

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	3	4	3	N/A			3	4	N/A			3	20	4	3	7
	2	1	1	1	N/A			1	1	N/A			2	7	1	2	3
	Tier Totals	4	5	4	N/A			4	5	N/A			5	27	5	5	10
2. Plant Systems	1	2	2	2	3	3	3	2	2	2	2	3	26	3	2	5	
	2	1	1	1	1	1	1	1	1	1	1	2	12	0	2	3	
	Tier Totals	3	3	3	4	4	4	3	3	3	3	5	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	2	1	2				

- Note:
1. Ensure that at least two topics from every applicable K/A category are sampled within each tier of the RO and SRO-only outlines (i.e., except for one category in Tier 3 of the SRO-only outline, the "Tier Totals" in each K/A category shall not be less than two).
  2. The point total for each group and tier in the proposed outline must match that specified in the table. The final point total for each group and tier may deviate by ±1 from that specified in the table based on NRC revisions. The final RO exam must total 75 points and the SRO-only exam must total 25 points.
  3. Systems/evolutions within each group are identified on the associated outline; systems or evolutions that do not apply at the facility should be deleted and justified; operationally important, site-specific systems that are not included on the outline should be added. Refer to Section D.1.b of ES-401 for guidance regarding the elimination of inappropriate K/A statements.
  4. Select topics from as many systems and evolutions as possible; sample every system or evolution in the group before selecting a second topic for any system or evolution.
  5. Absent a plant-specific priority, only those K/As having an importance rating (IR) of 2.5 or higher shall be selected. Use the RO and SRO ratings for the RO and SRO-only portions, respectively.
  6. Select SRO topics for Tiers 1 and 2 from the shaded systems and K/A categories.
  - 7.\* The generic (G) K/As in Tiers 1 and 2 shall be selected from Section 2 of the K/A Catalog, but the topics must be relevant to the applicable evolution or system. Refer to Section D.1.b of ES-401 for the applicable K/As.
  8. On the following pages, enter the K/A numbers, a brief description of each topic, the topics' importance ratings (IRs) for the applicable license level, and the point totals (#) for each system and category. Enter the group and tier totals for each category in the table above; if fuel handling equipment is sampled in other than Category A2 or G\* on the SRO-only exam, enter it on the left side of Column A2 for Tier 2, Group 2 (Note #1 does not apply). Use duplicate pages for RO and SRO-only exams.
  9. For Tier 3, select topics from Section 2 of the K/A catalog, and enter the K/A numbers, descriptions, IRs, and point totals (#) on Form ES-401-3. Limit SRO selections to K/As that are linked to 10 CFR 55.43.

ES-401		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	#
18	295001 Partial or Complete Loss of Forced Core Flow Circulation / 1 & 4						01. 27	Knowledge of system purpose and/or function.	3.9	1
17	295003 Partial or Complete Loss of AC / 6						04. 09	Knowledge of low power/shutdown implications in accident (e.g., loss of coolant accident or loss of residual heat removal) mitigation strategies.	3.8	1
20	295004 Partial or Total Loss of DC Pwr / 6		0 3					Knowledge of the interrelations between Partial or Total Loss of DC Pwr and the following: D.C. bus loads	3.3	1
16	295005 Main Turbine Generator Trip / 3						01. 19	Ability to use plant computers to evaluate system or component status.	3.9	1
6	295006 SCRAM / 1		0 1					Knowledge of the interrelations between SCRAM and the following: RPS	4.3	1
10	295016 Control Room Abandonment / 7				0 4			Ability to operate and/or monitor the following as they apply to Control Room Abandonment: A.C. electrical distribution	3.1	1
15	295018 Partial or Total Loss of CCW / 8					0 4		Ability to determine and/or interpret the following as they apply to Partial or Total Loss of CCW: System flow	2.9	1
12	295019 Partial or Total Loss of Inst. Air / 8				0 2			Ability to operate and/or monitor the following as they apply to Partial or Total Loss of Inst. Air: Instrument air system valves: Plant-Specific	3.3	1
11	295021 Loss of Shutdown Cooling / 4				0 2			Ability to operate and/or monitor the following as they apply to Loss of Shutdown Cooling: RHR/shutdown cooling	3.5	1
19	295023 Refueling Acc / 8					0 1		Ability to determine and/or interpret the following as they apply to Refueling Accidents: Area radiation levels	3.6	1
8	295024 High Drywell Pressure / 5			0 4				Knowledge of the reasons for the following responses as they apply to High Drywell Pressure: Emergency depressurization	3.7	1
13	295025 High Reactor Pressure / 3					0 3		Ability to determine and/or interpret the following as they apply to High Reactor Pressure: Suppression pool temperature	3.9	1
	295026 Suppression Pool High Water Temp. / 5									0
4	295027 High Containment Temperature / 5		0 2					Knowledge of the interrelations between High Containment Temperature and the following: Components internal to the containment: Mark-III	3.2	1
1	295028 High Drywell Temperature / 5	0 1						Knowledge of the operational implications of the following concepts as they apply to High Drywell Temperature: Reactor water level measurement	3.5	1
3	295030 Low Suppression Pool Wtr Lvl / 5	0 1						Knowledge of the operational implications of the following concepts as they apply to Low Suppression Pool Wtr Lvl: Steam condensation	3.8	1
14	295031 Reactor Low Water Level / 2					0 4		Ability to determine and/or interpret the following as they apply to Reactor Low Water Level: Adequate core cooling	4.6	1
9	295037 SCRAM Condition Present and Reactor Power Above APRM Downscale or Unknown / 1			0 6				Knowledge of the reasons for the following responses as they apply to SCRAM Condition Present and Reactor Power Above APRM Downscale or Unknown: Maintaining heat sinks external to the containment	3.8	1
7	295038 High Off-site Release Rate / 9			0 2				Knowledge of the reasons for the following responses as they apply to High Off-site Release Rate: System isolations	3.9	1
2	600000 Plant Fire On Site / 8	0 2						Knowledge of the operational implications of the following concepts as they apply to Plant Fire On Site: Fire Fighting	2.9	1
5	700000 Generator Voltage and Electric Grid Disturbances / 6		0 2					Knowledge of the interrelations between Generator Voltage and Electric Grid Disturbances and the following: Breakers, relays	3.1	1
K/A Category Totals:		3	4	3	3	4	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
23	295007 High Reactor Pressure / 3			0 4				Knowledge of the reasons for the following responses as they apply to High Reactor Pressure: Safety/relief valve operation: Plant-Specific	4.0	1
	295008 High Reactor Water Level / 2									0
	295009 Low Reactor Water Level / 2									0
	295010 High Drywell Pressure / 5									0
27	295011 High Containment Temp / 5						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 conditions, radioactivity release control, etc.	4.0	1
	295012 High Drywell Temperature / 5									0
25	295013 High Suppression Pool Temp. / 5					0 2		Ability to determine and/or interpret the following as they apply to High Suppression Pool Temp.: Localized heating/stratification	3.2	1
24	295014 Inadvertent Reactivity Addition / 1				0 5			Ability to operate and/or monitor the following as they apply to Inadvertent Reactivity Addition: Neutron monitoring system	3.9	1
	295015 Incomplete SCRAM / 1									0
	295017 High Off-site Release Rate / 9									0
21	295020 Inadvertent Cont. Isolation / 5 & 7	0 5						Knowledge of the operational implications of the following concepts as they apply to Inadvertent Cont. Isolation: Loss of drywell/containment cooling	3.3	1
	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
22	295035 Secondary Containment High Differential Pressure / 5		0 3					Knowledge of the interrelations between Secondary Containment High Differential Pressure and the following: Off-site release rate	3.3	1
	295036 Secondary Containment High Sump/Area Water Level / 5									0
26	500000 High CTMT Hydrogen Conc. / 5						04. 04	Ability to recognize abnormal indications for system operating parameters that are entry-level conditions for emergency and abnormal operating procedures.	4.5	1
K/A Category Totals:		1	1	1	1	1	2	Group Point Total:		7

ES-401		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	#
47	203000 RHR/LPCI: Injection Mode											01	Ability to manually operate and/or monitor in the control room: Pumps	4.3	1
46 53	205000 Shutdown Cooling					02						12	Knowledge of the operational implications of the following concepts as they apply to Shutdown Cooling: Valve operation; Ability to manually operate and/or monitor in the control room: Recirculation loop temperatures	2.8; 3.4	2
	206000 HPCI														0
	207000 Isolation (Emergency) Condenser														0
36 50	209001 LPCS				10	05							Knowledge of LPCS design feature(s) and/or interlocks which provide for the following: Testability of all operable components; Knowledge of the operational implications of the following concepts as they apply to LPCS: System venting	2.8; 2.5	2
30	209002 HPCS		03										Knowledge of electrical power supplies to the following: Initiation logic: BWR-5, 6	2.8	1
45	211000 SLC									01			Ability to monitor automatic operations of the SLC including: Pump discharge pressure: Plant-Specific	3.5	1
31	212000 RPS		02										Knowledge of electrical power supplies to the following: Analog trip system logic cabinets	2.7	1
29 52	215003 IRM	07									02		Knowledge of the physical connections and/or cause-effect relationships between IRM and the following: Reactor vessel; Ability to monitor automatic operations of the IRM including: Annunciator and alarm signals	3; 3.3	2
48	215004 Source Range Monitor											01. 25	Ability to interpret reference materials, such as graphs, curves, tables, etc.	3.9	1
37 51	215005 APRM / LPRM					01	07						Knowledge of the operational implications of the following concepts as they apply to APRM / LPRM: LPRM detector operation; Knowledge of the effect that a loss or malfunction of the following will have on the APRM / LPRM: Flow converter/comparator network: Plant-Specific	2.8; 3.2	2
33	217000 RCIC		02										Knowledge of the effect that a loss or malfunction of the RCIC will have on following: Reactor vessel pressure	3.6	1
35 49	218000 ADS			03								04. 01	Knowledge of ADS design feature(s) and/or interlocks which provide for the following: ADS logic control; Knowledge of EOP entry conditions and immediate action steps.	3.8; 4.6	2
34	223002 PCIS/Nuclear Steam Supply Shutoff			04									Knowledge of PCIS/Nuclear Steam Supply Shutoff design feature(s) and/or interlocks which provide for the following: Automatic bypassing of selected isolations during specified plant conditions	3.2	1
32	239002 SRVs		03										Knowledge of the effect that a loss or malfunction of the SRVs will have on following: Ability to rapidly depressurize the reactor	4.3	1
43	259002 Reactor Water Level Control							01					Ability to (a) predict the impacts of the following on the Reactor Water Level Control; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Loss of any number of main steam flow inputs	3.3	1
41	261000 SGTS						07						Ability to predict and/or monitor changes in parameters associated with operating the SGTS controls including: SGBTS train temperature	2.8	1
42	262001 AC Electrical Distribution							01					Ability to (a) predict the impacts of the following on the AC Electrical Distribution; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Turbine/generator trip	3.4	1
38	262002 UPS (AC/DC)					02							Knowledge of the effect that a loss or malfunction of the following will have on the UPS (AC/DC): D.C. electrical power	2.8	1
39	263000 DC Electrical Distribution					01							Knowledge of the effect that a loss or malfunction of the following will have on the DC Electrical Distribution: A.C. electrical distribution	3.2	1
40	264000 EDGs						03						Ability to predict and/or monitor changes in parameters associated with operating the EDGs controls including: Operating voltages, currents, and temperatures	2.8	1
44	300000 Instrument Air											04. 11	Knowledge of abnormal condition procedures.	4.0	1
28	400000 Component Cooling Water	01											Knowledge of the physical connections and/or cause-effect relationships between Component Cooling Water and the following: Service water system	3.2	1
K/A Category Totals:		2	2	2	3	3	3	2	2	2	2	3	Group Point Total:	26	



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Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (SRO)										
Q#	E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
	295001 Partial or Complete Loss of Forced Core Flow Circulation / 1 & 4									0
	295003 Partial or Complete Loss of AC / 6									0
76	295004 Partial or Total Loss of DC Pwr / 6					0 2		Ability to determine and/or interpret the following as they apply to Partial or Total Loss of DC Pwr: Extent of partial or complete loss of D.C. power	3.9	1
79	295005 Main Turbine Generator Trip / 3						02. 22	Knowledge of limiting conditions for operations and safety limits.	4.7	1
	295006 SCRAM / 1									0
	295016 Control Room Abandonment / 7									0
	295018 Partial or Total Loss of CCW / 8									0
80	295019 Partial or Total Loss of Inst. Air / 8						04. 45	Ability to prioritize and interpret the significance of each annunciator or alarm.	4.3	1
	295021 Loss of Shutdown Cooling / 4									0
78	295023 Refueling Acc / 8					0 4		Ability to determine and/or interpret the following as they apply to Refueling Accidents: Occurrence of fuel handling accident	4.1	1
	295024 High Drywell Pressure / 5									0
81	295025 High Reactor Pressure / 3						01. 07	Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.	4.7	1
	295026 Suppression Pool High Water Temp. / 5									0
	295027 High Containment Temperature / 5									0
82	295028 High Drywell Temperature / 5					0 3		Ability to determine and/or interpret the following as they apply to High Drywell Temperature: Reactor water level	3.9	1
77	295030 Low Suppression Pool Wtr Lvl / 5					0 2		Ability to determine and/or interpret the following as they apply to Low Suppression Pool Wtr Lvl: Suppression pool temperature	3.9	1
	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	4	3	Group Point Total:		7

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	#
84	295002 Loss of Main Condenser Vac / 3						01. 32	Ability to explain and apply system limits and precautions.	4.0	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
83	295012 High Drywell Temperature / 5					0 1		Ability to determine and/or interpret the following as they apply to High Drywell Temperature: Drywell temperature	3.9	1
	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
85	295032 High Secondary Containment Area Temperature / 5						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.	4.4	1
	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

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Plant Systems - Tier 2/Group 1 (SRO)															
Q#	System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
	203000 RHR/LPCI: Injection														0
	205000 Shutdown Cooling Mode														0
	206000 HPCI														0
	207000 Isolation (Emergency) Condenser														0
	209001 LPCS														0
	209002 HPCS														0
87	211000 SLC								0 6				Ability to (a) predict the impacts of the following on the SLC; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Valve openings	3.3	1
	212000 RPS														0
	215003 IRM														0
	215004 Source Range Monitor														0
	215005 APRM / LPRM														0
90	217000 RCIC								0 5				Ability to (a) predict the impacts of the following on the RCIC; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: D.C. power loss	3.3	1
	218000 ADS														0
86	223002 PCIS/Nuclear Steam Supply Shutoff								0 6				Ability to (a) predict the impacts of the following on the PCIS/Nuclear Steam Supply Shutoff; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Containment instrumentation failures	3.2	1
	239002 SRVs														0
88	259002 Reactor Water Level Control											04. 06	Knowledge of EOP mitigation strategies.	4.7	1
	261000 SGTS														0
	262001 AC Electrical Distribution														0
89	262002 UPS (AC/DC)											01. 23	Ability to perform specific system and integrated plant procedures during all modes of plant operation.	4.4	1
	263000 DC Electrical Distribution														0
	264000 EDGs														0
	300000 Instrument Air														0
	400000 Component Cooling Water														0
K/A Category Totals:		0	0	0	0	0	0	0	3	0	0	2	Group Point Total:		5

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	#	
92	201001 CRD Hydraulic												02.38	Knowledge of conditions and limitations in the facility license.	4.5	1
	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
93	234000 Fuel Handling Equipment								0	1				Ability to (a) predict the impacts of the following on the Fuel Handling Equipment; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or	3.7	1
91	239001 Main and Reheat Steam								0	3				Ability to (a) predict the impacts of the following on the Main and Reheat Steam, and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: MSIV	4.2	1
	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
K/A Category Totals:		0	0	0	0	0	0	0	2	0	0	1	Group Point Total:		3	

Facility Name:		Date of Exam:						
Q#	Category	K/A #	Topic	RO		SRO-Only		
				IR	#	IR	#	
66	1. Conduct of Operations	2.1. 45	Ability to identify and interpret diverse indications to validate the response of another indicator.	4.3	1	4.3		
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	3.9	1	3.8		
68		2.1. 43	Ability to use procedures to determine the effects on reactivity of plant changes, such as reactor coolant system temperature, secondary plant, fuel depletion, etc.	4.1	1	4.3		
94		2.1. 20	Ability to interpret and execute procedure steps.	4.6		4.6	1	
98		2.1. 04	Knowledge of individual licensed operator responsibilities related to shift staffing, such as medical requirements, "no-solo" operation, maintenance of active license status, 10CFR55, etc.	3.3		3.8	1	
		2.1.						
	Subtotal				3		2	
95	2. Equipment Control	2.2. 17	Knowledge of the process for managing maintenance activities during power operations, such as risk assessments, work prioritization, and coordination with the transmission system operator.	2.6		3.8	1	
96		2.2. 23	Ability to track Technical Specification limiting conditions for operations.	3.1		4.6	1	
69		2.2. 35	Ability to determine Technical Specification Mode of Operation.	3.6	1	4.5		
70		2.2. 41	Ability to obtain and interpret station electrical and mechanical drawings.	3.5	1	3.9		
71		2.2. 25	Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits.	3.2	1	4.2		
		2.2.						
	Subtotal				3		2	
97	3. Radiation Control	2.3. 11	Ability to control radiation releases.	3.8		4.3	1	
		2.3.						
72		2.3. 07	Ability to comply with radiation work permit requirements during normal or abnormal conditions.	3.5	1	3.6		
73		2.3. 15	Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.	2.9	1	3.1		
		2.3.						
		2.3.						
	Subtotal				2		1	
99	4. Emergency Procedures / Plan	2.4. 46	Ability to verify that the alarms are consistent with the plant conditions.	4.2		4.2	1	
100		2.4. 18	Knowledge of the specific bases for EOPs.	3.3		4.0	1	
74		2.4. 26	Knowledge of facility protection requirements, including fire brigade and portable fire fighting equipment usage.	3.1	1	3.6		
75		2.4. 22	Knowledge of the bases for prioritizing safety functions during abnormal/emergency operations.	3.6	1	4.4		
		2.4.						
		2.4.						
	Subtotal				2		2	
Tier 3 Point Total					10		7	