

Facility Name: Columbia		Date of Exam: April 2011																
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 Evolution	1	3	3	4	N/A			2	5	N/A			3	20	0	0	7	
	2	0	2	1				2	1				1	7	0	0	3	
	Tier Totals	3	5	5				4	6				4	27	0	0	10	
2. Plant Systems	1	3	2	1	2	4	2	2	3	2	3	2	26	0	0	5		
	2	2	0	1	1	1	1	0	1	3	1	1	12	0	0	3		
	Tier Totals	5	2	2	3	5	3	2	4	5	4	3	38	0	0	8		
3. Generic Knowledge and Abilities Categories					1		2		3		4		10	1	2	3	4	7
					2		3		2		3			0	0	0	0	

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 BWR Examination Outline Form ES-401-1										
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	#
1	295001 Partial or Complete Loss of Forced Core Flow Circulation / 1 & 4	0 2						Knowledge of the operational implications of the following concepts as they apply to partial or complete loss of forced core flow circulation: Power/Flow distribution	3.3	1
2	295003 Partial or Complete Loss of AC / 6					0 5		Ability to determine and/or interpret the following as they apply to partial or complete loss of AC power: Whether a partial or complete loss of AC power has occurred	3.9	1
3	295004 Partial or Total Loss of DC Pwr / 6			0 3				Knowledge of the reason for the following responses as they apply to partial or complete loss of DC power: Reactor SCRAM	3.1	1
4	295005 Main Turbine Generator Trip / 3				0 1			Ability to operate and/or monitor the following as they apply to Main Turbine Generator Trip: Recirculation System	3.1	1
5	295006 SCRAM / 1		0 2					Knowledge of the interrelationship between scram and the following: Reactor Water Level Control System	3.8	1
6	295016 Control Room Abandonment / 7						01. 13	Control Room Abandonment; Knowledge of facility requirements for controlling vital/controlled access	2.5	1
7	295018 Partial or Total Loss of CCW / 8	0 1						Knowledge of the operational implications of the following concepts as they apply to partial or complete loss of component cooling water: Effects on component/system operations	3.5	1
8	295019 Partial or Total Loss of Inst. Air / 8		0 1					Knowledge of the interrelations between partial or complete loss of instrument air and the following: CRD hydraulics	3.8	1
9	295021 Loss of Shutdown Cooling / 4			0 1				Knowledge of the reason for the following responses as they apply to loss of shutdown cooling: Raising RPV water level	3.3	1
10	295023 Refueling Acc / 8					0 2		Ability to determine and/or interpret the following as they apply to refueling accidents: Fuel Pool Level	3.4	1
11	295024 High Drywell Pressure / 5						01. 28	High Drywell Pressure - Knowledge of the purpose and function of major system components and controls	4.1	1
12	295025 High Reactor Pressure / 3			0 6				Knowledge of the reason for the following responses as they apply to High Reactor Pressure: Alternate rod insertion	4.2	1
13	295026 Suppression Pool High Water Temp. / 5					0 2		Ability to determine and/or interpret the following as they apply to Suppression Pool high water temperature: Suppression Pool level	3.8	1
	295027 High Containment Temperature / 5									0
14	295028 High Drywell Temperature / 5	0 2						Knowledge of the operational implications of the following as they apply to high drywell temperature: Equipment environmental qualification	2.9	1
15	295030 Low Suppression Pool Wtr Lvl / 5				0 2			Ability to operate and/or monitor the following as they apply to Low Suppression Pool water level: RCIC	3.4	1
16	295031 Reactor Low Water Level / 2		0 8					Knowledge of the interrelationship between Reactor Low Water Level and the following: Automatic Depressurization System	4.2	1
17	295037 SCRAM Condition Present and Reactor Power Above APRM Downscale or Unknown / 1			0 3				Knowledge of the reasons for the following as they apply to SCRAM condition present and reactor power above APRM downscale or unknown: Lowering reactor water level	4.1	1
18	295038 High Off-site Release Rate / 9						03. 11	High Off-site Release Rate: Ability to control radiation releases	3.8	1
19	600000 Plant Fire On Site / 8					0 3		Ability to determine and interpret the following as they apply to Plant Fire on site: Fire Alarm	2.8	1
20	700000 Generator Voltage and Electric Grid Disturbances / 6					0 8		Ability to determine and/or interpret the following as they apply to Generator Voltage and Electric Grid disturbances: Criteria to trip the turbine or reactor	4.3	1
K/A Category Totals:		3	3	4	2	5	3	Group Point Total:		20

	ES-401	BWR Examination Outline						Form ES-401-1		
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	#
	295002 Loss of Main Condenser Vac / 3									0
	295007 High Reactor Pressure / 3									0
	295008 High Reactor Water Level / 2									0
21	295009 Low Reactor Water Level / 2		0 4					Knowledge of the interrelations between Low Reactor Water level and the following: Reactor Water Cleanup	2.6	1
	295010 High Drywell Pressure / 5									0
	295011 High Containment Temp / 5									0
22	295012 High Drywell Temperature / 5				0 2			Ability to operate and/or monitor the following as they apply to High Drywell Temperature: Drywell cooling system	3.8	1
25	295013 High Suppression Pool Temp. / 5						04. 14	High Suppression Pool Temperature; Knowledge of general guidelines for EOP usage	3.8	1
	295014 Inadvertent Reactivity Addition / 1									0
	295015 Incomplete SCRAM / 1									0
27	295017 High Off-site Release Rate / 9			0 3				Knowledge of the reason for the following responses as they apply to high off-site release rate: Implementation of site emergency plan	3.3	1
	295020 Inadvertent Cont. Isolation / 5 & 7									0
24	295022 Loss of CRD Pumps / 1		0 4					Knowledge of the interrelations between loss of CRD pumps and the following: Reactor Water Level	2.5	1
	295029 High Suppression Pool Wtr Lvl / 5									0
	295032 High Secondary Containment Area Temperature / 5									0
	295033 High Secondary Containment Area Radiation Levels / 9									0
	295034 Secondary Containment Ventilation High Radiation / 9									0
23	295035 Secondary Containment High Differential Pressure / 5				0 1			Ability to operate and/or monitor the following as they apply to Secondary Containment High Differential Pressure: Secondary Containment ventilation system	3.6	1
26	295036 Secondary Containment High Sump/Area Water Level / 5					0 3		Ability to determine and/or interpret the following as they apply to secondary containment high sump/area water level: Cause of the high water level	3.4	1
	500000 High CTMT Hydrogen Conc. / 5									0
	K/A Category Totals:	0	2	1	2	1	1	Group Point Total:		7

BWR Examination Outline														Form ES-401-1	
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	203000 RHR/LPCI: Injection Mode								1 7				Ability to predict the impacts of the following on the RHR/LPCI: Injection mode; and based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Keep Fill system failure	3.3	1
29	205000 Shutdown Cooling				0 1								Knowledge of Shutdown Cooling design feature(s) and/or interlocks which provide for the following: High temperature isolation	3.4	1
	206000 HPCI												N/A at Columbia		0
	207000 Isolation (Emergency) Condenser												N/A at Columbia		0
30	209001 LPCS		0 3										Knowledge of the electrical power supply to the following: Initiation Logic	2.9	1
31	209002 HPCS					0 2							Knowledge of the operational implications of the following concepts as they apply to HPCS: Heat removal (transfer) mechanism	2.6	1
32	211000 SLC							0 6					Ability to predict and/or monitor changes in parameters associated with operating the Standby Liquid Control system controls including: flow indication	3.8	1
33	212000 RPS										1 2		Knowledge of Reactor Protection System design feature(s) and/or interlocks which provide for the following: Bypassing of selected SCRAM signals (manually and automatically)	3.9	1
34	215003 IRM	0 7											Knowledge of the physical connections and/or cause-effect relationship between Intermediate Range Monitor System and the following: Reactor vessel	3.0	1
35	215004 Source Range Monitor											01. 37	Source Range Monitor System 2.1.37 Knowledge of procedures, guidelines, or limitations associated with reactivity management	4.3	1
36	215005 APRM / LPRM						0 7						Knowledge of the effect that a loss or malfunction of the following will have on the Average Power Range Monitor System, Local Power Range Monitor System: Flow converter/comparator network	3.2	1
37	217000 RCIC										0 4		Ability to manually operate and/or monitor in the control room: Manually initiated controls	3.6	1
38	218000 ADS						0 5						Knowledge of the effect that a loss or malfunction of the following will have on the Automatically Depressurization System: A.C. Power	3.0	1
39	223002 PCIS/Nuclear Steam Supply Shutoff							0 2					Ability to predict and/or monitor changes in parameters associated with operating the Primary Containment Isolation System/Nuclear Steam Supply Shut-Off controls including: Valve Closures	3.7	1
40	239002 SRVs					0 4							Knowledge of the operational implications of the following concepts as they apply to Relief/Safety Valves: Tail pipe temperature monitoring	3.3	1
41	259002 Reactor Water Level Control		0 7										Knowledge of the effect that a loss or malfunction of the Reactor Water Level Control System will have on the following: Reactor Water Level indication	3.4	1
42	261000 SGTS									0 3			Ability to monitor automatic operation of the Standby Gas Treatment System including: valve operation	3.0	1
43	262001 AC Electrical Distribution										0 2		Ability to operate and/or monitor in the control room: Synchroscope, including understanding of running and incoming voltages	3.4	1
44	262002 UPS (AC/DC)	1 6											Knowledge of the physical connections and/or cause-effect relationship between Uninterruptable Power Supply (AC/DC) and the following: MSIVs	3.1	1
45	263000 DC Electrical Distribution					0 1							Knowledge of the operational implications of the following as they apply to DC Electrical Distribution: Hydrogen generation during battery charging	2.6	1
46	264000 EDGs									0 5			Ability to monitor automatic operation of the Emergency Generators including: Load shedding and sequencing	3.4	1
47	300000 Instrument Air	0 1											Knowledge of the electrical power supply to the following: Instrument Air Compressor	2.8	1
48	400000 Component Cooling Water				0 1								Knowledge of the CCWS design feature(s) and/or interlocks which provide for the following: Automatic start of standby pump	3.4	1
49	218000 ADS					0 1							Knowledge of the operational implications of the following concepts as they apply to Automatic Depressurization System: ADS logic operation	3.8	1
50	209002 HPCS											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	4.2	1
51	212000 RPS								2 0				Ability to (a) predict the impacts of the following on the Reactor Protection System; and based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions: Full system activation	4.1	1
52	215003 IRM								0 6				06Ability to (a) predict the impacts of the following on the Intermediate Range Monitor (IRM) System; and 9 (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Faulty range switch	3.0	1
53	263000 DC Electrical Distribution	0 2											Knowledge of the physical connections and/or cause-effect relationship between DC Electrical Distribution and the following: Battery charger and battery	3.2	1
K/A Category Totals:		3	2	1	2	4	2	2	3	2	3	2	Group Point Total:		26

ES-401		BWR Examination Outline													Form ES-401-1	
		Plant Systems - Tier 2/Group 2 (RO)														
Q#	System # / Name	K	1K	2K	3K	4K	5K	6A	1A	2A	3A	4	G	K/A Topic(s)	IR	#
	201001 CRD Hydraulic															0
59	201002 RMCS											0	1	Ability to manually operate and/or monitor in the control room: Rod movement control switch	3.5	1
58	201003 Control Rod and Drive Mechanism					0	4							Knowledge of Control Rod Drive Mechanism design feature(s) and/or interlocks which provide for the following: The use of either accumulator or reactor water to scram the control rod	3.6	1
	201004 RSCS															0
	201005 RCIS															0
	201006 RWM															0
54	202001 Recirculation											0	7	Ability to monitor automatic operation of the Recirculation System including: Pump trips	3.3	1
	202002 Recirculation Flow Control															0
65	204000 RWCU							0	1					Knowledge of the effect that a loss of the following will have on the Reactor Water Cleanup System: Component cooling water systems	3.1	1
	214000 RPIS															0
	215001 Traversing In-core Probe															0
55	215002 RBM												01 27	Rod Block Monitor System: Knowledge of the system purpose and/or function	3.9	1
64	216000 Nuclear Boiler Inst.									0	1			Ability to monitor automatic operation of the Nuclear Boiler Instrumentation system including: Relationship between meter/recorder readings and actual parameter values	3.4	1
	219000 RHR/LPCI: Torus/Pool Cooling Mode															0
	223001 Primary CTMT and Aux.															0
57	226001 RHR/LPCI: CTMT Spray Mode		1	2										Knowledge of the physical connections and/or cause-effect relationships between RHR/LPCI: Containment Spray System Mode and the following: Suppression pool (spray penetration)	3.0	1
	230000 RHR/LPCI: Torus/Pool Spray Mode															0
60	233000 Fuel Pool Cooling/Cleanup		1	4										Knowledge of the physical connections and/or cause-effect relationships between Fuel Pool Cooling and Clean-up and the following: Reactor Building ventilation	2.5	1
	234000 Fuel Handling Equipment															0
	239001 Main and Reheat Steam															0
	239003 MSIV Leakage Control															0
56	241000 Reactor/Turbine Pressure Regulator			0	2									Knowledge of the effect that a loss of the Reactor/Turbine Pressure Regulating System will have on the following: Reactor Pressure	4.2	1
	245000 Main Turbine Gen. / Aux.															0
	256000 Reactor Condensate															0
	259001 Reactor Feedwater															0
	268000 Radwaste															0
62	271000 Offgas									0	9			Ability to (a) predict the impacts of the following on the Offgas System; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Valve closures	2.6	1
	272000 Radiation Monitoring															0
	286000 Fire Protection															0
	288000 Plant Ventilation															0
61	290001 Secondary CTMT									0	2			Ability to monitor automatic operation of the Secondary Containment including: Normal building differential pressure	3.5	1
63	290003 Control Room HVAC					0	3							Knowledge of the operational implications of the following as they apply to Control Room HVAC: Temperature control	2.6	1
	290002 Reactor Vessel Internals															0
																0
K/A Category Totals:		2	0	1	1	1	1	0	1	3	1	1	1	Group Point Total:		12

ES-401		BWR Examination Outline						Form ES-401-1		
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	#
	295001 Partial or Complete Loss of Forced Core Flow Circulation / 1 & 4									0
	295003 Partial or Complete Loss of AC / 6									0
	295004 Partial or Total Loss of DC Pwr / 6									0
	295005 Main Turbine Generator Trip / 3									0
	295006 SCRAM / 1									0
	295016 Control Room Abandonment / 7									0
	295018 Partial or Total Loss of CCW / 8									0
	295019 Partial or Total Loss of Inst. Air / 8									0
	295021 Loss of Shutdown Cooling / 4									0
	295023 Refueling Acc / 8									0
	295024 High Drywell Pressure / 5									0
	295025 High Reactor Pressure / 3									0
	295026 Suppression Pool High Water Temp. / 5									0
	295027 High Containment Temperature / 5									0
	295028 High Drywell Temperature / 5									0
	295030 Low Suppression Pool Wtr Lvl / 5									0
	295031 Reactor Low Water Level / 2									0
	295037 SCRAM Condition Present and Reactor Power Above APRM Downscale or Unknown / 1									0
	295038 High Off-site Release Rate / 9									0
	600000 Plant Fire On Site / 8									0
	700000 Generator Voltage and Electric Grid Disturbances / 6									0
K/A Category Totals:		0	0	0	0	0	0	Group Point Total:	0	

ES-401		BWR Examination Outline						Form ES-401-1		
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	#
	295002 Loss of Main Condenser Vac / 3									0
	295007 High Reactor Pressure / 3									0
	295008 High Reactor Water Level / 2									0
	295009 Low Reactor Water Level / 2									0
	295010 High Drywell Pressure / 5									0
	295011 High Containment Temp / 5									0
	295012 High Drywell Temperature / 5									0
	295013 High Suppression Pool Temp. / 5									0
	295014 Inadvertent Reactivity Addition / 1									0
	295015 Incomplete SCRAM / 1									0
	295017 High Off-site Release Rate / 9									0
	295020 Inadvertent Cont. Isolation / 5 & 7									0
	295022 Loss of CRD Pumps / 1									0
	295029 High Suppression Pool Wtr Lvl / 5									0
	295032 High Secondary Containment Area Temperature / 5									0
	295033 High Secondary Containment Area Radiation Levels / 9									0
	295034 Secondary Containment Ventilation High Radiation / 9									0
	295035 Secondary Containment High Differential Pressure / 5									0
	295036 Secondary Containment High Sump/Area Water Level / 5									0
	500000 High CTMT Hydrogen Conc. / 5									0
K/A Category Totals:		0	0	0	0	0	0	Group Point Total:	0	

ES-401		BWR Examination Outline												Form ES-401-1	
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	#
	203000 RHR/LPCI: Injection														0
	205000 Shutdown Cooling Mode														0
	206000 HPCI														0
	207000 Isolation (Emergency) Condenser														0
	209001 LPCS														0
	209002 HPCS														0
	211000 SLC														0
	212000 RPS														0
	215003 IRM														0
	215004 Source Range Monitor														0
	215005 APRM / LPRM														0
	217000 RCIC														0
	218000 ADS														0
	223002 PCIS/Nuclear Steam Supply Shutoff														0
	239002 SRVs														0
	259002 Reactor Water Level Control														0
	261000 SGTS														0
	262001 AC Electrical Distribution														0
	262002 UPS (AC/DC)														0
	263000 DC Electrical Distribution														0
	264000 EDGs														0
	300000 Instrument Air														0
	400000 Component Cooling Water														0
															0
K/A Category Totals:		0	0	0	0	0	0	0	0	0	0	0	Group Point Total:		0

ES-401		BWR Examination Outline												Form ES-401-1	
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	#
	201001 CRD Hydraulic														0
	201002 RMCS														0
	201003 Control Rod and Drive Mechanism														0
	201004 RSCS														0
	201005 RCIS														0
	201006 RWM														0
	202001 Recirculation														0
	202002 Recirculation Flow Control														0
	204000 RWCU														0
	214000 RPIS														0
	215001 Traversing In-core Probe														0
	215002 RBM														0
	216000 Nuclear Boiler Inst.														0
	219000 RHR/LPCI: Torus/Pool Cooling Mode														0
	223001 Primary CTMT and Aux.														0
	226001 RHR/LPCI: CTMT Spray Mode														0
	230000 RHR/LPCI: Torus/Pool Spray Mode														0
	233000 Fuel Pool Cooling/Cleanup														0
	234000 Fuel Handling Equipment														0
	239001 Main and Reheat Steam														0
	239003 MSIV Leakage Control														0
	241000 Reactor/Turbine Pressure Regulator														0
	245000 Main Turbine Gen. / Aux.														0
	256000 Reactor Condensate														0
	259001 Reactor Feedwater														0
	268000 Radwaste														0
	271000 Offgas														0
	272000 Radiation Monitoring														0
	286000 Fire Protection														0
	288000 Plant Ventilation														0
	290001 Secondary CTMT														0
	290003 Control Room HVAC														0
	290002 Reactor Vessel Internals														0
															0
K/A Category Totals:		0	0	0	0	0	0	0	0	0	0	0	Group Point Total:		0

Facility Name: Columbia Date of Exam: April 2011

Q#	Category	K/A #	Topic	RO		SRO-Only	
				IR	#	IR	#
66	1. Conduct of Operations	2.1. 07	Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.	4.4	1		
67		2.1. 17	Ability to make accurate, clear, and concise verbal reports.	3.9	1		
		2.1.					
		2.1.					
		2.1.					
		2.1.					
		Subtotal				2	
68	2. Equipment Control	2.2. 22	Knowledge of limiting conditions for operations and safety limits.	4.0	1		
73		2.2. 14	Knowledge of the process for controlling equipment configuration or status.	3.9	1		
74		2.2. 12	Knowledge of surveillance procedures.	3.7	1		
		2.2.					
		2.2.					
		2.2.					
		Subtotal				3	
69	3. Radiation Control	2.3. 07	Ability to comply with radiation work permit requirements during normal or abnormal conditions.	3.5	1		
70		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.					
		2.3.					
		2.3.					
		2.3.					
		Subtotal				2	
71	4. Emergency Procedures / Plan	2.4. 39	Knowledge of RO responsibilities in emergency plan implementation.	3.9	1		
72		2.4. 27	Knowledge of "fire in the plant" procedures.	3.4	1		
75		2.4. 18	Knowledge of the specific bases for EOPs.	3.3	1		
		2.4.	TRUE				
		2.4.					
		2.4.					
		Subtotal				3	
Tier 3 Point Total					10		0

Facility Name:		Date of Exam:																	
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	0	0	0	N/A			0	0	N/A			0	20	5	2	7		
	2	0	0	0				0	0				0	7	1	2	3		
	Tier Totals	0	0	0				0	0				0	0	27	6	4	10	
2. Plant Systems	1	0	0	0	0	0	0	0	0	0	0	0	26	3	2	5			
	2	0	0	0	0	0	0	0	0	0	0	0	12	0	3	3			
	Tier Totals	0	0	0	0	0	0	0	0	0	0	0	38	6	2	8			
3. Generic Knowledge and Abilities Categories					1		2		3		4		10		1	2	3	4	7
					0		0		0		0				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 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		BWR Examination Outline						Form ES-401-1		
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	#
	295001 Partial or Complete Loss of Forced Core Flow Circulation / 1 & 4									0
	295003 Partial or Complete Loss of AC / 6									0
	295004 Partial or Total Loss of DC Pwr / 6									0
	295005 Main Turbine Generator Trip / 3									0
	295006 SCRAM / 1									0
	295016 Control Room Abandonment / 7									0
	295018 Partial or Total Loss of CCW / 8									0
	295019 Partial or Total Loss of Inst. Air / 8									0
	295021 Loss of Shutdown Cooling / 4									0
	295023 Refueling Acc / 8									0
	295024 High Drywell Pressure / 5									0
	295025 High Reactor Pressure / 3									0
	295026 Suppression Pool High Water Temp. / 5									0
	295027 High Containment Temperature / 5									0
	295028 High Drywell Temperature / 5									0
	295030 Low Suppression Pool Wtr Lvl / 5									0
	295031 Reactor Low Water Level / 2									0
	295037 SCRAM Condition Present and Reactor Power Above APRM Downscale or Unknown / 1									0
	295038 High Off-site Release Rate / 9									0
	600000 Plant Fire On Site / 8									0
	700000 Generator Voltage and Electric Grid Disturbances / 6									0
K/A Category Totals:		0	0	0	0	0	0	Group Point Total:	0	

ES-401		BWR Examination Outline						Form ES-401-1		
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	#
	295002 Loss of Main Condenser Vac / 3									0
	295007 High Reactor Pressure / 3									0
	295008 High Reactor Water Level / 2									0
	295009 Low Reactor Water Level / 2									0
	295010 High Drywell Pressure / 5									0
	295011 High Containment Temp / 5									0
	295012 High Drywell Temperature / 5									0
	295013 High Suppression Pool Temp. / 5									0
	295014 Inadvertent Reactivity Addition / 1									0
	295015 Incomplete SCRAM / 1									0
	295017 High Off-site Release Rate / 9									0
	295020 Inadvertent Cont. Isolation / 5 & 7									0
	295022 Loss of CRD Pumps / 1									0
	295029 High Suppression Pool Wtr Lvl / 5									0
	295032 High Secondary Containment Area Temperature / 5									0
	295033 High Secondary Containment Area Radiation Levels / 9									0
	295034 Secondary Containment Ventilation High Radiation / 9									0
	295035 Secondary Containment High Differential Pressure / 5									0
	295036 Secondary Containment High Sump/Area Water Level / 5									0
	500000 High CTMT Hydrogen Conc. / 5									0
K/A Category Totals:		0	0	0	0	0	0	Group Point Total:	0	

ES-401		BWR Examination Outline													Form ES-401-1		
Plant Systems - Tier 2/Group 1 (RO)																	
Q#	System # / Name	K	K	K	K	K	K	K	A	A	A	A	A	G	K/A Topic(s)	IR	#
	203000 RHR/LPCI: Injection Mode																0
	205000 Shutdown Cooling																0
	206000 HPCI																0
	207000 Isolation (Emergency) Condenser																0
	209001 LPCS																0
	209002 HPCS																0
	211000 SLC																0
	212000 RPS																0
	215003 IRM																0
	215004 Source Range Monitor																0
	215005 APRM / LPRM																0
	217000 RCIC																0
	218000 ADS																0
	223002 PCIS/Nuclear Steam Supply Shutoff																0
	239002 SRVs																0
	259002 Reactor Water Level Control																0
	261000 SGTS																0
	262001 AC Electrical Distribution																0
	262002 UPS (AC/DC)																0
	263000 DC Electrical Distribution																0
	264000 EDGs																0
	300000 Instrument Air																0
	400000 Component Cooling Water																0
																	0
K/A Category Totals:		0	0	0	0	0	0	0	0	0	0	0	0	0	Group Point Total:		0

ES-401		BWR Examination Outline												Form ES-401-1	
		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	#
	201001 CRD Hydraulic														0
	201002 RMCS														0
	201003 Control Rod and Drive Mechanism														0
	201004 RSCS														0
	201005 RCIS														0
	201006 RWM														0
	202001 Recirculation														0
	202002 Recirculation Flow Control														0
	204000 RWCU														0
	214000 RPIS														0
	215001 Traversing In-core Probe														0
	215002 RBM														0
	216000 Nuclear Boiler Inst.														0
	219000 RHR/LPCI: Torus/Pool Cooling Mode														0
	223001 Primary CTMT and Aux.														0
	226001 RHR/LPCI: CTMT Spray Mode														0
	230000 RHR/LPCI: Torus/Pool Spray Mode														0
	233000 Fuel Pool Cooling/Cleanup														0
	234000 Fuel Handling Equipment														0
	239001 Main and Reheat Steam														0
	239003 MSIV Leakage Control														0
	241000 Reactor/Turbine Pressure Regulator														0
	245000 Main Turbine Gen. / Aux.														0
	256000 Reactor Condensate														0
	259001 Reactor Feedwater														0
	268000 Radwaste														0
	271000 Offgas														0
	272000 Radiation Monitoring														0
	286000 Fire Protection														0
	288000 Plant Ventilation														0
	290001 Secondary CTMT														0
	290003 Control Room HVAC														0
	290002 Reactor Vessel Internals														0
															0
K/A Category Totals:		0	0	0	0	0	0	0	0	0	0	0	Group Point Total:		0

ES-401		BWR Examination Outline						Form ES-401-1		
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	#
15	295001 Partial or Complete Loss of Forced Core Flow Circulation / 1 & 4						01. 32	Ability to explain and apply system limits and precautions.	4.0	1
	295003 Partial or Complete Loss of AC / 6					0 2		Reactor power, pressure, and level	4.3	1
	295004 Partial or Total Loss of DC Pwr / 6									0
	295005 Main Turbine Generator Trip / 3									0
	295006 SCRAM / 1									0
	295016 Control Room Abandonment / 7									0
	295018 Partial or Total Loss of CCW / 8									0
	295019 Partial or Total Loss of Inst. Air / 8									0
	295021 Loss of Shutdown Cooling / 4									0
24	295023 Refueling Acc / 8					0 5		Entry conditions of emergency plan	4.6	1
	295024 High Drywell Pressure / 5									0
	295025 High Reactor Pressure / 3									0
13	295026 Suppression Pool High Water Temp. / 5						02. 38	Knowledge of conditions and limitations in the facility license.	4.5	1
	295027 High Containment Temperature / 5									0
	295028 High Drywell Temperature / 5									0
	295030 Low Suppression Pool Wtr Lvl / 5									0
	295031 Reactor Low Water Level / 2									0
1	295037 SCRAM Condition Present and Reactor Power Above APRM Downscale or Unknown / 1					0 4		Suppression pool temperature	4.1	1
	295038 High Off-site Release Rate / 9									0
14	600000 Plant Fire On Site / 8					0 3		Fire alarm	3.2	1
7	700000 Generator Voltage and Electric Grid Disturbances / 6					0 5		Operational status of offsite circuit	3.8	1
K/A Category Totals:		0	0	0	0	5	2	Group Point Total:		7

ES-401		BWR Examination Outline													Form ES-401-1						
Plant Systems - Tier 2/Group 1 (SRO)																					
Q#	System # / Name	K	K	2	3	4	5	6	7	8	9	10	11	12	13	14	15	K/A Topic(s)	IR	#	
	203000 RHR/LPCI: Injection																			0	
	205000 Shutdown Cooling Mode																			0	
	206000 HPCI																			0	
	207000 Isolation (Emergency) Condenser																			0	
	209001 LPCS																			0	
	209002 HPCS																			0	
	211000 SLC																			0	
	212000 RPS																			0	
	215003 IRM																			0	
	215004 Source Range Monitor																			0	
	215005 APRM / LPRM																			0	
	217000 RCIC																			0	
10	218000 ADS																	02.36	Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations.	4.2	1
	223002 PCIS/Nuclear Steam Supply Shutoff																			0	
	239002 SRVs																			0	
4	259002 Reactor Water Level Control													05					Loss of applicable plant air systems	3.4	1
19	261000 SGTS																	04.18	Knowledge of the specific bases for EOPs.	4.0	1
	262001 AC Electrical Distribution																			0	
	262002 UPS (AC/DC)																			0	
	263000 DC Electrical Distribution																			0	
23	264000 EDGs													05					Synchronization of the emergency generator with other electrical supplies	3.6	1
	300000 Instrument Air																			0	
22	400000 Component Cooling Water													01					Loss of CCW pump	3.4	1
																				0	
K/A Category Totals:		0	0	0	0	0	0	0	0	0	3	0	0	2	Group Point Total:			5			

ES-401 BWR Examination Outline Form ES-401-1										
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	#
8	295002 Loss of Main Condenser Vac / 3						04. 11	Knowledge of abnormal condition procedures.	4.2	1
	295007 High Reactor Pressure / 3									0
	295008 High Reactor Water Level / 2									0
	295009 Low Reactor Water Level / 2									0
	295010 High Drywell Pressure / 5									0
	295011 High Containment Temp / 5									0
	295012 High Drywell Temperature / 5									0
3	295013 High Suppression Pool Temp. / 5						01. 25	Ability to interpret reference materials, such as graphs, curves, tables, etc.	4.2	1
	295014 Inadvertent Reactivity Addition / 1									0
	295015 Incomplete SCRAM / 1									0
	295017 High Off-site Release Rate / 9									0
	295020 Inadvertent Cont. Isolation / 5 & 7									0
6	295022 Loss of CRD Pumps / 1					0 2		CRD system status	3.4	1
	295029 High Suppression Pool Wtr Lvl / 5									0
	295032 High Secondary Containment Area Temperature / 5									0
	295033 High Secondary Containment Area Radiation Levels / 9									0
	295034 Secondary Containment Ventilation High Radiation / 9									0
	295035 Secondary Containment High Differential Pressure / 5									0
	295036 Secondary Containment High Sump/Area Water Level / 5									0
	500000 High CTMT Hydrogen Conc. / 5									0
K/A Category Totals:		0	0	0	0	1	2	Group Point Total:		3

ES-401		BWR Examination Outline												Form ES-401-1	
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	#
	201001 CRD Hydraulic														0
	201002 RMCS														0
	201003 Control Rod and Drive Mechanism														0
	201004 RSCS														0
	201005 RCIS														0
	201006 RWM														0
	202001 Recirculation														0
16	202002 Recirculation Flow Control								0 2				Loss of A.C.	3.0	1
	204000 RWCU														0
	214000 RPIS														0
	215001 Traversing In-core Probe														0
	215002 RBM														0
	216000 Nuclear Boiler Inst.														0
	219000 RHR/LPCI: Torus/Pool Cooling Mode														0
12	223001 Primary CTMT and Aux.								1 1				Abnormal suppression pool level	3.8	1
	226001 RHR/LPCI: CTMT Spray Mode														0
	230000 RHR/LPCI: Torus/Pool Spray Mode														0
	233000 Fuel Pool Cooling/Cleanup														0
	234000 Fuel Handling Equipment														0
	239001 Main and Reheat Steam														0
	239003 MSIV Leakage Control														0
	241000 Reactor/Turbine Pressure Regulator														0
	245000 Main Turbine Gen. / Aux.														0
	256000 Reactor Condensate														0
	259001 Reactor Feedwater														0
	268000 Radwaste														0
	271000 Offgas														0
	272000 Radiation Monitoring														0
	286000 Fire Protection														0
	288000 Plant Ventilation														0
	290001 Secondary CTMT														0
2	290003 Control Room HVAC								0 2				Extreme environmental conditions	3.4	1
	290002 Reactor Vessel Internals														0
															0
K/A Category Totals:		0	0	0	0	0	0	0	3	0	0	0	Group Point Total:		3

Facility Name:		Date of Exam:		RO		SRO-Only	
Q#	Category	K/A #	Topic	IR	#	IR	#
5	1. Conduct of Operations	2.1. 36	Knowledge of procedures and limitations involved in core alterations.			4.1	1
9		2.1. 07	Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.			4.7	1
		2.1.					
		2.1.					
		2.1.					
		2.1.					
		Subtotal				0	
17	2. Equipment Control	2.2. 43	Knowledge of the process used to track inoperable alarms.			3.3	1
25		2.2. 06	Knowledge of the process for making changes to procedures.			3.6	1
		2.2.					
		2.2.					
		2.2.					
		2.2.					
	Subtotal				0		2
18	3. Radiation Control	2.3. 06	Ability to approve release permits.			3.8	1
21		2.3. 04	Knowledge of radiation exposure limits under normal or emergency conditions.			3.7	1
		2.3.					
		2.3.					
		2.3.					
		2.3.					
	Subtotal				0		2
11	4. Emergency Procedures / Plan	2.4. 30	Knowledge of events related to system operation/status that must be reported to internal organizations or external agencies, such as the State, the NRC, or the transmission system operator.			4.1	1
		2.4.					
		2.4.					
		2.4.					
		2.4.					
		2.4.					
	Subtotal				0		1
Tier 3 Point Total					0		7

Facility: <u>Columbia Generating Station</u>		Date of Examination: <u>April 2011</u>
Examination Level: RO <input checked="" type="checkbox"/> SRO <input type="checkbox"/>		Operating Test Number: <u>1</u>

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations	N, R	Alternate Determination of Drywell Identified Leakage per SOP-EDR-OPS Section 5.7 – Candidate is given parameters associated with EDR-P-5 and asked to determine the calculated identified Drywell leak rate
Conduct of Operations	D, R	The RO is given a turnover sheet that states a RX S/U is in progress and then parameters that indicate the reactor is critical. He has to realize the Reactor is Critical or will be critical prior to the ECP and take actions per PPM 3.1.2 which states to: stop control rod withdrawal and notify the CRS. The candidate will fill out an attachment indicating what his next action will be and the basis for that action.
Equipment Control	M, R	The RO is given a section of OSP-INST-H101 that has 4 reading that are incorrect. Candidate is told to perform a peer check and red circle any errors found.
Radiation Control	P, R	The RO Candidate is given data for his personal dose and told he is to perform work that is in a High Radiation Area. The candidate has to calculate his maximum stay time
Emergency Procedures/Plan		

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

* 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: <u>Columbia Generating Station</u>		Date of Examination: <u>April 2011</u>
Examination Level: RO SRO X		Operating Test Number: <u>1</u>

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations	D, R	The SRO candidate is given a turnover sheet that states a RX S/U is in progress and then parameters that indicate the reactor is critical. He is cued to determine his next action. To successfully complete the JPM he has to realize the Reactor is Critical prior to the ECP and take actions per PPM 3.1.2 which states to: stop control rod withdrawal, the CRS should direct the CRO to drive control rods in the reverse order until all rods are fully inserted.
Conduct of Operations	D, R	The SRO candidate is told that I & C has determined the Division 1 ADS Inhibit control switch is inoperable. Due to the LAN Operations Log System being out of service the SRO is directed to manually complete an INOP EQUIP/LCO/RFO STATUS SHEET and make the Log entry using PPM 1.3.1 Attachments 6.4 & 6.5.
Equipment Control	P, R	The SRO candidate is given a request to allow or disallow a move of a heavy load over the Spent Fuel Pool and a copy of PPM 1.3.40 and LCS 1.9.2. PPM 1.3.40 attachment 7.5 should be referenced which has 3 requirements to satisfy. Requirement #3 will not be satisfied and the move should not be allowed.
Radiation Control	N, R	The SRO Candidate is given parameters associated with Circ Water blowdown and is asked to approve or not approve the release permit. He is required to determine if the instrumentation necessary for blowdown is available. The primary instrument will be OOS but a viable alternate is available and the blowdown should be allowed to occur.
Emergency Procedures/Plan	N, R	The SRO candidate is given plant data and directed to perform a QEDPS and determine the EAL. The SRO will use the electronic QEDPS program to calculate the offsite release. The calculations will show that the CDE Thyroid dose at 1.2 miles is GT the General Emergency level and a GE will be declared per 5.1.G.2.

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

* 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: COLUMBIA GENERATING STATION
 Exam Level: RO X SRO-I X SRO-U X

Date of Examination: April 2011
 Operating Test No.: 1

Control Room Systems® (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U, including 1 ESF)

System / JPM Title	Type Code*	Safety Function
a. LPCS-P-2 Fails, Start LPCS-P-1, SW-V-12A Fails to Auto Open (LO001722) (IC 171)	N, A, S	8 R, SRO/I, SRO-U
b. Manually Initiate Containment Isolations (TIP Fails to Isolate) (LO001599) (IC 171)	D, A, S, L, EN	5 R, SRO/I, SRO-U
c. SRV Fails open does not close requiring a scram (ATWS occurs to aid in performance of other JPM but is not part of this JPM. This JPM is ended when MODE switch goes to shutdown. (LO001717) (IC 172)	M, A, S	3 R, SRO/I
d. ATWS – Install RPS Jumpers per PPM 5.5.11 (LO001685) (IC 172)	P, D, S	7 R, SRO/I
e. Rx Building Ventillation Trouble – Start SGT (LO001602) (IC 173)	M, A, S	9 R, SRO/I
f. Slow close the MSIVs (LR001792) (IC 173)	D, L, S	4 R, SRO/I
g. Start ASD Channel 1A2 – Uncontrolled rise in RRC/P speed (LO001718)	M, S, A	1 R, SRO/I
h. Transfer SM-7 from Startup Power to Backup Power (LR001943)	D, S	6 R

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

i. Vent Scram Air Header EOP 5.5.11 Tab D (LO001593)	D, E, R	1 R, SRO/I, SRO-U
j. Start RCIC from RSD – RPV/L LT –147” requires ED (LR001846)	D, P, A, E, R, L	2 R, SRO/I, SRO-U
k. CR EVAC - Start DG-2 and Trip HPCS per Attachment 7.5 (LO001719)	N, R, E, L, EN	6 R, SRO/I, SRO-U

@ All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all 5 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 (C)ontrol room (D)irect from bank (E)mergency or abnormal in-plant (EN)gineered safety feature (L)ow-Power / Shutdown (N)ew or (M)odified from bank including 1(A) (P)revious 2 exams (R)CA (S)imulator	4-6 / 4-6 / 2-3 $\leq 9 / \leq 8 / \leq 4$ $\geq 1 / \geq 1 / \geq 1$ - / - / ≥ 1 (control room system) $\geq 1 / \geq 1 / \geq 1$ $\geq 2 / \geq 2 / \geq 1$ $\leq 3 / \leq 3 / \leq 2$ (randomly selected) $\geq 1 / \geq 1 / \geq 1$

Actual JPM count:

(A) – 6 / 6 / 3

(C) - None

(D) – 6 / 5 / 3

(E) – 3 / 3 / 3

(EN) – 2 / 2 / 1

(L) – 4 / 4 / 3

(N) (M) – 5 / 5 / 2

(P) – 2 / 2 / 1

(R) – 3 / 3 / 3

(S) – 8 / 7 / 2

ES-301 Transient and Event Checklist Form ES-301-5

Facility: Columbia Generating Station					Date of Exam: April 2011					Operating Test Number: 1								
A P P L I C A N T	E V E N T T Y P E	Scenarios													T O T A L	M I N I M U M (*)		
		1			2			3			4							
		C R E W P O S I T I O N			C R E W P O S I T I O N			C R E W P O S I T I O N			C R E W P O S I T I O N							
		S R O	A T C	B O P	S R O	A T C	B O P	S R O	A T C	B O P	S R O	A T C	B O P					
																R	I	U
RO <input type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U Upgrade	RX	1,6			5			1,4							5	1	1	0
	NOR				1,2			2							3	1	1	1
	I/C	5,6,7			3,4,5,6,7			3,4,5,6,7,8							14	4	4	2
	MAJ	7			6,7			5,8							5	2	2	1
	TS	2,4			3,4,5			3,4							7	0	2	2
RO <input type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U Reactor Operators # 1 & #6	RX		1,6												2	1	1	0
	NOR									2					1	1	1	1
	I/C		6,7							3,4,5,7,8					7	4	4	2
	MAJ		7							5,8					3	2	2	1
	TS														0	0	2	2
RO <input type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U Reactor Operators # 2 & #7	RX				5										1	1	1	0
	NOR			3	2										2	1	1	1
	I/C			2,5,6,7,8	3,5,7										8	4	4	2
	MAJ			7	6,7										3	2	2	1
	TS														0	0	2	2

ES-301 Transient and Event Checklist Form ES-301-5

Facility: Columbia Generating Station					Date of Exam: April 2011					Operating Test Number: 1								
A P P L I C A N T	E V E N T T Y P E	Scenarios													T O T A L	M I N I M U M (*)		
		1			2			3			4							
		C R E W P O S I T I O N			C R E W P O S I T I O N			C R E W P O S I T I O N			C R E W P O S I T I O N							
		S R O	A T C	B O P	S R O	A T C	B O P	S R O	A T C	B O P	S R O	A T C	B O P					
																R	I	U
RO <input type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input type="checkbox"/>	RX								1,4						2	1	1	0
	NOR						1								1	1	1	1
	I/C						4,7		4,5, 6,7						6	4	4	2
Reactor Operators #3 & #8	MAJ						6,7		5						3	2	2	1
	TS														0	0	2	2
RO <input type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input type="checkbox"/>	RX								1,4						2	1	1	0
	NOR			3			1								2	1	1	1
	I/C			2,5, 6,7, 8			4,7		4,5, 6,7						11	4	4	2
Reactor Operator #4 & #5	MAJ			7			6,7		4						4	2	2	1
	TS														0	0	2	2
RO <input type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input type="checkbox"/>	RX	1,6				5		1,4							5	1	1	0
	NOR					2		2							2	1	1	1
Instants #1 & #3	I/C	5,6, 7				3,5, 7		4,5, 6,7, 8							11	4	4	2
	MAJ	7				6,7		5,8							5	2	2	1
	TS	2,4						3,4							4	0	2	2

ES-301 Transient and Event Checklist Form ES-301-5

Facility: Columbia Generating Station				Date of Exam: April 2011				Operating Test Number: 1										
A P P L I C A N T	E V E N T T Y P E	Scenarios												T O T A L	M I N I M U M (*)			
		1			2			3			4							
		C R E W P O S I T I O N			C R E W P O S I T I O N			C R E W P O S I T I O N			C R E W P O S I T I O N							
		S R O	A T C	B O P	S R O	A T C	B O P	S R O	A T C	B O P	S R O	A T C	B O P					
																R	I	U
RO <input type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input type="checkbox"/> Instant #2, #4 & #6	RX		1,6		5										3	1	1	0
	NOR				1,2					2					3	1	1	1
	I/C		6,7		3,4, 5,6, 7					3,5, 7,8					11	4	4	2
	MAJ		7		6,7					5,8					5	2	2	1
	TS				3,4, 5										3	0	2	2
RO <input type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input type="checkbox"/> Instant #5	RX	1,6							1,4						4	1	1	0
	NOR						1								1	1	1	1
	I/C	5,6, 7					4,7		4,5, 6,7						9	4	4	2
	MAJ	7					6,7		4						5	2	2	1
	TS	2,4													2	0	2	2
RO <input type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input type="checkbox"/> Instant #7	RX				5		1,4								3	1	1	0
	NOR			2		2		2							3	1	1	1
	I/C			4,5, 6,7, 8		3,5, 7		3, 4, 5, 6, 7, 8							14	4	4	2
	MAJ			7		6,7		5,8							5	2	2	1
	TS							3,4							2	0	2	2

Instructions:

1. Check the applicant level and enter the operating test number and Form ES-D-1 event numbers for each event type; TS are not applicable for RO applicants. ROs must serve in both the "at-the-controls (ATC)" and "balance-of-plant (BOP)" positions; Instant SROs must do one scenario, including at least two instrument or component (I/C) malfunctions and one major transient, in the ATC position.
2. Reactivity manipulations may be conducted under normal or *controlled* abnormal conditions (refer to Section D.5.d) but must be significant per Section C.2.a of Appendix D. (*) Reactivity and normal evolutions may be replaced with additional instrument or component malfunctions on a 1-for-1 basis.
3. Whenever practical, both instrument and component malfunctions should be included; only those that require verifiable actions that provide insight to the applicant's competence count toward the minimum requirements specified for the applicant's license level in the right-hand columns.

NRC EXAM SCENARIO #1

Columbia Generating Station NRC Exam - April, 2011

Facility: Columbia

NRC Exam Scenario No: 1

Examiners: _____

Operators: _____

Initial conditions: The plant is operating at 90% power due to economic dispatch.

Turnover Information: Power is to be raised to allow the Main Turbine to be placed in Governor Valve Optimization. A Reactivity Brief for the power increase has been held and power is to be increased immediately following shift turnover. There are no pre-conditioning limits. At the first opportunity, place the Main Turbine in Governor Valve Optimization and stop the power increase.

Event No.	Timeline	Event Type*	Event Description
1.	T=0	R (SRO/ATC)	Increase power with flow.
2.	T=5	N (BOP)	Place the Main Turbine in Governor Valve Optimization.
3.	T=10	C (SRO)	Report of an oil leak that inops HPCS-P-1 (Tech Spec).
4.	T=20	C (SRO/BOP)	DEH pressure slowly lowers due to a failing DEH pump. The standby DEH pump does not auto start but may be manually started. DEH pressure is restored.
5.	T=25	C, R (SRO/ATC)	ASD Channel B1 alarm and trips (Tech Spec).
6.	T=35	M, C (ALL)	ASD UPS trouble & trip of E-PP-ASD1/5 causes loss of both RRC pumps requiring insertion of a manual scram.
7.	T=40	C (ALL)	Both RFW Pumps can not be reset. RCIC trips on initiation and cannot be re-started. Lower RPV Pressure to feed with the Condensate Booster Pumps (Critical Task).
8.	T=45	M, C (ALL)	OBE and RHR-B Suction Break.
9.	T=60		Emergency Depressurization when SP Level cannot be maintained GT 19'2" (Critical Task).

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

NRC EXAM SCENARIO #2

Columbia Generating Station NRC Exam – April, 2011

Facility: Columbia

NRC Exam Scenario No: 2

Examiners: _____

Operators: _____

Initial conditions: The plant is operating at 100% power.

Turnover Information: Immediately following shift turnover, place RHR-C in Suppression Pool Mixing at 7000 gpm to allow Suppression Pool sampling. Allow service water to auto start. OPS 2 and OPS 4 have reported RHR-P-2C and SW-P-1B are ready to start and are on station waiting for the pump starts.

Event No.	Timeline	Event Type*	Event Description
1.	T = 0	N (BOP)	Place RHR-P-2C in Suppression Pool Mixing per SOP-RHR-SPC.
2.	T = 5	C (SRO/ATC)	Running CRD Pump trips. Standby pump does not start initially start (Tech Spec).
3.	T = 20	C (SRO/BOP)	Shaft seizure and trip of RHR-P-2C. (Tech Spec).
4.	T = 30	R (SRO/ATC) C (ALL)	Main Turbine High Vibration requiring reduction of reactor power to stabilize vibrations.
5.	T = 40	C (SOP/BOP) R (SRO/ATC)	Lowering TSW system pressure, Standby pump does not start due to discharge valve failing to auto open. Manual actions to open the valve are successful and the standby pump starts. TSW system pressure continues to lower. RRC flow lowered to 60 Mlbm/hr and a manual scram is inserted.
6.	T = 45	M (ALL)	Hydraulic ATWS; Lower RPV Level (Critical Task).
7.	T = 50	C (ATC)	SLC Reduced flow (18 gpm).
8.	T = 60		When level is lowered, Reset / Scram inserts control rods; RPV level is restored (Critical Task).

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

NRC EXAM SCENARIO #3

Columbia Generating Station NRC Exam – April, 2011

Facility: Columbia

NRCEXAM Scenario No: 3

Examiners: _____

Operators: _____

Initial Conditions: The plant is operating at 100% power. OSP-ELEC-M701, the DG-1 Monthly Operability Test Surveillance is in progress. Step 7.3.24 has been completed. SM-7 has been transferred to TR-B and DG-1 is running at RATED speed. PDIS is unavailable.

Turnover Information: After shift turnover, continue with OSP-ELEC-M701 starting at step 7.3.25. OPS 2 is standing by in DG-1 room.

Event No.	Timeline	Event Type*	Event Description
1.	T=0	N (BOP)	Continue with OSP-ELEC-M701, DG-1 Monthly surveillance.
2.	T=10	C (SRO/BOP)	When DG-1 is paralleled with SM-1, MVAR meter deflects and remains left of zero requiring the DG-1 output breaker to be opened (Tech Spec).
3.	T=20	R, C (SRO/ATC)	Drifting Control Rod, Rod sticks at a position GT position 00 requiring a RRC flow reduction to LE 80 Mlbm/hr (Tech Spec).
4.	T=35	C (ALL)	Lowering CAS pressure that continues to lower causing MSIVs closure (a manual scram should be inserted prior to MSIV closure).
5.	T=30	C (ALL)	Hydraulic ATWS - 6 Control Rods fail to insert.
6.	T=45	M, C (ALL)	RCIC steam leak when MSIVs close.
7.	T=50	C (ALL)	Failure of RCIC-V-8 and 63 to fully close (unisolable leak).
8.	T=60	M (ALL)	ATWS Emergency Depressurize (PPM 5.1.5) when two areas exceed their Max Safe Operating Temperature (Critical Task).

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