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ES-401, Rev. 9 **PWR Examination Outline** **Form ES-401-2**

Facility: Date of Exam:

Tier	Group	RO K/A Category Points												SRO-Only Points		
		K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G *	Total	A2	G*	Total
1. Emergency & Abnormal Plant Evolutions	1	3	3	3	N/A			3	3	N/A		3	18	3	3	6
	2	2	1	2				2	1			1	9	2	2	4
	Tier Totals	5	4	5				5	4			4	27	5	5	10
2. Plant Systems	1	3	3	3	2	3	2	3	2	3	2	2	28	3	2	5
	2	1	1	1	1	1	1	1	0	1	1	1	10	2	1	3
	Tier Totals	4	4	4	3	4	3	4	2	4	3	3	38	5	3	8
3. Generic Knowledge and Abilities Categories		1			2			3			4		10	1	2	3	4	7
		3			2			2			3			1	2	2	2	

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 (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.

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KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1 K2 K3 K4 K5 K6 A1 A2 A3 A4 G	TOPIC:
007EK2.03	Reactor Trip - Stabilization - Recovery / 1	3.5	3.6	☐ ☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of the interrelations between (EMERGENCY PLANT EVOLUTION) and the following:(CFR: 41.7 / 45.7 / 45.8)	Reactor trip status panel
008AG2.4.45	Pressurizer Vapor Space Accident / 3	4.1	4.3	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ This is a Generic, no stem statement is associated.	Ability to prioritize and interpret the significance of each annunciator or alarm.
009EA2.10	Small Break LOCA / 3	3.1	3.7	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ Ability to determine and interpret the following as they apply to (EMERGENCY PLANT EVOLUTION):(CFR: 41.10 / 43.5 / 45.13)	Airborne activity
015AA2.08	RCP Malfunctions / 4	3.4	3.5	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ Ability to determine and interpret the following as they apply to ABNORMAL PLANT EVOLUTION):(CFR: 41.10 / 43.5 / 45.13)	When to secure RCPs on high bearing temperature
022AK1.02	Loss of Rx Coolant Makeup / 2	2.7	3.1	☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of the operational implications of the following concepts as they apply to the (ABNORMAL PLANT EVOLUTION):(CFR: 41.8 to 41.10 / 45.3)	Relationship of charging flow to pressure differential between charging and RCS
025AG2.2.36	Loss of RHR System / 4	3.1	4.2	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ This is a Generic, no stem statement is associated.	Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions of operations

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1 K2 K3 K4 K5 K6 A1 A2 A3 A4 G	TOPIC:
026AA2.03	Loss of Component Cooling Water / 8	2.6	2.9	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ Ability to determine and interpret the following as they apply to ABNORMAL PLANT EVOLUTION):(CFR: 41.10 / 43.5 / 45.13)	The valve lineups necessary to restart the CCWS while bypassing the portion of the system causing the abnormal condition
029EG2.1.31	ATWS / 1	4.6	4.3	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ This is a Generic, no stem statement is associated.	Ability to locate control room switches, controls and indications and to determine that they are correctly reflecting the desired plant lineup.
040AK1.06	Steam Line Rupture - Excessive Heat Transfer / 4	3.7	3.8	☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of the operational implications of the following concepts as they apply to the (ABNORMAL PLANT EVOLUTION):(CFR: 41.8 to 41.10 / 45.3)	High-energy steam line break considerations
054AK1.02	Loss of Main Feedwater / 4	3.6	4.2	☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of the operational implications of the following concepts as they apply to the (ABNORMAL PLANT EVOLUTION):(CFR: 41.8 to 41.10 / 45.3)	Effects of feedwater introduction on dry S/G
055EK2.04	Station Blackout / 6			☐ ☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of the interrelations between (EMERGENCY PLANT EVOLUTION) and the following:(CFR: 41.7 / 45.7 / 45.8)	Pumps
056AA1.11	Loss of Off-site Power / 6	3.7	3.7	☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ ☐ Ability to operate and / or monitor the following as they apply to (ABNORMAL PLANT EVOLUTION):(CFR: 41.7 / 45.5 / 45.6)	HPI system

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KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1 K2 K3 K4 K5 K6 A1 A2 A3 A4 G	TOPIC:
057AK3.01	Loss of Vital AC Inst. Bus / 6	4.1	4.4	☐ ☐ ☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of the reasons for the following responses as they apply to (ABNORMAL PLANT EVOLUTION):(CFR: 41.5 / 41.10 / 45.6 / 45.13)	Actions contained in EOP for loss of vital ac electrical instrument bus
058AA1.01	Loss of DC Power / 6	3.4	3.5	☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ ☐ Ability to operate and / or monitor the following as they apply to (ABNORMAL PLANT EVOLUTION):(CFR: 41.7 / 45.5 / 45.6)	Cross-tie of the affected dc bus with the alternate supply
062AK3.04	Loss of Nuclear Svc Water / 4	3.5	3.7	☐ ☐ ☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of the reasons for the following responses as they apply to (ABNORMAL PLANT EVOLUTION):(CFR: 41.5 / 41.10 / 45.6 / 45.13)	Effect on the nuclear service water discharge flow header of a loss of CCW
065AK3.04	Loss of Instrument Air / 8	3	3.2	☐ ☐ ☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of the reasons for the following responses as they apply to (ABNORMAL PLANT EVOLUTION):(CFR: 41.5 / 41.10 / 45.6 / 45.13)	Cross-over to backup air supplies
077AA1.03	Generator Voltage and Electric Grid Disturbances / 6	3.8	3.7	☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ ☐ Ability to operate and / or monitor the following as they apply to (ABNORMAL PLANT EVOLUTION):(CFR: 41.7 / 45.5 / 45.6)	Voltatge regulator controls
WE11EK2.1	Loss of Emergency Coolant Recirc. / 4	3.6	3.9	☐ ☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of the interrelations between (EMERGENCY PLANT EVOLUTION) and the following:(CFR: 41.7 / 45.7 / 45.8)	Components and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes and automatic and manual features.

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KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1 K2 K3 K4 K5 K6 A1 A2 A3 A4 G	TOPIC:
001AK3.02	Continuous Rod Withdrawal / 1	3.2	4.3	☐ ☐ ☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of the reasons for the following responses as they apply to (ABNORMAL PLANT EVOLUTION):(CFR: 41.5 / 41.10 / 45.6 / 45.13)	Tech-Spec limits on rod operability
005AA1.01	Inoperable/Stuck Control Rod / 1	3.6	3.4	☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ ☐ Ability to operate and / or monitor the following as they apply to (ABNORMAL PLANT EVOLUTION):(CFR: 41.7 / 45.5 / 45.6)	CRDS
024AA2.01	Emergency Boration / 1	3.8	4.1	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ Ability to determine and interpret the following as they apply to ABNORMAL PLANT EVOLUTION):(CFR: 41.10 / 43.5 / 45.13)	Whether boron flow and/or MOVs are malfunctioning from plant conditions
036AK3.01	Fuel Handling Accident / 8	3.1	3.7	☐ ☐ ☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of the reasons for the following responses as they apply to (ABNORMAL PLANT EVOLUTION):(CFR: 41.5 / 41.10 / 45.6 / 45.13)	Different inputs that will cause a reactor building evacuation
059AK1.02	Accidental Liquid RadWaste Rel. / 9	2.6	3.2	☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of the operational implications of the following concepts as they apply to the (ABNORMAL PLANT EVOLUTION):(CFR: 41.8 to 41.10 / 45.3)	Biological effects on humans of various types of radiation, exposure levels that are acceptable for nuclear power plant personnel and the units used for radiation-intensity measurements and for radiation exposure levels
067AG2.1.31	Plant Fire On-site / 9 8	4.6	4.3	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ This is a Generic, no stem statement is associated.	Ability to locate control room switches, controls and indications and to determine that they are correctly reflecting the desired plant lineup.

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KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1 K2 K3 K4 K5 K6 A1 A2 A3 A4 G	TOPIC:
WE08EA1.1	RCS Overcooling - PTS / 4	3.8	3.8	☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ ☐ Ability to operate and / or monitor the following as they apply to (EMERGENCY PLANT EVOLUTION):(CFR: 41.7 / 45.5 / 45.6)	Components and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes and automatic and manual features.
WE10EK1.1	Natural Circ. With Seam Void/ 4	3.3	3.6	☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of the operational implications of the following concepts as they apply to the EMERGENCY PLANT EVOLUTION):(CFR: 41.8 to 41.10 / 45.3)	Components, capacity, and function of emergency systems.
WE14EK2.1	Loss of CTMT Integrity / 5	3.4	3.7	☐ ☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of the interrelations between (EMERGENCY PLANT EVOLUTION) and the following:(CFR: 41.7 / 45.7 / 45.8)	Components and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes and automatic and manual features.

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KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1 K2 K3 K4 K5 K6 A1 A2 A3 A4 G	TOPIC:
003A1.04	Reactor Coolant Pump	2.6	2.5	☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ ☐ Ability to predict and/or monitor changes in parameters associated with operating the (SYSTEM) controls including:(CFR: 41.5 / 45.5)	RCP oil reservoir levels
003K4.02	Reactor Coolant Pump	2.5	2.7	☐ ☐ ☐ ☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of (SYSTEM) design feature(s) and or interlock(s) which provide for the following:(CFR: 41.7)	Prevention of cold water accidents or transients
004A3.16	Chemical and Volume Control	3.8	4.2	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ Ability to monitor automatic operations of the (SYSTEM) including:(CFR: 41.7 / 45.5)	Interpretation of emergency borate valve position indicating lights
005K6.03	Residual Heat Removal	2.5	2.6	☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ ☐ ☐ Knowledge of the effect that a loss or malfunction of the following will have on the (SYSTEM):(CFR: 41.7 / 45.7)	RHR heat exchanger
006A3.06	Emergency Core Cooling	3.9	4.2	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ Ability to monitor automatic operations of the (SYSTEM) including:(CFR: 41.7 / 45.5)	Valve lineups
007A2.05	Pressurizer Relief/Quench Tank	3.2	3.6	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ Ability to (a) predict the impacts of the following on the (SYSTEM) and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operation:(CFR: 41.5 / 43.5 / 45.3 / 45.13)	Exceeding PRT high-pressure limits

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KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1 K2 K3 K4 K5 K6 A1 A2 A3 A4 G	TOPIC:
008A3.04	Component Cooling Water	2.9	3.2	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ Ability to monitor automatic operations of the (SYSTEM) including:(CFR: 41.7 / 45.5)	Requirements on and for the CCWS for different conditions of the power plant
008K1.04	Component Cooling Water	3.3	3.3	☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of the physical connections and/or cause-effect relationships between (SYSTEM) and the following:(CFR: 41.2 to 41.9 / 45.7 to 45.8)	RCS, in order to determine source(s) of RCS leakage into the CCWS
010A2.01	Pressurizer Pressure Control	3.3	3.6	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ Ability to (a) predict the impacts of the following on the (SYSTEM) and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operation:(CFR: 41.5 / 43.5 / 45.3 / 45.13)	Heater failures
012K2.01	Reactor Protection	3.3	3.7	☐ ☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of electrical power supplies to the following:(CFR: 41.7)	RPS channels, components and interconnections
013G2.4.46	Engineered Safety Features Actuation	4.2	4.2	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ This is a Generic, no stem statement is associated.	Ability to verify that the alarms are consistent with the plant conditions.
022K4.03	Containment Cooling	3.6	4.0	☐ ☐ ☐ ☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of (SYSTEM) design feature(s) and or interlock(s) which provide for the following:(CFR: 41.7)	Automatic containment isolation

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1 K2 K3 K4 K5 K6 A1 A2 A3 A4 G	TOPIC:
025K5 02	Ice Condenser	2.6	2.8	☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of the operational implications of the following concepts as they apply to the (SYSTEM):(CFR: 41.5 / 45.7)	Heat transfer
025K6.01	Ice Condenser	3.4	3.6	☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ ☐ ☐ Knowledge of the effect that a loss or malfunction of the following will have on the (SYSTEM):(CFR: 41.7 / 45.7)	Upper and lower doors of the ice condenser
026K2.01	Containment Spray	3.4	3.6	☐ ☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of electrical power supplies to the following:(CFR: 41.7)	Containment spray pumps
026K3.02	Containment Spray	4.2	4.3	☐ ☐ ☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of the effect that a loss or malfunction of the (SYSTEM) will have on the following:(CFR: 41.7 / 45.6)	Recirculation spray system
039K5.05	Main and Reheat Steam	2.7	3.1	☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of the operational implications of the following concepts as they apply to the (SYSTEM):(CFR: 41.5 / 45.7)	Bases for RCS cooldown limits
059K3.04	Main Feedwater	3.6	3.8	☐ ☐ ☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of the effect that a loss or malfunction of the (SYSTEM) will have on the following:(CFR: 41.7 / 45.6)	RCS
061K3.01	Auxiliary/Emergency Feedwater	4.4	4.6	☐ ☐ ☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of the effect that a loss or malfunction of the (SYSTEM) will have on the following:(CFR: 41.7 / 45.6)	RCS

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KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1 K2 K3 K4 K5 K6 A1 A2 A3 A4 G	TOPIC:
061K5.03	Auxiliary/Emergency Feedwater	2.6	2.9	☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of the operational implications of the following concepts as they apply to the (SYSTEM):(CFR: 41.5 / 45.7)	Pump head effects when control valve is shut
062K1.02	AC Electrical Distribution	4.1	4.4	☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of the physical connections and/or cause-effect relationships between (SYSTEM) and the following:(CFR: 41.2 to 41.9 / 45.7 to 45.8)	ED/G
063G2.4.8	DC Electrical Distribution	3.8	4.5	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ This is a Generic, no stem statement is associated.	Knowledge of how abnormal operating procedures are used in conjunction with EOPs.
064A1.02	Emergency Diesel Generator	2.5	2.8	☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ ☐ Ability to predict and/or monitor changes in parameters associated with operating the (SYSTEM) controls including:(CFR: 41.5 / 45.5)	Fuel consumption rate with load
064K1.04	Emergency Diesel Generator	3.6	3.9	☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of the physical connections and/or cause-effect relationships between (SYSTEM) and the following:(CFR: 41.2 to 41.9 / 45.7 to 45.8)	DC distribution system
073A4.02	Process Radiation Monitoring	3.7	3.7	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ Ability to manually operate and/or monitor in the control room:(CFR: 41.7 / 45.5 to 45.8)	Radiation monitoring system control panel
076A4.01	Service Water	2.9	2.9	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ Ability to manually operate and/or monitor in the control room:(CFR: 41.7 / 45.5 to 45.8)	SWS pumps

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KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1 K2 K3 K4 K5 K6 A1 A2 A3 A4 G	TOPIC:
078K2.02	Instrument Air	3.3	3.5	☐ ☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of electrical power supplies to the following:(CFR: 41.7)	Emergency air compressor
103A1.01	Containment	3.7	4.1	☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ ☐ Ability to predict and/or monitor changes in parameters associated with operating the (SYSTEM) controls including:(CFR: 41.5 / 45.5)	Containment pressure, temperature and humidity

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KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1 K2 K3 K4 K5 K6 A1 A2 A3 A4 G	TOPIC:
011K1.02	Pressurizer Level Control	3.7	3.8	☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of the physical connections and/or cause-effect relationships between (SYSTEM) and the following:(CFR: 41.2 to 41.9 / 45.7 to 45.8)	RCS
014K5.02	Rod Position Indication	2.8	3.3	☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of the operational implications of the following concepts as they apply to the (SYSTEM):(CFR: 41.5 / 45.7)	RPIS independent of demand position
015K3.04	Nuclear Instrumentation	3.4	4.0	☐ ☐ ☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of the effect that a loss or malfunction of the (SYSTEM) will have on the following:(CFR: 41.7 / 45.6)	ICS.
016K4.01	Non-nuclear Instrumentation	2.8	2.9	☐ ☐ ☐ ☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of (SYSTEM) design feature(s) and or interlock(s) which provide for the following:(CFR: 41.7)	Reading of NNIS channel values outside control room
017A3.02	In-core Temperature Monitor	3.4	3.1	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ Ability to monitor automatic operations of the (SYSTEM) including:(CFR: 41.7 / 45.5)	Measurement of in-core thermocouple temperatures at panel outside control room
027K2.01	Containment Iodine Removal	3.1	3.4	☐ ☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Knowledge of electrical power supplies to the following:(CFR: 41.7)	Fans
035K6.02	Steam Generator	3.1	3.5	☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ ☐ ☐ Knowledge of the effect that a loss or malfunction of the following will have on the (SYSTEM):(CFR: 41.7 / 45.7)	Secondary PORV

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KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1 K2 K3 K4 K5 K6 A1 A2 A3 A4 G	TOPIC:
041A1.02	Steam Dump/Turbine Bypass Control	3.1	3.2	☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ ☐ Ability to predict and/or monitor changes in parameters associated with operating the (SYSTEM) controls including:(CFR: 41.5 / 45.5)	Steam pressure
045G2.1.25	Main Turbine Generator	3.9	4.2	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ This is a Generic, no stem statement is associated.	Ability to interpret reference materials such as graphs, monographs and tables which contain performance data.
071A4.16	Waste Gas Disposal	2.5	2.2	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ Ability to manually operate and/or monitor in the control room:(CFR: 41.7 / 45.5 to 45.8)	Waste gas decay tank shifts

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ES-401, REV 9 **T3 PWR EXAMINATION OUTLINE** **FORM ES-401-3** 10/29/08

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
G2.1.14	Conduct of operations	3.1	3.1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of criteria or conditions that require plant-wide announcements, such as pump starts, reactor trip, mode changes, etc.
G2.1.3	Conduct of operations	3.7	3.9	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of shift or short term relief turnover practices.
G2.1.37	Conduct of operations	4.3	4.6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of procedures, guidelines or limitations associated with reactivity management
G2.2.13	Equipment Control	4.1	4.3	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of tagging and clearance procedures.
G2.2.37	Equipment Control	3.6	4.6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to determine operability and/or availability of safety related equipment
G2.3.11	Radiation Control	3.8	4.3	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to control radiation releases.
G2.3.4	Radiation Control	3.2	3.7	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of radiation exposure limits under normal and emergency conditions

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ES-401, REV 9 **T3 PWR EXAMINATION OUTLINE** **FORM ES-401-~~2~~ 3**

PBR 10/29/08

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
G2.4.13	Emergency Procedures/Plans	4.0	4.6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of crew roles and responsibilities during EOP usage.
G2.4.23	Emergency Procedures/Plans	3.4	4.4	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of the bases for prioritizing emergency procedure implementation during emergency operations.
G2.4.38	Emergency Procedures/Plans	2.4	4.4	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to take actions called for in the facility emergency plan, including supporting or acting as emergency coordinator.

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ES-401, REV 9 **SRO T1G1 PWR EXAMINATION OUTLINE** **FORM ES-401-2**

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1 K2 K3 K4 K5 K6 A1 A2 A3 A4 G	TOPIC:
008AG2.4.2	Pressurizer Vapor Space Accident / 3	4.5	4.6	☐☐☐☐☐☐☐☐☐☐☑ This is a Generic, no stem statement is associated.	Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions.
009EA2.37	Small Break LOCA / 3	4.2	4.5	☐☐☐☐☐☐☐☐☑☐☐☐ Ability to determine and interpret the following as they apply to (EMERGENCY PLANT EVOLUTION):(CFR: 41.10 / 43.5 / 45.13)	Existence of adequate natural circulation
011EA2.14	Large Break LOCA / 3	3.6	4	☐☐☐☐☐☐☐☐☑☐☐☐ Ability to determine and interpret the following as they apply to (EMERGENCY PLANT EVOLUTION):(CFR: 41.10 / 43.5 / 45.13)	Actions to be taken if limits for PTS are violated
015AA2.01	RCP Malfunctions / 4	3	3.5	☐☐☐☐☐☐☐☐☑☐☐☐ Ability to determine and interpret the following as they apply to ABNORMAL PLANT EVOLUTION):(CFR: 41.10 / 43.5 / 45.13)	Cause of RCP failure
022AG2.1.28	Loss of Rx Coolant Makeup / 2	4.1	4.1	☐☐☐☐☐☐☐☐☐☐☐☑ This is a Generic, no stem statement is associated.	Knowledge of the purpose and function of major system components and controls.
077AG2.4.45	Generator Voltage and Electric Grid Disturbances / 6	4.1	4.3	☐☐☐☐☐☐☐☐☐☐☐☑ This is a Generic, no stem statement is associated.	Ability to prioritize and interpret the significance of each annunciator or alarm.

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ES-401, REV 9 **SRO T1G2 PWR EXAMINATION OUTLINE** **FORM ES-401-2**

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1 K2 K3 K4 K5 K6 A1 A2 A3 A4 G	TOPIC:
068AG2.4.47	Control Room Evac. / 8	4.2	4.2	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ This is a Generic, no stem statement is associated.	Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material.
076AA2.04	High Reactor Coolant Activity / 9	2.6	3	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ Ability to determine and interpret the following as they apply to ABNORMAL PLANT EVOLUTION):(CFR: 41.10 / 43.5 / 45.13)	Process effluent radiation chart recorder
we01EG2.4.1	Rediagnosis / 3	4.0	4.2	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ This is a Generic, no stem statement is associated.	Knowledge of abnormal condition procedures.
WE16EA2.1	High Containment Radiation / 9	2.9	3.3	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ Ability to determine and interpret the following as they apply to (EMERGENCY PLANT EVOLUTION):(CFR: 41.10 / 43.5 / 45.13)	Facility conditions and selection of appropriate procedures during abnormal and emergency operations.

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ES-401, REV 9 **SRO T2G1 PWR EXAMINATION OUTLINE** **FORM ES-401-2**

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1 K2 K3 K4 K5 K6 A1 A2 A3 A4 G	TOPIC:
003A2.03	Reactor Coolant Pump	2.7	3.1	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ Ability to (a) predict the impacts of the following on the (SYSTEM) and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operation:(CFR: 41.5 / 43.5 / 45.3 / 45.13)	Problems associated with RCP motors, including faulty motors and current, winding and bearing temperature problems
026G2.4.20	Containment Spray	3.8	4.3	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ This is a Generic, no stem statement is associated.	Knowledge of operational implications of EOP warnings, cautions and notes.
039A2.01	Main and Reheat Steam	3.1	3.2	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ Ability to (a) predict the impacts of the following on the (SYSTEM) and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operation:(CFR: 41.5 / 43.5 / 45.3 / 45.13)	Flow paths of steam during a LOCA
062G2.4.18	AC Electrical Distribution	3.3	4.0	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ This is a Generic, no stem statement is associated.	Knowledge of the specific bases for EOPs.
076A2.02	Service Water	2.7	3.1	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ Ability to (a) predict the impacts of the following on the (SYSTEM) and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operation:(CFR: 41.5 / 43.5 / 45.3 / 45.13)	Service water header pressure

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ES-401, REV 9 **SRO T2G2 PWR EXAMINATION OUTLINE** **FORM ES-401-2**

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1 K2 K3 K4 K5 K6 A1 A2 A3 A4 G	TOPIC:
055G2.4.49	Condenser Air Removal	4.6	4.4	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ This is a Generic, no stem statement is associated.	Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.
071A2.05	Waste Gas Disposal	2.5	2.6	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ Ability to (a) predict the impacts of the following on the (SYSTEM) and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operation:(CFR: 41.5 / 43.5 / 45.3 / 45.13)	Power failure to the ARM and PRM Systems
072A2.02	Area Radiation Monitoring	2.8	2.9	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ ☐ Ability to (a) predict the impacts of the following on the (SYSTEM) and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operation:(CFR: 41.5 / 43.5 / 45.3 / 45.13)	Detector failure

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ES-401, REV 9 **SRO T3 PWR EXAMINATION OUTLINE** **FORM ES-401-3** PBC 10/24/08

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
G2.1.25	Conduct of operations	3.9	4.2	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to interpret reference materials such as graphs, monographs and tables which contain performance data.
G2.2.21	Equipment Control	2.9	4.1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of pre- and post-maintenance operability requirements.
G2.2.6	Equipment Control	3.0	3.6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of the process for making changes to procedures
G2.3.13	Radiation Control	3.4	3.8	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of radiological safety procedures pertaining to licensed operator duties
G2.3.14	Radiation Control	3.4	3.8	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities
G2.4.27	Emergency Procedures/Plans	3.4	3.9	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of "fire in the plant" procedures.
G2.4.28	Emergency Procedures/Plans	3.2	4.1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of procedures relating to emergency response to sabotage.

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ES-401 Record of Rejected K/As Form ES-401-4

Sequoyah 2009 RO exam

Tier / Group	Randomly Selected K/A	Reason for Rejection
1/1	062 AK3.04	Service water discharge header flow effected by loss of CCW. Difficulty in writing a quality question because losing CCW would only cause less heat transfer to the ERCW and the discharge header flow would be the same. Replaced by Chief Examiner on 09/02/08 with KA 062 AK3.03
2/1	004 A3.16	This K/A is similar to 024 AA2.01 which was also selected for the exam. Replaced by Chief Examiner on 09/02/08 with KA 004 A3.11
2/2	017 A3.02	Measurement of Incore thermocouples outside MCR.. Thermocouples can be read outside MCR via the PEDS programs on desktop computers. Difficult to write a quality question. Replaced by Chief Examiner on 09/02/08 with KA 017 A3.01
3	G2.4.38	The K/A importance rating is 2.4 (less than 2.5) Replaced by Chief Examiner on 09/02/08 with KA G2.4.39

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ES-401 **Record of Rejected K/As** Form ES-401-4

Sequoyah 2009 SRO exam

Tier / Group	Randomly Selected K/A	Reason for Rejection
1/2	076AA2.04	No process effluent radiation chart recorder for RCS activity Replaced by Chief examiner on 09/02/08 with KA 076 AA2.02
2/2	055 G2.4.9	No immediate operator actions for condenser air removal system unless can write question relating to turbine trip criteria. Replaced by Chief examiner on 09/02/08 with KA 055 G2.4.3

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Outline Development Methodology

Outlines for the Sequoyah Nuclear Plant - Reactor and Senior Reactor Operator Initial Examinations- 05000327/2009301 and 05000328/2009301 written examinations were developed by the NRC.

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ES-301 **Administrative Topics Outline** **Form ES-301-1**

Facility: Sequoyah 1 & 2 Date of Examination: 1/2009

Examination Level: RO ☑ SRO ☐ Operating Test Number: NRC

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations	M, R	2.1.5 Ability to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc. 2.9* / 3.9 **JPM: Evaluate Overtime Requirements**
Conduct of Operations	D, R	2.1.23 Ability to perform specific system and integrated plant procedures during all modes of plant operation. 4.3 / 4.4 **JPM: Calculate Manual Makeup to the Volume Control Tank (JPM 005)**
Equipment Control	N, S	2.2.12 Knowledge of surveillance procedures. 3.7 / 4.1 **JPM: Perform Monthly Shift Log 0-SI-OPS-000-003.M**
Radiation Control	M, R	2.3.7 Ability to comply with radiation work permit requirements during normal or abnormal conditions. 3.5 / 3.6 **JPM: 2A RHR Heat Exchanger Radiological Work Permit and Survey Map Usage (JPM 180)**
Emergency Procedures/Plan		**N/A**

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, (S)imulator, or Class(R)oom
(D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes)
(N)ew or (M)odified from bank (≥ 1)
(P)revious 2 exams (≤ 1; randomly selected)

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RO Admin JPM Summary

A1a Determine when conditions exist that requires approval to exceed work hour restrictions. Modified JPM

A1b Perform calculation of the correct amount of water and boric acid required to manually raise the level in the VCT. Bank JPM

A2 Perform a portion of Monthly Shift Log surveillance instruction 1-SI-OPS-000-003.M and recognize inoperable instruments. New JPM

A3 Using a survey map and radiological work permit, determine conditions in the room and the required dose monitoring and protective clothing required while inside the room. Modified JPM

A4 Not Applicable

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ES-301 **Administrative Topics Outline** **Form ES-301-1**

Facility: Sequoyah 1 & 2 Date of Examination: 1/2009

Examination Level: RO ☐ SRO ☑ Operating Test Number: NRC

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations	M, R	2.1.5 Ability to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc. 2.9* / 3.9 **JPM: Evaluate Overtime Requirements**
Conduct of Operations	D, R	2.1.23 Ability to perform specific system and integrated plant procedures during all modes of plant operation. 4.3 / 4.4 **JPM: Calculate Manual Makeup to the Volume Control Tank. (JPM 005)**
Equipment Control	D, R	2.2.12 Knowledge of surveillance procedures. 3.7 / 4.1 **JPM: Review a completed surveillance for accuracy. (JPM 175 AP)**
Radiation Control	N, R	2.3.11 Ability to Approve Release Permits. 3.8 / 4.3 **JPM: Approval of a Waste Gas Decay Tank Release.**
Emergency Procedures/Plan	D, S	2.4.38 Ability to take actions called for in the facility emergency plan, including supporting or acting as emergency coordinator if required. 2.4 / 4.4 **JPM: Classify the Event per the REP (Primary System Leakage with Potential Loss of Cntmt). (JPM #18)**

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, (S)imulator, or Class(R)oom
(D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes)
(N)ew or (M)odified from bank (≥ 1)
(P)revious 2 exams (≤ 1; randomly selected)

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SRO Admin JPM Summary

A1a Determine when conditions exist that requires approval to exceed work hour restrictions. Modified JPM.

A1b Perform calculation to manually raise the level in the VCT. Bank JPM

A2 Review a surveillance instruction for Shutdown margin and identify the incorrect Tavg was entered into the calculation. Bank JPM #175-AP.

A3 Determine requirements for releasing a Waste Gas Decay Tank including hold-up time requirements, approval required in outside normal release hours, requirements with radiation monitor out of service and requirement if monitor is not repaired in identified ODCM time. New JPM

A4 Evaluate plant conditions for E-Plan entry, classification, and required notifications in accordance with Radiological Emergency Plan procedures. Bank JPM #18.

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ES-301 **Control Room/In-Plant Systems Outline** **Form ES-301-2**

Facility: Sequoyah 1 & 2 Date of Examination: 1/2009

Exam Level: RO ☑ SRO-I ☐ SRO-U ☐ Operating Test No.: NRC

Control Room Systems@ (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U, including 1 ESF)

	System / JPM Title	Type Code*	Safety Function
a.	001 Control Rod Drive System (A2.11 4.4/4.7) Perform 0-SI-OPS-085-011.0	N, A, S	1
b.	003 Reactor Coolant Pump System (A2.03 2.7/3.1) Start #1 RCP in Mode 3 (182-AP)	D, A, L, S	4P
c.	E02 SI Termination (EA1.1 4.0/3.9) Terminate SI and Re-establish Charging Flow (JPM 027)	M, A, S	3
d.	040 Steam Line Rupture (AA2.01 4.2/4.7) Faulted SG Isolation with MSIV Stuck Open (JPM 058-AP2)	M, A, S	4S
e.	064 Emergency Diesel Generators (A1.08 3.1/3.4) Perform D/G Load Test on 1B-B D/G (JPM 077)	D, S	6
f.	028 Hydrogen Recombiner and Purge Control System (A4.03 3.1/3.3) Place 1B H2 Analyzer in Service	D, S	5
g.	008 Component Cooling Water System (A3.02 3.2/3.2) Swap Thermal Barrier Booster Pumps (JPM 073)	D, S	8
h.	015 Nuclear Instrumentation System (A4.02 3.9/3.9) Reinstate Source Range Detectors (JPM 119-AP)	D, A, L, S	7
	In-Plant Systems@ (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)		
i.	004 Chemical and Volume Control System (A2.14 3.8/3.9) Perform Boration of RCS from Outside MCR (JPM 006)	D, E, R	1
j.	062 Loss of Nuclear Service Water (AK3.03 4.0/4.2) Installation of Temporary Cooling (HPFP) to CCP 1A-A or 1B-B Oil Coolers	D, E, R	4S
k.	064 Emergency Diesel Generators (K1.05 3.4/3.9) Align Starting Air for Service on 2A-A D/G (JPM 023-2)	D	6

@ All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all 5 SRO-U systems must serve different safety functions; in-plant systems and functions may overlap those tested in the control room.

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* 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
(EN)gineered safety feature	- / - / ≥1 (control room system)
(L)ow-Power / Shutdown	≥ 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	

JPM Summary

A. The rod exercise surveillance instruction will be performed for 2 banks of control rods. During the second bank movement, the rod will being moving without a demand and result in a trip of the reactor being required. New alternate path JPM

B. With the plant in Mode 3 and the other RCPs already running, RCP #1 will be placed in service. After starting RCP #1 will experience high stator winding temperatures which will require the pump to be stopped. Bank alternate path low power JPM.

C. With the shutdown boards being powered from the diesel generator, the steps to terminate ECCS flow and to re-establish charging flow in accordance with ES-1.1, SI Termination will be required. JPM will require using procedure RNOs to lock out a charging pump and to address the failure of the normal charging valve to open. Bank modified alternate path JPM.

D. Response to a faulted SG with a stuck open MSIV will require completing steps to identify and isolate the faulted SG in accordance with E-2, Faulted Steam Generator Isolation. Bank modified alternate path JPM.

E. An operability test of D/G 1B-B will require manually starting and loading the D/G in accordance with 1-SI-OPS-082-007.B, Electrical Power System Diesel Generator 1B-B. Bank JPM.

F. 1B Hydrogen analyzer will be restored to service following maintenance in accordance with the system operating instruction. Bank JPM

G. Swapping thermal barrier booster pumps will require starting the 1A-A pump and securing the 1B-B pump in accordance with 1-SO-70-1, Component Cooling Water System "A" Train. Bank JPM.

H. A failed Intermediate Range channel will require manually reinstating Source Range detectors following a reactor trip in accordance with ES-0.1, Reactor Trip Response. Bank alternate path JPM.

I. Evacuation of the Main Control Room will require manually borating the RCS using the emergency boration valve in accordance with AOP-C.04, Control Room Inaccessibility. Bank JPM.

J. The locations, connections, and alignment required to establish temporary cooling to CCP-1A-A in accordance with AOP-M.01 due to a loss of ERCW. Bank JPM

K. Completion of maintenance work on the 2A-A D/G starting air system will require aligning the system for service in accordance with 0-SO-82-7, Diesel Generator 2A-A Support Systems. Bank JPM.

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ES-301 **Control Room/In-Plant Systems Outline** **Form ES-301-2**

Facility: Sequoyah 1 & 2 Date of Examination: 1/2009

Exam Level: RO ☐ SRO-I ☑ SRO-U ☐ Operating Test No.: NRC

Control Room Systems@ (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U, including 1 ESF)

	System / JPM Title	Type Code*	Safety Function
a.	001 Control Rod Drive System (A2.11 4.4/4.7) Perform 0-SI-OPS-085-011.0	N, A, S	1
b.	003 Reactor Coolant Pump System (A2.03 2.7/3.1) Start #1 RCP in Mode 3 (182-AP)	D, A, S	4P
c.	E02 SI Termination (EA1.1 4.0/3.9) Terminate SI and Re-establish Charging Flow (JPM 027)	M, A, S	3
d.	040 Steam Line Rupture (AA2.01 4.2/4.7) Faulted SG Isolation with MSIV Stuck Open (JPM 058-AP2)	M, A, S	4S
e.	064 Emergency Diesel Generators (A1.08 3.1/3.4) Perform D/G Load Test on 1B-B D/G (JPM 077)	D, S	6
f.	028 Hydrogen Recombiner and Purge Control System (A4.03 3.1/3.3) Place 1B H2 Analyzer in Service	D, S	5
g.	**NOT USED for SRO-I**		
h.	015 Nuclear Instrumentation System (A4.02 3.9/3.9) Reinstate Source Range Detectors (JPM 119-AP)	D, A, L, S	7
In-Plant Systems@ (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)			
i.	004 Chemical and Volume Control System (A2.14 3.8/3.9) Perform Boration of RCS from Outside MCR (JPM 006)	D, E, R	1
j.	062 Loss of Nuclear Service Water (AK3.03 4.0/4.2) Installation of Temporary Cooling (HPFP) to CCP 1A-A or 1B-B Oil Coolers	D, E, R	4S
k.	064 Emergency Diesel Generators (K1.05 3.4/3.9) Align Starting Air for Service on 2A-A D/G (JPM 023-2)	D	6

@ All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all 5 SRO-U systems must 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

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(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
(EN)gineered safety feature	- / - / ≥1 (control room system)
(L)ow-Power / Shutdown	≥ 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	

JPM Summary

A. The rod exercise surveillance instruction will be performed for 2 banks of control rods. During the second bank movement, the rod will being moving without a demand and result in a trip of the reactor being required. New alternate path JPM

B. With the plant in Mode 3 and the other RCPs already running, RCP #1 will be placed in service. After starting RCP #1 will experience high stator winding temperatures which will require the pump to be stopped. Bank alternate path low power JPM.

C. With the shutdown boards being powered from the diesel generator, the steps to terminate ECCS flow and to re-establish charging flow in accordance with ES-1.1, SI Termination will be required. JPM will require using procedure RNOs to lock out a charging pump and to address the failure of the normal charging valve to open. Bank modified alternate path JPM.

D. Response to a faulted SG with a stuck open MSIV will require completing steps to identify and isolate the faulted SG in accordance with E-2, Faulted Steam Generator Isolation. Bank modified alternate path JPM.

E. An operability test of D/G 1B-B will require manually starting and loading the D/G in accordance with 1-SI-OPS-082-007.B, Electrical Power System Diesel Generator 1B-B. Bank JPM.

F. 1B Hydrogen analyzer will be restored to service following maintenance in accordance with the system operating instruction. Bank JPM

G. not used

H. A failed Intermediate Range channel will require manually reinstating Source Range detectors following a reactor trip in accordance with ES-0.1, Reactor Trip Response. Bank alternate path JPM.

I. Evacuation of the Main Control Room will require manually borating the RCS using the emergency boration valve in accordance with AOP-C.04, Control Room Inaccessibility. Bank JPM.

J. The locations, connections, and alignment required to establish temporary cooling to CCP-1A-A in accordance with AOP-M.01 due to a loss of ERCW. Bank JPM

K. Completion of maintenance work on the 2A-A D/G starting air system will require aligning the system for service in accordance with 0-SO-82-7, Diesel Generator 2A-A Support Systems. Bank JPM.