

Facility Name: Byron 2014 Initial License														Date of Exam: 6/2/2014			
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	2	4	3	N/A			3	3	N/A			3	18	3	3	6
	2	1	2	1	N/A			2	2	N/A			1	9	2	2	4
	Tier Totals	3	6	4	N/A			5	5	N/A			4	27	5	5	10
2. Plant Systems	1	3	2	3	3	2	2	3	2	3	2	3	28	3	2	5	
	2	1	1	1	1	1	1	1	1	0	1	1	10	1	1	3	
	Tier Totals	4	3	4	4	3	3	4	3	3	3	4	38	5	3	8	
3. Generic Knowledge and Categories		Abilities			1	2	3	4	10				1	2	3	4	7
					3	3	2	2					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).
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)										
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
1	000008 Pressurizer Vapor Space Accident / 3						4.1 4	Knowledge of general guidelines for EOP usage.	3.8	1
2	000009 Small Break LOCA / 3		0 3					S/Gs	3.0	1
3	000011 Large Break LOCA / 3					1 3		Difference between overcooling and LOCA indications	3.7	1
4	000015 RCP Malfunctions / 4 000017 RCP Malfunctions (Loss of RC Flow) / 4	0 2						Consequences of an RCPS failure	3.7	1
	000022 Loss of Rx Coolant Makeup / 2									0
5	000025 Loss of RHR System / 4			0 3				Immediate actions contained in EOP for Loss of RHRS	3.9	1
	000026 Loss of Component Cooling Water / 8									0
6	000027 Pressurizer Pressure Control System Malfunction / 3			0 2				Verification of alternate transmitter and/or plant computer prior to shifting flow chart transmitters	2.9	1
7	000029 ATWS / 1		0 6					Breakers, relays, and disconnects	2.9	1
8	000038 Steam Gen. Tube Rupture / 3			0 4				Automatic actions provided by each PRM	3.9	1
9	000040 Steam Line Rupture - Excessive Heat Transfer / 4	0 1						Consequences of PTS	4.1	1
	WE12 Uncontrolled Depressurization of all Steam Generators / 4									
	000054 (CE/E06) Loss of Main Feedwater / 4									0
10	000055 Station Blackout / 6						4.4 9	Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.	4.6	1
11	000056 Loss of Off-site Power / 6						2.3 6	Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations.	3.1	1
	000057 Loss of Vital AC Inst. Bus / 6									0
12	000058 Loss of DC Power / 6				0 1			Cross-tie of the affected dc bus with the alternate supply	3.4	1
13	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
14	000065 Loss of Instrument Air / 8					0 8		Failure modes of air-operated equipment	2.9	1
15	W/E04 LOCA Outside Containment / 3		0 1					Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features	3.5	1
16	W/E11 Loss of Emergency Coolant Recirc. / 4				0 1			Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features	3.9	1
17	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
18	000077 Generator Voltage and Electric Grid Disturbances / 6				0 3			Voltage regulator controls	3.8	1
K/A Category Totals:		2	4	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)										
Q#	E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
19	000001 Continuous Rod Withdrawal / 1				01			Bank select switch	3.5	1
	000003 Dropped Control Rod / 1									0
	000005 Inoperable/Stuck Control Rod / 1									0
	000024 Emergency Boration / 1									0
20	000028 Pressurizer Level Malfunction / 2						4.2 1	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, containment	4.0	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
21	000059 Accidental Liquid RadWaste Rel. / 9					05		The occurrence of automatic safety actions as a result of a high PRM system signal	3.6	1
	000060 Accidental Gaseous Radwaste Rel. / 9									0
	000061 ARM System Alarms / 7									0
	000067 Plant Fire On-site / 8									0
22	000068 Control Room Evac. / 8			18				Actions contained in EOP for control room evacuation emergency task	4.2	1
	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									0
	W/E01 Rediagnosis / 3									1
23	W/E02 SI Termination / 3		01					Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features	3.4	1
24	W/E13 Steam Generator Over-pressure / 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	3.0	1
	W/E15 Containment Flooding / 5									0
25	W/E16 High Containment Radiation / 9				01			Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features	3.1	1
26	W/E03 LOCA Cooldown - Depress. / 4	01						Components, capacity, and function of emergency systems	3.4	1
27	W/E09 Natural Circulation Operations / 4					02		Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments	3.4	1
	W/E10 Natural Circulation with Steam Void in Vessel with/without RVLIS. / 4									0
	W/E08 RCS Overcooling - PTS / 4									0
K/A Category Totals:		1	2	1	2	2	1	Group Point Total:		9

ES-401		PWR Examination Outline											Form ES-401-2		
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	#
28	003 Reactor Coolant Pump					05							The dependency of RCS flow rates upon the number of operating RCPs	2.8	1
29	004 Chemical and Volume Control	0 6											Makeup system to VCT	3.1	1
30	005 Residual Heat Removal						0 3						RHR heat exchanger	2.5	1
31,54	006 Emergency Core Cooling		0 2									0 2	Valve operators for accumulators; Valves	2.5; 4	2
32,33	007 Pressurizer Relief/Quench Tank							0 3				1 0	Monitoring quench tank temperature; Recognition of leaking PORV/code safety	2.6; 3.6	2
34,35	008 Component Cooling Water							0 2				02. 42	CCW temperature; Ability to recognize system parameters that are entry-level conditions for Technical Specifications.	2.9; 3.9	2
36,37	010 Pressurizer Pressure Control				0 2							0 2	Prevention of uncovering PZR heaters; PZR pressure	3; 3.6	2
38, 41	012 Reactor Protection					0 2						04. 14	Power density; Knowledge of general guidelines for EOP usage.	3.1; 3.8	2
39	013 Engineered Safety Features Actuation	1 6											MRSS	2.9	1
40	022 Containment Cooling											0 1	Initiation of safeguards mode of operation	4.1	1
	025 Ice Condenser														0
42	026 Containment Spray			0 1									CCS	3.9	1
43	039 Main and Reheat Steam	0 5											T/G	2.5	1
44	059 Main Feedwater								0 3				Overfeeding event	2.7	1
45	061 Auxiliary/Emergency Feedwater		0 2										AFW electric driven pumps	3.7	1
46	062 AC Electrical Distribution			0 2									ED/G	4.1	1
47,48	063 DC Electrical Distribution							0 1				02. 20	Battery capacity as it is affected by discharge rate; Knowledge of the process for managing troubleshooting activities.	2.5; 2.6	2
49	064 Emergency Diesel Generator						0 8						Fuel oil storage tanks	3.2	1
50,51	073 Process Radiation Monitoring				0 1				0 1				Release termination when radiation exceeds setpoint; Erratic or failed power supply	4; 2.5	2
52	076 Service Water				0 6								Service water train separation	2.8	1
53	078 Instrument Air											0 1	Air pressure	3.1	1
55	103 Containment			0 2									Loss of containment integrity under normal operations	3.8	1
															0
K/A Category Totals:		3	2	3	3	2	2	3	2	3	2	3	Group Point Total:	28	

ES-401		PWR Examination Outline											Form ES-401-2		
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	#
56	001 Control Rod Drive	0 3											CRDM	3.4	1
61	002 Reactor Coolant											04. 34	Knowledge of RO tasks performed outside the main control room during an emergency and the resultant operational effects.	4.2	1
57	011 Pressurizer Level Control			0 3									PZR PCS	3.2	1
58	014 Rod Position Indication											0 1	Rod selection control	3.3	1
59	015 Nuclear Instrumentation		0 1										NIS channels, components, and interconnections	3.3	1
	016 Non-nuclear Instrumentation														0
	017 In-core Temperature Monitor														0
	027 Containment Iodine Removal														0
	028 Hydrogen Recombiner and Purge Control														0
60	029 Containment Purge							0 3					Containment pressure, temperature, and humidity	3.0	1
	033 Spent Fuel Pool Cooling														0
	034 Fuel Handling Equipment														0
62	035 Steam Generator								0 5				Unbalanced flows to the S/Gs	3.2	1
63	041 Steam Dump/Turbine Bypass Control						0 3						Controller and positioners, including ICS, S/G, CRDS	2.7	1
	045 Main Turbine Generator														0
	055 Condenser Air Removal														0
	056 Condensate														0
	068 Liquid Radwaste														0
	071 Waste Gas Disposal														0
64	072 Area Radiation Monitoring					0 2							Radiation intensity changes with source distance	2.5	1
	075 Circulating Water														0
	079 Station Air														0
65	086 Fire Protection				0 6								CO2	3.0	1
K/A Category Totals:		1	1	1	1	1	1	1	1	0	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	#
76	000007 Reactor Trip - Stabilization - Recovery / 1					0 2		Proper actions to be taken if the automatic safety functions have not taken place	4.6	1
	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
78	000025 Loss of RHR System / 4					0 6		Existence of proper RHR overpressure protection	3.4	1
	000026 Loss of Component Cooling Water / 8									0
	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
79	WE12 Uncontrolled Depressurization of all Steam Generators / 4						04. 06	Knowledge of EOP mitigation strategies.	4.7	1
80	000054 (CE/E06) Loss of Main Feedwater / 4					0 5		Status of MFW pumps, regulating and stop valves	3.7	1
	000055 Station Blackout / 6									0
	000056 Loss of Off-site Power / 6									0
81	000057 Loss of Vital AC Inst. Bus / 6						01. 36	Knowledge of procedures and limitations involved in core alterations.	4.1	1
	000058 Loss of DC Power / 6									0
	000062 Loss of Nuclear Svc Water / 4									0
	000065 Loss of Instrument Air / 8									0
	W/E04 LOCA Outside Containment / 3									0
	W/E11 Loss of Emergency Coolant Recirc. / 4									0
77	BW/E04; W/E05 Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4						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, containment	4.6	1
	000077 Generator Voltage and Electric Grid Disturbances / 6									0
K/A Category Totals:		0	0	0	0	3	3	Group Point Total:		6

ES-401	PWR Examination Outline							Form ES-401-2		
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
	000005 Inoperable/Stuck Control Rod / 1									0
	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
82	000037 Steam Generator Tube Leak / 3					04		Comparison of RCS fluid inputs and outputs, to detect leaks	3.7	1
	000051 Loss of Condenser Vacuum / 4									0
	000059 Accidental Liquid RadWaste Rel. / 9									0
	000060 Accidental Gaseous Radwaste Rel. / 9									0
83	000061 ARM System Alarms / 7					05		Need for area evacuation; check against existing limits	4.2	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									0
84	W/E06 Degraded Core Cooling / 4						02. 25	Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits.	4.2	1
	W/E07 Saturated Core Cooling / 4									0
	000076 High Reactor Coolant Activity / 9									0
	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									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									0
85	W/E08 RCS Overcooling - PTS / 4						02. 40	Ability to apply Technical Specifications for a system.	4.7	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)															
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	#
	003 Reactor Coolant Pump														0
86	004 Chemical and Volume Control								0 3				Boundary isolation valve leak	4.2	1
	005 Residual Heat Removal														0
87	006 Emergency Core Cooling								1 0				Low boron concentration in SIS	3.9	1
	007 Pressurizer Relief/Quench Tank														0
	008 Component Cooling Water														0
	010 Pressurizer Pressure Control														0
88	012 Reactor Protection											04. 04	Ability to recognize abnormal indications for system operating parameters that are entry-level conditions for emergency and abnormal operating procedures.	4.7	1
	013 Engineered Safety Features Actuation														0
	022 Containment Cooling														0
	025 Ice Condenser														0
	026 Containment Spray														0
89	039 Main and Reheat Steam								0 1				Flow paths of steam during a LOCA	3.2	1
	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
90	076 Service Water											01. 20	Ability to interpret and execute procedure steps.	4.6	1
	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

ES-401		PWR Examination Outline										Form ES-401-2			
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
91	034 Fuel Handling Equipment							0 2					Water level in the refueling canal	3.7	1
	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
92	071 Waste Gas Disposal							0 2					Use of waste gas release monitors, radiation, gas flow rate, and totalizer	3.6	1
	072 Area Radiation Monitoring														0
93	075 Circulating Water											01.07 Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.	4.7	1	
	079 Station Air														0
	086 Fire Protection														0
K/A Category Totals:		0	0	0	0	0	0	1	1	0	0	1	Group Point Total:		3

Facility Name:Byron 2014 Initial License Date of Exam:6/2/2014								
Q#	Category	K/A #	Topic	RO		SRO-Only		
				IR	#	IR	#	
66	1. Conduct of Operations	2.1. 21	Ability to verify the controlled procedure copy.	3.5	1			
67		2.1. 32	Ability to explain and apply system limits and precautions.	3.8	1			
73		2.1. 20	Ability to interpret and execute procedure steps.	4.6	1			
		2.1.						
94		2.1. 25	Ability to interpret reference materials, such as graphs, curves, tables, etc.			4.2	1	
95		2.1. 41	Knowledge of the refueling process.			3.7	1	
		Subtotal				3		2
68	2. Equipment Control	2.2. 06	Knowledge of the process for making changes to procedures.	3.0	1			
69		2.2. 39	Knowledge of less than or equal to one hour Technical Specification action statements for systems.	3.9	1			
70		2.2. 41	Ability to obtain and interpret station electrical and mechanical drawings.	3.5	1			
		2.2.						
96		2.2. 01	Ability to perform pre-startup procedures for the facility, including operating those controls associated with plant equipment that could affect reactivity.			4.4	1	
97		2.2. 37	Ability to determine operability and/or availability of safety related equipment.			4.6	1	
	Subtotal				3		2	
71	3. Radiation Control	2.3. 04	Knowledge of radiation exposure limits under normal or emergency conditions.	3.2	1			
72		2.3. 12	Knowledge of radiological safety principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc.	3.2	1			
		2.3.						
		2.3.						
		2.3.						
98		2.3. 13	Knowledge of radiological safety procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc.			3.8	1	
	Subtotal				2		1	
74	4. Emergency Procedures / Plan	2.4.						
		2.4. 47	Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material.	4.2	1			
75		2.4. 50	Ability to verify system alarm setpoints and operate controls identified in the alarm response manual.	4.2	1			
		2.4.						
99		2.4. 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	1	
100		2.4. 27	Knowledge of "fire in the plant" procedures.			3.9	1	
	Subtotal				2		2	
Tier 3 Point Total					10		7	