

**BWR Examination Outline**

Facility: JAF		Date of Exam: Date															
Tier	Group	RO K/A Category Points											SRO-Only Points				
		K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G *	Total	A2	G*	Total	
1 Emergency & Abnormal Plant Evolutions	1	4	4	3				3	3				3	20	3	4	7
	2	2	1	1				0	3				0	7	2	1	3
	<b>Tier Totals</b>	6	5	4				3	6				3	27	5	5	10
2 Plant Systems	1	3	1	2	3	2	1	3	3	2	3	3	26	3	2	5	
	2	2	1	1	1	0	1	1	1	1	2	1	12	2	1	3	
	<b>Tier Totals</b>	5	2	3	4	2	2	4	4	3	5	4	38	5	3	8	
3 Generic Knowledge and Abilities Categories				1	2	3	4						1	2	3	4	
				3	2	3	2						10	2	2	2	1

**Note:**

1. Ensure that at least two topics from every applicable K/A category are sampled within each tier of the RO and SRO-only outlines (i.e., except for one category in Tier 3 of the SRO-only outline, the "Tier Totals" in each K/A category shall not be less than two).
2. The point total for each group and tier in the proposed outline must match that specified in the table. The final point total for each group and tier may deviate by ±1 from that specified in the table based on NRC revisions. The final RO exam must total 75 points and the SRO-only exam must total 25 points.
3. Systems/evolutions within each group are identified on the associated outline; systems or evolutions that do not apply at the facility should be deleted and justified; operationally important, site-specific systems that are not included on the outline should be added. Refer to ES-401, Attachment 2, for guidance regarding the elimination of inappropriate K/A statements.
4. Select topics from as many systems and evolutions as possible; sample every system or evolution in the group before selecting a second topic for any system or evolution.
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.
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
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		ES-401-1 Rev 9 (Errata)	
Emergency and Abnormal Plant Evolutions - Tier 1 / Group 1 (RO)										
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G 2	K/A Topic(s)	Imp.	#	
295001 Partial or Complete Loss of Forced Core Flow Circulation / 1 & 4	1.02						Knowledge of the operational implications of the following concepts as they apply to PARTIAL OR COMPLETE LOSS OF FORCED CORE FLOW CIRCULATION : (CFR: 41.8 to 41.10) AK1.02 Power/flow distribution	3.3	1	
295003 Partial or Complete Loss of A.C. Power / 6		2.02					Knowledge of the interrelations between PARTIAL OR COMPLETE LOSS OF A.C. POWER and the following: (CFR: 41.7 / 45.8) AK2.02 Emergency generators	4.1	2	
295004 Partial or Complete Loss of D.C. Power / 6			3.03				Knowledge of the reasons for the following responses as they apply to PARTIAL OR COMPLETE LOSS OF D.C. POWER : (CFR: 41.5 / 45.6) AK3.03 Reactor SCRAM: Plant-Specific	3.1	3	
295005 Main Turbine Generator Trip / 3				1.04			Ability to operate and/or monitor the following as they apply to MAIN TURBINE GENERATOR TRIP : (CFR: 41.7 / 45.6) AA1.04 Main generator controls	2.7	4	
295006 SCRAM / 1					2.03		Ability to determine and/or interpret the following as they apply to SCRAM : (CFR: 41.10 / 43.5 / 45.13) AA2.03 Reactor water level	4.0	5	
295016 Control Room Abandonment / 7						2.4.12	2.4.12 Knowledge of general operating crew responsibilities during emergency operations. (CFR: 41.10 / 45.12)	3.4	6	
295018 Partial or Complete Loss of Component Cooling Water / 8	1.01						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	7	
295019 Partial or Complete Loss of Instrument Air / 8		2.09					Knowledge of the interrelations between PARTIAL OR COMPLETE LOSS OF INSTRUMENT AIR and the following: (CFR: 41.7 / 45.8) AK2.09 Containment	3.3	8	
295021 Loss of Shutdown Cooling / 21			3.05				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	9	
295023 Refueling Accidents / 8				1.02			Ability to operate and/or monitor the following as they apply to REFUELING ACCIDENTS : (CFR: 41.7 / 45.6) AA1.02 Fuel pool cooling and cleanup system	2.9	10	
295024 High Drywell Pressure / 5					2.02		Ability to determine and/or interpret the following as they apply to HIGH DRYWELL PRESSURE: (CFR: 41.10 / 43.5 / 45.13) EA2.02 Drywell temperature	3.9	11	
295025 High Reactor Pressure / 3						2.1.7	2.1.7 Ability to evaluate plant performance and make operational judgments based on operating characteristics / reactor behavior / and instrument interpretation. (CFR: 43.5 / 45.12 / 45.13)	3.7	12	

295026 Suppression Pool High Water Temperature / 5	1.01						Knowledge of the operational implications of the following concepts as they apply to SUPPRESSION POOL HIGH WATER TEMPERATURE : (CFR: 41.8 to 41.10) EK1.01 Pump NPSH	3.0	13	
295027 High Containment Temperature (Mark III Containment Only) / 5							N/A JAF			
295028 High Drywell Temperature / 5		2.03					Knowledge of the interrelations between HIGH DRYWELL TEMPERATURE and the following: (CFR: 41.7 / 45.8) EK2.03 Reactor water level indication	3.6	14	
295030 Low Suppression Pool Water Level / 5			3.06				Knowledge of the reasons for the following responses as they apply to LOW SUPPRESSION POOL WATER LEVEL: (CFR: 41.5 / 45.6) EK3.06 Reactor SCRAM	3.6	15	
295031 Reactor Low Water Level / 2				1.13			Ability to operate and/or monitor the following as they apply to REACTOR LOW WATER LEVEL : (CFR: 41.7 / 45.6) EA1.13 Reactor water level control	4.3	16	
295037 SCRAM Condition Present and Reactor Power Above APRM Downscale or Unknown / 1					2.07		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	17	
295038 High Off-Site Release Rate / 9						2.4.18	2.4.18 Knowledge of the specific bases for EOPs. (CFR: 41.10 / 45.13)	2.7	18	
600000 Plant Fire On Site / 8	1.02						Knowledge of the operation applications of the following concepts as they apply to Plant Fire On Site: AK1.02 Fire Fighting	2.9	19	
295018 Partial or Complete Loss of Component Cooling Water / 8		2.01					Knowledge of the interrelations between PARTIAL OR COMPLETE LOSS OF COMPONENT COOLING WATER and the following: (CFR: 41.7 / 45.8) AK2.01 System loads	3.3	20	
K/A Category Totals:	4	4	3	3	3	3		Group Point Total:	20	20

ES-401		BWR Examination Outline						401-1 Rev 9 (Errata)	
Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (SRO)									
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G 2	K/A Topic(s)	Imp.	#
295004 Partial or Complete Loss of D.C. Power / 6						2.2.13	2.2.13 Knowledge of tagging and clearance procedures. (CFR: 41.10 / 45.13)	3.8	76
295006 SGRAM / 1						2.4.27	2.4.27 Knowledge of fire in the plant procedure. (CFR: 41.10 / 43.5 / 45.13)	3.5	77
295016 Control Room Abandonment / 7						2.4.30	2.4.30 Knowledge of which events related to system operations/status should be reported to outside agencies. (CFR: 43.5 / 45.11)	3.6	78
295023 Loss of Shutdown Cooling / 21						2.07	Ability to determine and/or interpret the following as they apply to LOSS OF SHUTDOWN COOLING : (CFR: 41.10 / 43.5 / 45.13) AA2.07 Reactor recirculation flow	3.1	79
295024 High Drywell Pressure / 5						2.2.17	Knowledge of the process for managing maintenance activities during power operations. (CFR: 43.5 / 45.13)	3.5	80
295028 High Drywell Temperature / 5						2.05	Ability to determine and/or interpret the following as they apply to HIGH DRYWELL TEMPERATURE : (CFR: 41.10 / 43.5 / 45.13) EA2.05 Torus/suppression chamber pressure: Plant-Specific	3.8	81
295030 Low Suppression Pool Water Level / 5						2.04	Ability to determine and/or interpret the following as they apply to LOW SUPPRESSION POOL WATER LEVEL : (CFR: 41.10 / 43.5 / 45.13) EA2.04 Drywell/ suppression chamber differential pressure: Mark-I&II	3.7	82
<b>K/A Category Totals:</b>									
	0	0	0	0	3	4	<b>Group Point Total:</b>	7	7

ES-401							BWR Examination Outline		ES-401-1 Rev 9 (Errata)	
Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (RO)										
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G 2	K/A Topic(s)	Imp.	#	
295009 Low Reactor Water Level / 2					2.03		Ability to determine and/or interpret the following as they apply to LOW REACTOR WATER LEVEL : (CFR: 41.10 / 43.5 / 45.13) AA2.03 Reactor water cleanup blowdown rate	2.9	21	
295013 High Suppression Pool Temperature / 13		2.01					Knowledge of the interrelations between HIGH SUPPRESSION POOL TEMPERATURE and the following: (CFR: 41.7 / 45.8) AK2.01 Suppression pool cooling	3.6	22	
295017 High Off-Site Release Rate / 9					2.04		Ability to determine and/or interpret the following as they apply to HIGH OFF-SITE RELEASE RATE : (CFR: 41.10 / 43.5 / 45.13) AA2.04 †Source of off-site release	3.6	23	
295022 Loss of CRD Pumps / 1	1.02						Knowledge of the operational implications of the following concepts as they apply to LOSS OF CRD PUMPS: (CFR: 41.8 to 41.10) AK1.02 Reactivity control	3.6	24	
295032 High Secondary Containment Area Temperature / 5			3.01				Knowledge of the reasons for the following responses as they apply to HIGH SECONDARY CONTAINMENT AREA TEMPERATURE : EK3.01 Emergency/normal depressurization	3.5	25	
295034 Secondary Containment Ventilation High Radiation / 9					2.01		Ability to determine and/or interpret the following as they apply to SECONDARY CONTAINMENT VENTILATION HIGH RADIATION : (CFR: 41.10 / 43.5 / 45.13) EA2.01 Ventilation radiation levels	3.8	26	
295036 Secondary Containment High Sump/Area Water Level / 5	1.01						Knowledge of the operational implications of the following concepts as they apply to SECONDARY CONTAINMENT HIGH SUMP/AREA WATER LEVEL : (CFR: 41.8 to 41.10) EK1.01 Radiation releases	2.9	27	

<b>K/A Category Totals:</b>	2	1	1	0	3	0	<b>Group Point Total:</b>	7	7
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BWR Examination Outline										S-401-1 Rev 9 (Errata)	
Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (SRO)											
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G 2	K/A Topic(s)	Imp.	#		
295002 Loss of Main Condenser Vacuum / 3						2.4.11	2.4.11 Knowledge of abnormal condition procedures. (CFR: 41.10 / 43.5 / 45.13)	3.6	83		
295009 Low Reactor Water Level / 2					2.02		Ability to determine and/or interpret the following as they apply to LOW REACTOR WATER LEVEL : (CFR: 41.10 / 43.5 / 45.13) AA2.02 Steam flow/feed flow mismatch	3.7	84		
295035 Secondary Containment High Differential Pressure / 5					2.01		Ability to determine and/or interpret the following as they apply to SECONDARY CONTAINMENT HIGH DIFFERENTIAL PRESSURE: (CFR: 41.8 to 41.10) EA2.01 Secondary containment pressure: Plant-Specific	3.9	85		
<b>K/A Category Totals:</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>		<b>Group Point Total:</b>	<b>3</b>	<b>3</b>	

ES-401 BWR Examination Outline													ES-401-1 Rev 9 (Errata)	
Plant Systems - Tier 2 Group 1 (RO)														
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G 2	K/A Topic(s)	Imp.	#
203000 RHR/LPCI: Injection Mode							1.09					Ability to predict and/or monitor changes in parameters associated with operating the RHR/LPCI: INJECTION MODE (PLANT SPECIFIC) controls including: (CFR: 41.5 / 45.5) A1.09 Component cooling water systems	2.9	28
205000 Shutdown Cooling System (RHR Shutdown Cooling Mode)								2.03				Ability to (a) predict the impacts of the following on the SHUTDOWN COOLING SYSTEM (RHR SHUTDOWN COOLING MODE) ; 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) A2.03 A.C. failure	3.2	29
206000 High Pressure Coolant Injection System									3.08			Ability to monitor automatic operations of the HIGH PRESSURE COOLANT INJECTION SYSTEM including: (CFR: 41.7 / 45.7) A3.08 Condensate storage tank level: BWR-2,3,4	3.7	30
207000 Isolation (Emergency) Condenser												N/A JAF		
209001 Low Pressure Core Spray System										4.02		Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8) A4.02 Suction valves	3.5	31
209002 High Pressure Core Spray System (HPCS)												N/A JAF		
211000 Standby Liquid Control System											2.2.12	2.2.12 Knowledge of surveillance procedures. (CFR: 41.10 / 45.13)	3.0	32
212000 Reactor Protection System	1.04											Knowledge of the physical connections and/or causeeffect relationships between REACTOR PROTECTION SYSTEM and the following: (CFR: 41.2 to 41.9 / 45.7 to 45.8) K1.04 A.C. electrical distribution	3.4	33
215003 Intermediate Range Monitor (IRM) System	1.01											Knowledge of the physical connections and/or cause effect relationships between INTERMEDIATE RANGE MONITOR (IRM) SYSTEM and the following: (CFR: 41.2 to 41.9 / 45.7 to 45.8) K1.01 RPS	3.9	34
215004 Source Range Monitor (SRM) System			3.02									Knowledge of the effect that a loss or malfunction of the SOURCE RANGE MONITOR (SRM) SYSTEM will have on following: (CFR: 41.7 / 45.4) K3.02 Reactor manual control: Plant-Specific	3.4	35
215005 Average Power Range Monitor/Local Power Range Monitor System				4.07								Knowledge of AVERAGE POWER RANGE MONITOR/LOCAL POWER RANGE MONITOR SYSTEM design feature(s) and/or interlocks which provide for the following: (CFR: 41.7) K4.07 Flow biased trip setpoints	3.7	36

217000 Reactor Core Isolation Cooling System (RCIC)				5.06							Knowledge of the operational implications of the following concepts as they apply to REACTOR CORE ISOLATION COOLING SYSTEM (RCIC): (CFR: 41.5 / 45.3) K5.06 Turbine operation	2.7	37
218000 Automatic Depressurization System				6.01							Knowledge of the effect that a loss or malfunction of the following will have on the AUTOMATIC DEPRESSURIZATION SYSTEM: (CFR: 41.7 / 45.7) K6.01 RHR/LPCI system pressure: Plant-Specific	3.9	38
223002 Primary Containment Isolation System/Nuclear Steam Supply Shut-Off					1.02						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	39
239002 Relief/Safety Valves						2.02					Ability to (a) predict the impacts of the following on the RELIEF/SAFETY VALVES; 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 Leaky SRV	3.1	40
259002 Reactor Water Level Control System							3.04				Ability to monitor automatic operations of the REACTOR WATER LEVEL CONTROL SYSTEM including: (CFR: 41.7 / 45.7) A3.04 Changes in reactor feedwater flow 3.2 3.2	3.2	41
261000 Standby Gas Treatment System								4.07			Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8) A4.07 System flow	3.1	42
262001 A.C. Electrical Distribution									2.4.48		2.4.48 Ability to interpret control room indications to verify the status and operation of system / and understand how operator actions and directives affect plant and system conditions. (CFR: 43.5 / 45.12)	3.5	43
262002 Uninterruptable Power Supply (A.C./D.C.)	1.01										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) K1.01 Feedwater level control: Plant-Specific	2.8	44
263000 D.C. Electrical Distribution		2.01									Knowledge of electrical power supplies to the following: (CFR: 41.7) K2.01 Major D.C. loads	3.1	45
264000 Emergency Generators (Diesel/Jet)			3.02								Knowledge of the effect that a loss or malfunction of the EMERGENCY GENERATORS (DIESEL/JET) will have on following: (CFR: 41.7 / 45.4) K3.02 A.C. electrical distribution	3.9	46
300000 Instrument Air System (IAS)				4.03							Knowledge of (INSTRUMENT AIR SYSTEM) design feature(s) and or interlocks which provide for the following: (CFR: 41.7) K4.03 Securing of IAS upon loss of cooling water	2.8	47
400000 Component Cooling Water System (CCWS)									2.4.11		2.4.11 Knowledge of abnormal condition procedures. (CFR: 41.10/43.5/45.13)	2.8	48

261000 Standby Gas Treatment System								1.04							Ability to predict and/or monitor changes in parameters associated with operating the STANDBY GAS TREATMENT SYSTEM controls including: (CFR: 41.5 / 45.5) A1.04 Secondary containment differential pressure	3.0	49
262001 A.C. Electrical Distribution								2.04							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: (CFR: 41.5 / 45.6) A2.04 Types of loads that, if deenergized, would degrade or hinder plant operation	3.8	50
262002 Uninterruptable Power Supply (A.C./D.C.)							4.01								Knowledge of UNINTERRUPTABLE POWER SUPPLY (A.C./D.C.) design feature(s) and/or interlocks which provide for the following: (CFR: 41.7) K4.01 Transfer from preferred power to alternate supplies	2.8	51
263000 D.C. Electrical Distribution													4.02		Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8) A4.02 Battery voltage indicator: Plant-Specific	3.2	52
205000 Shutdown Cooling System (RHR Shutdown Cooling Mode)														5.03	Knowledge of the operational implications of the following concepts as they apply to SHUTDOWN COOLING SYSTEM (RHR SHUTDOWN COOLING MODE) : (CFR: 41.5 / 45.3) K5.03 Heat removal mechanisms	2.8	53
<b>K/A Category Totals:</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>				<b>Group Point Total:</b>	<b>26</b>	<b>26</b>

BWR Examination Outline												01-1 Rev 9 (Errata)		
Plant Systems - Tier 2, Group 1 (SRO)														
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G 2	K/A Topic(s)	Imp.	#
203000 RHR/LPCI Injection Mode								2.09				Ability to (a) predict the impacts of the following on the RHR/LPCI: INJECTION MODE (PLANT SPECIFIC); 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) A2.09 Inadequate system flow	3.4	86
209001 Low Pressure Core Spray System								2.03				Ability to (a) predict the impacts of the following on the LOW PRESSURE CORE SPRAY SYSTEM; 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) A2.03 A.C. failures	3.6	87
215004 Source Range Monitor (SRM) System											2.4.21	2.4.21 Knowledge of the parameters and logic used to assess the status of safety functions including: 1.) Reactivity control 2.) Core cooling and heat removal 3.) Reactor coolant system integrity 4.) Containment conditions 5.) Radioactivity release control. (CFR: 43.5 / 45.12)	4.3	88
218000 Automatic Depressurization System								2.04				Ability to (a) predict the impacts of the following on the AUTOMATIC DEPRESSURIZATION SYSTEM; 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) A2.04 ADS failure to initiate	4.2	89
262001 A.C. Electrical Distribution											2.1.6	2.1.6 Ability to supervise and assume a management role during plant transients and upset conditions. (CFR: 43.5 / 45.12 / 45.13)	4.3	90
<b>K/A Category Totals:</b>	0	0	0	0	0	0	0	3	0	0	2	<b>Group Point Total:</b>	5	5

BWR Examination Outline													ES-401-1 Rev 9 (Errata)		
Plant Systems - Tier 2 Group 2 (R0)															
ES-401	System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G 2	K/A Topic(s)	Imp.	#
	201003 Control Rod and Drive Mechanism								2.02				Ability to (a) predict the impacts of the following on the CONTROL ROD AND DRIVE MECHANISM ; 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 Uncoupled rod	3.7	54
	202001 Recirculation System											2.1.7	2.1.7 Ability to evaluate plant performance and make operational judgments based on operating characteristics / reactor behavior / and instrument interpretation.(CFR: 43.5 / 45.12 / 45.13)	3.7	55
	202002 Recirculation Flow Control System	1.08											Knowledge of the physical connections and/or cause effect relationships between RECIRCULATION FLOW CONTROL SYSTEM and the following: (CFR: 41.2 to 41.9 / 45.7 to 45.8) K1.08 Feedwater flow	3.1	56
	216000 Nuclear Boiler Instrumentation						6.02						Knowledge of the effect that a loss or malfunction of the following will have on the NUCLEAR BOILER INSTRUMENTATION : (CFR: 41.7 / 45.7) K6.02 D.C. electrical distribution	2.8	57
	219000 RHR/LPCI: Torus/Suppression Pool Cooling Mode		2.02										Knowledge of electrical power supplies to the following: (CFR: 41.7) K2.02 Pumps	3.1	58
	230000 RHR/LPCI: Torus/Suppression Pool Spray Mode										4.06		Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8) A4.06 Valve logic reset following automatic initiation of LPCI/RHR in injection mode	4.0	59
	234000 Fuel Handling Equipment	1.04											Knowledge of the physical connections and/or cause effect relationships between FUEL HANDLING EQUIPMENT and the following: (CFR: 41.2 to 41.9 / 45.7 to 45.8) K1.04 †Reactor manual control system: Plant-Specific	3.3	60
	290002 Reactor Vessel Internals			3.03									Knowledge of the effect that a loss or malfunction of the REACTOR VESSEL INTERNALS will have on following: (CFR: 41.7 /45.6) K3.03 Reactor power	2.9	61
	241000 Reactor/Turbine Pressure Regulating System				4.01								Knowledge of REACTOR/TURBINE PRESSURE REGULATING SYSTEM design feature(s) and/or interlocks which provide for the following: (CFR: 41.7) K4.01 Reactor pressure control	3.8	62



ES-401	BWR Examination Outline											01-1 Rev 9 (Errata)		
Plant Systems - Tier 2 Group 2 (SRO)														
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G 2	K/A Topic(s)	Imp.	#
241000 Reactor/Turbine Pressure Regulator												2.4.50 Ability to verify system alarm setpoints and operate controls identified in the alarm response manual. (CFR: 45.3)	3.3	91
219000 RHR/LPCI: Torus/Suppression Pool Cooling Mode								2.03				Ability to (a) predict the impacts of the following on the RHR/LPCI: TORUS/SUPPRESSION POOL COOLING MODE ; 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) A2.03 Valve closures	3.2	92
234000 Fuel Handling Equipment								2.01				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 operations: (CFR: 41.5 / 45.6) A2.01 †Interlock failure	3.7	93
<b>K/A Category Totals:</b>	0	0	0	0	0	0	0	2	0	0	1	<b>Group Point Total:</b>	<b>3</b>	<b>3</b>

ES-401		Generic Knowledge and Abilities Outline (Tier 3)			ES-401-1 Rev 9 (Errata)
Facility:	JAF		Date of Exam:	Date	Level: RO
Category	K/A #	Topic	Imp.	#	
1  Conduct of Operations	2.1.11	2.1.11 Knowledge of less than one hour technical specification action statements for systems. (CFR: 43.2 / 45.13) IMPORTANCE RO 3.0 SRO 3.8	3.0	66	
	2.1.33	2.1.33 Ability to recognize indications for system operating parameters which are entry-level conditions for technical specifications. (CFR: 43.2 / 43.3 / 45.3) IMPORTANCE RO 3.4 SRO 4.0	3.4	67	
	2.1.18	2.1.18 Ability to make accurate / clear and concise logs / records / status boards / and reports. (CFR: 45.12 / 45.13) IMPORTANCE RO 2.9 SRO 3.0	2.9	68	
			3	3	
2  Equipment Control	2.2.30	2.2.30 Knowledge of RO duties in the control room during fuel handling such as alarms from fuel handling area / communication with fuel storage facility / systems operated from the control room in support of fueling operations / and supporting instrumentation. (CFR: 45.12) IMPORTANCE RO 3.5 SRO 3.3	3.5	69	
	2.2.22	2.2.22 Knowledge of limiting conditions for operations and safety limits. (CFR: 43.2 / 45.2) IMPORTANCE RO 3.4 SRO 4.1	3.4	70	
			2	2	
	2.3.1	2.3.1 Knowledge of 10 CFR: 20 and related facility radiation control requirements. (CFR: 41.12 / 43.4. 45.9 / 45.10) IMPORTANCE RO 2.6 SRO 3.0	2.6	71	

3  Radiation Protection	2.3.11	2.3.11 Ability to control radiation releases. (CFR: 45.9 / 45.10) IMPORTANCE RO 2.7 SRO 3.2	2.7	72
	2.3.10	2.3.10 Ability to perform procedures to reduce excessive levels of radiation and guard against personnel exposure. (CFR: 43.4 / 45.10) IMPORTANCE RO 2.9 SRO 3.3	2.9	73
			3	3
4  Emergency Procedures and Plan	2.4.29	2.4.29 Knowledge of the emergency plan. (CFR: 43.5 / 45.11) IMPORTANCE RO 2.6 SRO 4.0	2.6	74
	2.4.18	2.4.18 Knowledge of the specific bases for EOPs. (CFR: 41.10 / 45.13) IMPORTANCE RO 2.7 SRO 3.6	2.7	75
		<b>Subtotal</b>	2	2
<b>Tier 3 Point Total</b>			10	10

ES-401		Generic Knowledge and Abilities Outline (Tier 3)			ES-401-3 Rev 9
Facility:	JAF	Date of Exam:		Date	Level: SRO
Category	K/A #	Topic		Imp.	#
1 Conduct of Operations	2.1.12	2.1.12 Ability to apply technical specifications for a system. (CFR: 43.2 / 43.5 / 45.3) IMPORTANCE RO 2.9 SRO 4.0		4	94
	2.1.10	2.1.10 Knowledge of conditions and limitations in the facility license. (CFR: 43.1 / 45.13) IMPORTANCE RO 2.7 SRO 3.9		3.9	95
		<b>Subtotal</b>		<b>2</b>	<b>2</b>
2 Equipment Control	2.2.8	2.2.8 Knowledge of the process for determining if the proposed change / test / or experiment involves an unreviewed safety question. (CFR: 43.3 / 45.13) IMPORTANCE RO 1.8 SRO 3.3		3.3	96
	2.2.24	2.2.24 Ability to analyze the affect of maintenance activities on LCO status.(CFR: 43.2 / 45.13) IMPORTANCE RO 2.6 SRO 3.8		3.8	97
		<b>Subtotal</b>		<b>2</b>	<b>2</b>
3 Radiation Protection	2.3.3	2.3.3 Knowledge of SRO responsibilities for auxiliary systems that are outside the control room (e.g. / waste disposal and handling systems). (CFR: 43.4 / 45.10) IMPORTANCE RO 1.8 SRO 2.9		2.9	98
	2.3.1	2.3.1 Knowledge of 10 CFR: 20 and related facility radiation control requirements. (CFR: 41.12 / 43.4. 45.9 / 45.10) IMPORTANCE RO 2.6 SRO 3.0		3	99
		<b>Subtotal</b>		<b>2</b>	<b>2</b>

<b>4 Emergency Procedures and Plan</b>	2.4.3	2.4.3 Ability to identify post-accident instrumentation. (CFR: 41.6 / 45.4) IMPORTANCE RO 3.5 SRO 3.8	3.8	100
		<b>Subtotal</b>	<b>1</b>	<b>1</b>
		<b>Tier 3 Point Total</b>	<b>7</b>	<b>7</b>



Facility: FitzPatrick Examination Level (circle one): <b>RO</b> / SRO		Date of Examination: 3/31/08 to 4/10/08 Operating Test Number: 1
Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations	N	Manually Compute Average Drywell Air Temperature
Conduct of Operations	N	Work Hour Restrictions
Equipment Control	M	Complete a Tagout
Radiation Control		N/A
Emergency Plan	D, P	ERO CallOut
<p><b>NOTE:</b> 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.</p> <p>* Type Codes &amp; Criteria: (C)ontrol room                  (D)irect from bank (<math>\leq 3</math> for ROs; <math>\leq 4</math> for SROs &amp; RO retakes)                  (N)ew or (M)odified from bank (<math>\geq 1</math>)                  (P)revious 2 exams (<math>\leq 1</math>; randomly selected)                  (S)imulator</p>		

Facility: FitzPatrick Examination Level (circle one): RO / SRO		Date of Examination: 3/31/08 to 4/10/08 Operating Test Number: 1
Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations	N	Manually Compute Average Drywell Air Temperature
Conduct of Operations	N	Work Hour Restrictions
Equipment Control	M	Complete a Tagout
Radiation Control	D, P	Canal Discharge Approval
Emergency Plan	M, S	Post Scenario Event Classification
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 (D)irect from bank ( $\leq 3$ for ROs; $\leq 4$ for SROs & RO retakes) (N)ew or (M)odified from bank ( $\geq 1$ ) (P)revious 2 exams ( $\leq 1$ ; randomly selected) (S)imulator		

Facility: FitzPatrick Exam Level (circle one): <b>RO</b> / SRO-I / SRO-U	Date of Examination: 3/31/08 to 4/10/08 Operating Test No.: 1	
Control Room Systems <sup>®</sup> (8 for RO; 7 for SRO-I; 2 or 3 for SRO-U, including 1 ESF)		
System / JPM Title	Type Code*	Safety Function
a. Component Cooling Water / Change In-Service RBCLC Pumps	A, N, S	8
b. Recirculation / Start Reactor Recirc Pump	A, N, S	1
c. High Pressure Coolant Injection / Shutdown HPCI	A, D, S	2
d. Main and Reheat Steam / MSIV Surveillance Test	N, S	3
e. Primary Containment System / Respond to High Drywell Temperature	A, N, S	5
f. Low Pressure Core Spray / Core Spray Surveillance Test	N, L, S	4
g. Emergency Generators / Load Test of B Emergency Diesel	D, L, S	6
h. APRM/LPRM / Restore Inoperable LPRM	N, S	7
In-Plant Systems <sup>®</sup> (3 for RO; 3 for SRO-I; 3 or 2 SRO-U)		
i. Safety Relief Valves / Pull Fuses for Stuck Open SRV	D, R	3
j. CRD Hydraulics / Change In-Service Flow Control Valves	D, E	1
k. Emergency Generators / SBO Start of EDG	N, E	6
@ All control room (and in-plant) systems must be different and 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	4-6 / 4-6 / 2-3	
(C)ontrol room		
(D)irect from bank	≤ 9 / ≤ 8 / ≤ 4	
(E)mergency or abnormal in-plant	≥ 1 / ≥ 1 / ≥ 1	
(L)ow-Power / <u>Shutdown</u>	≥ 1 / ≥ 1 / ≥ 1	
(N)ew or (M)odified from bank including 1(A)	≥ 2 / ≥ 2 / ≥ 1	
(P)revious 2 exams	≤ 3 / ≤ 3 / ≤ 2 (randomly selected)	
(R)CA		
(S)imulator	≥ 1 / ≥ 1 / ≥ 1	

Facility: FitzPatrick Exam Level (circle one): RO / <b>SRO-I</b> / SRO-U	Date of Examination: 3/31/08 to 4/10/08 Operating Test No.: 1	
Control Room Systems <sup>®</sup> (8 for RO; 7 for SRO-I; 2 or 3 for SRO-U, including 1 ESF)		
System / JPM Title	Type Code*	Safety Function
a. Component Cooling Water / Change In-Service RBCLC Pumps	A, N, S	8
b. Recirculation / Start Reactor Recirc Pump	A, N, S	1
c. High Pressure Coolant Injection / Shutdown HPCI	A, D, S	2
d. Main and Reheat Steam / MSIV Surveillance Test	N, S	3
e. Primary Containment System / Respond to High Drywell Temperature	A, N, S	5
f. Low Pressure Core Spray / Core Spray Surveillance Test	N, L, S	4
g. Emergency Generators / Load Test of B Emergency Diesel	D, L, S	6
h. N/A		
In-Plant Systems <sup>®</sup> (3 for RO; 3 for SRO-I; 3 or 2 for SRO-U)		
i. Safety Relief Valves / Pull Fuses for Stuck Open SRV	D, R	3
j. CRD Hydraulics / Change In-Service Flow Control Valves	D, E	1
k. Emergency Generators / SBO Start of EDG	N, E	6
@ All control room (and in-plant) systems must be different and 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	4-6 / 4-6 / 2-3	
(C)ontrol room		
(D)irect from bank	≤ 9 / ≤ 8 / ≤ 4	
(E)mergency or abnormal in-plant	≥ 1 / ≥ 1 / ≥ 1	
(L)ow-Power / <u>Shutdown</u>	≥ 1 / ≥ 1 / ≥ 1	
(N)ew or (M)odified from bank including 1(A)	≥ 2 / ≥ 2 / ≥ 1	
(P)revious 2 exams	≤ 3 / ≤ 3 / ≤ 2 (randomly selected)	
(R)CA	≥ 1 / ≥ 1 / ≥ 1	
(S)imulator		

Facility: <u>FitzPatrick</u>		Scenario No.: <u>1</u>	Op-Test No.: _____
Examiners: Fish _____ Fuller (U) _____		Operators: _____	
Johnson _____		_____	
Presby _____		_____	
Initial Conditions: <u>87% power (MOL)</u>			
_____			
Turnover: <u>Operating normally at 87%, after assuming shift will continue to 65% in preparation for cleaning condenser water boxes; Perform a swap of CRD pumps to allow maintenance to record vibration data on the 'B' CRD pump</u>			
Event No.	Malf. No.	Event Type*	Event Description
1	Trigger 1	N (RO)	Swap in service CRD pumps.
2	Trigger 2	C (BOP)	HPCI Aux Oil Pump breaker failure.
3	Trigger 3	R (RO)	5% power reduction.
4	Trigger 4	C (BOP)	'A' RFP trip and failure of Recirc runback.
5	Trigger 5	C (ALL)	Loss of all CRD pumps
6	Trigger 6	M (ALL)	ATWS due to RPS failure.
7	Trigger 7	C (BOP)	Main turbine trip, loss of Auxiliary busses
8	Trigger 8	C (BOP)	RCIC controller failure.
9	Trigger 9	M (ALL)	Emergency Depressurization
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

Facility: <u>FitzPatrick</u>		Scenario No.: <u>3</u>		Op-Test No.: _____	
Examiners: Fish _____		Fuller (U/) _____		Operators: _____	
Johnson _____		_____		_____	
Presby _____		_____		_____	
Initial Conditions: 50% (MOL)					
Turnover: <u>  </u> The plant at 50% power. Power ascension was suspended to allow Electrical Maintenance to perform an inspection of T4 following a report of a cooling fan problem. Busses 10200 and 10400 are currently fed from Reserve. Electrical Maintenance has successfully completed the inspection of T4. The shift will restore the electric plant lineup to normal by transferring busses 10200 and 10400 from Reserve to Normal.					
Raise reactor power with control rods. Start at Step 46 with rod 30-19. Pull from notch 12 to 24. Continue power ascension per OP-65					
Event No.	Malfunction No.	Event Type*	Event Description		
1	Trigger 1	I (RO)	APRM instrument failure.		
2	Trigger 2	N (ALL)	Restoration of busses 10200 and 10400 to T4.		
3	Trigger 3	R (RO)	Raises power with control rods		
4	Trigger 4	C (BOP)	Failure of LPCI inverter		
5	Trigger 5	C (BOP) (SRO)	Inadvertent HPCI initiation		
6	Trigger 6	C (ALL)	Unisolable leak on Instrument Air header		
7	Trigger 7	M (ALL)	SBLOCA on recirc line, containment spray required		
8	Trigger 8	C (ALL)	Spray torus, both loop of RHR fail		
9	Trigger 9	M (ALL)	Spray Torus/Drywell with RHR SW		
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor					

Facility: <u>FitzPatrick</u>		Scenario No.: <u>4</u>		Op-Test No.: _____	
Examiners: Fish _____		Fuller (U) _____		Operators: _____	
Johnson _____		_____		_____	
Presby _____		_____		_____	
Initial Conditions: 92% (MOL					
Turnover: 92% CTP, pulling rods to 103% rod line and 96% CTP, then hold for one hour prior to proceeding to 100% CTP using recirc flow.					
Rod pull sheet step 65. Next rod will be rod 18-15. rod pull from 12 - 16					
Crew will swap TBCLC pumps in preparation for maintenance.					
Event No.	Malf. No.	Event Type*	Event Description		
1	Trigger 1	C (BOP)	Trip of 'B' Service Water pump. Manual start of 'A' SW pump.		
2	Trigger 2	R (RO)	Raise power by withdrawing control rods		
3	Trigger 3	C (RO)	Stuck control rod		
4	Trigger 4	N (BOP)	Swap TBCLC pumps.		
5	Trigger 5	C (BOP)	Loss of level control 6A FW heater.		
6	Trigger 6	C (ALL)	Both Feed pumps trip.		
7	Trigger 7	C (ALL)	Condensate pumps trip.		
8	Trigger 8	C (BOP)	RCIC starts then trips after two minutes. HPCI fail to auto start.		
9	Trigger 8	M (ALL)	Recirc loop break in drywell. Containment sprays required.		
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor					

Facility: <u>FitzPatrick</u> Scenario No.: <u>5</u> Op-Test No.: _____			
Examiners: Fish _____ Fuller (U) _____ Operators: _____ Johnson _____ Presby _____			
Initial Conditions: 50% (MOL)			
Turnover: Drywell is being purged IAW OP-37 D.6.11. SBT 'A' is running to vent torus. 'C' Condensate pump is running in preparation for securing 'B' condensate pump for maintenance Control rods are at Step 47.			
Event No.	Malf. No.	Event Type*	Event Description
1	Trigger 1	C (BOP)	'A' Standby Gas Treatment fan trip.
2	Trigger 2	N (BOP)	Normal shutdown of 'B' condensate pump.
3	Trigger 3	I (RO)	Failure of 'B' NR level instrument upscale, level transient.
4	Trigger 4	C (ALL)	Fuel clad failure
5	Trigger 5	C (ALL)	ATWS due to RPS 'A' failure.
6	Trigger 6	C (BOP)	FW startup level control valve failure
7	Trigger 7	C (BOP)	RWCU failure to isolate
8	Trigger 8	M (ALL)	Steam leak in Reactor Building resulting in rad release.
9	Trigger 9	M (ALL)	Reactor depressurization.
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			