ES-401 **PWR Examination Outline** **FORM ES-401-2**

Facility Name:Braidwood Date of Exam:9/05/2016

Tier	Group	RO K/A Category Points												SRO-Only Points						
		K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G *	Total	A 2		G *		Total		
1. Emergency & Abnormal Plant Evolutions	1	3	3	3	N/A			3	3	N/A		3	18	3		3		6		
	2	1	2	1				1	2			2	9	2		2		4		
	Tier Totals	4	5	4				4	5			5	27	5		5		10		
2. Plant Systems	1	3	3	3	3	2	2	2	2	3	2	3	28	3		2		5		
	2	1	1	1	1	1	1	1	0	1	1	1	10	1	1	1		3		
	Tier Totals	4	4	4	4	3	3	3	2	4	3	4	38	5		3		8		
3. Generic Knowledge and Abilities Categories		1		2		3		4		10				1	2	3	4	7		
		2		3		2		3						2	2	1	2			

Note:
1. Ensure that at least two topics from every applicable K/A category are sampled within each tier of the RO and SRO-only outlines (i.e., except for one category in Tier 3 of the SRO-only outline, the "Tier Totals" in each K/A category shall not be less than two). (One Tier 3 Radiation Control K/A is allowed if the K/A is replaced by a K/A from another Tier 3 Category).
2. The point total for each group and tier in the proposed outline must match that specified in the table. The final point total for each group and tier may deviate by ±1 from that specified in the table based on NRC revisions. The final RO exam must total 75 points and the SRO-only exam must total 25 points.
3. Systems/evolutions within each group are identified on the associated outline; systems or evolutions that do not apply at the facility should be deleted and justified; operationally important, site-specific systems that are not included on the outline should be added. Refer to Section D.1.b of ES-401 for guidance regarding the elimination of inappropriate K/A statements.
4. Select topics from as many systems and evolutions as possible; sample every system or evolution in the group before selecting a second topic for any system or evolution.
5. Absent a plant-specific priority, only those K/As having an importance rating (IR) of 2.5 or higher shall be selected. Use the RO and SRO ratings for the RO and SRO-only portions, respectively.
6. Select SRO topics for Tiers 1 and 2 from the shaded systems and K/A categories.
7.* The generic (G) K/As in Tiers 1 and 2 shall be selected from Section 2 of the K/A Catalog, but the topics must be relevant to the applicable evolution or system. Refer to Section D.1.b of ES-401 for the applicable K/As.
8. On the following pages, enter the K/A numbers, a brief description of each topic, the topics' importance ratings (IRs) for the applicable license level, and the point totals (#) for each system and category. Enter the group and tier totals for each category in the table above; if fuel handling equipment is sampled in other than Category A2 or G* on the SRO-only exam, enter it on the left side of Column A2 for Tier 2, Group 2 (Note #1 does not apply). Use duplicate pages for RO and SRO-only exams.
9. For Tier 3, select topics from Section 2 of the K/A catalog, and enter the K/A numbers, descriptions, IRs, and point totals (#) on Form ES-401-3. Limit SRO selections to K/As that are linked to 10 CFR 55.43.

G* Generic K/As

ES-401	PWR Examination Outline							Form ES-401-2	
	Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (RO)								
Q#	E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
48	000007 Reactor Trip - Stabilization - Recovery / 1		03					Reactor trip status panel	3.5	1
49	000008 Pressurizer Vapor Space Accident / 3						02.38	Knowledge of conditions and limitations in the facility license.	3.6	1
50	000009 Small Break LOCA / 3					32		SDM	3.2	1
51	000011 Large Break LOCA / 3		02					Pumps	2.6	1
52	000015 RCP Malfunctions / 4 000017 RCP Malfunctions (Loss of RC Flow) / 4			02				CCW lineup and flow paths to RCP oil coolers	3.0	1
53	000022 Loss of Rx Coolant Makeup / 2			02				Actions contained in SOPs and EOPs for RCPs, loss of makeup, loss of charging, and abnormal charging	3.5	1
54	000025 Loss of RHR System / 4				01			RCS/RHRS cooldown rate	3.6	1
	000026 Loss of Component Cooling Water / 8									0
55	000027 Pressurizer Pressure Control System Malfunction / 3	03						Latent heat of vaporization/condensation	2.6	1
56	000029 ATWS / 1						02.25	Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits.	3.2	1
57	000038 Steam Gen. Tube Rupture / 3					05		Causes and consequences of shrink and swell in S/Gs	2.8	1
58	000040 Steam Line Rupture - Excessive Heat Transfer / 4	01						Consequences of PTS	4.1	1
	WE12 Uncontrolled Depressurization of all Steam Generators / 4									
59	000054 (CE/E06) Loss of Main Feedwater / 4				04			HPI, under total feedwater loss conditions	4.4	1
60	000055 Station Blackout / 6			02				Actions contained in EOP for loss of offsite and onsite power	4.3	1
61	000056 Loss of Off-site Power / 6					81		S/G level meter scale and pressure gauge	3.7	1
	000057 Loss of Vital AC Inst. Bus / 6									0
	000058 Loss of DC Power / 6									0
62	000062 Loss of Nuclear Svc Water / 4						02.12	Knowledge of surveillance procedures.	3.7	1
	000065 Loss of Instrument Air / 8									0
63	W/E04 LOCA Outside Containment / 3	02						Normal, abnormal and emergency operating procedures associated with LOCA Outside Containment	3.5	1
64	W/E11 Loss of Emergency Coolant Recirc. / 4				03			Desired operating results during abnormal and emergency situations	3.7	1
	BW/E04; W/E05 Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4									0
65	000077 Generator Voltage and Electric Grid Disturbances / 6		07					Turbine / generator control	3.6	1
	K/A Category Totals:	3	3	3	3	3	3	Group Point Total:		18

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Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (RO)

Q#	E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
	000001 Continuous Rod Withdrawal / 1									0
40	000003 Dropped Control Rod / 1		05					Control rod drive power supplies and logic circuits	2.5	1
	000005 Inoperable/Stuck Control Rod / 1									0
	000024 Emergency Boration / 1									0
39	000028 Pressurizer Level Malfunction / 2					01		PZR level indicators and alarms	3.4	1
	000032 Loss of Source Range NI / 7									0
	000033 Loss of Intermediate Range NI / 7									0
	000036 Fuel Handling Accident / 8									0
	000037 Steam Generator Tube Leak / 3									0
	000051 Loss of Condenser Vacuum / 4									0
	000059 Accidental Liquid RadWaste Rel. / 9									0
41	000060 Accidental Gaseous Radwaste Rel. / 9						04. 31	Knowledge of annunciator alarms, indications, or response procedures.	4.2	1
	000061 ARM System Alarms / 7									0
42	000067 Plant Fire On-site / 8			02				Steps called out in the site fire protection plan, FPS manual, and fire zone manual	2.5	1
	000068 Control Room Evac. / 8									0
43	000069 Loss of CTMT Integrity / 5				01			Isolation valves, dampers, and electropneumatic devices	3.5	1
	W/E14 High Containment Pressure / 5									
44	000074 Inad. Core Cooling / 4						02. 37	Ability to determine operability and/or availability of safety related equipment.	3.6	1
	W/E06 Degraded Core Cooling / 4									
	W/E07 Saturated Core Cooling / 4									
	000076 High Reactor Coolant Activity / 9									0
	W/E01 Rediagnosis / 3									0
	W/E02 SI Termination / 3									
	W/E13 Steam Generator Over-pressure / 4									0
	W/E15 Containment Flooding / 5									0
45	W/E16 High Containment Radiation / 9					02		Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments	3.0	1
46	W/E03 LOCA Cooldown - Depress. / 4	03						Annunciators and conditions indicating signals, and remedial actions associated with the LOCA Cooldown and Depressurization	3.5	1
47	W/E09 Natural Circulation Operations / 4		02					Facility's heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the	3.6	1
	W/E10 Natural Circulation with Steam Voide in Vessel with/without RVLIS. / 4									
	W/E08 RCS Overcooling - PTS / 4									0
	K/A Category Totals:	1	2	1	1	2	2	Group Point Total:		9

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Plant Systems - Tier 2/Group 1 (RO)

Q#	System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
11	003 Reactor Coolant Pump						04						Containment isolation valves affecting RCP operation	2.8	1
12,32	004 Chemical and Volume Control		05				10						MOVs; Boric acid storage tank/boron injection tank recirculation flow path	2.7; 2.7	2
13,33	005 Residual Heat Removal				02							01. 19	Modes of operation; Ability to use plant computers to evaluate system or component status.	3.2; 3.9	2
14,34	006 Emergency Core Cooling				21						05		Bypassing/blocking ESF channels; Transfer of ECCS flowpaths prior to recirculation	4.1; 3.9	2
15	007 Pressurizer Relief/Quench Tank							01					Maintaining quench tank water level within limits	2.9	1
16,35	008 Component Cooling Water	01								01			SWS; Setpoints on instrument signal levels for normal operations, warnings, and trips that are applicable to the CCWS	3.1; 3.2	2
17	010 Pressurizer Pressure Control	03											RCS	3.6	1
18	012 Reactor Protection	02											125V dc system	3.4	1
19	013 Engineered Safety Features Actuation					02							Safety system logic and reliability	2.9	1
20,36	022 Containment Cooling				02							01. 23	Correlation of fan speed and flowpath changes with containment pressure; Ability to perform specific system and integrated plant procedures during all modes of plant	3.1; 4.3	2
	025 Ice Condenser														0
21	026 Containment Spray								02				Failure of automatic recirculation transfer	4.2	1
22	039 Main and Reheat Steam									02			Isolation of the MRSS	3.1	1
23	059 Main Feedwater							03					Power level restrictions for operation of MFW pumps and valves	2.7	1
24,37	061 Auxiliary/Emergency Feedwater					05						02. 44	Feed line voiding and water hammer; Ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and	2.7; 4.2	2
25	062 AC Electrical Distribution			02									ED/G	4.1	1
26,38	063 DC Electrical Distribution		01								01		Major DC loads; Major breakers and control power fuses	2.9; 2.8	2
27	064 Emergency Diesel Generator		03										Control power	3.2	1
28	073 Process Radiation Monitoring			01									Radioactive effluent releases	3.6	1
29	076 Service Water			07									ESF loads	3.7	1
30	078 Instrument Air									01			Air pressure	3.1	1
31	103 Containment								03				Phase A and B isolation	3.5	1
															0
	K/A Category Totals:	3	3	3	3	2	2	2	2	3	2	3	Group Point Total:		28

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Plant Systems - Tier 2/Group 2 (RO)

Q#	System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
5	001 Control Rod Drive							06					Reactor power	4.1	1
1	002 Reactor Coolant					10							Relationship between reactor power and RCS differential temperature	3.6	1
	011 Pressurizer Level Control														0
	014 Rod Position Indication														0
2	015 Nuclear Instrumentation			01									RPS	3.9	1
3	016 Non-nuclear Instrumentation										02		Recorders	2.7	1
	017 In-core Temperature Monitor														0
	027 Containment Iodine Removal														0
	028 Hydrogen Recombiner and Purge Control														0
	029 Containment Purge														0
4	033 Spent Fuel Pool Cooling				04								Maintenance of spent fuel pool radiation	2.7	1
	034 Fuel Handling Equipment														0
6	035 Steam Generator	11											PRM system	3.1	1
7	041 Steam Dump/Turbine Bypass Control									05			Main steam pressure	2.9	1
	045 Main Turbine Generator														0
	055 Condenser Air Removal														0
	056 Condensate														0
	068 Liquid Radwaste														0
	071 Waste Gas Disposal														0
	072 Area Radiation Monitoring														0
9	075 Circulating Water		03										Emergency/essential SWS pumps	2.6	1
8	079 Station Air											01.30	Ability to locate and operate components, including local controls.	4.4	1
10	086 Fire Protection						04						Fire, smoke, and heat detectors	2.6	1
	K/A Category Totals:	1	1	1	1	1	1	1	0	1	1	1	Group Point Total:		10

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Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (SRO)

Q#	E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
	000007 Reactor Trip - Stabilization - Recovery / 1									0
	000008 Pressurizer Vapor Space Accident / 3									0
	000009 Small Break LOCA / 3									0
	000011 Large Break LOCA / 3									0
	000015 RCP Malfunctions / 4 000017 RCP Malfunctions (Loss of RC Flow) / 4									0
	000022 Loss of Rx Coolant Makeup / 2									0
	000025 Loss of RHR System / 4									0
88	000026 Loss of Component Cooling Water / 8						02.44	Ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and directives affect plant and system conditions.	4.4	1
	000027 Pressurizer Pressure Control System Malfunction / 3									0
	000029 ATWS / 1									0
	000038 Steam Gen. Tube Rupture / 3									0
	000040 Steam Line Rupture - Excessive Heat Transfer / 4									1
89	WE12 Uncontrolled Depressurization of all Steam Generators / 4						04.35	Knowledge of local auxiliary operator tasks during an emergency and the resultant operational effects.	4.0	
	000054 (CE/E06) Loss of Main Feedwater / 4									0
	000055 Station Blackout / 6									0
	000056 Loss of Off-site Power / 6									0
90	000057 Loss of Vital AC Inst. Bus / 6					19		The plant automatic actions that will occur on the loss of a vital ac electrical instrument bus	4.3	1
91	000058 Loss of DC Power / 6					03		DC loads lost; impact on to operate and monitor plant systems	3.9	1
	000062 Loss of Nuclear Svc Water / 4									0
92	000065 Loss of Instrument Air / 8						04.11	Knowledge of abnormal condition procedures.	4.2	1
	W/E04 LOCA Outside Containment / 3									0
	W/E11 Loss of Emergency Coolant Recirc. / 4									0
93	BW/E04; W/E05 Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4					02		Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments	4.3	1
	000077 Generator Voltage and Electric Grid Disturbances / 6									0
	K/A Category Totals:	0	0	0	0	3	3	Group Point Total:		6

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Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (SRO)

Q#	E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
	000001 Continuous Rod Withdrawal / 1									0
	000003 Dropped Control Rod / 1									0
84	000005 Inoperable/Stuck Control Rod / 1						04. 08	Knowledge of how abnormal operating procedures are used in conjunction with EOPs.	4.5	1
	000024 Emergency Boration / 1									0
	000028 Pressurizer Level Malfunction / 2									0
	000032 Loss of Source Range NI / 7									0
	000033 Loss of Intermediate Range NI / 7									0
	000036 Fuel Handling Accident / 8									0
85	000037 Steam Generator Tube Leak / 3						04. 46	Ability to verify that the alarms are consistent with the plant conditions.	4.2	1
	000051 Loss of Condenser Vacuum / 4									0
	000059 Accidental Liquid RadWaste Rel. / 9									0
	000060 Accidental Gaseous Radwaste Rel. / 9									0
	000061 ARM System Alarms / 7									0
	000067 Plant Fire On-site / 8									0
86	000068 Control Room Evac. / 8					02		Local boric acid flow	4.2	1
	000069 Loss of CTMT Integrity / 5									0
	W/E14 High Containment Pressure / 5									
	000074 Inad. Core Cooling / 4									1
	W/E06 Degraded Core Cooling / 4									
87	W/E07 Saturated Core Cooling / 4					02		Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments	3.9	
	000076 High Reactor Coolant Activity / 9									0
	W/E01 Rediagnosis / 3									0
	W/E02 SI Termination / 3									
	W/E13 Steam Generator Over-pressure / 4									0
	W/E15 Containment Flooding / 5									0
	W/E16 High Containment Radiation / 9									0
	W/E03 LOCA Cooldown - Depress. / 4									0
	W/E09 Natural Circulation Operations / 4									0
	W/E10 Natural Circulation with Steam Voide in Vessel with/without RVLIS. / 4									
	W/E08 RCS Overcooling - PTS / 4									0
	K/A Category Totals:	0	0	0	0	2	2	Group Point Total:		4

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Plant Systems - Tier 2/Group 1 (SRO)

Q#	System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
79	003 Reactor Coolant Pump								03				Problems associated with RCP motors, including faulty motors and current, and winding and bearing temperature problems	3.1	1
	004 Chemical and Volume Control														0
	005 Residual Heat Removal														0
	006 Emergency Core Cooling														0
	007 Pressurizer Relief/Quench Tank														0
	008 Component Cooling Water														0
80	010 Pressurizer Pressure Control								02				Spray valve failures	3.9	1
	012 Reactor Protection														0
	013 Engineered Safety Features Actuation														0
	022 Containment Cooling														0
	025 Ice Condenser														0
	026 Containment Spray														0
81	039 Main and Reheat Steam								03				Indications and alarms for main steam and area radiation monitors (during SGTR)	3.7	1
	059 Main Feedwater														0
	061 Auxiliary/Emergency Feedwater														0
	062 AC Electrical Distribution														0
	063 DC Electrical Distribution														0
83	064 Emergency Diesel Generator											01.32	Ability to explain and apply system limits and precautions.	4.0	1
82	073 Process Radiation Monitoring											04.21	Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity,	4.6	1
	076 Service Water														0
	078 Instrument Air														0
	103 Containment														0
															0
	K/A Category Totals:	0	0	0	0	0	0	0	3	0	0	2	Group Point Total:		5

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Plant Systems - Tier 2/Group 2 (SRO)

Q#	System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
	001 Control Rod Drive														0
	002 Reactor Coolant														0
	011 Pressurizer Level Control														0
	014 Rod Position Indication														0
	015 Nuclear Instrumentation														0
	016 Non-nuclear Instrumentation														0
	017 In-core Temperature Monitor														0
	027 Containment Iodine Removal														0
	028 Hydrogen Recombiner and Purge Control														0
	029 Containment Purge														0
	033 Spent Fuel Pool Cooling														0
77	034 Fuel Handling Equipment			0 1									Containment ventilation	2.9	1
76	035 Steam Generator											02. 22	Knowledge of limiting conditions for operations and safety limits.	4.7	1
78	041 Steam Dump/Turbine Bypass Control								0 2				Steam valve stuck open	3.9	1
	045 Main Turbine Generator														0
	055 Condenser Air Removal														0
	056 Condensate														0
	068 Liquid Radwaste														0
	071 Waste Gas Disposal														0
	072 Area Radiation Monitoring														0
	075 Circulating Water														0
	079 Station Air														0
	086 Fire Protection														0
	K/A Category Totals:	0	0	1	0	0	0	0	1	0	0	1	Group Point Total:		3

ES-401 **Generic Knowledge and Abilities Outline (Tier 3)** **Form ES-401-3**

Facility Name:Braidwood Date of Exam:9/05/2016

Q#	Category	K/A #	Topic	RO IR	RO #	SRO-Only IR	SRO-Only #
66	1. Conduct of Operations	2.1. 25	Ability to interpret reference materials, such as graphs, curves, tables, etc.	3.9	1	4.2	
67		2.1. 32	Ability to explain and apply system limits and precautions.	3.8	1	4.0	
94		2.1. 34	Knowledge of primary and secondary plant chemistry limits.	2.7		3.5	1
95		2.1. 36	Knowledge of procedures and limitations involved in core alterations.	3.0		4.1	1
		2.1.					
		2.1.					
		Subtotal			2		2
68	2. Equipment Control	2.2. 36	Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations.	3.1	1	4.2	
69		2.2. 07	Knowledge of the process for conducting special or infrequent tests.	2.9	1	3.6	
70		2.2. 44	Ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and directives affect plant and system conditions.	4.2	1	4.4	
96		2.2. 21	Knowledge of pre- and post-maintenance operability requirements.	2.9		4.1	1
97		2.2. 39	Knowledge of less than or equal to one hour Technical Specification action statements for systems.	3.9		4.5	1
		2.2.					
		Subtotal			3		2
71	3. Radiation Control	2.3. 14	Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities.	3.4	1	3.8	
72		2.3. 05	Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.	2.9	1	2.9	
98		2.3. 06	Ability to approve release permits.	2.0		3.8	1
		2.3.					
		2.3.					
		2.3.					
		Subtotal			2		1
73	4. Emergency Procedures / Plan	2.4. 13	Knowledge of crew roles and responsibilities during EOP usage.	4.0	1	4.6	
74		2.4. 49	Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.	4.6	1	4.4	
75		2.4. 05	Knowledge of the organization of the operating procedures network for normal, abnormal, and emergency evolutions.	3.7	1	4.3	
99		2.4. 04	Ability to recognize abnormal indications for system operating parameters that are entry-level conditions f	4.5		4.7	1
100		2.4. 28	Knowledge of procedures relating to a security event.	3.2		4.1	1
		2.4.					
		Subtotal			3		2
Tier 3 Point Total					10		7

Facility: Braidwood Date of Examination: 09/06/2016

Examination Level: RO ☐ SRO ☒ Operating Test Number: 15-1 NRC

Administrative Topic (See Note)	Type Code*	Describe activity to be performed
Conduct of Operations	S,R,D	Determine venting time for RX Vessel Head SIM-108 K/A 2.1.25 SRO 4.2
Conduct of Operations	S,R,N	Determine if Reactor Startup should continue. SIM 114 K/A 2.1.37 SRO 4.6
Equipment Control	S,R,D	Review a surveillance to determine battery operability S-204 K/A 2.2.40 SRO 4.7
Radiation Control	S,R,D	Review a gas decay tank release S-301 K/A 2.3.6 SRO 3.8
Emergency Plan	S,R,M	Classify an Event, cold EAL S-413 K/A 2.4.41 SRO 4.6

NOTE: All items (5 total) are required for SROs. RO applicants require only 4 items unless they are retaking only the administrative topics (which would require all five items).

* Type Codes & Criteria:
(C)ontrol room, (S)imulator, or Class(R)oom
(D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes)
(N)ew or (M)odified from bank (≥ 1)
(P)revious 2 exams (≤ 1; randomly selected)

Facility: Braidwood Date of Examination: 09/06/2016

Exam Level: RO ☐ SRO-I ☒ SRO-U ☐ Operating Test No.: 151 NRC

Control Room Systems: *8 for RO; 7 for SRO-I; 2 or 3 for SRO-U

System / JPM Title	Type Code*	Safety Function
a. Perform Emergency Boration SIM-113 K/A 0024AA1.17 RO 3.9 SRO 3.9	A,S,M,L	1
b. Align RHR for cold leg injection Sim-301 K/A 002A1.08 RO 3.7 SRO 3.8	D,S,L	2
c. Raise SI Accumulator Level Sim-203 K/A 006A1.13A1.17 RO 4.1 SRO 4.2	D,EN,S	3
d. Swap CC pumps Sim-800 K/A 008A4.01 RO 3.3 SRO 3.1	A,D,S	8
e. RV/IV Cycling Surveillance Sim-409 K/A 045A4.01 RO 3.1 SRO 2.9	D,S	4S
f. Start a reactor coolant pump SIM-409P K/A 003A4.02 RO 2.9 SRO 2.9	N,S,L	4P
g. Parallel the 1B DG to bus 142 with a failure of the voltage controller high SIM-612 K/A 064A4.02 RO 3.3 SRO 3.4	A,M,S	6
h.		

In-Plant Systems * (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)

i. Rod Drive MG startup IP-101 K/A 001A4.08 RO 3.7 SRO 3.4	D	1
j. Respond to a fire detection alarm/2B DG, IP-801 K/A 086A2.04 RO 3.3 SRO3.9	A,D	8
k. Locally control of aux feed flow IP-411 K/A APE068AA1.26 RO 3.6 SRO 3.8	A,E,N,R	4S

* All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all five SRO-U systems must serve different safety functions; in-plant systems and functions may overlap those tested in the control room.

* Type Codes	Criteria for RO / SRO-I / SRO-U
(A)lternate path	4-6 / 4-6 / 2-3
(C)ontrol room	
(D)irect from bank	≤ 9 / ≤ 8 / ≤ 4
(E)mergency or abnormal in-plant	≥ 1 / ≥ 1 / ≥ 1
(EN)gineered safety feature	≥ 1 / ≥ 1 / ≥ 1 (control room system)
(L)ow-Power / Shutdown	≥ 1 / ≥ 1 / ≥ 1
(N)ew or (M)odified from bank including 1(A)	≥ 2 / ≥ 2 / ≥ 1
(P)revious 2 exams	≤ 3 / ≤ 3 / ≤ 2 (randomly selected)
(R)CA	≥ 1 / ≥ 1 / ≥ 1
(S)imulator	

Facility: Braidwood Date of Examination: 09/06/2016

Examination Level: RO ☒ SRO ☐ Operating Test Number: 15-1 NRC

Administrative Topic (See Note)	Type Code*	Describe activity to be performed
Conduct of Operations	S,R,N	Perform 1BwOS RF-1. R-113 K/A 2.1.19 RO 3.9
Conduct of Operations	S,D	Perform QPTR without the plant process computer R-102 K/A 2.1.7 RO 4.4
Equipment Control	S,R,D	Identify leak isolation point from station mechanical drawings. R-204 K/A 2.2.41 RO 3.5
Radiation Control		
Emergency Plan	S,D	Perform NARS transmittal for a UE R-401 K/A 2.4.43 RO 3.2

NOTE: All items (5 total) are required for SROs. RO applicants require only 4 items unless they are retaking only the administrative topics (which would require all five items).

* Type Codes & Criteria:
(C)ontrol room, (S)imulator, or Class(R)oom
(D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes)
(N)ew or (M)odified from bank (≥ 1)
(P)revious 2 exams (≤ 1; randomly selected)

Facility: Braidwood Date of Examination: 09/06/2016

Exam Level: RO ☒ SRO-I ☐ SRO-U ☐ Operating Test No.: 151 NRC

Control Room Systems: *8 for RO; 7 for SRO-I; 2 or 3 for SRO-U

System / JPM Title	Type Code*	Safety Function
a. Perform Emergency Boration SIM-113 K/A 0024AA1.17 RO 3.9 SRO 3.9	A,S,M,L	1
b. Align RHR for cold leg injection Sim-301 K/A 002A1.08 RO 3.7 SRO 3.8	D,S,L	2
c. Raise SI Accumulator Level Sim-203 K/A 006A1.13A1.17 RO 4.1 SRO 4.2	D,EN,S	3
d. Swap CC pumps Sim-800 K/A 008A4.01 RO 3.3 SRO 3.1	A,D,S	8
e. RV/IV Cycling Surveillance Sim-409 K/A 045A4.01 RO 3.1 SRO 2.9	D,S	4S
f. Start a reactor coolant pump SIM-409P K/A 003A4.02 RO 2.9 SRO 2.9	N,S,L	4P
g. Parallel the 1B DG to bus 142 with a failure of the voltage regulator high SIM-612 K/A 064A4.02 RO 3.3 SRO 3.4	A,M,S	6
h. Respond to 1PR03J high radiation alarm SIM-706 K/A 073A4.02 RO 3.7 SRO 3.7	D,S	7
In-Plant Systems * (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)		
i. Rod Drive MG startup IP-101 K/A 001A4.08 RO 3.7 SRO 3.4	D	1
j. Respond to a fire detection alarm/2B DG, IP-801 K/A 086A2.04 RO 3.3 SRO3.9	A,D	8
k. Locally control of aux feed flow IP-411 K/A APE068AA1.26 RO 3.6 SRO 3.8	A,E,N,R	4S

* All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all five SRO-U systems must serve different safety functions; in-plant systems and functions may overlap those tested in the control room.

* Type Codes	Criteria for RO / SRO-I / SRO-U
(A)lternate path	4-6 / 4-6 / 2-3
(C)ontrol room	
(D)irect from bank	≤ 9 / ≤ 8 / ≤ 4
(E)mergency or abnormal in-plant	≥ 1 / ≥ 1 / ≥ 1
(EN)gineered safety feature	≥ 1 / ≥ 1 / ≥ 1 (control room system)
(L)ow-Power / Shutdown	≥ 1 / ≥ 1 / ≥ 1
(N)ew or (M)odified from bank including 1(A)	≥ 2 / ≥ 2 / ≥ 1
(P)revious 2 exams	≤ 3 / ≤ 3 / ≤ 2 (randomly selected)
(R)CA	≥ 1 / ≥ 1 / ≥ 1
(S)imulator	

Simulation Facility Braidwood		Scenario No.: **NRC 1**	Operating Test No.: **15-1 NRC**
Examiners:		Applicant:	SRO
			ATC
			BOP

Initial Conditions: IC-21

Turnover: Unit 1 is at 100% power, steady state, equilibrium xenon, BOL. Following completion of turnover, the Shift Manager requests that the BOP swap the 0A & 0B WS pumps per BwOP WS-1 and WS-3 in preparation for surveillance testing on Unit 2.

Event No.	Malf. No.	Event Type*	Event Description
Preload	Trgset 1 "ZLO1HSMP025(3) == 0" Trg 1 "IMF ED04A"		Offsite power is lost on the main generator trip
1	None	N-BOP, US	Swap WS pumps
2	IMF NI08H 500 10	I-ATC, US TS-US	PR NI N-44 fails high
3	IMF RX03C 4.8	I-BOP, US	1B SG steam flow, 1FT-522, fails high
4	IMF CV05 600 5	C-ATC, US	Letdown line pressure controller 1PK-131 output fails low
5	IOR ZDI1WO01PA TRIP	C-BOP, US	1A Containment Chilled Water Pump trip
6	TH03B 5 60	TS-US	1B SG Tube Leak
7	None	R-ATC, US	1BwOA SEC-8 Fast Ramp
8	IMF TH03B 550	M-ALL	1B SGTR
9	Preload	C-ALL	Offsite power is lost on the main generator trip

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

SCENARIO OVERVIEW

Unit 1 is at 100% power, steady state, equilibrium xenon, BOL. Following completion of turnover, the Shift Manager requests that the BOP swap the 0A & 0B WS pumps per BwOP WS-1 and WS-3 in preparation for surveillance testing on Unit 2.

After completing shift turnover and relief, the BOP will swap the 0A & 0B WS pumps in accordance with BwOP WS-1 and WS-3. The 0B WS pump will be started and the 0A WS pump will be placed in standby.

After swapping WS pumps, a failure of power range N-44 lower detector will occur. The crew will take actions per hard card 1BwPR 1-10-RD & 1BwOA INST-1 "NUCLEAR INSTRUMENTATION MALFUNCTION" including defeating the channel functions. Technical Specifications 3.3.1 Conditions A, D & E apply.

After the Power Range failure is addressed, a failure of 1FT-522, 1B SG steam flow channel, will occur. The crew will take actions per hard card 1BwPR 1-15-SG & 1BwOA INST-2 "OPERATION WITH FAILED INSTRUMENT CHANNEL" and perform required actions. The crew will swap to an operable steam flow channel.

After completion of steam flow failure actions, letdown pressure controller, 1PK-131, output will fail low. The letdown pressure control valve, 1CV131, will close and letdown pressure will rise lifting the letdown line relief valve. The ATC will take manual control of letdown pressure controller per hard card 1BwPR 1-9-LD and restore letdown pressure. The crew may isolate letdown due to the lifting letdown relief valve. If letdown is isolated, it will be restored per BwOP CV-17.

After the 1PK-131 controller failure is addressed, the 1A Containment Chilled Water pump will trip resulting in a trip of the 1A Containment Chiller. The crew will start the standby 1B Chilled Water pump and Chiller per BwOP VP-1 after receiving a report that the 1A Chilled Water pump motor appears damaged. Containment pressure and temperature will slowly rise as a result of the loss of Containment Cooling. The US should reference Tech Spec 3.6.4 and 3.6.5 and place a priority to start the standby Cnmt Chiller.

After the Containment Chilled Water malfunction has been addressed, a 1B Steam Generator Tube Leak will be initiated. The crew will implement 1BwOA SEC-8 "STEAM GENERATOR TUBE LEAK." The crew should determine from the estimated leak size that a fast ramp to remove the unit from power is required and make preparations to ramp the unit off line using 1BwGP 100-4, POWER DESCENSION or 1BwOA PWR-1 "POWER REDUCTION." Technical Specifications 3.4.13 Condition B applies.

After the SGTL has been addressed and the crew has ramped the unit sufficiently for a reactivity manipulation, the 1B SGTL will degrade to a 550 gpm Steam Generator Tube Rupture. The crew will implement 1BwEP-0 "REACTOR TRIP OR SAFETY INJECTION." The crew will transition to 1BwEP-3 "SGTR."

The scenario is complete when the crew has terminated high head injection and established normal charging flow in 1BwEP-3.

Critical Tasks

1. Identify the 1B SG as the ruptured SG and isolate prior to a transition to 1BwCA-3.1 is required. (Westinghouse – CT-18) (K/A number - EPE038EA1.32 importance 4.6/4.7)
2. Depressurize RCS to restore RCS inventory prior to 1B SG PORV or safety valve water release. (Westinghouse – CT-20) (K/A number - EPE038EA1.04 importance 4.3/4.1)

Simulation Facility	Braidwood	Scenario No.: **NRC 2**	Operating Test No.: **15-1 NRC**
Examiners:	_____	Applicant:	_____ SRO
	_____		_____ RO
	_____		_____ BOP

Initial Conditions: IC-31

Turnover: Unit 1 is operating at 90% power, steady state, equilibrium xenon, BOL. Online risk is green. Following completion of turnover, coordinate with Unit 2 and lower total station reactive load by a total of 2 KV in accordance with BwOP MP-23. The 1B HD pump was taken out of service 3 days ago and will NOT be returned to service for an additional 5 days.

Event No.	Malf. No.	Event Type*	Event Description
Preload	IMF MS01A 100 IMF MS01B 100 IMF MS01C 100 IMF MS01D 100 IMF CS01A IRF RP63 OUT		1A MSIV failed open 1B MSIV failed open 1C MSIV failed open 1D MSIV failed open 1A CS pump fails to start K643 1B CS slave relay fails to actuate
1	None	N-BOP, US	Lower reactive load 1 KV.
2	IMF RX10A 0 15	I-ATC, US TS-US	Turbine impulse pressure channel, 1PT-505, fails low
3	IMF CV10 0 30	I-ATC, US	1CV121 controller failure low
4	IMF RX06K 0 15	I-BOP, US TS-US	1C SG NR level transmitter, 1LT-539, fails low
5	IMF FW35A	C-BOP, US	1A Heater Drain Pump trip
6	None	R-ATC, US	Turbine runback (only 1 HD pump running)
7	IMF MS07C 4	M-ALL	Uncontrolled depressurization of all SGs
8	Preload	C-ALL	Failure of both CS trains to start automatically

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

SCENARIO OVERVIEW

Unit 1 is operating at 90% power, steady state, equilibrium xenon, BOL. Online risk is green. Following completion of turnover, coordinate with Unit 2 and lower total station reactive load by a total of 2 KV in accordance with BwOP MP-23. The 1B HD pump was taken out of service 3 days ago and will NOT be returned to service for an additional 5 days.

After completing shift turnover and relief, the BOP will lower Unit 1 reactive load 1 KV in accordance with BwOP MP-23.

After lowering reactive load, First Stage Turbine Impulse Pressure channel, 1PT-505, will fail low. After the crew diagnoses the failure of 1PT-505, the ATC will take manual control of rods after verifying turbine load stable. Initial ATC response is per hard card 1BwPR 1-10-RD, followed by entry into 1BwOA INST-2 "OPERATION WITH A FAILED INSTRUMENT CHANNEL, ATTACHMENT D." Tech Spec 3.3.1 Conditions A and P will be entered. The ATC will return rod control to automatic after verifying Tave and Tref are stable and within 1°F.

After the 1PT-505 failure is addressed, 1CV121, Charging Pump Flow Control Valve Controller 1FK-121, will fail to 0% demand. The 1CV121 valve will fully close and pressurizer level will drop. The crew will take actions to stabilize the plant by taking manual control of the 1FK-121 controller and restore charging flow.

After the 1FK-121 failure has been addressed, 1C SG NR level transmitter, 1LT-539, will fail low. 1FW530, Feedwater Regulating Valve, will open and 1C SG level will rise. The BOP will take manual control of 1C SG level per hard card 1BwPR 1-15-SG and stabilize 1C SG level. 1BwOA INST-2 "OPERATION WITH A FAILED INSTRUMENT CHANNEL," ATTACHMENT E, will be entered. The BOP will restore 1C SG level control to automatic after 1C SG level is restored to normal and an operable 1C SG NR level controlling channel is selected. Tech Specs 3.3.1 Conditions A and E and 3.3.2 Conditions A and D are applicable.

After the 1LT-539 failure has been addressed, 1A Heater Drain Pump will trip. 1BwOA SEC-1 "SECONDARY PUMP TRIP," ATTACHMENT C, will be entered. The BOP will initiate a turbine load reduction to 780 MW at 20 MW/minute. The ATC will borate the RCS as necessary during the load reduction.

As the crew is reducing load to address the 1A HD pump trip, a large steam break will occur on the 1C MS line. When containment pressure reaches 20 psig, Phase B actuates but the CS pumps do not start. The crew should manually realign train B CS valves which will start the 1B CS pump. Operators should transition to 1BwEP-2 "FAULTED STEAM GENERATOR ISOLATION" and recognize that the MSIVs have failed to close and that an uncontrolled depressurization of all SGs is in progress. The crew will transition to 1BwCA-2.1 "UNCONTROLLED DEPRESSURIZATION OF ALL STEAM GENERATORS" where they will throttle AF flow to the SGs. Entry into 1BwFR-H.1 "RESPONSE TO LOSS OF SECONDARY HEAT SINK" will be required when the crew throttles AF flow to 45 gpm per SG; however, a note in 1BwFR-H.1 directs that the procedure should NOT be performed. The crew will continue in 1BwCA-2.1.

Completion criteria is stopping the RH pumps in 1BwCA-2.1.

Critical Tasks

1. Manually actuate one train of containment spray prior to transition out of 1BwEP-0. (Westinghouse – CT-3) (K/A number - 013000A4.01 importance - 4.5/4.8)

2. Manually control AF flowrate to 45 gpm for each SG before orange path in integrity occurs. (Westinghouse – CT-33) (K/A number - EPEE12EA1.3 importance – 3.4/3.9

Simulation Facility: Braidwood		Scenario No.: **NRC 3**	Operating Test No.: **151 NRC**
Examiners:	_____	Applicant:	_____ SRO
	_____		_____ ATC
	_____		_____ BOP

Initial Conditions: IC-21

Turnover: Unit 1 is operating at 100% power, steady state, equilibrium xenon, BOL. 1B CW pump is OOS for motor inspection. Automatic Rod Control is failed (rod speed programmer failure). Rods are in MANUAL. IMD troubleshooting will commence in 3-4 hours. Following completion of turnover, the crew is to perform 1BwOS EH-M1 "UNIT 1 PUMP OPERABILITY SURVEILLANCE," using the preferred method of depressing and holding the MCB pushbutton. An Equipment Operator has been briefed and is standing by at the Unit 1 EH skid.

Event No.	Malf. No.	Event Type	Event Description
Preload	IMF RX17 0 IOR ZDI1CW01PB PTL IMF FW44 IMF FW43 IMF SI12B IRF RP30 OUT IRF RP56 OUT trgset 1 "ZLO52BRKA(2) == 1" IMF FW19C 3.5 (1 0) IMF CV01B (1 0)		Rod speed programmer failure 1B CW pump OOS 1A AF pump fails to start 1B AF pump fails to start 1B SI pump fails to automatically start Phase A slave failure Phase A slave failure 1C feedline break inside Cnmt when reactor trips 1B CV pump trips when reactor trips
1	None	N-BOP, US	Perform 1BwOS EH-M1
2	IMF RX04E 0 120	I-BOP, US	Feed Flow channel, 1FT530, fails low
3	IMF CV29A 100	C-ATC, US TS-US	1A CV pump shaft shear
4	IMF SW01A	C-BOP, US TS-US	1A SX Pump Trip
5	IMF RX15 2195	I-ATC, US	Master Pressurizer Pressure Controller output fails to 2195 psig (0% demand)
6	IMF FW36 500 scfm to 120 scfm over 600 seconds	R-ATC, US	Condenser vacuum leak requiring load reduction
7	IMF CV03	C-ALL	Boric acid transfer pump trip
8	IMF RP09A	M-ALL	Inadvertent FWI Feed line break inside containment
9	Preload	C-ALL	1B CV pump trip when reactor trips
10	Preload	M-ALL	Loss of heat sink (1A/1B AF pumps tripped)

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

SCENARIO OVERVIEW

Unit 1 is operating at 100% power, steady state, equilibrium xenon, BOL. 1B CW pump is OOS for motor inspection. Automatic Rod Control is failed (rod speed programmer failure). Rods are in MANUAL. IMD troubleshooting will commence in 3-4 hours. Following completion of turnover, the crew is to perform 1BwOS EH-M1 "UNIT 1 PUMP OPERABILITY SURVEILLANCE," using the preferred method of depressing and holding the MCB pushbutton. An Equipment Operator has been briefed and is standing by at the Unit 1 EH skid.

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

After completing the surveillance, feed flow channel, 1FT-530, will fail low resulting in rising feed flow and opening of 1FW530, 1C S/G Feed Reg Valve, to match feed flow with steam flow. The BOP will diagnose the failure and take manual control of 1FW530 to restore 1C SG level. The US will enter 1BwOA INST-2 "OPERATION WITH A FAILED INSTRUMENT CHANNEL - ATTACHMENT G." The crew will take actions per hard card 1BwPR 1-15-SG & 1BwOA INST-2 and perform appropriate actions. The crew will swap to an operable feed flow channel.

After addressing the failed feed flow channel, the 1A CV pump shaft shear will occur. The crew will implement 1BwOA PRI-15 "LOSS OF NORMAL CHARGING." The crew will start the 1B CV pump to restore normal charging. Technical Specifications 3.5.2 Condition A and TRM 3.1.d Condition A apply.

After the charging pump failure is addressed, the 1A Essential Service Water (SX) pump will trip due to an overcurrent condition. The crew will take actions per hard card 1BwPR 1-2-A1 to start the 1B SX pump. The crew MAY enter 1BwOA PRI-8, ESSENTIAL SERVICE WATER MALFUNCTION. Tech Specs 3.7.8 Condition A applies. The 1A SX pump will remain unavailable for the rest of the scenario.

After the 1A SX pump trip is addressed, the master pressurizer pressure controller output will fail to 2195 psig (0% demand) in automatic. The RO will identify the failure and take manual control to restore pressurizer pressure.

After the master pressurizer pressure controller failure has been addressed, an air leak will develop in the main condenser. The crew will enter 1BwOA SEC-3 "LOSS OF CONDENSER VACUUM," dispatch operators to locate the leak and contact Engineering to evaluate the leakage. With the 1B CW pump OOS; the crew will be required to commence a ramp down of Unit 1 to stabilize the loss of vacuum.

During the ramp, the boric acid transfer pump will trip during the first boration. The common boric acid pump will not be available and the ATC will have to continue the ramp with rods only.

After a sufficient reactivity manipulation has occurred, an inadvertent FWI occurs. When the crew manually trips the reactor, a feed line break on the 1C SG inside containment will occur. The 1B CV pump trips when the reactor trips. The crew will enter 1BwEP-0 to stabilize the plant and SI will actuate. The 1B SI pump fails to auto start and must be manually started. The 1A and 1B AF pumps will not start resulting in a transition to 1BwFR-H.1 "RESPONSE TO LOSS OF SECONDARY HEAT SINK" at step 15 of 1BwEP-0. Bleed and feed will be required due to NO CV pumps running.

Completion criteria is establishing bleed and feed during the loss of heat sink.

Critical Tasks

1. Close containment isolation valves such that at least one valve is closed on each Phase A penetration before the end of the scenario. (Westinghouse CT-11) (K/A number APE069AA1.01 importance 3.5/3.7)
2. Initiate RCS bleed and feed so that the RCS depressurizes sufficiently for SI pump injection to occur. (Westinghouse CT-46) (K/A number EPEE05EA1.1 importance 4.1/4.0)

Simulation Facility: Braidwood		Scenario No.: **NRC 4**	Operating Test No.: **151 NRC**
Examiners:	_____	Applicant:	_____ SRO
	_____		_____ ATC
	_____		_____ BOP

Initial Conditions: IC-16

Turnover: Unit 1 is at 53% power, steady state, equilibrium xenon, MOL. Online risk is green. Following completion of turnover, the crew will perform 1BwOSR 3.7.4.1 "MAIN STEAM SYSTEM ISOLATION 1MS018A/B/C/D VALVE TRAVEL AND INDICATION 18 MONTH SURVEILLANCE." Once the surveillance is complete, the SM has directed ramping Unit 1 to 938 MW at 3 MW/min.

Event No.	Malf. No.	Event Type*	Event Description
	IMF CV32B TRGSET 1 "ZLO1SI01PA(3) = = 1" IMF CV01A (1 0) TRGSET 2 "ZAO1PI524A < 0.46" IMF TH03B (2 10) 600 60		1B CV pump auto start failure 1A CV pump trip on 1A SI pump start 1A CV pump trips on 1A SI pump start 1B SGTR when 1B SG pressure < 600 psig
1	TRGSET 3 "ZAO1PKMS042A > 0.90" IMF PB2411 (3 0) ON IMF PB2412 (3 0) ON IOR ZLO1MS018B2 (3 0) ON IOR ZLO1MS018B1 (3 0) ON IOR ZAO1ZIMS010 (3 0) 90 TRGSET 2 "ZDI1MS018B == 0" TRG 2 "DOR ZAO1ZIMS010"	N-BOP, US TS-US	1BwOSR 3.7.4.1, 1MS018A/B/C/D Surv with 1MS018B valve failure.
2	None	R-ATC, US	Raise power from 53% to 938 MW
3	IMF TH10B 100 15	C-ATC, US	1RY455C spray valve fails open in auto
4	IMF RX13A 0	C-ATC, US TS-US	PZR level channel, 1LT-459, fails low
5	IMF RX29B 100 30	I-BOP, US	1FW520 controller fails high in auto
6	IMF FW17 10 30	I-BOP, US	HD Tank level controller failure in auto
7	IOR ZDI1MS001B CLS IMF MS03B 100 IMF MS03F 100 IMF MS03J 100	M-ALL	1B MSIV fails closed causing 1B SG safety valves to stick open
8	Preload	C-ALL	1A CV pump trips/1B CV pump fails to auto start
9	Preload	M-ALL	1B SGTR (600 gpm) (faulted and ruptured SG)

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

SCENARIO OVERVIEW

Unit 1 is at 53% power, steady state, equilibrium xenon, MOL. Online risk is green. Following completion of turnover, the crew will perform 1BwOSR 3.7.4.1 "MAIN STEAM SYSTEM ISOLATION 1MS018A/B/C/D VALVE TRAVEL AND INDICATION 18 MONTH SURVEILLANCE." Once the surveillance is complete, the SM has directed ramping Unit 1 to 938 MW at 3 MW/min.

After completing shift turnover and relief, the BOP performs 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, the crew will commence a ramp to 938 MW at 3 MW/min.

After a measurable change in power, 1PK-455C, Pressurizer Spray Valve controller, will fail to 100% demand position. 1RY455C will fail full open and pressurizer pressure will drop. The ATC will take manual control of 1PK-455C per hard card 1BwPR 1-12-RY and lower demand to close the pressurizer spray valve. Tech Spec 3.4.1 Condition A will apply if pressurizer pressure drops below 2209 psig.

After the 1PK-455C failure has been addressed, the controlling PZR level channel, 1LT-459, will fail low. The crew will implement 1BwOA INST-2 and take actions to restore PZR level control and stabilize plant conditions. Technical Specification 3.3.1 Conditions A and K apply (Tech Spec 3.3.3 and 3.3.4 for Accident Monitoring and Remote Shutdown Panel minimum channel requirements are still met).

After the failed PZR level channel has been addressed, 1FK-520, Feed Reg Valve 1FW520 Controller, will fail to 100% demand. 1FW520, 1B FRV, will fully open and 1B SG level will rise. The crew will take actions per hard card 1BwPR 1-15-SG to stabilize the plant by taking manual control of the 1B FRV controller.

After the 1FK-520 failure is addressed, Heater Drain Tank (HDT) Level Controller, 1LK-HD009A, will fail to 0% demand. The 1HD046A/B valves will throttle close and HDT level will rise. The BOP will take actions to stabilize the plant by taking manual control of the 1LK-HD009A controller.

After the HDT Level Controller 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." When 1B SG pressure drops to 600 psig, a SGTR will occur on the 1B SG, causing a faulted/ruptured SG. The crew will complete isolation of 1B SG and transition to 1BwEP-3 "STEAM GENERATOR TUBE RUPTURE" based on secondary radiation trends on the 1B SG. In addition, the crew will recognize 1B SG pressure does not drop to zero and lowering pressurizer level/pressure will indicate a SGTR (alternate indications). After determining the ruptured SG pressure is less than 320 psig, the crew will transition 1BwCA-3.1 "SGTR WITH LOSS OF REACTOR COOLANT – SUBCOOLED RECOVERY DESIRED."

Completion criteria is completion of step 8 to stop the RH pumps in 1BwCA-3.1.

Critical Tasks

1. Manually start the 1B CV pump prior to completion of step 6 of 1BwEP-0.
   (Westinghouse – CT-6) (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-18) (K/A number - APE040AA1.10 importance 4.1/4.1)