

Facility: Duane Arnold Energy Center													Date of Exam: June					
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	3	N/A			4	4	N/A		3	20	4	3	7		
	2	1	1	2				1	1			7	1	2	3			
	Tier Totals	4	4	5				5	5			4	27	5	5	10		
2. Plant Systems	1	2	3	3	2	3	3	2	2	2	2	2	26	3	2	5		
	2	1	1	1	2	1	1	1	1	1	1	1	12	1	2	3		
	Tier Totals	3	4	4	4	4	4	3	3	3	3	3	38	4	4	8		
3. Generic Knowledge and Abilities Categories					1		2		3		4		10	1	2	3	4	7
					3		2		2		3			2	2	1	2	
<p>Note:</p> <ol style="list-style-type: none"> 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). (One Tier 3 Radiation Control K/A is allowed if the K/A is replaced by a K/A from another Tier 3 Category.) 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 with justification; 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. 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 a category 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. 																		
<p>G* Generic K/As</p>																		

ES-401		BWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (RO / SRO)						Form ES-401-1	
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 3				Knowledge of the reasons for the following responses as they apply to PARTIAL OR COMPLETE LOSS OF FORCED CORE FLOW CIRCULATION: Idle Loop Flow	2.8	1
295001 Partial or Complete Loss of Forced Core Flow Circulation / 1 & 4					0 4		Ability to determine and/or interpret the following as they apply to PARTIAL OR COMPLETE LOSS OF FORCED CORE FLOW CIRCULATION: Individual jet pump flows: Not-BWR-1&2	3.1	76
295003 Partial or Complete Loss of AC / 6					0 1		Ability to determine and/or interpret the following as they apply to PARTIAL OR COMPLETE LOSS OF A.C. POWER: Cause of partial or complete loss of A.C. power	3.4	2
295004 Partial or Total Loss of DC Pwr / 6			0 3				Knowledge of the reasons for the following responses as they apply to PARTIAL OR COMPLETE LOSS OF D.C. POWER: Reactor SCRAM: Plant-Specific	3.1	3
295005 Main Turbine Generator Trip / 3						X	2.4.11 Knowledge of abnormal condition procedures: Main Turbine Generator Trip	4.0	4
295006 SCRAM / 1				0 1			Ability to operate and/or monitor the following as they apply to SCRAM: RPS	4.2	5
295016 Control Room Abandonment / 7					0 3		Ability to determine and/or interpret the following as they apply to CONTROL ROOM ABANDONMENT: Reactor pressure	4.3	6
295016 Control Room Abandonment / 7					0 2		Ability to determine and/or interpret the following as they apply to CONTROL ROOM ABANDONMENT: Reactor Water Level	4.3	77
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	7
295019 Partial or Total Loss of Inst. Air / 8						X	2.1.30 Ability to locate and operate components, including local controls: Partial or Complete Loss of Instrument Air	4.4	8
295019 Partial or Total Loss of Inst. Air / 8					0 2		Ability to determine and/or interpret the following as they apply to PARTIAL OR COMPLETE LOSS OF INSTRUMENT AIR: Status of safety-related instrument air system loads	3.7	78
295021 Loss of Shutdown Cooling / 4	0 1						Knowledge of the operational implications of the following concepts as they apply to LOSS OF SHUTDOWN COOLING: Decay heat	3.6	9
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	3.4	10
295023 Refueling Acc / 8						X	2.2.22 Knowledge of limiting conditions for operations and safety limits: Refueling Accidents	4.7	79
295024 High Drywell Pressure / 5		0 3					Knowledge of the interrelations between HIGH DRYWELL PRESSURE and the following: Low Pressure Core Spray System (LPCS): Plant-Specific	3.8	11
295025 High Reactor Pressure / 3		1 1					Knowledge of the interrelations between HIGH REACTOR PRESSURE and the following: Reactor water level	3.5	12

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	4.1	80
295026 Suppression Pool High Water Temp. / 5			0 5				Knowledge of the reasons for the following responses as they apply to SUPPRESSION POOL HIGH WATER TEMPERATURE: Reactor SCRAM	3.9	13
295027 High Containment Temperature / 5									
295028 High Drywell Temperature / 5			0 4				Ability to operate and/or monitor the following as they apply to HIGH DRYWELL TEMPERATURE: Drywell pressure	3.9	14
295028 High Drywell Temperature / 5						X	2.4.8 Knowledge of how abnormal operating procedures are used in conjunction with EOPs.: High Drywell Temperature		81
295030 Low Suppression Pool Wtr Lvl / 5			0 6				Ability to operate and/or monitor the following as they apply to LOW SUPPRESSION POOL WATER LEVEL: Condensate storage and transfer (make-up to the suppression pool): Plant-Specific	3.4	15
295031 Reactor Low Water Level / 2		1 4					Knowledge of the interrelations between REACTOR LOW WATER LEVEL and the following: Emergency generators	3.9	16
295037 SCRAM Condition Present and Reactor Power Above APRM Downscale or Unknown / 1			0 4				Ability to operate and/or monitor the following as they apply to SCRAM CONDITION PRESENT AND REACTOR POWER ABOVE APRM DOWNSCALE OR UNKNOWN: Standby Liquid Control System (SBLC)	4.5	17
295037 SCRAM Condition Present and Reactor Power Above APRM Downscale or Unknown / 1						X	2.4.34 Knowledge of RO tasks performed outside the main control room during an emergency and the resultant operational effects: SCRAM Condition Present and Reactor Power Above APRM Downscale or Unknown	4.1	82
295038 High Off-site Release Rate / 9					0 4		Ability to determine and/or interpret the following as they apply to HIGH OFF-SITE RELEASE RATE: Source of off-site release	4.1	18
600000 Plant Fire On Site / 8						X	2.1.20 Ability to interpret and execute procedure steps: Plant Fire On Site	4.6	19
700000 Generator Voltage and Electric Grid Disturbances / 6	0 3						Knowledge of the operational implications of the following concepts as they apply to GENERATOR VOLTAGE AND ELECTRIC GRID DISTURBANCES: Under-excitation	3.3	20
K/A Category Totals:	3	3	3	4	4 4	3 3	Group Point Total:		20/7

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500000 High CTMT Hydrogen Conc. / 5										
K/A Category Point Totals:	1	1	2	1	1 1	1 2	Group Point Total:			7/3

ES-401		BWR Examination Outline Plant Systems - Tier 2/Group 1 (RO / SRO)											Form ES-401-1	
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		0 1										Knowledge of electrical power supplies to the following: Pumps	3.5	28
205000 Shutdown Cooling									0 2			Ability to monitor automatic operations of the SHUTDOWN COOLING SYSTEM (RHR SHUTDOWN COOLING MODE) including: Pump trips	3.2	29
206000 HPCI											X	2.4.50 Ability to verify system alarm setpoints and operate controls identified in the alarm response manual: High Pressure Coolant Injection System	4.2	30
206000 HPCI								0 2				Ability to (a) predict the impacts of the following on the HIGH PRESSURE COOLANT INJECTION SYSTEM ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Valve closures: BWR-2,3,4 [High Pressure Coolant Injection (HPCI) System]	3.5	86
207000 Isolation (Emergency) Condenser														
209001 LPCS							0 4					Ability to predict and/or monitor changes in parameters associated with operating the LOW PRESSURE CORE SPRAY SYSTEM controls including: Reactor pressure	3.7	31
209001 LPCS											X	2.4.4 Ability to recognize abnormal indications for system operating parameters that are entry-level conditions for emergency and abnormal operating procedures: Low Pressure Core Spray System	4.7	87
209002 HPCS														
211000 SLC			0 1									Knowledge of the effect that a loss or malfunction of the STANDBY LIQUID CONTROL SYSTEM will have on following: Ability to shutdown the reactor in certain conditions	4.3	32
212000 RPS					0 2							Knowledge of the operational implications of the following concepts as they apply to REACTOR PROTECTION SYSTEM: Specific logic arrangements	3.3	33
212000 RPS								0 2				Ability to (a) predict the impacts of the following on the REACTOR PROTECTION SYSTEM ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: RPS bus power supply failure	3.7	34
212000 RPS								0 2				Ability to (a) predict the impacts of the following on the REACTOR PROTECTION SYSTEM ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: RPS bus power supply failure	3.9	88

215003 IRM			0 1										Knowledge of the effect that a loss or malfunction of the INTERMEDIATE RANGE MONITOR (IRM) SYSTEM will have on following: RPS	3.9	35
215003 IRM								0 1					Ability to (a) predict the impacts of the following on the INTERMEDIATE RANGE MONITOR (IRM) SYSTEM ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Power Supply Degraded	2.8	36
215004 Source Range Monitor											X		2.2.40 Ability to apply Technical Specifications for a system: Source Range Monitor (SRM) System	3.4	37
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/LOCAL POWER RANGE MONITOR SYSTEM: Flow converter/comparator network: Plant-Specific	3.2	38
217000 RCIC										0 8			Ability to manually operate and/or monitor in the control room: Reactor Core Isolation Cooling (RCIC) System flow	3.7	39
217000 RCIC											X		2.4.6 Knowledge of EOP mitigation strategies: Reactor Core Isolation Cooling (RCIC) System	4.7	89
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	40
223002 PCIS/Nuclear Steam Supply Shutoff				0 4									Knowledge of PRIMARY CONTAINMENT ISOLATION SYSTEM/NUCLEAR STEAM SUPPLY SHUT-OFF design feature(s) and/or interlocks which provide for the following: Automatic bypassing of selected isolations during specified plant conditions	3.2	41
239002 SRVs		0 1											Knowledge of electrical power supplies to the following: SRV solenoids	2.8	42
259002 Reactor Water Level Control					0 4								Knowledge of the effect that a loss or malfunction of the following will have on the REACTOR WATER LEVEL CONTROL SYSTEM: Reactor feedwater flow input	3.1	43
261000 SGTS				0 1									Knowledge of STANDBY GAS TREATMENT SYSTEM design feature(s) and/or interlocks which provide for the following: Automatic system initiation	3.7	44
262001 AC Electrical Distribution										0 2			Ability to manually operate and/or monitor in the control room: Synchroscope, including understanding of running and incoming voltages [A.C. Electrical Distribution]	3.4	45
262001 AC Electrical Distribution								0 6					Ability to (a) predict the impacts of the following on the A.C. ELECTRICAL DISTRIBUTION ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Deenergizing a plant bus	2.9	90

262002 UPS (AC/DC)	0 1															Knowledge of the physical connections and/or cause effect relationships between UNINTERRUPTABLE POWER SUPPLY (A.C./D.C.) and the following: Feedwater Level Control	2.8	46
262002 UPS (AC/DC)						0 2										Knowledge of the effect that a loss or malfunction of the following will have on the UNINTERRUPTABLE POWER SUPPLY (A.C./D.C.): D.C. electrical power	2.8	47
263000 DC Electrical Distribution			0 2													Knowledge of the effect that a loss or malfunction of the D.C. ELECTRICAL DISTRIBUTION will have on following: Components using D.C. control power (i.e. breakers)	3.5	48
263000 DC Electrical Distribution							0 1									Ability to predict and/or monitor changes in parameters associated with operating the D.C. ELECTRICAL DISTRIBUTION controls including: Battery charging/discharging rate	2.5	49
264000 EDGs					0 6											Knowledge of the operational implications of the following concepts as they apply to EMERGENCY GENERATORS (DIESEL/JET): Load sequencing	3.4	50
264000 EDGs									0 6							Ability to monitor automatic operations of the EMERGENCY GENERATORS (DIESEL/JET) including: Cooling water system operation	3.1	51
300000 Instrument Air		0 2														Knowledge of electrical power supplies to the following: Emergency air compressor	3.0	52
400000 Component Cooling Water	0 2															Knowledge of the physical connections and / or cause-effect relationships between CCWS and the following: Loads cooled by CCWS	3.2	53
K/A Category Point Totals:	2	3	3	2	3	3	2	2 3	2	2	2	2 2				Group Point Total:		26/5

ES-401		BWR Examination Outline Plant Systems - Tier 2/Group 2 (RO / SRO)										Form ES-401-1		
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														
201002 RMCS														
201003 Control Rod and Drive Mechanism														
201004 RSCS														
201005 RCIS														
201006 RWM						0 3						Knowledge of the effect that a loss or malfunction of the following will have on the ROD WORTH MINIMIZER SYSTEM (RWM) (PLANT SPECIFIC): Rod position indication: P-Spec(Not-BWR6)	2.9	54
201006 RWM											X	2.2.40 Ability to apply Technical Specifications for a system: Rod Worth Minimizer System (Plant Specific)	4.7	91
202001 Recirculation	2 8											Knowledge of the physical connections and/or cause effect relationships between RECIRCULATION SYSTEM and the following: End-of-cycle recirculation pump trip circuitry: Plant-Specific	3.9	55
202002 Recirculation Flow Control				0 3								Knowledge of RECIRCULATION FLOW CONTROL SYSTEM design feature(s) and/or interlocks which provide for the following: Signal failure detection: Plant-Specific	3.0	56

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Facility:		Date of Exam:				
Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1.2	Knowledge of operator responsibilities during all modes of plant operation.	4.1	66		
	2.1.28	Knowledge of the purpose and function of major system components and controls.	4.1	67		
	2.1.38	Knowledge of the station's requirements for verbal communications when implementing procedures.	3.7	68		
	2.1.5	Ability to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc.			3.9	94
	2.1.36	Knowledge of procedures and limitations involved in core alterations.			4.1	95
	Subtotal			3		2
2. Equipment Control	2.2.25	Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits.	3.2	69		
	2.2.37	Ability to determine operability and/or availability of safety related equipment.	3.6	70		
	2.2.6	Knowledge of the process for making changes to procedures.			3.6	96
	2.2.44	Ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and directives affect plant and system conditions.			4.4	97
	Subtotal			2		2
3. Radiation Control	2.3.4	Knowledge of radiation exposure limits under normal or emergency conditions.	3.2	71		
	2.3.15	Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.	2.9	72		
	2.3.5	Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.			2.9	98
	Subtotal			2		1
4. Emergency Procedures / Plan	2.4.19	Knowledge of EOP layout, symbols, and icons.	3.4	73		
	2.4.29	Knowledge of the emergency plan.	3.1	74		
	2.4.39	Knowledge of RO responsibilities in emergency plan implementation.	3.9	75		
	2.4.37	Knowledge of the lines of authority during implementation of the emergency plan.			4.1	99
	2.4.41	Knowledge of the emergency action level thresholds and classifications.			4.6	100
	Subtotal			3		2
Tier 3 Point Total				10		7

