Facility Name:Byron Date of Exam:09/27/2010

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	2				1	2			1	9	2		2		4
	Tier Totals	4	5	5				4	5			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	0	1	1	1	1	1	1	1	1	10	1	1	1		3
	Tier Totals	4	3	3	4	3	3	4	3	4	3	4	38	5		3		8
3. Generic Knowledge and Abilities Categories		1		2		3		4					10	1	2	3	4	7
		3		3		2		2						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)

Q#	E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
39	000007 Reactor Trip - Stabilization - Recovery / 1			01				Actions contained in EOP for reactor trip	4.0	1
40	000008 Pressurizer Vapor Space Accident / 3		01					Valves	2.7	1
	000009 Small Break LOCA / 3									0
	000011 Large Break LOCA / 3									0
41	000015 RCP Malfunctions / 4		10					RCP indicators and controls	2.8	1
	000017 RCP Malfunctions (Loss of RC Flow) / 4									
42	000022 Loss of Rx Coolant Makeup / 2				06			CVCS charging pump ammeters and running indicators	2.9	1
43	000025 Loss of RHR System / 4				20			HPI pump control switch, indicators, ammeter running lights, and flow meter	2.6	1
44	000026 Loss of Component Cooling Water / 8			04				Effect on the CCW flow header of a loss of CCW	3.5	1
45	000027 Pressurizer Pressure Control System Malfunction / 3					02		Normal values for RCS pressure	3.8	1
	000029 ATWS / 1									0
46	000038 Steam Gen. Tube Rupture / 3						04.01	Knowledge of EOP entry conditions and immediate action steps.	4.6	1
47	000040 Steam Line Rupture - Excessive Heat Transfer / 4		02					Sensors and detectors	2.6	1
	WE12 Uncontrolled Depressurization of all Steam Generators / 4									
48	000054 (CE/E06) Loss of Main Feedwater / 4					07		Reactor trip first-out panel indicator	3.4	1
49	000055 Station Blackout / 6	02						Natural circulation cooling	4.1	1
50	000056 Loss of Off-site Power / 6					77		Auxiliary feed pump (running)	4.1	1
51	000057 Loss of Vital AC Inst. Bus / 6			01				Actions contained in EOP for loss of vital ac electrical instrument bus	4.1	1
	000058 Loss of DC Power / 6									0
52	000062 Loss of Nuclear Svc Water / 4						02.15	Ability to determine the expected plant configuration using design and configuration control documentation, such as drawings, line-ups, tag-outs, etc.	3.9	1
53	000065 Loss of Instrument Air / 8						02.41	Ability to obtain and interpret station electrical and mechanical drawings.	3.5	1
	W/E04 LOCA Outside Containment / 3									0
54	W/E11 Loss of Emergency Coolant Recirc. / 4	02						Normal, abnormal and emergency operating procedures associated with Loss of Emergency Coolant Recirculation	3.6	1
55	BW/E04; W/E05 Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4	02						Normal, abnormal and emergency operating procedures associated with Loss of Secondary Heat Sink	3.9	1
56	000077 Generator Voltage and Electric Grid Disturbances / 6				02			Turbine / generator controls	3.8	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)

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
57	000003 Dropped Control Rod / 1						04. 08	Knowledge of how abnormal operating procedures are used in conjunction with EOPs.	3.8	1
	000005 Inoperable/Stuck Control Rod / 1									0
58	000024 Emergency Boration / 1			01				When emergency boration is required	4.1	1
	000028 Pressurizer Level Malfunction / 2									0
	000032 Loss of Source Range NI / 7									0
	000033 Loss of Intermediate Range NI / 7									0
59	000036 Fuel Handling Accident / 8					02		Occurrence of a fuel handling incident	3.4	1
	000037 Steam Generator Tube Leak / 3									0
60	000051 Loss of Condenser Vacuum / 4			01				Loss of steam dump capability upon loss of condenser vacuum	2.8	1
	000059 Accidental Liquid RadWaste Rel. / 9									0
	000060 Accidental Gaseous Radwaste Rel. / 9									0
61	000061 ARM System Alarms / 7		01					Detectors at each ARM system location	2.5	1
62	000067 Plant Fire On-site / 8				09			Plant fire zone panel (including detector location)	3.0	1
	000068 Control Room Evac. / 8									0
	000069 Loss of CTMT Integrity / 5									1
63	W/E14 High Containment Pressure / 5	03						Annunciators and conditions indicating signals, and remedial actions associated with the High Containment Pressure	3.3	
	000074 Inad. Core Cooling / 4									0
	W/E06 Degraded Core Cooling / 4									
	W/E07 Saturated Core Cooling / 4									
	000076 High Reactor Coolant Activity / 9									0
64	W/E01 Rediagnosis / 3					01		Facility conditions and selection of appropriate procedures during abnormal and emergency operations	3.2	1
	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
65	W/E09 Natural Circulation Operations / 4		01					Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and	3.2	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	2	1	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	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	IR	#
1,2	003 Reactor Coolant Pump						04					04. 46	Containment isolation valves affecting RCP operation; Ability to verify that the alarms are consistent with the plant conditions.	2.8; 4.2	2
3	004 Chemical and Volume Control				13								Interlock between letdown isolation valve and flow control valve	3.2	1
4	005 Residual Heat Removal					01							Nil ductility transition temperature (brittle fracture)	2.6	1
5	006 Emergency Core Cooling						01						BIT/borated water sources	3.4	1
6	007 Pressurizer Relief/Quench Tank								06				Bubble formation in PZR	2.6	1
7	008 Component Cooling Water		02										CCW pump, including emergency backup	3.0	1
8	010 Pressurizer Pressure Control			02									RPS	4.0	1
9,10	012 Reactor Protection							01		06			Trip setpoint adjustment; Trip logic	2.9; 3.7	2
11,12	013 Engineered Safety Features Actuation							05		02			Main steam pressure; Operation of actuated equipment	3.4; 4.1	2
13,14	022 Containment Cooling								06		05		Loss of CCS pump; Containment readings of temperature, pressure, and humidity system	2.8; 3.8	2
	025 Ice Condenser														0
15,16	026 Containment Spray	01										04. 31	ECCS; Knowledge of annunciator alarms, indications, or response procedures.	4.2; 4.2	2
17	039 Main and Reheat Steam	06											Condenser steam dump	3.1	1
18	059 Main Feedwater			03									S/Gs	3.5	1
19	061 Auxiliary/Emergency Feedwater					05							Feed line voiding and water hammer	2.7	1
20,21	062 AC Electrical Distribution		01									01. 20	Major system loads; Ability to interpret and execute procedure steps.	3.3; 4.6	2
22,23	063 DC Electrical Distribution			01							02		ED/G; Battery voltage indicator	3.7; 2.8	2
24	064 Emergency Diesel Generator	03											Diesel fuel oil supply system	3.6	1
25	073 Process Radiation Monitoring				01								Release termination when radiation exceeds setpoint	4.0	1
26	076 Service Water									02			Emergency heat loads	3.7	1
27	078 Instrument Air				02								Cross-over to other air systems	3.2	1
28	103 Containment							01					Containment pressure, temperature, and humidity	3.7	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	#
29	001 Control Rod Drive									01			Reactor power	4.1	1
	002 Reactor Coolant														0
30	011 Pressurizer Level Control					06							Indicated charging flow: seal flow plus actual charging flow	2.9	1
31	014 Rod Position Indication											02.40	Ability to apply Technical Specifications for a system.	3.4	1
	015 Nuclear Instrumentation														0
32	016 Non-nuclear Instrumentation				01								Reading of NNIS channel values outside control room	2.8	1
	017 In-core Temperature Monitor														0
33	027 Containment Iodine Removal										02		Remote operation and handling of iodine filters	2.8	1
	028 Hydrogen Recombiner and Purge Control														0
	029 Containment Purge														0
34	033 Spent Fuel Pool Cooling								02				Loss of SFPCS	2.7	1
	034 Fuel Handling Equipment														0
35	035 Steam Generator							02					S/G pressure	3.5	1
	041 Steam Dump/Turbine Bypass Control														0
	045 Main Turbine Generator														0
	055 Condenser Air Removal														0
	056 Condensate														0
36	068 Liquid Radwaste						10						Radiation monitors	2.5	1
37	071 Waste Gas Disposal	06											ARM and PRM systems	3.1	1
	072 Area Radiation Monitoring														0
38	075 Circulating Water		03										Emergency/essential SWS pumps	2.6	1
	079 Station Air														0
	086 Fire Protection														0
	K/A Category Totals:	1	1	0	1	1	1	1	1	1	1	1	Group Point Total:		10

ES-401 PWR Examination Outline Form ES-401-2

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
84	000009 Small Break LOCA / 3					2 5		Reactor trip setpoints	4.1	1
85	000011 Large Break LOCA / 3					0 2		Consequences to RHR of not resetting safety injection	3.7	1
	000015 RCP Malfunctions / 4									0
	000017 RCP Malfunctions (Loss of RC Flow) / 4									
	000022 Loss of Rx Coolant Makeup / 2									0
	000025 Loss of RHR System / 4									0
	000026 Loss of Component Cooling Water / 8									0
	000027 Pressurizer Pressure Control System Malfunction / 3									0
86	000029 ATWS / 1						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
	000038 Steam Gen. Tube Rupture / 3									0
	000040 Steam Line Rupture - Excessive Heat Transfer / 4									1
87	WE12 Uncontrolled Depressurization of all Steam Generators / 4						04. 41	Knowledge of the emergency action level thresholds and classifications.	4.6	
	000054 (CE/E06) Loss of Main Feedwater / 4									0
	000055 Station Blackout / 6									0
	000056 Loss of Off-site Power / 6									0
	000057 Loss of Vital AC Inst. Bus / 6									0
88	000058 Loss of DC Power / 6						04. 32	Knowledge of operator response to loss of all annunciators.	4.0	1
	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
89	BW/E04; W/E05 Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4					0 2		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

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
90	000005 Inoperable/Stuck Control Rod / 1					01		Stuck or inoperable rod from in-core and ex-core NIS, in-core or loop temperature measurements	4.1	1
	000024 Emergency Boration / 1									0
91	000028 Pressurizer Level Malfunction / 2					05		Flow control valve isolation valve indicator	2.7	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									
	000074 Inad. Core Cooling / 4									0
	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
	W/E16 High Containment Radiation / 9									0
92	W/E03 LOCA Cooldown - Depress. / 4						01. 25	Ability to interpret reference materials, such as graphs, curves, tables, etc.	4.2	1
	W/E09 Natural Circulation Operations / 4									0
	W/E10 Natural Circulation with Steam Voide in Vessel with/without RVLIS. / 4									
93	W/E08 RCS Overcooling - PTS / 4						01. 07	Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior,	4.7	1
	K/A Category Totals:	0	0	0	0	2	2	Group Point Total:		4

ES-401 PWR Examination Outline Form ES-401-2

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
76	004 Chemical and Volume Control											03. 05	Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.	2.9	1
	005 Residual Heat Removal														0
	006 Emergency Core Cooling														0
77	007 Pressurizer Relief/Quench Tank											04. 23	Knowledge of the bases for prioritizing emergency procedure implementation during emergency operations.	4.4	1
	008 Component Cooling Water														0
	010 Pressurizer Pressure Control														0
	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
78	061 Auxiliary/Emergency Feedwater								05				Automatic control malfunction	3.4	1
	062 AC Electrical Distribution														0
	063 DC Electrical Distribution														0
	064 Emergency Diesel Generator														0
79	073 Process Radiation Monitoring								01				Erratic or failed power supply	2.9	1
80	076 Service Water								01				Loss of SWS	3.7	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
81	002 Reactor Coolant								02				Loss of coolant pressure	4.4	1
	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
82	029 Containment Purge											01.36	Knowledge of procedures and limitations involved in core alterations.	4.1	1
	033 Spent Fuel Pool Cooling														0
83	034 Fuel Handling Equipment							02					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
	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	0	0	0	0	1	1	0	0	1	Group Point Total:		3

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

Facility Name:Byron Date of Exam:09/27/2010

Q#	Category	K/A #	Topic	RO IR	RO #	SRO-Only IR	SRO-Only #
66	1. Conduct of Operations	2.1. 15	Knowledge of administrative requirements for temporary management directives, such as standing orders, night orders, operations memos, etc.	2.7	1		
67		2.1. 44	Knowledge of RO duties in the control room during fuel handling such as responding to alarms from the fuel handling area, communication with the fuel storage facility, systems operated from the control room in support of fueling operations, and supporting instrumentation.	3.9	1		
68		2.1. 02	Knowledge of operator responsibilities during all modes of plant operation.	4.1	1		
94		2.1. 40	Knowledge of refueling administrative requirements.			3.9	1
95		2.1. 42	Knowledge of new and spent fuel movement procedures.			3.4	1
		2.1.					
		Subtotal			3		2
69	2. Equipment Control	2.2. 13	Knowledge of tagging and clearance procedures.	4.1	1		
70		2.2. 42	Ability to recognize system parameters that are entry-level conditions for Technical Specifications.	3.9	1		
71		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		
		2.2.					
96		2.2. 05	Knowledge of the process for making design or operating changes to the facility.			3.2	1
		2.2.					
		Subtotal			3		1
	3. Radiation Control	2.3.					
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		
73		2.3. 14	Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities.	3.4	1		
		2.3.					
97		2.3. 11	Ability to control radiation releases.			4.3	1
98		2.3. 15	Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.			3.1	1
		Subtotal			2		2
74	4. Emergency Procedures / Plan	2.4. 16	Knowledge of EOP implementation hierarchy and coordination with other support procedures or guidelines such as, operating procedures, abnormal operating procedures, and severe accident management guidelines.	3.5	1		
75		2.4. 39	Knowledge of RO responsibilities in emergency plan implementation.	3.9	1		
		2.4.					
99		2.4. 22	Knowledge of the bases for prioritizing safety functions during abnormal/emergency operations.			4.4	1
100		2.4. 50	Ability to verify system alarm setpoints and operate controls identified in the alarm response manual.			4.0	1
		2.4.					
		Subtotal			2		2
Tier 3 Point Total					10		7