

Facility Name: Braidwood		Date of Exam: 11/10/2014																
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	2	2	1	N/A			2	1	N/A			1	9	2	2	4	
	Tier Totals	5	5	4	N/A			5	4	N/A			4	27	5	5	10	
2. Plant Systems	1	3	2	2	3	3	2	2	3	2	3	3	28	3	2	5		
	2	0	1	1	1	1	1	1	1	1	1	1	10	0	1	3		
	Tier Totals	3	3	3	4	4	3	3	4	3	4	4	38	4	4	8		
3. Generic Knowledge and Categories		Abilities			1	2	3	4					10	1	2	3	4	7
					2	3	2	3						2	1	2	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).
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.

ES-401	PWR Examination Outline						Form ES-401-2		
Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (RO)									
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 5		Reactor trip first-out indication	3.4	1
000008 Pressurizer Vapor Space Accident / 3					3 0		Inadequate core cooling	4.3	1
000009 Small Break LOCA / 3		0 3					S/Gs	3.0	1
000011 Large Break LOCA / 3						04. 20	Knowledge of the operational implications of EOP warnings, cautions, and notes.	3.8	1
000015 RCP Malfunctions / 4 000017 RCP Malfunctions (Loss of RC Flow) / 4									0
000022 Loss of Rx Coolant Makeup / 2						02. 22	Knowledge of limiting conditions for operations and safety limits.	4.0	1
000025 Loss of RHR System / 4									0
000026 Loss of Component Cooling Water / 8				0 6			Control of flow rates to components cooled by the CCWS	2.9	1
000027 Pressurizer Pressure Control System Malfunction / 3	0 2						Expansion of liquids as temperature increases	2.8	1
000029 ATWS / 1									0
000038 Steam Gen. Tube Rupture / 3			0 4				Automatic actions provided by each PRM	3.9	1
000040 Steam Line Rupture - Excessive Heat Transfer / 4	0 1						Valves	2.6	1
WE12 Uncontrolled Depressurization of all Steam Generators / 4									
000054 (CE/E06) Loss of Main Feedwater / 4				0 3			AFW auxiliaries, including oil cooling water supply	3.5	1
000055 Station Blackout / 6									0
000056 Loss of Off-site Power / 6				1 2			Reactor building cooling unit	3.2	1
000057 Loss of Vital AC Inst. Bus / 6						04. 11	Knowledge of abnormal condition procedures.	4.0	1
000058 Loss of DC Power / 6	0 1						Battery charger equipment and instrumentation	2.8	1
000062 Loss of Nuclear Svc Water / 4					0 6		The length of time after the loss of SWS flow to a component before that component may be damaged	2.8	1
000065 Loss of Instrument Air / 8									0
W/E04 LOCA Outside Containment / 3	0 1						Components, capacity, and function of emergency systems	3.5	1
W/E11 Loss of Emergency Coolant Recirc. / 4			0 2				Normal, abnormal and emergency operating procedures associated with Loss of Emergency Coolant Recirculation	3.5	1
BW/E04; W/E05 Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4		0 1					Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features	3.7	1
000077 Generator Voltage and Electric Grid Disturbances / 6			0 1				Reactor and turbine trip criteria	3.9	1
K/A Category Totals:	3	3	3	3	3	3	Group Point Total:		18

ES-401		PWR Examination Outline						Form ES-401-2	
Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (RO)									
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	03						Relationship of reactivity and reactor power to rod movement	3.9	1
000003 Dropped Control Rod / 1									0
000005 Inoperable/Stuck Control Rod / 1		02					Breakers, relays, disconnects, and control room switches	2.5	1
000024 Emergency Boration / 1						01. 20	Ability to interpret and execute procedure steps.	4.6	1
000028 Pressurizer Level Malfunction / 2									0
000032 Loss of Source Range NI / 7				01			Manual restoration of power	3.1	1
000033 Loss of Intermediate Range NI / 7									0
000036 Fuel Handling Accident / 8	02						SDM	3.4	1
000037 Steam Generator Tube Leak / 3									0
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			02				Guidance contained in alarm response for ARM system	3.4	1
000067 Plant Fire On-site / 8									0
000068 Control Room Evac. / 8									0
000069 Loss of CTMT Integrity / 5									0
W/E14 High Containment Pressure / 5									0
000074 Inad. Core Cooling / 4		03					AFW pump	4.0	1
W/E06 Degraded Core Cooling / 4									
W/E07 Saturated Core Cooling / 4									
000076 High Reactor Coolant Activity / 9									0
W/E01 Rediagnosis / 3				02			Operating behavior characteristics of the facility	3.3	1
W/E02 SI Termination / 3									
W/E13 Steam Generator Over-pressure / 4									0
W/E15 Containment Flooding / 5					02		Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments	2.9	1
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:	2	2	1	2	1	1	Group Point Total:		9

ES-401	PWR Examination Outline											Form ES-401-2		
Plant Systems - Tier 2/Group 1 (RO)														
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	#
003 Reactor Coolant Pump	08											Containment isolation	2.7	1
004 Chemical and Volume Control						09						Purpose of VCT divert valve	2.8	1
005 Residual Heat Removal		01				03						RHR pumps; RHR heat exchanger	3; 2.5	2
006 Emergency Core Cooling					05							Effects of pressure on a solid system	3.4	1
007 Pressurizer Relief/Quench Tank							01			01		Maintaining quench tank water level within limits; PRT spray supply valve	2.9; 2.7	2
008 Component Cooling Water									04			Requirements on and for the CCWS for different conditions of the power plant	2.9	1
010 Pressurizer Pressure Control				03								Over pressure control	3.8	1
012 Reactor Protection			03								04.45	SDS; Ability to prioritize and interpret the significance of each annunciator or alarm.	3.1; 4.1	2
013 Engineered Safety Features Actuation				16								Avoidance of PTS	3.8	1
022 Containment Cooling			02									Containment instrumentation readings	3.0	1
025 Ice Condenser														0
026 Containment Spray								02				Failure of automatic recirculation transfer	4.2	1
039 Main and Reheat Steam					08							Effect of steam removal on reactivity	3.6	1
059 Main Feedwater							03					Power level restrictions for operation of MFW pumps and valves	2.7	1
061 Auxiliary/Emergency Feedwater	02										01.30	MFW System; Ability to locate and operate components, including local controls.	3.4; 4.4	2
062 AC Electrical Distribution								01		03		Types of loads that, if de-energized, would degrade or hinder plant operation; Synchroscope, including an understanding of running and incoming voltages	3.4; 2.8	2
063 DC Electrical Distribution									01			Meters, annunciators, dials, recorders, and indicating lights	2.7	1
064 Emergency Diesel Generator		01									02.38	Air compressor; Knowledge of conditions and limitations in the facility license.	2.7; 3.6	2
073 Process Radiation Monitoring					02							Radiation intensity changes with source distance	2.5	1
076 Service Water				02								Automatic start features associated with SWS pump controls	2.9	1
078 Instrument Air	04									01		Cooling water to compressor; Pressure gauges	2.6; 3.1	2
103 Containment								04				Containment evacuation (including recognition of the alarm)	3.5	1
														0
K/A Category Totals:	3	2	2	3	3	2	2	3	2	3	3	Group Point Total:		28

ES-401	PWR Examination Outline											Form ES-401-2		
Plant Systems - Tier 2/Group 2 (RO)														
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 2						RCP	3.6	1
011 Pressurizer Level Control														0
014 Rod Position Indication														0
015 Nuclear Instrumentation														0
016 Non-nuclear Instrumentation				0 1								Reading of NNIS channel values outside control room	2.8	1
017 In-core Temperature Monitor									0 1			Indications of normal, natural, and interrupted circulation of RCS	3.6	1
027 Containment Iodine Removal										0 4		Filter temperature	2.8	1
028 Hydrogen Recombiner and Purge Control														0
029 Containment Purge														0
033 Spent Fuel Pool Cooling														0
034 Fuel Handling Equipment								0 3				Mispositioned fuel element	3.3	1
035 Steam Generator											01. 23	Ability to perform specific system and integrated plant procedures during all modes of plant operation.	4.3	1
041 Steam Dump/Turbine Bypass Control														0
045 Main Turbine Generator			0 1									Remainder of the plant	2.9	1
055 Condenser Air Removal														0
056 Condensate														0
068 Liquid Radwaste														0
071 Waste Gas Disposal					0 4							Relationship of hydrogen/oxygen concentrations to flammability	2.5	1
072 Area Radiation Monitoring							0 1					Radiation levels	3.4	1
075 Circulating Water		0 3										Emergency/essential SWS pumps	2.6	1
079 Station Air														0
086 Fire Protection														0
K/A Category Totals:	0	1	1	1	1	1	1	1	1	1	1	Group Point Total:		10

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Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (SRO)									
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 1		Cause of RCP failure	3.5	1
000022 Loss of Rx Coolant Makeup / 2									0
000025 Loss of RHR System / 4					0 1		Proper amperage of running LPI/decay heat removal/RHR pump(s)	2.9	1
000026 Loss of Component Cooling Water / 8									0
000027 Pressurizer Pressure Control System Malfunction / 3									0
000029 ATWS / 1						01. 07	Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.	4.7	1
000038 Steam Gen. Tube Rupture / 3									0
000040 Steam Line Rupture - Excessive Heat Transfer / 4									1
WE12 Uncontrolled Depressurization of all Steam Generators / 4						04. 09	Knowledge of low power/shutdown implications in accident (e.g., loss of coolant accident or loss of residual heat removal) mitigation strategies.	4.2	
000054 (CE/E06) Loss of Main Feedwater / 4									0
000055 Station Blackout / 6						04. 06	Knowledge of EOP mitigation strategies.	4.7	1
000056 Loss of Off-site Power / 6									0
000057 Loss of Vital AC Inst. Bus / 6									0
000058 Loss of DC Power / 6									0
000062 Loss of Nuclear Svc Water / 4									0
000065 Loss of Instrument Air / 8					0 6		When to trip reactor if instrument air pressure is decreasing	4.2	1
W/E04 LOCA Outside Containment / 3									0
W/E11 Loss of Emergency Coolant Recirc. / 4									0
BW/E04; W/E05 Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4									0
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)									
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
000005 Inoperable/Stuck Control Rod / 1									0
000024 Emergency Boration / 1									0
000028 Pressurizer Level Malfunction / 2						02. 25	Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits.	4.2	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
000060 Accidental Gaseous Radwaste Rel. / 9									0
000061 ARM System Alarms / 7									0
000067 Plant Fire On-site / 8									0
000068 Control Room Evac. / 8									0
000069 Loss of CTMT Integrity / 5									0
W/E14 High Containment Pressure / 5									0
000074 Inad. Core Cooling / 4									0
W/E06 Degraded Core Cooling / 4									0
W/E07 Saturated Core Cooling / 4									0
000076 High Reactor Coolant Activity / 9						04. 35	Knowledge of local auxiliary operator tasks during an emergency and the resultant operational effects.	4.0	1
W/E01 Rediagnosis / 3									0
W/E02 SI Termination / 3									0
W/E13 Steam Generator Over-pressure / 4									0
W/E15 Containment Flooding / 5									0
W/E16 High Containment Radiation / 9					01		Facility conditions and selection of appropriate procedures during abnormal and emergency operations	3.3	1
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									0
W/E08 RCS Overcooling - PTS / 4					01		Facility conditions and selection of appropriate procedures during abnormal and emergency operations	4.2	1
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)															
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	#	
003 Reactor Coolant Pump												04.50	Ability to verify system alarm setpoints and operate controls identified in the alarm response manual.	4.0	1
004 Chemical and Volume Control												04.01	Knowledge of EOP entry conditions and immediate action steps.	4.8	1
005 Residual Heat Removal															0
006 Emergency Core Cooling								1	3				Inadvertent SIS actuation	4.2	1
007 Pressurizer Relief/Quench Tank															0
008 Component Cooling Water															0
010 Pressurizer Pressure Control								0	1				Heater failures	3.6	1
012 Reactor Protection															0
013 Engineered Safety Features Actuation															0
022 Containment Cooling															0
025 Ice Condenser															0
026 Containment Spray															0
039 Main and Reheat Steam															0
059 Main Feedwater															0
061 Auxiliary/Emergency Feedwater															0
062 AC Electrical Distribution															0
063 DC Electrical Distribution															0
064 Emergency Diesel Generator															0
073 Process Radiation Monitoring															0
076 Service Water															0
078 Instrument Air															0
103 Containment								0	3				Phase A and B isolation	3.8	1
															0
K/A Category Totals:	0	0	0	0	0	0	0	3	0	0	2	Group Point Total:		5	



ES-401	PWR Examination Outline											Form ES-401-2		
Plant Systems - Tier 2/Group 2 (SRO)														
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												04.08 Knowledge of how abnormal operating procedures are used in conjunction with EOPs.	4.5	1
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								01				Inadequate SDM	3.5	1
034 Fuel Handling Equipment														0
035 Steam Generator														0
041 Steam Dump/Turbine Bypass Control														0
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												04.47 Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material.	4.2	1
086 Fire Protection														0
K/A Category Totals:	0	0	0	0	0	0	0	1	0	0	2	Group Point Total:		3