Facility: **Byron**

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	A2	G*	Total
1. Emergency & Abnormal Plant Evolutions	1	4	2	3				3	3			3	18	3	3	6
	2	1	1	2	N/A			1	2	N/A		2	9	2	2	4
	Tier Totals	5	3	5				4	5			5	27	5	5	10
2. Plant Systems	1	2	2	3	3	3	3	3	3	2	2	2	28	3	2	5
	2	1	0	1	1	1	1	1	1	1	1	1	10	2	1	3
	Tier Totals	3	2	4	4	4	4	4	4	3	3	3	38	5	3	8
3. Generic Knowledge and Abilities Categories		1			2			3			4		10	1	2	3	4	7
		3			2			2			3			2	2	2	1	

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 ES-401, Attachment 2, 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.
e. 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.
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. Use duplicate pages for RO and SRO-only exams.
f. 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 Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (RO / SRO)							Form ES-401-2	
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	IR	#
000007 (BW/E02&E10; CE/E02) Reactor Trip - Stabilization - Recovery / 1			01				Actions Contained in EOP for Reactor Trip	4.0	1
000008 Pressurizer Vapor Space Accident / 3				01			Pzr Spray Block Valve and PORV Block Valve	4.2	1
000009 Small Break LOCA / 3					13		Charging Pump Flow Indication	3.4	1
000022 Loss of Rx Coolant Makeup / 2						X	(2.1.30) Ability to Locate and Operate Components, Including Local Controls	3.9	1
000015/17 RCP Malfunctions / 4	02						Consequences of an RCPS Failure	3.7	1
000029 ATWS / 1	05						Definition of Negative Temperature Coefficient as Applied to Large PWR Coolant Systems	2.8	1
000038 Steam Gen. Tube Rupture / 3			06				Actions contained in EOP for RCS water inventory balance, S/G tube rupture, and plant shutdown procedures.	4.2	1
000040 (BW/E05; CE/E05; W/E12) Steam Line Rupture - Excessive Heat Transfer / 4				07			Steam Pressure and Flow Rates Via Computer, Safety Parameter Display System, and other Indications	3.4	1
000054 (CE/E06) Loss of Main Feedwater / 4					01		Occurrence of reactor and/or turbine trip.	4.3	1
000055 Station Blackout / 6						X	(2.4.50) Ability to Verify System Alarrn Setpoints and Operate Controls Identified in the Alarm Response Manual	3.3	1
000056 Loss of Off-site Power / 6	01						Principle of Cooling by Natural Convection	3.7	1
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				01			Cross-tie of the Affected DC Bus with the Alternate Supply	3.4	1
000062 Loss of Nuclear Svc Water / 4					01		Location of a Leak in the SWS	2.9	1
000065 Loss of Instrument Air / 8						X	(2.4.2) Knowledge of How the Event-Based Emergency/Abnormal Operating Procedures Are Used in Conjunction with the Symptom-Based EOPs	3.0	1
W/E04 LOCA Outside Containment / 3		01					Components, and Functions of Control and Safety Systems, Including Instrumentation, Signals, Interlocks, Failure Modes, and Automatic and Manual Features	3.5	1

W/E11 Loss of Emergency Coolant Recirc. / 4		01					Components, and Functions of Control and Safety Systems, Including Instrumentation, Signals, Interlocks, Failure Modes, and Automatic and Manual Features	3.6	1
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
000015/17 RCP Malfunctions / 4					11		(SRO) When to Jog RCPs during ICC	3.8	1
000011 Large Break LOCA / 3						X	(SRO) (2.3.10) Ability to Perform Procedures to Reduce Excessive Levels of Radiation and Guard Against Personnel Exposure	3.3	1
000029 ATWS / 1					07		(SRO) Reactor Trip Breaker Indication Lights	4.3	1
000038 Steam Gen. Tube Rupture / 3					08	X	(SRO) Viable Alternatives for Placing Plant in Safe Condition when Condenser Is not Available/ (2.3.6) Knowledge of the Requirements for Reviewing and Approving Release Permits	4.4/ 3.1	2
000056 Loss of Off-site Power / 6						X	(SRO) (2.1.20) Ability to Execute Procedure Steps	4.2	1
K/A Category Totals:	4	2	3	3	3/3	3/3	Group Point Total:		18/ 6

ES-401	PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (RO / SRO)							Form ES-401-2
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	IR	#
000003 Dropped Control Rod / 1					04		Rod Motion Stops Due to Dropped Rod	3.4	1
000005 Inoperable/Stuck Control Rod / 1						X	(2.1.7) Ability to Evaluate Plant Performane and Make Operational Judgments Based on Operating Characteristics, Reactor Behavior, and Instrument Interpretation	3.7	1
000024 Emergency Boration / 1	01						Relationship Between Boron Addition and Change in T-ave	3.4	1
000028 Pressurizer Level Malfunction / 2		03					Controllers and Positioners	2.6	1
000032 Loss of Source Range NI / 7			01				Startup Termination on Source-Range Loss	3.2	1
000033 Loss of Intermediate Range NI / 7				03			Manual Restoration of Power	3.0	1
000061 ARM System Alarms / 7					03		Setpoints for Alert and High Alarms	3.0	1
000037 Steam Generator Tube Leak / 3						X	(2.2.22) Knowledge of Limiting Conditions for Operations and Safety Limits	3.4	1
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						X	(SRO) (2.3.1) Knowledge of 10 CFR 20 and Related Facility Radiation Control Requirements	3.0	1
000036 (BW/A08) Fuel Handling Accident / 8					02		(SRO) Occurrence of a Fuel Handling Incident	4.1	1
000069 (W/E14) Loss of CTMT Integrity / 5					01		(SRO) Loss of Conatinment Integrity	4.3	1
W/E13 Steam Generator Over-pressure / 4						X	(SRO) (2.1.32) Ability to Explain and Apply all System Limits and Precautions	3.8	1
K/A Category Point Totals:	1	1	2	1	2	2	Group Point Total:		9/4

ES-401 PWR Examination Outline Form ES-401-2
Plant Systems - Tier 2/Group 1 (RO / 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					01	02						Relationship between the RCPS Flow Rate and the Nuclear Reactor Core Operating Parameters/ RCP Seals and Seal Water Supply	3.3/ 2.7	2
004 Chemical and Volume Control					09	10						Thermal Shock: High Component Stress Due to Rapid Temperature Change / Boric Acid Storage Tank/Boron Injection Tank Recirculation Flow Path	3.7/ 2.7	2
005 Residual Heat Removal							02	04				RHR Flow Rate/ RHR Valve Malfunction	3.3/ 2.9	2
006 Emergency Core Cooling								01	02			High Bearing Temperature / Pumps	2.9/ 4.1	2
007 Pressurizer Relief/Quench Tank										04		PZR Vent Valve	2.6	1
008 Component Cooling Water											X	(2.1.20) Ability to execute procedure steps.	4.2	1
010 Pressurizer Pressure Control	05											PRTS	3.4	1
012 Reactor Protection		01										RPS Channels, Components, and Interconnections	3.3	1
013 Engineered Safety Features Actuation			01									Fuel	4.4	1
022 Containment Cooling				01								Cooling of Containment Penetrations	2.5	1
026 Containment Spray							01					Containment Pressure	3.9	1
039 Main and Reheat Steam					08							Effect of Steam Removal on Reactivity	3.6	1
059 Main Feedwater								05				Rupture in MFW Suction or Discharge Line	3.1	1
061 Auxiliary/Emergency Feedwater						01						Controllers and Positioners	2.5	1
062 AC Electrical Distribution									05			Safety-Related Indicators and Controls	3.5	1
063 DC Electrical Distribution										02		Battery Voltage Indicator	2.8	1

064 Emergency Diesel Generator											X	(2.1.11) Knowledge of less than one hour technical specification action statements.	3.8	1
073 Process Radiation Monitoring	01											Those Systems Served by PRMs	3.6	1
076 Service Water		04	03									Reactor Building Closed Cooling Water / Reactor Building Closed Cooling Water	2.5/ 3.5	2
078 Instrument Air			03	01								Cross-tied Units / Manual/Automatic Transfers of Control	3.0/ 2.7	2
103 Containment				04			01					Personnel Access Hatch and Emergency Access Hatch / Containment Pressure, Temperature, and Humidity	2.5/ 3.7	2
006 Emergency Core Cooling								10				(SRO) Safety Injection Tank Heating System	2.8	1
007 Pressurizer Relief/Quench Tank											X	(SRO) (2.4.6) Knowledge of symptom based EOP mitigation strategies.	4.0	1
010 Pressurizer Pressure Control								01				(SRO) Heater Failures	3.9	1
026 Containment Spray											X	(SRO) (2.2.22) Knowledge of Limiting Conditions for Operations and Safety Limits.	4.1	1
103 Containment								03				(SRO) Phase A and B isolation.	3.8	1
K/A Category Point Totals:	2	2	3	3	3	3	3	3/ 3	2	2	2/ 2	Group Point Total:		28/ 5

ES-401 PWR Examination Outline Form ES-401-2
Plant Systems - Tier 2/Group 2 (RO / 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							05					Effect on T-ave, of Dilution without Rod Motion Compensation	3.4	1
002 Reactor Coolant								01				Loss of Coolant Inventory	4.3	1
011 Pressurizer Level Control									03			Charging and letdown	3.2	1
014 Rod Position Indication										01		Rod Selection Control	3.3	1
015 Nuclear Instrumentation											X	(2.1.33)		
016 Non-nuclear Instrumentation	08											Pzr PCS	3.4	1
055 Condenser Air Removal			01									Main Condenser	2.5	1
068 Liquid Radwaste				01								Safety and Environmental Precautions for Handling Hot, Acidic, and Radioactive Liquids	3.4	1
071 Waste Gas Disposal					04							Relationship of Hydrogen/Oxygen Concentrations to Flammability	2.5	1
086 Fire Protection						04						Fire, Smoke, and Heat Detectors	2.6	1
001 Control Rod Drive								09				(SRO) Station Blackout	4.0	1
011 Pressurizer Level Control								04				(SRO) Loss of One, Two or Three Charging Pumps	3.7	1
035 Steam Generator								X				(SRO) (2.4.21) Knowledge of the Parameters and Logic Used to Assess the Status of Safety Functions	4.3	1
K/A Category Point Totals:	1	0	1	1	1	1	1	1/ 2	1	1	1/ 1	Group Point Total:		10/ 3

Facility: Date of Exam:

Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1.2	Knowledge of Operator Responsibilities during all Modes of Plant Operation			4.0	1
	2.1.20	Ability to Execute Procedure Steps			4.2	1
	2.1.24	Ability to Obtain and Interpret Station Electrical and Mechanical Drawings	2.8	1		
	2.1.32	Ability to Explain and Apply all System Limits and Precautions	3.4	1		
	2.1.33	Ability to Recognize Indications for System Operating Parameters which are Entry-Level Conditions for Technical Specifications	3.4	1		
	2.1.					
	Subtotal			3		2
2. Equipment Control	2.2.1	Ability to Perform Pre-Startup Procedures for the Facility, Including Operating those Controls Associated with Plant Equipment that Could Affect Reactivity.	3.7	1		
	2.2.5	Knowledge of the Process for Making Changes in the Facility as Described in the Safety Analysis Report			2.7	1
	2.2.18	Knowledge of the Process for Managing Troubleshooting Activities			3.3	1
	2.2.33	Knowledge of Control Rod Programming	2.5	1		
	2.2.					
	2.2.					
	Subtotal			2		2
3. Radiation Control	2.3.5	Knowledge of Use and Function of Personnel Monitoring Equipment			2.5	1
	2.3.7	Knowledge of the Process for Preparing a Radiation Work Permit			3.3	1
	2.3.10	Ability to Perform Procedures to Reduce Excessive Levels of Radiation and Guard Against Personnel Exposure	2.9	1		
	2.3.11	Ability to Control Radiation Releases	2.7	1		
	2.3.					
	2.3.					

	Subtotal			2		2
4. Emergency Procedures / Plan	2.4.7	Knowledge of Event Based EOP Mitigation Strategies			3.8	1
	2.4.12	Knowledge of General Operating Crew Responsibilities during Emergency Operations	3.4	1		
	2.4.24	Knowledge of Loss of Cooling Water Procedures	3.3	1		
	2.4.39	Knowledge of the RO's Responsibilities in Emergency Plan Implementation	3.3	1		
	2.4.					
	2.4.					
	Subtotal			3		1
Tier 3 Point Total				10		7