner.		
	CRS goes to step 19 and continues on in SGTR-1		
Examiners Note: If the crew determines that RCS pressure is still lowering, the crew will stop all but one RCP.			
The scenario maybe terminated when the 21 and 23 RCPs are stopped or as directed by the Lead Examiner.			

VI. SCENARIO REFERENCES

1. Alarm Response Procedures (Various)
2. Technical Specifications
3. Emergency Plan (ECG)
4. OP-AA-101-111-1003, Use of Procedures
5. S2.OP-IO.ZZ-0003, Hot Standby to Minimum Load
6. S2.OP-AB.RAD-0001, Radiation System Abnormality
7. S2.OP-SO.MS-0002, Steam Dump System Operation
8. S2.OP-AB.CW-0001, CW System Abnormality
9. S2.OP-AB.PZR-0001, PZR Pressure Malfunction
10. S2.OP-AB.SG-0001, Steam Generator Tube Leak
11. 2-EOP-TRIP-1, Reactor Trip or Safety Injection
12. 2-EOP-SGTR-1, Steam Generator Tube Rupture

ATTACHMENT 1 (NRC-4)
UNIT TWO PLANT STATUS
TODAY

MODE: 2 POWER: 2% RCS BORON: 1584 MWe 0

SHUTDOWN SAFETY SYSTEM STATUS (5, 6 & DEFUELED):

N/A

REACTIVITY PARAMETERS

- Control Bank D at 127 steps.
- Reactor Engineering directs use of control rods and steam dumps to raise power to 10%. No Fuel Conditioning Limits are imposed until 50%.

MOST LIMITING LCO AND DATE/TIME OF EXPIRATION:

None

EVOLUTIONS/PROCEDURES/SURVEILLANCES IN PROGRESS:

- S2.OP-IO.ZZ-0003, Hot Standby to Minimum Load complete up to Section 4.3, step 4.3.18 and S2.OP-SO.MS-0002, Steam Dump System Operation is open at (5.4.1)
- IF RC Loop Tavg – Tref Deviation console alarm is in, then extra NCO will log Tavg > 541 F once per 30 minutes.
- Crew to continue Power ascension to 10% using control rods and steam dumps, and enter Mode 1.
- Reactor Engineering is standing by to support power ascension.
- Mode 1 entry is authorized.

ABNORMAL PLANT CONFIGURATIONS:

CONTROL ROOM:

Unit 1 and Hope Creek at 100% power.

PRIMARY:

SECONDARY:

- On main feedwater using 21 SGFP; 22 SGFP is Out of Service

RADWASTE:

No discharges in progress

CIRCULATING WATER/SERVICE WATER:

ATTACHMENT 2

SIMULATOR READY FOR TRAINING CHECKLIST

____ 1. Verify simulator is in “TRAIN” Load
____ 2. Simulator is in RUN
____ 3. Overhead Annunciator Horns ON
____ 4. All required computer terminals in operation
____ 5. Simulator clocks synchronized
____ 6. All tagged equipment properly secured and documented
____ 7. TSAS Status Board up-to-date
____ 8. Shift manning sheet available
____ 9. Procedures in progress open and signed-off to proper step
____ 10. All OHA lamps operating (OHA Test) and burned out lamps replaced
____ 11. Required chart recorders advanced and ON (proper paper installed)
____ 12. All printers have adequate paper AND functional ribbon
13. Required procedures clean
____ 14. Multiple color procedure pens available
____ 15. Required keys available
____ 16. Simulator cleared of unauthorized material/personnel
____ 17. All charts advanced to clean traces and chart recorders are on.
____ 18. Rod step counters correct (channel check) and reset as necessary
____ 19. Exam security set for simulator
____ 20. Ensure a current RCS Leak Rate Worksheet is placed by Aux Alarm Typewriter
____ with Baseline Data filled out
____ 21. Shift logs available if required
____ 22. Recording Media available (if applicable)
____ 23. Ensure ECG classification is correct
____ 24. Reference verification performed with required documents available
____ 25. Verify phones disconnected from plant after drill.
____ 26. Verify EGC paperwork is marked “Training Use Only” and is current revision.
____ 27. Ensure sufficient copies of ECG paperwork are available.

ATTACHMENT 3

CRITICAL TASK METHODOLOGY

In reviewing each proposed CT, the examination team assesses the task to ensure, that it is essential to safety. A task is essential to safety if, in the judgment of the examination team, the improper performance or omission of this task by a licensee will result in direct adverse consequences or in significant degradation in the mitigative capability of the plant.
The examination team determines if an automatically actuated plant system would have been required to mitigate the consequences of an individual's incorrect performance. If incorrect performance of a task by an individual necessitates the crew taking compensatory action that would complicate the event mitigation strategy, the task is safety significant.

I. Examples of CTs involving essential safety actions include those for which operation or correct performance prevents...

- degradation of any barrier to fission product release
- degraded emergency core cooling system (ECCS) or emergency power capacity
- a violation of a safety limit
- a violation of the facility license condition
- incorrect reactivity control (such as failure to initiate Emergency Boration or Standby Liquid Control, or manually insert control rods)
- a significant reduction of safety margin beyond that irreparably introduced by the scenario

II. Examples of CTs involving essential safety actions include those for which a crew demonstrates the ability to...

- effectively direct or manipulate engineered safety feature (ESF) controls that would prevent any condition described in the previous paragraph.
- recognize a failure or an incorrect automatic actuation of an ESF system or component.
- take one or more actions that would prevent a challenge to plant safety.
- prevent inappropriate actions that create a challenge to plant safety (such as an unintentional Reactor Protection System (RPS) or ESF actuation.

ATTACHMENT 4

SIMULATOR SCENARIO REVIEW CHECKLIST

SCENARIO IDENTIFIER: 20-01 NRC Scenario #4 REVIEWER: R. Chan

Initials		Qualitative Attributes
RC	1.	The scenario has clearly stated objectives in the scenario.
RC	2.	The initial conditions are realistic, in that some equipment and/or instrumentation may be out of service, but it does not cue crew into expected events.
RC	3.	The scenario consists mostly of related events.
RC	4.	Each event description consists of: • the point in the scenario when it is to be initiated • the malfunction(s) that are entered to initiate the event • the symptoms/cues that will be visible to the crew • the expected operator actions (by shift position) • the event termination point
RC	5.	No more than one non-mechanistic failure (e.g., pipe break) is incorporated into the scenario without a credible preceding incident such as a seismic event.
RC	6.	The events are valid with regard to physics and thermodynamics.
RC	7.	Sequencing/timing of events is reasonable, and allows for the examination team to obtain complete evaluation results commensurate with the scenario objectives.
RC	8.	The simulator modeling is not altered.
RC	9.	All crew competencies can be evaluated.
RC	10.	The scenario has been validated.
NA	11.	If the sampling plan indicates that the scenario was used for training during the requalification cycle, evaluate the need to modify or replace the scenario.
RC	12.	ESG-PSA Evaluation Form is completed for the scenario at the applicable facility.

ATTACHMENT 5

ESG CRITICAL TASKS

20-01 NRC Scenario #4

Critical Tasks:

CT-1 (CT-18) - Isolate feed and stem flow to ruptured SG before transition to SGTR-3, SGTR with LOCA – Subcooled Recovery, occurs.

SAFETY SIGNIFICANCE -- Failure to isolate the ruptured SG causes a loss of differential pressure between the ruptured SG and the intact SGs. The fact that the crew allows the differential pressure to dissipate and, as a result, are then forced to transition to a contingency ERG constitutes an incorrect performance that "necessitates the crew taking compensating action that would complicate the event mitigation strategy...."

The analyses presented in the ERG Background Document for E-3 demonstrate that a SGTR violates the RCS fission-product barrier because the SGTR allows radioactive RCS inventory to
leak into the SG. As a result, the SG inventory, radioactivity, and pressure increase. If the primary-to-secondary leakage is not stopped, the SG pressure increases until either the SG PORV or the safety valve(s) opens, releasing radioactivity to the environment. If the leakage continues, the SG inventory increase leads to water release through the PORV or safety valve(s) or to SG overfill, which seriously compromises the SG as a fission-product barrier and complicates mitigation. To stop the primary-to-secondary leakage, the crew must intervene to mitigate excessive inventory increase in the ruptured SG.

To mitigate excessive inventory increase, the crew must take the following actions:

- Identify and isolate the ruptured SG
- Cool down to establish RCS subcooling margin
- Depressurize RCS to restore inventory
- Terminate SI to stop primary-to-secondary leakage

The RCS depressurization decreases the RCS leakage into the SG, which helps to mitigate the excessive increase in SG inventory. The RCS depressurization also helps the ECCS restore RCS inventory, which in turn allows SI termination. SI termination eliminates the remaining cause of leakage from the RCS into the SG, mitigating the increase in SG inventory.

However, the RCS depressurization and SI termination cannot occur until the crew establishes RCS subcooling margin. To establish subcooling margin, the crew must cool down the RCS to a target temperature. But the crew cannot start the RCS cooldown until the ruptured SG is completely isolated. (Isolation means that all steam flow from the SG and all feedwater flow into
the SG must be stopped.)

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ESG CRITICAL TASKS

Isolating the ruptured SG maintains a differential pressure between the ruptured SG and the intact SGs. The differential pressure (250 psi) ensures that minimum RCS subcooling remains after RCS depressurization.

Without steam isolation, the ruptured SG pressure decreases to less than 250 psi above the intact SG as the cooldown occurs. When the crew cannot maintain the 250 psi differential, the ERGs require a transition to contingency ERG ECA-3.1. This transition unnecessarily delays the sequence of actions leading to RCS depressurization and SI termination.

For the feedwater, isolation must occur after the ruptured SG level exceeds minimum indication,
delaying isolation until after the SG tubes are covered. The feedwater coverage of the tubes places a water barrier between the tubes and the steam in the upper portion of the SG. Failure to maintain the water barrier allows the SG steam to contact the tubes. When the tube temperature decreases during the subsequent RCS cooldown, the tubes condense the hot steam, decreasing the SG pressure. The decreasing SG pressure decreases the differential pressure between the ruptured SG and the intact SGs to less than 250 psi. This forces the crew
to transition to contingency ERG ECA-3.1, which delays RCS depressurization and SI termination.

Any delay in the feedwater isolation allows the ruptured SG level to increase as the feedwater adds additional inventory along with the primary-to-secondary leakage. Too long a delay prevents the crew from depressurizing the RCS and terminating SI before excessive inventory seriously compromises the SG as a fission-product barrier, which complicates mitigation. The delay in feedwater isolation cannot be measured in terms of SG water level. But the delay can be measured in terms of the crew's inability to complete the RCS depressurization or SI termination before excessive SG inventory accumulates.

Thus, when the crew fails to isolate steam and feedwater when it is possible to do so (as in the postulated conditions), it constitutes the following:

- An incorrect action that "necessitates the crew to take compensating actions that would complicate the event mitigation"

AND

- A "significant reduction of safety margin beyond that irreparably introduced by the scenario"

Cues:

- Indication and/or annunciation of SGTR in one SG
  - Increasing SG water level
  - Radiation

AND

ATTACHMENT 5

ESG CRITICAL TASKS

- Indication and/or annunciation of reactor trip

AND

- Indication and/or annunciation of SI

Measurable Performance Standard:
Isolate feed and steam flow to ruptured SG before transition to SGTR-3, SGTR with LOCA – Subcooled Recovery, occurs

- [Main steam isolation valve position lamps indicate closed
- Main steam isolation bypass valve position lamps indicate closed
- PORV setpoint adjusted to ERG Footnote O.03
- Blowdown isolation valve position lamps indicate closed
- Steam isolation valve to TDAFW pump position lamps indicate closed
- AFW valve position lamps and/or indicators indicate closed
- Feedwater isolation valve position lamps indicate closed]$_2$

Feedback:

- Indication of stable or increasing pressure in the ruptured SG
- Indication of decreasing or zero feedwater flow rate in the ruptured SG

CT-2 (CT-19) - Cooldown RCS to target temperature so that transition from SGTR-1, Steam Generator Tube Rutpure, does not occur.

SAFETY SIGNIFICANCE -- Failure to establish and maintain the correct RCS temperature during a SGTR leads to a transition from E-3 to a contingency ERG. This failure constitutes an incorrect performance that “necessitates the crew taking compensating action that would complicate the event mitigation strategy....”

The analyses presented in the ERG Background Document for E-3 demonstrate that a SGTR violates the RCS fission-product barrier because the SGTR allows radioactive RCS inventory to
leak into the SG. As a result, the SG inventory, radioactivity, and pressure increase. If the primary-to-secondary leakage is not stopped, the SG pressure increases until either the SG PORV or the safety valve(s) open, releasing radioactivity to the environment. If the leakage continues, the SG inventory increase leads to water release through the PORV or safety valve(s) or to SG overfill, which seriously compromises the SG as a fission-product barrier and complicates mitigation. To stop the primary-to-secondary leakage, the crew must intervene to mitigate excessive inventory increase in the ruptured SG.

ATTACHMENT 5

ESG CRITICAL TASKS

To mitigate excessive inventory increase, the crew must take the following actions:

- Identify and isolate the ruptured SG
- Cool down to establish RCS subcooling margin
- Depressurize RCS to restore inventory
- Terminate SI to stop primary-to-secondary leakage

The RCS depressurization decreases the RCS leakage into the SG, which helps to mitigate the excessive increase in SG inventory. The RCS depressurization also helps the ECCS restore RCS inventory, which in turn allows SI termination. SI termination eliminates the remaining cause of leakage from the RCS into the SG, mitigating the increase in SG inventory.

However, the RCS depressurization and SI termination cannot occur until the crew establishes RCS subcooling margin. To establish subcooling margin, the crew must cool down the RCS to a target temperature. Terminating the RCS cooldown before reaching the target temperature prevents achieving the minimum RCS subcooling. Failure to achieve the required RCS subcooling results in a condition that forces the crew to transition to contingency ERG ECA-3.1, thereby delaying the RCS depressurization and SI termination. Such a delay allows the excessive inventory increase of the ruptured SG to continue until the SG overpressure components release water or until SG overfill occurs.

In addition to achieving the minimum target temperature, the crew must maintain that temperature to avoid a similar delay.

Terminating the cooldown too late challenges either the subcriticality CSF or the integrity CSF. Because the crew is directed to cool down at the maximum rate, late termination of cooldown could force the RCS temperature low enough to challenge the integrity CSF. The crew must then transition to one of the integrity FRGs. The transition also delays RCS depressurization and SI termination.

For plants without the BIT (BAT for LP plants) or with reduced BIT (BAT) boron concentration, late termination of cooldown could force the RCS temperature low enough to challenge the subcriticality CSF. Also, the crew's transition delays RCS depressurization and SI termination. In addition to avoiding challenges to the CSFs during the cooldown, the crew must maintain the RCS temperature high enough to avoid similar challenges.

Thus, when the crew fails to establish and maintain the correct RCS temperature when it is possible to do so (as in the postulated conditions) without transition from E-3, it constitutes the following:

- An incorrect action that "necessitates the crew to take compensating actions that would complicates the event mitigation"

AND

- A "significant reduction of safety margin beyond that irreparably introduced by the

ATTACHMENT 5

ESG CRITICAL TASKS

scenario

Cues:

- Indication and/or annunciation of SGTR in one SG
  - Increasing SG water level
  - Radiation

AND

- Indication and/or annunciation of reactor trip

AND

- Indication and/or annunciation of SI

AND

- Indication of ruptured SG pressure [greater than minimum required pressure][4]

Measurable Performance Standard:

Cooldown RCS to target temperature so that transition from SGTR-1 does not occur.

- Steam dump valve position lamps and/or indicators indicate closed
- SG PORV valve position lamps and/or indicators indicate closed

Indications of the RCS temperature is in either of the following conditions:

- Too high to maintain [minimum required subcooling]
- Below [the RCS temperature that causes an extreme (RED path) or a severe (PURPLE path) challenge to the subcriticality and/or the integrity CSF

Feedback:

- Indication of steam flow rate greater than zero
- Indication of RCS temperature decreasing

OR

- Indication of RCS temperature less than target temperature

ATTACHMENT 6

ESG-PRA RELATIONSHIP EVALUATION

EVENTS LEADING TO CORE DAMAGE

Y/N	Event	Y/N	Event
N	TRANSIENTS with PCS Unavailable	N	Loss of Service Water
Y	Steam Generator Tube Rupture	N	Loss of CCW
N	Loss of Offsite Power	N	Loss of Control Air
N	Loss of Switchgear and Pen Area Ventilation	N	Station Black Out
N	LOCA		

COMPONENT/TRAIN/SYSTEM UNAVAILABILITY THAT INCREASES CORE DAMAGE FREQUENCY

Y/N	COMPONENT, SYSTEM, OR TRAIN	Y/N	COMPONENT, SYSTEM, OR TRAIN
N	Containment Sump Strainers	N	Gas Turbine
N	SSWS Valves to Turbine Generator Area	N	Any Diesel Generator
N	RHR Suction Line valves from Hot Leg	N	Auxiliary Feed Pump
N	CVCS Letdown line Control and Isolation Valves	N	SBO Air Compressor

OPERATOR ACTIONS IMPORTANT IN PREVENTING CORE DAMAGE

Y/N	OPERATOR ACTION
N	Restore AC power during SBO
N	Connect to gas turbine
N	Trip Reactor and RCPs after loss of component cooling system
N	Re-align RHR system for re-circulation
N	Un-isolate the available CCW Heat Exchanger
N	Isolate the CVCS letdown path and transfer charging suction to RWST
Y	Cooldown the RCS and depressurize the system
Y	Isolate the affected Steam Generator that has the tube rupture(s)
N	Early depressurize the RCS
N	Initiate feed and bleed

Complete this evaluation form for each ESG