

Facility: Indian Point

Printed: 05/01/2018

Date Of Exam: 06/13/2018

Tier	Group	RO K/A Category Points												SRO-Only Points				
		K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	Total	A2		G*	Total	
1. Emergency & Abnormal Plant Evolutions	1	3	3	3	N/A			3	3	N/A			3	18	0		0	0
	2	1	2	2				1	2				1	9	0		0	0
	Tier Totals	4	5	5				4	5				4	27	0		0	0
2. Plant Systems	1	3	2	4	3	2	2	3	1	4	3	1	28	0		0	0	
	2	1	1	0	1	1	1	1	1	1	1	1	10	0	0	0	0	
	Tier Totals	4	3	4	4	3	3	4	2	5	4	2	38	0		0	0	
3. Generic Knowledge And Abilities Categories					1		2		3		4		10	1	2	3	4	0
					2		3		2		3			0	0	0	0	

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/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 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.

PWR RO Examination Outline

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ES - 401

Emergency and Abnormal Plant Evolutions - Tier 1 / Group 1

Form ES-401-2

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
000007 Reactor Trip - Stabilization - Recovery / 1	X						EK1.02 - Shutdown margin	3.4	1
000009 Small Break LOCA / 3	X						EK1.02 - Use of steam tables	3.5	1
000011 Large Break LOCA / 3			X				EK3.13 - Hot-leg injection/recirculation	3.8	1
000015/000017 RCP Malfunctions / 4					X		AA2.08 - When to secure RCPs on high bearing temperature	3.4	1
000022 Loss of Rx Coolant Makeup / 2					X		AA2.04 - How long PZR level can be maintained within limits	2.9	1
000025 Loss of RHR System / 4				X			AA1.02 - RCS inventory	3.8	1
000026 Loss of Component Cooling Water / 8						X	2.1.20 - Ability to interpret and execute procedure steps.	4.6	1
000027 Pressurizer Pressure Control System Malfunction / 3		X					AK2.03 - Controllers and positioners	2.6	1
000029 ATWS / 1		X					EK2.06 - Breakers, relays, and disconnects	2.9*	1
000038 Steam Gen. Tube Rupture / 3	X						EK1.02 - Leak rate vs. pressure drop	3.2	1
000040 Steam Line Rupture - Excessive Heat Transfer / 4						X	2.3.15 - Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.	2.9	1
000055 Station Blackout / 6			X				EK3.02 - Actions contained in EOP for loss of offsite and onsite power	4.3	1
000057 Loss of Vital AC Inst. Bus / 6					X		AA2.19 - The plant automatic actions that will occur on the loss of a vital ac electrical instrument bus	4.0	1
000058 Loss of DC Power / 6				X			AA1.03 - Vital and battery bus components	3.1	1
000062 Loss of Nuclear Svc Water / 4			X				AK3.02 - The automatic actions (alignments) within the nuclear service water resulting from the actuation of the ESFAS	3.6	1
000077 Generator Voltage and Electric Grid Disturbances / 6		X					AK2.07 - Turbine / Generator control	3.6	1
W/E04 LOCA Outside Containment / 3						X	2.4.4 - Ability to recognize abnormal indications for system operating parameters that are entry-level conditions for emergency and abnormal operating procedures.	4.5	1

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Emergency and Abnormal Plant Evolutions - Tier 1 / Group 1

Form ES-401-2

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
W/E11 Loss of Emergency Coolant Recirc. / 4				X			EA1.1 - Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features	3.9	1
K/A Category Totals:	3	3	3	3	3	3	Group Point Total:		18

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Emergency and Abnormal Plant Evolutions - Tier 1 / Group 2

Form ES-401-2

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
000001 Continuous Rod Withdrawal / 1		X					AK2.06 - T-ave./ref. deviation meter	3.0*	1
000051 Loss of Condenser Vacuum / 4			X				AK3.01 - Loss of steam dump capability upon loss of condenser vacuum	2.8*	1
000061 ARM System Alarms / 7					X		AA2.06 - Required actions if alarm channel is out of service	3.2	1
000068 Control Room Evac. / 8						X	2.4.34 - Knowledge of RO tasks performed outside the main control room during an emergency and the resultant operational effects.	4.2	1
000074 Inad. Core Cooling / 4			X				EK3.08 - Securing RCPs	4.1	1
000076 High Reactor Coolant Activity / 9				X			AA1.04 - Failed fuel-monitoring equipment	3.2	1
W/E02 SI Termination / 3					X		EA2.2 - Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments	3.5	1
W/E03 LOCA Cooldown - Depress. / 4	X						EK1.1 - Components, capacity, and function of emergency systems	3.4	1
W/E10 Natural Circ. / 4		X					EK2.2 - Facility's heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility	3.6	1
K/A Category Totals:	1	2	2	1	2	1	Group Point Total: 9		

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ES - 401

Plant Systems - Tier 2 / Group 1

Form ES-401-2

Sys/Evol # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
003 Reactor Coolant Pump						X						K6.14 - Starting requirements	2.6	1
004 Chemical and Volume Control			X									K3.01 - CRDS (automatic)	2.5*	1
004 Chemical and Volume Control											X	2.2.42 - Ability to recognize system parameters that are entry-level conditions for Technical Specifications.	3.9	1
005 Residual Heat Removal					X							K5.09 - Dilution and boration considerations	3.2	1
006 Emergency Core Cooling										X		A4.07 - ECCS pumps and valves	4.4	1
006 Emergency Core Cooling	X											K1.09 - Nitrogen	2.6	1
007 Pressurizer Relief/Quench Tank				X								K4.01 - Quench tank cooling	2.6	1
008 Component Cooling Water								X				A2.01 - Loss of CCW pump	3.3	1
010 Pressurizer Pressure Control	X											K1.07 - Containment	2.9	1
012 Reactor Protection									X			A3.05 - Single and multiple channel trip indicators	3.6	1
013 Engineered Safety Features Actuation				X								K4.12 - Safety injection block	3.7	1
022 Containment Cooling									X			A3.01 - Initiation of safeguards mode of operation	4.1	1
022 Containment Cooling		X										K2.01 - Containment cooling fans	3.0*	1
026 Containment Spray			X									K3.02 - Recirculation spray system	4.2*	1
039 Main and Reheat Steam									X			A3.02 - Isolation of the MRSS	3.1	1
059 Main Feedwater			X									K3.02 - AFW System	3.6	1
061 Auxiliary/Emergency Feedwater					X							K5.01 - Relationship between AFW flow and RCS heat transfer	3.6	1
061 Auxiliary/Emergency Feedwater						X						K6.02 - Pumps	2.6	1
062 AC Electrical Distribution			X									K3.03 - DC system	3.7	1
062 AC Electrical Distribution							X					A1.03 - Effect on instrumentation and controls of switching power supplies	2.5	1
063 DC Electrical Distribution							X					A1.01 - Battery capacity as it is affected by discharge rate	2.5	1
063 DC Electrical Distribution										X		A4.01 - Major breakers and control power fuses	2.8*	1
064 Emergency Diesel Generator		X										K2.03 - Control power	3.2*	1
064 Emergency Diesel Generator							X					A1.08 - Maintaining	3.1	1

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Plant Systems - Tier 2 / Group 1

Form ES-401-2

Sys/Evol # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic minimum load on ED/G (to prevent reverse power)	Imp.	Points
073 Process Radiation Monitoring										X		A4.03 - Check source for operability demonstration	3.1	1
076 Service Water	X											K1.01 - CCW system	3.4	1
078 Instrument Air									X			A3.01 - Air pressure	3.1	1
103 Containment				X								K4.04 - Personnel access hatch and emergency access hatch	2.5	1
K/A Category Totals:	3	2	4	3	2	2	3	1	4	3	1	Group Point Total:	28	

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Plant Systems - Tier 2 / Group 2

Form ES-401-2

Sys/Evol # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
001 Control Rod Drive					X							K5.88 - Effects of boron on temperature coefficient	2.9	1
011 Pressurizer Level Control		X										K2.01 - Charging pumps	3.1	1
015 Nuclear Instrumentation						X						K6.02 - Discriminator/compensation circuits	2.6	1
017 In-core Temperature Monitor				X								K4.01 - Input to subcooling monitors	3.4	1
028 Hydrogen Recombiner and Purge Control							X					A1.02 - Containment pressure	3.4*	1
041 Steam Dump/Turbine Bypass Control										X		A4.08 - Steam dump valves	3.0*	1
045 Main Turbine Generator								X				A2.12 - Control rod insertion limits exceeded (stabilize secondary)	2.5	1
055 Condenser Air Removal											X	2.3.14 - Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities.	3.4	1
056 Condensate	X											K1.03 - MFW	2.6*	1
068 Liquid Radwaste									X			A3.02 - Automatic isolation	3.6	1
K/A Category Totals:	1	1	0	1	1	1	1	1	1	1	1	Group Point Total:	10	

Generic Knowledge and Abilities Outline (Tier 3)

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Form ES-401-3

<u>Generic Category</u>	<u>KA</u>	<u>KA Topic</u>	<u>Imp.</u>	<u>Points</u>
Conduct of Operations	2.1.37	Knowledge of procedures, guidelines, or limitations associated with reactivity management.	4.3	1
	2.1.42	Knowledge of new and spent fuel movement procedures.	2.5	1
	Category Total:			2
Equipment Control	2.2.14	Knowledge of the process for controlling equipment configuration or status.	3.9	1
	2.2.22	Knowledge of limiting conditions for operations and safety limits.	4.0	1
	2.2.35	Ability to determine Technical Specification Mode of Operation.	3.6	1
	Category Total:			3
Radiation Control	2.3.4	Knowledge of radiation exposure limits under normal or emergency conditions.	3.2	1
	2.3.7	Ability to comply with radiation work permit requirements during normal or abnormal conditions.	3.5	1
	Category Total:			2
Emergency Procedures/Plan	2.4.9	Knowledge of low power /shutdown implications in accident (e.g. LOCA or loss of RHR) mitigation strategies.	3.8	1
	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.	4.0	1
	2.4.26	Knowledge of facility protection requirements, including fire brigade and portable fire fighting equipment usage.	3.1	1
	Category Total:			3

Generic Total: 10

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Tier	Group	RO K/A Category Points												SRO-Only Points				
		K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	Total	A2		G*	Total	
1. Emergency & Abnormal Plant Evolutions	1	0	0	0	N/A			0	0	N/A		0	0	3		3	6	
	2	0	0	0				0	0			2		2	4			
	Tier Totals	0	0	0				0	0			0	5		5	10		
2. Plant Systems	1	0	0	0	0	0	0	0	0	0	0	0	0	3		2	5	
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	3	
	Tier Totals	0	0	0	0	0	0	0	0	0	0	0	0	5		3	8	
3. Generic Knowledge And Abilities Categories					1		2		3		4		0	1	2	3	4	7
					0		0		0		0			2	2	1	2	

Note:

1. Ensure that at least two topics from every applicable K/A category are sampled within each tier of the RO and SRO-only outlines (i.e., except for one category in Tier 3 of the SRO-only outline, the "Tier Totals" in each K/A category shall not be less than two).
2. The point total for each group and tier in the proposed outline must match that specified in the table. The final point total for each group and tier may deviate by ± 1 from that specified in the table based on NRC revisions. The final RO exam must total 75 points and the SRO-only exam must total 25 points.
3. Systems/evolutions within each group are identified on the associated outline; systems or evolutions that do not apply at the facility should be deleted and justified; operationally important, site-specific systems/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 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.

PWR SRO Examination Outline

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ES - 401

Emergency and Abnormal Plant Evolutions - Tier 1 / Group 1

Form ES-401-2

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
000009 Small Break LOCA / 3					X		EA2.36 - Difference between overcooling and LOCA indications	4.6	1
000022 Loss of Rx Coolant Makeup / 2					X		AA2.02 - Charging pump problems	3.7	1
000025 Loss of RHR System / 4						X	2.4.4 - Ability to recognize abnormal indications for system operating parameters that are entry-level conditions for emergency and abnormal operating procedures.	4.7	1
000038 Steam Gen. Tube Rupture / 3						X	2.1.45 - Ability to identify and interpret diverse indications to validate the response of another indication.	4.3	1
000065 Loss of Instrument Air / 8					X		AA2.06 - When to trip reactor if instrument air pressure is decreasing	4.2	1
W/E05 Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4						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.	4.6	1
K/A Category Totals:	0	0	0	0	3	3	Group Point Total: 6		

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ES - 401

Emergency and Abnormal Plant Evolutions - Tier 1 / Group 2

Form ES-401-2

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
000005 Inoperable/Stuck Control Rod / 1						X	2.1.7 - Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.	4.7	1
000032 Loss of Source Range NI / 7						X	2.2.25 - Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits.	4.2	1
W/E03 LOCA Cooldown - Depress. / 4					X		EA2.1 - Facility conditions and selection of appropriate procedures during abnormal and emergency operations	4.2	1
W/E08 RCS Overcooling - PTS / 4					X		EA2.1 - Facility conditions and selection of appropriate procedures during abnormal and emergency operations	4.2	1
K/A Category Totals:	0	0	0	0	2	2	Group Point Total: 4		

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Plant Systems - Tier 2 / Group 1

Form ES-401-2

Sys/Evol # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
006 Emergency Core Cooling								X				A2.02 - Loss of flow path	4.3	1
026 Containment Spray											X	2.2.21 - Knowledge of pre- and post-maintenance operability requirements.	4.1	1
061 Auxiliary/Emergency Feedwater								X				A2.07 - Air or MOV failure	3.5	1
064 Emergency Diesel Generator											X	2.2.36 - Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations.	4.2	1
103 Containment								X				A2.03 - Phase A and B isolation	3.8*	1
K/A Category Totals:	0	0	0	0	0	0	0	3	0	0	2	Group Point Total:	5	

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Plant Systems - Tier 2 / Group 2

Form ES-401-2

Sys/Evol # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
002 Reactor Coolant											X	2.2.40 - Ability to apply Technical Specifications for a system.	4.7	1
035 Steam Generator								X				A2.04 - Steam flow/feed mismatch	3.8	1
068 Liquid Radwaste								X				A2.04 - Failure of automatic isolation	3.3	1
K/A Category Totals:	0	0	0	0	0	0	0	2	0	0	1	Group Point Total:	3	

Generic Knowledge and Abilities Outline (Tier 3)

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Form ES-401-3

<u>Generic Category</u>	<u>KA</u>	<u>KA Topic</u>	<u>Imp.</u>	<u>Points</u>
Conduct of Operations	2.1.35	Knowledge of the fuel-handling responsibilities of SROs.	3.9	1
	2.1.40	Knowledge of refueling administrative requirements.	3.9	1
	Category Total:			2
Equipment Control	2.2.17	Knowledge of the process for managing maintenance activities during power operations, such as risk assessments, work prioritization, and coordination with the transmission system operator.	3.8	1
	2.2.38	Knowledge of conditions and limitations in the facility license.	4.5	1
	Category Total:			2
Radiation Control	2.3.11	Ability to control radiation releases.	4.3	1
	Category Total:			1
Emergency Procedures/Plan	2.4.41	Knowledge of the emergency action level thresholds and classifications.	4.6	1
	2.4.44	Knowledge of emergency plan protective action recommendations.	4.4	1
	Category Total:			2
Generic Total:				7

Tier / Group	Randomly Selected K/A	Reason for Rejection
RO 1/1	025 G2.4.21	RHR not part of the parameters or logic used to assess the status of safety functions
RO 1/1	026 G2.4.41	EALs and classifications not RO level knowledge
RO 1/2	E15 A2.2	Containment flooding sampled on Audit exam.
RO 2/1	004 G2.4.6	EOP mitigation strategies not conducive to system level question
RO 2/1	059 A2.12	Oversampling of MFW failure in A2 category (two 039 K/As selected were A2.
RO 2/1	076 K2.04	No Reactor Building closed cooling water system at IP3
RO 2/1	078 G2.2.3	Multi-unit license N/A
RO 2/2	055 G2.2.42	No Tech Specs associated with Condenser Air Removal system
RO 3	2.2.15	Using design and configuration control documents to determine expected plant condition not suitable to written exam or RO level of knowledge.
RO 3	2.2.37	Determining operability/availability of safety related equipment is SRO level knowledge
SRO 2/1	013 2.1.34	Primary and Secondary chemistry limits N/A to ESF system
SRO 2/1	025 A2.05	No ice condenser at IP3
SRO 1/1	038 2.2.13	Managing shutdown maintenance risk NA to SGTR
SRO 3	2.3.5	Ability to use rad monitors not SRO level
SRO 2/1	103 A2.01	Unable to write discriminating question at SRO level for this infrequently performed evolution
RO 1/2	028 A2.05	IP3 does not have a charging flow control valve, all PDPs
RO 1/1	065 AA1.05	Oversampling of loss of instrument air and RPS between RO and SRO exam
RO 1/2	060 K3.02	PAB vent is not isolated during release
RO 2/1	073 K4.02	There is no letdown isolation on high RCS activity
RO 2/1	007 K5.02	Unable to write question which meets KA.
RO 2/1	059 A2.05	Topic sampled on SRO exam (035 A2.04)