

Facility:		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	3	3	N/A			4	4	N/A			3	20			7	
	2	1	2	1	N/A			1	1	N/A			1	7			3	
	Tier Totals	4	5	4	N/A			5	5	N/A			4	27			10	
2. Plant Systems	1	2	2	3	3	2	4	2	2	2	2	2	26			5		
	2	1	1	1	1	1	1	1	1	1	2	1	12			3		
	Tier Totals	3	3	4	4	4	4	3	3	3	4	3	38			8		
3. Generic Knowledge and Abilities Categories				1		2		3		4		10		1	2	3	4	7
				3		3		2		2								

- Note:
- 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).
  - 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.
  - 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/evolutions 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.
  - 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.
  - 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.
  - Select SRO topics for Tiers 1 and 2 from the shaded systems and K/A categories.
  - \* 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.
  - 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.
  - 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 Emergency and Abnormal Plant Evolutions – Tier 1/Group 1 (RO / SRO)						Form ES-401-1 Rev. 01	
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						X	2.1.20 Ability to interpret and execute procedure steps.   (CFR: 41.10 / 43.5 / 45.12)	4.6	39
295003 Partial or Complete Loss of AC / 6					X		AA2. Ability to determine and/or interpret the following as they apply to PARTIAL OR COMPLETE LOSS OF A.C. POWER : (CFR: 41.10 / 43.5 / 45.13) AA2.03 Battery status: Plant-Specific	3.2	40
295004 Partial or Total Loss of DC Pwr / 6									
295005 Main Turbine Generator Trip / 3				X			AA1. Ability to operate and/or monitor the following as they apply to MAIN TURBINE GENERATOR TRIP : (CFR: 41.7 / 45.6) AA1.01 Recirculation system: Plant-Specific	3.1	41
295006 SCRAM / 1						X	2.4.4 Ability to recognize abnormal indications for system operating parameters that are entry-level conditions for emergency and abnormal operating procedures.   (CFR: 41.10 / 43.2 / 45.6)	4.5	42
295016 Control Room Abandonment / 7		X					AK2. Knowledge of the interrelations between CONTROL ROOM ABANDONMENT and the following: (CFR: 41.7 / 45.8) AK2.01 Remote shutdown panel: Plant-Specific	4.4	43
295018 Partial or Total Loss of CCW / 8	X						AK1. Knowledge of the operational implications of the following concepts as they apply to PARTIAL OR COMPLETE LOSS OF COMPONENT COOLING WATER : (CFR: 41.8 to 41.10) AK1.01 Effects on component/system operations	3.5	44
295019 Partial or Total Loss of Inst. Air / 8		X					AK2. Knowledge of the interrelations between PARTIAL OR COMPLETE LOSS OF INSTRUMENT AIR and the following: (CFR: 41.7 / 45.8) AK2.05 Main steam system	3.4	45
295021 Loss of Shutdown Cooling / 4			X				AK3. Knowledge of the reasons for the following responses as they apply to LOSS OF SHUTDOWN COOLING : (CFR: 41.5 / 45.6) AK3.05 Establishing alternate heat removal flow paths	3.6	46
295023 Refueling Acc / 8				X			AA1. Ability to operate and/or monitor the following as they apply to REFUELING ACCIDENTS : (CFR: 41.7 / 45.6) AA1.04 Radiation monitoring equipment	3.4	47
295024 High Drywell Pressure / 5					X		EA2. Ability to determine and/or interpret the following as they apply to HIGH DRYWELL PRESSURE: (CFR: 41.10 / 43.5 / 45.13) EA2.06 Suppression pool temperature	4.1	48
295025 High Reactor Pressure / 3						X	2.1.27 Knowledge of system purpose and/or function. (CFR: 41.7)	3.9	49
295026 Suppression Pool High Water Temp. / 5					X		EA2. Ability to determine and/or interpret the following as they apply to SUPPRESSION POOL HIGH WATER TEMPERATURE: (CFR: 41.10 / 43.5 / 45.13) EA2.03 Reactor pressure	3.9	50
295027 High Containment Temperature / 5				X			EA1. Ability to operate and/or monitor the following as they apply to HIGH CONTAINMENT TEMPERATURE (MARK III CONTAINMENT ONLY) : (CFR: 41.7 / 45.6) EA1.02 Containment ventilation/cooling: Mark-III	3.5	51

295028 High Drywell Temperature / 5			X			EK3. Knowledge of the reasons for the following responses as they apply to HIGH DRYWELL TEMPERATURE : (CFR: 41.5 / 45.6) EK3.02 RPV flooding	3.5	52
295030 Low Suppression Pool Wtr Lvl / 5	X					EK1. Knowledge of the operational implications of the following concepts as they apply to LOW SUPPRESSION POOL WATER LEVEL: (CFR: 41.8 to 41.10) EK1.03 Heat capacity	3.8	53
295031 Reactor Low Water Level / 2	X					EK1. Knowledge of the operational implications of the following concepts as they apply to REACTOR LOW WATER LEVEL : (CFR: 41.8 to 41.10) EK1.03 Water level effects on reactor power	3.7	54
295037 SCRAM Condition Present and Reactor Power Above APRM Downscale or Unknown / 1		X				EA2. Ability to determine and/or interpret the following as they apply to SCRAM CONDITION PRESENT AND REACTOR POWER ABOVE APRM DOWNSCALE OR UNKNOWN : (CFR: 41.10 / 43.5 / 45.13) EA2.07 Containment conditions/isolations	4.0	55
295038 High Off-site Release Rate / 9			X			EK1. Knowledge of the operational implications of the following concepts as they apply to HIGH OFF-SITE RELEASE RATE : (CFR: 41.8 to 41.10) EK1.01 Biological effects of radioisotope ingestion	2.8	56
600000 Plant Fire On Site / 8				X		AA1 Ability to operate and / or monitor the following as they apply to PLANT FIRE ON SITE: AA1.05 Plant and control room ventilation systems	3.0	57
700000 Generator Voltage and Electric Grid Disturbances / 6					X	AK2. Knowledge of the interrelations between GENERATOR VOLTAGE AND   ELECTRIC GRID DISTURBANCES and the following: (CFR: 41.4, 41.5, 41.7, 41.10 / 45.8) AK2.07 Turbine/generator control	3.6	58
K/A Category Totals:						Group Point Total:	20/7	



500000 High CTMT Hydrogen Conc. / 5									
K/A Category Point Totals:								Group Point Total:	7/3

ES-401		BWR Examination Outline Plant Systems – Tier 2/Group 1 (RO / SRO)										Form ES-401-1 Rev. 01		
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 Mode			X									K3. Knowledge of the effect that a loss or malfunction of the RHR/LPCI: INJECTION MODE (PLANT SPECIFIC) will have on following: (CFR: 41.7 / 45.4) K3.02 Suppression pool level	3.5	1
205000 Shutdown Cooling				X								K4. Knowledge of SHUTDOWN COOLING SYSTEM (RHR SHUTDOWN COOLING MODE) design feature(s) and/or interlocks which provide for the following: (CFR: 41.7) K4.05 Reactor cooldown rate	3.6	2
206000 HPCI												BWR 6 Design not applicable		
207000 Isolation (Emergency) Condenser												BWR 6 Design not applicable		
209001 LPCS							X					A1. Ability to predict and/or monitor changes in parameters associated with operating the LOW PRESSURE CORE SPRAY SYSTEM controls including: (CFR: 41.5 / 45.5) A1.02 Core spray pressure	3.2	3
209002 HPCS								X				A2. Ability to (a) predict the impacts of the following on the HIGH PRESSURE CORE SPRAY SYSTEM (HPCS) ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: (CFR: 41.5 / 45.6) A2.01 System initiation: BWR-5,6	3.8	4
211000 SLC									X			A3. Ability to monitor automatic operations of the STANDBY LIQUID CONTROL SYSTEM including: (CFR: 41.7 / 45.7) A3.03 Explosive valves indicating lights: Plant-Specific	3.8	5
212000 RPS										X		A3. Ability to monitor automatic operations of the REACTOR PROTECTION SYSTEM including: (CFR: 41.7 / 45.7) A3.01 Reactor Power	4.4	6
215003 IRM											X	2.4.21 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. (CFR: 41.7 / 43.5 / 45.12)	4.0	7
215004 Source Range Monitor										X		A4. Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8) A4.07 Verification of proper functioning/ operability	3.4	8
215005 APRM / LPRM									X			A3. Ability to monitor automatic operations of the AVERAGE POWER RANGE MONITOR/LOCAL POWER RANGE MONITOR SYSTEM including: (CFR: 41.7 / 45.7) A3.08 Control rod block status	3.7	9

217000 RCIC								X					A2. Ability to (a) predict the impacts of the following on the REACTOR CORE ISOLATION COOLING SYSTEM (RCIC) ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: (CFR: 41.5 / 45.6) A2.02 Turbine trips	3.8	10
218000 ADS								X					A1. Ability to predict and/or monitor changes in parameters associated with operating the AUTOMATIC DEPRESSURIZATION SYSTEM controls including: (CFR: 41.5 / 45.5) A1.02 ADS valve acoustical monitor noise: Plant-Specific	3.7	11
223002 PCIS/Nuclear Steam Supply Shutoff	X												K1. Knowledge of the physical connections and/or cause/effect relationships between PRIMARY CONTAINMENT ISOLATION SYSTEM/NUCLEAR STEAM SUPPLY SHUT-OFF and the following: (CFR: 41.2 to 41.9 / 45.7 to 45.8) K1.01 Main steam system	3.8	12
239002 SRVs					X								K5. Knowledge of the operational implications of the following concepts as they apply to RELIEF/SAFETY VALVES : (CFR: 41.5 / 45.3) K5.02 Safety function of SRV operation	3.7	13
259002 Reactor Water Level Control				X									K4. Knowledge of REACTOR WATER LEVEL CONTROL SYSTEM design feature(s) and/or interlocks which provide for the following: (CFR: 41.7) K4.10 Three element control (main steam flow, reactor feedwater flow and reactor water level provide input)	3.4	14
261000 SGTS			X										K3. Knowledge of the effect that a loss or malfunction of the STANDBY GAS TREATMENT SYSTEM will have on following: (CFR: 41.7 /45.6) K3.02 Off-site release rate	3.6	15
262001 AC Electrical Distribution		X											K2. Knowledge of electrical power supplies to the following: (CFR: 41.7) K2.01 Off-site sources of power	3.3	16
262002 UPS (AC/DC)	X												K1. Knowledge of the physical connections and/or cause/effect relationships between UNINTERRUPTABLE POWER SUPPLY (A.C./D.C.) and the following: (CFR: 41.2 to 41.9 / 45.7 to 45.8) K1.10 Fire protection system	2.6	17
263000 DC Electrical Distribution		X											K2. Knowledge of electrical power supplies to the following: (CFR: 41.7) K2.01 Major D.C. loads	3.1	18
264000 EDGs			X										K3. Knowledge of the effect that a loss or malfunction of the EMERGENCY GENERATORS (DIESEL/JET) will have on following: (CFR: 41.7 / 45.4) K3.01 Emergency core cooling systems	4.2	19
300000 Instrument Air				X									K4. Knowledge of (INSTRUMENT AIR SYSTEM) design feature(s) and or interlocks which provide for the following: (CFR: 41.7) K4.02 Cross-over to other air systems	3.0	20
400000 Component Cooling Water						X							K6 Knowledge of the effect that a loss or malfunction of the following will have on the CCWS: (CFR: 41.7 / 45.7) K6.05 Pumps	3.0	21

218000 ADS						X								K5. Knowledge of the operational implications of the following concepts as they apply to AUTOMATIC DEPRESSURIZATION SYSTEM (CFR: 41.5 / 45.3) K5.01 ADS logic operation	3.8	22
259002 Reactor Water Level Control							X							K6. Knowledge of the effect that a loss or malfunction of (the following) will have on REACTOR WATER LEVEL CONTROL SYSTEM : (CFR: 41.5 / 45.3) K6.03 Main steam flow input	3.1	23
223002 PCIS/Nuclear Steam Supply Shutoff								X						A1. Ability to predict and/or monitor changes in parameters associated with operating the PRIMARY CONTAINMENT ISOLATION SYSTEM/NUCLEAR STEAM SUPPLY SHUT-OFF controls including: (CFR: 41.5 / 45.5) A1.02 Valve closures	3.7	24
264000 EDGs							X							K6. Knowledge of the effect that a loss or malfunction of the following will have on the EMERGENCY GENERATORS (DIESEL/JET) : (CFR: 41.7 / 45.7) K6.01 Starting air	3.8	25
400000 Component Cooling Water											X			2.1.27 Knowledge of system purpose and/or function.   (CFR: 41.7)	3.9	26
K/A Category Point Totals:														Group Point Total:		26/5





245000 Main Turbine Gen. / Aux.										X										K6. Knowledge of the effect that a loss or malfunction of the following will have on the MAIN TURBINE GENERATOR AND AUXILIARY SYSTEMS : (CFR: 41.7 / 45.7) K6.02 Reactor/turbine pressure control system: Plant-Specific	3.5	34
256000 Reactor Condensate																						
259001 Reactor Feedwater																						
268000 Radwaste																						
271000 Offgas											X									K4. Knowledge of OFFGAS SYSTEM design feature(s) and/or interlocks which provide for the following: (CFR: 41.7) K4.04 The prevention of hydrogen explosions and/or fires	3.3	35
272000 Radiation Monitoring																			X	A4. Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8) A4.02 Meter indications	3.0	36
286000 Fire Protection																			X	K3. Knowledge of the effect that a loss or malfunction of the FIRE PROTECTION SYSTEM will have on following: (CFR: 41.7 / 45.4) K3.03 Plant protection	3.6	37
288000 Plant Ventilation																						
290001 Secondary CTMT																						
290003 Control Room HVAC																			X	K5. Knowledge of the operational implications of the following concepts as they apply to CONTROL ROOM HVAC (CFR: 41.5 / 45.3) K5.01 Airborne contamination (e.g., radiological, toxic gas, smoke) control	3.2	38
290002 Reactor Vessel Internals																						
K/A Category Point Totals:																				Group Point Total:		12/3

Facility:		Date of Exam:				
Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1.	2.1.14 Knowledge of criteria or conditions that require plant-wide announcements, such as pump starts, reactor trips, mode changes, etc. (CFR: 41.10 / 43.5 / 45.12)	3.1			66
	2.1.	2.1.29 Knowledge of how to conduct system lineups, such as valves, breakers, switches, etc. (CFR: 41.10 / 45.1 / 45.12)	4.1			67
	2.1.	2.1.37 Knowledge of procedures, guidelines, or limitations associated with reactivity management. (CFR: 41.1 / 43.6 / 45.6)	4.3			68
	2.1.					
	2.1.					
	2.1.					
	Subtotal				3	
2. Equipment Control	2.2.	2.2.12 Knowledge of surveillance procedures. (CFR: 41.10 / 45.13)	3.7			69
	2.2.	2.2.14 Knowledge of the process for controlling equipment configuration or status. (CFR: 41.10 / 43.3 / 45.13)	3.9			70
	2.2.	2.2.22 Knowledge of limiting conditions for operations and safety limits. (CFR: 41.5 / 43.2 / 45.2)	4.0			71
	2.2.					
	2.2.					
	2.2.					
	Subtotal				3	
3. Radiation Control	2.3.	2.3.4 Knowledge of radiation exposure limits under normal or emergency conditions. (CFR: 41.12 / 43.4 / 45.10)	3.2			72
	2.3.	2.3.13 Knowledge of radiological safety procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc. (CFR: 41.12 / 43.4 / 45.9 / 45.10)	3.4			73
	2.3.					
	2.3.					
	2.3.					
	2.3.					
	Subtotal				2	

4. Emergency Procedures / Plan	2.4.	2.4.1 Knowledge of EOP entry conditions and immediate action steps. (CFR: 41.10 / 43.5 / 45.13)	4.6			74
	2.4.	2.4.32 Knowledge of operator response to loss of all annunciators. (CFR: 41.10 / 43.5 / 45.13)	3.6			75
	2.4.					
	2.4.					
	2.4.					
	2.4.					
	Subtotal				2	
Tier 3 Point Total				10		7

Tier / Group	Randomly Selected K/A	Reason for Rejection
1/1	295038/EK1.03	Rejected due to low operational validity for discriminatory RO level question. RO's make no decisions about offsite release based on meteorological data at RBS.  Redrew to EK1.01
1/2	295035 / EK2.01	Not possible to prepare a psychometrically sound question related to the subject K/A for RO level question.  Redrew to EK2.03
2/1	262002 / K1.16	This is not applicable to RBS, the MSIV solenoids are powered from RPS.  Redrew to K1.10
2/1	259002 / K5.07	Not applicable to RBS (motor driven RFP)  Redrew to K6.03
2/2	201002 / K1.05	RMCS is not a BWR6 specific system. BWR6's use RC&IS to perform rod control and movement functions.  Redrew within safety function 1 to 211000 K1.05
2/2	214000 / G2.4.21	RPIS is not applicable to RBS.  Redrew within safety function 7 to 215003 G2.1.32
2/2	226001 / A3.01	CTMT Spray Mode is not a viable mode of RHR operation at RBS.  Redraw within Safety Function 5 to 219000 A3.01
2/2	234000 / A2.01	Rejected due to low operational validity for discriminatory RO level Question  Redrew to A2.03