

Facility:		2016 NRC												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 & Plant Evolution	1	4	3	3				3	4			3	20	4		3	7	
	2	1	1	1				2	1			1	7	2		1	3	
	Tier Totals	5	4	4				5	5			4	27	6		4	10	
2. Plant Systems	1	3	3	2	2	2	3	2	2	2	2	3	26	2		3	5	
	2	1	1	1	1	1	1	1	1	1	2	1	12	0	1	2	3	
	Tier Totals	4	4	3	3	3	4	3	3	3	4	4	38	3		5	8	
3. Generic Knowledge & Abilities Categories				1		2		3		4		10	1		2	3	4	7
				3		2		3		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). (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.

G* Generic K/As

2016 NRC
Written Examination Outline
Emergency and Abnormal Plant Evolutions – Tier 1 Group 1

EAPE # / Name Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Q#
295024 High Drywell Pressure / 5					X		EA2.02 - Ability to determine and/or interpret the following as they apply to HIGH DRYWELL PRESSURE: Drywell temperature	4.0	76
295016 Control Room Abandonment / 7					X		AA2.07 - Ability to determine and/or interpret the following as they apply to CONTROL ROOM ABANDONMENT : Suppression chamber pressure	3.4	77
295003 Partial or Complete Loss of AC / 6					X		AA2.02 - Ability to determine and/or interpret the following as they apply to PARTIAL OR COMPLETE LOSS OF A.C. POWER : Reactor power, pressure, and level	4.3	78
295031 Reactor Low Water Level / 2						X	2.4.47 - Emergency Procedures / Plan: Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material.	4.2	79
295038 High Off-site Release Rate / 9						X	2.4.35 - Emergency Procedures / Plan: Knowledge of local auxiliary operator tasks during emergency and the resultant operational effects.	4.0	80
295018 Partial or Total Loss of CCW / 8						X	2.4.11 - Emergency Procedures / Plan: Knowledge of abnormal condition procedures.	4.2	81
295026 Suppression Pool High Water Temp. / 5					X		EA2.03 - Ability to determine and/or interpret the following as they apply to SUPPRESSION POOL HIGH WATER TEMPERATURE: Reactor pressure	4.0	82
295026 Suppression Pool High Water Temp. / 5	X						EK1.01 - Knowledge of the operational implications of the following concepts as they apply to SUPPRESSION POOL HIGH WATER TEMPERATURE : Pump NPSH	3.0	39
295024 High Drywell Pressure / 5	X						EK1.01 - Knowledge of the operational implications of the following concepts as they apply to HIGH DRYWELL PRESSURE : Drywell integrity: Plant-Specific	4.1	40
600000 Plant Fire On-site / 8	X						AK1.02 - Knowledge of the operation applications of the following concepts as they apply to Plant Fire On Site: Fire Fighting	2.9	41
295030 Low Suppression Pool Water Level / 5		X					EK2.03 - Knowledge of the interrelations between LOW SUPPRESSION POOL WATER LEVEL and the following: LPCS	3.8	42
295038 High Off-site Release Rate / 9		X					EK2.01 - Knowledge of the interrelations between HIGH OFF-SITE RELEASE RATE and the following: Radwaste	3.1	43
295021 Loss of Shutdown Cooling / 4		X					AK2.03 - Knowledge of the interrelations between LOSS OF SHUTDOWN COOLING and the following: RHR/shutdown cooling	3.6	44
295018 Partial or Total Loss of CCW / 8			X				AK3.01 - Knowledge of the reasons for the following responses as they apply to PARTIAL OR COMPLETE LOSS OF COMPONENT COOLING WATER : Isolation of non-essential heat loads: Plant-Specific	2.9	45
295003 Partial or Complete Loss of AC / 6			X				AK3.02 - Knowledge of the reasons for the following responses as they apply to PARTIAL OR COMPLETE LOSS OF	2.9	46

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Written Examination Outline
Emergency and Abnormal Plant Evolutions – Tier 1 Group 1

EAPE # / Name Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Q#
							A.C. POWER : Selective tripping		
295005 Main Turbine Generator Trip / 3			X				AK3.03 - Knowledge of the reasons for the following responses as they apply to MAIN TURBINE GENERATOR TRIP: Feedwater temperature decrease	2.8	47
295001 Partial or Complete Loss of Forced Core Flow Circulation / 1 & 4				X			AA1.03 - Ability to operate and/or monitor the following as they apply to PARTIAL OR COMPLETE LOSS OF FORCED CORE FLOW CIRCULATION : RMCS: Plant-Specific	2.6	48
295025 High Reactor Pressure / 3				X			EA1.04 - Ability to operate and/or monitor the following as they apply to HIGH REACTOR PRESSURE: HPCI: Plant-Specific	3.8	49
295037 SCRAM Conditions Present and Reactor Power Above APRM Downscale or Unknown / 1				X			EA1.10 - Ability to operate and/or monitor the following as they apply to SCRAM CONDITION PRESENT AND REACTOR POWER ABOVE APRM DOWNSCALE OR UNKNOWN : Alternate boron injection methods: Plant-Specific	3.7	50
295028 High Drywell Temperature / 5					X		EA2.05 - Ability to determine and/or interpret the following as they apply to HIGH DRYWELL TEMPERATURE : Torus/suppression chamber pressure: Plant-Specific	3.6	51
700000 Generator Voltage and Electric Grid Disturbances					X		AA2.07 - Ability to determine and/or interpret the following as they apply to GENERATOR VOLTAGE AND ELECTRIC GRID DISTURBANCES: Operational status of engineered safety features.	3.6	52
295006 SCRAM / 1					X		AA2.06 - Ability to determine and/or interpret the following as they apply to SCRAM : Cause of reactor SCRAM	3.5	53
295004 Partial or Total Loss of DC Pwr / 6						X	2.1.20 - Conduct of Operations: Ability to interpret and execute procedure steps.	4.6	54
295019 Partial or Total Loss of Inst. Air / 8						X	2.1.27 - Conduct of Operations: Knowledge of system purpose and / or function.	3.9	55
295016 Control Room Abandonment / 7						X	2.2.3 - Equipment Control: (multi-unit license) Knowledge of the design, procedural, and operational differences between units.	3.8	56
295031 Reactor Low Water Level / 2	X						EK1.01 - Knowledge of the operational implications of the following concepts as they apply to REACTOR LOW WATER LEVEL : Adequate core cooling	4.6	57
295023 Refueling Acc Cooling Mode / 8					X		AA2.01 - Ability to determine and/or interpret the following as they apply to REFUELING ACCIDENTS : Area radiation levels	3.6	58
K/A Category Totals:	4	3	3	3	4/4	3/3	Group Point Total:	20/7	

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Written Examination Outline
Emergency and Abnormal Plant Evolutions – Tier 1 Group 2

EAPE # / Name Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Q#
500000 High CTMT Hydrogen Conc. / 5					X		EA2.01 - Ability to determine and / or interpret the following as they apply to HIGH PRIMARY CONTAINMENT HYDROGEN CONCENTRATIONS: Hydrogen monitoring system availability	3.5	83
295007 High Reactor Pressure / 3						X	2.1.7 - Conduct of Operations: Ability to evaluate plant performance and make operational judgements based on operating characteristics, reactor behavior, and instrument interpretation.	4.7	84
295022 Loss of CRD Pumps / 1					X		AA2.02 - Ability to determine and/or interpret the following as they apply to LOSS OF CRD PUMPS : CRD system status	3.4	85
295022 Loss of CRD Pumps / 1	X						AK1.02 - Knowledge of the operational implications of the following concepts as they apply to LOSS OF CRD PUMPS: Reactivity control	3.6	59
295012 High Drywell Temperature / 5		X					AK2.02 - Knowledge of the interrelations between HIGH DRYWELL TEMPERATURE and the following: Drywell cooling	3.6	60
295002 Loss of Main Condenser Vac / 3			X				AK3.02 - Knowledge of the reasons for the following responses as they apply to LOSS OF MAIN CONDENSER VACUUM : Turbine trip	3.4	61
295008 High Reactor Water Level / 2				X			AA1.09 - Ability to operate and/or monitor the following as they apply to HIGH REACTOR WATER LEVEL : Ability to drain: Plant-Specific	3.3	62
295034 Secondary Containment Ventilation High Radiation / 9					X		EA2.01 - Ability to determine and/or interpret the following as they apply to SECONDARY CONTAINMENT VENTILATION HIGH RADIATION : Ventilation radiation levels	3.8	63
295017 High Off-site Release Rate / 9						X	2.4.47 - Emergency Procedures / Plan: Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material.	4.2	64
295033 High Secondary Containment Area Radiation Levels / 9				X			EA1.05 - Ability to operate and/or monitor the following as they apply to HIGH SECONDARY CONTAINMENT AREA RADIATION LEVELS : Affected systems so as to isolate damaged portions	3.9	65
K/A Category Totals:	1	1	1	2	1/2	1/1	Group Point Total:	7/3	

2016 NRC
Written Examination Outline
Plant Systems – Tier 2 Group 1

System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A2	A 3	A 4	G		Imp	Q#
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264000 EDGs								X				A2.10 - Ability to (a) predict the impacts of the following on the EMERGENCY GENERATORS (DIESEL/JET) ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: LOCA	4.2	86
215005 APRM / LPRM								X				A2.02 - Ability to (a) predict the impacts of the following on the AVERAGE POWER RANGE MONITOR/LOCAL POWER RANGE MONITOR SYSTEM ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions Upscale or downscale trips	3.7	87
212000 RPS											X	2.2.42 - Equipment Control:: Ability to recognize system parameters that are entry-level conditions for Technical Specifications.	4.6	88
400000 Component Cooling Water											X	2.2.4 - Equipment Control: (multi-unit license) Ability to explain the variations in control board layouts, systems, instrumentation and procedural actions between units at a facility.	3.6	89
203000 RHR/LPCI: Injection Mode											X	2.1.31 - Conduct of Operations: Ability to locate control room switches, controls, and indications, and to determine that they correctly reflect the desired plant lineup.	4.3	90
206000 HPCI	X											K1.04 - Knowledge of the physical connections and/or cause- effect relationships between HIGH PRESSURE COOLANT INJECTION SYSTEM and the following: Reactor feedwater system: BWR-2,3,4	3.6	1
262002 UPS (AC/DC)	X											K1.17 - Knowledge of the physical connections and/or cause- effect relationships between UNINTERRUPTABLE POWER SUPPLY (A.C./D.C.) and the following: Scram solenoid valves: Plant-Specific	3.1	2
262001 AC Electrical Distribution		X										K2.01 - Knowledge of electrical power supplies to the following: Off-site sources of power	3.3	3
211000 SLC		X										K2.02 - Knowledge of electrical power supplies to the following: Explosive valves	3.1	4

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Written Examination Outline
Plant Systems – Tier 2 Group 1

System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G		Imp	Q#
218000 ADS			X										4.5	5
215004 Source Range Monitor			X										3.7	6
215005 APRM / LPRM				X									4.1	7
259002 Reactor Water Level Control				X									3.1	8
209001 LPCS					X								2.6	9
205000 Shutdown Cooling					X								2.8	10
400000 Component Cooling Water						X							2.7	11
203000 RHR/LPCI: Injection Mode							X						3.3	12
212000 RPS								X					2.6	13

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Written Examination Outline
Plant Systems – Tier 2 Group 1

System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A2	A 3	A 4	G		Imp	Q#
261000 SGTS							X					A1.03 - Ability to predict and/or monitor changes in parameters associated with operating the STANDBY GAS TREATMENT SYSTEM controls including: Off-site release levels	3.2	14
215003 IRM								X				A2.05 - 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: Faulty or erratic operation of detectors/system	3.3	15
264000 EDGs								X				A2.08 - Ability to (a) predict the impacts of the following on the EMERGENCY GENERATORS (DIESEL/JET) ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Initiation of emergency generator room fire protection system	3.3	16
239002 SRVs									X			A3.02 - Ability to monitor automatic operations of the RELIEF/SAFETY VALVES including: SRV operation on high reactor pressure	4.3	17
263000 DC Electrical Distribution									X			A3.01 - Ability to monitor automatic operations of the D.C. ELECTRICAL DISTRIBUTION including: Meters, dials, recorders, alarms, and indicating lights	3.2	18
300000 Instrument Air										X		A4.01 - Ability to manually operate and/or monitor in the control room: Pressure gauges	2.6	19
217000 RCIC										X		A4.05 - Ability to manually operate and/or monitor in the control room: Reactor water level	4.1	20
223002 PCIS/Nuclear Steam Supply Shutoff											X	2.4.9 - Emergency Procedures / Plan: Knowledge of low power / shutdown implications in accident (e.g., loss of coolant accident or loss of residual heat removal) mitigation strategies.	3.8	21
218000 ADS											X	2.4.20 - Emergency Procedures / Plan: Knowledge of operational implications of EOP warnings, cautions, and notes.	3.8	22
215004 Source Range Monitor											X	2.1.30 - Conduct of Operations: Ability to locate and operate components, including local controls.	4.4	23

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Written Examination Outline
Plant Systems – Tier 2 Group 1

System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A2	A 3	A 4	G		Imp	Q#
223002 PCIS/Nuclear Steam Supply Shutoff						X						K6.05 - Knowledge of the effect that a loss or malfunction of the following will have on the PRIMARY CONTAINMENT ISOLATION SYSTEM/NUCLEAR STEAM SUPPLY SHUT-OFF : Containment instrumentation	3.0	24
203000 RHR/LPCI: Injection Mode	X											K1.17 - Knowledge of the physical connections and/or cause- effect relationships between RHR/LPCI: INJECTION MODE (PLANT SPECIFIC) and the following: Reactor pressure	4.0	25
205000 Shutdown Cooling		X										K2.02 - Knowledge of electrical power supplies to the following: Motor operated valves	2.5	26
K/A Category Totals:	3	3	2	2	2	3	2	2/2	2	2	3/3	Group Point Total:	26/5	

2016 NRC
Written Examination Outline
Plant Systems – Tier 2 Group 2

System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A2	A 3	A 4	G		Imp.	Q #
290002 Reactor Vessel Internals								X				A2.01 - Ability to (a) predict the impacts of the following on the REACTOR VESSEL INTERNALS : and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: LOCA	4.0	91
286000 Fire Protection											X	2.2.25 - Equipment Control: Knowledge of bases in technical specifications for limiting conditions for operations and safety limits.	4.2	92
214000 RPIS											X	2.4.34 - Emergency Procedures / Plan: Knowledge of RO tasks performed outside the main control room during an emergency and the resultant operational effects.	4.1	93
201002 RMCS	X											K1.01 - Knowledge of the physical connections and/or cause- effect relationships between REACTOR MANUAL CONTROL SYSTEM and the following: Control rod drive hydraulic system	3.2	27
223001 Primary CTMT and Aux.		X										K2.09 - Knowledge of electrical power supplies to the following: Drywell cooling fans: Plant-Specific	2.7	28
288000 Plant Ventilation			X									K3.02 - Knowledge of the effect that a loss or malfunction of the PLANT VENTILATION SYSTEMS will have on following: Reactor building temperature: Plant-Specific	2.9	29
290002 Reactor Vessel Internals				X								K4.05 - Knowledge of REACTOR VESSEL INTERNALS design feature(s) and/or interlocks which provide for the following: Natural circulation	3.3	30
271000 Off-gas					X							K5.09 - Knowledge of the operational implications of the following concepts as they apply to OFFGAS SYSTEM : Hydrogen and oxygen recombination	2.6	31
241000 Reactor/Turbine Pressure Regulator						X						K6.06 - Knowledge of the effect that a loss or malfunction of the following will have on the REACTOR/TURBINE PRESSURE REGULATING SYSTEM : Reactor pressure	3.8	32
239001 Main and Reheat Steam							X					A1.10 - Ability to predict and/or monitor changes in parameters associated with operating the MAIN AND REHEAT STEAM SYSTEM controls including: Reactor power	3.8	33

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Written Examination Outline
Plant Systems – Tier 2 Group 2

System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A2	A 3	A 4	G		Imp.	Q #
256000 Reactor Condensate								X				A2.12 - Ability to (a) predict the impacts of the following on the REACTOR CONDENSATE SYSTEM; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Loss of equipment component cooling water systems	3.1	34
201003 Control Rod and Drive Mechanism									X			A3.01 - Ability to monitor automatic operations of the CONTROL ROD AND DRIVE MECHANISM including: Control rod position	3.7	35
214000 RPIS										X		A4.01 - Ability to manually operate and/or monitor in the control room: RCIS rod action control bypass switches	3.2	36
214000 RPIS											X	2.4.2 - Emergency Procedures / Plan: Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions.	4.5	37
233000 Fuel Pool Cooling/Cleanup										X		A4.10 - Ability to manually operate and/or monitor in the control room: Tank levels	2.5	38
K/A Category Totals:	1	1	1	1	1	1	1	1/1	1	2	1/2	Group Point Total:	12/3	

Facility:	2016 NRC		Date:			
Category	K/A #	Topic	RO		SRO-Only	
			IR	Q#	IR	Q#
1. Conduct of Operations	2.1.42	Knowledge of new and spent fuel movement procedures.			3.4	94
	2.1.5	Ability to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc.			3.9	98
	2.1.9	Ability to direct personnel activities inside the control room.	2.9	66		
	2.1.26	Knowledge of industrial safety procedures (such as rotating equipment, electrical, high temperature, high pressure, caustic, chlorine, oxygen and hydrogen).	3.4	67		
	2.1.6	Ability to manage the control room crew during plant transients.	3.8	75		
	Subtotal			3		2
2. Equipment Control	2.2.35	Ability to determine Technical Specification Mode of Operation.			4.5	95
	2.2.1	Ability to perform pre-startup procedures for the facility, including operating those controls associated with plant equipment that could affect reactivity.			4.4	100
	2.2.4	(multi-unit license) Ability to explain the variations in control board layouts, systems, instrumentation and procedural actions between units at a facility.	3.6	68		
	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 effect plant and system conditions.	4.2	69		
	Subtotal			2		2
3. Radiation Control	2.3.15	Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.			3.1	96
	2.3.11	Ability to control radiation releases.	3.8	70		

	2.3.15	Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.	2.9	71		
	2.3.12	Knowledge of Radiological Safety Principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc.	3.2	74		
	Subtotal			3		1
4. Emergency Procedures / Plan	2.4.38	Ability to take actions called for in the facility emergency plan, including supporting or acting as emergency coordinator if required.			4.4	97
	2.4.11	Knowledge of abnormal condition procedures.			4.2	99
	2.4.17	Knowledge of EOP terms and definitions.	3.9	72		
	2.4.49	Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.	4.6	73		
	Subtotal			2		2
Tier 3 Point Total				10		7

